One Charlotte, One Water

A House-to-Harbor Approach Joining County Government, Regional Agencies, and the Citizens We Serve to Protect Our Water For Future Generations

One Water Task Summary

The following is a summary of One Water Tasks discussed in this iteration of the Plan. For additional information on these tasks as well as the Visions and Pathways that drive them, please see the associated section of this document.

Monitoring, Modeling, and Watershed Improvement Planning	
Task Type	**Vision Task**
	Install comprehensive water flow and elevation monitoring system to track pollutant loading rates, identify areas of flood and tidal surge risk, and calibrate/validate predictive flow and pollutant loading models.
	Build initial iteration of the *Spatially Integrated Model for Pollutant Loading Estimates* (SIMPLE) pollutant loading model to identify possible sources and drivers of pollutant discharges in the county.
	Coordinate with regional partners to initiate Charlotte Harbor and Lemon Bay water circulation study to determine hydrologic dynamics in areas experiencing chronic annual macroalgae and cyanobacteria blooms.
	Begin developing restoration plans based on prioritization described in this plan. For those impaired waterbodies recommended for TMDL development, confer with relevant partners to request FDEP's prioritization of these areas for modeling and restoration strategy development.
	Participate in and support implementing recommendations emerging from the regional harmful algal bloom working group.
	For waterbodies indicating potential water quality impacts but for which no impairment designation has been established, determine data needs as applicable and implement enhanced monitoring in the area to support assessment by FDEP. In addition, expand current monitoring program to account for impacts from National Pollutant Discharge Elimination System (NPDES) wastewater discharge facilities and other point sources.
	Create Charlotte Harbor nutrient loading reduction and management strategy, to be integrated with regional agencies' management strategies for restoring the health of Charlotte Harbor. Work with partner agencies to develop an annual "state of the estuary" one-pager to describe current water chemistry and ecological health of Charlotte Harbor, in order to maintain focus on addressing management gaps. Participate in and support implementing recommendations emerging from the regional Charlotte Harbor/Lemon Bay harmful algal bloom working group.
	Implement central data management, review, and storage warehouse for all water quality and quantity monitoring efforts collected or funded by the county.
	Partner with regional monitoring agencies as needed to create complimentary, cooperative monitoring programs. Assist partner agencies in streamlining data review and management processes to maximize the efficiency and accuracy of monitoring activities in our estuary.

Stormwater Management	
Task Type	**Vision Task**
	Initiate the first phases of the stormwater maintenance optimization process, identifying waterway-specific maintenance needs and upgrading maintenance communications/logistics.
	Review and Revise the County Stormwater Master Plan as needed, incorporating portions of the county not currently included in the Plan, and identifying opportunities for enhancing stormwater treatment and levels of service considering revised 2024 stormwater rule, and newly acquired information on flood risks due to current and future coastal storm surge scenarios.
	Install water elevation monitoring networks to track flow rates, flood risk, and tidal influence on water drainage in the region.
	Based on output from the county Vulnerability Assessment and Watershed Master Plan, develop predictive tools as needed for stormwater runoff and drainage rates to assist in: -prioritizing enhanced water management in areas of higher flood risk. -developing predictive flood risk tools to assist in evaluating impacts of changing land use in an area.
	Based on modeling and observed drainage characteristics, establish adaptation action areas, identify opportunities and options for neighborhood-scale detention and water quality improvement to serve residential and/or commercial areas as needed.
	Implement pilot eelgrass planting projects in select waterways to evaluate water quality improvement efficacy and considerations related to flood control.
	Pilot the installation of floating canal barrier systems to sequester and minimize the spread of nuisance floating vegetation throughout the canals, to reduce the frequency/need for treatment.
	Pilot installation of stormwater filter/infiltration system in association with canal systems exhibiting higher pollutant concentrations than other waterways in the region.
	Develop pond monitoring and stewardship program to assist residents in identifying opportunities for enhancing private residential ponds. Evaluate options for including cost-share program to implement remediation solutions such as plantings and aeration structures.

Drinking Water and Wastewater Management	
Task Type	**Vision Task**
	Conduct a needs and cost analysis of expanding sewer and potable water service to portions of west Port Charlotte.
	Increase groundwater elevation and salinity monitoring network to track saltwater intrusion trends in the region, especially in areas with higher densities of groundwater withdrawal wells.
	In cooperation with other relevant departments (such as Community Development), identify opportunities to organize and implement enhanced education and enforcement process to reduce construction-related breaks in water supply and wastewater transmission pipes.

	Initiate reclaimed water user irrigation education campaign, providing guidance on water content and application to reduce fertilizer use and inappropriate irrigation application.

**** NOTE:** The Utilities Department has developed multiple plans with recommendations related to water supply and treatment processes while addressing water quality and quantity considerations. The measures in those plans should be considered components of the county's One Water Program, with the recommendations in this document intended to be complimentary to those efforts.*

Policy, Programmatic, and Organizational Activities	
Categories	**Task**
	As a component of the proposed citizen science program, initiate a comprehensive stewardship marketing campaign to better inform the public of the part they play in maintaining a healthy water system from house to harbor.
	Establish Environmental Analyst, Technician, and Programs Coordinator positions to assist with reporting, prioritization, analysis, and recommendations associated with the county water quality program.
	Prioritize green stormwater infrastructure (GSI) implementation at county properties, to serve as demonstration measures for private and residential development and be held as a benchmark in the county for integration of comprehensive water management/ treatment processes.
	Evaluate the need, feasibility, cost/benefit, and authority to alter the current fertilizer ordinance based on recent research regarding timing and duration of fertilizer bans.
	Establish water program steering and collaboration board comprised of residents, representatives from local government entities, and water-related commercial interests.
	Implement Comp Plan FLU Policy 2.3.2 by formalizing collaborative efforts with the regional water protection agencies through the implementation of Charlotte County Water Improvement Workgroup.
	Support and participate in the development of a statewide One Water coalition.
	Create central online water resource education hub to provide information to the public on water management considerations in the region as well as address frequently asked questions/concerns posed to county departments.
	Support and assist in the renewal of Conservation Charlotte.

Initial Implementation Schedule

Near Term (complete within 1 year of Plan acceptance):

- Initiate water quality/quantity monitoring infrastructure and pollutant loading models to support development of Reasonable Assurance Plans (RAP) and other pollutant reduction/minimization products.
- Initiate RAP development based on prioritization scheme recommended in the plan, with additional focus on creating the data/modeling resources needed to support RAP development for Charlotte Harbor.

- Centralize and standardize county data storage, retrieval, and evaluation processes.
- Implement water treatment/management pilot projects to determine feasibility for more widespread adoption (e.g eelgrass-based treatment, floating vegetation sequestration barriers, further sediment nutrient analysis and remediation measures).
- Expand water elevation network and conduct flow/elevation data gap analysis for flow and stormwater model development.
- Identify and commence development of additional outreach programming related to function and stewardship of canals and drainage ways.
- Initiate the first phases of the stormwater maintenance optimization process, identifying waterway-specific maintenance needs and upgrading maintenance communications/logistics.
- Initiate comprehensive stewardship marketing campaign to better inform the public of the part they play in maintaining a healthy water system from house to harbor.
- Establish water program advisory and collaboration board comprised of residents, representatives from local public entities, and water-related commercial interests.
- Create central online water resource education hub to provide information to the public on water management considerations in the region as well as address frequently asked questions/concerns posed to county departments.
- Advocate, promote, and participate in regionalized efforts to address systemic water quality/quantity issues in Charlotte Harbor and contributing basins, such as the statewide One Water consortium.
- Determine needs for increased groundwater elevation, quality and salinity monitoring network to track water quality trends in the region, especially in areas with higher densities of groundwater withdrawal wells.
- Evaluate current education and enforcement process around construction-related breaks in water supply and wastewater transmission pipes and investigate opportunities and feasibility of enacting additional proactive measures to reduce frequency of breaks.
- Initiate reclaimed water user irrigation education campaign, providing guidance on water content and application to reduce fertilizer use and inappropriate irrigation application.

Mid Term (initiate upon Plan acceptance, completion dependent on scope of task):

- For waterbodies not impaired, develop watershed management/stewardship plans.
- For those impaired waterbodies recommended for TMDL development, confer with relevant partners to request FDEP's prioritization of these areas.
- Coordinate with partner agencies in regionalizing predictive stormwater modeling efforts.
- Conduct a needs and cost analysis of expanding sewer and potable water service to currently undeveloped regions of west Port Charlotte.
- Identify feasibility and funding options for upgrading certain transmission systems in the county.

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SECTION 1: Introduction and Origin of the Plan

As a designated Outstanding Florida Water (OFW) and principal driver of economic activity for the region, the Charlotte Harbor and all waters that feed it are of paramount concern to the Charlotte County Commission and citizens. Tourism is a primary economic draw to this area, with charter fishing and other water-related recreational activities being especially popular. The harbor and its surrounding natural environs are estimated to bring upward of $1.49 billion in economic benefits and $1.1 billion in recreational spending to Charlotte County per year. Maintaining the ecological viability of Charlotte Harbor is thus essential to maintaining the economic viability of Charlotte County.

Thanks in part to the county's competitive cost of living in relation to other coastal counties in the region, Charlotte Harbor and Lemon Bay have proven to be major attractants for residents and businesses alike. Like much of Southwest Florida, Charlotte County has experienced a recent boom in residential development (**Figure 1**). From 2016–2021, the jobs market in Charlotte County increased by 6.1 percent, outpacing the national growth rate.

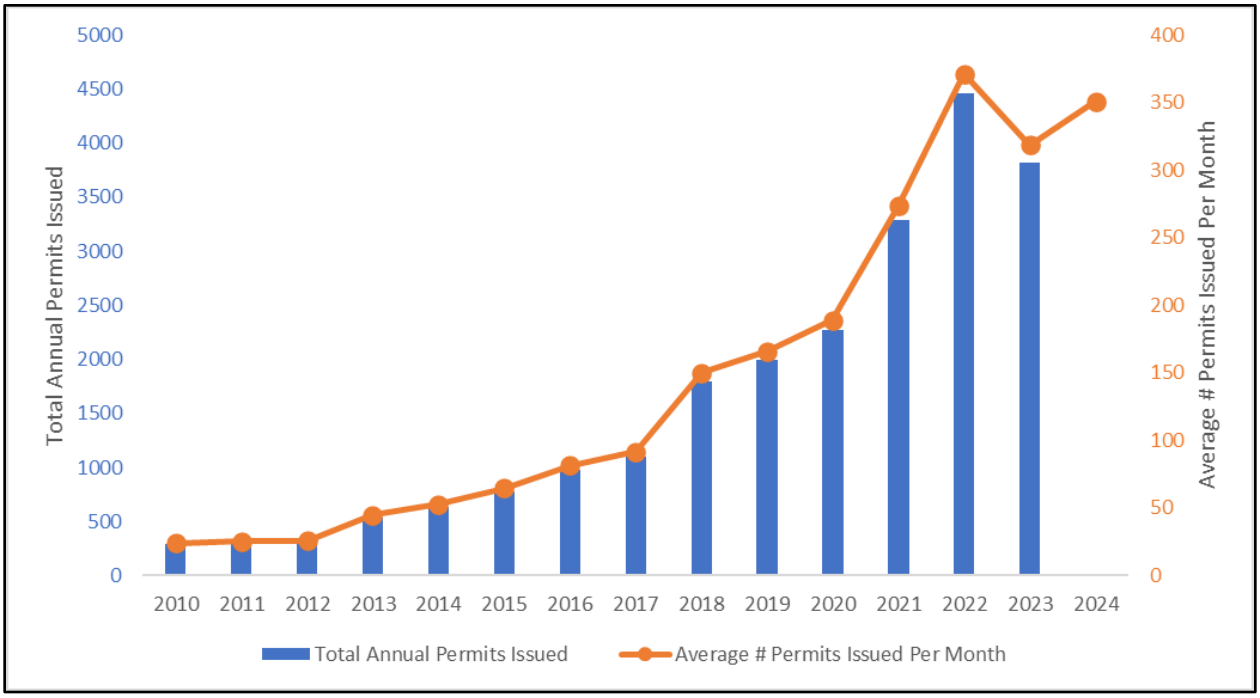


Figure 1. Single-family building permits issued in Charlotte County through July 2024.

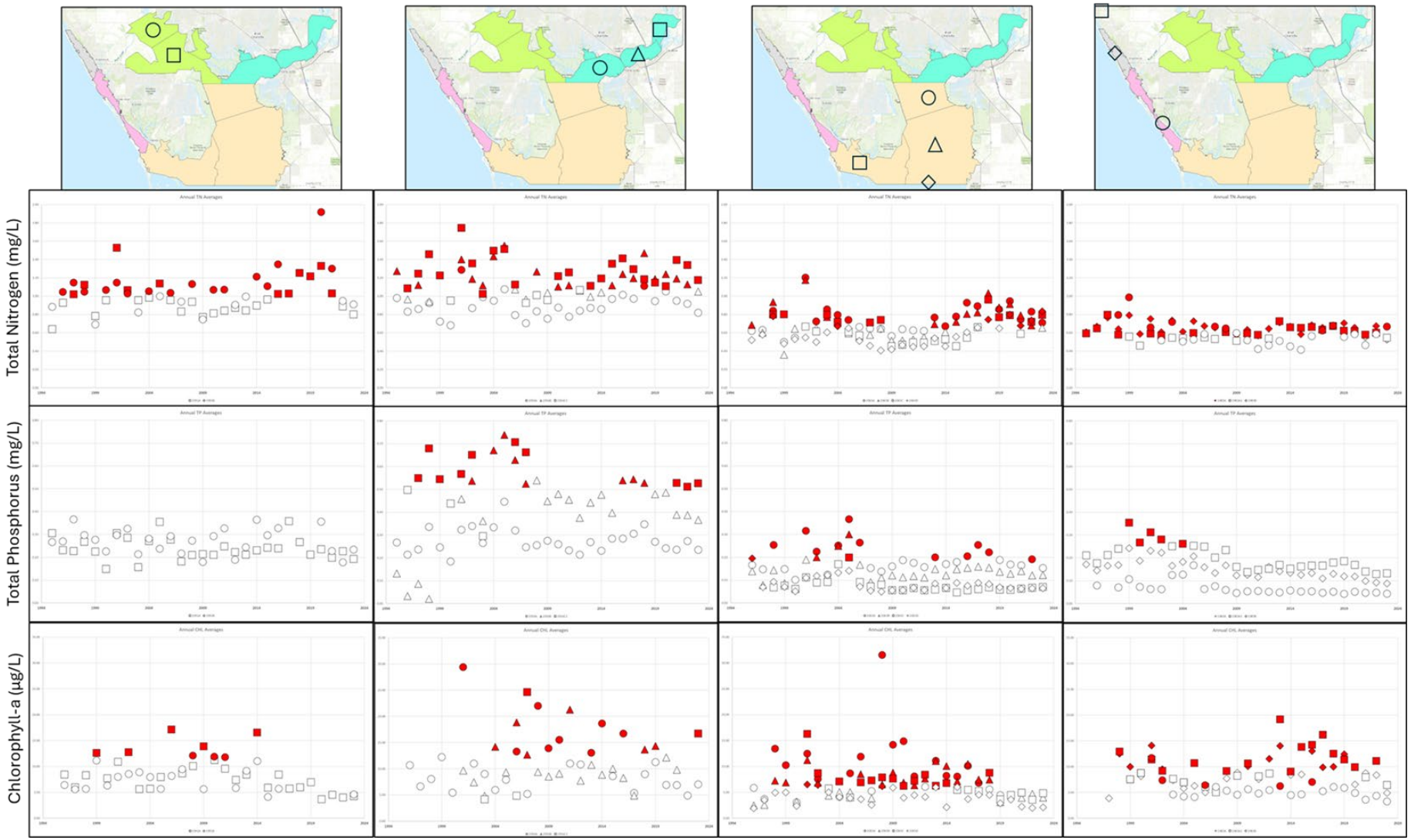
Charlotte Harbor is facing multiple environmental challenges. The analysis of results from long standing and recently implemented water quality and seagrass monitoring programs have suggested that overall, there is a degrading trend in water quality in the Harbor. This downward trend has led to downward shifts in the health and proliferation of seagrass habitat – a key component in the lifecycle of most marine animals.

Coinciding with the loss of seagrass abundance has been a proliferation of various macroalgae and cyanobacteria species, such as *Caulerpa fastigiata* and *Dapis* sp. Anecdotal reports from regional water managers imply algal bloom conditions were observed with some frequency in the early 2010s, with widespread blooms occurring shortly after Hurricane Irma and a subsequent protracted red tide bloom in 2018–2019. Large-scale bloom events in Charlotte Harbor have been documented as recently as the 2024 wet season (**Figure 3**). In addition, recent regional data analysis efforts indicate nitrogen concentrations are trending upwards in the upper reaches of Charlotte Harbor, particularly the Tidal Peace, Tidal Myakka, and East and West Walls of Charlotte Harbor (**Figure 2**).

Figure 2. Nutrient Trends in Charlotte Harbor-Lemon Bay, 1996-2023

Red Icons = Exceedance of nutrient criteria for that constituent/region

Source: Florida EPD Impaired Waters Rule Database 66



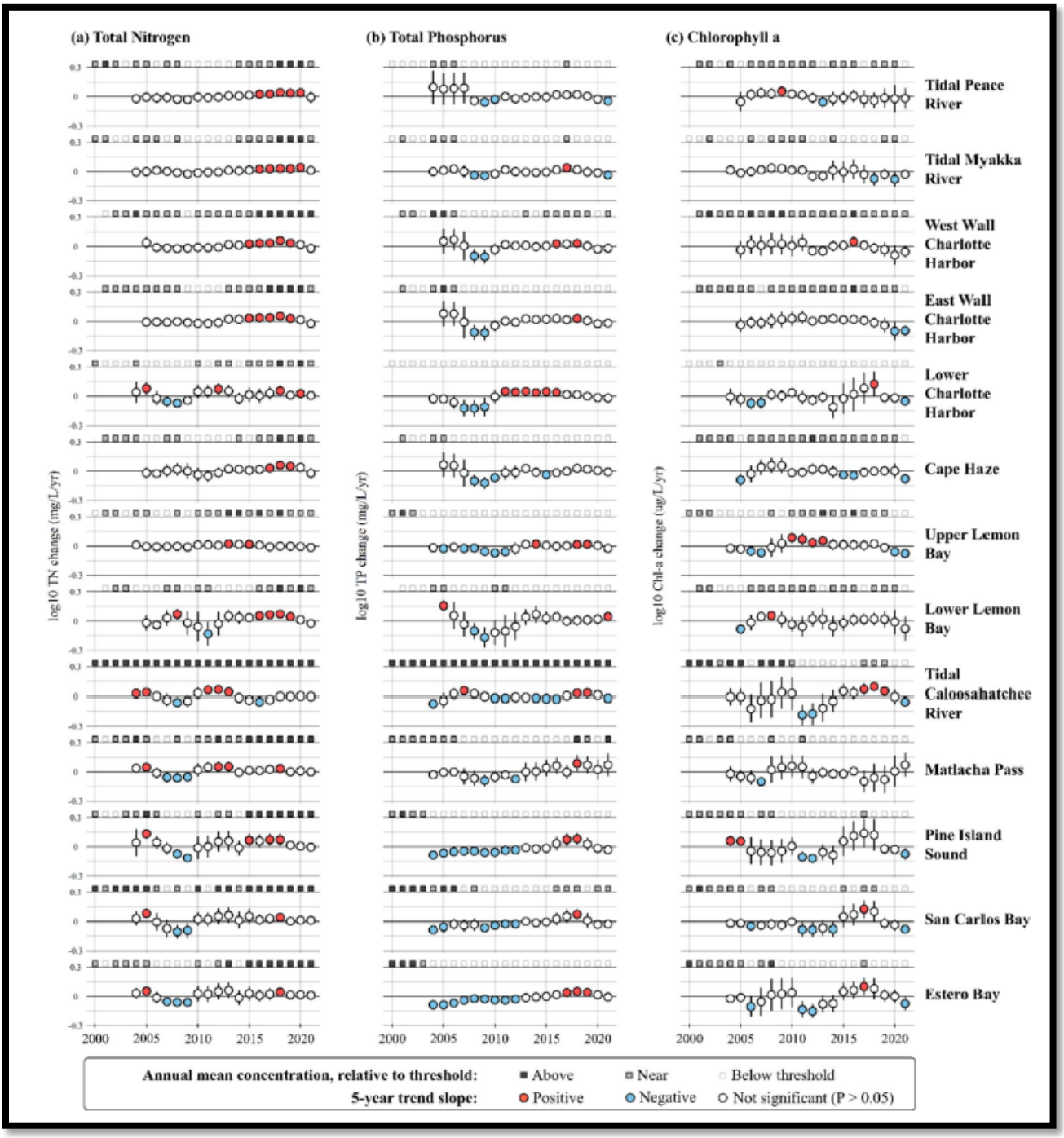


Figure 3: Rolling five-year trends for annual mean concentrations of a total nitrogen, b total phosphorus, and c chlorophyll-a via data collected by the Coastal Charlotte Harbor Monitoring Network, 2004-2021. Within each plot, circles indicate 5-year periods with significant upward trends (red), significant downward trends (blue), and no significant trends (white) (α = 0.05). Slope values are assigned to the terminal year of each 5-year window. Above each plot, squares classify annual mean concentrations relative to FDEP water quality standards: black squares indicate the 95% confidence interval (CI) of the mean is wholly above the standard, gray squares indicate the CI overlaps the standard, and white squares indicate the CI is wholly below the standard (Medina et al 2025).

Figure 4: Cyanobacteria bloom and die-off event in east Charlotte Harbor, June 2023 (photo courtesy FWC)

In 2020, Charlotte County convened the inaugural One Charlotte, One Water Conference. During this event, subject matter experts and local stakeholders gathered to discuss the state of the County's water management programs, water challenges facing our region, and recommendations for ensuring responsible stewardship of all our water resources into the future. Central to this conversation was the theme of the "One Water" concept; that is, water management should be an integrated approach involving all aspects of water and the departments that manage and benefit from these water resources, including surface, ground, potable, and stormwater. This holistic approach can support the foundation of a thriving coastal community (**Figure 5**).

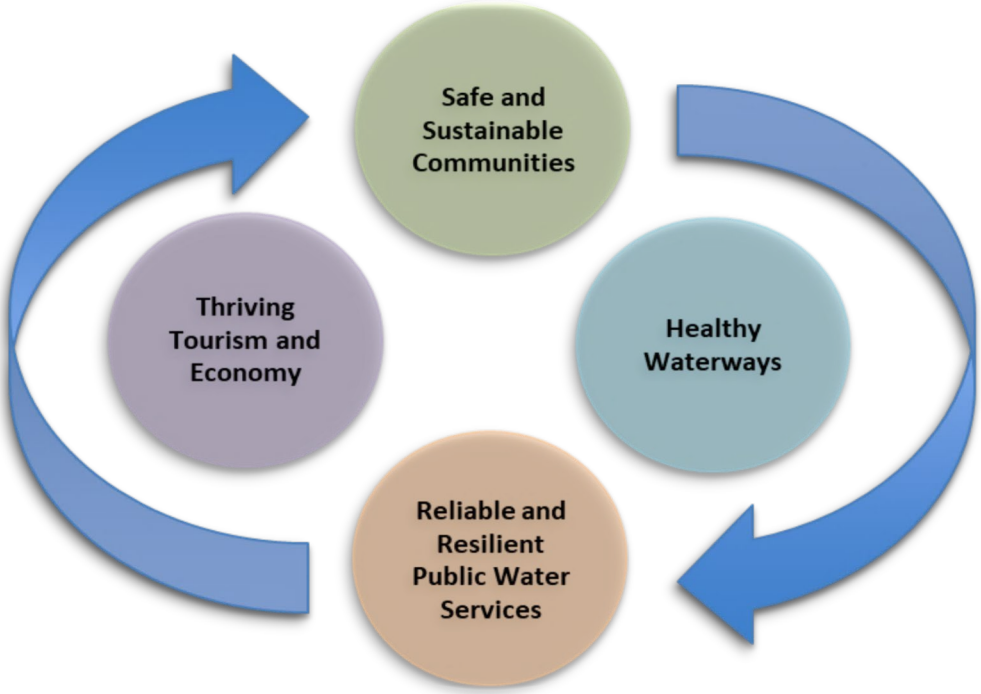


Figure 5. Conceptual One Water Approach

Subsequently, the Board of County Commissioners updated their Strategic Plan to include two water-management-related goals:

- Inventory current water monitoring efforts throughout the county, identify gaps in those efforts, and implement a county monitoring program to expand our knowledge of regional water quality/quantity dynamics.

- Develop and implement a "One Charlotte, One Water" plan to guide the County's current and future water management efforts.

Following the 2020 conference and Strategic Plan update, county staff developed and implemented a water quality monitoring program to better understand local watersheds' contribution to the current water quality conditions of Charlotte Harbor, Lemon Bay, and the Peace and Myakka Rivers. In addition, the county created a Water Quality Manager position to coordinate this and other water management-related efforts not in the purview of county departments. Through these efforts, staff have identified the following issues facing Charlotte County and our adjacent waters, which in turn drive the focus and goals of this initial iteration of the One Water Plan:

1. The surface hydrology of coastal Charlotte County and the immediate Charlotte Harbor watersheds have been substantially altered, most of which have occurred within the last 70 years.

2. Much of the landscape immediately surrounding Charlotte Harbor and Lemon Bay was platted and dredged before stormwater management rules were established in the early 1980s. As such, large scale detention-based methods of treating stormwater may not be possible in certain parts of the county. More innovative solutions for stormwater treatment may be necessary, such as using existing water conveyance features (canals and swales) as the primary means for treating runoff. Water quality improvement mechanisms implemented within canals and

swales will thus also need to allow for these features to continue serving their intended purpose of mitigating against flood events in the County.

3. Population growth in the County has increased dramatically since 2020, resulting in accelerated loss of land that previously helped attenuate pollutants in stormwater runoff before discharging into Charlotte Harbor/Lemon Bay. Given that significant portions of fallow land in Charlotte County are platted and available to be used for construction of single-family homes, that loss of attenuation capacity is expected to continue.

4. Much of our citizenry possess knowledge gaps regarding water quality-related topics, though alongside those gaps are a substantial desire among our community to take action to ensure our waters are as free of pollutants as possible. The county foresees opportunities to provide more resources to better serve the community in this capacity.

5. Charlotte Harbor serves as the receiving waters for the Peace and Myakka Rivers, which drain 224,000 acres of lands within 6 counties. In addition, multiple communities within these basins and outside Charlotte County's jurisdiction are experiencing even greater rates of population influx and development than our county, which will impact the harbor. Overall, our capacity to directly impact the quantity and quality of water entering Charlotte Harbor and lower Lemon Bay is limited to the region immediately surrounding the harbor and bay. Advocacy and participation in regional partnerships are going to be critical in ensuring that the county's concerns are made known and that effective water protection practices are implemented outside our jurisdiction.

6. Charlotte County Utilities is but one of multiple drinking/wastewater treatment providers within the county. In addition to the City of Punta Gorda, several independent regional operators serve their local communities; operation of all of these are beyond Charlotte County's oversight authority.

7. Substantial water quality monitoring efforts have been ongoing in Charlotte Harbor, Lemon Bay, and the mainstem Peace and Myakka Rivers for decades. Data obtained through these programs have been used to identify impairments throughout these waterbodies. However, these impairment determinations are only the first step in addressing pollution issues; source assessments and management plans must be developed so that appropriate pollution-reduction measures are identified and acted on. For Charlotte Harbor and the rivers, development of management plans are either beyond the County's authority (e.g., Total Maximum Daily Loads [TMDLs] and Basin Management Action Plan [BMAPs], which are driven by FDEP) or must consist of a regional effort requiring participation from multiple independent jurisdictions (Alternative Restoration Plans).

8. For many waters within Charlotte County's jurisdiction, prior to 2022 insufficient information had been collected to determine their impairment status and to what extent they may contribute to identified impairments in Charlotte Harbor, Lemon Bay, and the Peace/Myakka Rivers. As of this writing, many basins have been monitored for over three years, and it is expected FDEP will be using that data to make impairment determinations in future assessment cycles.

9. Multiple water-related Comprehensive Plan elements, codes, and programs should be reviewed to determine if the extent to which they meet the county's modern water management needs.

10. Current state rules may prevent implementation of changes to Comp Plan goals or codes the county might wish to pursue. For example, Senate Bill 250 bars Charlotte County from proposing or adopting more "restrictive or

burdensome" amendments to its Comprehensive Plan or land development regulations. However, the recent ratification of updated statewide stormwater rules may provide an opportunity to revisit and revise our policies to conform to these rules.

Plan Structure and Metrics for Success

The long-term goals of the Plan and proposed performance metrics are presented in **Table 1** and summarized below:

1. Identify, prioritize, and execute measures assuring that at a minimum, State water quality standards are met, and our waters can support healthy, vibrant ecosystems in county waters, the tidal Peace and Myakka Rivers, Charlotte Harbor, and Lemon Bay;

2. Support a comprehensive system for monitoring water quality and quantity trends in Charlotte County, creating meaningful stories to inform those activities that affect our waters now and into the future, while developing watershed management and improvement plans to guide future water protection actions;

3. Integrate further water quality protection/improvement practices within the county's stormwater management program, above and beyond the mandatory minimum pollutant treatment standards where necessary;

4. Maintain efficient, resilient, and fiscally sound water supply and treatment services to Charlotte County while protecting our aquatic resources;

5. Achieve and build on water protection goals in the Comprehensive Plan and establish and outlay formal mechanisms for regular public participation in One Water visioning, watershed protection, and the water quality program.

Table 1. Summary of overarching goals and associated metrics.

One Water Goal	Quantitative Metrics	Policy Metrics
Prioritize measures assuring that at a minimum, State water quality standards are met, and our waters can support healthy, vibrant ecosystems.	Achieve compliance with applicable Water Quality Standards in county waters. Through interagency coordination and regional pollutant management strategies, achieve water quality standards in Charlotte Harbor and Lemon Bay. Maintain nutrient loading rates from county waterways at or below goals appropriate for all watersheds.[1]	Implement funding and workflow cycle to allow initiation of RAP/Watershed Management Plan development for waterways at a minimum rate of one per year.

One Water Goal	Quantitative Metrics	Policy Metrics
Support water monitoring and build meaningful stories to celebrate successes and relay calls to action.	Annual development and execution of basin restoration or management plans to address impaired waters based on the prioritization strategy in this plan.	Coordinate with partner agencies to develop chemistry/ecology annual reporting tools to inform managers and the public on progress towards achieving water protection goals. Increased research on circulation, hydrology, basin loading, and nutrient budgets in Charlotte County Waters and Charlotte Harbor/Lemon Bay.
Integrate water quality protection/improvement practices within the county's stormwater management program	Reduction in citizen-initiated service requests for algal bloom/aquatic weed treatment or drainage maintenance due to concerns related to vegetation impaction. Reduction in need for regular treatment of aquatic weeds. Increase in participation of private waterway stewardship activities.	Create county wide Level of Service (LOS) for maintenance that outlines current maintenance practices and identifies management practices that will support improved water quality.
Maintain efficient, resilient, and fiscally sound water supply and treatment services	Achieve progressively higher availability of reclaim water meeting AWT standards. Reduction of occurrences of wastewater transmission line breaks and spills, based on annual counts	Build partnerships with independent water provider and treatment authorities in the county to support good water stewardship practices. Promote responsible use of reclaimed water to encourage conservation of potable water.
Implement water quality goals in the Comprehensive Plan, and encourage increased public participation	Create citizen science monitoring database, tracking participation rates and water trends identified through their efforts. Track visitation rates to One Water online resources site, in order to evaluate rate of community interest/ messaging penetration in water stewardship concepts.	Initiate citizen science programs to supplement existing county-led monitoring Update the existing objectives and policies and add additional objectives and policies if applicable.

[1]SWFWMD recommends maintaining a nitrogen loading threshold in the Peace River basin of 2.7 lb/acre/year. Additional research is needed to determine the applicability of this threshold to other basins in Charlotte County.

Meeting these metrics while maintaining focus on the actions needed to achieve them require setting incremental pathways and tasks that move the county towards compliance with this plan. Each area of focus described in the plan breaks down needs and recommendations into three components and is shown in **Figure 6**:

One Water Vision: This is the overarching conceptual long-term goal for the focus area, used to guide recommendations and tasks for this and future iterations of the Plan.

Pathways to the Vision: These are proposed "steps" towards achieving the One Water Vision, which can change in future iterations of the Plan as they are achieved, or new information suggests a different direction is needed to meet the One Water Vision.

Vision Tasks: These are focused, actionable activities that should be executed to complete the Pathways. For those that may require external funding or support, each section contains a breakdown of those tasks, including resource costs, justification of need, and considerations. Ideally, the language contained in these task descriptions can be utilized in funding requests.

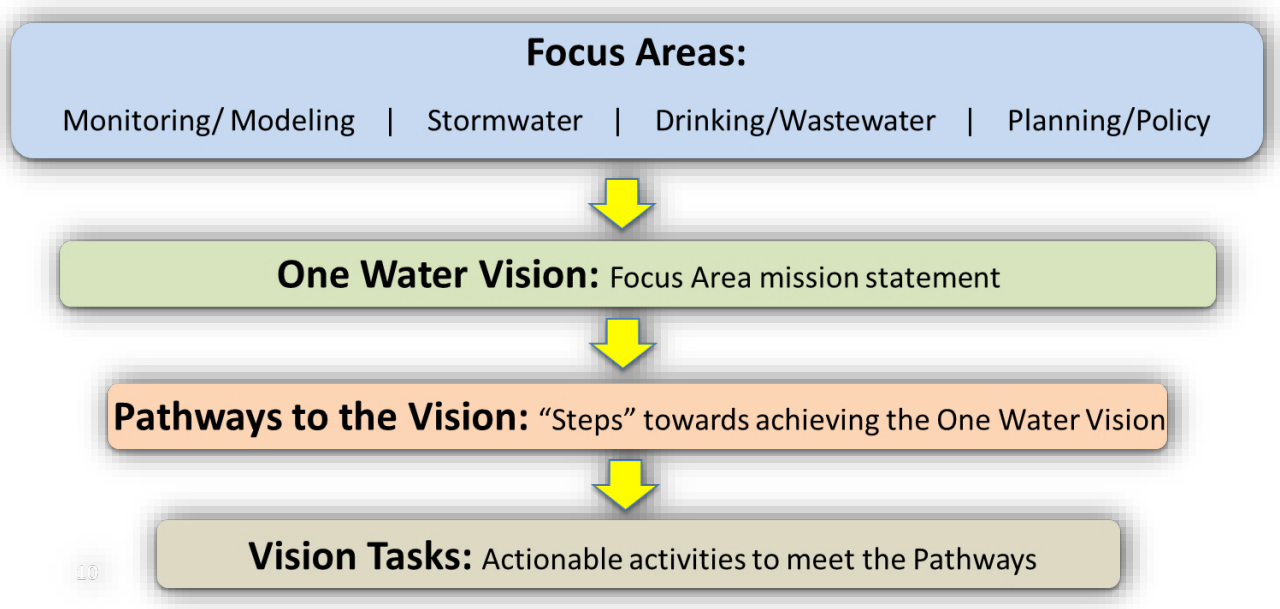


Figure 6. OCOW Plan Organizational Structure

Central to this effort is attaining these goals via a "House to Harbor" approach; that is, success in attaining our water quality and quantity goals depends on the actions of our county, neighbors, and citizens. Throughout this document are recommendations that address one or more of these facets:


Infrastructure and physical activities


Property-scale activities


Policy and planning-related activities


Local watershed-scale activities


Collaborative activities and partnerships


Regional-scale activities

It is anticipated that with the initiation of each of the above activities, the County will see regional benefits. The classification of benefits is noted below and assigned to the tasks.


Surface water benefits


Habitat-related benefits


Groundwater benefits


Water supply strategies

County departments have historically been engaged in addressing various facets of water quality and supply (**Table 2**). This Plan is not intended to replace their efforts, but rather to support them while identifying and filling gaps in knowledge or activities. In addition, the county must leverage the initiatives of regional, state, and federal agencies implementing their own water management plans for Charlotte Harbor, Lemon Bay, and the surrounding watersheds. Where applicable, this Plan will reference these complementary efforts.

Table 2. Water Management Entities in Charlotte County

Subject Focus	Entity
Drinking Water	Charlotte County Utilities
Wastewater/Reclaimed Water	Charlotte County Utilities
Stormwater	Charlotte County Public Works (county regional system), Charlotte County Community Development (Construction and code enforcement) Charlotte County Facilities Management (County-managed buildings) Charlotte County Community Services
Land Conservation, Aquatic Habitat, and Water Quality	Charlotte County Community Services (Parks and Recreation) Charlotte County Administration
Recreational Use	Charlotte County Tourism, Community Services

This Plan should be viewed as a living document, reviewed and revised every five years, with ongoing updates provided to the public and advisory panel proposed later in this document. The first iteration of the Plan is focused on building the foundation for creating and maintaining a robust water management platform for the county while identifying and recommending measures to address our information and programmatic needs. In addition, water quality improvement projects will be recommended for activities where sufficient data indicate those as potential sources of nutrient discharges into the receiving estuary system. Such recommendations will be limited in this first iteration of the Plan, however, because substantial information gaps exist. Therefore, this Plan intends for both planning and implementation activities to occur in parallel; for example, pilot projects should be implemented now to determine the efficacy of that activity in our waters, while planning projects are developed to identify areas best suited for increased implementation of those pilot efforts.

SECTION 2: Charlotte County's Past and Present Water Story

To understand how to best move forward in ensuring Charlotte County can maintain sufficient water quantity and quality for future generations, we must understand the history of water in our county and how the actions of the past shape the challenges of our present.

As the receiver of drainage from over 224,000 acres of watershed, Charlotte Harbor and the county's waters are inexorably tied to the activities of those upstream. Charlotte County's waters are also a direct reflection of the residential lot sales boom of the 1950s–1980s and how those activities directly affect our capacity to manage water quality and quantity.

Charlotte Harbor lies within five regional basins: Charlotte Harbor, Lemon Bay, and the Peace, Myakka, and Caloosahatchee River Basins (**Figure 7**). The majority of Charlotte County's population resides close to Charlotte Harbor, Lemon Bay, and the Peace and Myakka Rivers. The bulk of Charlotte County's lands in the Caloosahatchee River basin consists of agriculture and parks/wildlife management areas. The only significantly populated area in Charlotte County's portion of that watershed is Babcock Ranch, a relatively young and fast-growing development near the west boundary of the basin. General flow directions from these areas are shown in **Figure 8**.

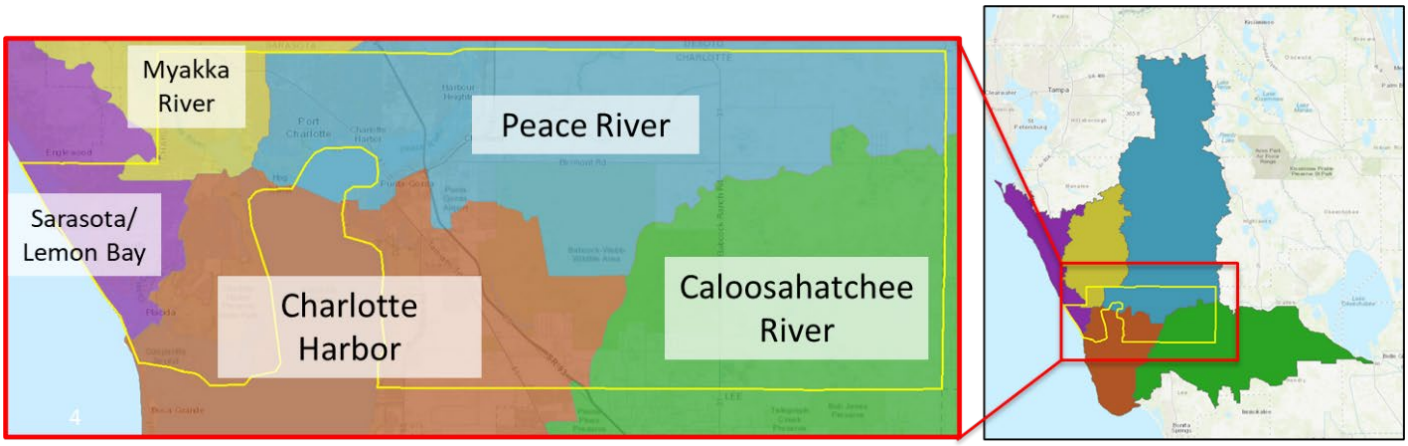


Figure 7. Watersheds in Charlotte County.

