

# **Ideas for Enhancing Charlotte County's Management of Our Exceptional Estuaries, Waterways and Water Quality – Now**

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**Coty Keller, David Blewett, and Judy Ott  
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## Executive Summary

This discussion paper provides ideas for enhancing Charlotte County's management of our exceptional waterways, waterways and water quality, so that needed changes can be implemented before irreversible damage occurs. It is intended to encourage discussions between citizens, staff and elected officials which lead to positive actions. The authors are three Charlotte County community leaders and scientists interested in sustaining the health of the county's waterways, economy and lifestyle for future generations. Charlotte County is a special place with a water-based lifestyle but it is changing rapidly. Correcting current water quality issues and planning to accommodate future growth are essential to long-term sustainability of our estuaries, waterways and economy.

The four underlying principles for the discussion paper are: 1) healthy local estuaries are essential to our economy; 2) we have a water quality crisis in the making; 3) wastewater and stormwater, aggravated by climate change, are the two main causes of our water quality problems; and 4) our county government isn't organized to best manage our estuaries, waterways and water quality.

The five essential elements for efficiently and effectively managing our waterways and water quality include: 1) water quality monitoring and reporting; 2) wastewater management; 3) stormwater treatment; 4) supplemental water resource management programs; and 5) education and awareness.

Ten solutions to local water quality issues are presented in more detail to promote discussions and actions, including: 1) acknowledge we have water quality problems in the county; 2) manage county water quality to meet state standards; 3) create a comprehensive county water quality management function; 4) create a county water quality monitoring and reporting program; 5) focus county efforts on reducing high nutrients from wastewater and stormwater; 6) initiate complementary county water resource management programs; 7) pursue county actions relating to climate change; 8) create a county education and awareness program; 9) engage with strategic partners and allies; and 10) manage county government organizational changes with assistance from experts.

Conclusions are presented, based on the 4 underlying principles, 5 essential elements and 10 suggested solutions. The most critical actions are: 1) acknowledging we have a water quality crisis and commit to action now; 2) create a county waterway and water quality management program; and 3) seek assistance from organizational development experts.

This discussion paper is presented with a sense of urgency to encourage dialogue between community members to act now to begin solving the threats to our invaluable waterways.

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## Introduction to Discussion Paper

### Organization

This discussion paper is organized into the following 8 sections:

- **Introduction** – which introduces the organization, purpose, audience, authors, and acronyms used for this discussion paper.
- **Location and setting** – which briefly describes relevant county information including population, habitats, waters, parks and changing conditions.
- **Underlying Principles** – which defines the 4 premises this discussion paper is based on.
- **Essential Water Resource Management Elements** – which describes 5 elements of effective water resource management.
- **Suggested Actions** – which presents 10 actions for consideration that address local water resource management issues.
- **Conclusions** – which summarize the main discussion points into 3 “take home messages”.
- **References** – which include all sources included in this discussion paper.
- **Appendices** – with Florida Water Quality Standards (Appendix A) and a chronology of the county’s past water quality related events (Appendix B).

### Purpose

The purpose of this discussion paper is to provide time-sensitive ideas for enhancing Charlotte County’s management of our exceptional estuaries, waterways and water quality – which must be implemented as soon as possible to avoid irreparable damage to the waterways that our economy and way of life depends on. Improving the county’s water management functions is increasingly critical because our estuaries are already impaired and rapidly reaching an irreversible tipping point. Currently, the county does not have a suitable organizational structure or programs in place to most efficiently manage our estuaries’ health within the urgent timeframe. Significant changes must be implemented to augment existing county capabilities if we are to maintain and improve our water quality and water-dependent economy. Suggested actions are presented in the fifth section of this discussion paper.

### Audience

The audiences for this discussion paper include Charlotte County citizens, elected officials and staff. Informing local community members about our existing water quality problems and potential solutions is intended to initiate discussions which lead to the actions needed to address our water quality crisis as soon as possible.

### Authors

The authors include 3 Charlotte County community leaders and scientists interested in sustaining the health of the county’s waters, economy and lifestyle for future generations. Please note that the authors have no financial interests in the solutions presented in this discussion paper. And, the views expressed here are the authors’ own and do not represent the opinions or positions of organizations they work for or support.

- **Dr. William (Coty) Keller, PhD**, is retired from careers as a Naval Officer (including tours as ships' captain) and college professor teaching decision sciences including organizational behavior. Coty is in his third career (non-paying) working to conserve and restore the natural relationships among living things and the environment. Water quality has been a concern for about a decade (since he became a Port Charlotte resident), and especially during the last two years through his work on the county's Beaches and Shores Advisory Committee.
- **Mr. David Blewett, B.S.**, is a Charlotte County resident and fisheries ecologist with the FWC for over twenty-five years. He specializes in sport fishery populations and habitat. Dave believes that Charlotte Harbor is a unique and special estuary system and it is rooted deeply in our culture, which accounts for the great amount of interest in the fish and wildlife in our area.
- **Capt. Judy Ott, M.S.**, is an estuary scientist and educator who has been involved with managing the Charlotte Harbor estuaries since 1990 with the FDEP Charlotte Harbor Aquatic Preserves, Charlotte Harbor National Estuary Program, and Estuary Escapes LLC. Her experience includes water and seagrass monitoring, watershed management and education.

#### Acronyms

- **CHAPs:** FDEP Charlotte Harbor Aquatic Preserves
- **CHEC:** Charlotte Harbor Environmental Center
- **CHNEP:** Coastal and Heartlands National Estuary Partnership since 2019; Charlotte Harbor National Estuary Program from 1995 to 2019
- **FDEP:** Florida Department of Environmental Protection
- **FWC:** Florida Fish and Wildlife Conservation Commission
- **NOAA:** National Oceanic and Atmospheric Administration
- **SWFWMD:** Southwest Florida Water Management District
- **TNC:** The Nature Conservancy
- **UF/IFAS:** University of Florida Institute for Food and Agricultural Science
- **USEPA:** United States Environmental Protection Agency

### Location and Setting

Charlotte County is a special place. It is nestled between the Gulf of Mexico and the urban areas of Sarasota and Lee Counties and the rural areas of Desoto and Glades Counties. Charlotte County is 21% water and 79% land (US Gazetteer, 2010). The heart of the county is Charlotte Harbor. Our local estuaries have been collectively recognized as an “estuary of national significance” at both the state and national levels (CHNEP, 2000; FDEP, 1983). The great diversity of wet and dry natural habitats which thrive throughout the county attracts tourists, residents and retirees. Punta Gorda has been recognized many times as one of America’s best small cities to live, sail and retire in many times by Money, Forbes and other magazines (Charlotte County, 2007; Fuller, 2018; Fried, et al., 1996).

Charlotte County supports a water-based, small town life style with a strong sense of community. The population in 2018 was 184,998, with 93% living near the water and 90% living in unincorporated communities (US Census Bureau, 2019). The largest community is Port Charlotte (54,392 people) and one of the smallest is Solana (792 people) (US Census Bureau, 2019). The oldest is Punta Gorda, established in 1884 and the youngest is Babcock Ranch, established in 2018. About half the population is working age (48% are 19 – 64 years old), slightly less are retirement age (40% are older than 65), and 12% are school age (under 18 years old) (US Census Bureau, 2019).

The top employment sectors in the county are: retail and business (30%); construction and maintenance (16%); leisure and hospitality (15%); and health care (14%) (TownCharts.com, 2019). Estuary and ocean dependent tourism and fishing account for over 5,550 jobs in Charlotte County, with earnings of over \$101 million dollars, contributing over \$196 million to local economy (NOEP, 2016).

<b>Estimated Ocean Related Jobs, Wages &amp; GDP in Charlotte County FL for 2016*</b>			
	<b>Jobs</b>	<b>Wages GDP</b>	<b>GDP</b>
<b>Tourism and Living Resources</b> (tours, boating, marinas, hotels, restaurants, retail, fishing, aquaculture, seafood)	<b>5,551</b>	<b>\$101,469,000</b>	<b>\$196,249,000</b>
<b>*Source: National Ocean Economics Program (NOEP, 2016)</b>			

Both residents and tourists are attracted to, and depend on the natural habitats found throughout Charlotte County. These diverse natural communities include (Charlotte County, 2016):

- **Uplands:** pine flatwoods, palmetto and dry prairies, sand pine and xeric oak scrub, live oak and mesic hammocks, and others;
- **Wetlands:** freshwater marshes, wet prairies, sloughs, hardwood and cypress swamps, river riparian wetlands, saltmarshes, mangroves, and others; and
- **Submerged habitats:** seagrass meadows, oyster beds and tidal flats.

These upland and wetland communities are spread throughout the county’s watersheds – “lands that shed rainwater to downstream creeks, rivers, lakes and estuaries”. The 5 major watersheds within Charlotte County include: Lemon Bay, Myakka River, Peace River, Charlotte Harbor and Caloosahatchee River. The watersheds drain rainwater through a series of waterways from freshwater, through brackish water, to the salty Gulf of Mexico. Brackish waters are a tidal mixture of freshwater and salt water called estuaries – “where rivers meet the sea”. Salinity in estuaries changes daily, seasonally and annually with tide and weather conditions, which makes them some of the most productive habitats on earth (Pendleton, 2011). Estuaries include open waterbodies as well as tidal creeks and tidal rivers. Examples of Charlotte County’s diverse waterways include:

- **Freshwater creeks:** Shell, Prairie, and Trout;
- **Freshwater rivers:** Myakka and Peace;

- **Tidal creek estuaries:** Gottfried, Ainger, Oyster, Lemon, Buck, Coral, Catfish, Whidden, Alligator, Winegourd, Bear Branch, Trout and Telegraph;
- **Tidal river estuaries:** Myakka and Peace;
- **Constructed canals:** Rotonda, South Gulf Cove, Manchester Waterway, Port Charlotte, Harbor Heights, Punta Gorda Isles, and Zemel Canal;
- **Open water estuaries:** Lemon Bay, Gasparilla Sound, Cape Haze and Charlotte Harbor; and
- **Gulf passes:** Stump Pass and Gasparilla Pass.

The diverse land and water habitats in the county support remarkable fauna, including:

- **Fish:** Over 255 species of freshwater, marine, game and non-game fish, of which over 80% depend on healthy estuaries during some part of their life stage (FCES, 2000; Poulakis et al., 2004);
- **Birds:** Over 320 resident and migrating bird species depend on the local estuaries and watersheds (FCES, 2000; FWC, 2014; Peace River Audubon Society, 2019); and
- **Wildlife:** Over 45 species of mammals, 55 species of reptiles and 590 species of invertebrates inhabit the Charlotte County natural habitats (FCES, 2000; FWC, 2014); and
- **Rare Species:** Over 20 rare and imperiled species rely on the estuarine, wetland and upland habitats in Charlotte County, including the endangered or threatened Eastern Indigo Snake, Gopher Tortoise, Florida Scrub Jay, Florida Manatee, Florida Panther and Sea Turtles (FCES, 2000; FWC, 2014; FWC 2017).