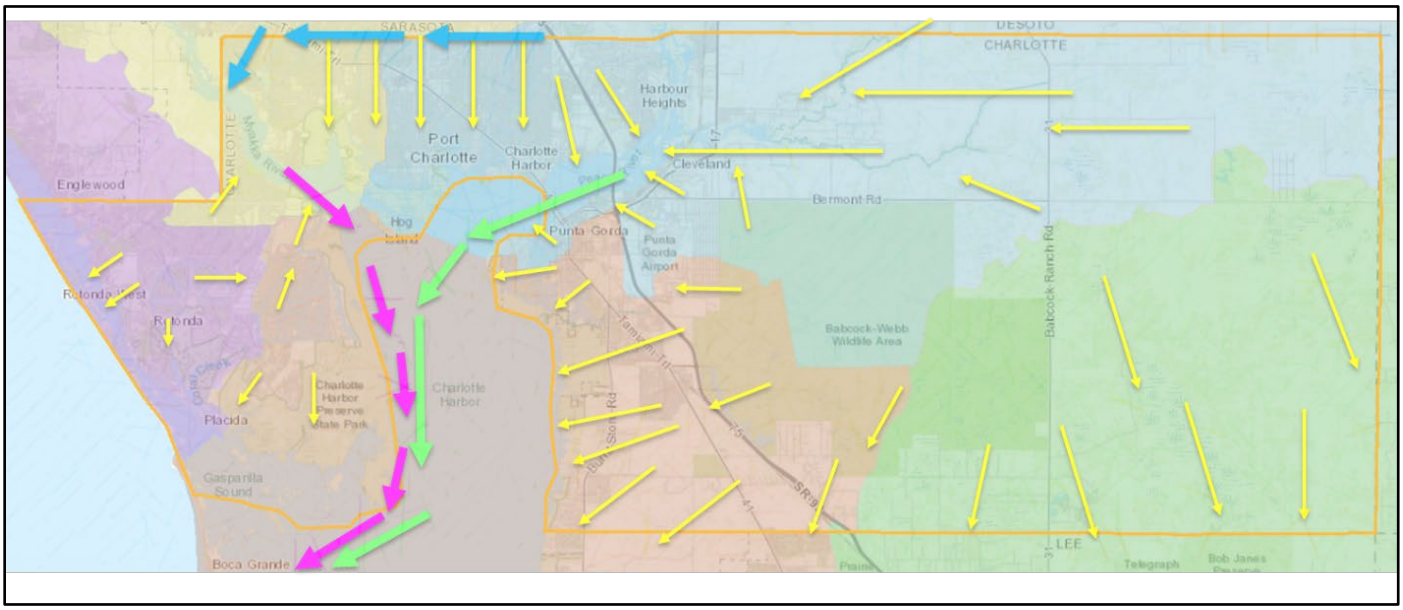


Figure 8. Direction of flow in Charlotte County. General Peace River flow is represented by green arrows, Myakka River by pink arrows, and drainage from Big Slough/City of North Port in blue arrows.

Water quality and quantity of the Peace River are influenced by urbanization, agriculture, and industrial activities such as phosphate mining. The Myakka River basin is home to agricultural and urban land uses. A 34-mile segment of the Myakka River (from the Charlotte/Sarasota County line to County Road 780) was designated a Florida Wild and Scenic River in 1985; this applies additional protections and restrictions to land use in this region. In addition, the 1988 Grizzle-Figg Bill requires Advanced Wastewater Treatment (AWT) for all wastewater reclamation facilities (WRFs) in the Myakka River basin (note a provision of this bill grandfathered facilities that were permitted by February 1, 1987).

Water management in Charlotte County north and west of Charlotte Harbor was shaped by residential and agricultural development beginning in the early 1900s, with most of the current configuration occurring during and immediately following the lot sales booms of the 1950s–1990s. As thousands of acres across the west portion of the county were platted and sold to individual homeowners, disconnected community clusters emerged in various sections of the county. In many cases, these communities established their own drinking/wastewater treatment system because no central public authority was available to provide such services. In fact, the county's Utilities Department and the Peace River Manasota Regional Water Supply Authority were created after the collapse of General Development Corporation (GDC) in the late 1980s, which previously supplied water services to a significant portion of the east Port Charlotte region of the county. Over the years, as many of these community systems reached end of life or fell into substantial disrepair, the county absorbed their facilities and communities into its service area.

Canals and stormwater conveyance systems began to form in the late 1800s to early 1900s in response to drainage needs for pasture operations and early residential areas such as Murdock Village (shown in **Figure 9** below) and what eventually became the City of Punta Gorda. Ditching and draining of the landscape accelerated dramatically from the 1950s onward, establishing flood control networks throughout the then-platted residential communities in the county. In addition, sections of what is now within the boundaries of the City of North Port was platted in parallel to the communities in Port Charlotte, and thus the stormwater conveyance system is designed such that North Port's stormwater system can discharge water directly into many of Port Charlotte's canals. More details on stormwater pathways and treatment processes may be found in the Stormwater section of this document.

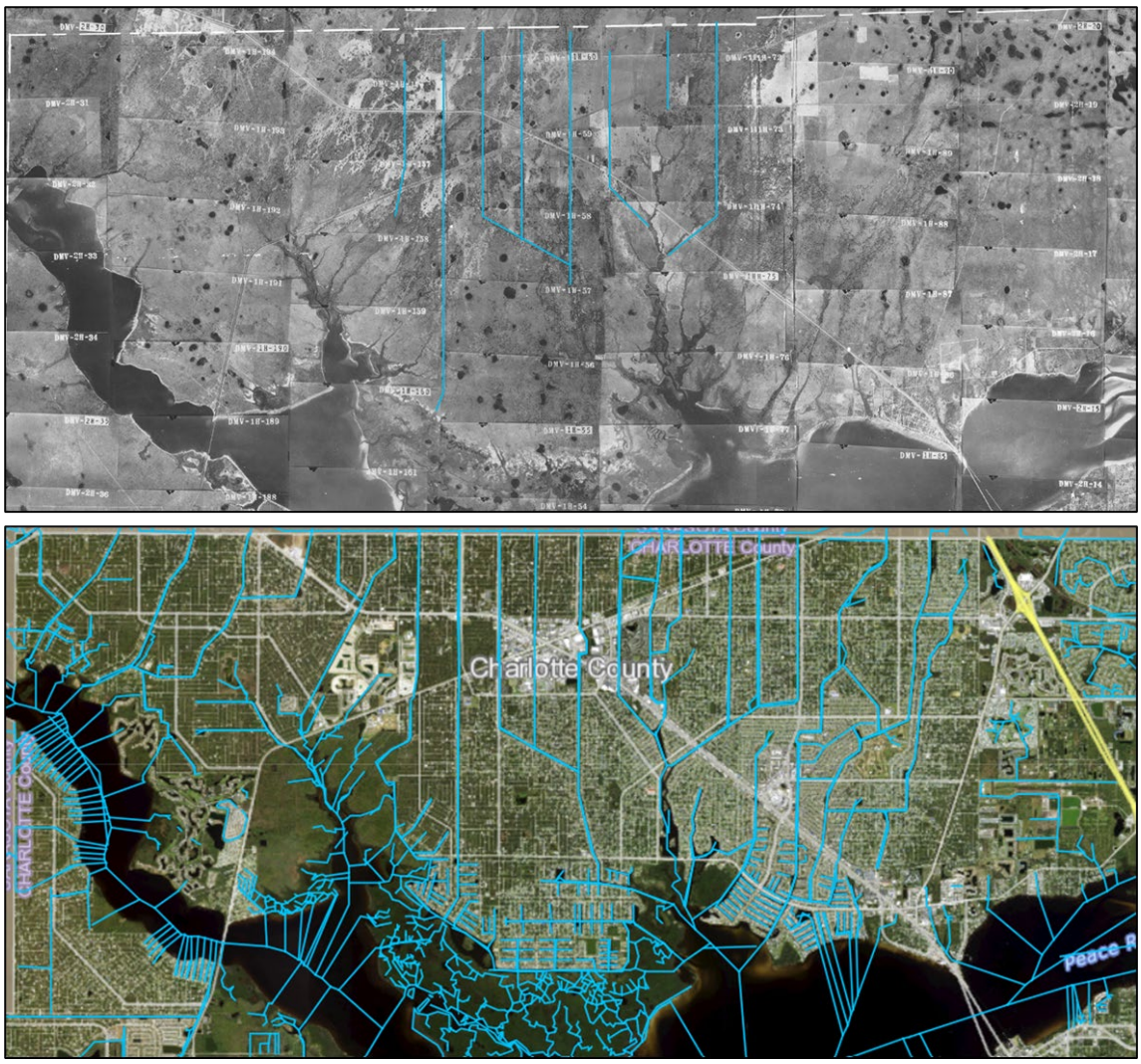


Figure 9. Comparison of artificially channelized waterways in the early 1950s (upper panel) versus present day (lower panel) in the Port Charlotte region of Charlotte County. 1950s imagery courtesy of UF Digital Imagery Collections.

In the 2010s, FDEP established Numeric Nutrient Criteria for the Charlotte Harbor/Lemon Bay estuaries, much of which was based on a "reference period" approach of measured nutrient concentrations between 2003–2007. This timeframe corresponds to that point when seagrass abundance was observed at their highest levels in the harbor and bay since seagrass surveying efforts began in the 1980s. The logic was that, by maintaining nutrient concentrations at or below what was measured during this reference period, the estuaries should be able to support healthy seagrass populations.

Upon FDEP's initial assessment of Charlotte Harbor and Lemon Bay in 2016, much of the harbor was determined to be impaired for excess nutrients. This coincided with reports of increased algae and cyanobacteria blooms in the region beginning around 2012–2013. For the most part, blooms were initially localized, first identified in and around the Hog Island region near Port Charlotte and pockets of Lemon Bay subject to low rates of flow and flushing from tidal waters. Evidence of habitat degradation in these estuaries accelerated shortly after Hurricane Irma and the subsequent protracted red tide bloom of 2017–2019. Since then, waterbodies in the region have remained on FDEP's impaired list, with few exceptions (see **Figures 10** and **11**).

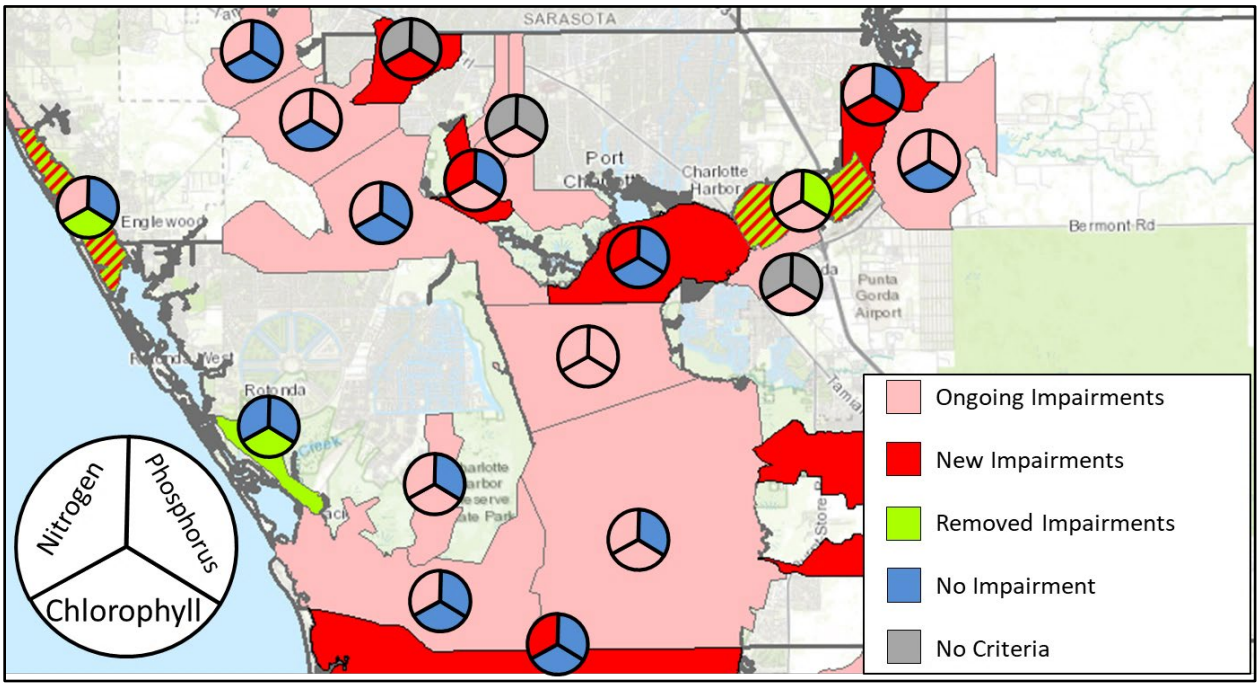


Figure 10. Distribution of nutrient impairments in Charlotte Harbor, Lemon Bay, and Charlotte County, as determined by FDEP (from IWR Run 64).

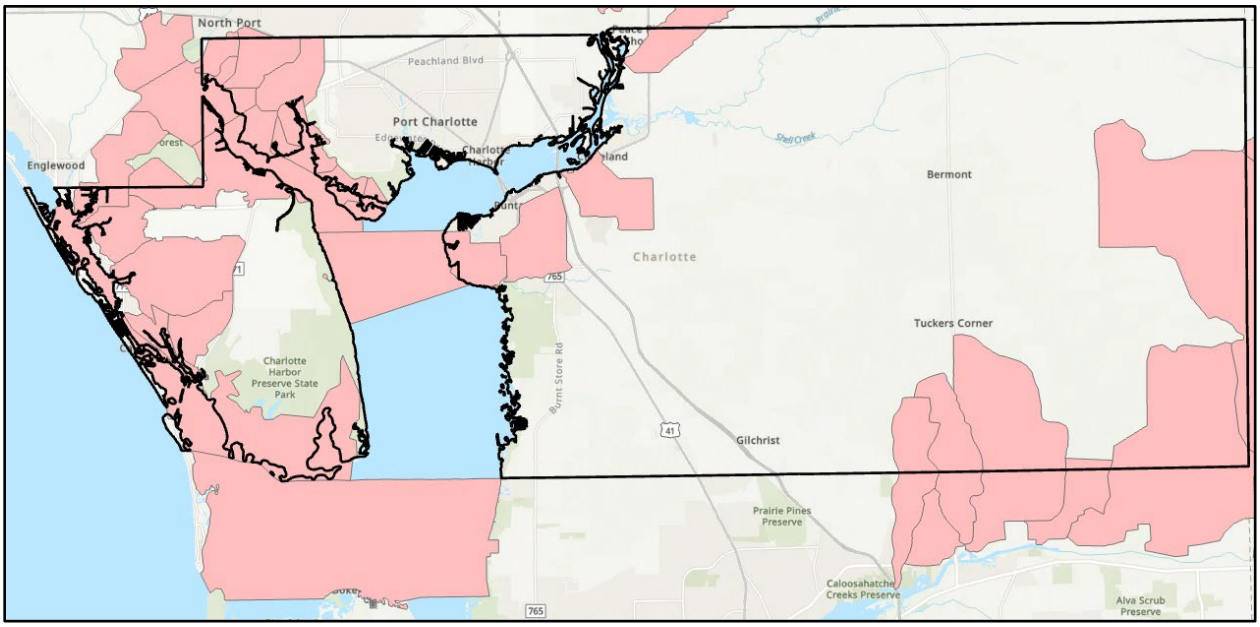


Figure 11. Distribution of bacteria impaired waterways, as determined by FDEP (from IWR run 64).

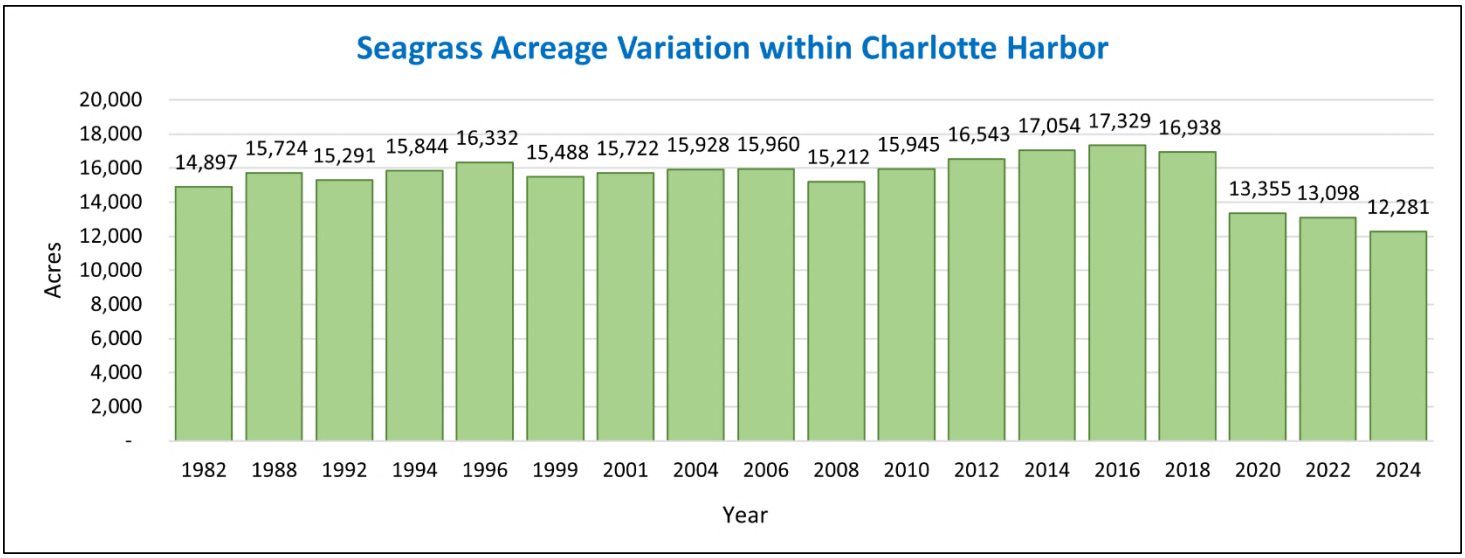


Figure 12. Mapped seagrass abundance in Charlotte Harbor from 1988–2024 (Source: SWFWMD and CHNEP).

Given the recent rapid decline of seagrass populations in portions of our estuaries (**Figure 12**), accompanied by the dramatic increase in macroalgae and cyanobacteria, a regional priority has been placed on identifying possible sources of nutrients and other factors that might contribute to increasing nutrient concentrations and algal blooms in our region. Several observations and theories have emerged during initial investigations including:

- Multiple water quality data investigations commissioned by the Charlotte Harbor Aquatic Preserves (CHAP), Southwest Water Management District (SWFWMD) and Coastal & Heartland National Estuary Partnership (CHNEP) indicate increasing trends in Total Nitrogen concentrations in portions of the harbor, and nitrogen levels in combination with other environmental factors (such as rising temperatures) may be creating conditions leading to seagrass losses.
- The recent SWFWMD Surface Water Improvement and Management (SWIM) update compared estimated nitrogen loading rates into Charlotte Harbor from the gaged portion of the Peace River during 1985–1992 vs 2009–2015. They found that average annual loading changed less than 5% between these two periods. Note that loading from the tidal portion of the system was estimated as no gauge data was available for that area. In addition, this study did not incorporate water quality information after 2015.
- Separate circulation studies by researchers with the University of Florida, Florida Gulf Coast University, and North Carolina State University indicate the possibility of discharges from the Caloosahatchee River reaching portions of the east wall of Charlotte Harbor. The probability of this occurring depends on wind, currents, and the flow rate of the Caloosahatchee River. These models predict northward flow to the east wall only during those occasions in which substantial volumes of water are being discharged from the river's S-79 structure.

For many waters within Charlotte County's jurisdiction, insufficient information has been collected to determine their impairment status and to what extent they may contribute to identified impairments in Charlotte Harbor, Lemon Bay, and the Peace/Myakka Rivers. To address this information gap, in 2022 the county implemented a monitoring program designed to examine the physical and chemical characteristics of waters discharging into Charlotte Harbor and Lemon Bay. Initial observations and next steps in this effort are discussed in subsequent sections of this plan.

The recent pervasive algal bloom conditions experienced annually in Charlotte Harbor and Lemon Bay, in conjunction with increased environmental pressures posed by ongoing and future development of surrounding lands, necessitate the creation of a plan to address today's challenges while planning for future risks. Florida's estuaries are no stranger to extensive environmental degradation, but estuary management strategies like those in Tampa and Sarasota Bays have demonstrated that, with sufficient planning, focus, and investment, we can rehabilitate and restore our harbors and bays to vibrant ecoystems for the benefit of our citizens, economy, and wildlife.

SECTION 3: Charlotte County's Future Water Story

--Monitoring, Modeling, and Watershed Improvement Planning--

ONE WATER VISION: Create a comprehensive system for monitoring water quality and quantity trends in Charlotte County, creating meaningful stories to inform those activities that affect our waters now and into the future.

PATHWAYS TO THE VISION

	Establish a comprehensive water flow and pollutant load-based monitoring network, tracking and identifying regions with high rates of loading compared to background conditions and water quality criteria exceedances.
	Develop interactive flow, flood, and pollutant modeling products to inform water management and permitting decisions.
	Develop and implement water quality restoration plans throughout impaired areas of the county.
	Develop Watershed Management Plans to protect non-impaired waters.

CURRENT VISION TASKS

Categories	Task	Anticipated Regional Benefits
	Install comprehensive water flow and elevation monitoring system to track pollutant loading rates, identify areas of flood and tidal surge risk, and calibrate/validate predictive flow and pollutant loading models.	
	Build initial iteration of the *Spatially Integrated Model for Pollutant Loading Estimates* (SIMPLE) pollutant loading model to identify possible sources and drivers of pollutant discharges in the county.	
	Coordinate with regional partners to initiate Charlotte Harbor and Lemon Bay water circulation study to determine hydrologic dynamics in areas experiencing chronic annual macroalgae and cyanobacteria blooms.	
	Begin developing restoration plans based on prioritization described in this plan. For those impaired waterbodies recommended for TMDL	

Categories	Task	Anticipated Regional Benefits
	development, confer with relevant partners to request FDEP's prioritization of these areas for modeling and restoration strategy development.	
	Create Charlotte Harbor nutrient loading reduction and management strategy, to be integrated with regional agencies' management strategies for restoring the health of Charlotte Harbor. Work with partner agencies to develop an annual "state of the estuary" one-pager to describe current water chemistry and ecological health of Charlotte Harbor, in order to maintain focus on addressing management gaps. Participate in and support implementing recommendations emerging from the regional Charlotte Harbor/Lemon Bay harmful algal bloom working group.	
	For waterbodies indicating potential water quality impacts but for which no impairment designation has been established, determine data needs as applicable and implement enhanced monitoring in the area to support assessment by FDEP. In addition, expand current monitoring program to account for impacts from National Pollutant Discharge Elimination System (NPDES) wastewater discharge facilities and other point-sources.	
	Implement central data management, review, and storage warehouse for all water quality and quantity monitoring efforts collected or funded by the county.	
	Partner with regional monitoring agencies as needed to support complimentary, cooperative monitoring programs. Assist partner agencies in streamlining data review and management processes to maximize the efficiency and accuracy of monitoring activities in our estuary.	

Associated Plans, Ordinances, and Mandates

- Charlotte County Ambient Monitoring Project Plan

Background

Water quality/quantity monitoring, modeling, and source tracking are foundational activities to most recommendations in this Plan; such efforts are essential to understanding the drivers behind current and future impacts to our aquatic resources. Water quality monitoring in Charlotte Harbor and Lemon Bay has been ongoing for decades, allowing us to identify general water quality trends for nutrients and other parameters that have been sampled over the life of these programs. In contrast, water quality and quantity information in Charlotte County is sporadic at best, with project-specific efforts occurring in various locations, but before 2022 no long-term accounting of water quality and quantity characteristics was available for the county. This creates both a lack of clarity on potential pollution contributions to Charlotte Harbor and Lemon Bay from county waters, as well as an inability to determine the water quality status of

county watersheds; only a handful of waterbodies in Charlotte County are considered impaired, but this may be because of insufficient data available to assess those waters rather than a lack of impairment.

This began to change with the implementation of the county's ambient monitoring program, where approximately 60 locations across the county were selected with the following goals in mind:

- Identify long-term trends and ambient water quality conditions within:
    - Waters discharging to Charlotte Harbor, Lemon Bay, and the Caloosahatchee River.
    - Waters within Water Body Identification Numbers (WBIDs) within Charlotte County's boundaries.
    - Waters entering Charlotte County (where warranted/possible).
- Inform potential needs for source tracking and opportunities for water quality improvement.
- Conduct investigatory work as warranted to identify or clarify the origin and/or impact of in-stream conditions identified through the ambient monitoring activities of this project.
- Submit data to FDEP WIN for assessing Charlotte County WBIDs in accordance with 62-302, 62-303, and 62-304, Florida Administrative Code (FAC).
- Develop models that will allow loading characteristics and trends in Charlotte County to be identified and predicted.
- Present sample results to the public in a manner that clearly describes water quality trends in relation to applicable water quality criteria.

As of this writing, three years' worth of monitoring has been completed. Although this is not a sufficient dataset to draw definitive conclusions about water quality trends in the county, some general observations can be gleaned from the data:

- The Charlotte County ambient surface water monitoring program, though early on, has already led to informed decisions. Using the data collected to date, staff have identified segments of the county with higher concentrations of nutrients than others, prompting more focused investigations into potential sources of those nutrients. Bacteria hot spots have also been identified, and staff have been collecting DNA tracing samples to determine if those levels are due to anthropogenic inputs. From a state assessment standpoint, the County has identified a number of watersheds mis-classified as tidal systems by FDEP, and has been working with them to ensure the proper waterbody classifications (and thus the correct water quality criteria) are being used to assess the county's waters. This is important as different criteria are used to assess different waterbody types. These changes will be instituted as part of FDEP's next biennial assessment.

- DEP will also begin using the data gathered by the County with its next Biennial Assessment, which will assess ambient surface water quality data through July 2024. Unfortunately, three years' worth of data are needed to assess a waterbody for nutrient impairment determinations, a primary parameter of concern for most waterbodies. It takes a minimum of 5 years of monthly data to determine statistically significant trends in water quality. Long-term trends provide an indication whether a waterbody is degrading or improving. As such, it is recommended that the County continue its current monitoring effort for the time being to get the most of its investment to date.

Other recommendations regarding water quality monitoring include:

- Developing a consistent QA/QC program across all county sampling programs to ensure a timely accurate assessment of the data collected.

- Continue to participate in the Southwest Florida Regional Ambient Monitoring Program (RAMP) working group. The group strives to assist member organizations to achieve quality water quality data consistently along the

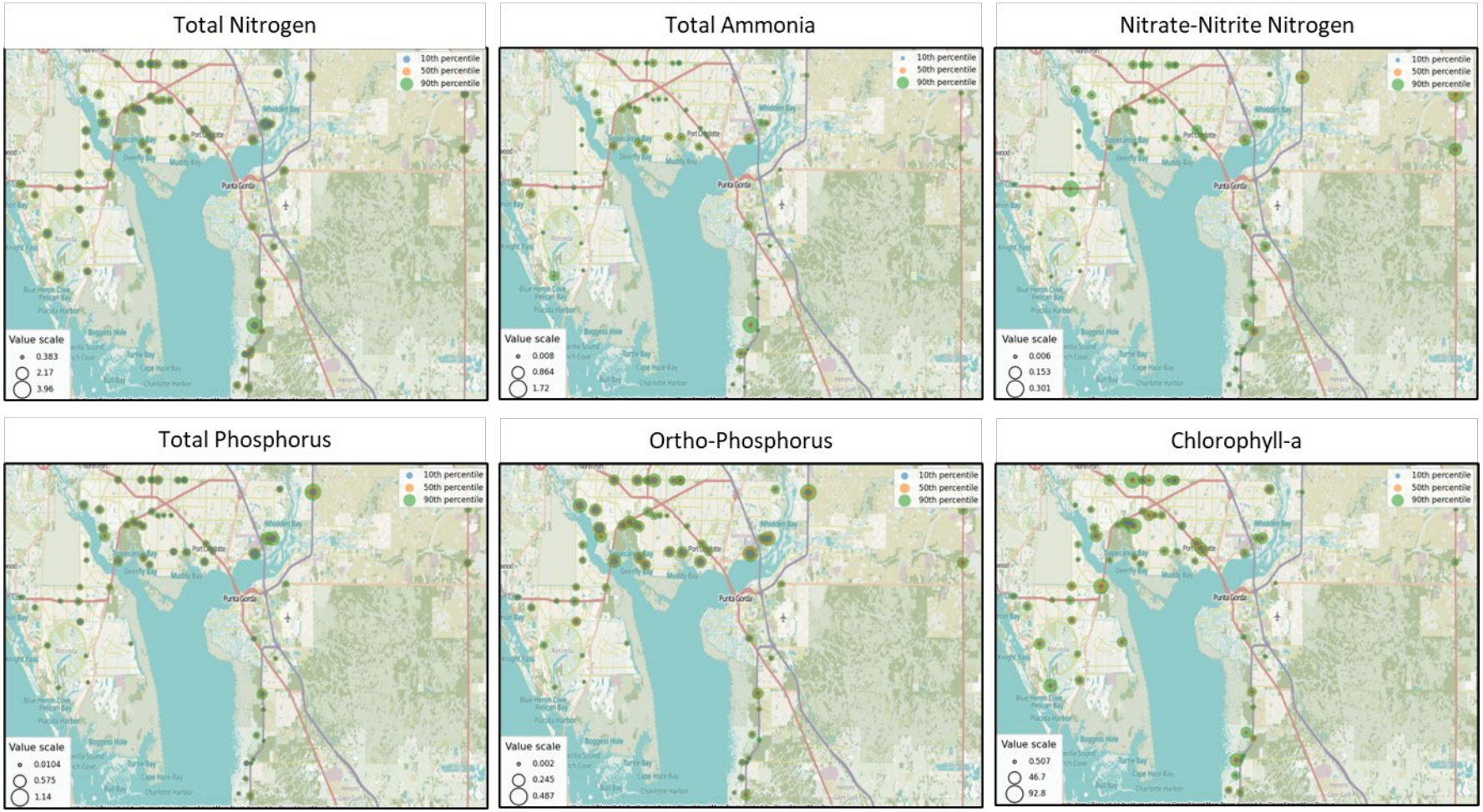
southwest Florida coast. The County should encourage other organizations collecting data within its waters to participate in RAMP.

- Conducting pre- and post-monitoring of water quality improvement projects to evaluate the efficacy of those measures.
- Looking towards utilizing the DEP's Fecal Indicator Bacteria Toolkit to track down the source of excessive bacteria or determine if it is naturally occurring. The DEP verified impairment list and the County's data indicate areas where fecal indicator bacteria exceed the appropriate criteria.
- The County should continue collecting the appropriate fecal indicator bacteria parameter for the waterbody Class rather than based on the conductivity at the time of collection as that is how DEP will assess the data.

Many of the County's receiving waters have been deemed impaired for nutrients, including Charlotte Harbor, Lemon Bay and the tidal Peace/Myakka Rivers. These impairments usually are the result of pollutant loading throughout the drainage basin contributing runoff to the impaired waterbody, the sources of which often include a combination of non-point and point source discharges from varying types of land uses. To best prioritize watersheds based on their relative pollutant contribution to our estuaries, it is as important to understand the quantity of water discharging from these systems as it is the quality of the water. To do so requires the use of models and/or flow monitoring equipment. Therefore, it is recommended that the County begin a water **quantity** monitoring program to compliment current water quality efforts. The installation of flow meters at key locations where water quality is collected will assist in targeting areas with high loading rates for possible BMP implementation. This will also be important for calibrating/verifying any pollutant loading model the County may be considering deploying.

Figure 13. Nutrient Concentration Trends at Charlotte County Monitoring Locations, June 2022-June 2025

For each location, three dots are displayed corresponding to the 10th, 50th, and 90th percentile of data collected at that site; larger dots indicate higher concentrations. Sites at which the three dots are very different in size from one another indicate potentially flashy conditions, meaning stormwater or intermittent point-source discharges might be contributing to the nutrient concentrations. For Chlorophyll-a, high concentrations indicate a greater chance of algal blooms in the area, and thus a more persistent source of excessive nutrients may be present.



Impaired Waters Restoration Pathways

Generally, the regulatory path to assessing the health of waters is described in **Figure 14** below. In short, water quality data collected by the county and other regional partners are submitted to the state Department of Environmental Protection (FDEP). If said data meets their data sufficiency and quality requirements, they will utilize it to evaluate the health of the waterbody by comparing that information to established water quality criteria. Failure to meet that criteria will result in the waterbody being placed on the Impaired Waters list. If data indicates the waterbody might be trending towards impairment but insufficient information is available to make a final determination, FDEP may place the waterbody on their Planning or Study lists, earmarking that location for additional data collection in the near future.

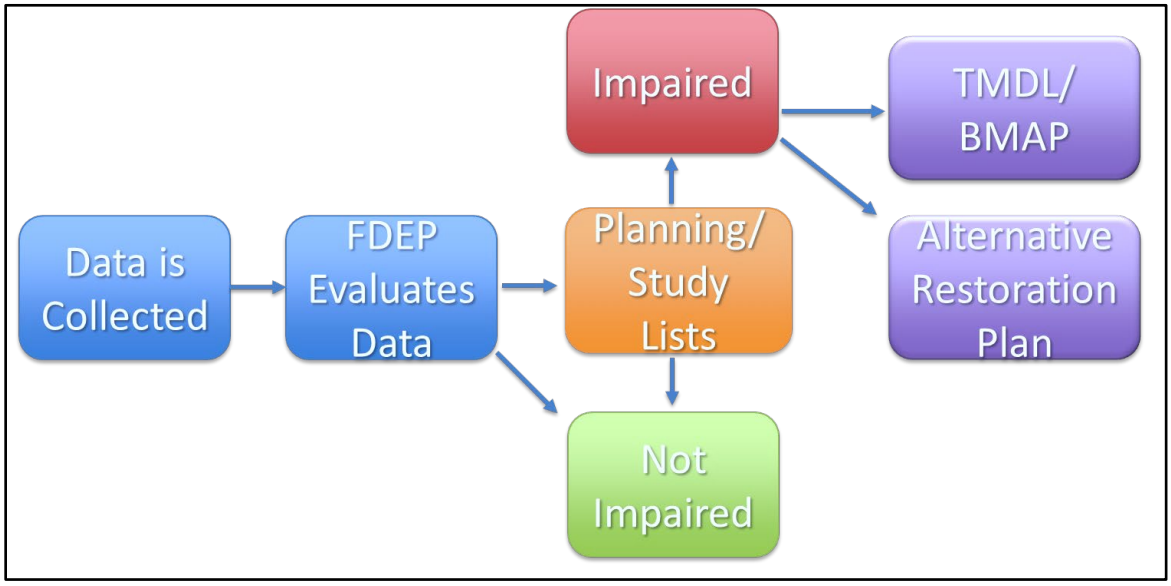


Figure 14. General regulatory pathway for assessing surface waters in Florida.

Historically, once a waterbody has been placed on the Impaired Waters list FDEP would then initiate development of a Total Maximum Daily Load (TMDL), followed by a Basin Management Action Plan (BMAP). The TMDL process utilizes empirical data, modeling, and land use analysis to identify the sources of impairment to the waterbody, and the extent to which each of those sources must reduce their pollutant discharges in order to bring the waterbody back into compliance with water quality criteria. The BMAP then outlines the specific actions each source will take to reduce their pollutant discharges. Note this effort is initiated and funded by FDEP. The county does not have the authority to initiate this process.

Similarly, the Alternative Restoration Plan (ARP) is designed to accomplish the same goals as the TMDL/BMAP process; that is, it identifies sources of pollution and describes strategies and mechanisms to reduce pollutant discharges from those sources. The key difference is this can be enacted by local governments, allowing them to take control of the restoration process rather than wait for FDEP to take action in a given waterbody. Alternative Restoration Plans must be submitted to FDEP for approval, after which it carries a similar level of enforcement as TMDL/BMAP pollution reduction requirements. The obstacles to creating an ARP are twofold: the cost of developing the plan is borne by the local government(s), and participation in developing an ARP is voluntary, thus relying on all entities responsible for the health of a watershed willingly agreeing to work together to address said pollution issues.

The following three (3) tables list FDEP verified impaired waters as of July 11, 2022. The tables are grouped by parameter type: Nutrients, Fecal Indicator Bacteria and General. Due to the different complexities of these groups, each WBID group should be addressed by different means.

The water segments in **Table 3** are categorized by Readiness ratings; that is, the potential for fast-tracking ARP development based on the availability of regional partners also aligned with, and committed towards, developing ARPs for these segments, as well as monitoring and modeling data that can be used to support selection of appropriate water quality improvement activities. Segments are also categorized by Priority, which ranks the need for restoration plans for each area based on known impairments. Restoration planning for waterbodies will commence immediately for those segments with high Readiness or high Priority designations.

With respect to nutrients (**Table 4**), it is recommended to address impairments by developing Alternative Restoration Plans as they lead to "cleaner water faster" than the traditional DEP TMDL/BMAP approach. As it is a priority to bring the waters into compliance with State water quality criteria, these waterbodies are assigned a "readiness" rating, based on how fast a reasonable assurance plan can be initiated and completed. It makes the most sense to utilize a regional approach when addressing nutrient impairments in estuarine receiving waters, which would include assistance from additional partners to restore waterways back to compliance. For example, Sarasota County has conducted extensive monitoring and pollutant loading analyses in northern Lemon Bay, in part to inform their Lemon Bay Watershed Management Plan. As such, of the nutrient impaired waters described in **Table 5 below,** an ARP for Lemon Bay can be developed more expediently than for other watersheds, generating water quality protection/improvement mechanisms while also providing "lessons learned" for ARP development in other county waters.

That said, the Charlotte Harbor estuary system should be considered highest priority to begin restoration planning and implementation activities, given water quality and ecological degradation observed in that system. Ultimately, both Lemon Bay and Charlotte Harbor efforts could occur simultaneously, doing the work needed on Lemon Bay while gathering financial, regional partnership, and data/modeling support for Charlotte Harbor. Details on the strategy for positioning Charlotte Harbor for RAP development are detailed in Task G.

Table 3. Charlotte County waterbodies impaired for nutrients

Water Segment Name	WBID	Waterbody Type	Waterbody Class[1]	Parameters Assessed Using the Impaired Waters Rule (IWR)	Recommendation	Readiness	Priority
Charlotte Harbor (Middle Segment1)	2065B	Estuary	2	Nutrients (Chlorophyll-a)	Charlotte Harbor RAP	Low	High
Charlotte Harbor (Middle Segment1)	2065B	Estuary	2	Nutrients (Total Nitrogen)			
Charlotte Harbor (Middle Segment2)	2065C	Estuary	2	Nutrients (Total Nitrogen)			
Charlotte Harbor (Upper Segment)	2065A	Estuary	2	Nutrients (Chlorophyll-a)			
Charlotte Harbor (Upper Segment)	2065A	Estuary	2	Nutrients (Total Nitrogen)			
Charlotte Harbor (Upper Segment)	2065A	Estuary	2	Nutrients (Total Phosphorus)			
Whidden Creek	2079	Estuary	2	Nutrients (Chlorophyll-a)			
Whidden Creek	2079	Estuary	2	Nutrients (Total Nitrogen)			
Coral Creek (West Branch)	2078A	Estuary	2	Nutrients (Chlorophyll-a)	Lemon Bay RAP	High	Medium
Coral Creek (West Branch)	2078A	Estuary	2	Dissolved Oxygen (Percent Saturation)			
Upper Lemon Bay	1983A	Estuary	2	Nutrients (Chlorophyll-a)			
Upper Lemon Bay	1983A	Estuary	2	Nutrients (Total Nitrogen)			
Myakka River	1991A	Estuary	2	Nutrients (Total Nitrogen)	Lower Myakka RAP	Medium	High
Myakka River	1991B	Estuary	2	Nutrients (Total Nitrogen)			
Myakka River	1991B	Estuary	2	Nutrients (Total Phosphorus)			
Tippecanoe Bay	2055	Estuary	3M	Nutrients (Chlorophyll-a)			
Direct Runoff to Stream	2061	Estuary	3M	Nutrients (Chlorophyll-a)		Medium	Medium

Water Segment Name	WBID	Waterbody Type	Waterbody Class[1]	Parameters Assessed Using the Impaired Waters Rule (IWR)	Recommendation	Readiness	Priority
Flopbuck Creek	2048C	Estuary	3M	Nutrients (Chlorophyll-a)	Either TMDL or grouped into Lower Peace River TMDL		
Huckaby Creek	2048B	Estuary	3M	Nutrients (Chlorophyll-a)			
Manchester Way	2047	Estuary	3M	Nutrients (Chlorophyll-a)			
Shell Creek below Hendrickson Dam	2041A	Estuary	3M	Nutrients (Total Nitrogen)			
Shell Creek below Hendrickson Dam	2041A	Estuary	3M	Nutrients (Total Phosphorus)			
Middle Peace River Estuary (Middle Segment)	2056B	Estuary	3M	Nutrients (Chlorophyll-a)	Lower Peace River RAP	Low	High
Middle Peace River Estuary (Middle Segment)	2056B	Estuary	3M	Nutrients (Total Nitrogen)			
Middle Peace River Estuary (Middle Segment)	2056B	Estuary	3M	Nutrients (Total Phosphorus)			
Peace River Estuary(Upper Segment South)	2056C2	Estuary	3M	Nutrients (Total Nitrogen)			
Gator Slough Canal	2082C	Stream	3F	Nutrients (Macrophytes)	Exotic Vegetation Removal	As needed	Medium
Cow Slough	1964	Stream	1	Nutrients (Macrophytes)			
Myrtle Slough	2040	Stream	1	Nutrients (Macrophytes)			Medium

[1]Waterbody Classes are defined in 62-302.400, F.A.C.

Table 4 describes waterbodies with fecal indicator bacteria impairments. DEP has recently adopted a regional approach to adopting bacteria TMDLs at a basin scale. The first example of this was the draft Everglades West Coast TMDL (DEP, 2024). It is thus recommended that the County allow DEP to determine TMDLs for these waters; however, source tracking activities should be implemented in the interim, in order to determine if the cause of any of these impairments stem from anthropogenic activities. Prioritization should be given to Class 1 (potable water supplies) and Class 2 (shellfish harvesting areas) waters. For the Class 2 waters determined to be impaired for failing the fecal coliform criteria for shellfish harvesting areas, it should first be determined that the waterbody classification is appropriate for the waterbody.

Table 4. Charlotte County waterbodies impaired for fecal indicator bacteria.

Water Segment Name	WBID	County (-ies)	Waterbody Type	Waterbody Class	Parameters Assessed Using the Impaired Waters Rule (IWR)	Recommendation	Priority
Alligator Creek	2074	Charlotte	Stream	1	Fecal Coliform	Regional TMDL	Medium
Coral Creek (West Branch)	2078A	Charlotte	Estuary	2	Fecal Coliform	Regional TMDL	High
Coral Creek (West Branch)	2078A	Charlotte	Estuary	2	Fecal Coliform (3)		
Upper Lemon Bay	1983A	Charlotte, Sarasota	Estuary	2	Enterococci		
Upper Lemon Bay	1983A	Charlotte, Sarasota	Estuary	2	Fecal Coliform (3)		
Myakka River	1991B	Charlotte, Sarasota	Estuary	2	Fecal Coliform (3)	Regional TMDL	High
Tippecanoe Bay	2055	Charlotte	Estuary	2	Fecal Coliform		
Trailer Park Canal	2053	Charlotte	Estuary	2	Fecal Coliform		
Cleveland Cemetery Ditch	2059	Charlotte	Estuary	3M	Enterococci	Regional TMDL	High
Lee Branch	2035	Charlotte, DeSoto	Stream	3F	Fecal Coliform		
Myrtle Slough	2054	Charlotte	Estuary	3M	Fecal Coliform		
Telegraph Creek	3236A	Charlotte, Lee	Stream	3F	Escherichia coli	Regional TMDL	Low
Chapel Creek / Bayshore Creek	3240B1	Charlotte, Lee	Stream	3F	Escherichia coli	Regional TMDL	Low
Daughtrey Creek	3240F	Charlotte, Lee	Stream	3F	Escherichia coli		
Owl Creek	3240N	Charlotte, Lee	Stream	3F	Escherichia coli		
Popash Creek	3240Q	Charlotte, Lee	Stream	3F	Escherichia coli		
Powell Creek	3240L	Charlotte, Lee	Stream	3F	Escherichia coli		
Stroud Creek	3240M	Charlotte, Lee	Stream	3F	Escherichia coli		

Water Segment Name	WBID	County (-ies)	Waterbody Type	Waterbody Class	Parameters Assessed Using the Impaired Waters Rule (IWR)	Recommendation	Priority
Trout Creek	3240G	Charlotte, Lee	Stream	3F	Escherichia coli		
Cypress Creek	3235C	Charlotte, Lee	Stream	3F	Escherichia coli	Regional TMDL	Low
Jacks Branch	3235D	Charlotte, Glades, Hendry	Stream	3F	Fecal Coliform		

The remaining impairments include waterbodies exceeding iron, copper, or dissolved oxygen criteria, or are related to shellfish harvesting classifications (**Table 5**). Priority is given to how quickly an impairment can be verified, starting with bacteria-related impairments, followed by iron and dissolved oxygen, and finally copper. Once these impairments are verified, TMDLs (which are recommended for these parameters) may be developed. The number of iron impairments indicate a natural source of iron may be present and should be identified. The source of the singular dissolved oxygen and copper impairments should be identified prior to determining a TMDL. Finally, those waters impaired due to the shellfish harvesting classifications should be verified as shellfish harvesting areas and reviewed to determine the rationale provided by state agencies for the impairment designation is sufficient to proceed with restoration activities.

Table 5. Charlotte County waterbodies impaired for general parameters.

Water Segment Name	WBID	County (-ies)	Waterbody Type	Waterbody Class	Parameters Assessed Using the Impaired Waters Rule (IWR)	Recommendations	Priority
Charlotte Harbor Upper	2065A	Charlotte	Estuary	2	Iron	Determine if source is Natural Background	Medium
Rock Creek	2045	Charlotte, Sarasota	Estuary	3M	Iron		
Trailer Park Canal	2053	Charlotte	Estuary	2	Iron		
Prairie Creek	1962	Charlotte, DeSoto	Stream	1	Iron		
Flopbuck Creek	2048C	Charlotte	Estuary	3M	Iron		
Myrtle Slough	2054	Charlotte	Estuary	3M	Iron		
Peace River Estuary (Lower Segment)	2056A	Charlotte	Estuary	3M	Iron		
Middle Peace River Estuary (Middle Segment)	2056B	Charlotte	Estuary	3M	Iron		
Peace River Estuary (Upper Segment North)	2056C1	Charlotte, DeSoto	Estuary	3M	Iron		
Peace River Estuary(Upper Segment South)	2056C2	Charlotte	Estuary	3M	Iron		
Cleveland Cemetery Ditch	2059	Charlotte	Estuary	3M	Iron		
Direct Runoff to Stream	2061	Charlotte	Estuary	3M	Iron		
Sam Knight Creek	2048A	Charlotte	Estuary	3M	Dissolved Oxygen	Identify possible sources.	Medium
Trailer Park Canal	2053	Charlotte	Estuary	2	Copper	Identify possible sources.	Low
Lemon Bay	1983B	Charlotte	Estuary	2	Bacteria (in Shellfish)	Verify waterbody classification	High
Charlotte Harbor Mid	2065C	Charlotte	Estuary	2	Bacteria (in Shellfish)		
Lemon Bay	1983A	Charlotte, Sarasota	Estuary	3M	Bacteria (in Shellfish)		

Water Segment Name	WBID	County (-ies)	Waterbody Type	Waterbody Class	Parameters Assessed Using the Impaired Waters Rule (IWR)	Recommendations	Priority
Myakka River	1991A	Charlotte, Sarasota	Estuary	2	Bacteria (in Shellfish)		
Myakka River	1991B	Charlotte, Sarasota	Estuary	2	Bacteria (in Shellfish)		

Summary of Opportunities and Obstacles

As directed by the Strategic Plan, Charlotte County established a surface water monitoring program in 2022 to help identify water quality trends in our canal systems. Through this effort, FDEP will be able to assess many watersheds in our county previously lacking sufficient data to conduct assessments.

Most impaired waterways in Charlotte County do not have TMDLs associated with them, nor are they currently considered priorities for development of TMDLs by FDEP. Because of this, the county will need to pursue Alternative Restoration Plans to accelerate the process for improving impaired waterways.

The county lacks a comprehensive flow and water elevation monitoring program, which would help identify areas at higher risk of flooding, track tidal surge rates and risk to our coastal communities, and create a load-based assessment tool to better narrow focus on addressing waterways with the highest loading rates in the county.

Vision Task Details

Task A: *Install comprehensive water flow and elevation monitoring system to track pollutant loading rates, identify areas of flood and tidal surge risk, and calibrate/validate predictive flow and pollutant loading models.*

Estimated Cost: MEDIUM ($100,000-$1,000,000): Tidal and inland networks will cost an estimated $200,000 for the first year of installation and calibration, and $80,000-$100,000 per year for annual maintenance.

Details and Justification: Recent regional storm events have underscored the county's need for enhanced water elevation and flow monitoring systems to allow the county to better predict and prepare areas susceptible to flooding. In the immediate aftermath of Hurricane Ian, historic rainfall throughout the region caused near unprecedented levels of flooding in the Peace River, Myakka River, and Big Slough basins draining into Charlotte Harbor and breached some water control structures in North Port (Due to multiple factors involved in the history of residential lot design/development in southwest Florida, North Port's stormwater management system is hydrologically connected to Port Charlotte's system at multiple locations). This created concern among Charlotte County staff that Port Charlotte was at risk of receiving uncontrolled discharges from North Port, potentially threatening life and property if the stormwater canals responsible for managing runoff in the area were already at or near maximum capacity due to localized rain and flooding.

Nearly 1 year later, Hurricane Idalia brought moderate rainfall to the area (3–5 inches on average), which the county's stormwater system has sufficient capacity to manage. Unlike Ian, however, tidal surges helped push harbor and tidal river elevations into low-lying areas of the county, causing extensive flooding in our coastal communities. If we experience a storm that combines precipitation rates on par with Hurricane Ian in addition to tidal surges like Idalia, the flood impacts to our residents could be catastrophic.

These events highlight the need to establish mechanisms by which county Emergency Operations Center (EOC) staff can receive advance notice of potential flooding by installing telemetry-based water elevation/flow gages. No elevation gages are present in any canals in Charlotte County, preventing decision-makers at the county EOC from ascertaining the actual risk of flooding within residential areas. Only one telemetry-based water elevation station is present in the marine waters of Charlotte County, in the tidal Peace River near the Harbor Heights neighborhood. In addition, the county lacks a comprehensive stormwater flow model, and thus the EOC has relied on flow estimates from generalized models provided by the National Oceanic and Atmospheric Administration (NOAA). As these model runs predicted varying pictures of the actual flood risk to residents during Hurricane Ian, a stormwater model calibrated using data collected within Charlotte County waterways is clearly needed to accurately predict and act on future potential flood risks in our jurisdiction.

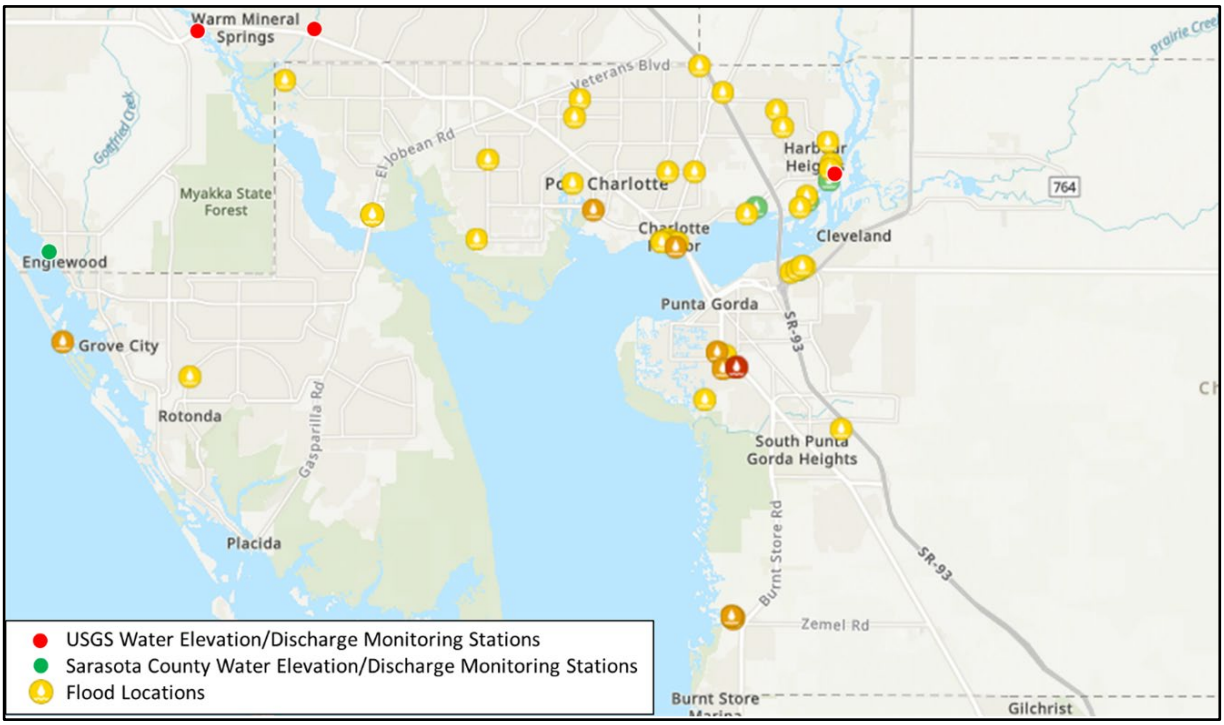


Figure 15. Reported tidal surge and stormwater flooding locations during the Hurricane Idalia weather event.

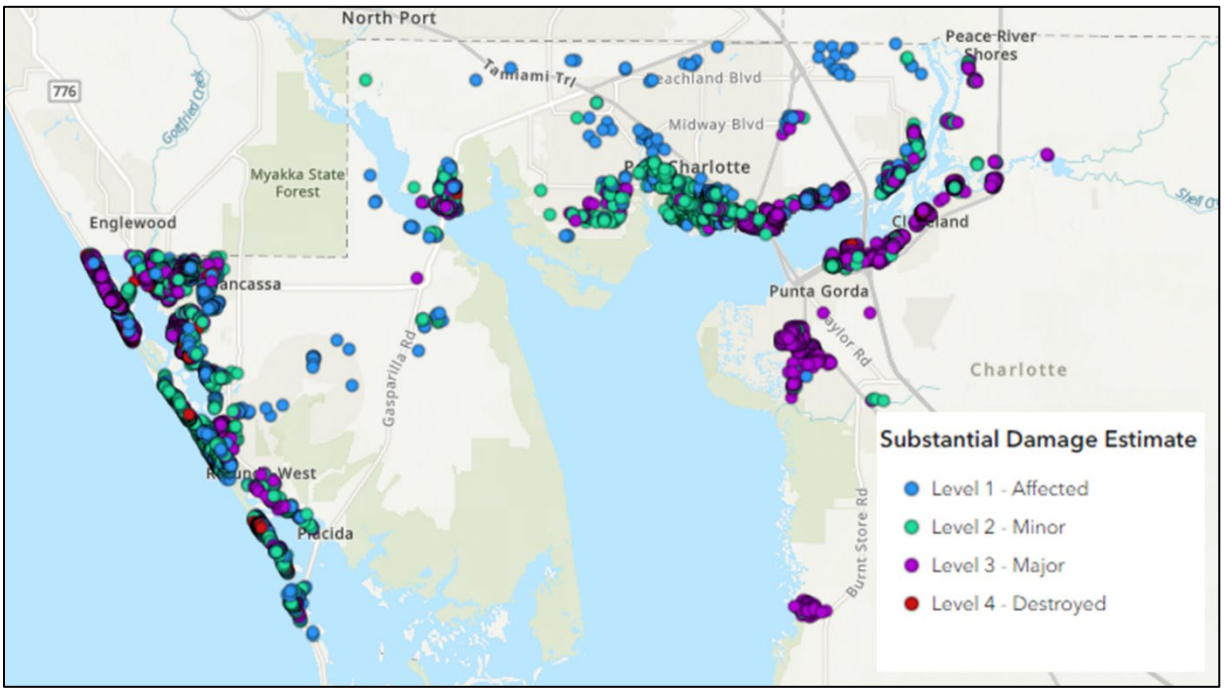


Figure 16. Residential properties damaged during the Hurricane Milton surge event.

To provide emergency response staff with the necessary tools to quickly assess and act on potential life-threatening flood events, the county is requesting funding for designing and installing a stormwater system elevation gage network and flood warning system. The County will partner with appropriate agencies and private firms to install telemetry-capable flow and/or elevation gages in tidal areas around the county such as in the Myakka River, Charlotte Harbor, and Lemon Bay. In addition, the county will work with experienced hydrologists to install telemetry-capable gages for real-time tracking of elevation and drainage capacity within our canal management system. Final locations will be determined based on review of past regional flood events in consultation with contractors experienced in designing stormwater tracking systems.

The data collected by this proposed elevation monitoring network will be used in the future development of a comprehensive stormwater model for the population centers in Charlotte County. The goal is to use this in concert with the Sarasota County and North Port existing stormwater models to complete a full Myakka River/Big Slough basin hydrodynamic stormwater model.

The data collected through this effort will also be used to develop pollutant loading models and monitoring programs to better target pollution "hot spots" that need to be addressed through the county's One Charlotte, One Water initiative.

Task B: *Build initial iteration of the Spatially Integrated Model for Pollutant Loading Estimates (SIMPLE) pollutant loading model to identify possible sources and drivers of pollutant discharges in the county*

Estimated Development Cost: MEDIUM ($100,000-$1,000,000)

Details and Justification: To support the many goals under the One Charlotte One Water Plan, a pollutant loading model must be developed to project and track pollutant loads across the county. For mainly the same needs that Charlotte County currently has, Sarasota County (with SWFWMD) requested that Jones Edmunds develop the *Spatially Integrated*

Model for Pollutant Loading Estimates (SIMPLE). The model was originally formulated as a seasonal/annual loading model (SIMPLE-Seasonal) and later expanded to a monthly loading model (SIMPLE-Monthly). This pollutant-loading model, which has been accepted by FDEP on previous alternative restoration plans, is the clear choice to serve the County's needs and support water-quality planning. Model calibration should be conducted at least two locations where the watershed area is mostly urbanized and two where it is mostly unurbanized. To properly calibrate the model, at least a year of flow data is needed to complement the current water quality sampling.

The following describes the underlying data needed for developing the model. In some cases, additional sampling might be required to fulfill the data requirements described below; those expenses are not incorporated into the cost estimate for this task:

Rainfall Data - Rainfall is the primary driver of pollutant loads from direct runoff and is highly variable temporally and spatially. Because of its superior spatial coverage to gauge data, Next Generation Weather Radar (NEXRAD)-derived rainfall data should be used to generate direct runoff and baseflow via a hydrologic engine. NEXRAD-derived rainfall data are readily available at a relatively nominal cost.

Evapotranspiration (ET) Data - Although less important than rainfall, ET affects the amount of annual direct runoff and base flow. Daily ET data calculated using the Priestly-Taylor method on a 2-km-by-2-km pixel grid are available from the USGS Integrated Science Center.

Soils Data - Soils data are also important in calculating direct runoff and base flow. The US Department of Agriculture Natural Resources Conservation Service Soil Survey Geographic Database (SSURGO) is the most widely used and comprehensive geographic information system (GIS) layer of soils data and will be used for this project. Soils files will be used to parameterize the primary groundwater and vadose zone (infiltration) parameters.

Land Use Data - Land use affects direct runoff and base flow quantities and concentrations. SIMPLE-Monthly uses time-aware land use data so that a single land use dataset can be modeled over a long period (e.g., decades) without user intervention. Each polygon can have multiple land use attributes and corresponding start dates for when that polygon was converted to that land use. To create the time-aware land use layer, two land use layers are initially used – one from the beginning of the simulation period and one from the end. When these two layers are merged, a significant amount of cleanup is required due to inconsistencies in the layers and the number of slivers created. The final step to set up this layer is to determine when each polygon changed land use conditions.

Direct Runoff and Baseflow Time Series - Current hydrologic methods of creating time series of flow for direct runoff and baseflow will be used for the County's SIMPLE-Monthly model. Alternatively, ICPR4 models could be built with the groundwater component exercised at an increased project cost but with the benefit of greater accuracy. In addition, ICPR4 modeling can benefit flow and flood predictions to guide decision making within the stormwater, emergency management, and community development sectors of the county.

BMP Layer Data - BMPs reduce direct runoff pollutant loads and sometimes base flow pollutant loads. This layer is one of the most time-intensive to build, requiring compiling information from Environmental Resource Permitting files from SWFWMD, the South Florida Water Management District (SFWMD), and FDEP. Each BMP needs to have a polygon created showing the area it serves, the BMP type, its removal efficiencies, and the year built. Following that process, aerial photographs need to be reviewed to determine whether any significant BMPs were not captured in the initial process. Date-built data need to be estimated from available historical aerial photographs, and BMP types need to be

estimated from available imagery. In addition, an analysis of pollutant attenuation in canals with control structures will need to be conducted.

Event-Mean and Baseflow Concentration Data - Event-mean concentrations (EMCs) are correlated with land use and multiplied by direct runoff volumes to predict direct runoff pollutant loads. Determining this will require sufficient baseflow concentration data for the county in addition to EMC data, derived from local flow-weighted mean data (which is not currently available) or estimates from the recently ratified stormwater rule update.

Point Source Data - Point source loads are ones that typically discharge to a single (point) location, although in some instances such as reclaimed wastewater for irrigation the 'point' source is spatially distributed. The model requires point source data for pollutants that are ultimately discharged to a surface waterbody in the County. Non-recurring point source data (e.g., spills) can also be included in this category, though analyses in other similar studies showed that spills were generally not significant enough to consider.

Irrigation Data - Irrigation is sometimes added to the model. Except for reuse, past modeling efforts have shown irrigation to be a relatively small contributor. The county will need to determine whether including non-reuse irrigation is worth the expenditure. For reuse data, this overlaps with point source data. Reuse polygons need to be created for where reuse is applied, and reuse data (flows and concentrations) from the DMRs have to be distributed to the polygons as time series.

Onsite Sewage Treatment and Disposal System (OSTDS) Data - OSTDSs contribute pollutant loads primarily through discharge to shallow groundwater tables that flow horizontally to a surface waterbody. The current septic module in SIMPLE-Monthly was developed well before the current methods that FDEP uses for BMAPs and TMDLs. FDEP's current standard guidance is that the ArcNLET model would need to be used to estimate these loads due to the large number of OSTDSs in the County.

Atmospheric Deposition Data - For watersheds with large waterbodies (e.g., Charlotte Harbor), the loading from atmospheric deposition can be significant and is important to account for. The data are generally readily available for this element, and some preprocessing is involved to pair that data with the rainfall data.

Out-of-County Loading Data – The Myakka River, Peace River, and Shell Creek have watersheds that extend well beyond the County border. If these waterbodies or Charlotte Harbor are part of future evaluations, these loads (presumably) outside the SIMPLE-Monthly model must be accounted for. That type of accounting is usually done using measure flow and concentration data.

Task C: *Coordinate with regional partners to initiate Charlotte Harbor and Lemon Bay water circulation study to determine hydrologic dynamics in areas experiencing chronic annual macroalgae and cyanobacteria blooms.*

Estimated Development Cost: MEDIUM ($100,000-$1,000,000)

Details and Justification: Over the last decade, researchers at various universities have attempted to model the hydrodynamics of Charlotte Harbor, in an effort to describe the various mechanisms impacting flow direction, water quality, and residence rates in our area. These models have identified the following:

General circulation patterns are such that water discharging from the Peace and Myakka rivers have more influence on the western portion of the Charlotte Harbor, while the eastern region of the harbor is influenced by tidal flows to/from the Gulf of Mexico.

Under certain conditions, discharges from the Caloosahatchee River might reach portions of the eastern wall of Charlotte Harbor. Two separate modeling efforts have identified this possibility, contingent on the volume of water entering the Caloosahatchee estuary and the time of year in which discharges are occurring.

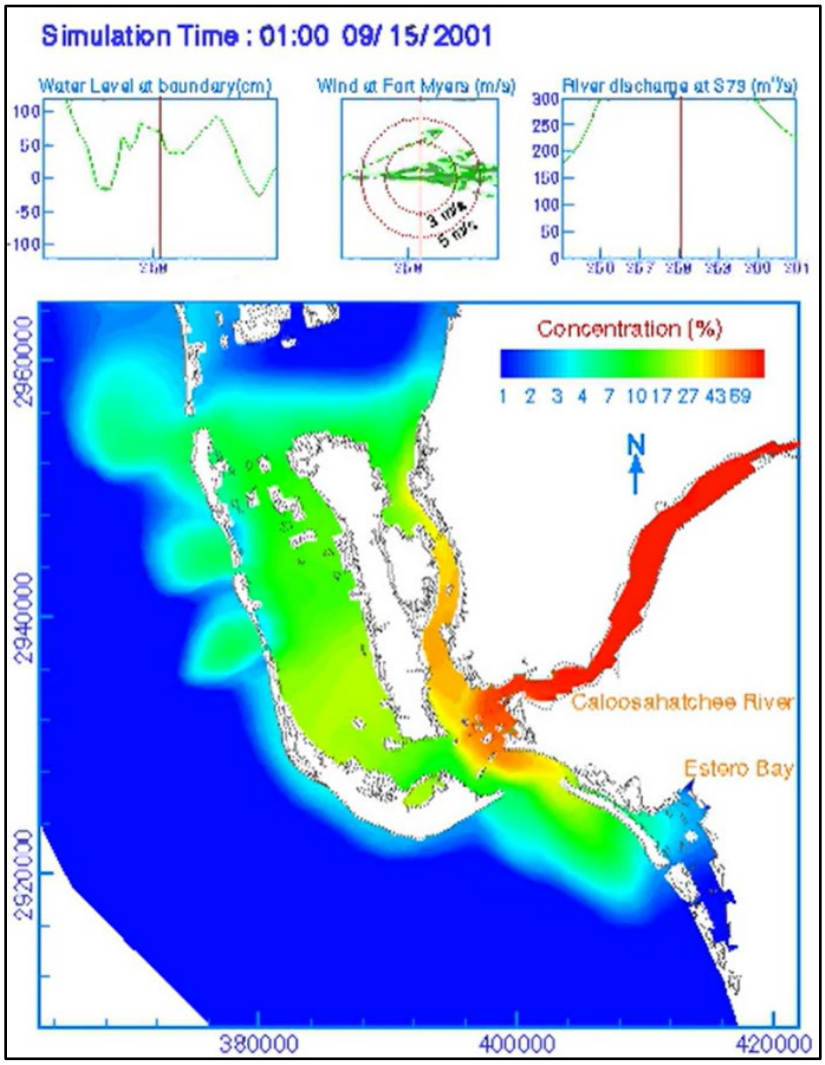


Figure 17. Predicted distribution and concentration of Caloosahatchee discharges, from Sheng et al 2010. Note the high volume of discharge from structure S-79 shown here, influencing the distribution of Caloosahatchee discharges northward into Charlotte Harbor.

In addition, recent doppler-based monitoring of tidal Peace River dynamics have revealed that:

- Tidal inflow to the Peace River is more pronounced around the Port Charlotte than Punta Gorda;
- Wind is not the only factor that can drive differences in water elevation near Port Charlotte vs Punta Gorda;
- Surge events can result in different recovery responses in different parts of the tidal Peace. During hurricane Idalia, post-surge drainage back into the harbor was detected in the mainstem of the Peace and the Port Charlotte side of the river within 24 hours of the surge event. On the Punta Gorda side of the river, however, water continued pushing northward for as long as 72 hours after the hurricane passed.

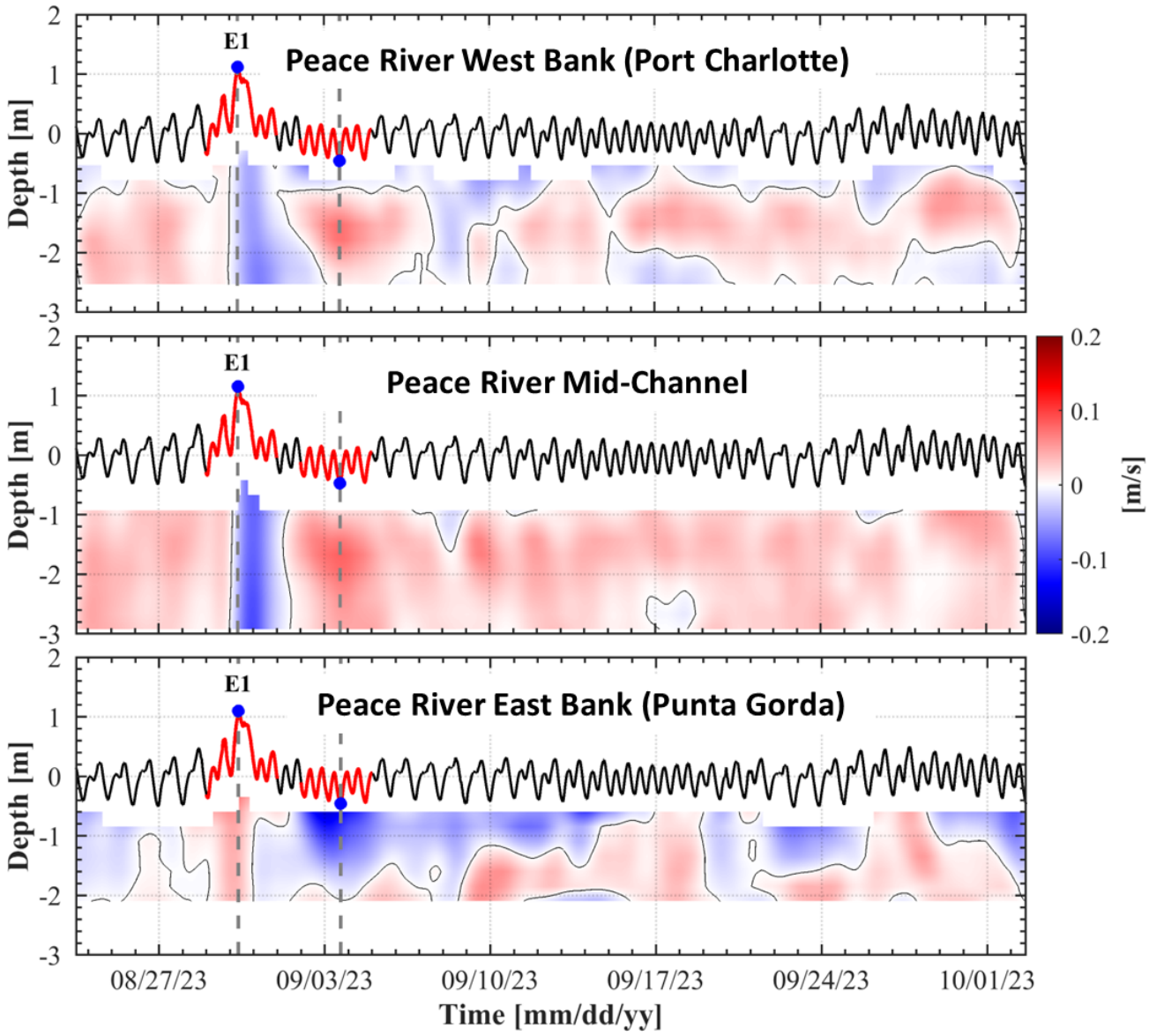


Figure 18. Measured flow velocities of a cross-section of the Peace River during Tropical Storm Idalia (labeled as "E1" on the graphs). Blue areas indicate water discharging towards Charlotte Harbor, while red areas show water flowing upstream towards DeSoto County. Note that waters along the Punta Gorda side of the river were measured flowing upstream after the Idalia surge event for as long as 72 hours post-storm, while the mid-channel and Port Charlotte portions of the river were discharging towards Charlotte Harbor.

Given the above, there is a pronounced need to refine existing predictive flow models for the Harbor and Lemon Bay, in order to better identify areas of heightened surge and flood risk, and to track potential sources of water quality impairment in regions disproportionately impacted by declining water quality (such as the east wall of Charlotte Harbor). This effort will also establish tide monitoring gauges for the Lemon Bay area, as the nearest NOAA or USGS maintained gauges are currently in the tidal Caloosahatchee and Tampa Bay.

Task D: *Begin developing restoration plans based on the prioritization described in this Plan. For impaired waterbodies recommended for TMDL development, confer with relevant partners to request FDEP's prioritization of these areas for modeling and restoration strategy development.*

Estimated Development Cost: MEDIUM ($100,000-$1,000,000)

Details and Justification:

Restoration Planning is a necessary step on the path to water quality improvement, as this process helps determine the extent, sources, and strategies needed to reduce pollutant inflow into a waterbody and sets reduction targets for each source. As the county lacks the authority to develop Total Maximum Daily Loads and Basin Management Action Plans, it is recommended to address impaired watersheds in our jurisdiction using the Reasonable Assurance Plan (RAP) approach.

The cost of a RAP is influenced by several factors. Some of the biggest factors are the magnitude of pollutant load reductions identified, and the effort required to develop a set of projects/programs that will achieve them, the number of stakeholders and number of needed stakeholder meetings, the complexity of the modeling/analysis required to determine targets and required reductions. These factors are assuming that a useable pollutant loading model already exists and that no additional monitoring/field data collection is required. A RAP for a small watershed (e.g., a few square miles) with a single key stakeholder may cost roughly $100,000-$200,000, not considering the cost of time needed from the stakeholder. A RAP for a medium-sized watershed (e.g. tens of square miles) with approximately five key stakeholders may cost roughly $500,000. A RAP for a large watershed with many key stakeholders could be in excess of $1,500,000. Current estimates to develop a RAP for the Lemon Bay watershed are approximately $400,000 for Charlotte County's portion of the Bay, while smaller waterbodies such as those in Mid-County may cost roughly $200,000-$250,000. In addition, FDEP requires annual reporting and five-year update reports for approved Plans, similar to what is conducted with BMAPs. Depending on the complexity and scale of the RAP, development of these reports may cost approximately $40,000-$80,000.

Task E: *In collaboration with regional entities responsible for monitoring and maintaining the health of Charlotte Harbor and Lemon Bay, Create Charlotte Harbor algae reduction and seagrass management strategy, to be integrated with agencies' own management strategies for restoring the health of Charlotte Harbor. Work with partner agencies to develop an annual "state of the estuary" one-pager to describe current water chemistry and ecological health of Charlotte Harbor, to maintain focus on addressing management gaps. Participate in and support implementing recommendations emerging from the regional Charlotte Harbor/Lemon Bay harmful algal bloom working group.*

Task F: *Participate in and support implementing recommendations emerging from the regional harmful algal bloom working group.*

Task G: *Partner with regional monitoring agencies as needed to create complementary, cooperative monitoring programs. Assist partner agencies in streamlining data review and management processes to maximize the efficiency and accuracy of monitoring activities in our estuary.*

Estimated Development Cost: LOW (<$100,000) NOTE: future iterations of the One Water Plan may be updated with specific project needs based on working group and partner recommendations, each with their own cost estimate that may exceed that which is described here.

Details and Justification: Many of the tasks described in this plan are centered around a key reality when protecting the quality of our waters: meaningful progress in restoring and managing the health of the Charlotte Harbor and Lemon Bay estuaries will require action by, and cooperation with, both Charlotte County and our regional partners. Since the establishment of the Water Quality Manager position, the county has been working extensively with its partners to aid, coordinate efforts, and collaborate on measures designed to improve our understanding of the drivers impacting water quality. These tasks aim to help advance those activities as a cornerstone requirement of the county's water quality management program.

This Plan also recognizes that formal regional coordination among multiple agencies and local governments can take significant time to coalesce, and action should be taken now to begin to address possible sources of nutrient loading into the Charlotte Harbor estuary. Additional work is needed within the harbor to determine drivers and management opportunities of the large-scale algae and cyanobacteria blooms impacting the estuary. The county recognizes that it has the responsibility to serve as a leader in driving forward the science and policy needed to address impairments in Charlotte Harbor.

As such, the county, in partnership with Florida Sea Grant, has organized a regional inter-agency harmful algal bloom working group such that representatives from various agencies can:

- Collaborate on identifying and addressing knowledge, management, and education/outreach gaps related to the ecological issues impacting the harbor;
- Codify agreed-upon mitigation activities into applicable management plans, allowing for additional avenues to fund said efforts;
- Inform county activities and investments into those efforts that would be most effective in reducing nutrient loading from county managed waters;
- Identify and recruit the partners necessary to build substantial, comprehensive restoration strategies for our estuaries, and;
- Through the above efforts, create the blueprint for what can serve as an impairment reduction/ecosystem restoration strategy for Charlotte Harbor, not unlike the elements of a Reasonable Assurance Plan.

It should be emphasized that this task is intended to complement the other nutrient loading reduction strategies proposed in this Plan; in effect, many of the other tasks described in this document focus on improving the water quality in county-maintained waters which discharge into Charlotte Harbor and Lemon Bay, while this task is focused on strategies to be enacted within the estuary itself and other waters not within the county's jurisdiction.

This partnership is an appropriate forum to serve as an advisory group for the creation of estuary condition reports. The Coastal and Heartland Estuary Partnership has been developing water quality and seagrass trend information dashboards, as well as summary handouts with this information. Using input from the public and One Water advisory panel (see the "Programmatic and Policy" section for more details), the county will work with agencies to refine these resources into an annual "one-pager" similar to a report card, that can be used to quickly inform citizens of the current status and trends related to the health of the harbor.

Task H: *For waterbodies indicating potential water quality impacts but for which no impairment designation has been established, determine data needs as applicable and implement enhanced monitoring in the area to support assessment by FDEP.*

Estimated Development Cost: MEDIUM ($100,000-$1,000,000); current sample collection costs to the county are approximately $7,200 per site, per year. As such, total costs of this task will vary based on the level of effort needed in each watershed of concern.

Details and Justification: As previously discussed, Charlotte County's ambient water quality monitoring program is still in in its infancy, having begun in full in July 2022. For most waterbodies in the county, the current design and budget allows samples to be collected at one location per watershed, which is used to determine the concentration of constituents entering receiving estuaries just downstream. In the event that measured concentrations at a location are nearing or exceeding its designated water quality criteria, additional sampling should be conducted to narrow down potential sources and determine

Task I: *Implement central data management, review, and storage warehouse for all water quality and quantity monitoring efforts collected or funded by the county.*

Estimated Development Cost: LOW (<$100,000)

Details and Justification: As the county's water quality data collection has increased, so too has the need for establishing mechanisms for streamlining and standardizing the process of recording, processing, and presenting this information. This task seeks to create a central repository designed to allow for ease of access to data collected by the county, facilitate the ability to compare data across multiple projects, and streamline the process for generating reports and responding to data requests. In addition, data quality review functions will be built into the system, allowing for automatic checks of both the data and supporting metadata. This will serve to standardize QC processes in the county while also expediting those efforts, so more time is spent on interpreting, rather than reviewing data collected.

--Stormwater Management--

ONE WATER VISION: Integrate flood protection and water quality enhancement into a unified system of stormwater management

PATHWAYS TO THE VISION

	Evolve canal management activities toward the need for minimal human intervention, promoting nature-based pollutant attenuation systems and mechanical management where viable.
	Conduct stormwater maintenance optimization process, identifying waterway-specific maintenance needs and upgrading maintenance communications/logistics.
	Address portions of the county that are exempt from current stormwater regulations by implementing stormwater mitigation incentives and features for lands outside of the county's MS4 system.
	Position the county as an incubator for emerging technologies to address water quality and quantity challenges
	In concert with complementary strategies such as the county's Watershed Master Plan and Vulnerability Assessment, identify opportunities to expand and/or enhance current stormwater management infrastructure.
	Using data acquired as part of comprehensive water quality and pollutant loading assessment efforts, identify and expand water quality improvement infrastructure within the county's MS4 system as needed, with the goal to meet water quality improvement standards in the 2024 stormwater rule.
	Increase outreach efforts among residents along county canal systems through stewardship and education programs.

CURRENT VISION TASKS

Categories	Task	Anticipated Regional Benefits
	Initiate the first phases of the stormwater maintenance optimization process, identifying waterway-specific maintenance needs and upgrading maintenance communications/logistics.	
	Review and Revise the County Stormwater Master Plan as needed, incorporating portions of the county not currently included in the Plan, and identifying opportunities for enhancing stormwater treatment and levels of service in light of revised 2024 stormwater	

Categories	Task	Anticipated Regional Benefits
	rule, and newly-acquired information on flood risks due to current and future coastal storm surge scenarios.	
	Install water elevation monitoring networks to track flow rates, flood risk, and tidal influence on water drainage in the region.	
	Based on output from the county Vulnerability Assessment and Watershed Master Plan, develop predictive tools as needed for stormwater runoff and drainage rates to assist in: -prioritizing enhanced water management in areas of higher flood risk. -developing predictive flood risk tools to assist in evaluating impacts of changing land use in an area.	
	Based on modeling and observed drainage characteristics, establish adaptation action areas, identify opportunities and options for neighborhood-scale detention and water quality improvement to serve residential and/or commercial areas as needed.	
	Implement pilot eelgrass planting projects in select waterways to evaluate water quality improvement efficacy and considerations related to flood control.	
	Pilot the installation of canal barrier systems to sequester and minimize the spread of nuisance floating vegetation throughout canals, in order to reduce the frequency/need for treatment.	
	Pilot installation of stormwater filter/infiltration system in association with canal systems exhibiting higher pollutant concentrations than other waterways in the region.	
	Develop pond monitoring and stewardship program to assist residents in identifying opportunities for enhancing private residential ponds. Evaluate options for including cost-share program to implement remediation solutions such as plantings and aeration structures.	

Associated Plans, Ordinances, and Mandates

- Charlotte County Stormwater Master Plan
- County NPDES MS4 Permit (LINK)
- Charlotte County Code of Ordinances Article V, Article XV
- Watershed Master Plan
- Charlotte County Vulnerability Assessment

Background

The county's stormwater management system plays a central role in how our actions influence the health of our surrounding estuaries. Much of the current infrastructure was developed as part of the mass platting of land for single family homes in the 1950s–1980s. Based on stormwater management requirements of that era, drainage ditch and canal systems were established for flood control purposes, but little to no infrastructure is present in these areas to attenuate the content of stormwater before discharging into canals and Charlotte Harbor. As increasing development in the county will result in greater coverage of impervious surface (and thus heightened stormwater runoff rates and nonpoint discharges), environmental degradation pressures experienced by the harbor may increase significantly. Due to the manner in which habitable land was platted and sold, retroactively implementing modern management features such as stormwater retention areas will be challenging, as such projects may rely on obtaining land from willing private sellers (**Figures 15-16**).

In addition to our need to account for the environmental impacts of development in Charlotte County, we must consider the influence of activities outside the county's boundaries. From the north, Charlotte Harbor receives drainage from over 1.85 million acres of river basin running through five counties. In addition, over 128,000 acres of land immediately surrounding Charlotte Harbor drain into this estuary, and the Lemon Bay watershed encompasses approximately 58,000 acres draining Sarasota and Charlotte Counties. The impact of land uses in the counties upstream of Charlotte Harbor and Lemon Bay vary in their influence on the harbor depending on the nature of those activities and their proximity to the harbor/bay. For example, the City of North Port's stormwater management system is designed so that most of their drainage is directed west toward the Myakka River via Myakkahatchee Creek. Charlotte County's stormwater management system is also linked to North Port's, so drainage from North Port can directly discharge into Charlotte County's canal systems if North Port canal levels exceed certain elevations. Sixteen potential discharge points from North Port into Charlotte County exist. This illustrates how imperative it is for Charlotte County to maintain strong relationships with our upstream neighbors to ensure all are working together to protect Charlotte Harbor and Lemon Bay.