Charlotte County's fish, wildlife and natural habitats provide a very large part of the local economy. There are over 85 natural areas enjoyed daily by residents and tourists, including:

- **County and state beaches (3):** Port Charlotte, Chadwick-Englewood, and Stump Pass;
- **County preserves and parks (74):** Amberjack, Bill Coy, Charlotte Flatwoods, Oyster Creek, Peace River, Prairie Creek, Shell Creek, Thornton Key, Tippecanoe, Tippecanoe II, plus 64 parks (Charlotte County, 2019);
- **Non-profit preserves (4):** CHEC's Alligator Creek and Cedar Point, Lemon Bay Conservancy's Wildflower, and Audubon's Pennington Nature Park;
- **State and Federal parks and wildlife management areas (5):** Charlotte Harbor Preserves, Stump Pass and Don Pedro State Parks, Babcock/Webb Wildlife Management, and Island Bay National Wildlife Refuge; and
- **State aquatic preserves (3):** Cape Haze, Gasparilla Sound/Charlotte Harbor, and Lemon Bay.

However, many changes are coming to Charlotte County which are already influencing our quality of water and life-style, including:

- **Increasing population** – up 30% since 2000, with another 15% expected by 2030 (Charlotte County, 2011; US Census Bureau, 2019);
- **Increasing lot “build out”** – steadily increasing from the current 40% residential lot built out, especially in urbanized coastal communities (Charlotte County, 2011);

- **Increasing infrastructure needs** – including additional demand for water supply, wastewater treatment and stormwater management as the population grows (Charlotte County, 2011);
- **Increasing impervious areas and decreasing natural areas** – as natural habitats are converted to residential and commercial uses, the greater impervious area contributes to flashier stormwater runoff (Charlotte County, 2011);
- **Increasing storm intensity** – local rainfall and hurricanes are predicted to be more flashy and intense in the future (Emanuel, 2017; National Center for Environmental Information, 2019);
- **Increasing stormwater runoff** – greater impervious areas and storm intensity cause higher volumes and velocities of runoff to deliver higher sediment and nutrient loads to surface waters; runoff from urban areas with 40% imperviousness is 3 times higher than that from forests (USEPA 2019; USGS, 2019);
- **Increasing flooding** – especially in coastal urban areas, more flooding will occur associated with increasing runoff, storms and sea level rise – which has been rising locally at least 1” a decade for the last 70 years (Climate Central, 2016; NOAA, 2019);
- **Decreasing water quality** – water clarity, essential for healthy seagrass, has been declining throughout the Charlotte County estuaries (CHNEP, 2016 and 2017) and the estuaries are not meeting state standards for nutrients, chlorophyll and dissolved oxygen (CHNEP, 2018); and
- **Potentially increasing algae** – while algae trends for Charlotte County waters aren’t readily available, unusually dense, widespread mats of filamentous algae were observed during FWC fisheries monitoring and FDEP seagrass monitoring in northern Charlotte Harbor in 2012, 2015 and 2019 (Keller et al., 2019); increasing nutrients can trigger estuarine macro-algae and freshwater cyanobacteria (“blue-green algae”) and exacerbate marine red tide blooms (UF/IFAS, 2019).

We are fortunate to have the pristine natural beauty of the Charlotte Harbor Preserve State Park surrounding our local estuaries. However, this can lull us into a perception that our estuaries are not threatened by encroaching urbanization and increasing nutrients, algae, temperatures and water levels. To maintain our water-based life styles and restore the county’s natural habitats for the next generations to enjoy, we must work together – now – as a community – to find solutions to these growing problems before the damage becomes irreversible. This discussion paper is intended to stimulate a productive dialogue between citizens, community leaders and elected officials throughout the county to plan and implement pro-active improvements to our wastewater treatment, stormwater management and water quality monitoring as soon as possible.

The county has already taken the first step towards opening discussions about the value of healthy estuaries, waterways and water quality during its 2019 – 2021 Budget Workshop, which was held June 18, 2019. At the Budget Workshop, water quality was recognized as 1 of 3 primary budget goals for the county, along with affordable housing and secondary education. Integrating water resource management activities throughout the county was recognized as an



efficient approach towards maintaining and enhancing the county's estuaries, waterways and water quality. The county's One Water Approach discussed at the Budget Workshop includes the following 8 values of healthy estuaries, waterways and water quality (Charlotte County, 2019):

- Contribute to a **livable community**;
- Protect **human health**;
- Provide **flood protection**;
- Minimize **environmental pollution**;
- Use and reuse **natural resources** efficiently;
- Provide resiliency to changes in **climate and economy**;
- Provide reliable, secure, clean **water supply**; and
- Recognize, preserve, and enhance this **important economic driver**.

This discussion paper builds on the county's previous successes and available information to support the need for pursuing an integrated water resource management approach as soon as possible. Additional information about county resources can be found in these management plans:

- **Charlotte 2050 Comprehensive Plan** (Charlotte County, 2011);
- **Charlotte County Florida Scrub Jay Habitat Conservation Plan** (Quest Ecology, 2013);
- **Charlotte County Manatee Protection Plan** (FWC, 2017);
- **CHNEP Comprehensive Conservation and Management Plans** (CHNEP, 2000, 2008, 2013 and 2019);
- **CHNEP Water Atlas** (USF, 2019);
- **FDEP Charlotte Harbor Aquatic Preserves Management Plans** (FDEP, 1983 and 2017);
- **FDEP Lemon Bay Aquatic Preserves Management Plan** (FDEP, 1992);
- **FDEP Charlotte Harbor Preserve State Park Unit Management Plan** (FDEP, 2007);
- **SWFWMD Charlotte Harbor Surface Water Improvement and Management (SWIM) Plan** (SWFWMD, 1993 and 2000);
- **SWFWMD Lower Charlotte Harbor Surface Water Improvement and Management (SWIM) Plan** (SWFWMD 2008).

## Underlying Principles

Four principles supporting the need for enhancing our water quality and water resource management in Charlotte County are discussed in more detail in this section.

### 1. Our local estuaries are an economic and lifestyle necessity.

Residents, tourists and economists often focus on beaches. But, without healthy estuaries, beaches – and all their associated livelihoods – are threatened. Estuaries are where freshwater and saltwater mix, forming brackish water. Like all estuaries, Charlotte Harbor, Gasparilla Sound, Cape Haze, Tidal Myakka, Tidal Peace and Lemon Bay provide valuable nursery habitat for commercial and recreational fishes. They also provide the economic and lifestyle basis for most Charlotte County communities. We rely on our estuaries for recreational fishing, seafood,

boating, birding, and the aesthetics of daily life here (UF/IFAS, 2016). Information from UF/IFAS Sea Grant shows boating and fishing licenses and services alone brought in almost \$16 million to the county economy in 2010 (Staugler et al., 2011). In 2016, tourism supported over 5,500 jobs in the county, with wages over \$100 million dollars, contributing more than \$195 million to the local GDP. These sources of revenue for the county would be drastically reduced if the health of our estuaries and waterways declines.

<b>Economic Value of Charlotte County Boating and Fishing Licenses (2010)*</b>		
	<b>Licenses</b>	<b>Est. Total Benefit</b>
<b>Recreational Fishing</b>	<b>22,485</b>	<b>\$8,000,000</b>
<b>Marine Related Businesses</b>	<b>4,700</b>	<b>\$4,900,000</b>
<b>Boating</b>	<b>21,000</b>	<b>\$1,900,000</b>
<b>Commercial Fishing</b>	<b>154</b>	<b>\$1,100,000</b>
<b>TOTAL</b>	<b>48,339</b>	<b>\$15,900,000</b>

**\*Source: UF UFS Sea Grant (Staugler, 2011)**

While these numbers are very large, they do not capture the full value of our waterways to our livelihoods and lifestyles. Property values are based, in large part, on proximity to pristine waters and natural areas. Many residents’ primary investments are their real estate. If water quality declines, so will property values. The potential loss of millions of dollars in property values and quality of life emphasizes the necessity for protecting and restoring our estuaries, waterways and water quality, even at what might first appear to be considerable costs. In addition, it is significantly less expensive to maintain healthy watersheds which protect water quality than to pay for expensive restoration of water quality and habitats after they have already been degraded (USEPA, 2012).

**2. We have a local water quality crisis in the making.**

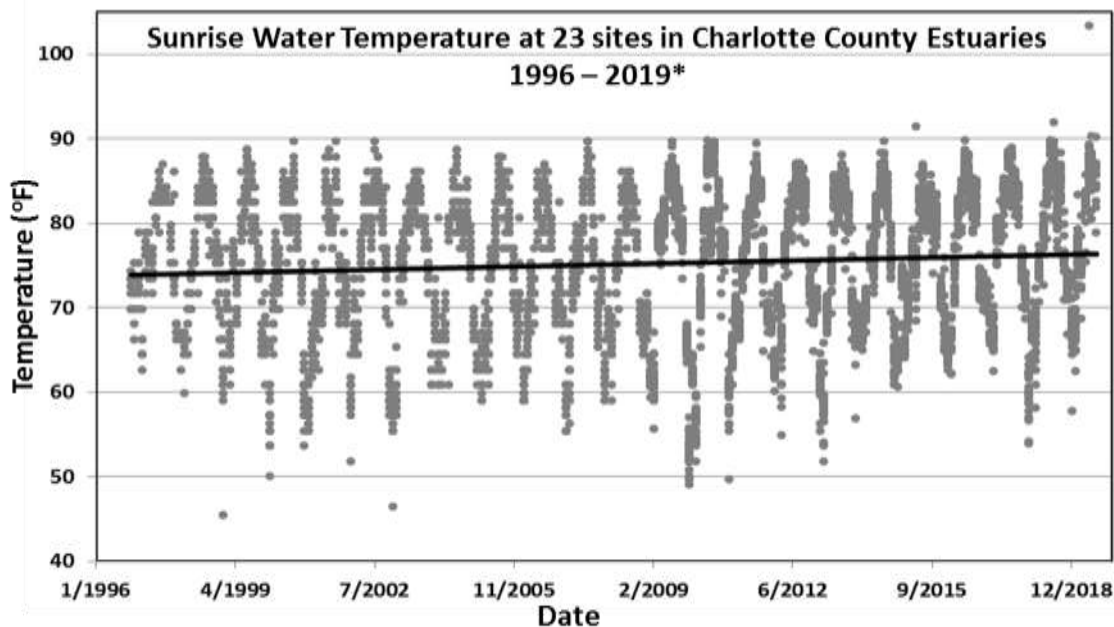
Recent water quality reports raised awareness that the health of our estuaries is at a tipping point. In 2018, The Conservancy of Southwest Florida issued its 2017 Estuary Report Card and Charlotte Harbor only received with a C+ grade. The Estuary Report Card cited that 54% of the Charlotte Harbor watershed (including estuarine and fresh waters) is impaired for at least one parameter, with the most pervasive problems being dissolved oxygen, nutrients and metals (Conservancy of SW Florida, 2018). Also last year, the CHNEP released water quality status reports for its estuaries. The status reports showed many areas of impairments for nutrients, chlorophyll, dissolved oxygen and fecal coliform bacteria in the tidal Myakka River, Tippecanoe Bay, greater Charlotte Harbor and Lemon Bay (CHNEP, 2018).

In November 2018, FDEP released the State’s Impaired Waters Rule Draft Assessment (of water quality), including data for recently established estuary criteria and the Charlotte Harbor region. The Tidal Myakka and Tidal Peace River estuaries were listed as having several impairments for nutrients and chlorophyll. Continued impairments may cause our local waters to become part of the State’s Total Minimal Daily (TMDL) Load program. The TMDL program requires local governments to work with the State to initiate short and long-term, often costly, actions to

restore water quality within a specified time period. If we don't work together now to locally start improving our water quality, there is a strong potential that the county will be required to cede control of its water quality management to the state (FDEP, 2018).