Current Stormwater Management

Charlotte County manages its stormwater via requirements described in the county Code of Ordinances and Nonpoint Discharge Elimination System MS4 Permit. Charlotte County is classified as a Phase 2 MS4 system, which requires: establishment and enforcement of ordinances designed to curtail illicit discharges and construction-induced runoff; stormwater system operation and maintenance procedures designed to reduce pollutant runoff; and public outreach programs designed to facilitate responsible management of lands and activities that could induce an illicit discharge if not sufficiently managed. In addition, construction activities are required to obtain an Environmental Resource Permit, which includes stormwater management requirements (though some construction activities such as single-family residences are exempted from certain requirements). In general, permits are issued by both water management districts and the county, though the county typically defers to SWFWMD or SFWMD requirements (depending on which District has jurisdiction over the construction location). Exceptions to that rule do occur, however; if during review the county identifies localized drainage considerations not considered by SWFWMD/SFWMD, the county will work with the agency to ensure permit requirements reflect additional management needs.

The county is responsible for maintaining most of the region-scale flood control canals and structures, whereas management of neighborhood-scale drainage systems can fall within the purview of the county, property owners associations served by that system, or individual homeowners where no such association or county authority is present. County-managed stormwater infrastructure is funded by various Municipal Services Benefit Units (MSBUs); three

regional MSBUs fund infrastructure serving all communities throughout that area, whereas many communities have their own MSBU to fund maintenance needs specific to their neighborhood.

Water elevations in several of the major drainage canals in Charlotte County are regulated via fixed-elevation weirs, providing some amount of water quality treatment by allowing particulates to settle out of the water column prior to discharging into the Charlotte Harbor/Lemon Bay estuary system. Much of the non-navigable segments of these canals have not been dredged since their construction in the mid-20th century, and have accumulated sediment and other material from decades of runoff. In late 2020, County Public Works received authorization to sequester MSBU funding for dredging several canals, citing potential water quality benefits from reducing organic matter and sediment in these systems. Dredging is not expected to increase the water carrying capacity in these canals because most were initially constructed well below the groundwater table (as evidenced by these systems containing water throughout the year, including during the dry season and drought conditions).

In addition, many undeveloped regions of the county currently function as natural stormwater attenuation features. As of January 2020, less than 50 percent of residential land around the harbor had been developed (**Figure 5**); many of these lots thus allow rain to collect and percolate into the surficial aquifer. Much of the undeveloped lands surrounding the harbor and bay is platted and will experience increased development, increasing flow rates and reducing potential pollutant attenuation by adding impervious surface and elevating parcels. Portions of the county may therefore experience reductions in stormwater mitigation capacity as the county population continues to increase (**Figures 5-6**).

In addition to water storage and conveyance systems, several stormwater runoff mitigation sites can be found throughout the county. Most of these sites are located along major roadways, receiving runoff from those roads and the surrounding community. These sites often focus on managing aquatic vegetation to support wildlife and help filter runoff and non-point source water discharge, thereby improving water quality in receiving waterways.

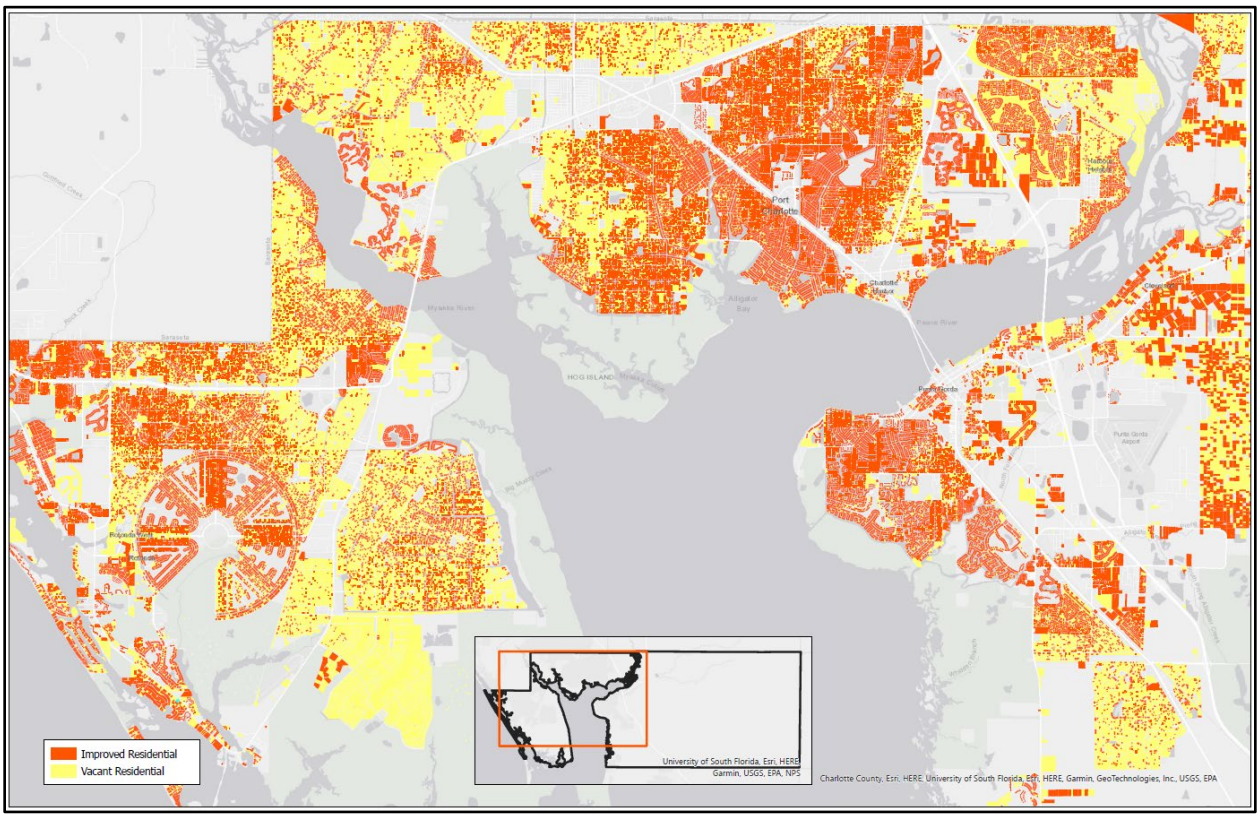


Figure 19. Residential parcels in west Charlotte County. Yellow regions are vacant, and orange are constructed as of January 2022.

Figure 20. Residential parcels near Port Charlotte. Most of these properties are unimproved (not developed); stormwater volume is expected to increase in this area as these lots are developed.

2024 Stormwater Rule

In June 2024, Governor DeSantis signed Senate Bill 7040, which contained extensive revisions to stormwater management requirements in the state. Most notable are implementing minimum treatment requirements for stormwater systems, which vary depending on proximity to impaired waters or Outstanding Florida Waters such as Charlotte Harbor (**Table 6**). Treatment estimates must be based on modeling or empirical data rather than presumptive Best Management Practice (BMP) efficiency estimates. In addition, permittees must provide a schedule and assurance of available funding for ongoing operations and maintenance of the stormwater system post-construction.

TABLE 6: SB 7040 nutrient reduction requirements.

Project Scenario	TP % Reduction	TN % Reduction	Additional Criteria
All Sites	80	55	Or post-construction discharge ≤ pre-construction
Adjacent to OFW	90	80	Or post-construction discharge ≤ pre-construction
Adjacent to Impaired Water	80	80	And post ≤ pre plus net improvement
Adjacent to Impaired + OFW	95	95	And post ≤ pre plus net improvement
Redevelopment Activity	80	45	N/A
Redevelopment + Adjacent to OFW	90	60	N/A
Redevelopment + Adjacent to Impaired Water	80	45	And net improvement for the pollutant of concern

Certain activities are exempt from these requirements, such as National Pollutant Discharge Elimination Systems (NPDES) (such as the previously described county MS4), single-family residences, project areas of less than 1 acre, and impervious surface designs less than 2 acres. This is of particular concern for water management in Charlotte County, as platted lots zoned as single-family homes dominate certain regions of the county, such as Northwest Port Charlotte.

The effective date of the rule varies by the parts within the rule. The new performance criteria become effective 18 months after its ratification, whereas other parts became effective immediately. The rules also have grandfathering considerations.

Vegetation and Mosquito Control Practices

Ensuring the proper function of the county's stormwater systems, while recognizing the role these systems must play in attenuating pollutant runoff within the county, is a priority for both environmental and public health and safety considerations. Water conveyance systems, including canals, ponds, and rights-of-way, are crucial for managing stormwater and facilitating drainage in Charlotte County. These systems also support local ecosystems by providing habitats for various wildlife species and enabling recreational activities such as fishing and boating. However, poorly maintained waterways can lead to flooding and other safety hazards, emphasizing the need for regular upkeep. The

presence of invasive aquatic plants can hinder drainage and impact local ecosystems, making effective management vital. Meanwhile, rights-of-way adjacent to roads and highways require ongoing management to prevent the spread of aquatic weeds that could impede drainage and exacerbate flooding issues. Addressing these challenges is essential for maintaining the functional integrity of these water bodies and ensuring they continue to serve the community effectively. Ultimately, a well-rounded approach to aquatic weed control can prevent loss of life and property, support healthy ecosystems, and enhance recreational opportunities for visitors and residents.

Effective water conveyance helps to minimize the risk of stagnant water, which can create breeding grounds for a variety of mosquito species including Mansonia sp., Culex sp., Aedes sp. and Anopheles sp. Psorophora sp. These mosquitoes are capable of vectoring diseases such as West Nile virus, St Louis Encephalitis, Easter Equine Encephalitis, Chikungunya, Yellow Fever, Dengue Fever Zika and even Malaria. Stagnant systems can also be overwhelmed by invasive aquatic weed proliferation, potentially choking out native vegetation and degrading aquatic habitats.

Waterway maintenance is currently conducted by two departments in Public Works: Operations and Maintenance addresses drainage concerns in swales and terrestrial vegetation on county waterway shorelines, while Aquatic Weed and Mosquito Control manages freshwater canals, drainage rights-of-way, and mitigation sites throughout 2,521 surface acres (or roughly 415 miles) of drainageways. Canals are scheduled to be inspected three times a year, but an investigation can also occur in response to a citizen service request. Whether scheduled or not, the inspector utilizes this opportunity to evaluate the site for vegetation treatment prior to it becoming a larger issue. Citizen requests for service also provide us an opportunity to engage the public and inform them about beneficial or native plants that are good for the ecosystem as well as the specifics of our program. A recently implemented software management tool called FieldSeeker ® GIS for Mosquito Control provides real-time dispatching and response to citizen service requests along with updates to treatment records and inventory management by the licensed applicators in the field.

Accurate identification of aquatic plants is crucial for effective weed management in Charlotte County. Trained applicators must be skilled in recognizing various aquatic species to implement appropriate control measures. Understanding the differences between native and non-native plants is particularly important for managing invasive species effectively. Native plants contribute to ecosystem health and support local wildlife. Conversely, non-native invasive species can outcompete these beneficial plants, necessitating focused management efforts to protect local biodiversity.

The most common nuisance and invasive plants that are encountered by the Unit of aquatic weed control are Brazilian Pepper Trees, Primrose species, Alligator Weed, Water Lettuce, Ambulia, and Chara. Many factors are considered prior to conducting an herbicide treatment but it usually starts with the plant type and the plant density. Other factors of equal importance include time of day, time of year, current weather conditions, and dissolved oxygen levels in the prospective treatment area.

Several state and federal agencies play pivotal roles in aquatic weed management in Charlotte County. The Florida Fish and Wildlife Conservation Commission (FWC) oversees biological control methods and regulates herbicide use in local water bodies. Additionally, the Florida Department of Environmental Protection (FDEP) ensures compliance with environmental standards for chemical applications, contributing to the overall effectiveness of management efforts. These agencies work collaboratively to develop comprehensive management strategies that address ecological health while meeting the needs of the community. Integrated Pest Management (IPM) strategies utilized by the Charlotte county's Aquatic Weed Program employs a combination of managing aquatic weeds effectively while minimizing environmental impact. This approach includes a mix of education and plant control, often through herbicide after biological control methods have been evaluated and implemented. By using IPM, aquatic weed managers can target invasive species without harming native plants or disrupting local ecosystems. Regular monitoring and assessment of

aquatic vegetation help inform management decisions, ensuring that interventions are timely and effective. Through the implementation of IPM practices, Charlotte County attempts to create a balanced and sustainable approach to aquatic weed management.

Herbicides are a widely used method for managing invasive aquatic plants due to their low cost and high effectiveness. The application of herbicides must be carefully regulated to ensure public safety and environmental protection. Licensed applicators are trained to apply these chemicals responsibly, adhering to strict guidelines that minimize risks to non-target species and the environment. The regulatory framework governing herbicide use requires that applicators demonstrate a clear understanding of safe application practices and compliance with environmental standards. By focusing on responsible herbicide use, Charlotte County can effectively control invasive aquatic weeds while safeguarding the health of its waterways. This careful approach is vital for maintaining the ecological integrity of local ecosystems as well as stormwater management.

Under certain conditions, Triploid grass carp can serve as an effective biological control for managing aquatic weeds by preferably grazing on invasive species such as hydrilla, which can promote the health of native vegetation. Their introduction offers a sustainable, long-term solution with minimal reliance on herbicides, but requires permits from the Florida Fish and Wildlife Conservation Commission (FWC) to monitor ecological impacts. This regulatory process is essential for maintaining oversight of biological control methods and ensuring they align with environmental protection goals. The application for permits must include detailed information about the proposed introduction and its potential ecological effects. By enforcing permit requirements, the FWC helps safeguard local ecosystems while allowing for effective management of invasive aquatic weeds. This regulatory framework fosters responsible practices that benefit both the environment and the community. As a key component of an integrated management strategy, triploid grass carp contribute significantly to maintaining healthy aquatic environments. Their role underscores the importance of varied approaches in addressing environmental challenges and promoting biodiversity. Certain communities in the county utilize carp to maintain waterways under their jurisdiction.

Future Management Considerations

The planting of native noninvasive plants in mitigation areas and Rights of Way can prevent monocultures from becoming established. Such plants filter and benefit non-point surface runoff which ultimately reach ditches, canals, and the Charlotte Harbor/ Lemon Bay estuaries. Native plants are easier managed and can establish complex plant and animal ecosystems benefiting both flora and fauna. Through this, Charlotte County can enhance its approach to aquatic weed management and promote the sustainability of its waterways.

County stormwater staff are charged with assuring the county's water conveyance systems maximize protection of life and property from flooding. To achieve this goal, the waterways often must be maintained so they are free of nuisance vegetation and debris that may otherwise impede flow and flushing. Current county processes are largely effective in accomplishing this goal, however multiple challenges in maintaining the system persist, such as:

- Natural challenges- in subtropical environments, nuisance vegetation proliferation is rapid and constant, especially during the wet season when flood control is most critical.
- Economic challenges- Increasing resource and personnel costs, in addition to competitive labor markets, creates persistent obstacles to obtaining and retaining sufficient numbers of qualified water management staff.
- In addition to the above, several portions of the county are going to see increased stormwater input into the system due to rapid development of currently natural lands, adding impervious surface and further runoff to the landscape. While the county's flood management system is engineered to accommodate storm events at full

buildout, additional water quality improvement measures will be needed to protect ecosystems services in downstream receiving waters.

Given these challenges, it is recommended to conduct a review and refinement of storm system management practices, with the goal to maximize maintenance efficiency while minimizing staff onboarding/training requirements and allowing for greater nature-based water quality attenuation in these systems.

Examples of opportunities to be addressed in this process include:

- Many drainage systems maintained by the county are plagued by regular vegetative obstruction of the inflow and outflow culverts, creating flood risks for upstream communities. Maintenance practices thus involve mowing of bankside and littoral vegetation around the waterway. In some cases, limiting vegetation removal to the points of inflow and outflow should provide the same flood control benefits as current practices, while also minimizing impacts to the system's ability to improve water quality and providing habitat to aquatic fauna. As each system might need its own targeted management plan, simply instructing staff on what should be maintained for each waterway will require a level of training that is simply not tenable; as such, app-based systems should be developed to guide individuals towards exactly what areas should be cleared, eliminating guesswork and allowing staff to document exactly what maintenance has been done in each drainage system.

Figure 21: Typical stormwater pond system maintained by the county. Yellow arrows indicate inflow/outflow points requiring regular maintenance

- Certain drainageways are entirely impacted by vegetation, and current management strategies may allow only short-term relief from potential drainage concerns. For example, vegetation such as cattails which regularly infiltrate county canal systems will reestablish their shoots relatively rapidly, refilling a canal in a matter of weeks. Review of the contours of some of these drainageways should be conducted to determine more permanent solutions for addressing vegetation impaction issues like the one shown in **Figure 22**. For example, it may be possible to alter channel morphology such that cattails are less likely to proliferate in the centerline of the channel, which would assure proper floodwater drainage while decreasing maintenance frequency. This would have the added benefit of allowing vegetation to remain along the banks and edge of the main channel, allowing for additional water quality improvement benefits. In addition, in some cases the conveyance system as designed may have much greater capacity than what is needed to service an area; as such, the maintenance refinement process should include the determination of drainage area to canal ratio via stormwater modeling, in order to ascertain if active vegetation maintenance is even necessary.

Figure 22: Vegetation maintenance operation in local drainage way, which is fully impacted by cattail growth.

Transitioning to an app-based system for directing maintenance priorities and processes also allows for streamlining documentation of activities, which will be a valuable asset to confirm waterways are being maintained to established levels of service, and for public communication needs. Apps are also capable of collecting written and photographic confirmation of what activities are needed and have been completed.

As has been alluded to in this section, citizens can be a major driver of where, when, and how often the county engages in canal maintenance activities. While citizen reporting can help the county stay on top of areas in need of canal maintenance, it is not uncommon for staff to receive complaints for drainage ways that do not need attention at that point in time. By creating a system with operating procedures and level of service requirements outlining what is needed

to assure a drainage system is optimally maintained, while also verifying what work has been done, staff will be able to better educate the public when their concerns over the flood mitigation capability of a system might be unwarranted. In addition, significant public outreach efforts will be needed to educate our populace concerning what is truly required to assure a well-functioning conveyance system, and how over-maintenance of a system can result in significant negative impacts to water quality.

In summary, optimizing our maintenance processes will allow the county to identify opportunities for streamlining current waterway maintenance procedures, while also promoting establishment/protection of aquatic and shoreline vegetation critical to attenuating pollutant inflows creating vibrant ecosystems within our waterways. In addition, the county is engaging in pilot aquatic vegetation planting projects to demonstrate the viability and benefits of establishing such restoration projects throughout the county.

Summary of Opportunities and Obstacles

Recent implementation of revised state stormwater management rules will result in greater reduction of nutrients entering Charlotte Harbor and Lemon Bay for qualifying projects under the rule.

New stormwater rule requirements may not be applicable to a significant proportion of undeveloped acreage in the county, as several large-scale developments will be grandfathered under the previous requirements, or are exempt, such as single-family housing.

Due to the widespread platting of single-family lots in the latter half of the 20th Century, substantial swaths of the county do not have modern stormwater treatment systems nor will they be required to implement such a system.

In 2023, the state issued a moratorium on adding or amending any ordinances or permit requirements that may be construed as “burdensome” to development; as of this writing, that moratorium is scheduled to lift in fall 2026.

For the reasons described above, the county’s swales and canal systems are the primary stormwater management/treatment systems in several regions of the county. Increasing the county stormwater treatment capabilities will require refocusing our canal systems as part of that treatment train and managing it as such.

Based on initial surveys and conversations with Public Works staff and local citizens, canal-adjacent residents appear to be divided on whether a more “natural-looking” canal is desirable or appropriate. Some of this is because of the need for additional outreach to waterfront communities, educating them on beneficial, native vegetation vs invasive or potentially toxic species and algal blooms. Additional effort is needed to determine residents’ support of converting canals to a more nature-based treatment system and what level of outreach will be required to combat misconceptions about aquatic vegetation.

Charlotte County has a substantial available resource in our citizenry, and their concern for the health of our waters can be leveraged to initiate robust citizen monitoring and neighborhood pond enhancement programs.

Vision Task Details

Task A: *Initiate the first phases of the stormwater maintenance optimization process, identifying waterway-specific maintenance needs and upgrading maintenance communications/logistics.*

Estimated Development Cost: HIGH (>$1,000,000). Other modeling and related tasks in this document may significantly reduce this estimate.

Details and Justification: As discussed in the Background section, opportunities exist to optimize stormwater management processes to streamline time and personnel expense, while also maximizing preservation of aquatic habitat and the system's natural pollutant filtration/interception capacity. This task seeks to accomplish the first phases of that effort via the following:

1. Use information provided by maintenance staff alongside independent field surveys and identify inflow/outflow points, maintenance priority, frequency of maintenance required, and optimal drainage patterns for each waterway maintained by the county.
2. Design waterway-specific maintenance processes and appropriate Levels of Service (LOS) to minimize the impact to aquatic habitats while allowing for efficient conveyance of water. In some cases, an initial investment in resources might be needed to adjust the waterway in a manner that will allow for more efficient maintenance.
3. Create a geospatial application that field staff can use to quickly identify inflow/outflow points and precise maintenance regions for more targeted efforts. This can also be designed to allow managers to easily create work queues in the app so that it can serve as an all-in-one tool to guide timing, location, and type of maintenance needed for each waterway. In addition, the app can be used to document the timing and extent of management efforts in track maintenance progress and respond to citizen concerns.

Task B: *Review and Revise the County Stormwater Master Plan as needed, incorporating portions of the county not currently included in the Plan, and identifying opportunities for enhancing stormwater treatment and levels of service in light of revised 2024 stormwater rule, and newly-acquired information on flood risks due to current and future coastal storm surge scenarios.*

Estimated Development Cost: MEDIUM ($100,000-$1,000,000)

Details and Justification: The county Stormwater Master Plan was last revised in the late 1990s; since then, the county has seen dramatic changes in growth, land use, and stormwater management needs. Because of this and the recent issuance of the revised statewide stormwater rule, the Master Plan should be reviewed and modernized to address our current and future stormwater management requirements and processes. This is proposed to be accomplished in two phases:

Phase 1:

- Develop updated stormwater model for Charlotte County MS4:
    - Model storm events based on current required level of service, as well as max event that most of the system is capable of mitigating, in order to identify areas that might underperform in either scenario

    - Model system response to storm events based on current database of water control structures, via two scenarios:
        - All structures are fully functioning to designed specifications.
        - Structures are not operating to designed specifications.
- Based on model output and county staff input, develop documented minimum maintenance requirements to achieve levels of service for conveyance systems within the county's jurisdiction.
- Conduct system-wide assessment of location, condition, and maintenance needs of county stormwater conveyance infrastructure in Mid and West Counties, and that portion of South County outside of the current Burnt Store modeling area.
- Based on results from tasks, develop maintenance/improvement strategy for infrastructure not meeting current minimum maintenance requirements, as specified in updated Stormwater Master Plan.
- Based on output of model and input from county staff, conduct system-wide assessment of communities/neighborhoods at high risk of localized flooding, and determine remediation options to address impacted properties through either infrastructure improvement, property enhancement, or property acquisition.

Task C: *Install water elevation monitoring networks to track flow rates, flood risk, and tidal influence on water drainage in the region.*

Estimated Development Cost: MEDIUM ($100,000-$1,000,000). Current estimates place this Activity at Approximately $300,000 for the first year of equipment installation and calibration, and ~$120,000 per year for Maintenance and Operation.

Details and Justification: Recent regional storm events have underscored the county's need for enhanced water elevation and flow monitoring systems to allow the county to better predict and prepare areas susceptible to flooding. For example, immediately after Hurricane Ian, historic rainfall throughout the region caused near unprecedented levels of flooding in the Peace River, Myakka River, and Big Slough basins draining into Charlotte Harbor and breached some water control structures in North Port. This created concern among Charlotte County staff that Port Charlotte was at risk of receiving uncontrolled discharges from North Port, potentially threatening life and property if the stormwater canals responsible for managing runoff in the area were already at or near maximum capacity due to localized rain and flooding.

Nearly 1 year later, Hurricane Idalia brought moderate rainfall to the area (3–5 inches on average), which the county's stormwater system has sufficient capacity to manage. Unlike Ian, however, tidal surges helped push harbor and tidal river elevations into low-lying areas of the county, causing extensive flooding in our coastal communities. Surge flooding from Hurricanes Helene and Milton were even more extreme than Idalia, damaging or destroying thousands of homes throughout the county. If we experience a storm that combines precipitation rates on par with Ian in addition to tidal surges like Idalia, Helene, or Milton, the flood impacts to our residents could be catastrophic.

These events highlight the need to establish mechanisms by which county EOC staff can receive advance notice of potential flooding by installing telemetry-based water elevation/flow gages. No elevation gages are present in any canals in Charlotte County, preventing decision-makers at the county EOC from ascertaining the actual risk of flooding within residential areas. Only one telemetry-based water elevation station is in the marine waters of Charlotte County, in the tidal Peace River near the Harbor Heights neighborhood. In addition, the county lacks a comprehensive stormwater flow model, and thus the EOC has relied on flow estimates from generalized models provided by NOAA. Because these model runs predicted wildly varying pictures of the actual flood risk to residents during Hurricane Ian, a stormwater model calibrated using data collected within Charlotte County waterways is clearly needed to accurately predict and act on future potential flood risks in our jurisdiction.

In addition to the public safety elements described above, establishing a water elevation monitoring system is the first step in developing accurate stormwater and pollutant loading models, allowing the county to more accurately target "hot spots" of pollution sources into Charlotte Harbor and Lemon Bay. This is a necessary element to developing waterbody restoration plans such as Reasonable Assurance Plans, which are vital component to have in place when requesting water quality improvement funding.

Task D: *Based on output from the county Vulnerability Assessment, Watershed Master Plan, and water elevation monitoring network described in Stormwater Task C, develop predictive tools as needed for storm runoff and drainage rates to assist in prioritizing enhanced water management in areas of higher flood risk, and inform predictive flood risk tools to assist in evaluating impacts of changing land use in an area.*

Estimated Development Cost: MEDIUM ($100,000-$1,000,000)

Details and Justification: As of this writing, multiple flood and surge impact investigation products are being developed in the county. The state-mandated vulnerability assessment is examining tidal surge and flooding probabilities based on current tides and future sea level rise estimates. Meanwhile, the Watershed Master Plan (being developed to benefit the county's standing in the National Flood Insurance Program) uses the most recently collected land elevation data to estimate the location and extent of flood-prone areas when subjected to various intensity rainfall events and to recommend strategies for mitigating flood impacts. Missing from each of these projects are flood and flow data because the county lacks an extensive water elevation monitoring network. In addition, these products are static in that they are not currently planned to be updated to account for any substantial changes in land use or local land elevation (which can occur when extensive development in an area results in large regions elevated with imported fill to protect infrastructure from flooding and tidal surges). Hence, the county needs a dynamic predictive tool that can be used by Community Development, Stormwater, and other planners to evaluate possible impacts from proposed changes in land use and stormwater management. The tool will leverage information provided by the aforementioned plans in conjunction with the water elevation monitoring network described in Task B.

Task E: *Based on modeling and observed drainage characteristics, establish adaptation action areas, identify opportunities and options for neighborhood-scale detention and water quality improvement to serve residential and/or commercial areas as needed.*

Estimated Development Cost: HIGH (>$1,000,000)

Details and Justification: Due to the manner with which much of Charlotte County was planned and platted, significant acreage adjacent to Charlotte Harbor and Lemon Bay contains single-family residential dwellings exempt from implementing any meaningful stormwater treatment practices. In addition, little public land is available in these areas, making immediate construction of stormwater treatment basins in some areas impossible without relying on willing sellers of private property in the areas of greatest need for increased stormwater management. This task proposes to use the previously described projects to identify high-priority areas for property acquisition to create water quality improvement infrastructure at a neighborhood scale. These features can also serve as an amenity to the local community, creating an oasis of nature within a developed area for the community to enjoy. Such features have proven to be popular among residents in other portions of the county with similar features, such as Ollie's Pond Park in Port Charlotte.

Task G: *Implement pilot eelgrass planting projects in select waterways to evaluate water quality improvement efficacy and considerations related to flood control.*

Estimated Development Cost: LOW (<$100,000)

Details and Justification: For many locations in the county, the flood control canal system will likely be among the only opportunities to attenuate stormwater pollution in these areas before discharging into the harbor and bay. Swale systems provide some nutrient reduction during winter and early spring, but most of that network will have limited treatment capability during more intense stormwater events and peak wet season when surficial groundwater levels are high enough to drastically reduce the landscape's soil infiltration capacity. As such, adjusting canal management practices to allow for nature-based filtration of nutrients and pollutants should be explored. Planting eelgrass, a native freshwater submerged grass, in canal systems has shown success in reducing nutrient and bacteria concentrations in other south Florida counties while allowing for flow to continue unobstructed (as a grass, the plant lacks rigidity to emerge above the water surface and otherwise block or reduce flow). In theory, this activity should help to reduce nutrients in the system, reduce the frequency of canal vegetation management activities by the county, and create habitat for aquatic biota to thrive. However, some boating communities in Charlotte County already experience a proliferation of seagrass in their canals, and several residents have complained that the eelgrass is a nuisance to navigation.

The county has identified a few candidate non-navigable canals to test plant eelgrass to evaluate its efficacy in reducing nutrient concentrations and enhancing habitat and to determine any management considerations that will need to be taken into account if this effort were expanded throughout the county.

Task H: *Pilot installation of floating canal barrier systems to sequester and minimize spread of nuisance floating vegetation and litter to reduce the frequency/need for chemical-based treatment.*

Estimated Development Cost: LOW (<$100,000)

Details and Justification: One of the drivers of the frequency and extent of nuisance vegetation management by the county concerns the volume of floating vegetation transported into and throughout these systems. Other counties have had success in limiting the proliferation of floating vegetation by installing booms at key locations to intercept and "hold" vegetation pending removal by county staff. The goal of this project is to use booms to evaluate whether installing and maintaining vegetation at boom installation locations can reduce the frequency of herbicide application downstream. This is a companion project to the eelgrass study above; the goal is to determine if using native grass combined with physical management of nuisance floating vegetation can reduce, if not eliminate, the need for more active vegetation management throughout the entirety of the canal system.

Task I: *Pilot installation of stormwater filter/infiltration system in association with canal systems exhibiting higher pollutant concentrations than other waterways in the region.*

Estimated Development Cost: LOW-MEDIUM (<$1,000,000), dependent on installation

Details and Justification: Many urbanized areas have used underground stormwater storage/filtration systems to reduce pollution in runoff, especially in neighborhoods with few opportunities for installing surface ponds or land infiltration. Certain portions of Charlotte County transport stormwater via swale systems, and water from these swales discharges directly into receiving canals. In some parts of the county, land elevation at the point of the swale discharge may be high

enough to allow a test installation of filtration basins to evaluate treatment efficiency and maintenance needs (Most of these systems require installing above the surficial groundwater table, which can be a challenge for many locations in Charlotte County that are at or near sea level). **Appendix B** describes options and efficiency expectations for recommended filtration systems used to successfully reduce nutrient outflows. The initial area of focus for this effort should be the region around western Port Charlotte/ tidal Myakka, which based on data collected thus far is exhibiting occasional periods of high Nitrogen concentrations compared to other areas of the county.

Task J: *Develop pond monitoring and stewardship program to assist residents in identifying opportunities for enhancing private residential ponds, including cost-share program for implementing remediation solutions like plantings and aeration structures.*

Estimated Development Cost: LOW (<$100,000)

Details and Justification: Many stormwater ponds in Charlotte County are managed by property owner associations, who often desire to see a vibrant, healthy aquatic system in their backyard. Over the years, the county has received requests from associations for advice or support in assessing and rehabbing their pond, but the county does not have a formal program in place to assist with this. Using similar programs in Lee and Sarasota Counties as guidance, this task will develop a formal mechanism for residents to sample, assess, and determine management strategies to create a healthy habitat for aquatic species while providing some level of nutrient reduction in these systems before their inevitable discharge into Charlotte Harbor or Lemon Bay. In addition, this task should explore the possibility of installing a cost-share program to acquire and establish remediation solutions for those communities that may lack the resources to do so. This could take the form of a revolving fund with annual limits or multi-year grants from state or national non-point source focused entities.

Task K: *Develop stormwater and green infrastructure design manual for county asset construction and maintenance.*

Estimated Development Cost: MEDIUM ($100,000-$1,000,000)

Details and Justification: The design manual for county facilities currently requires stormwater management plans to meet the base detention and treatment requirements in the state and SWFWMD's ERP permit manuals. In recognition of the need to maximize stormwater treatment capabilities of county properties, adapt to anticipated changes to stormwater management requirements in the updated 2024 stormwater rule, and create opportunities to demonstrate the efficacy of comprehensive stormwater management systems, the county will update the design manual and operation procedures as follows:

- Develop a menu of options for green infrastructure implementation on county properties as part of both construction and refurbishment activities, prioritizing options that maximize water infiltration, retention, and canopy cover for facilitating evapotranspiration. Construction planning processes will utilize a cost/benefit analysis to determine appropriate measures for achieving minimum infiltration rates.
- For construction activities centered around expansion of existing facilities, require design strategies that result in, at minimum, no net loss of stormwater attenuation capacity, and minimal to zero loss of pervious land.
- Outline comprehensive maintenance plan to assure treatment system continues to operate as designed, including determination of responsible parties for assuring maintenance requirements are met.

In addition to the above, routine sampling efforts will be expanded to select facility stormwater systems to evaluate the efficacy of implemented management features and refine future stormwater management system design strategies.

--Drinking Water and Wastewater Management--

ONE WATER VISION: Maintain efficient, resilient, and fiscally sound water supply and treatment services to Charlotte County while protecting our aquatic resources.

PATHWAYS TO THE VISION

	Using guidance provided through Utilities Department's planning processes, develop, support, and align Department monitoring initiatives with existing county monitoring and assessment projects and initiatives to track water quality/quantity impacts from Department activities.
	Expand surface water monitoring program to target water quality trends for surface waters served by non-county wastewater management systems.
	Identify and prioritize opportunities for reducing new septic installations within areas with potential surface and ground water quality impacts.
	Identify and prioritize opportunities for addressing areas at higher risk of saltwater intrusion.
	Prioritize implementation of infrastructure resiliency enhancements, especially in areas with highest risk of flooding and tidal surge impacts, and higher failure rates during storm events.

CURRENT VISION TASKS*

Categories	Task	Anticipated Regional Benefits
	Conduct a needs and cost analysis of expanding sewer and potable water service to portions of west Port Charlotte.	
	Increase groundwater elevation and salinity monitoring network to track saltwater intrusion trends in the region, especially in areas with higher densities of groundwater withdrawal wells.	
	In cooperation with other relevant departments (such as Community Development), organize and implement enhanced education and enforcement process to reduce construction-related breaks in water supply and wastewater transmission pipes.	
	Initiate reclaimed water user irrigation education campaign, providing guidance on water content and application to reduce fertilizer use and inappropriate irrigation application.	

*** NOTE:*** The Utilities Department has developed multiple plans with recommendations related to addressing water supply and treatment processes while addressing water quality and quantity considerations. The measures in those plans

should be considered components of the county's One Water Program, with the recommendations in this document intended to be complimentary to those efforts.

Associated Plans, Ordinances, and Mandates

- Charlotte County Sewer Master Plan
- Charlotte County Potable Water Master Plan
- Charlotte County Capacity, Management, Operations, and Maintenance (CMOM) Program
- Charlotte County Capacity Assessment and Assurance Program Framework
- Southwest Florida Water Management District Minimum Flows and Levels for Peace River
- Peace River Manasota Regional Water Supply Authority Operations Guidance

Background

Prior to the 1990s, water supply and wastewater treatment services in unincorporated Charlotte County were provided by a suite of commercial and community-funded utilities systems, the largest of which was serviced by General Development Corporation (GDC) until their decline toward bankruptcy in the late 1980s. Charlotte County Utilities (CCU) was formed upon the county's purchase of GDC's wastewater conveyance and treatment system in 1991. Since then, the county has acquired other local wastewater treatment networks as they reach the end of life or operation costs of those systems exceed the financial capability of the community it serves.

To address the loss of potable water services due to GDC's collapse, in the early 1990s SWFWMD partnered with multiple counties in the region to create the Peace River Manasota Regional Water Supply Authority (PRMRWSA), which is tasked with providing potable water for member counties. The PRMRWSA provides withdrawal, initial treatment, and transmission of water to county facilities; the county, in turn, conducts an additional level of treatment before distribution to end users in their service area. The principal source of potable water is the Peace River; the PRMRWSA maintains intakes in Desoto County, just south of the river's confluence with Horse Creek near Fort Ogden. Withdrawal rates are regulated via permitting through SWFWMD, which determines minimum flow and level requirements of the Peace River to protect aquatic life. In addition, the PRMRWSA must conduct extensive monitoring in the lower Peace River to demonstrate withdrawals are not negatively impacting aquatic systems downstream.

CCU operates two independent public water systems: the Port Charlotte Water System and the Burnt Store Water System. The Port Charlotte Water System serves Mid and West County and is supplied by the PRMRWSA. The Burnt Store Water System serves South County and is supplied by the Burnt Store Reverse Osmosis (RO) Water Treatment Plant (WTP). The County's water facilities include groundwater supply wells, water booster stations (WBSs), water storage tanks, and emergency interconnects with neighboring utilities.

CCU is one of several providers of potable water and wastewater treatment in the county; the City of Punta Gorda provides utilities services to its residents, and multiple smaller community-scale systems still exist in various pockets of the county. **Figures 23-24** shows the current distribution of utilities in the county. As with any growing county, Charlotte County has private utilities that were the right solution at the time they were built. As the growth in the County has continued and regulations have increased on utilities, consolidating poor-performing systems into the County systems is the best solution for both parties. The County has been continually consolidating private systems where it is mutually beneficial to both parties. The ongoing Sewer Master Plan Update is further evaluating consolidation. With the elevated

level of AWT and reuse that will be provided by the County's systems, this consolidation will further reduce pollutant loading to the County's receiving waterbodies.

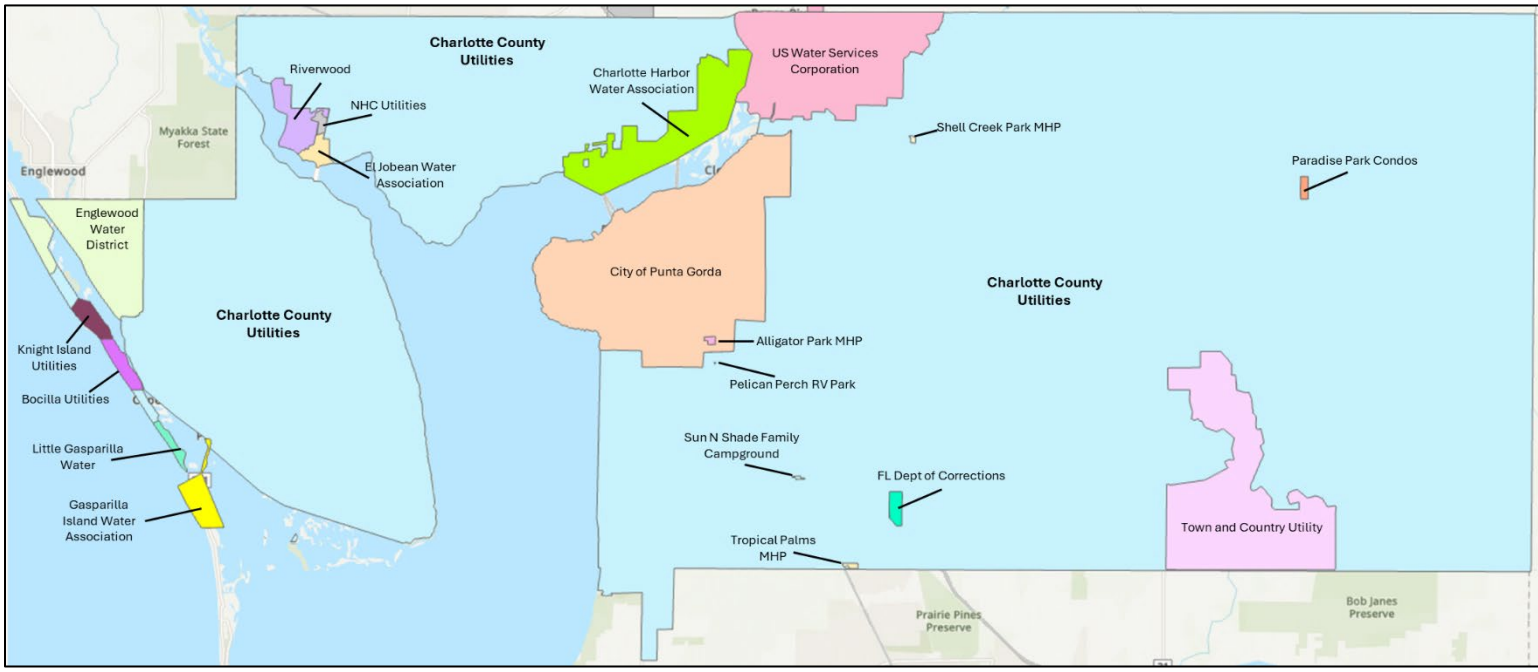


Figure 23. Certificated Water Service areas in Charlotte County. Shaded regions do not represent water service availability, only the authority to provide such services.

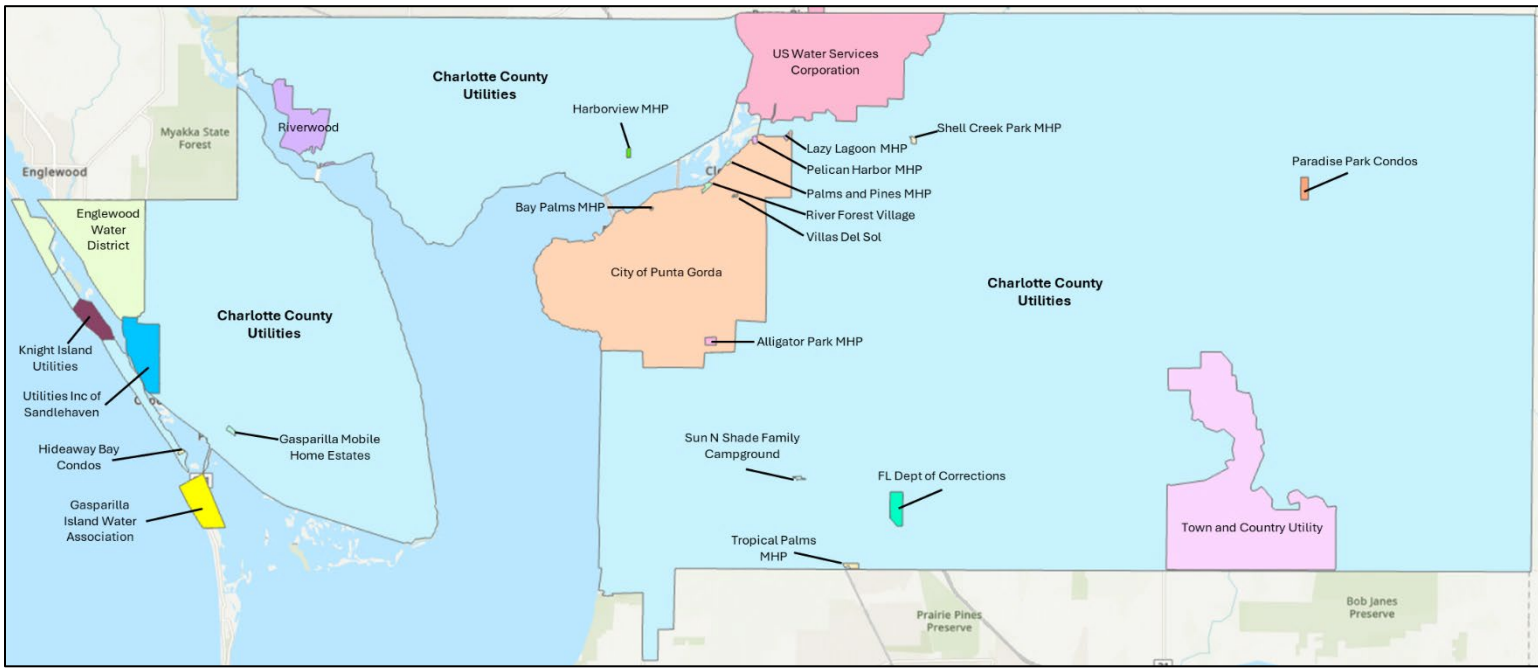


Figure 24. Certificated Sewer Areas in Charlotte County. Shaded regions do not represent sewer availability, only the authority to provide sewer services.

Potable Water Supply

Charlotte County's potable water supply is best summarized by the Charlotte County Potable Water Master Plan (CCPWMP) completed in 2023. The CCPWMP's purpose is to ensure a sustainable and reliable potable water supply for Charlotte County through 2045. The CCPWMP outlines the county's water system development, current water supply, treatment, distribution, and future water demand projections while also addressing water conservation, regional supply options, and capital improvement projects.

The CCPWMP's primary goal is to meet the current and future water needs of Charlotte County residents while protecting the natural environment. Key objectives include:

- Summarize historical water demands and present the water system components.
- Model and estimate system growth and water demands.
- Identify methods to reduce potable water demands through conservation and reclaimed water use.
- Update the County's Water Conservation Plan (WCP).
- Review water treatment capacities and identify water supply options.
- Update water distribution system models and conduct simulations to determine future system requirements.
- Develop a water quality improvement plan and a hydrant installation planning map.
- Develop capital improvement projects (CIPs) and identify funding options.

Guiding Principles

The CCPWMP was developed with the guiding principles of affordability, sustainability, efficiency, reliability, resiliency, and modernization. These principles ensure that the CCPWMP focuses on affordable solutions, incorporates water conservation initiatives, implements efficient construction methods, updates water treatment and conveyance infrastructure, increases system resilience, and expands the use of advanced tools for utility operations.

Hydraulic models were used to analyze the current and future performance of the water distribution systems. The models helped determine system requirements, size new transmission mains, identify expansion areas, reduce energy consumption, and increase system resilience. The CCPWMP includes recommendations for improving the hydraulic performance and fire protection capabilities of the water systems.

As Charlotte County's population grows, expanding the water systems will be necessary to meet future demands. The CCPWMP uses GIS data to track and manage water service assets and projects future water demands through 2045. The CCPWMP considers infill growth, new developments, and potential utility acquisitions. Water demand projections indicate that the Port Charlotte Water System will exceed its allocated capacity by 2027, and the Burnt Store Water System will exceed its permitted capacity by 2034.

Several regional water supply options to meet future demands were evaluated in the CCPWMP, including:

- Use the Babcock Ranch water supply.
- Increase the PRMRWSA allocation.
- Install new groundwater wells.
- Implement potable reuse.
- Use neighboring interconnects.

Each option was evaluated based on regulatory and legal considerations, advantages, and disadvantages. The CCPWMP recommended a combination of these options to ensure a reliable and sustainable water supply.

Given current and projected potable water needs in the county, water conservation is a critical component of the CCPWMP. The CCPWMP includes public education programs, incentive-based water-rate structures, indoor and outdoor water-use reduction programs, and a water-loss-reduction program. The CCPWMP also promotes the use of reclaimed water for irrigation and other non-potable uses. The effectiveness of the water conservation program is assessed through trends in potable water use, reclaimed water use, and non-revenue water use.

Ensuring drinking water meets or exceeds regulatory requirements for safe consumption is essential for public health and regulatory compliance. The CCPWMP includes strategies for monitoring and improving water quality, such as chemical monitoring, disinfectant residuals, bacteriological monitoring, and lead and copper monitoring. The CCPWMP also addresses water age and quality modeling scenarios to identify areas for improvement.

The CCPWMP outlines capital maintenance and improvement projects to ensure the long-term sustainability and reliability of the water systems. These projects include installing new water mains, upgrading booster stations, and constructing new water storage tanks. The CCPWMP also identifies funding options such as grant funding, legislative appropriations, loan funding, revenue bonds, and taxes and rate increases. The CCPWMP emphasizes the importance of securing adequate funding to support the long-term sustainability of the water systems.

Wastewater Treatment

Charlotte County disposes of treated wastewater through their reuse water distribution network and deep well injection. Treated waters meeting certain regulatory quality requirements are provided to permitted entities for irrigation needs. Each permittee is allowed a limited allocation of reuse water, subject to:

- Availability of reuse water - Generally speaking, reuse water is stored in reservoirs at the East Port, West Port, Rotonda, and Burnt Store WRFs. Water is then pumped into the network based on usage requests and available capacity in the reservoirs. This availability is contingent on:
  1. Wastewater inflow rates reaching WRFs (which can decrease when many seasonal residents have left Charlotte County).
  2. Reuse demand (which tends to increase during the dry season).
  3. The proportion of treated wastewater meeting minimum water quality requirements for reuse. Water not meeting those requirements are discharged via deep well injection.
- Capacity of the end user to accept reuse water - With few exceptions, reuse water is distributed into holding ponds on permittees' properties, and permittees irrigate their lands with water from these ponds. These ponds often also serve as stormwater runoff and retention areas for the surrounding land and can thus discharge once water in the pond reaches a certain elevation. Automatic triggers are in place to prevent reuse water from entering ponds that are discharging or are full enough that discharges are imminent.

When discharges occur from permittees' ponds due to rain events, some volume of those discharges likely contain reuse water. This necessitated the need to implement AWT at the County's four WRFs. AWT will further reduce the nutrient concentrations in the WRF effluent. Construction at the East Port WRF began early in 2024. As of this writing, the current schedule for implementation of AWT at the other CCU WRFs are:

- Burnt Store: Construction expected to start date of August 2024
- West Port: In design now; construction starting summer 2027;
- Rotonda: In design now; construction starting winter 2027 or spring 2028.

Per state statutory requirements, AWT must be implemented at all CCU facilities by 2031.

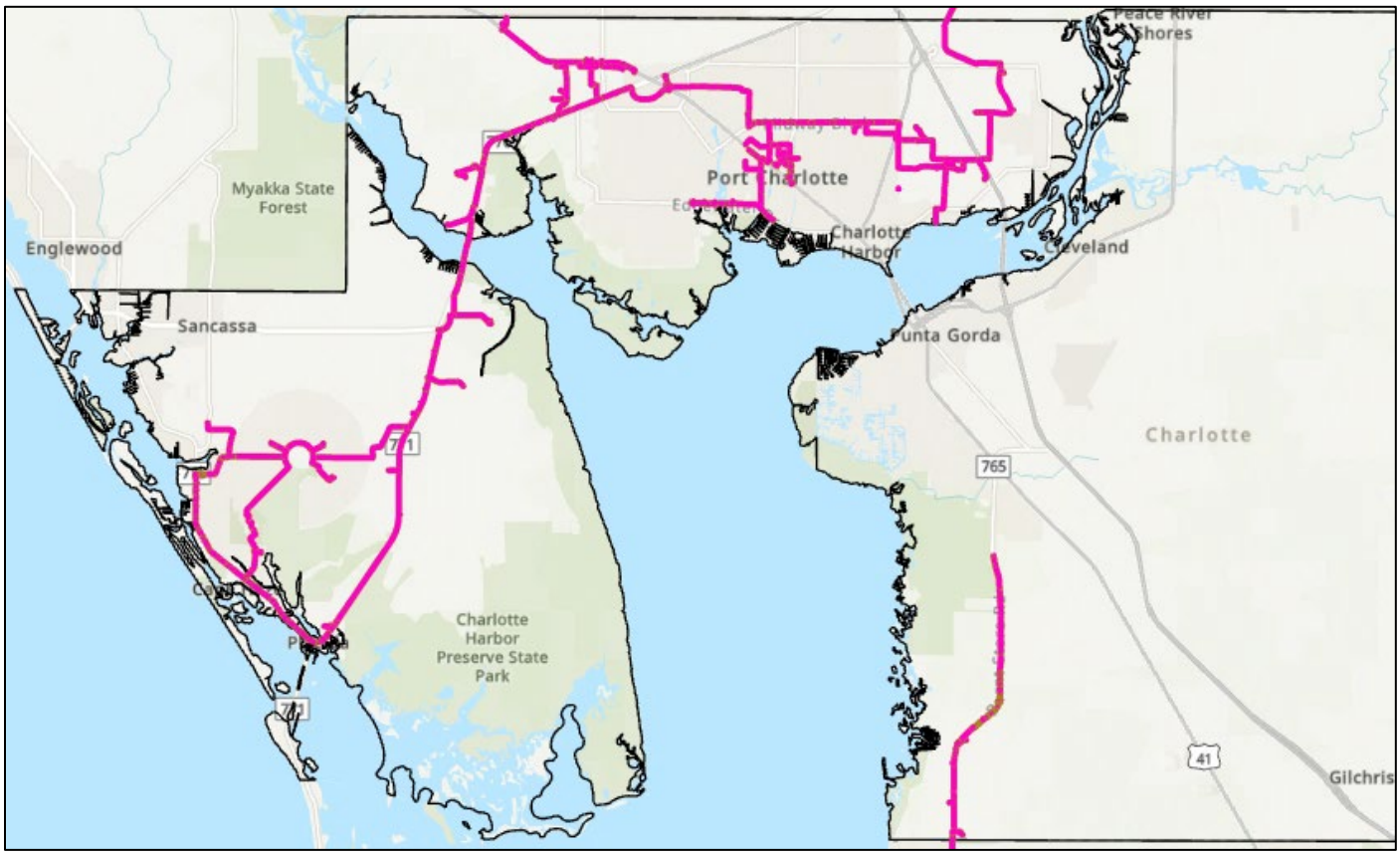


Figure 25. Reclaim water distribution network in Charlotte County.

The biosolids from the County's four WRFs are sent to the East Port WRF where it is dewatered and processed. The processed biosolids are sent to the County's Zemel Road Landfill where it is made into Class AA compost at the on-site Synagro Compost Facility (a public-private partnership) or sent to the County's landfill for disposal. These methods of disposal minimize the impact of biosolids on the County's receiving waterbodies. The County is also evaluating other options for biosolids disposal that are similarly favorable to receiving waterbodies.

Wastewater Management Planning

CCU continually engages in the Sewer Master Planning process on a 5-year recurring basis in part to ensure and sustain the quality of natural water resources to protect and provide a safe water supply, a recreational haven, and an environmental resource. The previous Sewer Master Plan was completed in 2017, and the 2023 Sewer Master Plan update is in progress. The Sewer Master Plan serves as high-level planning document to assess the county's sewer system and provide short- and long-term recommendations for improvements. Implementing these elements is discussed further below. The Sewer Master Plan provides background on the county's sewer collection, transmission, treatment, reuse, and disposal systems; consolidation of private utilities; sewer improvements to address current needs and future growth (capital improvement planning); septic-to-sewer prioritization; overview of collection system Capacity, Management, Operations and Maintenance Program (CMOM), biosolids management; and funding. From a water quality perspective, this planning helps to minimize pollutant loading to the county's receiving waterbodies.

CCU has an ongoing Septic-to-Sewer Program and has been eliminating septic systems by extending the collection and transmission systems throughout the County. The prioritization since 2017 has largely been based on the prioritization

developed in the 2017 Sewer Master Plan. The prioritization is being updated in the ongoing Sewer Master Plan Update. The County is committed to continuing the Septic-to-Sewer Program, which is a total turnkey construction program that includes the on-lot sewer connections to each home/business and proper abandonment of the septic tank.

Senate Bill 64, enacted in 2021, outlined key requirements for eliminating surface water discharges from WRFs. CCU is largely in compliance with Senate Bill 64 already since they dispose of their reclaimed water by distributing it to large-user public access reuse systems and by disposing of excess reclaimed water through deep injection wells. CCU has no direct outfalls to the Charlotte Harbor estuary or its tributaries. With the commitment to implement to AWT at all WRFs, pollutant loading to surface waterbodies via groundwater infiltration from reuse areas will be further reduced.

Infrastructure Performance and Resiliency

CCU developed their CMOM program in 2021 to improve the wastewater collection and transmission system. The CMOM Program aims to better manage, operate, and maintain the collection system, investigate capacity constraints, reduce sanitary sewer overflows (SSOs), and provide high-quality service. The CMOM outlines CCU's organizational structure, collection system management practices, capacity assessment and assurance program, and operation and maintenance (O&M) programs.

Overall, the CMOM Program establishes a structured approach for CCU to manage its wastewater infrastructure, comply with regulations, and provide reliable service to customers. The document serves as a guide for ongoing implementation and continuous improvement of CCU's wastewater management practices.

A component of the CMOM Program is the Capacity Assessment and Assurance Program (CAAP) and flow monitoring program. The county has recently developed the framework for the CAAP and a pilot program for flow monitoring. Future efforts will continue in both programs. Both programs will improve the understanding of how the collection and transmission systems are functioning.

CCU regularly inspects and maintains it collection and transmission systems, including ongoing activities such as closed-circuit television inspections, cleaning, and fat/grease removal. These activities ensure that the collection and treatment systems are operating at full capacity and are structurally sound. CCU uses a portion of its annual budget on repair and replacement (R&R) of the collection and treatment system. R&R activities are based on inspection findings or ad hoc needs. Relatively recent rulemaking for collections systems covered under Chapter 62-600, FAC, requires utilities to submit “a pipe assessment, repair, and replacement action plan with at least a 5-year planning horizon for all collection/transmission systems under the utility’s control to mitigate sanitary sewer overflows and underground pipe leaks to the extent technically and economically feasible.” To assist with implementing measures of the aforementioned plans, CCU has recently developed an asset management system using Cityworks to track and schedule inspections, O&M, and R&R. In addition to streamlining operations, CCU will be able to better analyze data on system performance.

Occasional breaks, malfunctions, and inadvertent spills of untreated wastewater are an inevitability in a system the size of Charlotte County’s. **Figure 26** below provides a breakdown of sewage spills between 2017-2024. There are multiple culprits for these spills, ranging from breakdowns due to aging infrastructure, environmental damage (such as debris strikes and flooding), and accidental line strikes by construction-related activities. Processes such as the aforementioned CMOM program should result in fewer spills due to aging infrastructure. Utilities has also collaborated with the county’s code enforcement office to implement more measures assuring contractors are locating water and sewage transmission lines prior to construction, and are appropriate enforcement actions are taken if strikes occur due to their negligence.

Since 2022, multiple hurricanes have brought historic rain, flood, and wind damage to the Charlotte County region, damaging numerous lift stations and transmission lines. These storms thus highlight sites with vulnerable stations and lines that will need armoring and/or elevating to better withstand future storms and impacts from sea level rise and changing weather patterns. Ongoing county asset vulnerability assessment and remediation planning are identifying current and future at-risk utilities structures, with the goal to conduct future planning and prioritization for asset upgrades and armoring. In addition, vulnerability modeling outputs will be shared with community utility providers so they may be better informed of current and future risks to their own systems. Federal storm recovery funds are being utilized to restore damaged stations and increase their resistance to failures in future storm events.

Figure 26. Charlotte County Utilities effluent spill statistics from 2017-2024.

	2017	2018	2019	2020	2021	2022	2023	2024
Total Spilled	389,750	111,743	210,325	629,720	1,279,618	547,017	169,554	621,745
Total Into Waterways	89,430	29,622	168,950	182,270	20,850	88,882	26,500	166,462
Total Reported Spills	60	35	40	46	63	151	65	120
Average Spill Amount	6,496	3,193	5,258	13,690	20,311	3,623	2,609	5,181
	Hurricane Irma			Quesada FM Break Year	Tropical Storm Elsa	Hurricane Ian	Hurricane Idalia	Hurricane Helene and Hurricane Milton

Future Operational Considerations

As illustrated in this section, the Utilities Department have invested substantial resources in creating roadmaps for service expansion, maintenance, and improvement. That said, there are external factors that can influence aspects of timing and prioritization in implementing the Department's operational strategies:

- Since 2020, infrastructure construction and maintenance costs have increased dramatically, such that the cost of these activities is exceeding current and predicted revenue from rate payers. For example, when initial planning commenced for the expansion of the Burnt Store plant, the original engineering report estimated a project cost of $30 million. When that project was revisited in 2023, the estimate increased to $90-$100 million, and the final bid estimate in 2024 was $181 million;
- Saltwater intrusion continues to be a specter for coastal communities in Florida relying on groundwater for their drinking water supply. In Charlotte County, substantial portions of the western and central portions of the county contain groundwater with measured chloride concentrations in excess of 1,000 mg/L (**Figure 25**). As of this writing, certain regions of Charlotte County with no potable water service, such as that area in western Port Charlotte, could be at risk for enhanced saltwater intrusion impacts as the volume of single family residential homes requiring well water increase.
- The county is currently developing community and asset flood/tidal surge risk assessment models, in order to identify and prioritize resiliency enhancement measures needed for the most vulnerable portions of the county. These efforts are anticipated to be completed in 2025.

Summary of Opportunities and Obstacles

Recent utilities management processes have mitigated the potential for accidental spill events to occur, such that the principal cause of spills is unintentional infrastructure breaches during construction activities. Additional outreach and enforcement are necessary to reduce the frequency of incidents.

Due in part to aging infrastructure, population growth, and recent inflation trends, maintenance and expansion needs are rapidly increasing, bringing unprecedented funding needs that far exceed current revenue.

Expansion plans for the WRFs include implementing AWT, which should dramatically decrease the volume of nutrients being introduced into reclaimed water distribution systems, thus reducing risk of nutrient pollution incidents.

CCU has allocated staff resources toward identifying and applying for external funding opportunities to offset costs to ratepayers. CCU is at a competitive disadvantage with many of these opportunities (especially those offered by the state), because agencies often prioritize areas with restoration plans developed to address water quality impairment issues. Several impaired watersheds in the region and surrounding area lack such plans. In addition, multiple watersheds lack sufficient data sets to determine water quality status, a knowledge gap the water quality monitoring program is looking to fill.

Vision Task Details

Task A and B: *Conduct a needs and cost analysis of expanding sewer and potable water service to currently undeveloped regions of west Port Charlotte. Increase groundwater elevation and salinity monitoring network to track saltwater intrusion trends in the region, especially in areas with higher densities of groundwater withdrawal wells.*

Estimated Development Cost: LOW (<$100,000)

Details and Justification: Because of the lot sales boom of the 1950's-1980's, the region of Charlotte County just east of the Myakka River is divided into thousands of individual single family home plats. Construction of homes in this area has historically been sporadic, but over the last few years has been increasing in frequency. At this point, potable water supply or central sewer services are unavailable for much of this area, as there is currently an insufficient volume of prospective rate payers present in the region to support extension of those services. That said, this portion of the county is under threat from encroaching saltwater intrusion, which can be exacerbated if a substantive increase in water withdrawal wells are permitted in the area. In addition, lack of centralized sewer availability will necessitate the installation of septic systems throughout, which may pose future water quality issues to the Myakka River.

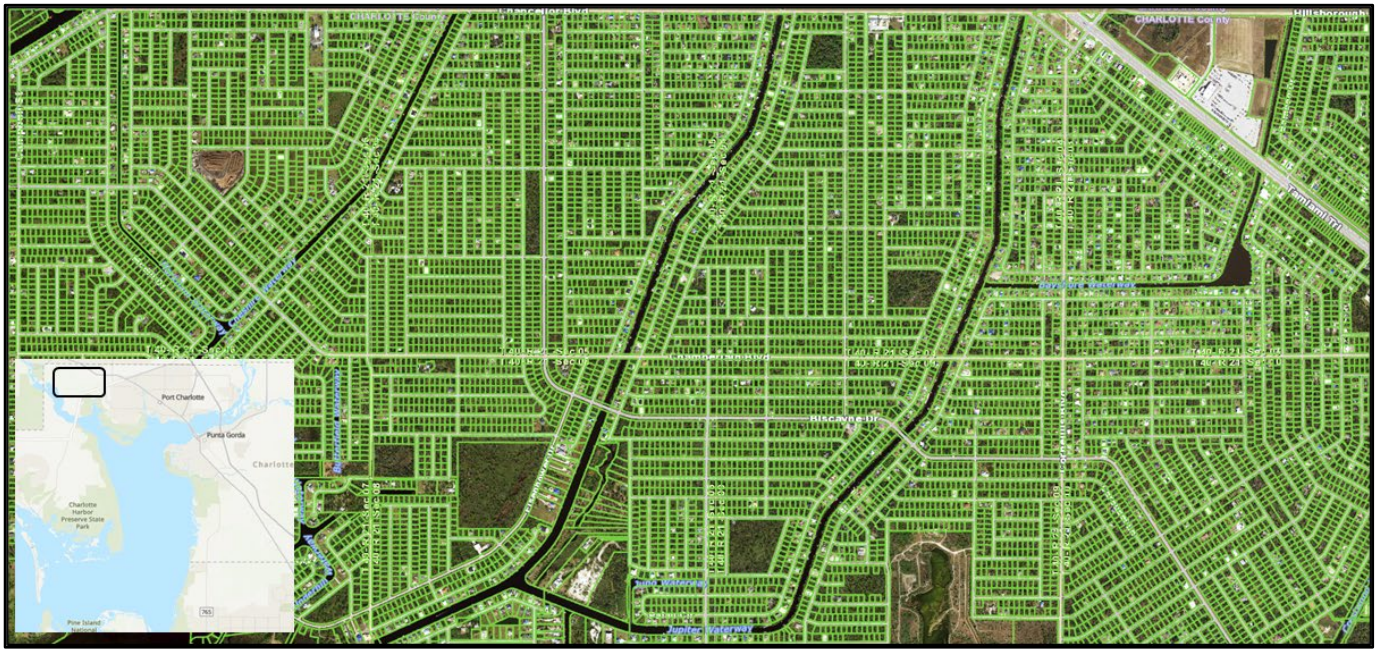


Figure 27. Distribution of platted lands in West Port Charlotte.

Figure 28. Chloride isohaline line as described by SWFWMD Regional Water Supply Plan (2020). Note 250 mg/L is the water quality standard for chlorides in drinking water.

In order to mitigate these potential issues, a feasibility study and menu of options should be developed to determine the most cost-effective options for expanding Utilities service to the region. Included in this effort should be an analysis of construction cost trends in recent years, cost and funding availability for existing low-population areas with Utilities services (such as the Rotonda Meadows region), and feasibility of, at minimum, a tiered system of service expansion into west Port Charlotte.

Task C: *In cooperation with other relevant departments (such as Community Development), organize and implement enhanced education and enforcement process to reduce construction-related breaks in water supply and wastewater transmission pipes.*

Estimated Development Cost: LOW (<$100,000) Note this estimate may increase based on number of additional FTEs needed for sufficient enforcement measures.

Details and Justification: In recent years, the Utilities Department has been making strides to reduce the frequency of unpermitted discharges due to failing infrastructure. New asset management protocols are prioritizing replacement and maintenance of equipment and materials as they near "end of life", rather than waiting for mechanical failure to occur prior to replacement or repair. As such, a significant proportion reported spills over the last several years are due to construction-related accidents, during which transmission lines were accidentally breached. Given the accelerated rate of construction activity occurring in this county, a communications, education, and enforcement strategy needs to be developed to identify the most common root causes of these accidental spills and determine the most effective combination of activities to reduce future spill incidents.

Task D: *Initiate reclaimed water user irrigation education campaign, providing guidance on water content and application to reduce fertilizer use and inappropriate irrigation application.*

Estimated Development Cost: LOW (<$100,000)

Details and Justification: Currently, Charlotte County manages treated wastewater by distributing it through a system-wide reclaim use distribution network (water that does not meet minimum requirements for reclaim use are disposed of via deep well injection). Currently, the concentration of nutrients in reclaim irrigation systems far exceed ambient nutrient concentrations, which can discharge into natural systems during large storm events.

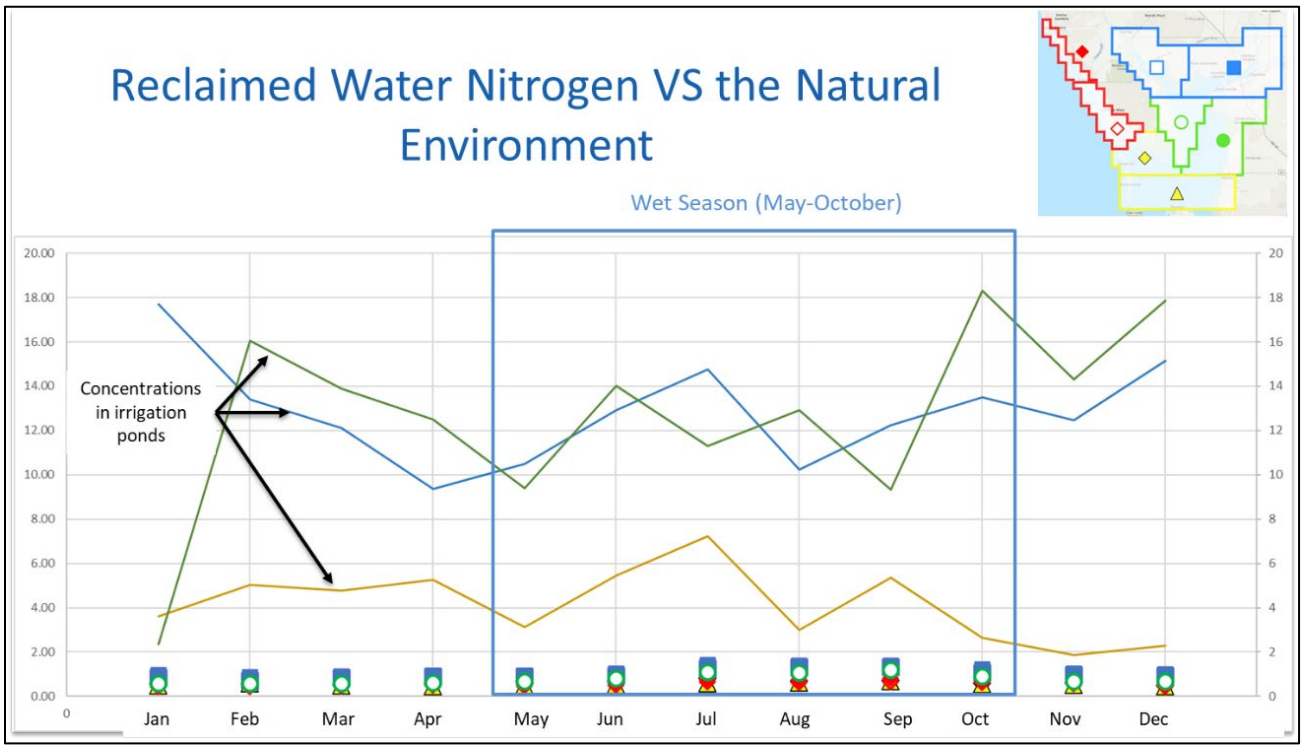


Figure 29. Average monthly measured Nitrogen concentrations in reclaim-augmented irrigation ponds (lines) and Charlotte Harbor/Lemon Bay (colored icons) from 2021-2023.

Planned implementation of Advanced Wastewater Treatment processes to the county's water reclamation facilities will serve to reduce these concentrations substantially, requiring effluent to be treated to a Total Nitrogen concentration at or below 3 mg/l and Total Phosphorus at 1 mg/l. That said, these lowered targets are still above ambient nutrient

concentrations. As such, this task seeks to create a responsible reclaim campaign targeting end-users of the county's reclaim distribution network. The campaign will focus on two facets of reclaim use:

1. Develop nutrient calculators, allowing end-users to view the volume of nutrients applied to their lands through reclaim irrigation, so that they can adjust the rate/frequency of fertilizer application to account for these nutrients.
2. Create mechanisms to guide educating users on proper application of reclaim water, and the consequences to the environment of failing to do so (such as limiting overspray onto impervious surfaces, avoiding irrigation in areas with direct/focused runoff into receiving waters, etc.).

--Policy, Programmatic, and Organizational Activities--

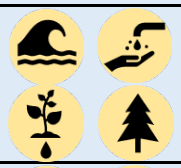
ONE WATER VISION: Achieve and build upon the water protection goals in the Comprehensive Plan, lay the groundwork for sustained input of resources to support the One Water plan, and establish formal mechanisms for regular public input into One Water visioning and the water quality program.

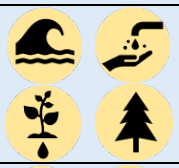
PATHWAYS TO THE VISION

	Through research and public feedback, identify and evaluate the feasibility of aspirational water-related goals and policies in the Comprehensive Plan and put them on the pathway to becoming actionable.
	Support sustainable, perpetually funded habitat conservation and land acquisition programs such as Conservation Charlotte.
	Establish a permanent public-private and public-public partnership consortium integrating tourism, economic development, community development, and the private sector to identify opportunities for joint water protection activities.
	Promote and expand ecotourism programs to drive attention to the county's unique natural resources and help drive management priorities for ecosystem preservation.
	Build organizational capacity to efficiently implement the many facets of this plan.
	Consolidate and organize department resilience-related activities to create cohesive climate change risk/adaptation hub
	Establish formal mechanisms for regular public and interagency input into One Water visioning and the water quality program.
	Establish comprehensive citizen science initiatives to facilitate stewardship, education, and information exchange between the county and our residents. Build these initiatives in support of primary education initiatives.
	Create formal communication pathways between county stakeholders and the water quality program
	Where applicable, align county water management activities with regional water protection initiatives, supporting other agencies and local governments'

	activities which result in reduced pollution impacts to the Peace, Myakka, Caloosahatchee River basins, and Charlotte Harbor and Lemon Bay.
	Further regional climate resiliency communication and coordination

CURRENT VISION TASKS

Categories	Task	Anticipated Regional Benefits
	As a component of the proposed citizen science program, initiate a comprehensive stewardship marketing campaign to better inform the public of the part they play in maintaining a healthy water system from house to harbor.	
	Establish Environmental Analyst, Technician, and Programs Coordinator positions to assist with reporting, prioritization, analysis, and recommendations associated with the county water quality program.	
	Prioritize green stormwater infrastructure (GSI) implementation at county properties, to serve as demonstration measures for private and residential development and be held as a benchmark in the county for integration of comprehensive water management/ treatment processes.	
	Evaluate the need, feasibility, cost/benefit, and authority to alter the current fertilizer ordinance based on recent research regarding timing and duration of fertilizer bans.	
	Establish water program steering and collaboration board comprised of residents, representatives from local government entities, and water-related commercial interests.	
	Implement Comp Plan FLU Policy 2.3.2 by formalizing collaborative efforts with the regional water protection agencies through the implementation of Charlotte County Water Improvement Workgroup.	
	Support and participate in the development of a statewide One Water coalition.	

Categories	Task	Anticipated Regional Benefits
	Create central online water resource education hub to provide information to the public on water management considerations in the region as well as address frequently asked questions/concerns posed to county departments.	
	Support and assist in the renewal of Conservation Charlotte.	

Associated Plans, Ordinances, and Mandates

- Charlotte County Comprehensive Plan
- Board of County Commissioners Strategic Plan
- Charlotte County Code of Ordinances
- Charlotte County Watershed Master Plan
- Charlotte County Vulnerability Assessment
- Charlotte County Conservation Plan
- SWFWMD Surface Water Improvement and Management Plan
- Charlotte Harbor Aquatic Preserves Management Plan
- CHNEP Comprehensive Conservation and Management Plan
- USACE Lake Okeechobee System Operating Manual
- UF/IFAS Florida Sea Grant (Charlotte County)
- Charlotte Harbor Environmental Center Cedar Point Nature Center and Educational Activities

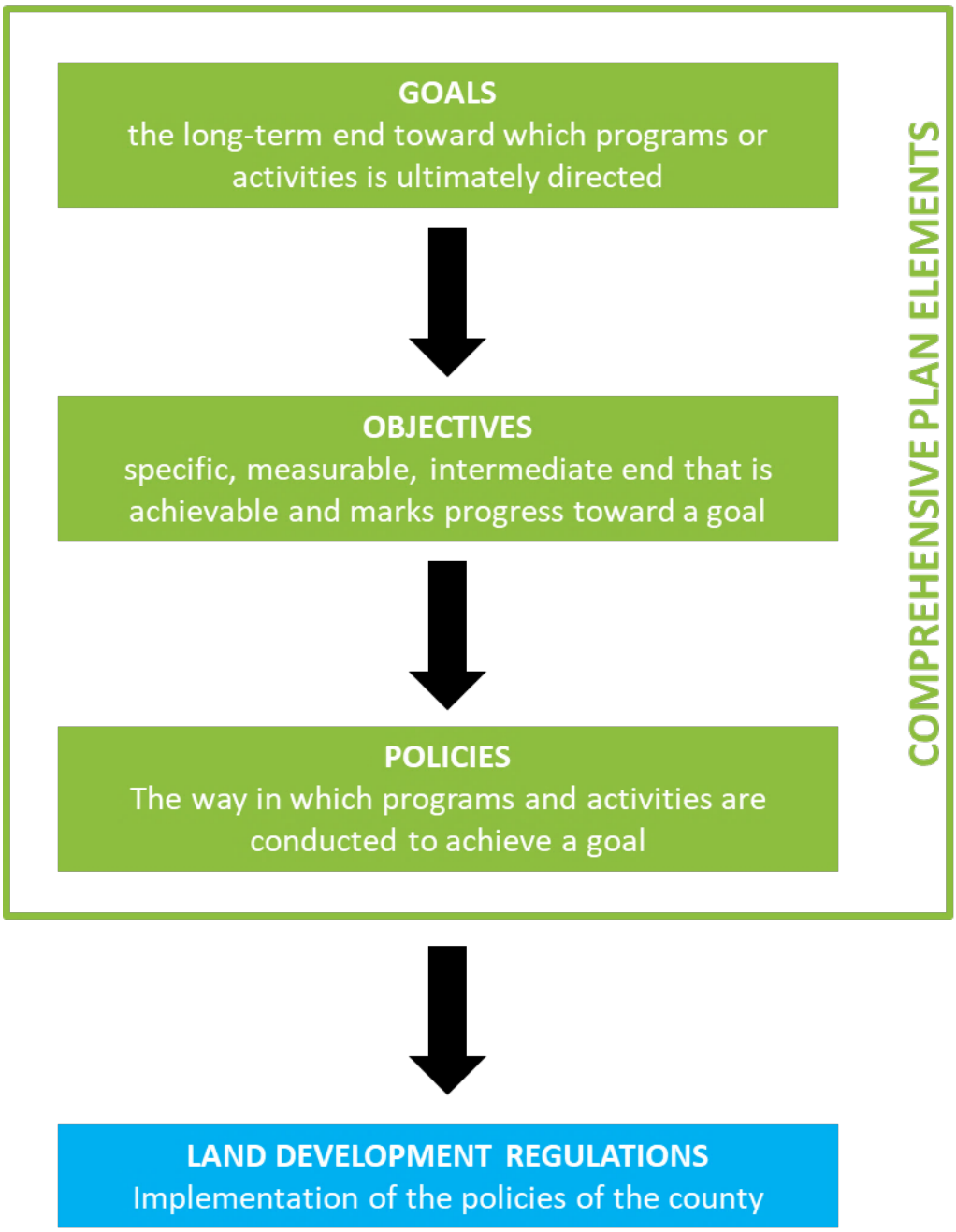
This section focuses on the processes and practices the county currently employs to guide overall water protection and management strategies, and seeks to lay the groundwork to:

- Systematically evaluate current county programmatic goals related to water protection and form a roadmap for prioritizing and executing on those goals yet to be implemented.
- Increase attention on the extensive natural systems present in the county and Charlotte Harbor, in order to continue supporting ecotourism as a major economic driver while establishing mechanisms to assure the natural environs of the county remain attractive to ecotourism.
- Build strategies furthering public education and participation in water protection activities, including county planning processes.

Background

Comprehensive Plan and Ordinances

The Comprehensive Plan is an integral component of the One Water Program, as it is the foundation for local planning and land use decision-making. Within its pages are over 90 Goals, Objectives, and Policies related to water and wetland protection. Development in the county must be consistent with both the Comprehensive Plan and Land Development Regulations within the Code of Ordinances.



According to state statute, the Comprehensive Plan is reviewed and revised every 7 years; the last full review and updates occurred in 2022. The review process involves multiple visioning sessions with citizens and stakeholders as well as public hearings. The Plan is meant to serve as guidance to staff on how the community wants to see growth managed in the county; as such, strong public participation in the review process is critical.

The Comprehensive Plan itself does not regulate or enforce growth management policies; rather, it guides the development of land development regulations and programs that are enforceable. Multiple Goals, Objectives, and Policies have not been implemented and as of this writing are more aspirational in nature. Table 7 discusses water-related elements of the Comprehensive Plan not fully implemented; additional discussion on these topics is presented later in this section. Attachment A provides a full list of water-related Comprehensive Plan measures (as of July 2024).

TABLE 7: Aspirational or Partially Enacted Water-Related Comprehensive Plan Elements

Comp Plan Element	Current Status	Implementation Gaps and Recommendations
Water quality and quantity (multiple elements- see ENV 1.4, SWM 2.1.2, 3.1, 4.1, and 4.2, WSW 5.2 in Appendix A)	A countywide canal/stream monitoring program was initiated in July 2022. This One Water Plan is the first iteration of a planning document written specifically to comprehensively address water quality/management needs in the county. The recently ratified statewide stormwater rule significantly improves water quality protection from stormwater runoff and reduces the need for local measures to bridge the gap that existed in the previous rule. As for groundwater protection, aquifer recharge protection policies are already in place to maintain very low density and intensity in these areas to protect groundwater resources.	Continued sources of funding will be needed to develop and implement remediation strategies for impaired waters identified through the new monitoring program. In addition, more coordination, research, and funding is needed to implement certain guidelines, e.g. prioritizing non-chemical control of mosquitoes and vegetation, and land acquisition to protect surface waters. The county may need to review land development regulations, such as for lot coverage, runoff from urban areas, residential landscapes, and agricultural lands, as well as criteria of non-residential uses to further prevent contamination of groundwater resources.
Conservation Lands (FLU Policy 2.1.1): *The County shall protect conservation lands in public and private ownership and assure the protection of large-scale conservation areas across the County. The planning principles that guide the decisions regarding the identification and protection of these conservation areas include:* *1. Protect native biological diversity.* *2. Protect viable portions of natural plant communities.* *3. Link conservation lands.* *4. Allow for natural flooding, prescribed fires and other natural land management tools.*	Conservation Charlotte, the county's principal vehicle for land acquisition for preservation, was established in 2006. The county's Community Services Department implements a maintenance program for all county-owned conservation lands, with management protocols in place to control invasive species and promote healthy ecosystems.	Much of the available funds for Conservation Charlotte was exhausted in 2008, and requires reauthorization for continued funding. There continues to be a sizeable gap between funding availability and market value of lands under consideration for acquisition. As such, the county should consider enhanced incentivization/ regulatory programs similar to those described in Appendix XX, Programmatic Recommendations, As well as modification of the county's existing TDU program to encourage residential development rights to be removed from environmentally sensitive areas.