The high nutrient and chlorophyll values throughout our local waters are also reflected in decreasing water clarity trends, as shown in the CHNEP Water Clarity Report Card (CHNEP, 2016). Water clarity is essential for seagrass growth, the basis of our estuarine biological communities, especially fishery populations. Seagrass acreage and associated water clarity targets have been established for our estuaries and data indicates declining conditions throughout our estuaries. Water clarity is reduced by excess nutrients, chlorophyll and turbidity (CHNEP, 2016).

Rising water temperatures also contribute to increasing phytoplankton growth (UF/IFAS, 2016; Pittman, 2018). Sunrise water temperature is measured each month at 23 locations throughout coastal Charlotte County since 1996 through the FDEP Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (FDEP, 2008). Increasing water temperature trends can be shown by this 20 year data set because the sampling occurs at the same times and locations each month (FDEP, 2019). Temperatures have increased, on average, about 3 degrees in our estuaries over the past two decades.



\*Source: FDEP Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

A unique insight into the gravity of potential nutrient pollution impacts comes from analysis of fishery resiliency to environmental disturbances. Analysis over the past decades shows that fishery populations are able to recover, in time, from red tide, cold spells and hurricanes. But, they are not able to survive chronic, severe water quality stresses, such as the algae blooms fueled by excess nutrients as recently observed in the Indian River Lagoon estuary (Blewett, et al. 2018)

The documented nutrient impairments in our local estuaries are corroborated by increasing sightings of filamentous algae blooms by local FWC fisheries and FDEP seagrass researchers during regular monitoring events. Widespread algae blooms were recorded in northern Charlotte Harbor during 2012, 2015 and 2019, even though few were observed prior to those years (Keller et al., 2019). Quantitative and qualitative observations of our local estuaries indicates that we may be following the same water quality decline patterns experienced in Indian River Lagoon (Keller et al., 2019). It is important to note that once an estuary is severely degraded, such as the Indian River Lagoon, the damage cannot be reversed in a timely or affordable way – if ever (Keller et. al, 2019). Because of the recent local nutrient impairments and algae blooms, as well as potential economic and fisheries impacts, the declining conditions in our estuaries need our urgent attention and immediate action.

### **3. We know the basic causes and solutions to our local water quality problems.**

While our water quality concerns are local, the natural processes that cause them are universal and well understood and described by scientists, educators, and resource managers. The processes our local estuaries are going through are understandably explained through the Florida Master Naturalist Program (UF/IFAS, 2016). From Port Charlotte to Florida’s east coast, the Mississippi delta and beyond, human activities which are poorly managed create recurring patterns in declining water quality and estuarine ecosystems.

When runoff water that is high in dissolved nutrients from wastewater, stormwater and agriculture reaches our waterways, it contributes to algae blooms and low dissolved oxygen. When algae blooms occur, their shade limits how deep sunlight can reach through the water to support seagrass growth. The seagrasses retreat to shallower waters, loose abundance or die-off and overall acreage of seagrass declines. As the seagrass acres decline, habitat for the diverse fauna communities is lost accordingly, as is the seagrass seed source needed to replenish itself. In addition, as the algae blooms die and decompose, they use up the dissolved oxygen needed to sustain fish, crustacean, shellfish, invertebrate and other populations. The cycle continues as the nutrients in the decomposing algae are released back into the water, fueling the next bloom.

Harmful algae blooms occur more frequently during warmer months, partly because algae growth rates and metabolisms are temperature dependent (UF/IFAS, 2016). In southwest Florida, the warmer months are also the wetter months, when extra nutrients are carried into surface waters via rainwater. The combination of rising temperatures, rainfall and water, associated with climate change increases the probability that algae blooms will become more frequent and widespread unless we change the way we manage our water and greatly reduce our nutrient contributions (Pittman, 2018).

In extreme, though not rare cases, high nutrients and water temperatures lead to waterbody areas devoid of oxygen, plants and animals – known as “dead zones” (UF/IFAS, 2016). Locally, Sunshine Lake in Port Charlotte has experienced a dead zone, as has the Indian River Lagoon estuary and the Gulf of Mexico. The Indian River Lagoon, on Florida’s east coast, was one of the

most biodiverse estuaries in the Northern Hemisphere. The estuarine system supported more than 4,300 species of plants and animals, five state parks, four federal wildlife refuges and a national seashore. The recent crash of the seagrasses and estuarine ecosystem in the Indian River is considered a major ecological crisis. While restoration solutions are possible, they are costly and slow (Audubon, 2013). The crisis in Indian River Lagoon is a vivid reminder that our local estuaries, while threatened, are still relatively intact. To avoid a similar catastrophe in the Charlotte Harbor estuaries we must work together now to significantly reduce nutrients reaching our waterways – to compensate for the effects of increasing temperatures, storms and sea level – a challenge, but not impossible.

#### **4. We have insufficient local capabilities to manage the health of our waterways.**

To ensure the sustainability of our communities and economy, the county must provide a strong leadership role in adequately protecting and restoring our waterways and water quality. While the county currently has staff and departments dedicated to specific water quality tasks, its present structure is not organized or equipped to focus on the overall health of our estuaries and waterways. The existing county organizational structure separates water quality responsibilities into two departments: Utilities, concerned with wastewater, and Public Works, concerned with stormwater. This county structure makes a comprehensive water resource vision difficult to create and achieve.

The county has been contending with surface water quality issues for several decades, as partially documented in Appendix B: Chronology of Water Quality Related Events in Charlotte County. The documented water quality concerns, reports, and events are the foundation for this discussion paper. Four specific events are described in more detail below, to show the need for a strong leadership role in managing our invaluable estuaries, waterways and water quality.

#### **2015 Inter-Agency Water Quality Meeting Shows Need for Intra-Department Coordination:**

Charlotte County staff attended a meeting hosted by CHNEP in August 2015 to explore establishing a water quality monitoring program in the Port Charlotte canals. At that time, CHNEP Director Lisa Beever offered to partner with the county to develop a volunteer water monitoring program because: *“Port Charlotte is the largest urbanized areas in the coastal CHNEP area that isn’t included in a routine water quality monitoring program. Having additional information about the ambient condition of the water quality in the Port Charlotte canals will help us collectively implement cost effective and efficient resource management activities through our partnerships”.*

The meeting topics included the need, examples, design and steps for creating a volunteer water monitoring program in the Port Charlotte canals. However, the monitoring program has not been established to date, partly because:

- The county lacks a department with the responsibility and/or authority to coordinate the inter-departmental water quality efforts needed to sustain healthy water resources throughout the county over the long-term. Because the county water quality responsibilities are separated between the Utilities and Public Works Departments, conducting comprehensive water quality programs is challenging.

- The lack of a coordinated county water quality program limits the understanding, management and monitoring of our estuaries and waterways. This limitation continues, and despite recognizing the need to integrate sewage treatment, stormwater management and water quality monitoring, our water quality crisis is intensifying.
- The current county organizational structure limits coordination of water quality monitoring and restoration efforts, despite staff willingness to do so. Because of department structure and staff workloads, the Utilities and Public Works Departments continue to focus on their independent mandates, leaving the overall water quality and health of our estuaries and waterways unattended to.

**2016 Charlotte County Funds Water Quality Study by FL Atlantic University:** Charlotte County contracted with Dr. Brian Lapointe from Florida Atlantic University to analyze historical water quality data for the Port Charlotte area. The study looked at nutrient and bacteria data for surface water, ground water, and stormwater data. It also included water sampling for nutrients and tracers of human waste pollution to help distinguish nutrient sources from septic tanks vs. other sources, such as fertilizers. The report included data summaries and recommendations for developing a cost-effective, comprehensive monitoring program to measure nutrient loading changes during the septic-to-sewer conversion processes. The findings were presented to the Board of County Commissioners in December 2016. Important conclusions of the FAU report (Lapointe, et al. 2016) include:

- Water quality problems are primarily associated with wastewater and stormwater runoff throughout the county.
- The long-term health of the county’s economically essential estuaries depends on managing wastewater and stormwater to meet state water quality standards for nitrogen, phosphorus and chlorophyll – the state’s Numeric Nutrient Criteria (NNC).
- A comprehensive water quality monitoring and reporting program is essential for effectively managing and improving water quality throughout the county.
- The comprehensive water quality monitoring and reporting program should be initiated as soon as possible.

**2019 Water Quality Summit and Budget Workshop:** Two recent workshops demonstrate how the lack of an integrated water resource management vision and structure weaken the effectiveness of existing county programs. During the **January 2019 Charlotte County Water Quality Summit**, the existing impairments of our estuaries and need for comprehensive water quality monitoring and reporting were not addressed (Charlotte County, 2019). And, during the **June 2019 County Commissioners Budget Workshop** the three top county budget priorities presented were: water quality, affordable housing and education (Charlotte County, 2019; Calvert, 2019). Several important topics were discussed at these workshops, but several critical items were missing (Charlotte County, 2019):

- The value and impaired status of our exceptional estuaries was not discussed;
- The causes of our water quality problems – wastewater and stormwater – were not emphasized nor was planning for future treatment and management systems;

- The water quality data, problems and solutions identified by experts and provided to the county for many years was not provided;
- The cost-effectiveness of prevention vs. restoration, especially over a larger geographic and time scale, was not considered; and
- The need to create an integrated county approach for ensuring the overall health of our estuaries, waterways and water quality was not included in the budget discussions.

Additional information about past county water quality related events is included in the chronology in Appendix B.

Note: To date, the county has not acknowledged the extent of our water quality problems or the need for an integrated approach to restore and preserve our estuaries, waterways and water quality. And, a comprehensive county water quality monitoring program has not been established, nor have state water quality standards been used locally to evaluate water quality conditions and/or guide wastewater treatment and stormwater management activities.

### Essential Estuary, Waterway and Water Quality Management Elements

There are five essential elements for effectively managing the county’s estuaries, waterways and water quality, which are shown in the following figure and summarized in the paragraphs below.



#### 1. Water Quality Monitoring and Reporting

The central element upon which all other effective water resource actions depend is a comprehensive, well designed and supported water quality monitoring and reporting program (Lapointe et al., 2016). Acquiring and understanding accurate, representative water quality data

in a timely manner allows both healthy and disturbed locations and parameters to be identified. This enables limited funding and efforts to be efficiently focused into the most critical and cost-effective solutions. The resulting water quality data can be compared to water quality goals – which are, most credibly, the state water quality standards – and used to measure the success of management and restoration activities. In addition, trends in the data can help drive pro-active planning for future water management needs and budgeting. The county doesn't currently have a unified program for coordinating water quality monitoring and reporting.

## **2. Wastewater Treatment**

The second element of effective county water resource management is adequate wastewater treatment for current and future populations. The county's current population is about 185,000 and it is expected to increase by 35% in the next 25 years (Rayer et al., 2017). Most of the population (93%) lives near the water (US Census Bureau, 2019), where sea level has been rising about 1" per decade for the last 70 years and is expected to continue at least at that rate the future (NOAA, 2019). These factors contribute to wastewater being one of the main sources of nutrients delivered to the county's estuaries and waterways. The county Utilities Department is currently addressing some existing wastewater sources through its septic-to-sewer projects, including some monitoring of project success. The Utilities Department also has plans for meeting future projected wastewater treatment needs. However, existing wastewater projects and plans would be strengthened by creating a comprehensive county water monitoring, reporting and management program to exchange expertise, identify common goals and implement the most-cost effective solutions to existing and future water quality problems. As a specific example, additional monitoring of reuse water at the source where it is applied and in the adjacent receiving water would provide the county with specific data about appropriate locations to utilize this valuable resource without causing additional harm to estuaries, waterways and water quality.

## **3. Stormwater Management**

The next key water resource management element, and major source of nutrients, is stormwater runoff from impervious surfaces associated with urban development. The county platted lots are currently 40% built out, with most of the development occurring near or adjacent to waterways (Charlotte County, 2011). As imperviousness increases, the volume and velocity of runoff water increases, allowing it to carry more sediment and nutrients to receiving waters. In addition, rainfall patterns are becoming more intense and coasts are being inundated more frequently as our climate continues to change. The county Public Works Department is planning for stormwater management needs for both short and long-term future development. However, existing and future stormwater management could be addressed more efficiently with the help of an integrated county water resource management approach. This would allow the county to development and implement innovative approaches for managing changing stormwater conditions, which could be more effective at preventing flooding and pollutant delivery to waterways. Specifically, evaluating the effectiveness of current stormwater retention designs under increasing rainfall "flashiness" could lead to designs that significantly reduce pollutant loads for the long-term, for little additional cost.



#### **4. Supplemental Resource Management Programs**

Comprehensive water resource management also includes implementing a great diversity of supplemental projects to maintain and restore water and habitat – on land, in water, for plants, for animals. Projects can be large or small, complex or simple, cheap or expensive and implemented by citizens, nonprofit organizations, local or regional governments, consulting firms, or others – but must be widespread throughout the watershed. The two collective goals are to retain and infiltrate rainwater to slow runoff and capture pollutants, and to create native upland, wetland and submerged habitats to support diverse biological communities. While the list of potential projects is lengthy and site specific, examples include: adding native wetland plants to stormwater ponds, creating littoral shelves and shoreline buffers, moving structures out of floodplains, investing in conservation lands, installing oyster and seagrass restoration projects, seeding clams and scallops, restoring natural overland flows, mitigating climate change and many more. Identifying and accomplishing this necessary but effective suite of projects requires a community effort of citizens, staff and elected officials, which could be best coordinated under the umbrella of a comprehensive water resource management program. (Boswell et al., 2012; CHNEP, 2013; CHNEP, 2012; SWFWMD, 2010; UF/IFAS, 2015);

#### **5. Education and Awareness**

The final important element of comprehensive water resource management includes education and awareness. These are essential ingredients at all levels of our community from elected officials to public employees to citizens. Our water quality problems and solutions are complex and must have community-wide buy in to be accomplished. This community acceptance needs to be built on the foundation of widespread knowledge and understanding of the scope of the problems, their impacts, causes and solutions. Until the varieties of audiences in our community are educated, we will lack sufficient motivation and/or political will to make the investments and organizational changes needed to solve our water quality crisis. This element would also benefit from being part of a comprehensive local water resource management program. Expertise and contacts could help identify audiences (new residents, newly elected officials, boating, fishing and tourism guides, road and park managers and crews, staff...), communication tools (training, citizen science, community restoration events, literature...) and sources of materials (CHAPs, Charlotte County Sea Grant, CHEC, CHNEP, FWC).

While many water resource management solutions are technically straightforward, their social aspects are more challenging. A local comprehensive approach, as described above, could most efficiently be accomplish by creating an integrated county office of estuaries, waterways and water quality, with adequate staff, training, knowledge, funding, and authority to manage the various aspects of monitoring, reporting, treatment, management, and education. However, an organizational change of this magnitude would require adjustments to program goals, staff roles, budgets, paradigms, etc. Guiding such an institutional reorganization is complicated, but expertise is available on the best way to accomplish this with the least disruption. If the county chooses to move towards this comprehensive approach for the long-term sustainability of our estuaries, waterways and economy, investing in a consultant to manage the organizational change could be the most cost-effective path.

## Suggested Actions

Based on the importance of our waterways and scale of our water quality issues described previously, the following 10 actions are suggested as steps towards strengthening the county's management of our invaluable estuaries and waterways – as soon as possible. Initiating actions now will provide benefits over the long-term for our waterways, local economy, and residents, as well as our fish and wildlife. The sooner we act, the more cost effective the solutions will be.

### **1. Acknowledge publicly what we have water quality problems in the county.**

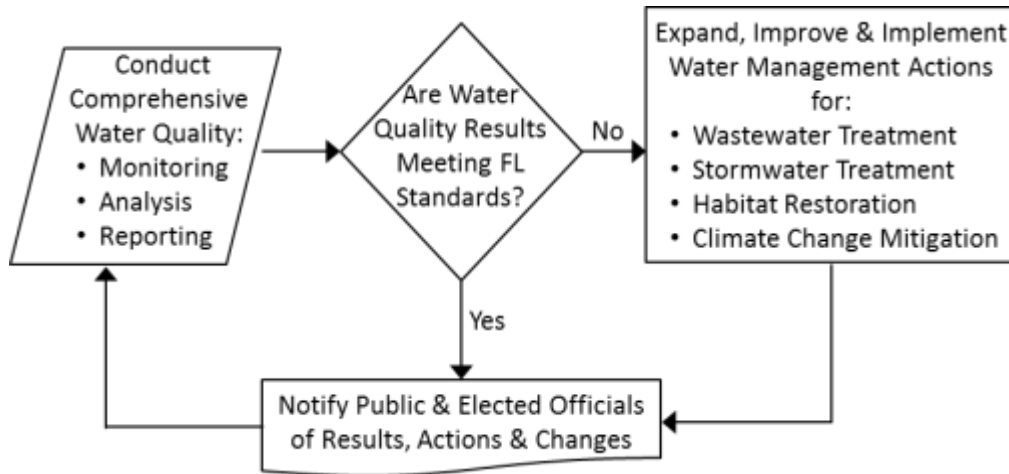
It is unacceptable that we have a water quality crisis in the making and local residents and elected officials are not informed. The county has an ethical responsibility to inform its citizens about the values of our local water resources and extent of our current water quality issues. A three-part public statement is necessary to inform the public of the problems and the county's planned solutions. The message should understandably describe our water quality impairments (citing the 2018 Conservancy of SW Florida, CHNEP and FDEP reports) and clearly explain the harmful impacts of these conditions on our economy and lifestyles - especially if not corrected very soon. The message should also inform citizens that the county has been aware of the water quality issues and needed corrective actions for many years, and been remiss by not taking the corrective actions recommend by experts. to guard and restore our invaluable estuaries. Finally, the message should commit the county to creating a comprehensive, effective program for managing our estuaries, waterways and water quality.

Garnering public support through understanding is the first step towards restoring our exceptional waterways for their long-term sustainability. Well-informed citizens and elected officials will be more likely to support, and participate in, water quality restoration projects. It is important to educate the community as soon as possible, before water quality problems reach an irreversible tipping point. Additional details for creating an effective surface water quality awareness and education campaign are included in Action 8 below. It is important for citizens and elected officials to understand that a comprehensive local approach for managing our local water resource issues is vital. While the costs of creating a comprehensive water quality management capability in the county might appear to be high at first, it is imperative that Charlotte county citizens and elected officials understand that these investments now will pay off over the long-term by increasing the protection and sustainability of our waterways, economy and property values.

### **2. Manage county waters to meet state water quality standards.**

Measurable water quality goals are indispensable for effective water resource management. Quantifiable goals are used in 3 ways: to identify conditions that sustain healthy waterways over the long-term, to define design criteria for water quality restoration projects, and to provide values to measure restoration project success against. Florida has existing water quality standards that serve as the minimum conditions our local estuaries and waterways are legally required to meet. To maintain and restore our estuaries and waterways, these state water quality standards should become central to our water resource management processes.

An example of how water quality standards should be incorporated into our water resource management decision processes and actions is shown in the flow diagram that follows:



This process would allow water management decisions and actions to be guided by water quality sampling data analysis, evaluation and interpretation. When and where data results show that water quality standards are not being met, it will be necessary to expand and/or improve wastewater treatment, stormwater management and other support programs to reduce pollutant loads into the specific receiving waters. The public and appropriate officials would be informed and restoration actions would be started. For times and locations where water sampling results show that water bodies are meeting state standards, the public and officials would be informed and no management actions would be taken, but regular sampling, analysis and interpretation would continue.

State water quality standards are set by FDEP, under guidance from USEPA, for estuaries and waterways throughout the state (FDEP, 2016). The water quality standards for each of our local estuaries are provided in Appendix A. Additional water quality standards for other Charlotte County waterbodies and parameters are available from FDEP (FDEP, 2016).

The most important parameters for evaluating waterway health include: dissolved oxygen (for fish and invertebrates), water clarity (for light for seagrasses), chlorophyll *a* (as a measure of algae), nutrients (nitrogen and phosphorus as potential sources of algae growth) and bacteria and metals (for human health). This discussion paper focuses on nutrients and chlorophyll, because they are the primary contributors to algae blooms, and potential “dead zones”, which are the largest water quality threats to our economy and lifestyles (Hale et al., 2009; Lipp et al., 2001). Nitrogen, Phosphorus and Chlorophyll *a* standards are expressed as:

- **Total phosphorus (TP)**, which is measured in milligrams per liter (mg/L). TP is utilized by aquatic plants for growth and is the nutrient which often limits plant growth in fresh waters (Smith, 1984). Excess phosphorus contributes to algae blooms, including harmful freshwater cyanobacteria. TP is often an indicator of pollution and potential sources include: wastewater, stormwater, agriculture runoff, reuse water, and re-suspended bottom sediments.

- **Total nitrogen (TN)**, which is measured in milligrams per liter (mg/L). TN is a combination of inorganic and organic forms of nitrogen; common inorganic forms of nitrogen needed for plants growth are ammonia, nitrate, and nitrite. TN is calculated as the sum of laboratory measurements for nitrate+nitrite (NO<sub>x</sub>) plus Total Kjeldahl Nitrogen (TKN) (organic N+NH<sub>3</sub>). Nitrogen is necessary for plant growth and is the nutrient which often limits plant growth in estuaries (Smith, 19840). Excess nitrogen contributes to phytoplankton and macro algae blooms. Some algae species can fix atmospheric nitrogen, including freshwater cyanobacteria, which is released into estuarine waters as the algae decomposes. High levels of nitrogen are an indicator of pollution and sources include: wastewater, stormwater, agriculture and fertilizer runoff, atmospheric deposition, and reuse water.
- **Chlorophyll *a* (Chl *a*)**, which is measured in micrograms per liter (µg/L). Chlorophyll *a* is a green pigment used by plants for photosynthesis. It serves as an indicator of primary productivity – photosynthetic activity of aquatic plants – and is a useful indicator of algae levels in water. Phytoplankton are an important base of the estuarine ecosystem because they contribute oxygen to the water. However, too much algae can shade light reaching seagrasses and cause oxygen levels to decline as they decompose. High chlorophyll is an indicator of nutrient enrichment and degraded water quality (FDEP, 2016).

Below are the specific TP, TN and Chl *a* standards for Charlotte County estuaries (FDEP, 2016).