Comp Plan Element	Current Status	Implementation Gaps and Recommendations
Charlotte Harbor Management Plan (FLU Policy 2.3.2): *The County shall require all development approvals, Future Land Use Map amendments and rezoning actions to be consistent with the provisions of the Charlotte Harbor Aquatic Preserves Management Plan (February 2017), which provides goals to protect and enhance the ecological integrity of the aquatic preserves; restore areas to their natural condition; encourage sustainable use and foster active stewardship by engaging local communities in the protection of aquatic preserves; and improve management effectiveness through a process based on sound science, consistent evaluation, and continual reassessment. Charlotte Harbor Surface Water Improvement and Management (SWIM) Plan Update November 2020), which focuses on water quality, hydrologic alterations, and the natural system.*	Natural resource protection has been established in the County's Comprehensive Plan to require that the review of rezoning requests and FLUM amendments include: -Preserve, protect, and reduce threats to wading bird nesting areas; - Preserve natural habitats within the CHAP watershed in order to maintain or restore water quality and natural resources within CHAP; - Support efforts to restore and protect natural freshwater inflows to the fullest extent possible; - Support projects such as septic tank retrofitting and connection to sewer systems, stormwater treatment upgrades, reduction of impervious surfaces within the watershed; -Assure communication with related state agencies regarding proposed development measures that might impact the Aquatic Preserves.	The county may need to create specific policies and land development regulations to implement its recommendations. Currently, the extent to which the county can create or enhance development-related mandates in support of the regional aquatic management plans are hindered by the implementation of Senate Bill 250. That said, the county can still work towards developing more robust incentivization measures to help achieve the protection/preservation goals of CHAP and the SFWMD SWIM program. In addition, the review process for FLU Map amendments and rezoning actions should be amended to assure CHAP and other regional offices for relevant state agencies are notified.

Comp Plan Element	Current Status	Implementation Gaps and Recommendations
Public Water System Wellhead Protection (FLU 2.3.5): *The County shall evaluate the effects of development on wellheads for all proposed land uses within delineated cones of influence for all central potable water supply wellheads used for public consumption (FLUM Series Map #7). Where a cone of influence is not determined, all proposed development within 1,500 feet of the wellhead will be evaluated. Land uses in which hazardous materials, such as petroleum products, chemical or biological wastes, are produced or stored are not permitted to adversely impact groundwater resources. Landfills, wastewater treatment facilities, or feedlots/concentrated animal facilities are prohibited.*	Implementation of this measure is in place (see County Code Section 3-9-90: Wellhead Protection Area) as part of development application review processes, though proximity to wellhead is utilized as part of the review, rather than establishing a cone of influence.	An investigation may be needed to evaluate the effect of development on wellheads for all proposed land uses within delineated cones of influence for all central potable water supply wellheads used for public consumption. Appendix A provides examples of ordinances enacted in other jurisdictions to address this issue. Section 3-9-90 may then need to be revised to reflect recommendations from that investigation.
Green Design at the Site Planning Scale (FLU 2.4.4) *The County shall consider introducing green design concepts into the site plan review and approval process through amendments to the Code of Laws and Ordinances within one year of the effective date of this comprehensive plan that will:* *1. Create incentives and remove obstacles to allow a mix of uses on development sites.* *2. Provide incentives to reduce conventional energy consumption.* *3. Reduce fertilizers in urban landscapes.* *4. Require Florida Friendly Landscaping.* *5. Encourage a connected street network.*	The county instituted a fertilizer ordinance in 2008 (amended 2011) limiting fertilizer application rate and timing, notwithstanding certain exemptions.	Apart from implementation of the fertilizer ordinance, the measures listed here have either been partially implemented, or not at all. In addition, statutory rules create multiple difficulties in attempting to address violations related to ordinances such as fertilizer usage restrictions. The county may thus need to create a mixture policies and land development regulations, incentives, and programs to introduce and implement green design concepts into the review of land use changes and rezonings as well as the site plan review and approve process for any new development and redevelopment. In addition, the County should create land development regulations/ incentives for runoff mitigation at the building scale. Implementation of such a

Comp Plan Element	Current Status	Implementation Gaps and Recommendations
6. Minimize air pollution through the inclusion of multimodal transportation systems and a mixture of land uses. *7. Protect water quality and supply, and minimize water consumption.*		measure can start with updates to the county facilities design manual, mandating incorporation of green infrastructure design. Appendix XX describes low impact/ green infrastructure design manuals employed by other jurisdictions. Note Senate Bill 250 may prohibit the county from executing measures regulating private development regulations until 2026 at the earliest.
Sea level rise and climate adaptation (FLU 2.4.7): The County shall require all development and redevelopment to be in compliance with the Florida Building Code, as may be amended, and FEMA regulations and requirements to minimize impacts or damage from coastal erosion, 100-year floods, tidal surges from hurricanes and coastal storms, and a projected year 2050, year 2080, and year 2100, sea level rise, as shown on FLUM Series Map #15, based on the Federal Emergency Management Agency's Community Rating System for future condition requirements for coastal communities, 2017 manual, Section 404. *FLU Policy 2.4.8: Long-term Strategy to Address the Effects of Climate Change The County shall explore and consider adopting policies determined necessary and appropriate to implement the recommendations regarding inundation protection, accommodation, avoidance, and relocation of impacts from erosion, inland flood, storm surges, and wildfires based on applicable Florida Statutes, "Integrating Hazard Mitigation into MPO Long Range*	Per statutory requirements, tidal surge and coastal storm flooding vulnerability assessments are being assembled for the county, with a project completion date of Fall 2025. In addition, the in-development Watershed Master Plan will further identify portions of the county at greatest risk of flooding from storm events, and will recommend mechanisms to mitigate flood impacts in those areas. Completion of the Watershed Master Plan will result in additional credits towards the county's National Flood Insurance Program's rating; higher ratings assigned to a local jurisdiction results in greater discounts to flood insurance premiums for the residents of that jurisdiction. In 2024, the County adopted revisions to 3-9-50, Manasota and Sandpiper Key Zoning District Overlay to add new definitions of "freeboard" and including the definition of "Height, building or structure". This ultimately permitted construction of housing with a taller footprint, allowing for those structures to be more elevated and thus making them more resilient to impacts from future flood events.	As predicted in coastal flood risk models and demonstrated in recent major storm events such as Hurricanes Helene and Milton, many of the county's coastal communities are at ongoing significant risk of destructive flooding due to coastal storm surge. In some locales, sea level rise has caused multiple residential homes constructed just above mean sea level to now be threatened by nuisance flooding during king tide events. The county will thus need to explore and consider creating and adopting specific policies, land development regulations, and programs to address how to minimize impacts or damage from coastal erosion, 100-year floods, and tidal surges from hurricanes and coastal storms, especially for historic communities developed well before modern base elevation requirements.

Comp Plan Element	Current Status	Implementation Gaps and Recommendations
Transportation Planning" initiated by the Department of Economic Opportunity, and "Best Practices Guidebook" prepared by Florida State University.		

The county Code of Ordinances, in combination with land development regulations, comprise the full suite of the county's enforceable water management measures. Some regulatory requirements are dictated by federal, state or regional water management districts; in some cases, these requirements are cited in lieu of county-specific mandates. In addition, the state legislature has occasionally passed statutes temporarily or permanently preempting Charlotte County's authority to enforce certain rules and zoning requirements or pass rules more restrictive than state requirements. For example:

- In 2023, the state issued a moratorium on adding or amending any ordinances or permit requirements that may be construed as "burdensome" to development; the moratorium was scheduled to lift in the fall 2024 but has since been extended to fall 2026.

- In 2024, the legislature ratified revised statewide stormwater rules, altering stormwater treatment standards to mandate minimum removal requirements of nitrogen and phosphorus based on the location and impairment status of the watershed, as well as the nature of the development activity. Included in this law is language preventing local governments from enacting measures more restrictive than the state rule and exempts single-family homes from many of the treatment requirements.

- The Bert Harris Act allows a property owner to receive compensation if a government entity enacts an ordinance or zoning amendment that can be considered an "inordinate burden" on the owner's ability to use their property. For example, in certain cases an entity that purchases property for a specific allowable use may file a claim under this Act if the local governing authority changes zoning rules to disallow that use after the property has been purchased.

Given the state's continued issuance of local government preemption measures, establishing codes and ordinances mandating water treatment and management above and beyond those minimum requirements dictated by the state and water management districts may be difficult at best. As such, investment should be made to research and evaluate the feasibility of implementing incentivization measures focusing on green infrastructure on commercial properties and water distribution/perviousness on residential properties. Examples of possible measures could include:

- Property tax discount or cost-share rebates for landowners for implementing certain water management BMPs on their property, including maintaining a certain percentage of natural pervious land cover on their property, using pervious pavers for driveways and sidewalks, and distributing stormwater runoff from roofs and other pervious surfaces to multiple locations on the property to reduce volume and velocity of runoff exiting the property.
- Accelerated permit review and fee discount for commercial development/redevelopment that implements stormwater management systems exceeding the mandates described in the current stormwater rule. For redevelopment activities, the stormwater management system would need to meet treatment requirements assigned to new construction. Similarly, consider leveraging the county TDU program to incentivize development designs which maximize green infrastructure and vegetated buffers near waterways and wetlands.
- "One Water Steward" program highlighting businesses with a demonstrated commitment to exceeding minimum stormwater treatment and management requirements during and after construction.

Conservation and Land Acquisition

As described in the Stormwater section of this document, one of the impediments to increasing our stormwater management and treatment capabilities centers on the relative lack of available public land to construct such features. Often, construction projects mandating development of new water treatment structures (such as road expansions) require the county to acquire privately-owned land from willing sellers. Many areas of the county were platted long before current stormwater management requirements were established, and enhancing water treatment in these areas will likely require acquisition of properties to serve as water detention/filtration basins. As many of these platted lots and other vacant lands are transformed from natural water detention areas to sources of impervious surface runoff, acquiring and preserving natural lands to serve as habitat for displaced organisms, diversion/relief from upstream runoff for downstream entities, and natural treatment of deposition and pollutants in runoff becomes more critical.

In 2006, Charlotte County taxpayers approved a $77-million tax referendum to acquire lands via the Conservation Charlotte Program. Funding is accrued through annual ad valorem taxes assessed through 2027. Much of the funds in this program were used early to purchase large tracts of preserve lands and were mostly exhausted by 2008. This created a gap in available funding to take advantage of new acquisition opportunities until at least 2027. While external funding opportunities for property acquisition are available from time to time, they not always align with the window of time which a targeted property might become available for acquisition. Further complicating the acquisition process is properties most desirable for conservation may also be valued by the private sector as a potential development opportunity, often resulting in acquisition costs far exceeding market value. The need for a consistently available, nimble funding mechanism (both internal and external) is apparent and should be considered a high priority for the One Charlotte, One Water program.

The Charlotte County's Community Services Department is evaluating options for a new iteration of the Conservation Charlotte program after 2027. This One Water program seeks to support this effort by:

- Advocating for increased resource support to acquire properties as needed throughout the life of the program, with mechanisms in place to ensure continued funding and capability to quickly act on acquisition opportunities.
- Expanding the program criteria to include acquisition (or establishment of permanent easements) of areas for conservation and/or habitat enhancement that can serve as water quality protection/treatment areas, water diversion for flood relief, and tidal/ coastal storm surge mitigation features (such as mangrove stands).

Sea Level Rise and Flood Vulnerability Adaptation

Over the last several years, Charlotte County has received stark reminders of the dangers inherent to large-scale flood events and tidal surges. Hurricane Ian brought historic levels of rain to the region in September 2022, causing multi-day flood events, submerged interstates, and breached water control structures. In 2023, Hurricane Idalia generated tidal surges in Port Charlotte and Punta Gorda at levels not seen for at least the last 20 years. The following year, Hurricanes Helene and Milton brought surges far eclipsing Idalia's impacts, pushing harbor and tidal river water into low-lying areas of the county and causing extensive flooding and destruction of our coastal communities. Combined with observed accelerated rates of sea level rise in the Gulf of Mexico and increased annual average temperatures creating the risk for a greater volume of more intense storm events, coastal communities need to identify high-risk areas and determine adaptation and protection strategies now. Recognizing this, the state enacted 380.093, F.S., requiring communities to create a Vulnerability Assessment for their jurisdiction. In 2022, Charlotte County commissioned the development of a storm surge model and visualization tool known as ACUNE. As of this writing, the county has begun developing the

Vulnerability Assessment, using the ACUNE output as guidance. In addition, the county took steps to increase their National Flood Insurance Program Community Rating System score by commissioning development of a Watershed Master Plan in 2023, which is designed to identify communities at high risk of storm-induced flooding and recommend adaptation strategies to mitigate said risk. Although the overarching goals of both efforts are similar, the methodology and requirements guiding them differ.

Multiple jurisdictions in the region are developing their own Vulnerability Assessments, including the cities of Punta Gorda and North Port, Sarasota County, DeSoto County, and Lee County. Additionally, FDEP recently completed a Statewide Vulnerability Assessment. Each of these efforts involve creating a predictive model, resulting in the possibility of conflicting information being created in areas where two jurisdictions meet or overlap. To help mitigate this, Charlotte County has maintained communication with these jurisdictions to exchange data and discuss their respective findings. That said, creating a formal coalition of local governments could have helped facilitate coordinating this effort among these jurisdictions and reduced the potential for creating conflicting conclusions.

Coordination and collaboration across jurisdictional boundaries are needed now more than ever, and Charlotte County should lead the way in working with our local partners to establish a regional compact. The benefits to doing so extend beyond information sharing; as capital needs rise and capital costs skyrocket, counties will be competing ever more for external funding support, whether through competitive grants or state appropriations requests. Local governments should thus look for ways to regionalize efforts and identify projects that benefit communities beyond their borders. Examples of prospective efforts include:

- Regionalized aquatic biological debris removal: During the red tide bloom of 2018–2019, coastal counties utilized contractors for removal of the vast volume of biological debris that accumulated on public beaches and in local waterways. Funding for much of these activities was provided by a state reimbursement grant. Unfortunately, competition ensued for the services of the few qualified debris removal companies, and the areas with the highest volume of debris needing removal were prioritized by those companies (as they were primarily compensated on a per-ton basis). Working with FDEP to establish and fund a regional biological debris removal program should mitigate issues like this in the future, as such agreements can build in requirements for contractors to address each participating county. In addition, eliminating the need for individual county contracts should reduce staff time needed to administer the program, as most facets of contract management (apart from debris removal tracking) should be reduced if not outright eliminated.

- Sarasota County is seeking opportunities to alleviate flooding issues experienced by certain sections of North Port; one such proposal involves restoring natural hydrologic patterns in the Big Slough basin, just north of the city. Currently, multiple relic drainage ditches in that region quickly drain the surrounding landscape, increasing the rate at which the constrained Big Slough/Myakkahatchee system reaches capacity in North Port. This exacerbates the potential for flooding in portions of the city, which then risks increased introduction of pollutants into the water before it can drain out. Restoring the hydrology north of North Port should help increase drainage capacity in the system. In theory, this should reduce potential volume of pollutants discharged into the Myakka River just upstream of Charlotte Harbor; as such, Charlotte County should consider supporting such a project for the benefit of the region.

Resources Considerations and Funding Sources

Many recommendations in this plan will require substantial investment, in both financial and personnel resources, to manage many of these investments once completed. Achieving most of these goals is going to require a balance of external funding support, supplemented with a commitment by the county to provide the necessary resources for O&M of those projects/programs. Among the challenges to this lies in the land use makeup and demographics of Charlotte County itself; as a predominantly "bedroom" community, much of our population relies on fixed incomes and as such any increase in their cost of living creates substantial concern as to how they will be able to accommodate that additional financial burden. Combined with increasing costs beyond the county's control (such as inflationary trends in goods and services), any upward adjustment to taxation rates is understandably met with public demands to justify the necessity of such increases while proving that no other viable funding alternative exists. In addition, legislative-mandated taxation rate caps are in place, limiting homestead properties to a 3% rate (which comprises a significant portion of the county) and non-homestead properties to 10%. State limits on impact fee increases (no more than 12.5% in a given year, and 50% over a 4-year period) restrict opportunities to leverage these revenue streams as mechanisms for funding water management projects.

Recognizing this, the following sections describe considerations for funding or financial incentivization mechanisms for implementing aspects of this plan, including the pros and cons of each.

Funding Opportunities

Many of the recommendations contained herein can be initiated through external funding, effectively "kickstarting" the implementation of the process. However, grants are not going to be the sole solution to expanding water management and protection measures because few grants allow funding for ongoing maintenance necessary to ensure the perpetuation of much of the projects described herein. Operations, maintenance, or perpetuation of programs will likely require support via taxation-based measures. There is already precedence for this in the county; for example, Conservation Charlotte was enacted in 2006 via referendum, and the county's water quality monitoring program is funded via an annual allocation from the county stormwater MSBUs.

Table 8 below describes some of the more consistently available options for obtaining funding for water-related projects. Note grant programs tend to be dynamic; available funding can vary significantly from year to year, some programs will expire or not be renewed, and new grant programs will be created. It is helpful to have a set of priority projects available each year and an awareness of grant deadlines to that each project can be compared to the available grant opportunities each year.

Table 8. Options for Available Funding for Water-Related Projects

Funding Source	Administering Entity	Types of Work Funded	Considerations
RESTORE/RECOVER	US Treasury Department	Coastal Flood Protection and Infrastructure, Natural Resources and Ecosystems, State Parks and Tourism, and Infrastructure and Economic Development	Projects must be selected via a public engagement process to ensure community involvement and support
EPA Section 319	EPA/DEP	Nonpoint source protection and restoration	Funded by EPA and administered by DEP

Funding Source	Administering Entity	Types of Work Funded	Considerations
Water Infrastructure Finance and Innovation Act	EPA	Provides long-term, low-cost loans for significant water infrastructure projects	Projects typically need to cost $20 million or more to be eligible for WIFIA assistance
State Revolving Fund	FDEP	Low-interest loans to local governments to plan, design, and build or upgrade wastewater, stormwater, and nonpoint source pollution prevention projects	Varies by fund type
Water Quality Improvement Grant Program	FDEP	Water quality	This Program covers multiple grants that vary from year to year
Resilient Florida Grant Program	FDEP	Mostly for protection against threats such as flooding	Planning grants are fully grant funded and Implementation grants are up to 50 percent
Florida Department of Economic Opportunity Grants	Self	FDEO administers several types of grants	Varies by program
State Appropriations Requests	Florida Legislature	Wide range	Requires sponsorship
Cooperative Funding Initiative	SWFWMD/SFWMD	This program allows local governments to share costs for projects that assist in creating sustainable water resources, provide flood protection and enhance conservation efforts	Annual application process with highly variable funding.
Gulf of Mexico Alliance	Self	Research and mitigation, with emphasis on community education/interaction	Funding is provided by partnered corporations, and as such funding priorities vary with each corporation.
Mitigation	FDEM/FEMA	Multiple grants primarily aimed at flood protection	Varies by grant type
Community Development Block Grant	HUD/FDEO	Develop viable urban communities by providing decent housing and a suitable living environment and expanding economic opportunities	Varies by grant type
Natural Resources Conservation Services Grants	Natural Resources Conservation Services	A variety of grants and programs aimed at promoting conservation and improving natural resources.	Varies by grant type
Hazard Mitigation Grant Program	Federal Emergency Management Agency	Provides funding for mitigation projects to reduce disaster risk	Rolling application process

Funding Source	Administering Entity	Types of Work Funded	Considerations
Partnership grants	Coastal and Heartland National Estuary Program	Offers grants to Florida citizens, organizations, businesses, government agencies, schools, colleges and universities who are implementing activities that support the objectives outlined in the Comprehensive Conservation and Management Plan (CCMP) to protect and improve the ecological integrity of the greater Charlotte Harbor watershed	Projects vary greatly in scope and scale, and are usually funded in cooperation with other sources
National Coastal Wetlands Conservation Grants Program	United States Fish and Wildlife Service	Provides grants to protect, restore, and enhance coastal wetlands	Can also be used to acquire property or easements
HUD grants	U.S. Department of Housing and Urban Development	Varies by year	Green and Resilient Retrofit Program (GRRP) Elements is an example from FY23
Conservation Charlotte	Charlotte County BOCC	Acquisition of land for conservation/preservation	Referendum required for continuance past its expiration
Funding allocation through applicable MSBU/MSTU budgets	Charlotte County BOCC	Any work that benefits the county's stormwater system and helps meet NPDES MS4 requirements	Limited to activities directly relevant to county's stormwater system; cannot be used areas outside of the county's stormwater management jurisdiction

Based on the needs identified in this document and the current trends in grant funding for the programs identified in the table above, there are three grant programs in particular that should be a focus in the short term. The first is the Resilient Florida Grant Program. The County can apply for an Adaptation Plan grant – which does not require a local match contribution – to follow the completion of its Vulnerability Assessment. The Adaptation Plan would allow the County to develop additional conceptual alternatives to address resiliency issues, followed by design and permitting. Those projects would then be well-positioned for an Implementation Grant. Although design and permitting can be covered under the Implementation Grant, the current scoring puts projects that have not been through design and permitting at enough of a disadvantage that it is difficult to obtain grant funding for that phase for this increasingly competitive grant.

The Cooperative Funding Initiative through SWFWMD and SFWMD (mostly SWFWMD based on the respective coverages of the County) is another promising grant program for the County. In SWFWMD's Cooperative Funding Initiative, the normal pathway for funding related to flooding, water quality, or natural systems begins with a planning process known as a Watershed Management Plan (WMP) or Surface Water Resource Assessment (SWRA). The County has not participated in this program as strongly as others in the past, and SWFWMD staff have indicated receptiveness to increased participation by the County in the program. Once the County has completed WMPs or SWRAs, they can then apply for funding for construction dollars for projects recommended in those planning efforts.

The County continues to participate in the Hazard Mitigation Grant Program. Funding for that program can vary by year and can depend on monies allocated by state for post-disaster recovery. There is often a significant lag between the disaster and when the funding becomes available. With the County and state significantly impacted by multiple hurricanes and tropical events over the past several years, there should be increased funding available over the next few years.

Cost-Mitigation Partnerships

In addition to seeking funding support from our citizens and external entities, the county should partner with external entities to enact the recommendations described in this document. Partnerships bring subject matter expertise from outside the county, while providing an opportunity to share the burden of project management among multiple groups. For these partnerships to be successful, however, the county must bring resources to bear, though that does not have to be purely financial in nature. Examples of recent county-entity partnerships include:

- In 2024, the Florida Fish and Wildlife Conservation Commission (FWC) received approximately $100,000 to rehabilitate the Snapper Creek corridor, one of the few remaining natural streams in the Port Charlotte region. FWC staff applied for and received the funding and will provide management and oversight of the project. Charlotte County joined as a partner and has provided matching support via county staff to identify project boundaries, assist with identifying project areas that overlap with private property boundaries, and work with FWC to interface with and obtain access permissions from private property owners as needed. Much of the on-the-ground field effort has been executed by participants in our county internship program, leveraging future professionals in the natural sciences to generate valuable information for this effort while giving them resume-building experiences to become future leaders in this field.
- In 2023, FDEP declared portions of Charlotte County and the City of Punta Gorda as impaired for excessive fecal indicator bacteria. In response, a consortium of local citizen groups initiated a citizen monitoring project in the impaired area, with the goal to identify the extent and sources of the impairment. To support the program, the county contributed laboratory analytical support for samples collected by the group, pending them acquiring grant funding to support the effort (which has since been secured). This cooperative effort allowed the group to begin sampling as soon as possible, while giving the county and city a seat at the table as stakeholders in the process. In addition, some of the citizens involved in the effort leveraged their professional connections to bring the University of Miami into the program, giving the county another source of subject matter experts to provide insight and guidance on sampling and assessment strategies. Another benefit to this partnership is that it allowed the county to expand its internship opportunities to University of Miami students, who will now bring their expertise and research interests to Charlotte Harbor.
- A consortium of research scientists with the University of Florida is seeking funding from the National Science Foundation (NSF) to analyze nutrient fluctuations and hot spots in our canal system. Through this arrangement, the research staff will manage the project and maintain responsibility for grant reporting requirements, while the county provides logistical and coordination support for canal access, instrumentation installation, and neighborhood communications. Given the importance of this effort and the current lack of certainty that it will be funded, the county is taking advantage of the opportunity by collecting samples and water surveys now for the researchers to analyze and provide initial feedback on possible areas of concern (this also provides supporting evidence further justifying the need for this project). If NSF chooses not to fund this effort, the county will seek support elsewhere because this research is critical to determining specific management options for these canals.

These are just a few of many opportunities available to leverage outside groups in helping us understand the dynamics of our watershed, identify areas of concern, and work together to address them. To maximize the county's ability to take advantage of these opportunities, developing a formalized water improvement partnership and innovation hub should be considered because this will allow for a portal to more easily attract willing partners to assist with research and restoration priorities. The next section will describe this concept in more detail.

Ecotourism and Economic Development Opportunities

For decades, Charlotte Harbor and the County has benefited from the presence of vast stretches of natural coastline and wildlife management areas. Through a combination of forward-thinking preservation in the 1970s and slow population growth relative to neighboring counties, much of the immediate coastline surrounding the harbor consists of relatively uninterrupted stands of mangroves, tidal ponds, and shallow estuarine habitat supporting a diverse array of aquatic life. The harbor contains natural wonders like the endangered smalltooth sawfish and world-renown sportfishing opportunities. Sportfishing has long been credited as an economic driver in this predominantly bedroom community, but opportunities exist to establish Charlotte County's reputation as a haven for the natural world and to experience Florida wildlife while still being convenient to nearby travel, entertainment, and recreational opportunities.

Establishing an ecotourism and water economy promotional program as an element of the One Water advisory panel consisting of representatives from sportfishing, boating/marinas, nature tours, and local tourism and economic development bureaus can provide multiple benefits:

- Positioning ecotourism as a principal focus for economic development in the county will by placing continued focus on maintaining healthy waters, controlling harmful discharges, and implementing measures described in this plan. That is, maintaining a vibrant ecotourism program ensures the vitality of the One Water initiative.
- Growing the ecotourism industry brings additional revenue to local businesses, which may offer an opportunity to assign some portion of tax revenue from these activities to support many of the measures in this plan, along with other environmental protection activities.

Charlotte County is also well positioned to support developing an innovation hub to further the research and restoration needs of Charlotte Harbor, Lemon Bay, and the freshwaters that feed them. This would consist of three principal components:

- Research and Community Engagement Assistantship: Building on recent successes by Charlotte County in growing their water quality internship program and encouraging research partnerships with local universities and agencies, create a one-stop hub for advertising local research and communication needs. The county can help research efforts by assisting with funding needs, identifying candidate project areas, and providing staff support in conducting facets of data collection and community outreach as needed. Projects will be identified and prioritized based on input from local consortiums, participatory interests with other potential partners, and the recommendations of this plan.
- Pilot Project and Entrepreneurial Support Center: The county frequently receives inquiries from new and established business wanting to expand their markets into our region or demonstrating the efficacy of their new water improvement technology. The county can take advantage of this by working with the proposing business to pilot their technologies in our waters while demonstrating Charlotte County as an ideal place to establish commercial roots and tap into a readily available workforce from our community and university system. To

encourage participation, the county can assist in identifying and submitting funding requests and with navigating permit requirements and other regulatory approvals necessary for project implementation.

- Water Improvement and Community Collaborative Interface: As mentioned elsewhere in the Plan, Charlotte County is home to a vibrant collective of concerned citizens wanting to "do their part" to identify and address sources of impairments to our waters. Similarly, numerous established organizations have reached out to the county to identify actions they can take to improve our watersheds. A mechanism by which these groups, in partnership with the county, can more easily coordinate each other is needed, which will in turn accelerate the rate at which meaningful watershed improvements can happen at the local level.

Agency Coordination and Collaboration

Much of the impetus driving the development of this Plan centers around our community's desire to protect Charlotte Harbor and Lemon Bay; indeed, the opening sections of this document describe the health of these systems as the barometer to be used to determine how effective our water protection efforts are. However, Charlotte Harbor and Lemon Bay do not "belong" to Charlotte County, nor are our activities the sole factor affecting the health of these waters. This estuary system is managed by a consortium of regional, state, and federal agencies. Together, they work toward identifying measures to improve and remediate impacts originating from Charlotte County and the many anthropogenic activities along the Peace, Myakka, and Caloosahatchee Rivers. **Table 9** outlines the various agencies and their role/regions of authority in protecting Charlotte Harbor and Lemon Bay. Links to the plans guiding efforts described in the table may be found at the beginning of this section.

TABLE 9: Regional Water Management/Protection Agencies

PUBLIC AGENCY	REGION	ROLE IN CHARLOTTE HARBOR/ LEMON BAY
SWFWMD	Surface and ground waters in the Peace and Myakka River Basins, Charlotte Harbor, and Lemon Bay	Regulate groundwater withdrawals and stormwater management components of construction permits; establish minimum flows and levels for aquifers and streams; and implement the Surface Water Improvement and Management Plan (SWIM) for Charlotte Harbor and Lemon Bay watersheds.
SFWMD	Caloosahatchee River and estuary system	Similar regulatory functions as SWFWMD for the Caloosahatchee River basin; coordinate with US Army Corps of Engineers in their management of Lake Okeechobee water levels.
FDEP	All sovereign submerged lands	Permitting authority for activities impacting sovereign submerged lands; freshwater HAB and illicit spill response/enforcement.
Charlotte Harbor Aquatic Preserves (FDEP)	Charlotte Harbor, Lemon Bay, Gasparilla Sound, Cape Haze,	Implement and support monitoring, protection, and restoration strategies;

PUBLIC AGENCY	REGION	ROLE IN CHARLOTTE HARBOR/ LEMON BAY
	Pine Island Sound, and Matlacha Pass	implement measures of their management plan.
Coastal & Heartland National Estuary Partnership (CHNEP)	Charlotte Harbor, Lemon Bay, Dona and Roberts Bay, Estero Bay, the Caloosahatchee Estuary, and all river basins contributing drainage to them	Coordinate stakeholders and undertake projects to implement measures of the Partnership's management plan; provide funding and staff support to promote habitat protection and enhancement, water quality monitoring and improvement, hydrological restoration, enhanced resiliency, and collaborations across multiple jurisdictions.
Florida Fish and Wildlife Conservation Commission (Charlotte County Office)	All sovereign submerged lands	Implement Fisheries Independent Monitoring Program; coordinate habitat research and restoration projects.
Florida Sea Grant (Charlotte County Office)	Charlotte Harbor/Lemon Bay	Develop, implement, and evaluate a comprehensive marine and coastal Extension program in Charlotte County that measures and addresses community needs. This includes but is not limited to managing citizen science and environmental stewardship programs focused on aquatic flora, fauna and the environmental factors impacting them.

Table 10: Charlotte Harbor and Lemon Bay Watershed Management Plans

Management Plan Name	Managing Entity	Overall Goals and Recommendations
SWIM	SWFWMD	• Maintain nitrogen loads from the Peace and Myakka Rivers at or below 2009–2015 average levels (Peace – 2.7 pounds TN per acre per year and 5-year average total TN load of 1,800 tons/year; Myakka – 2.8 pounds TN per acre per year). • Continue implementing hydrologic restoration in the Myakka River watershed. • Participate in ongoing hydrologic restoration of Dona Bay watershed. • Participate in Charlotte Harbor Flatwoods Initiative • Participate in ongoing hydrologic restoration on conservation lands.

Management Plan Name	Managing Entity	Overall Goals and Recommendations
		• Maintain seagrass coverage in Charlotte Harbor and Lemon Bay at 2016 levels (Charlotte Harbor – 20,280 acres; Lemon Bay – 3,223 acres). • Continue to implement natural systems projects throughout the watershed within SWFWMD.
Charlotte Harbor Aquatic Preserves Management Plan	Charlotte Harbor Aquatic Preserves (CHAP) (FDEP)	• Maintain and improve water quality within the CHAP. • Assess the condition of the CHAP's submerged resources to identify threats to the health of the estuaries. • Preserve, protect, and restore submerged resources within the CHAP. • Assess the condition of the CHAP's wading and diving bird colonies. • Preserve and protect wading bird nesting islands • Protect and improve the ecological integrity of the CHAP watershed. • Increase public involvement, awareness, and knowledge of the CHAP. • Assist federal, state, and local agencies and organizations in managing public use and access while protecting the natural resources of the CHAP. • Educate the public about the importance of sustainable public use.
Comprehensive Conservation and Management Plan	Coastal & Heartland National Estuary Partnership (CHNEP)	• Undertake and support comprehensive and coordinated water quality monitoring, and projects and programs that reduce pollutants entering waterways. • Undertake and support data-driven watershed planning and hydrologic restoration projects to protect and restore natural flow regimes and provide sufficient fresh surface water and groundwater to natural systems. • Undertake habitat restoration planning to promote the support facilitate permanent acquisition and effective protection and management of critical natural habitats including wildlife dispersal areas, movement and habitat migration corridors, wetlands, flowways, and environmentally sensitive lands and estuarine habitats. • Undertake activities to promote environmental awareness, understanding, and stewardship to the general public, professionals new target audiences, and policymakers as well as strengthen partner collaboration in education and engagement programs.

Plan Management, Execution, and Community Input

As illustrated by the volume and variety of recommendations presented in this plan, a significant amount of resources will be needed to achieve the goals described herein. Given how much of this resource investment will likely come from public funding, successful implementation of the plan will require extensive citizen education, communication, and endorsement. As such, this plan recommends the following measures:

- Continue participation in the quarterly West-, Mid-, and South County stormwater MSBU advisory board meetings. The county surface water monitoring program is funded primarily through these stormwater MSBUs, and regular updates on progress, findings, feedback, and changes to the monitoring efforts should continue through these meetings.
- Establish an ecotourism and water economy advisory panel, as described in the previous section. This will provide an outlet for the business community to provide feedback and direction on those facets of the county water management strategy that should be prioritized for the benefit of their operations. Alternatively, this effort could be integrated into the Tourist Development Council as a subcommittee or secondary focus.
- Create a One Water science steering and advisory board consisting of subject matter experts who reside in Charlotte County or work within fields related to water management of the Charlotte Harbor/Lemon Bay watersheds. The goal is to create a two-stage "peer review" process for activities conducted through the One Water Program. This advisory board would serve as the first stage of the review and advisory process, providing prioritization recommendations, review of citizen concerns, and visioning input for long-term program planning. The second stage of peer review would come through participation in the CHNEP Technical Advisory Committee, which consists of representatives of local and state agencies associated with Charlotte Harbor and Lemon Bay. Information on county initiatives are passed to members of this Committee for comment and identification of external resources that could be levied to accomplish the goals of those initiatives.

Summary of Opportunities and Obstacles

The county's Comprehensive Plan contains many elements that can contribute toward enhancing water protection, providing a foundational layer of justification for expanding water management activities.

Senate Bill 250 imposed a moratorium on adding or amending any ordinances or permit requirements that may be construed as "burdensome" to development; as of this writing, that moratorium is scheduled to expire in fall 2026. This and other preemption rules limit the extent to which local government can update ordinances or implement certain aspects of the Comprehensive Plan.

Opportunities are available for partnering with entities to implement multiple measures of this plan, but the county will need to commit the necessary resources to ensure the long-term success of those measures. For example, public-private and public-public partnerships are viable options for installing GSI infrastructure and pond enhancement measures, but responsibility for maintenance of these efforts needs to be identified and afforded sufficient resource support.

Charlotte County has a substantial available resource in our citizenry, and their concern for the health of our waters can be leveraged to initiate robust citizen environmental monitoring and improvement programs.

Vision Task Details

Task A: As a component of the proposed citizen science program, initiate comprehensive stewardship marketing campaign to better inform the public of the part they play in maintaining a healthy water system from house to harbor.

Estimated Development Cost: LOW (<$100,000).

Details and Justification: As has been described elsewhere in this Plan, Charlotte County's rapid population growth is bringing new and greater economic opportunities to the county alongside increasing stress to our water resources resulting from that growth. One such source of that stress is new residents' general lack of understanding on how they can have a significant influence on the function of our water quality, quantity, and the health of our ecosystem. In addition, new residents may be ill-informed on the various ordinances the county has put in place over the years to mitigate negative anthropogenic impacts to our natural system. The county maintains an active social media presence, which is used to educate and inform all our citizens on these topics; however, additional messaging mediums will need to be utilized in order to assure we are reaching as much of our intended audience as possible.

There is already a substantial volume of print and audiovisual material developed by the state, neighboring counties, and other public and private sectors; as such, much of the cost to implement this task is allocated towards publication fees and staff time to adapt these pre-existing resources to our audience. In addition, multiple county interns are being leveraged to create messaging on special topics of concern to our community, such as fecal indicator bacteria impairments. This is being done with an eye towards informing our residential community while also identifying avenues for reaching the county's younger generations, to build an environmental stewardship mentality at an earlier age.

Task B: Establish water data analyst and project manager positions to assist with reporting, prioritization, analysis, and recommendations associated with the county water quality program.

Estimated Development Cost: MEDIUM ($100,000-$1,000,000)

Details and Justification: As discussed earlier in this section, numerous funding sources are available to kick-start the tasks described herein, but human resources will also be needed to shepherd these projects to conclusion, maintain initiatives after they've been established, and compile/deliver timely information on water-related questions and concerns to the Commissioners and citizenry. The majority of the recommendations in this first iteration of the Plan center on pollution assessment and mitigation, and communication/coordination. As such, this Plan recommends establishing three position classes to assist in these efforts:

Environmental Programs Coordinator- The many restoration planning and public communication actions described in this Plan will require countless hours of coordination between the county and other agencies, public and private interest groups, and county citizenry. This position will focus on effectively managing these multiple concurrent efforts while assuring consistency in communication. In addition, successful citizen outreach programs require staff time dedicated to

promoting, training, and responding to participants concerns; a portion of this position's FTE will be dedicated to these needs.

Environmental Analyst- Given the establishment of the county's water quality monitoring program, this Plan's recommendations to develop multiple water quality restoration strategies, and the growing need to aggregate and interpret water-related data in support of public communication and departmental requests, this technical position will serve to support decision-making and management of data related components of restoration efforts. Responsibilities will include review and oversight of data used in planning projects, developing data-based products to quickly evaluate and communicate water quality trends, and supporting other departments in data evaluation and summary.

Environmental Technician- As the county expands its monitoring capabilities and identifies new research needs and concerns, staff will be needed to collect routine and emergency response samples, conduct investigations and inspections, maintain/repair equipment, and problem solve solutions to emerging information needs. Technician positions are field-oriented roles that will fulfill these tasks while also providing support for other departments with similar needs. In the near term, this role will also assist in expanding and maintaining our water quality/flow/elevation monitoring network, inspecting and recalibrating instrumentation as needed.

Task C: Prioritize green stormwater infrastructure (GSI) implementation at county properties, to serve as demonstration measures for private and residential development and be held as a benchmark in the county for integration of comprehensive water management/ treatment processes.

Estimated Development Cost: LOW (<$100,000)

Details and Justification: The design manual for county facilities currently requires stormwater management plans to meet the base detention and treatment requirements in the state and SWFWMD's ERP permit manuals. In recognition of the need to maximize stormwater treatment capabilities of county properties, adapt to anticipated changes to stormwater management requirements in the updated 2024 stormwater rule, and create opportunities to demonstrate the efficacy of comprehensive stormwater management systems, the county will update the design manual and operation procedures as follows:

1. Develop a menu of options for green infrastructure implementation on county properties as part of both construction and refurbishment activities, prioritizing options that maximize water infiltration, retention, and canopy cover for facilitating evapotranspiration. Construction planning processes will utilize a cost/benefit analysis to determine appropriate measures for achieving minimum infiltration rates.
2. For construction activities centered around expansion of existing facilities, require design strategies that result in, at minimum, no net loss of stormwater attenuation capacity, and minimal to zero loss of pervious land.
3. Outline comprehensive maintenance plan to assure treatment system continues to operate as designed, including determination of responsible parties for assuring maintenance requirements are met.

In addition to the above, routine sampling efforts will be expanded to select facility stormwater systems to evaluate the efficacy of implemented management features and refine future stormwater management system design strategies.

Task D: Evaluate the need, feasibility, cost/benefit, and authority to alter or extend the current fertilizer ordinance based on recent research regarding timing and duration of fertilizer bans.

Estimated Development Cost: LOW (<$100,000)

Details and Justification: The University of Florida's 2024 report on the effectiveness of seasonal fertilizer restrictions highlighted multiple studies examining the ecological impact of fertilizer bans in Florida, some of which warrant consideration in Charlotte County's current fertilizer ordinance. For example, a review of 30 years' worth of lake data throughout the state indicated that winter fertilizer bans may produce a more positive impact on nutrient levels in aquatic systems than summer bans. Other similar studies showed reduction in phosphorus concentrations in receiving waters after wet season bans were put in place, but little positive impact in Nitrogen concentrations were observed. Given these observations, it would be beneficial to examine the source of nutrients in runoff and stormwater in Charlotte County and determine if a more ecologically beneficial fertilizer management regime might be possible.

Task E: Create central online water resource education hub and inter-departmental collaborative to provide information to the public on water management considerations in the region as well as address frequently asked questions/concerns posed to county departments.