<b>FL Water Quality Standards for Charlotte Harbor Estuaries for TP, TN &amp; Chl <i>a</i> (FDEP, 2016)*</b>				
	<b>Tidal Myakka (including Tippecanoe Bay)</b>	<b>Tidal Peace River</b>	<b>Charlotte Harbor Proper</b>	<b>Lower Lemon Bay</b>
<b>TP</b>	<b>0.31 mg/L</b>	<b>0.50 mg/L</b>	<b>0.19 mg/L</b>	<b>0.17 mg/L</b>
<b>TN</b>	<b>1.02 mg/L</b>	<b>1.08 mg/L</b>	<b>0.67 mg/L</b>	<b>0.62 mg/L</b>
<b>Chl <i>a</i></b>	<b>11.7 µg/L</b>	<b>12.6 µg/L</b>	<b>6.1 µg/L</b>	<b>6.1 µg/L</b>
<b>*Based on annual geometric mean. Not to be exceeded more than once in a 3 year period.</b>				

We suggest that the county use these state water quality standards as our local water quality goals, along with the iterative data driven decision process described above. Together, these 2 actions would create a science-based approach and decision-making process that leads us most effectively towards achieving our healthy, sustainable estuaries.

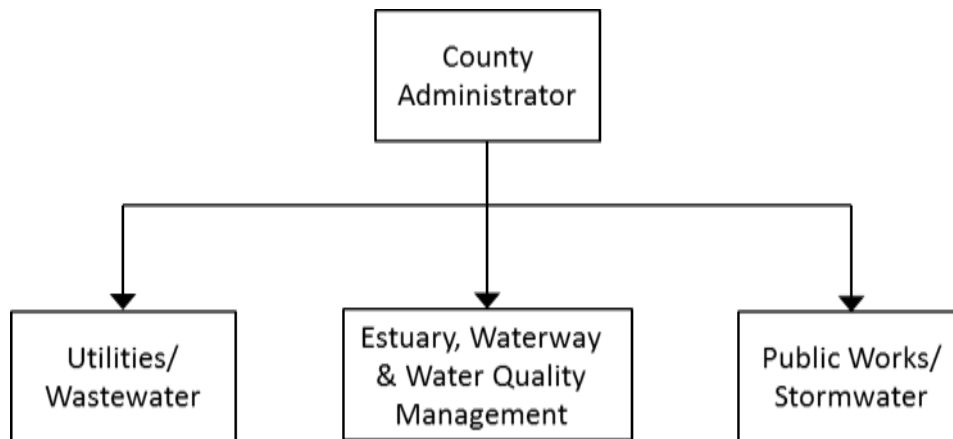
### 3. Create an overall county waterways and water quality management function.

Because of the documented values of, and threats, to our estuaries and waterways, a comprehensive local water resource management approach is imperative to ensure the restoration and sustainability of our invaluable resources. An integrated approach would build on existing water related programs housed in the county Utilities and Public Works Departments but would facilitate the exchange of expertise, information, and support needed to identify and solve critical issues more efficiently and effectively. Working together to develop a unified county water resource vision, water monitoring program, and outreach collaboration would allow wastewater treatment and stormwater management systems to be focused into

the most critical locations. It would also allow for long-term planning that avoids duplication of efforts and/or gaps in data and project implementation.

The existing county organizational structure does not lend itself to managing our estuaries, waterways and water quality holistically because there isn't a dedicated position responsible for overseeing our collective waterways and water quality. Because county Utilities and Public Works staff are already working at capacity, we need additional employees, specialized in appropriate disciplines, who are assigned to conducting comprehensive water resource management functions. This could include contracts, new county employees, and/or restructuring county departments.

Because of the nature of organizational behavior, departments within a government or corporate structure tend to act in a way that serves their own interests – focusing, understandably, on the missions and tasks assigned to their specific units (McShane et al., 2014; Vecchio, 2003). To be most effective at addressing the county's complex water quality issues and timelines, we suggest the most efficient approach may be to create a new county department or office whose primary focus is the health of our estuaries and waterways. A separate, independent county office could be created with the responsibility for guiding and coordinating all actions relating to estuaries, waterways and water quality. The relevant parts of a county organization chart might look similar to that shown in the diagram below – with a distinct office for water resource management.



The functions of this new office would be identified by its mission – to restore our estuaries and waterways to state water quality standards, and then preserve them for the long-term community and economic good. It is important that this new office be given the adequate authority, expertise, resources and support needed to achieve this mission. An integral part of a unified office of estuaries, waterways and water quality would be for the county to formally adopt a mission to safeguard our local estuaries and waterways, including Charlotte Harbor, Lemon Bay, Gasparilla Sound, Cape Haze, Myakka River and Peace River, and their tributaries.

Options for staffing the new water resource office and/or functions require additional evaluation. Some functions might be better suited to outside contracting, such as water quality monitoring and reporting, while other functions might be better served by hiring permanent employees – such as managing core department functions, interpreting and conveying results, and coordinating restoration efforts (Ketchen et al., 2009). A combination of in-house and out-sourced responsibilities would likely be needed for the new department to operate smoothly.

#### **4. Create a broad county water quality monitoring and reporting program.**

The first task of the county's new integrated estuaries, waterways and water quality management functioning (and/or office) should be to create a comprehensive water quality monitoring and reporting program. The monitoring program should be technically designed to measure conditions in our waterways and how they compare to state water quality standards. The monitoring program should also be designed to measure the success of county wastewater treatment, stormwater management and supporting projects. Suggested guidelines for some details of a well-designed water monitoring program include:

- **Purpose:** To collect, analyze, evaluate and report representative water quality data to decisions makers and the public so that it can be used to direct management actions towards the priority locations and problems needed to protect and restore waterways.
- **Components:**
  1. A well planned design which compliments and fills gaps in locations, frequency and parameters of existing water monitoring programs.
  2. Regular sampling throughout our estuaries and adjoining waterways.
  3. Laboratory analysis for specified parameters.
  4. Analysis, interpretation, evaluation and reporting of resulting water quality data to county water resource managers.
  5. Routine review of water quality reports by county water resource managers who have the authority, responsibility and expertise to direct restoration actions and projects in response to the monitoring data.
  6. Readily available and understandable reports which are provided to the water resource managers, public and elected officials.
- **Process:**

Refer to the previous 2 diagrams for Essential Water Quality Management Elements (page 14) and Process for Managing to Water Quality Standards (page 18). Together, these diagrams show how the results from the water quality monitoring and reporting program can be used through a coordinated, constant process to guide county resource management activities and direct projects and actions towards the most critical needs.
- **Staffing:**

Subcontracting can be a cost-effective way for conducting parts of a water monitoring program. Two options for outsourcing components of a water monitoring program are:

  1. One Time Consulting – to create and put in place a local monitoring and reporting system; including design and initial set up of the monitoring and reporting program.
  2. Long-Term Contract – to conduct routine sampling, laboratory analyses, and data computation, interpretation, evaluation and reporting; including production of

regular, readily available and understandable reports to county water resource managers, elected officials and the public.

Examples of two local companies with expertise and experience to accomplish these tasks are:

1. Janicki Environmental, Inc. – Mike Wessel, Vice President;  
Email: [wessel@janickienvironmental.com](mailto:wessel@janickienvironmental.com); phone: (727) 895-7722.
2. ESA – David Tomasko, Ph.D., Principle Associate;  
Email: [DTomasko@esassoc.com](mailto:DTomasko@esassoc.com); phone: (813) 207-7200.

#### **5. Focus county efforts on removing high nutrients from wastewater and stormwater.**

Efforts of an integrated water resource management program and office should focus on reducing our primary sources of pollutants, using the most expedient and efficient means possible. As previously discussed, the primary sources of excess nutrients to our estuaries and waterways are wastewater and stormwater from residential, commercial and agricultural uses (Hale et al., 2009). The impacts of these sources are worsened by trends in the flashier rainfall, warming temperatures and rising seas associated with climate change. Traditional and innovative methods for reducing wastewater and stormwater contaminants to waterways are readily understood and available. Adapting and mitigating climate change is a newer science and discussed in more detail in Action 7 below.

While many of our existing wastewater treatment and stormwater management projects were built with aging technologies that are out of date, we are fortunate that the county is only 40% built out, which leaves space and time for installation of newer, more effective alternatives. Implementing modern alternatives includes: retro-fitting existing infrastructure with upgraded technologies, installing innovative practices to curb untreated existing pollutant sources and directing future development into appropriate locations at sustainable densities. To continually reduce pollutant loads over their life span, new projects must be designed to accommodate the higher runoff volumes and velocities, coastal surface water tables, temperatures and reuse water volumes anticipated in the future. Forward-thinking design of future development, combined with upgrades to existing systems can help us meet water quality standards and goals. And, while these collective projects may appear to be expensive and inconvenient in the short term, they will pay off in the long-term by ensuring the health of our estuaries, waterways and water quality is restored and sustained. Additional wastewater treatment and stormwater management considerations are briefly outlined below.

**Wastewater treatment:** Existing and new wastewater treatment systems – including treatment facilities and septic systems – must be upgraded and designed to assure that they adequately keep nutrients from reaching our waterways. This includes:

- Replacing all septic systems that are failing and/or inappropriately located in low-lying areas adjacent to waterways – on an accelerated schedule.
- Requiring that all wastewater treatment facility discharges to our waterways meet water quality standards and goals.
- Using reclaimed wastewater only in the locations and amounts documented to be beneficial, not harmful.\*

- Designing, building and inspecting wastewater treatment facilities to minimize leaks and spills.
- Designing and locating wastewater treatment facilities to be resilient to storms and rising seas.

\*Reclaimed water from wastewater treatment plants is currently being used for irrigation in some residential areas of Charlotte County, and the use will increase in the future as our population and development grow. Originally, reusing treated wastewater was an important conservation concept because it was thought to provide beneficial water and nutrients to lawns and gardens. However, recent studies show that when reclaimed water, which is high in nutrients, is applied too close to canals, waterways and high water tables, the excess nutrients aren't adequately absorbed by vegetation and are delivered to adjacent waterways – especially during the rainy season. To be able to utilize reclaimed water near waterways without causing harm, we will need to upgrade our wastewater treatment facilities to advanced treatment processes which remove almost all nutrients. As we plan for future development and build-out, we need to include upgraded treatment of reclaimed water before it can be used on residences, golf courses, and other lands. (Sanibel Captiva Conservation Foundation, 2018).

**Stormwater management:** Throughout the county, rain either falls on vegetated lands and soaks into the soil, or on impervious surfaces, like roofs and parking lots, and runs off – carrying sediment and attached nutrients downhill. As an estimate, the yearly runoff from 1 acre of pavement is roughly equivalent to 36 acres of forest (Cotrone, 2015). Before our region was developed, most rainfall soaked into the ground, recharging groundwater, or was recycled into the atmosphere by vegetation. As the county develops, increasing impervious surfaces lead to higher volumes and velocities of rainfall traveling through our stormwater systems, carrying contaminants to our waterways.

Projects and plans that retrofit existing stormwater management systems and accommodate future urban development should be designed to hold and infiltrate runoff, including higher future volumes of rainfall and runoff. In addition to urban stormwater management, agricultural landowners should be required to capture, store and clean runoff from their fields, pasture, feed lots and buildings as well – to meet the same state water quality standards (Sanibel Captiva Conservation Foundation, 2018).

Because the county is developing rapidly, now is the time to plan and implement upgrades to our wastewater treatment and stormwater management. This will allow us to consider, fund and construct effective, innovative projects that support healthy estuaries, in a cost-effective, timely manner. The recommended comprehensive monitoring and reporting program can be used to measure the success of these projects at meeting water quality goals.

## **6. Initiate a variety of county complementary resource management programs.**

Complementary to wastewater treatment and stormwater management, adequate reduction of pollutants to our waterways will require creative technical, communication, problem solving, and funding skills to implement an assortment of smaller, but widely



distributed, projects throughout the county. Under direction of a new office of estuaries, waterways and water quality management, coordinating these more diverse and numerous projects should receive significant attention. Together these projects would contribute to reducing and treating runoff and restoring natural habitats. Specific types of projects that could be included in this action are unlimited, but several general categories of projects are briefly described below.

**Native landscaping:** Runoff from our own yards and neighborhoods, as well as businesses, roads and other landuses, can be nearly eliminated by installing native landscaping. Native trees, shrubs and grasses do not require fertilizers, pesticides or irrigation – three ingredients of contaminated runoff – and create habitat for birds, wildlife and humans. Native landscaping can be cost-effectively added to existing yards and incorporated into new development. It requires very little maintenance, adds significantly to property and aesthetic values, and dramatically moderates temperatures. Small and large projects can be created by individuals, community groups and local governments. They can be voluntary or required by local landuse codes for new development and roadway stormwater ponds. On a grand scale, we should be incorporating native landscaping and impervious surface concepts into urban design and future development plans. These concepts incorporate more space and time to capture and treat runoff, allowing clean rainwater to recharge groundwater and waterways.

Professional guidance for design, installing and promoting native landscapes is available from our local County Extension Sea Grant Office, through the Florida Friendly Landscaping Program (UF/IFAS, 2019). These IFAS/UF guidelines help create yards, neighborhoods, developments, businesses, and thoroughfares that capture rainfall from roofs and promote use of pervious walkways and drives, which together facilitate rainwater infiltration and create the diverse habitats intended by nature. There are several ways to promote large scale adaptation of native landscapes, including: educational and awareness campaigns, property tax exemptions, home owner association (HOA) rules, development codes, fertilizer ordinances, and others.

**Waterfront vegetation:** Native landscaping is especially beneficial when used along the shorelines of canals, estuaries, waterways and stormwater ponds. It buffers runoff from impervious roofs and driveways, filters fertilizers, and creates fish and bird habitats. Examples of shorefront designs include living shorelines (NOAA, 2017), littoral shelves in stormwater ponds (Hansen et al., 2013), raingardens and bioswales (WET PLAN, 2019), view window mangrove trimming configurations (Punta Gorda, 2016), and others.

**Fertilizer ordinances:** Many Florida counties and cities have adopted local ordinances to restrict the types, amounts and timing of fertilizer applications on residential and commercial lots (UF/IFAS, 2019). The purpose of the ordinances is to limit the amount of nitrogen and phosphorus carried from lawns with rain and irrigation water into waterways, especially during the rainy season. Charlotte, Lee and Sarasota Counties and Punta Gorda have adopted fertilizer ordinances. Studies have shown that the ordinances have varying degrees of success at reducing pollutant loadings to waterways, primarily because of lack of enforcement, training and awareness. Enforcing the ordinances, adding year-round effectiveness dates, improving training

and awareness, and requiring soil tests before applying fertilizers would significantly contribute to reducing nutrient loadings and encouraging native landscaping.

**Habitat preservation and restoration:** Preserving and restoring native habitats, including uplands, wetlands, mangroves and seagrasses, benefits clean water, native species and human aesthetics, as well as moderates climate change. The County, SWFWMD, state and local organizations have programs to support conservation land acquisition. Restoration projects are funded and supported by several governmental and non-profit organizations (Charlotte County Natural Resources, SWFWMD, FDEP, Lemon Bay Conservancy, etc.). Examples of successful local habitat restoration projects include Lemon Bay Conservancy's Wildflower Preserve tarpon habitat restoration (Lemon Bay, 2019), SWFWMD's Coral Creek hydrologic restoration (SWFWMD, 2017) and Charlotte County's Tippecanoe II Preserve Florida Scrub Jay habitat restoration (Charlotte County, 2019). While there are many existing parks and preserves throughout Charlotte County (see list on page 4), their value and necessity will increase rapidly as the county population grows.

**Shellfish restoration:** Shellfish are generally grouped into those with 1 shell, called gastropods, like snails and conchs, and those with 2 shells, called bi-valves. Economically and ecologically important bi-valves in our local estuaries include oysters, clams and scallops. These bi-valves help clarify water by filtering out sediment, nutrients and algae. And they provide food for fish, rays and humans. Each species has its own life cycle, lifespan and optimal ranges of temperature, salinity and turbidity. Shellfish will grow slower or die if water quality declines, temperatures rise or salinity ranges widen (Staugler, 2019) – which are often a result of altered flows from human activities. Shellfish restoration can be accomplished 2 primary ways: by distributing live juveniles or adults into the proper habitats, and by restoring habitat for naturally occurring recruits. Habitat restoration is often more cost-effective and successful over larger areas and time periods. Examples of local shellfish restoration and monitoring projects include TNC's oyster restoration in Punta Gorda (Geselbracht et al., 2017) and Charlotte County Sea Grant's annual Great Bay Scallop Searches in Lemon Bay and Gasparilla Sound. The first step towards successful shellfish restoration is ensuring a basic level of water quality through wastewater treatment, stormwater management and complementary projects.

## **7. Pursue county actions to adapt to and mitigate climate change.**

Warming water is the third cause of increased algae blooms, after wastewater and stormwater (Pittman, 2018). Global warming and climate change are caused by too many heat-trapping gases in the atmosphere. Climate change mitigation focuses on reducing heat-trapping emissions and removing carbon already in the atmosphere (UN IPCC, 2014). We can each contribute to mitigating our impacts in many different ways; some are surprisingly easy (Global Stewards, 2019; Hawkens, 2017; Holth, 2017; Project Drawdown, 2019; Wright, 2017). Climate change mitigation ideas most relevant to this discussion paper include:

- use Florida Friendly Landscaping – to reduce fertilizer and water use;
- preserve native habitats – to remove and store high carbon volumes and create habitat;
- restore mangroves – to remove 10 X carbon as other forests, and protect water and fish;
- use less fertilizer – to reduce emissions from manufacture and application.

These actions not only help mitigate and adapt to climate change, they also conserve, restore and sustain our ecosystems and their services, which protects fisheries, water quality and coasts, and improves human well-being (Howard et al., 2016).

An important community-level climate change mitigation action is to incorporate the concept into the pending update to Charlotte County's Comprehensive Plan. Recent "Peril of Flood" legislation mandated that counties upgrade their comprehensive plans by 2021 to address sea level rise and climate change (Jubb, 2019). The county's new plan should include an "adaptive mitigation" strategy. By embracing adaptive mitigation, the county would draw down excess carbon in the atmosphere, as well as help residents adapt to rising seas and the other threats from the changing climate. This strategy would also help our county remain livable in the future (Ravens, 2017).

Adaptive mitigation includes both actions to adapt to actual or expected climate change and actions to reduce emissions and remove carbon. We must do both, but emphasize mitigation. If we only adapt, future impacts from rising temperatures, seas and storms will be too severe to manage. We must begin serious local climate change mitigation efforts now if we want to sustain our coastal communities for the future. For specific information about adaptive mitigation ideas for Charlotte County, see the presentation "Towards a Plan for Charlotte County's Resiliency and Sustainability" made to the Beaches and Shores Advisory Committee in June 2018 by Dr. Keller (Keller, 2018).

The Charlotte County Comprehensive Plan update for 2021 can, if we do it right, serve as a road map for accomplishing what we need to do to preserve and sustain our estuaries, waterways, water quality, economy and lifestyles. It can include innovative, progressive plans for future wastewater treatment and stormwater management which will allow our estuaries to meet state standard as our population grows, increasing build-out from the current 40% to full capacity. The plan could also provide actions to help mitigate global warming, minimize algae blooms, limit temperature rise, and reduce impacts from sea level rise and extreme weather events. These actions are critical for ensuring our community's future. It is fitting to have such a plan installed on the 100<sup>th</sup> anniversary of our county's founding in 1921.



#### **8. Create a county education and awareness campaign for water resource issues.**

While many county residents understand and value our waterways, many – especially new residents and tourists – have not had the opportunity to learn about our natural resources and their importance to our economy and future. An anecdotal example is that one of our elected officials recently learned from a newspaper editorial that our fish depend on our estuaries for a safe place to grow up (Keller, 2018). Because water quality is one of 3 priorities in the county's 2019-2021 budget (Charlotte County, 2019), it should be well understood by citizens, staff and elected officials. Citizens will be involved in managing our estuaries, waterways and water quality directly (fertilizer bans, native landscapes) and indirectly (funding upgraded stormwater

and wastewater systems with tax dollars), so they should be informed about the values, problems, solutions, costs and benefits of our local waterways and projects.

A broad community-wide education and awareness campaign about waterways and water quality should be created and implemented under the direction of the office of estuaries, waterways and water quality management, with close coordination with the public affairs office. An effective education campaign would help county residents, employees and elected officials understand the urgency of our water quality issues. And, an important psychological aspect of awareness is that it helps us manage change more easily because people tend to accept change more readily once they understand why it is needed and what the benefits are. Once local residents understand how improving our wastewater treatment, stormwater management and supplemental projects (i.e.: native landscapes, fertilizer use, habitat restoration and climate change mitigation) will benefit our economy and life-styles and they will respond positively by supporting the changes.

The County Extension and Sea Grant Offices can be valuable at helping to create and implement an effective water resource awareness and education campaign. Specifically, the Florida Master Naturalist Program is a wealth of readily available resources. Topics for an awareness campaign include, but are not limited to:

- Estuaries and you – why our economy and lifestyles depend on healthy estuaries;
- Water pollution basics – where it comes from and how to reduce it;
- History of human impacts to local estuaries – how development put estuaries at risk;
- Future human impacts to local estuaries – how to manage future growth to reduce risks;
- Water quality monitoring and reporting – why it is so important;
- Wastewater and stormwater – understanding projects and budgets;
- Retrofitting wastewater and stormwater systems – why it is so important;
- Non-native vs. native lawns – why green lawns and exotic palms trees aren't good for waterways and wildlife; and
- Florida Friendly Landscape Program.

## **9. Engage with strategic allies and partners.**

Working with capable, like-minded allies can help us restore our waterways and save costs. We can improve our partnerships with several local water quality allies. We share the same mission: to restore and preserve our estuaries and waterways. These partnerships can exchange expertise and resources, leading to smarter operations and investment decisions. An important example is the CHNEP Water Atlas, which is a user-friendly online data warehouse for water resources information (USF, 2019). The county's estuary, waterways and water quality management activities could be strengthened by improved partnerships with:

- **FDEP's Charlotte Harbor Aquatic Preserves (CHAPs)** – which protects more than 180,000 acres of estuaries from Lemon Bay to Pine Island Sound and Matlacha Pass to be “set aside so that their aesthetic, biologic and scientific values endure for the enjoyment of future generations.” Aquatic preserves staff and volunteers routinely

monitor water quality, seagrasses and nesting birds throughout the Aquatic Preserves and provide educational materials and scientific data (FDEP, 2019). CHAPs could provide technical and educational support for county waterways restoration activities.