Estimated Development Cost: LOW (<$100,000)

Details and Justification: In Charlotte County, outreach concerning management and quality of our waters is distributed amongst multiple departments, typically in fulfillment of grant, permit, or other regulatory requirements. As the county's population has grown, so too has the need for education resources to help our citizens better understand typical water management practices in south Florida, indicators of harmful algal blooms, and the benefits of nature-based attenuation of pollution. This is especially important as many of our new residents are not from Florida and thus are unfamiliar with the water management challenges we face. Consider a poll presented to residents at a recent water quality conference:

- When shown a picture of duckweed buildup in a canal system, 55% of respondents stated they could not identify what was shown in the picture, but it appeared toxic. 7% of respondents were certain what they were viewing was toxic.

- Participants were shown pictures of waterways in the county and asked to score the management of the vegetated banks on a scale of 1-5:

	**1** (Banks are in serious need of revegetation)	**28%**
	2	**4%**
	3 (I would live on this canal, but I would probably plant more vegetation in my yard)	**27%**
	4	**3%**
	5 (This is what a waterway and canal banks/yard should look like)	**38%**

	**1** (Banks are in serious need of clearing, and I would call the county immediately to address it)	**11%**
	2	**1%**
	3 (I would live on this canal, but the county should address some aspect of it)	**44%**
	4	**14%**
	5 (This is what a waterway and canal banks/yard should look like)	**30%**

	1 (Banks are in serious need of clearing, and I would call the county immediately to address it)	**4%**

	**2**	**3%**
	3 (I would live on this canal, but the county should address some aspect of it)	**19%**
	4	**6%**
	5 (This is what a waterway and canal banks/yard should look like)	**69%**

Note the audience for this poll were voluntary participants in a water quality conference, and as such these individuals are often more aware of water quality and natural systems issues than the average citizen. Differing viewpoints like those expressed in the poll can have tangible consequences in county operations and budgets, as a less educated citizenry results in more complaints to the county over perceived public health and aesthetic issues that don't necessarily warrant management.

This task seeks to address the above issue and fill our current outreach subject matter gaps by instituting an educational resource hub in conjunction with our regional partners such as Sea Grant and the Coastal and Heartland National Estuary Partnership. Phase 1 of the hub will focus on creating a FAQ library for county staff to use for distribution in response to the most common citizen complaints, especially for those concerns related to algal blooms and waterway maintenance needs. In addition, an interactive HAB identification tool will be created to help concerned citizens better identify the type of algae, vascular plant, or cyanobacteria growing in their waterway, and whether the presence of those may pose a health risk. The goal is to create mechanisms that help citizens understand what situations require intervention by the county, another agency, or if intervention is necessary by any entity at all.

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memorandum

date	May 28, 2025
to	Brandon Moody, Charlotte County
cc	Brett Cunningham, Jones Edmunds
from	Jon Perry, ESA
subject	Task 2: Water Quality Monitoring Program Review and Recommendations

OBJECTIVE

Based on our knowledge of current County monitoring, the County's goals for monitoring, the *Charlotte County Project Plan for Ambient Surface Water Monitoring Program*, and the information gathered in Task 1, the Jones Edmunds team will evaluate the existing and proposed water-quality monitoring in the County and provide recommendations to support the County's goals.

INTRODUCTION

Water quality monitoring of waterbodies associated with Charlotte County is handled by a number of agencies. The County monitors the watershed areas through its ambient surface water monitoring program it began in 2022. The Coastal and Heartland National Estuary Partnership (CHNEP) is responsible for monitoring the estuarine regions including Charlote Harbor and Lemon Bay. The Peace River Manasota Regional Water Supply Authority monitors the lower Peace River. All of these programs provide a monthly snapshot of the ambient water quality not only in the receiving waters but also the contributing watershed covering general water quality characteristics, nutrients, fecal indicator bacteria and in some cases metals.

Samples from all three programs are analyzed by Department of Environmental Protection (DEP) certified laboratories and undergo quality assurance checks before being uploaded to the DEP's Watershed Information Network, the state's primary repository for water quality. The DEP use these data, combined with any and all additional data as part of their Biennial Assessment of waters to determine if waters are fail to meet their designated uses. Data may also be accessed through Charlotte County's water quality dashboard. Data from the CHNEP is available through the CHNEP Water Atlas. Links to all of the repositories are available below (Table 1).

TABLE 1. LINKS TO ONLINE DATA REPOSITORIES OF CHARLOTTE COUNTY AMBIENT WATER QUALITY DATA.

Monitoring Program	Website
Charlotte County Ambient Surface Water Monitoring	https://www.charlottecountyfl.gov/one-charlotte-one-water/
CHNEP Water Atlas	https://chnep.wateratlas.usf.edu/
DEP Watershed Information Network	https://prodenv.dep.state.fl.us/DearWin/public/welcomeGeneralPublic?calledBy=GENERALPUBLIC

REVIEW AND RECOMMENDATIONS

Water Quality

After a long hiatus, Charlotte County resumed monitoring their watersheds in June 2022. Their stated objectives are to:

- Identify of long-term trends and ambient water quality conditions within:
  - waters discharging to Charlotte Harbor, Lemon Bay, and the Caloosahatchee River,
  - waters within WBIDs located in Charlotte County's boundaries, and
  - waters entering Charlotte County (where warranted/possible);
- Inform potential needs for source tracking and opportunities for water quality improvement;
- Conduct investigatory work as warranted in order to identify or clarify the origin and/or impact of in-stream conditions identified through the ambient monitoring activities of this project;
- Submission of data to FDEP WIN for the purpose of assessing Charlotte County WBIDs per 62-302, 62-303, and 62-304, F.A.C;
- Development of models that will allow for the identification and prediction of loading characteristics and trends and in Charlotte County;
- Presentation of sample results to the public in a manner that clearly describes water quality trends in relation to applicable water quality criteria.

The Charlotte County ambient surface water monitoring program, though early on, has already led to informed decisions. Using the data collected to date, the County has been able to work with DEP to ensure the proper waterbody classifications are being used to assess the county's waters (Appendix A). This is important as different criteria are used to assess different waterbody types. These changes will be instituted as part of the DEP biennial assessment.

DEP will also begin using the data gathered by the County with its next Biennial Assessment which will assess ambient surface water quality data through July 2024. Unfortunately, it takes three years to assess a waterbody to determine if it is impaired for nutrients, a primary parameter of concern for most waterbodies. It takes a minimum of 5 years of monthly data to determine statistically significant trends in water quality. Long-term trends provide an indication that a waterbody is degrading or improving. As such, it is recommended that the County continue its current monitoring effort for the time being to get the most out of its investment.

Other recommendations regarding water quality monitoring include:

- Developing a consistent QA/QC program across all sampling programs to ensure a timely accurate assessment of the data collected.
- Continue to participate in the Southwest Florida Regional Ambient Monitoring Program (RAMP) working group. The group strives to assist member organizations to achieve quality water quality data consistently along the southwest Florida coast. The County should encourage other organizations collecting data within its waters to participate in RAMP.
- Conduct pre-/post-monitoring of water quality best management capital improvement projects to ensure accurate credit for these improvements. This is important not only for stormwater projects but utility projects as well.

- The DEP verified impairment list and the County's data indicate areas where fecal indicator bacteria exceed the appropriate criteria. The County should look towards utilizing the DEP's Fecal Indicator Bacteria Toolkit to track down the source of excessive bacteria or determine if it is naturally occurring.
- The County should collect the correct fecal indicator bacteria parameter for the waterbody Class rather than based on the conductivity at the time of collection as that is how DEP will assess the data.
- Maintaining the current water quality monitor will be necessary to assess changes due to watershed management actions and increases in development.
- A consistent long-term dataset, consistent with the current program, coupled with discharge flow data will be critical in validating any future development of a future loading model.

Water Quantity

Many of the Counties receiving waters have been deemed impaired for nutrients (Table2). Charlotte Harber, Lemon Bay and the two rivers are examples of these impaired receiving waters. These impairments usually are the result of pollutant loading from within the watershed contributing runoff to the impaired waterbody. In order to target areas contributing pollutant loads for installation of stormwater improvement, it is also important to understand the quantity of the water running off as it is the quality of the water. To do so requires the use of models or flow monitoring equipment.

Table 2. Charlotte County waterbodies deemed impaired for nutrients.

Water Segment Name	WBID	Waterbody Type	Waterbody Class	Parameters Assessed Using the Impaired Waters Rule (IWR)
Charlotte Harbor (Middle Segment1)	2065B	Estuary	2	Nutrients (Chlorophyll-a)
Charlotte Harbor (Middle Segment1)	2065B	Estuary	2	Nutrients (Total Nitrogen)
Charlotte Harbor (Middle Segment2)	2065C	Estuary	2	Nutrients (Total Nitrogen)
Charlotte Harbor (Upper Segment)	2065A	Estuary	2	Nutrients (Chlorophyll-a)
Charlotte Harbor (Upper Segment)	2065A	Estuary	2	Nutrients (Total Nitrogen)
Charlotte Harbor (Upper Segment)	2065A	Estuary	2	Nutrients (Total Phosphorus)
Whidden Creek	2079	Estuary	2	Nutrients (Chlorophyll-a)
Whidden Creek	2079	Estuary	2	Nutrients (Total Nitrogen)
Coral Creek (West Branch)	2078A	Estuary	2	Nutrients (Chlorophyll-a)
Coral Creek (West Branch)	2078A	Estuary	2	Dissolved Oxygen (Percent Saturation)
Upper Lemon Bay	1983A	Estuary	2	Nutrients (Chlorophyll-a)
Upper Lemon Bay	1983A	Estuary	2	Nutrients (Total Nitrogen)
Myakka River	1991A	Estuary	2	Nutrients (Total Nitrogen)
Myakka River	1991B	Estuary	2	Nutrients (Total Nitrogen)
Myakka River	1991B	Estuary	2	Nutrients (Total Phosphorus)
Tippecanoe Bay	2055	Estuary	3M	Nutrients (Chlorophyll-a)
Direct Runoff to Stream	2061	Estuary	3M	Nutrients (Chlorophyll-a)
Flopbuck Creek	2048C	Estuary	3M	Nutrients (Chlorophyll-a)
Huckaby Creek	2048B	Estuary	3M	Nutrients (Chlorophyll-a)
Manchester Way	2047	Estuary	3M	Nutrients (Chlorophyll-a)

Table 2. Charlotte County waterbodies deemed impaired for nutrients.

Water Segment Name	WBID	Waterbody Type	Waterbody Class	Parameters Assessed Using the Impaired Waters Rule (IWR)
Shell Creek below Hendrickson Dam	2041A	Estuary	3M	Nutrients (Total Nitrogen)
Shell Creek below Hendrickson Dam	2041A	Estuary	3M	Nutrients (Total Phosphorus)
Middle Peace River Estuary (Middle Segment)	2056B	Estuary	3M	Nutrients (Chlorophyll-a)
Middle Peace River Estuary (Middle Segment)	2056B	Estuary	3M	Nutrients (Total Nitrogen)
Middle Peace River Estuary (Middle Segment)	2056B	Estuary	3M	Nutrients (Total Phosphorus)
Peace River Estuary(Upper Segment South)	2056C2	Estuary	3M	Nutrients (Total Nitrogen)
Gator Slough Canal	2082C	Stream	3F	Nutrients (Macrophytes)
Cow Slough	1964	Stream	1	Nutrients (Macrophytes)
Myrtle Slough	2040	Stream	1	Nutrients (Macrophytes)

Therefore, it is recommended that the County begin a water quantity monitoring program. The installation of flow meters at key locations where water quality is collected will assist in targeting areas with high loading rates for possible BMP implementation. This will also be important for calibrating/verifying any pollutant loading model the County may be considering deploying.

CONCLUSION

The current effort of the County to understand its waterbodies is comparable to similar areas and will provide a good baseline for future evaluation. Utilizing the data for assessment and trends analysis will assist in developing management actions to offset their contribution to downstream impairments, especially when coupled with flow monitoring.

Appendix A

Memorandum: Recommended Revisions to Charlotte County WBIDs

ESA

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Technical Memorandum

date	June 19, 2024
to	Brandon Moody, Charlotte County
cc	Brett Cunningham, Jones Edmunds
from	Jon Perry, Tony Janicki, ESA
subject	Recommended Revisions to Charlotte County WBIDs

Introduction

ESA, as a subcontractor to Jones Edmunds, is assisting Charlotte County in developing the County's One Charlotte/ One Water Plan. This technical memorandum related to Task 2 – Monitoring Plan Recommendations.

Objective

During the review of the available data, it became clear that some of the waterbody classifications attributed by the Florida Department of Environmental Protection (FDEP) to waters in Charlotte County may be incorrect. As part of Task 2 – Monitoring Plan Recommendations, we reviewed the boundaries and classifications of WBIDs in Charlotte County. WBIDs are spatial units FDEP uses to assess waterbodies for impairments and determine Total Maximum Daily Loads. Having the proper waterbody classification ensures the proper criteria are used to assess the waters. The following describes our recommended changes that resulted from the review.

WBID Review

Myakka River (WBID 1991A)

The Myakka River WBID (1991A) is a Class 2 estuarine waterbody and part of the Estuarine Nutrient Region (ENR) designated ENRD7. The Class 2 designation denotes the waterbody is designated for commercial shellfish harvesting if the proper conditions are met. The current boundary extends outside ENR boundary, upstream into the watershed to the west as it extends all the way to Winchester Blvd. We recommend limiting the boundary of the original WBID to the ENR boundary (Figure 1). On the west bank, two (2) WBIDs will be created, one designated Class 3F and the other Class 3M, separated by control structure at Jennings Blvd. A single WBID would be created on the east bank of the Myakka and include Vizcaya Lakes.

Coco Plum Waterway (WBIDs 2010A & 2010B)

We recommend shifting the southern boundary of the South Cocoplum Waterway (2010A) and East Cocoplum Waterway (2010B) north to align with the County boundary and Hillsborough Blvd. (Figure 2). There are drainage structures controlling the discharge from the Cocoplum all along Hillsborough Blvd, which acts as a boundary. The City has established water quality sampling sites both upstream and downstream of these structures to denote the difference in water quality in the Cocoplum Waterway and their various canals. As the

boundary is currently drawn, the stations downstream of the structure would be lumped in with those collected upstream of the structure.

Little Alligator Creek (WBID 2046)

The Little Alligator Creek consists of a system of canals that discharges to the Peace River and is classified as a Class 3 estuarine creek. There are a series of structures along Toledo Blade Blvd. that act as salinity barriers, separating freshwater from marine waters. We recommend splitting WBID 2046 along Toledo Blade Blvd and classifying the waters upstream of Toledo Blade as a Class 3 Freshwater WBID (Figure 3).

Sunrise Waterways (WBID 2056E)

The Sunrise Waterways WBID comprises a number of canals discharging to various locations along the western bank of the Peace River. The various canals all have unique characteristics with land uses representing different eras of development. We recommend breaking this WBID into five distinct areas (Figure 4). The first WBID will include the tidal areas west of US 41and extend up to the Cocoplum Waterway (Labeled 1, Figure 4). The second WBID will include the freshwaters upstream of the structures along US41 and adjacent to the Port Charlotte Canal System (WBID 2056EA) (Labeled 2, Figure 4). The third WBID created would be east of US 41 and west of Interstate 75 adjacent to WBID 2056EA on the west (Labeled 3, Figure 4). The fourth would be bounded by Interstate 75 on the west, WBID 2056C2 on the east, Sandhill Blvd on the north, and Harborview Rd on the south (Labeled 4, Figure 4). This WBID would be classified as Class 3 freshwater. The final WBID would be the remaining northeast corner of the original WBID boundary (Labeled 5, Figure 4) with some editing of the Bobcat Creek WBID6 in Desoto County (Labeled 6, Figure 4).

We also recommend extending the boundary of the Port Charlotte Canal System north Veterans boulevard, including the Price End and Blueleaf neighborhoods (Labeled 7, Figure 4). This WBID is currently classified as a Class 1 waterbody designated for potable water use. The County is considering changing this designation to Class 3 freshwater as there is no plans to use it as a potable water source.

Buck Creek (WBID 2068)

Buck Creek is currently classified as a Class 3 marine waterbody. The canal features within the Rotunda neighborhood are separated from the rest Buck Creek by structures on the east and west sides of Rotunda and based on data from the County's monitoring program. These waters are consistently well below the 4850 µs/cm definition for marine waters found in 62-302 F.A.C. We recommend separating the Rotunda Canals and classifying them as Class 3 freshwater (Figure 5). We also recommend extending the Coral Creek (West Branch) north into the SSW quadrant of Rotunda as a hydrologic connection has been restored as part of the Coreal Creek Restoration project. That WBID would remain Class 3 marine.

Cleveland Cemetery Ditch (WBID 2059)

This WBID is classified as Class 3 marine. All of the samples collected by Charlotte County at Belmont Rd have been freshwater samples with specific conductivities < 700 µs/cm (Figure 6). We recommend that this WBID be reclassified as Class 3 freshwater.

Bear Branch (WBID 2094)

Bear Branch is currently classified as Class 3 freshwater stream. More than half the samples collected by Charlotte County exceed the 4850 µs/cm definition for marine waters found in 62-302 F.A.C. No data were

identified associated with this WBID during a review of IWR Run 65. We suggest reclassifying this WBID as Class 3 marine.

Conclusion

The revisions described above are being offered for consideration to ensure that the proper water quality criteria are used to assess waterbodies for compliance. It is important that management decisions are made to correct the proper impairments as many of the engineering fixes are expensive to implement.

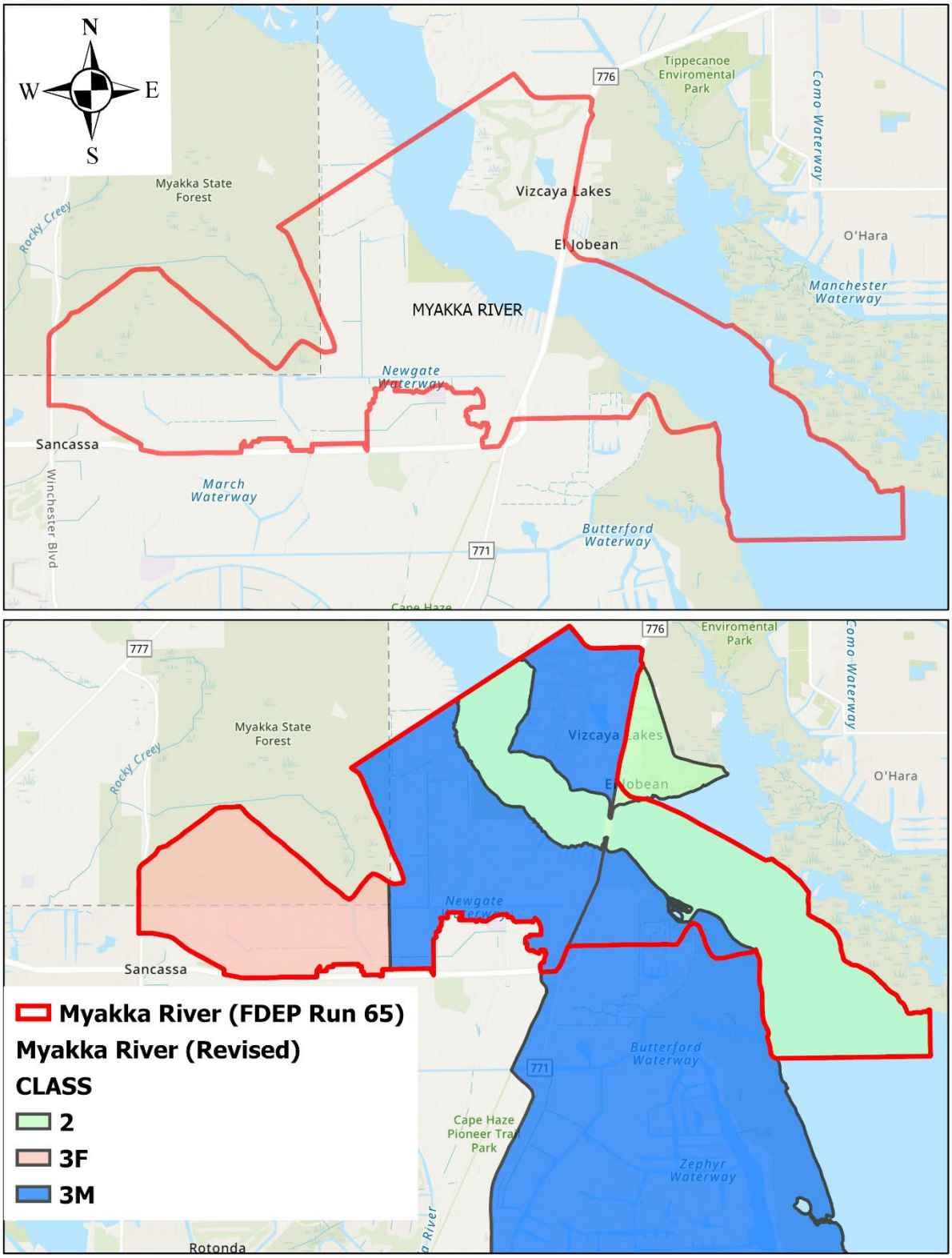

Figure 1 Recommended revisions to the Myakka River (WBID 1991A).

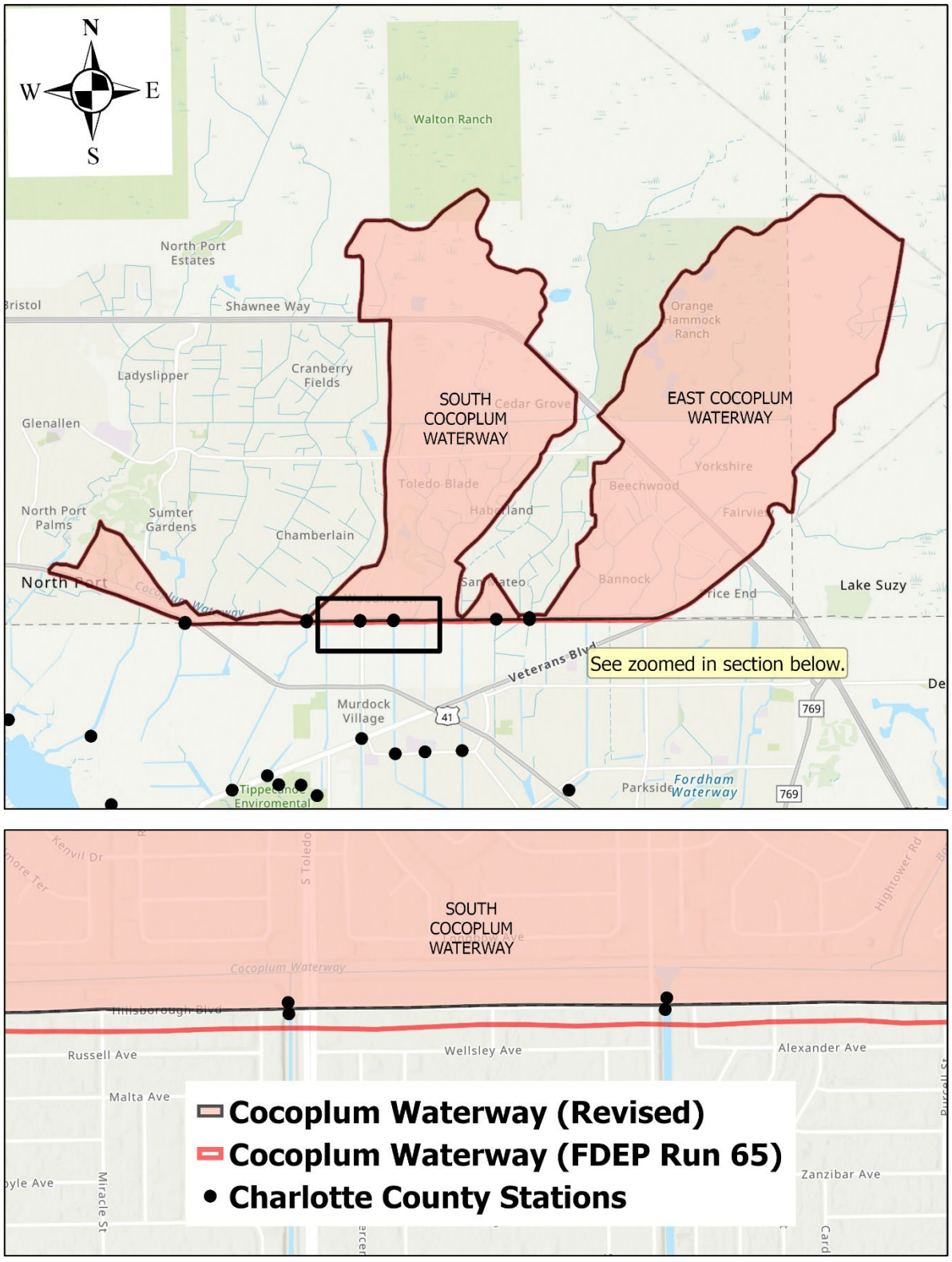

Figure 2 Recommended revisions to the Cocoplum Waterway (WBIDs 2010A & 2010B).

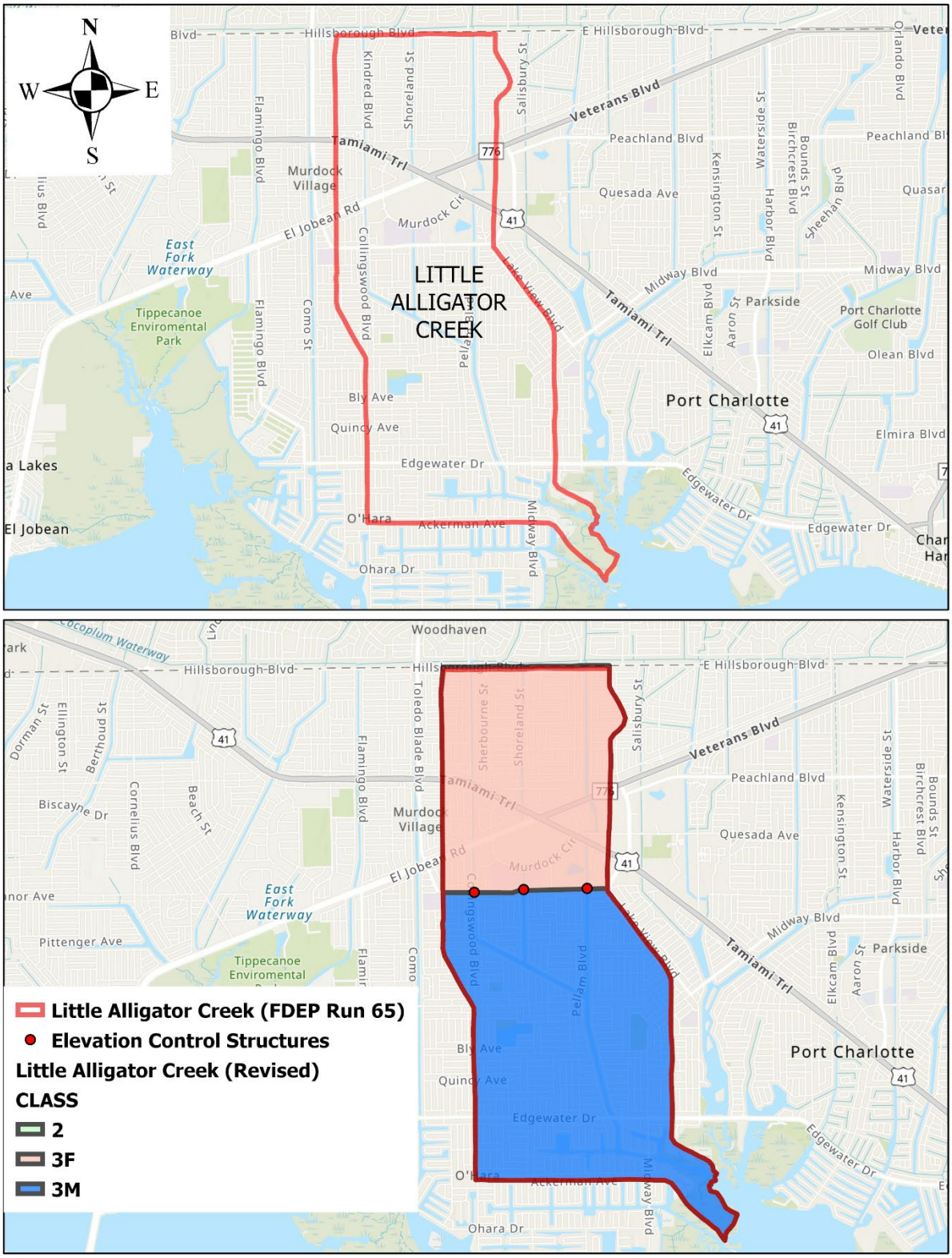

Figure 3 Recommended revisions to the Little Alligator Creek (WBID 2046).

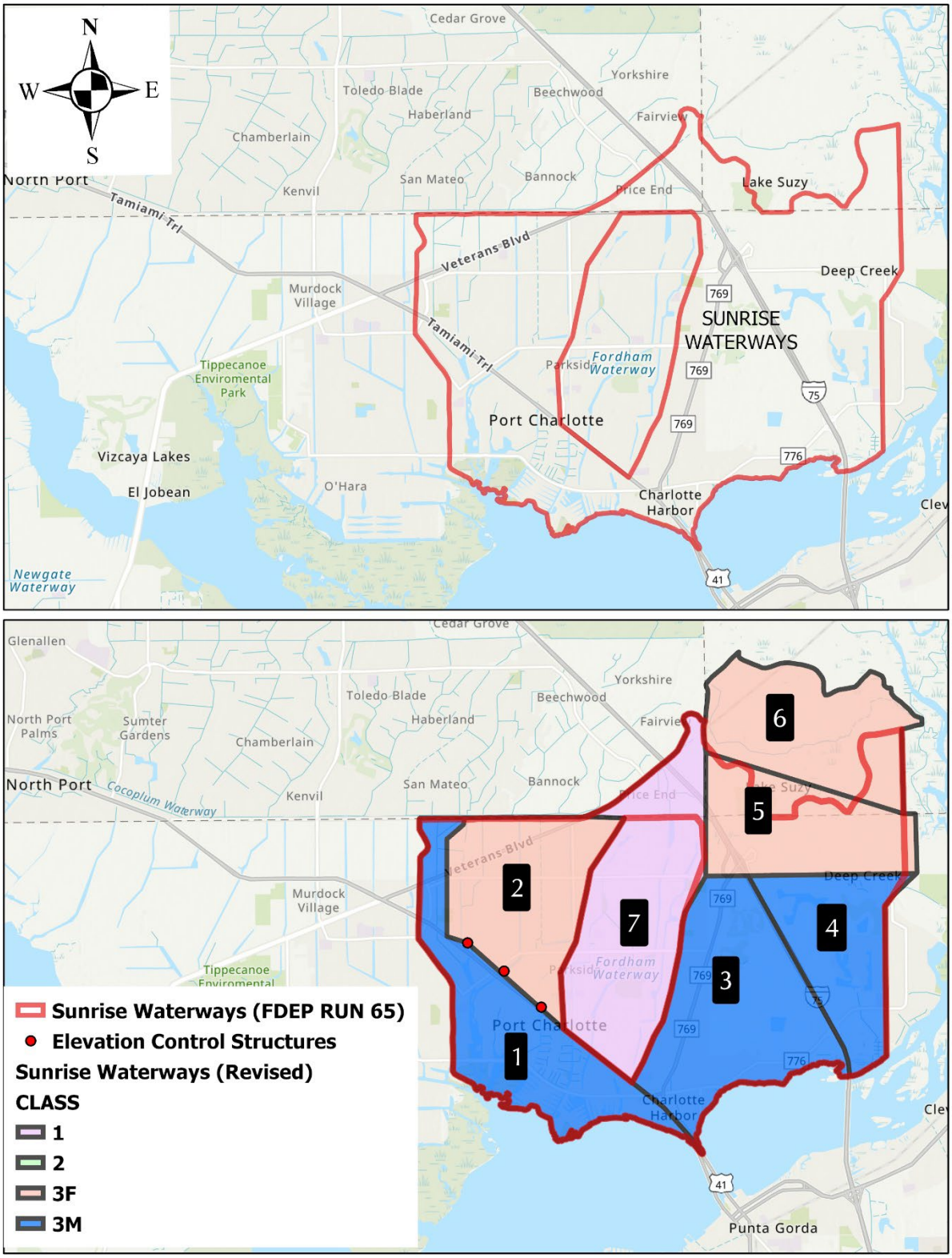

Figure 4 Recommended revisions to the Sunrise Waterway (WBIDs 2056E).

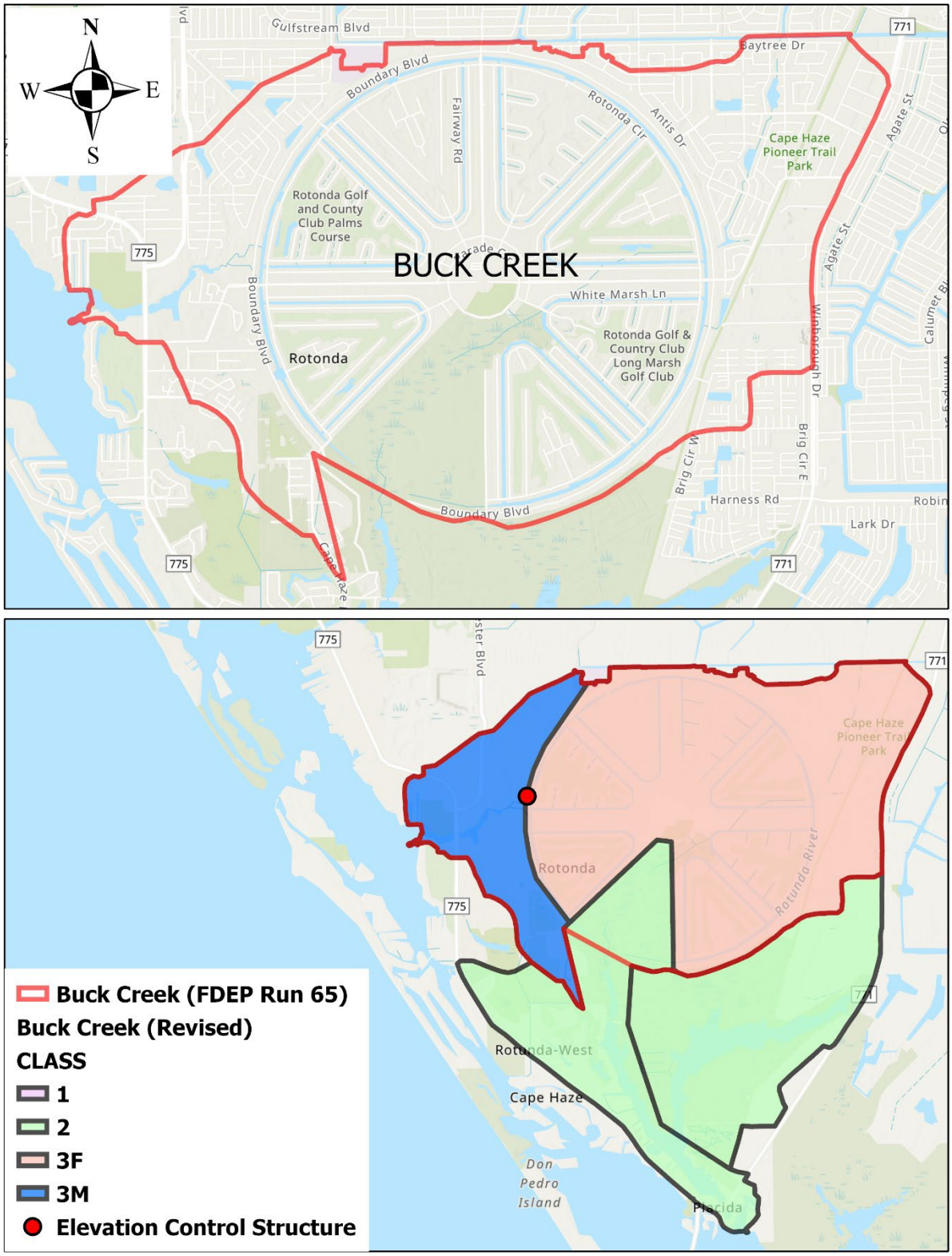

Figure 5 Recommended revisions to Buck Creek (WBID 2068).

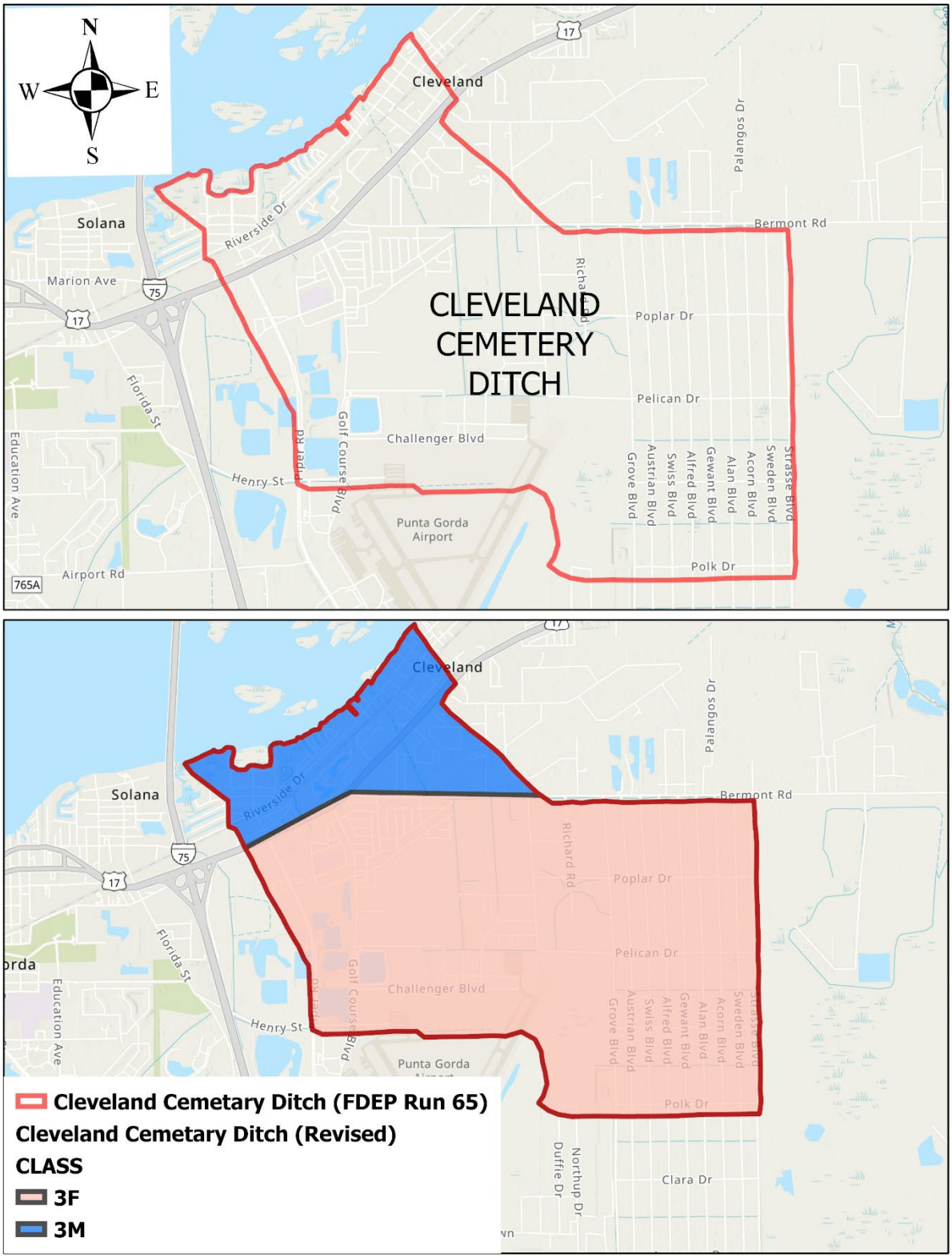

Figure 6 Recommended revisions to Cleveland Cemetery Ditch (WBID 2059).

TECHNICAL MEMORANDUM

One Charlotte One Water Plan

TO: Brandon Moody

FROM: Brett Cunningham, PE, ENV SP; Suzanne Kaufman, PE; Tony Janicki, PhD; and Jon Perry, GISP

DATE: March 21, 2025

SUBJECT: Pollutant-Loading Model Framework
Jones Edmunds Project No. 03405-052-01

1 INTRODUCTION

To support the many goals under the One Charlotte One Water Plan, a pollutant loading model must be developed to project and track pollutant loads across the County. For mainly the same needs that Charlotte County currently has, Sarasota County (together with the Southwest Florida Water Management District [SWFWMD]) requested that Jones Edmunds develop the *Spatially Integrated Model for Pollutant Loading Estimates* (SIMPLE). The model was originally formulated as a seasonal/annual loading model (SIMPLE-Seasonal) and later expanded to a monthly loading model (SIMPLE-Monthly). This pollutant-loading model, which has been accepted by the Florida Department of Environmental Protection (FDEP) on previous alternative restoration plans, is the clear choice to serve the County's needs and support water-quality planning. The following are important needs that are well-supported by the SIMPLE-Monthly model:

- Accounting of a large magnitude of pollutant sources – Virtually every parcel in the County generates direct runoff and base flow pollutant loads, and each one is unique. Other sources of pollutants such as on-site sewage treatment and disposal systems (OSTDSs), point sources, and direct atmospheric deposition are numerous and dispersed throughout the County. Each of these sources must be accounted for to accurately estimate pollutant loads.

- Location of pollutant sources – The location of each source is also important because it allows the results to be visualized to determine sources of higher loading and to integrate results at a receiving waterbody level.