- **Coastal and Heartland National Estuary Partnership (CHNEP)** – is committed to protecting the estuaries and watersheds from Dona and Roberts Bays to Estero Bay. CHNEP coordinates monthly water quality monitoring throughout the estuaries conducted by the Coastal Charlotte Harbor Monitoring Network. CHNEP scientists review water quality data from other entities used for state water quality assessments, pollutant limits and clean-up plans. The CHNEP Water Atlas compiles water quality data from throughout our area and makes the data and tools publicly available and easily understood (USF, 2019). CHNEP could make technical expertise, grant assistance and funding available to the county for restoration projects.
- **SWFWMD SWIM** – the Surface Water Improvement and Management (SWIM) program recognizes important water bodies, including Charlotte Harbor, identifies potential problems, and implements projects to improve water quality. SWIM projects include reducing pollutant loads from stormwater runoff and/or restoring habitat, both of which are vital parts of the county’s water management efforts. SWIM could provide technical expertise and funding (state and federal) for restoration projects (SWFWMD, 2017).

#### **10. Manage county organizational changes with help from consultants.**

As discussed previously, to restore and sustain our local estuaries and economy over the long-term requires enhancing local water resource management functions. Creating a comprehensive local water resource management program might be accomplished through contracting, hiring permanent employees and/or creating a new office of estuaries, waterways and water quality. These solutions require significant changes to the county organizational structure. We are fortunate that a crisis as severe as Indian River Lagoon’s isn’t yet driving our interest in changing our organizational structure to improve protection of our waterways. However, we must not wait until our estuaries, waterways and water quality decline enough to trigger a public outcry or state TMDL processes before acting on these changes. The old adage that prevention is cheaper than the cure applies directly to water resource management.

Many organizations only make major changes as the result of a crisis. While external pressure during crises may cause change to happen, there are risks and costs associated with waiting. Organizations and individuals are naturally resistant to change. Creating a separate office of estuaries, waterways and water quality management is a significant change to local organizational structure. There may be barriers to the change: some might view the change as a threat; some might oppose it; some might fear it. And, there may be community resistance because of the cost of the additional staffing and programs (Johnson, 2002; McShane et al., 2014; Vecchio, 2003). Natural resistance to change can be overcome by helping people see the benefits of the changes. Citizens will support the changes once they understand that potential tax increases will help preserve their property values, lifestyles and economy. And, providing open communication and participation in decision-making will enhance community support for the changes. It takes skill and experience to guide organizational change toward success with minimal stress. Many organizations contract with consultants to manage the change process.

Because of the importance of creating an effective local water resource management program, as well as the risks and costs of not succeeding, investing in change management consultants is essential.

## Conclusions and Next Steps

In summary, conclusions from the discussions presented previously include:

- Charlotte County is a special place with a water-dependent economy and lifestyle, but it is changing rapidly.
- Charlotte County estuaries already have impaired water quality and we need to make changes immediately to avoid irreversible damage.
- The primary causes of Charlotte County water quality problems are wastewater and stormwater, aggravated by increasing water temperatures and sea level and storms.
- Current Charlotte County governmental organization lacks a comprehensive waterways and water quality management function.
- The 5 elements of effective waterways and water quality management include: water quality monitoring/reporting; wastewater treatment; stormwater management; supplemental resource management programs; and education and awareness.
- State water quality standards should be used as local water quality goals, as well as to inform citizens, staff and elected officials and direct water quality actions.
- The most effective and efficient approach to restoring water quality and healthy estuaries is a comprehensive county waterways and water quality management program.

While 10 actions have been presented to facilitate discussions and actions, the most critical actions which should be implemented as soon as possible include:

- 1. We must acknowledge our water quality crisis exists and commit to action – now.**  
The county has the ethical responsibility to inform its citizens, staff and elected officials of the extent of our current water quality issues and commit to the actions needed to restore and protect our estuaries and waterways for their long-term sustainability. Better understanding of options, costs and benefits of needed wastewater, stormwater and supplemental projects, and urban planning will foster necessary support for future funding decisions and potential organizational changes.
- 2. We must create a county waterway and water quality management program - now.**  
Because of the seriousness of our water quality issues, the county must create a comprehensive county water resource management function as soon as possible. The comprehensive program would augment existing county Utilities and Public Works Departments activities. The most effective and efficient strategy would be to create a new county office of waterways and water quality management. The mission of the office would be to restore our estuaries and waterways to state water quality standards, and then preserve the waterways for our long-term community and economic good. The office would coordinate actions relating to water quality monitoring/reporting, wastewater treatment, stormwater management, education and awareness and

supplemental resource management projects. The office could develop a broad, scientifically designed water quality monitoring and reporting program to provide data to citizens, staff and elected officials for supporting restoration activities. The office would also seek partnerships and educate and inform constituents.

**3. We should seek assistance from organizational development experts – soon.**

Creating a new local waterways and water quality management program would require some changes to existing county organizational structure. It has been recognized that establishing new functions within existing organizational structures can be challenging – this is normal human and organizational behavior. Organizational development experts are trained in developing efficient organizational changes with minimal resistance and disruption and maximum success. It would be cost-effective and wise for the county to invest in expert assistance from professional organizational development consultants when creating a comprehensive waterways and water quality management program.

The ideas in this discussion paper have been presented with a sense of urgency. If our water quality continues to degrade, impacts to our residents, fish and wildlife, and economy will become increasingly more dramatic, if not irreversible. Because restoring our waterways and water quality is significantly more costly than protecting them, the time for the county to act is now.

The purpose of this discussion paper is to encourage open dialogue between local citizens, staff and elected officials about steps towards restoring and sustaining our exceptional waterways, using a creative combination of educational activities, restoration projects and planning – which can only be successful when the community works together.

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## Appendix A: Florida Water Quality Standards Charlotte County Estuaries

Nutrient Data will be analyzed as annual geometric means and are <i>not to be exceeded more than once in a 3 year period.</i>				
	Tidal Myakka (includes Tippecanoe Bay)	Tidal Peace River	Charlotte Harbor Proper	Lower Lemon Bay
Total phosphorus	0.31 mg/L	0.50 mg/L	0.19 mg/L	0.17 mg/L
Total nitrogen	1.02 mg/L	1.08 mg/L	0.67 mg/L	0.62 mg/L
chlorophyll a	11.7 µg/L	12.6 ug/L	6.1 µg/L	6.1 µg/L

**Total phosphorus (TP):** milligrams per liter (mg/L); equivalent to parts per million (ppm). Although TP is used for plant growth, excess phosphorus is often an indicator of pollution. Sources of TP include wastewater, watershed and agriculture runoff, and/or leaching and resuspension of phosphorus rich sediments.

**Total nitrogen (TN):** milligrams per liter (mg/L); is calculated as the sum of total Kjeldahl nitrogen (TKN) plus nitrate and nitrite (NOX). Nitrogen is an element necessary for plant growth; low levels of nitrogen or phosphorus may limit plant growth in surface waters; high levels may cause excess plant and phytoplankton growth; common inorganic forms needed for plants: ammonia (NH<sub>3</sub>), nitrate (NO<sub>3</sub>) and nitrite (NO<sub>2</sub>). High levels of nitrogen are often an indicator of pollution. Sources of nitrogen include wastewater, watershed runoff, agriculture and fertilizer runoff, and atmospheric deposition.

**Chlorophyll a (Chl a):** micrograms per liter (µg/L). Chlorophyll a is a green pigment used by plants for photosynthesis and is a useful indicator of algae levels in the water; important because algae form the base of the food chain and help in oxygenating the water, but too much algae can cause oxygen levels to collapse. Measures the amount of photosynthetic (phytoplankton/plant) productivity in the water. Excess chlorophyll can be used as an indicator of nutrient enrichment or degraded water quality.

**For fecal coliform, in all waterbodies:**

- Monthly average must not exceed 200 cfu/100ml.
- 10% of samples must not exceed 400 cfu/100ml
- Must not exceed 800 cfu/100ml on any given day

**Fecal coliform bacteria (FC):** number of colonies per 100 milliliters (CFU/100ml). Fecal coliform bacteria are rod-shaped bacteria that can grow in elevated temperatures and are usually associated with the fecal material of warm-blooded animals; includes *E. coli* and can serve as an indicator of other pathogens that can cause serious human health risks.

The daily average percent of **Dissolved Oxygen in all waterbodies:** saturation shall not be below 42 percent saturation in more than 10 percent of the values.

**Dissolved oxygen (DO):** milligrams per liter (mg/L) or saturation (%). Measures the concentration of oxygen contained in the water; it is influenced by water temperature and salinity (the higher the temperature or salinity, the lower the amount of oxygen that can dissolve in the water); it is necessary for organisms to breathe; at low levels, fish and other animals can become stressed or even die. In terms of DO saturation, this measures the percent of dissolved gas molecules. High photosynthetic activity or rapid temperature change can cause DO saturation readings above 100%

**Turbidity in all waterbodies** must not exceed 29 NTU or above natural background conditions.

**Turbidity:** Nephelometric Turbidity Units (NTU). Turbidity measures how cloudy water is; influenced by plankton, sediment, water color; may limit plant growth if sunlight cannot penetrate. Sources of turbidity include resuspension of organic material and solids, watershed runoff, and erosion.

Source: Florida DEP Surface Water Quality Standards <https://www.flrules.org/gateway/ruleNo.asp?id=62-302.300>

## Appendix B: Chronology of Water Quality Related Events in Charlotte County August 13, 2019

Compiled by Coty Keller, David Blewett, and Judy Ott

This chronology provides a summary of some of Charlotte County’s relevant water quality related events over the past several years. The events span from the decades-old issue of septic tank/sewers through the June 2019 Budget Workshop for the Board of County Commissioners. These events form the foundation of the ideas and objectivity of a forthcoming discussion paper.

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### **2000 – 2019: Septic System Impacts Identified throughout the County for Many Years.**

Septic system impacts on water quality in Charlotte County have been the topic of multiple studies over the last 18 years, including:

- **2001** Evaluation of effects of seasonal variability and weather on fecal pollution in Charlotte Harbor (Lipp, 2001).
- **2003** Assessment of the density and potential water quality impacts of septic tank systems in the Peace and Myakka River Basins (Charlotte Harbor Environmental Center, 2003).
- **2005** Assessment of water quality of Charlotte Harbor (FDEP, 2005).
- **2009** Use of nitrogen isotopes to quantify sources of nutrients in the Peace River watershed (Hale, 2009).
- **2010** Evaluation of wastewater service alternatives for Area 1 (Charlotte County Utilities Department, 2010).
- **2013** Review of water quality in East and West Spring Lake (Tetra Tech, 2013).
- **2015** Infrastructure workshop presentation to Charlotte County Board of County Commissioners (Charlotte County Utilities Department, 2015).
- **2016** Assessment of Charlotte County water quality, analysis of data and recommendations for long-term monitoring (Lapointe, 2016).

- **2016** Survey of County residents' water quality concerns (Staugler, 2016).
- **2017** Completion of Sewer Master Plan (Charlotte County Utilities Department, 2017).
- **2019** Convening of Charlotte County Water Quality Summit in Punta Gorda (Charlotte County, 2019).
- **2019** Inclusion of water quality improvement goals in 2019 Budget Workshop (Charlotte County, 2019).