- Planning for load reductions – Understanding the location, source, and current treatment (or lack thereof) of all pollutant loads is the foundation for reducing the most loads for the least cost (i.e., the pollutant load reduction planning process).

- Means of tracking changes and progress – Restoration and preservation of the County's waterbodies will be a lengthy process. It will also very likely require adaptive management as the restoration process occurs. SIMPLE-Monthly provides

the means to track changes in pollutant loads and progress towards restoration while also providing other functionality.

Charlotte County does not currently have a tool to support these needs.

Sarasota County's use of SIMPLE-Monthly is an excellent example of how it can be applied to One Charlotte, One Water:

- Its original application was to develop annual loads for the County's MS4 permit in a way that could be readily verified and updated in a consistent manner from year to year. Sarasota County continues to use it for that purpose.
- Sarasota County has applied it to each of its Watershed/Water Quality Management Plans to understand sources and magnitudes of pollutant loads and plan for their reductions.
- Sarasota County and Sarasota Bay Estuary Program recently applied SIMPLE-Monthly to develop a Reasonable Assurance Plan.

This Technical Memorandum focuses on identifying what data are available for the SIMPLE-Monthly model development, determining what data gaps exist, and developing a summary and cost estimate for future model development.

2 POLLUTANT LOADING AND HYDROLOGIC DATA

This Section discusses the availability of hydrologic data for computing direct runoff and baseflow loads, as well as other pollutant-loading data sources. Previous applications of the model have not made pollutant-loading calculations before the mid-1990s since that is when Next Generation Weather Radar (NEXRAD)-derived rainfall (i.e., rainfall that is based on NEXRAD returns and calibrated to available local rain gauge data) is considered to have become reasonably reliable at a scale of 2 kilometers (km) by 2 km or smaller. Other needed datasets often do not reliably go back before that point. The start date may end up being later than the mid-1990s, but we used that as a cutoff for assessing available data.

2.1 RAINFALL DATA

Rainfall is the primary driver of pollutant loads from direct runoff and is highly variable temporally and spatially. Because of its superior spatial coverage to gauge data, NEXRAD-derived rainfall data will be used to generate direct runoff and baseflow via a hydrologic engine. NEXRAD-derived rainfall is readily available at a relatively nominal cost. Processing the data into the needed model format is a straightforward task, with checking for missing data and gap-filling being most of the effort. We estimate this effort to be approximately $5,000.

2.2 EVAPOTRANSPIRATION DATA

Although less important than rainfall, evapotranspiration affects the amount of annual direct runoff and base flow. Daily evapotranspiration (ET) data calculated using the Priestly-Taylor method on a 2-km by 2-km pixel grid are available from the US Geological Survey (USGS) Integrated Science Center. Although this dataset represents an improvement of readily

available ET data for large areas, the spatial accuracy from pixel to pixel has not been validated. As such, we will calculate an average of ET for the pixels covering Charlotte County for the available period of record. For nearby counties, sensitivity runs using the pixel-based daily ET and the daily-average ET showed no significant difference for monthly runoff and base flow volumes, validating the use of the daily-averaged ET data. We estimate this effort to be approximately $5,000.

2.3 Soils Data

Soils data are also important in the calculation of direct runoff and base flow. The US Department of Agriculture Natural Resources Conservation Service Soil Survey Geographic Database (SSURGO) is the most widely used and comprehensive geographic information system (GIS) layer of soils data and will be used for this project. The latest version for the County can be easily downloaded. Soils files will be used to parameterize the primary groundwater and vadose zone (infiltration) parameters. Minor processing is needed to condition its use for application in SIMPLE-Monthly. We estimate this effort to be approximately $2,500.

2.4 Land Use Data

Land use affects direct runoff and base flow quantities and concentrations. SIMPLE-Monthly uses time-aware land use data so that a single land use dataset can be modeled over a long period (e.g., decades) without user intervention. Each polygon can have multiple land use attributes and corresponding start dates for when that polygon was converted to that land use. To create the time-aware land use layer, two land use layers are initially used – one from the beginning of the simulation period and one from the end. When these two layers are merged, a significant amount of cleanup is required due to inconsistencies in the layers and the number of slivers created. The raw data are readily available for download.

The final step to set up this layer is to determine when each polygon changed land use conditions. This process is best done using the best management practices (BMP) layer, which is described in the next section. We estimate this effort to create the land use layer to be approximately $25,000.

2.5 Direct Runoff and Baseflow Time Series

We are assuming that current hydrologic methods of creating time series of flow for direct runoff and baseflow will be used for the County's SIMPLE-Monthly model. An alternative approach would be to build and use ICPR4 models with the groundwater component exercised. This alternative is not part of our cost estimate. Exercising the model's current method to generate the time series is estimated to be approximately $10,000.

2.6 BMP Layer Data

BMPs reduce direct runoff pollutant loads and sometimes base flow pollutant loads. This layer is one of the most time-intensive to build. The starting point is Environmental Resource Permitting files from SWFWMD, the South Florida Water Management District (SFWMD), and FDEP. Each BMP needs to have a polygon created showing the area it serves, the BMP type, its removal efficiencies, and the year built. Following that process, aerial

photographs need to be reviewed to determine whether any significant BMPs were not captured in the initial process. Date-built data need to be estimated from available historical aerial photographs, and BMP types need to be estimated from available imagery.

One issue we will need to resolve is consideration of pollutant attenuation in the canals. The County has a record of where County-maintained control structures are located, so we recommend using different removal efficiencies for those with control structures versus those without since the presence of control structures increases residence time and removal efficiencies. The location of non-County-maintained control structures will need to be identified by review of high-resolution aerial photography. We will also need to consider canals that are part of Waters of the State/Waters of the US since we would not recommend accounting for removal in Waters of the State as it is not allowed and would likely not be accepted by FDEP. The County's current data on canals is generally sufficient for us to make that determination. The distinction between private canals and canals in the County's MS4 is less important for creating this layer.

We generally recommend a cutoff size for BMP capture since very small BMPs do not significantly influence pollutant loads at a watershed scale. Assuming a cutoff size for areas served of approximately 2 acres, we estimate the effort to develop the time-aware BMP layer to be approximately $50,000.

2.7 Event-Mean and Baseflow Concentration Data

Event-mean concentrations (EMCs) are correlated with land use and multiplied by direct runoff volumes to predict direct runoff pollutant loads. Unless a sufficiently large dataset of locally sampled flow-weighted EMC data are available, we propose to use the latest EMC data from the recently approved but unratified *Stormwater Rule*. We also propose to use local data for the baseflow concentrations. The baseflow concentrations will be spatially varied to the extent that the data will support them. The effort will depend on the amount of spatial variability supported by the data, but we estimate this effort to be approximately $2,500.

2.8 Point Source Data

Point source loads are ones that typically discharge to a single (point) location, although there are instances such as reclaimed wastewater for irrigation where the 'point' source is spatially distributed. The model requires point source data for pollutants that are ultimately discharged to a surface water body in the County. These are typically water reclamation facilities. These data are available through the monthly National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Reports (DMRs). The monthly data are applied daily since finer-scale data are rarely available.

There are 27 facilities in Charlotte County with an NPDES wastewater discharge permit that have a potential to discharge directly or indirectly to surface water bodies. However, only 10 of them have a permitted capacity of 0.1 MGD or greater. In discussions with the County, we recommended that a simplified approach be used for facilities with a permitted discharge of 0.1 MGD, which is also consistent with the approach taken in an ongoing alternative restoration plan. For those, we will assume a constant flow rate and concentration based on the average data we calculate from their DMRs. DEP has provided us electronic copies of

the 10 facilities with a permitted of 0.1 MGD or greater. With the exception of one facility, the data goes back to the beginning of 2003. The one exception is FLA665495, which only received its permit in 2017 – the year through which we were provided the DMR data.

We have spotted-checked the DEP-provided data for accuracy and found it to match the individual DMRs we used for spot-checking. There is a relatively small amount of missing data and a few points that may be outliers. These issues are straightforward to address.

The other consideration is if the disposal method is not directly to a surface water body (e.g., reuse or sprayfields). For those instances, the flows and pollutant loads need to be reduced outside the model as a pre-processing step. We estimate the effort to create the point source data layer to be approximately $10,000.

Non-recurring point source data (e.g., spills) can also be included in this category. Analyses in other similar studies showed that spills were generally not significant enough to consider. We are assuming that will be the case in Charlotte County as well, so we are not currently including a cost estimate for them.

2.9 Irrigation Data

Irrigation is sometimes added to the model. Except for reuse, past modeling efforts have shown irrigation to be a relatively small contributor. The County will need to determine whether including non-reuse irrigation is worth the expenditure. For reuse data, this overlaps with point source data. Reuse polygons need to be created for where reuse is applied, and reuse data (flows and concentrations) from the DMRs have to be distributed to the polygons as time series. We estimate the effort to create the reuse layer to be $15,000.

2.10 OSTDS Data

OSTDSs contribute pollutant loads primarily through discharge to shallow groundwater tables that flow horizontally to a surface waterbody. We have the best available OSTDS dataset from the Charlotte County Sewer Master Plan. These data should be adequate for developing the septic load. The current septic module in SIMPLE-Monthly was developed well before the current methods that FDEP uses for basin management action plans (BMAPs) and total maximum daily loads (TMDLs). FDEP's current standard guidance is that the ArcNLET model would need to be used to estimate these loads due to the large number of OSTDSs in the County. However, FDEP may support the use of one of the simpler methods (TMDL Method or SJRWMD-DEP-Modified). The current SIMPLE-Monthly method for septic systems is being used for the alternative restoration plan being developed for the Sarasota Bay Estuary Program. We recommend a discussion with FDEP on this issue before finalizing since it will have a significant impact on the required budget. Assuming that one of the simpler methods can be used, we estimate the effort for this element to be $10,000. The effort using ArcNLET is estimated to be $40,000.

2.11 Atmospheric Deposition Data

For watersheds with large water bodies (e.g., Charlotte Harbor), the loading from atmospheric deposition can be significant and is important to account for. The data are generally readily available for this element, and some preprocessing is involved to pair that data with the rainfall data. We estimate the effort to be $10,000.

2.12 Out-of-County Loading Data

Myakka River, Peace River, and Shell Creek have watersheds that extend well beyond the County border. If those water bodies or Charlotte Harbor are part of future evaluations, it will be necessary to account for those loads (presumably) outside of the SIMPLE-Monthly model. That type of accounting is usually done using measure flow and concentration data.

There are other smaller watersheds (WBIDs) that extend a relatively small amount out of the County. The ones that extend into Sarasota County are covered already by Sarasota County's SIMPLE-Monthly model. We propose extending Charlotte County's SIMPLE-Monthly model extents to capture the remainder of the small watersheds since the increased effort is minimal and it will be convenient to have complete results. We estimate the effort to be $15,000, which does not include monitoring.

There are 16 connections from the Cocoplum into Port Charlotte and multiple weirs at different design elevations along the Cocoplum itself. If a finer resolution of this flow split is required, we could modify North Port's existing ICPR4 model for use in continuous simulation, which would include exercising the groundwater component. We do not currently have a copy of that model, but we estimate that this effort would be approximately $70,000.

2.13 Model Calibration

We recommend performing model calibration at two locations where the watershed area is mostly urbanized and two where the watershed is mostly unurbanized. To properly calibrate the model, we need at least a year of flow data to complement the current water quality sampling. We recommend avoiding selecting locations where model calibration is complicated by hydraulic interconnections. The Task 2 Technical Memorandum will cover the recommended locations. We estimate the effort to be $20,000.

2.14 Documentation

Adequate documentation will need to be created for the efforts discussed above. We estimate the effort to be $15,000.

2.15 Training

Although this element may be considered optional, the County may want to include training of select County staff on use of the model. We estimate the effort to be $10,000.

2.16 Total

Table 1 shows the total estimated effort in 2023 dollars to set up and calibrate the SIMPLE-Monthly model for Charlotte County.

Table 1 Total Estimated Effort for SIMPLE-Monthly Development

Data/Task	Estimated Effort
Rainfall Data	$5,000
Evapotranspiration Data	$5,000
Soils Data	$2,500

Data/Task	Estimated Effort
Land Use Data	$25,000
Direct Runoff and Baseflow Time Series	$10,000
BMP Layer Data	$55,000
Event-Mean and Baseflow Concentration Data	$2,500
Point Source Data	$10,000
Irrigation Data	$15,000
OSTDS Data	$40,000[1]
Atmospheric Deposition Data	$10,000
Out-of-County Loading Data	$15,000[2,3]
Model Calibration	$20,000[2]
Documentation	$15,000
Training	$10,000[4]
Total	**$240,000**

[1] A less-costly effort may be an option.

[2] Does not include monitoring costs.

[3] Does not include ICPR4 continuous simulation.

[4] This may be considered an optional task.

TECHNICAL MEMORANDUM

One Charlotte One Water Plan

TO: Brandon Moody

FROM: Brett Cunningham, PE, ENV SP; Justin Gregory, PE

DATE: May 5, 2026

SUBJECT: Programmatic Recommendations
Jones Edmunds Project No. 03405-052-01

1 INTRODUCTION

The *One Charlotte One Water Plan* has identified several aspirational elements of the *Charlotte County Comprehensive Plan* that would be helpful to further implement. This Technical Memorandum provides examples of how other Florida communities have addressed these elements.

2 INCENTIVIZING CONSERVATION CORRIDORS

There are several good examples where conservation corridors are incentivized. Hernando County's Comprehensive Plan and Land Development Code use density incentives and easement to encourage conservation corridors. The "Rural Cluster Overlay" option allows a landowner to build at higher density than normally allowed if at least 50 percent of the development is set aside as permanent open space connecting to public conservation lands. The permanent open space must be configured as a contiguous wildlife corridor that links existing public preserves or other planned conservation areas on adjacent lands and is protected in perpetuity by a conservation easement held by the county or a conservation agency.

Collier County's Rural Lands Stewardship Area is an overlay planning program established in the early 2000s that directs growth away from ecologically important areas and secures private land as permanent conservation to form broad habitat corridors. It uses a credit system to incentivize landowners to designate Stewardship Sending Areas for conservation via easements or deed restrictions in exchange for the right to build more intensely in designated Receiving Areas. The program has a credit system that favors lands that contribute to large connected ecosystems.

Alachua County's Comprehensive Plan Conservation requires that new developments provide open-space linkages to adjacent habitat corridors or greenways. Alachua County has also identified a network of Critical Ecological Corridors and protects them through multiple tools. The Comprehensive Plan calls for establishing habitat corridors throughout the county and developing economic incentives for private property owners to voluntarily

participate in corridor preservation. The County runs the Alachua County Forever land acquisition program (voter-approved) and a Transfer of Development Rights (TDR) system to purchase or conserve lands in these corridors.

Osceola County has a focus on conservation corridor connectivity in its land acquisition programs and planning policies. The County's Environmental Lands Conservation Program (named SAVE – "Save And Value Environment") uses a voter-approved property tax millage to acquire or place conservation easements on ecologically important private lands. A specific goal of this program is to target lands that serve as links between existing public conservation areas.

Volusia County has collaborated with state and regional partners to establish conservation corridors. Through its Volusia Forever program (a voter-funded conservation land acquisition initiative) and coordination with Florida Forever (state funding), the county has been assembling the Volusia Conservation Corridor – a continuous band of preserved lands running from Tiger Bay State Forest in the west, through central Volusia's wetlands, to the marshes of the St. Johns River in the east. The County's Comprehensive Plan and ECHO recreation grant program also support developing trailheads and multi-use trails on these lands, which increases connectivity.

In 2023 Seminole County approved the Seminole Forever program (modeled after Volusia's) to fund acquisitions that will link pieces of the Florida Wildlife Corridor within the County. Seminole's Comprehensive Plan recognizes the need to connect the Wekiva Basin park lands to the Econlockhatchee River conservation areas, ensuring wildlife can travel between public lands.

3 INCENTIVIZING GREEN DESIGN AT THE SITE PLANNING SCALE

Fee reductions and expedited permitting are the two most common ways that green design is incentivized. The City of Sebastian offers non-residential property owners up to a 50 percent reduction in their stormwater utility fee if they install and maintain approved green design practices on site. Orlando, Tampa, and Gainesville also provide stormwater fee discounts for green design practices.

Other cities provide incentives for green design retrofits. For example, the City of Dunedin has its Resiliency and Sustainability Rebate Program rebates building permit fees (up to $2,500) for property owners who implement approved resiliency improvements, which can include green site design to better manage stormwater. Similarly, the City of Tallahassee has its Think About Personal Pollution (TAPP) Program which provides education for local-scale water quality improvements and has a grant application process to assist with them.

4 FUNDING VOLUNTARY RETREAT FROM FLOODING

In 2017 Monroe County established a Voluntary Home Buyout Program with $15 million of disaster recovery funds after Hurricane Irma. Under this program, the County buys private homes that were repetitively damaged, demolishes the structures, and guarantees the land will remain open space or used for flood mitigation in perpetuity. The Monroe County

program prioritized low-income households and high-vulnerability areas, framing it as a step toward managed retreat for a stronger community.

The City of Marathon in the Keys implemented a CDBG-DR funded buyout initiative: the city purchases Irma-damaged homes at post-storm market value and clears the lots to become either small green parks or stormwater retention areas.

Bay County used the Rebuild Florida Voluntary Home Buyout grant program to acquire clusters of flood-prone homes and remove them from development. The City of Jacksonville has been investing local and FEMA funds to buy out homes in chronically flooded neighborhoods even absent a disaster. The land will be turned into green space as a permanent flood buffer, with the goal of helping residents move to higher ground. The program is strictly voluntary.

Sarasota County has implemented the Resilient SRQ Voluntary Buyout Program to acquire properties impacted by Hurricane Ian (2022) and in flood-prone areas. It prioritizes low-to moderate-income homeowners in repetitive loss areas who have limited recovery resources.

5 FLORIDA FRIENDLY LANDSCAPE REQUIREMENTS AS BUFFERS ALONG SHORELINES AND PONDS AND FOR NEW CONSTRUCTION

5.1 Local Ordinances Requiring Florida-Friendly Buffers and Practices

In 2022 the City of Fort Walton Beach updated its Land Development Code to further protect water bodies. Any new development abutting a waterway is required to retain the natural shoreline vegetation or plant a vegetated buffer if one does not exist. The ordinance also incorporates Florida-Friendly Landscaping (FFL) principles by requiring landscape plants be selected from Florida-Friendly plant lists for North Florida. This requirement promotes drought-tolerant, native or Florida-friendly species are used in buffer areas and throughout the landscape.

Orange County’s code encourages FFL principles in site landscaping. Developers may follow an FFL landscape plan in lieu of conventional planting, with limits on turf area (no more than 60 percent turf). For stormwater ponds, the County requires continuous drought-tolerant planting along the pond shore in the form of a row of low-maintenance shrubs and understory trees that must line the top of bank around ponds. The code also explicitly prevents HOAs or rules from prohibiting FFL on private property.

St. Johns County’s Land Development Code requires that all new development projects follow FFL principles. At least 50% of installed plant species must be native, and at least half of the landscaped area’s irrigation must use low-volume systems. This requirement applies to commercial projects and new residential subdivisions (common areas).

Panama City’s landscaping ordinance adopted FFL best practices in 2018. It states that all landscape plans for new development will be evaluated on Florida-Friendly design principles.

The code describes the nine FFL principles and requires designers to incorporate those practices.

Many other Florida jurisdictions have similar provisions. The City of Milton references the Florida-Friendly Landscaping Guide to Plant Selection and Design in its landscape code and prefers native/FFL plants for required buffers and open spaces. The City of Coral Springs and Town of Davie have ordinances stating that all new or redeveloped landscapes must adhere to Florida-Friendly principles. Hernando County's fertilizer ordinance defines a 10-foot "low-maintenance zone" along waterbodies that is planted "preferably with native or Florida-Friendly Landscaping" and requires no mowing or fertilizer in that strip. Many county fertilizer ordinances throughout Florida include a similar fertilizer-free buffer (typically 10 feet) and recommend planting a 6–10 feet Florida-friendly vegetative buffer at the water's edge.

5.2 Incentive Programs for Florida-Friendly Shoreline Buffers

Pinellas County's Florida-Friendly Landscaping Incentive Program (FLIP) was a multi-year pilot rebate program to encourage water-conserving landscapes. Homeowners in target watersheds could receive a 50 percent cost rebate (up to $2,000) for replacing irrigated turf with Florida-Friendly plants and micro-irrigation. The program's goal was to reduce fertilizer and water use to protect local water bodies. By funding Florida-friendly retrofits – including transitioning lakefront yards to planted buffer zones – the County provided a direct incentive for residents to create FFL-compliant shore buffers.

The City of Dunedin's Resiliency & Sustainability Rebate offers rebates (i.e., grants) for projects that improve environmental resiliency on private property. This includes up to $2,500 rebates for landscaping projects that use native Florida-Friendly plants or that create "living shorelines" along waterfront yards. For example, a homeowner who converts a mowed lakeshore into a Florida-Friendly planted buffer or installs a mangrove/oyster living shoreline can qualify. The City lists "landscaping for resiliency with native Florida plants and Florida-Friendly practices" and "living shoreline enhancement" as eligible activities.

Haines City's Florida-Friendly Landscape Rebate partners with its utility to incentivize retrofitting landscapes to FFL standards. The program will reimburse up to $3,000 (covering 75 percent of costs) for converting at least 250 square feet of high-irrigation turf into a Florida-Friendly landscape with low-volume or no irrigation.

Brevard County's Lagoon Loyal Program initiative uses an incentive approach to encourage behaviors that protect water quality. Waterfront residents can earn points (redeemable for local business discounts) for actions like establishing a "lagoon-friendly" vegetative buffer at the water's edge. The program emphasizes planting native Florida-Friendly plants and shrubs along canals or lagoon-front yards in place of lawn. By uploading photos of their shoreline buffer, participants earn points and recognition. This incentive program, funded by the Save Our Indian River Lagoon sales tax, specifically targets private yards along waterways.

6 COUNTY-SUBSIDIZED/SUPPORTED REPLACEMENT OF NON-NATIVES NEAR SENSITIVE HABITATS LIKE AQUATIC PRESERVES

Broward County's NatureScape Broward targets urban and suburban landscapes connecting to sensitive ecosystems (from Everglades "sawgrass" wetlands to coastal seagrass habitats). It is County-funded, and participation is voluntary. Participants are encouraged to create Florida-Friendly landscapes. It emphasizes replacing non-native/invasive ornamentals with native species. The program provides education, landscaping workshops, and free consultations to promote native planting and invasive removal. It partners with the National Wildlife Federation to certify wildlife-friendly yards.

Palm Beach County's Invasive Vegetation Removal & Cost-Share Program targets County natural areas (preserves of wetlands, scrub, mangroves, etc.) and a 500-foot buffer zone around these conservation lands. It is County-funded, and code enforcement ensures long-term compliance. Within 500 feet of county natural preserves, private landowners were offered incentives to voluntarily remove invasive plants. After designated deadlines, removal became mandatory by ordinance. Palm Beach County offered to pay 100% for removal of Australian pine and melaleuca and provided a cost-share for removing the other seven species within the buffer.

Keep Brevard Beautiful (KBB), a non-profit, in partnership with Brevard County and the Indian River Lagoon National Estuary Program created Lagoon Friendly Lawns. It has support from local municipalities, UF/IFAS Extension, Marine Resources Council, and others. It focuses on residential lawns and community greenspaces near the Indian River Lagoon and waterfront properties for "living shoreline" native plantings. The voluntary program provides guidelines and recognizes participants who follow Lagoon-friendly practices. Participants earn certification signs and sometimes rebates or prizes via related initiatives. It emphasizes reducing turf and fertilizer use, removing invasive exotics, and planting native vegetation. Yards are rated (Member, Silver, Gold) based on practices that curb nutrient pollution and enhance native habitat.

7 CITIZEN SCIENCE INITIATIVES MANAGED BY COUNTY/LOCAL GOVERNMENTS

The Sarasota Bay Estuary Program has a citizen science program that enlists citizen scientists to monitor wildlife, water quality, and plant health. It has multiple funding sources.

Florida LAKEWATCH is statewide example that has been in existence since 1986. It is "a citizen volunteer lake monitoring program that facilitates "hands-on" citizen participation in the management of Florida lakes, estuaries, rivers and springs through monthly monitoring activities." It is credited as being one of the largest programs of its kind in the country. Monroe County has Florida Keys Water Watch, which works in partnership with Florida LAKEWATCH. Orange County has a similar partnership for their program.

Hillsborough County has the Adopt-A-Pond Program, which is a citizen stewardship and monitoring program in Hillsborough County focused on neighborhood stormwater ponds. Established in the early 1990s, its purpose is to engage residents in restoring and monitoring their local ponds to improve water quality and aquatic habitat. Residents adopt a stormwater pond and receive guidance, training, and resources from the County to help clean debris, plant native vegetation, and monitor the pond's condition. It is partly funded through the County's stormwater utility fund.

The LagoonWatch Program for the Indian River Lagoon is a multi-county program where volunteers collect water samples in the Indian River Lagoon. It is coordinated by the Marine Resources Council. For over 30 years, LagoonWatch has trained and equipped volunteers to perform weekly water sampling at sites throughout the 156-mile lagoon.

8 ORDINANCES LIMITING CONTAMINANT SOURCES THAT MAY DEGRADE WATER SUPPLY WELLS

Wakulla County has an ordinance that requires advanced nitrogen-removing septic systems in vulnerable areas, caps residential septic tank density, mandates connection to central sewer for new developments in sensitive zones, enforces 100–300 ft setbacks of septic systems from karst features (springs, sinkholes), regulates hazardous material storage near public wellheads, has local fertilizer-use restrictions, and bans fracking and unapproved large water withdrawal.

Miami-Dade County's Northwest Wellfield Protection Ordinance limits residential development on septic tanks to 1 dwelling per 5 acres in the wellfield protection area, prohibits industrial facilities that generate hazardous or non-domestic wastewater from using septic systems, requires a minimum 100 ft well-to-septic setback, and delineates multiple protection zones with stricter controls on land use and chemical storage closer to the wells.

Broward County's Wellfield Protection Ordinance defines wellfield protection zones and prohibits high-risk activities in close zones. It also requires facility handling regulated substances in certain zones to obtain a County license and spill-prevention plan. All potential contaminant sources – including septic tanks – within these zones are inventoried and monitored to prevent groundwater pollution.

Pinellas County Wellhead Protection Ordinance defines four wellhead protection zones around public supply wells and regulates storage or use of hazardous substances in those zones. New high-risk land uses are limited to prevent groundwater contamination. Their Fertilizer Ordinance prohibits the sale or use of lawn fertilizers containing N or P during the summer rainy season (June 1 – Sept 30) and requires best management practices (like slow-release formulations and buffer distances) similar to other counties.

9 LOCAL GOVERNMENTS DEVELOPING AND IMPLEMENTING A LOW-IMPACT DEVELOPMENT MANUALS

Table 1 identifies local governments in Florida that have adopted a low-impact development (LID)/green stormwater infrastructure (GSI) manual.

Table 1 Local Governments in Florida with LDI/GIS Manuals

Local Government	Manual Title	Date
Alachua County	Stormwater Treatment Manual	2018
Brevard County	Low Impact Development Retrofit Guide	2020
Duval County (Jacksonville)	Low-Impact Development Design Manual	2013
Escambia County	Low Impact Design Best Management Practices Manual	2016
Orange County	Stormwater Low Impact Development Manual	2024
City of Ormond Beach	Low Impact Development Design Manual	2013
Sarasota County	Low Impact Development Guidance Document	2014
Hillsborough County	Green Infrastructure Manual	2023

10 FUNDING SUMMARY AND RECOMMENDATIONS

We evaluated the aspirational elements of the items above in terms of noticeable benefits in water quality improvements and citizen literacy/awareness. Based on that evaluation, we recommend prioritizing the following highest ranked issues in the order shown below:

1. Incentivizing Green Design at the Site Planning Scale – This item provides both types of benefits. Retrofit water quality treatment is challenging in many parts of the County due to the nature of the development. Being able to reduce loads one lot at a time while increasing citizen literacy/awareness with the homeowner and likely with the surrounding homeowner at a relatively modest investment for the County is very positive. An added benefit in terms of cost is that the County is not taking on the maintenance of the retrofit water quality treatment.

2. Local Governments Developing and Implementing a Low-Impact Development Manual – This item can go hand-in-hand with the issue above. Low-Impact Development or Green Stormwater Infrastructure manuals can be aimed at a design professional audience, a lay audience, or both. If you develop a Manual for a lay audience, it would supplement the item above.

3. Citizen Science Initiatives Managed by County/Local Governments – This item is very useful for citizen literacy/awareness. It can also add value to County programs with a modest investment from the County.

4. Funding Voluntary Retreat from Flooding – The biggest impact from this item is flood protection. However, vacated properties are often in lower-lying areas, which often make them favorable locations for water quality retrofits.

As discussed in the sections above and in the draft of the *One Charlotte One Water Plan*, there are multiple ways in which local governments in Florida have incentivized some of the aspirational elements of the *Charlotte County Comprehensive Plan*. Fee reductions and other incentives (e.g., increased densities as a tradeoff for important conservation land) are a viable option for many of the aspirational elements. However, they are not universally applicable (e.g., they don't apply to voluntary retreat from flooding), and any reduction in fees may have to be made up elsewhere in the budget. Our recommendation is to incentivize the elements where incentivization is applicable. Those elements should then be tracked for a period of time (e.g., 2 years) to test the effectiveness of incentives. The County should be prepared to remove the incentives if they are not adequately effective.

A Special Purpose Local Option Sales Tax (SPLOST) could be used in conjunction with the incentives as a way to fund them. A significant advantage of a SPLOST is that it could be used to fund much more of the *One Charlotte One Water Plan*. Although funding referendums are typically difficult to pass, ones related to water quality have usually been well received. If the County intends to more broadly implement the *One Charlotte One Water Plan*, we recommend pursuing a SPLOST.

TECHNICAL MEMORANDUM

One Charlotte One Water Plan

TO: Brandon Moody

FROM: Brett Cunningham, PE, ENV SP; Tony Janicki, PhD; and Jon Perry, GISP

DATE: March 21, 2025

SUBJECT: Charlotte County Early-Out Project Identification
Detailed Task Description for a Lemon Bay Reasonable Assurance Plan
Jones Edmunds Project No. 03405-052-01

1 INTRODUCTION

When the *One Charlotte One Water Plan* was originally scoped, Task 6 was envisioned as an effort that would identify an early-out project for grant funding. Several projects were evaluated to fulfill that goal, but no suitable projects were identified during the last grant window. As a substitute for one of the early-out projects, the County and Jones Edmunds agreed to the Jones Edmunds Team providing a detailed description of the steps required to develop an alternative restoration plan – in this case, a Reasonable Assurance Plan (RAP) – for Lemon Bay. This Technical Memorandum (TM) describes those steps, which are as follows:

1. Build consensus among elected officials, management, and technical staff on the need for a RAP for Lemon Bay.
2. Develop a Joint Project Agreement (JPA) or similar mechanism for advertising and managing the RAP.
3. Establish a project budget for each stakeholder entity.
4. Select a consultant.
5. Determine the pollutants of concern.
6. Establish/confirm the water quality targets.
7. Select and develop a pollutant-loading model.
8. Determine the flows and loads.
9. Determine the load-response relationship.
10. Determine the load reductions needed.
11. Develop the load-reduction projects.
12. Develop the draft RAP.
13. Confirm stakeholder commitments.
14. Respond to comments and finalize the RAP.
15. Provide stakeholder involvement.

2 BUILD CONSENSUS

A critical first step in developing a RAP is building consensus among the elected officials of stakeholders who will have a financial stake in the RAP (i.e., those with jurisdiction in the watershed). In the case of Lemon Bay, the largest stakeholders are Charlotte and Sarasota Counties. The Cities of Venice and North Port also have small footprints in the watershed and would need to be included or could possibly be considered de minimis. Discussions during recent Charlotte and Sarasota County Commission meetings indicate a favorable stance on a project like the Lemon Bay RAP, but it will be important to get confirmation from the Commissions that are current at the time the decision to move forward is made since it is a multi-year financial commitment.

Likewise, support for the RAP among management and technical staff is important. Although they take directions from the Commission, it is still helpful for the process if they are supportive of the idea. Management or technical staff not being fully supportive of the idea is typically a result of not having a full understanding of the advantages and disadvantages of a RAP versus the Total Maximum Daily Load (TMDL)/Basin Management Action Plan (BMAP). This gap in understanding can be resolved with a short workshop discussing the different approaches.

During the consensus-building process, identifying the "champions" for the process is also important. Ideally, one of the champions would be at the technical staff level from one of the stakeholders and will serve as the project manager for the stakeholders. RAPs require many meetings and decisions. Keeping the group engaged and seeing the process to a timely conclusion is well-served by someone who has a passion for the subject matter. Having champions among management and elected officials is also highly desirable.

3 DEVELOP A JPA OR SIMILAR MECHANISM

From a practical standpoint, one of the stakeholder entities must be the lead for matters such as procurement and cost-sharing. This process is normally facilitated with a JPA or similar mechanism. The JPA covers items such as legal authority, scope of work, governance and management, funding, responsibilities of parties, terms, liability, and insurance, among other topics. The simplest way to split the funding is based on the percentage of the watershed area that each entity encompasses. A more complex method is to base it on the percentage of pollutant loading; however, that may not be practical if an existing estimation of the pollutant loads that covers the full watershed area and is reasonable to all parties does not exist.

4 ESTABLISH A PROJECT BUDGET FOR EACH STAKEHOLDER ENTITY

This step may be completed in conjunction with the JPA so that each entity understands their financial obligation before finalizing the JPA. Regardless of order, some entities may require a line item in their budget to fund the project. Therefore, this effort should occur early in the process since budgets are typically approved annually.

5 SELECT A CONSULTANT

This step could be optional if adequate expertise and availability exists among the staff of the stakeholders. However, it is usually difficult for both conditions to hold true, and a consultant is generally considered a third party that is impartial in the process. Given that the consultant selection is done under a JPA, a longer than normal selection process may be necessary.

6 DETERMINE THE POLLUTANTS OF CONCERN

In most estuaries in Florida, total nitrogen is the primary nutrient of concern. However, the Florida Department of Environmental Protection (FDEP) may also require that total phosphorus is considered in the RAP. With the work already done on Lemon Bay through the Coastal & Heartland National Estuary Partnership (CHNEP) and FDEP, this step may possibly be skipped. However, the findings used for skipping this step (i.e., agreeing to the already completed science) must be acknowledged and documented.

7 ESTABLISH/CONFIRM THE WATER QUALITY TARGETS

As with the previous step, CHNEP and FDEP previously established the water quality targets for Lemon Bay. Using those well-vetted targets would reduce the effort and timeline for establishing the RAP. However, if the stakeholders have concerns about the existing targets, this could be a worthwhile exercise. Changing targets could trigger other regulatory requirements that would add more time and cost to the process.

8 SELECT AND DEVELOP A POLLUTANT-LOADING MODEL

For the portion of the Lemon Bay watershed in Sarasota County, a pollutant-loading model (the Spatially Integrated Model for Pollutant Loading Estimates [SIMPLE]) currently exists that has been in use since the early 2000s. As part of the *One Charlotte One Water Plan* project, we have already provided a budget estimate for developing a SIMPLE model for Charlotte County. Although other approaches could be used, using SIMPLE is likely the logical choice for performing this part of the RAP. Developing the SIMPLE model for Charlotte County while the steps above are being implemented – or at least the Lemon Bay portion – will expedite development of the RAP and should be considered for the sake of the overall schedule. FDEP accepted the SIMPLE model for use on the Mosquito Lagoon RAP.

9 DETERMINE THE FLOWS AND LOADS

Because of the variability and complexity involved, estuarine water quality criteria are normally based on multi-year annual geometric means. The Lemon Bay water quality criteria are an exception in that they were developed using arithmetic means. A time series of flows and loads that is long enough to support a multi-year analysis for Lemon Bay must be developed. Typically, 10 years is the minimum-desired duration for the time series.

10 DETERMINE THE LOAD-RESPONSE RELATIONSHIP

Before determining the load reductions required to restore Lemon Bay, a connection between nutrient loading and estuarine response will need to be determined using one of three approaches:

- An empirical stressor response approach
- Mechanistic modeling
- A reference condition approach

Each approach should be considered and the most scientifically defensible approach brought forward. An empirical stressor response approach is predicated on having an adequately long dataset to perform the analysis and finding statistically significant signals in the data to support the approach. This approach begins with development of a logical model – one that can be borrowed from other estuaries as a starting point – followed by a statistical analysis to support (or reject) the logical model. Because of the confounding factors that often exist in an ecosystem as complex as an estuary, it is not always possible to use an empirical stressor response approach. However, it should be considered since it is one of the two most cost-effective approaches, along with the reference condition approach.

Mechanistic modeling would be the most expensive and time-consuming of the three approaches. The most efficient approach would likely be to add a water quality component to the existing Environmental Fluid Dynamics Code (EFDC) model that exists for Lemon Bay. That portion of the model would need to be calibrated and verified in order to use for this application, which would require an adequate amount of water quality data to exist for those purposes. One advantage of a mechanistic model is that it is more open to "what if" analyses.

A reference period approach is the most common of the three approaches and is predicated on several requirements – one of which is having a period in the observed data when resources and measurable metrics were being met or at least close to being met (i.e., the reference period). In addition to being straightforward to apply, an advantage to this approach is that it is the most easily understood by a wide range of stakeholders.

Regardless of the approach used, loading targets will need to be identified as protective of estuarine health, and there is sufficient long-term data for Lemon Bay to support the selected approach

11 DETERMINE THE LOAD REDUCTIONS NEEDED

Given the recommended nutrient loading targets, the next step is to identify a defensible baseline for which the calculation of load reductions will be based. The baseline loads can consist of a single year or as a composite (mean or median) that accounts for temporal variability of hydrologic conditions. A consensus from the stakeholders will be sought regarding the appropriate baseline. The load reductions may then be allocated among the stakeholders to account for the spatial distribution of loadings to Lemon Bay.

12 DEVELOP THE LOAD-REDUCTION PROJECTS

Load-reduction projects for the RAP do not need to be designed and permitted – they can simply be conceptual-level projects. The projects can be from existing concepts or ones that are developed during the RAP. Typically, they are more of the former than the latter. Load-reduction goals in RAPs are usually significant, so the focus of the project types needs to be on larger projects.

Cost opinions need to be developed for the capital portions of the project in part to support grant applications. Since the resulting best management practices (BMPs) usually require operation and maintenance, life-cycle cost opinions also need to be developed for the RAP. The consultant will develop the cost opinions. Each project must also have an owner or owners since a responsible implementing stakeholder is required for each one.

Predicted load reductions need to be in line with what FDEP will accept. We recommend using the draft guidelines developed by FDEP (Statewide Best Management Practice (BMP) Efficiencies for Crediting Projects in Basin Management Action Plans (BMAPs) and Alternative Restoration Plans, Draft – September 2021) as a starting point. There may be instances when deviated from those draft guidelines is warranted, and those discussions should occur as part of the normal project communications with FDEP. The consultant will need to estimate load reductions using the best available data for projects using technologies that are not well tested. These projects will likely also have post-construction monitoring requirements. Consideration should also be given to projects that are especially grant-fundable for inclusion in the RAP.

13 DEVELOP THE DRAFT RAP

Developing the draft RAP is generally straightforward since it is mostly a compilation of the work done up to this point in the project. Typical report sections include the following:

- Background
- Description of the Watershed
- Description of the Water Quality Goals
- Description of Proposed Management Actions
- Description of Procedures for Monitoring, Compliance, Assessment, and Reporting
- Commitment to Corrective Actions
- References

In the RAP, the projects developed in Step 12 will need to be prioritized into a schedule with 5-year increments. The RAP will also include annual reporting and 5-year update requirements.

14 CONFIRM STAKEHOLDER COMMITMENTS

With a 15-year schedule, implementation of projects will cover a period that likely exceeds the terms of the elected officials approving the expenditures. To that end, bringing the draft RAP – and particularly the projects that are the responsibility of a given stakeholder – back to the elected officials for buy-in is an important step in the process.

15 RESPOND TO COMMENTS AND FINALIZE THE RAP

Since FDEP is heavily involved in developing the draft RAP, comments on the draft are generally minor and easy to address. However, it is another step in the process and overall schedule that needs to be accounted for.

16 PROVIDE STAKEHOLDER INVOLVEMENT

The importance of stakeholder involvement in developing a RAP cannot be overemphasized. Although it is the final step in this TM, it occurs throughout the entirety of the project. From the JPA on, stakeholders must fully understand and work collaboratively to build consensus on important decisions. Frequent regular meetings should be scheduled throughout the process. As an example, over 20 stakeholder meetings were held while developing the Mosquito Lagoon RAP.

A well-run stakeholder process should include vetting methods and approaches before their application. No surprises regarding how results were developed should arise when they are presented to the stakeholder group. Information sharing and documentation are also important. A repository for technical data and meeting agendas, presentations, and minutes should be readily available for all stakeholders, including a venue for written stakeholder comments.

To distinguish between stakeholders that will have a financial commitment associated with the RAP versus ones that are interested parties, the former group is sometimes called key stakeholders. Selection/solicitation of (non-key) stakeholders is critical. Unintentionally missing a stakeholder that may be vocal against the RAP because they were not made aware of the details of its development could cause needless delay, rework, and frustration among the stakeholder group. Including any group that would have an interest in how the RAP is developed and implemented is important. Although this will likely result in a large number of stakeholders, the result will be a RAP that is well-supported by the community.