It is significant to note that during the September 2018 Beaches and Shores Advisory Committee meeting a lengthy discussion ensued about septic system issues “haunting” the county for many years. Reference was made to a previous study that indicated that the County has been aware of the need to replace septic systems with sewers for almost 20 years. The study explains why septic systems are not suitable for Florida’s geology, and if septic systems are not replaced with sewage systems in identified areas, overall water quality will continue to degrade throughout the County. Discussions included informing newly elected Commissioners of the study and educating the public about the value of the septic-to-sewer conversions on community wellbeing and economy.

Comparing the number of water quality studies with the rate of septic-to-sewer conversions completed to date highlights several important points:

- **Understanding water quality issues and solutions in the County is not new;** both have been discussed for decades.
- **Critical water quality solutions have not been implemented in a timely manner.** Septic-to-sewer conversion projects are not being implemented as planned; only two of the eight projects on the five-year list will be completed within five years.
- **Effective water quality problem solving needs to be based more science than politics.** More efficient and effective approaches to solving the County’s water quality issues can be initiated by relying on technical expertise of staff and paid consultants. For example, the County paid for the 2016 water quality assessment, data analysis and long-term monitoring solutions developed by Dr. Brian Lapointe, Florida Atlantic University (Lapointe et al. 2016). The study identifies limits on nutrient levels for County waterways that will keep them healthy. The study also emphasizes the need for a comprehensive water quality monitoring program that provides data to guide effective water resource management. Without conducting technically sound water quality monitoring, an evaluation of the success or failure of treatment programs isn’t possible.

**2015: Inter-Agency Water Quality Meeting Shows Need for Intra-Department Coordination.**

Charlotte County staff attended a meeting hosted by the Charlotte Harbor National Estuary Program (CHNEP) in August 2015 to explore establishing a water quality monitoring program in the Port Charlotte canals. At that time, CHNEP Director Lisa Beever offered to partner with the County to develop a volunteer water monitoring program because: *“Port Charlotte is the largest urbanized areas in the coastal CHNEP area that isn’t included in a routine water quality monitoring program. Having additional information about the ambient condition of the water*

*quality in the Port Charlotte canals will help us collectively implement cost effective and efficient resource management activities through our partnerships”.*

The meeting topics included:

- Need for Water Quality Monitoring in Port Charlotte
- Volunteer Monitoring Program Successes
- Existing Volunteer Water Quality Monitoring Programs in CHNEP
- Steps for Developing Volunteer Water Quality Monitoring Programs
- Define Purpose and Design of Port Charlotte Volunteer Water Quality Monitoring

The meeting highlighted several County organizational hurdles related to water quality:

- **There is no County entity with the responsibility and/or authority to coordinate the inter-departmental water quality efforts needed to sustain healthy water resources throughout the County over the long-term.** The current County organizational structure separates water quality responsibilities into two departments: Utilities, concerned with sewage, and Public Works, concerned with stormwater – making coordination of water quality programs challenging.
- **The lack of coordination of County water quality programs creates a void in the basic understanding, management and monitoring of our vital estuaries and interior waterways.** This void continues, despite recognition of the need to integrate sewage treatment, stormwater management and water quality monitoring – intensifying our water quality crisis.
- **The current County organizational structure limits coordination of water quality monitoring and restoration efforts, despite staff willingness to do so.** Due to structural design and workload, the County’s two water quality departments, Utilities and Public Works, continue to focus on their independent mandates – leaving the County’s overall water quality picture unattended to.
- **Charlotte County remains the only urbanized area in the Charlotte Harbor region without a comprehensive water quality monitoring program.**

#### **2016: Charlotte County Funds Water Quality Study by FL Atlantic University.**

With support from Charlotte County, Dr. Brian Lapointe and colleagues from Florida Atlantic University analyzed historical water quality data in the Port Charlotte area. The study looked at nutrient and bacterial pollutant data for surface water, ground water, and stormwater available in state and county datasets. The study also included water sampling for nutrients and tracers of human waste pollution to help distinguish nutrient sources from septic tanks vs. other sources, such as fertilizers. The report included data summaries and recommendations for developing a cost-effective, comprehensive monitoring program to measure nutrient loading changes during the septic-to-sewer conversion processes. The findings were presented to the Board of County Commissioners in December 2016.

Important conclusions of the FAU report (Lapointe, et al. 2016) include:

- **Water quality problems are primarily associated with wastewater and stormwater runoff** throughout the County.
- **The long-term health of the County's economically essential estuaries depends on managing sewage and stormwater systems to meet state water quality standards for nitrogen, phosphorus and chlorophyll** – the state's Numeric Nutrient Criteria (NNC).
- **A comprehensive water quality monitoring and reporting program is essential for effectively managing and improving water quality** throughout the County.
- **The comprehensive water quality monitoring and reporting program should be initiated as soon as possible** – but it has yet to be started three years following presentation of the study to the County.

### **2017 – 2018: Water Quality Impairments are Reported throughout Charlotte Harbor.**

In its 2017 Estuary Report Card, The Conservancy of Southwest Florida (CSWF) gave Charlotte Harbor a grade of C+ for overall water resource health. According to the report, 54% of the Charlotte Harbor watershed, including both fresh and estuarine waters, is impaired for at least one parameter. Dissolved oxygen, nutrients and metals are the most pervasive problems.

In March 2018, the CHNEP's watershed status reports showed many areas of nutrient impairment in the tidal Myakka River, Tippecanoe Bay, Charlotte Harbor and Lemon Bay estuaries and watersheds.

Details of the water quality impairments are found in the reports and links to the reports are included in the References section. These published analyses and interpretations of water quality data are important to the County because:

- **The County contracts for sampling and analysis of much of the water quality data used to prepare the Conservancy and CHNEP status reports.** However, the County currently lacks support for analyzing, reporting, understanding and utilizing the water quality data it pays to collect. As of August 2018, County staff reported that they were not aware of water quality problems within the County, contrary to the published reports.
- **The County's organizational structure does not include a department or person tasked with evaluating and reporting the health of our essential estuaries and waterways.** As of June 2019, the County has not publicly recognized that our estuaries are impaired.

### **2018 August: Water Quality Crisis and Solutions are Topic of Editorial in Local Newspapers.**

The August 27, 2018 edition of the Charlotte Sun Newspapers (Englewood, Port Charlotte and Northport) carried a guest opinion article addressing local water quality concerns and emphasizing local solutions (Keller, 2018). The article focused on local estuaries, why they are important to our economy and lifestyles and what we can do here in Charlotte County to protect the future of our estuaries.

The main discussion points of the editorial included:

- People are ready to hear about water quality because of red tide and blue-green algae.
- Water quality and algae problems in Lake Okeechobee and the Gulf of Mexico are important, but beyond our local control; we need to focus on what we can do locally.
- Our pristine lifestyle here is threatened and we are contributing to the excess nutrients and global warming that have worsened the crisis.
- Without a viable water monitoring and evaluation program, we cannot tell if our estuary is healthy or if our corrective actions are having positive effects.
- Because of inadequate funding for state, regional and County environmental and water management budgets, we aren't able to effectively manage local water quality.
- One solution is to have the County assume full responsibility for the monitoring, evaluation and public reporting of water quality in our local estuaries and waterways.
- Other local actions needed to preserve our waterways are: reduce stormwater runoff and upgrade urban stormwater treatment as the County develops; continue conversion from septic-to-sewers; upgrade reclaimed water; and mitigate climate change.

This editorial is important because:

- **It helped inform County Commissioner Stephen Deutsch about the importance of local estuaries, waterways and water quality** to County citizens.
- **It helped encourage the Beaches and Shores Advisory Committee to include water quality as a regular topic** on meetings agendas.
- **It outlined the importance of local action** – local Charlotte County citizens and officials have more at stake economically, care more about the resources and are more knowledgeable about issues and solutions than state and federal agencies might be.

### **2018 September: Beaches and Shores Advisory Committee Calls for Action on Water Quality.**

Following lengthy discussions, by fall 2018, the Beaches and Shores Advisory Committee understood the critical need for comprehensive water quality monitoring and reporting and was aware that the County lacks such a program. The Advisory Committee concluded that the County should initiate a comprehensive water quality effort. Even though the Committee's role is advisory and they aren't a decision making body, they passed a water quality action resolution for the record. Subsequently, the resolution was brought to the attention of the County Commissioners, specifically Commissioners Stephen Deutsch and Bill Truex.

The water quality action resolution was passed unanimously by the Beaches and Shores Advisory Committee on September 6, 2018. It recommends that the Commission takes specific actions to safeguard the quality of water in local waters by **establishing an effective water quality program that ensures that:**

- Waterways in and adjoining local estuaries are sampled routinely.
- Analysis is performed to state standards and criteria for acceptable levels of nutrients. Standards for key water quality parameters for local waters are provided in Appendix A.
- Someone with authority reviews the results and decides what actions need to be taken.
- Reports are generated and distributed to the public to ensure their interests are served.

- Runoff from homes and businesses is eliminated.
- Septic tanks are replaced by sewers and appropriate waste treatment systems.
- Untreated agricultural runoff is eliminated.
- Improved urban runoff systems are required in future development.
- Reclaimed water systems are upgraded.

**2018 November: FDEP Reports Water Quality Impairments in Tidal Peace and Myakka Rivers.**

Waters in the Tidal Peace and Tidal Myakka watersheds were reported as impaired in the Florida Department of Environmental Protection’s (FDEP) draft assessment in November 2018, under the state’s impaired waters rule. Continued water quality impairments may cause the FDEP to require the County to take actions to reduce the pollutants causing impairment.

The state’s pollutant load reduction program – or Total Minimal Daily Load (TMDL) program – follows steps where FDEP requires the County to initiate water quality improvement actions:

1. Assess the quality of surface waters – are they meeting water quality standards?
2. Determine which waters are impaired – which waters are not meeting standards?
3. Establish a TMDL for each impaired water for each pollutant.
4. Develop Basin Management Action Plan (BMAP) to identify actions to reduce pollutants.
5. Implement the strategies and actions recommended in the BMAP.
6. Measure the effectiveness of the BMAP – locally, plus by state every five years.
7. Adapt – change BMP and actions if things aren’t working.
8. Reassess the quality of surface waters continuously.

Details about impaired waters, TMDLs and BMAPs are at: <https://floridadep.gov/dear/water-quality-evaluation-tmdl/content/total-maximum-daily-loads-tmdl-program> .

Having waters included on the state’s impaired waters list is important because:

- If the County does not act collectively, soon, to improve water quality, **control of water quality management will be ceded from the County to the state FDEP.**
- Water quality impairments severe enough to trigger the TMDL program indicate degradation that may not be reversed in a timely or affordable way. **It is more cost-effective and efficient to prevent water quality impairment than to clean up** – and acting sooner than later is critical.

**2019 January: Authors Request Meeting with County Administrator about Water Quality.**

The authors requested a meeting with the County Administrator Sandrock to discuss the County taking a more proactive role in evaluating local water quality. While the meeting was not granted, an invitation was extended to attend the Charlotte County Water Quality Summit to be held January 29, 2019. The purpose of the Summit was to educate the public and elected officials about harmful algal blooms, such as red tide and blue-green algae. While the meeting did not occur, the contact was important. It became clear that the County was focusing on the latest red tide and blue-green algae crisis, but was not aware of the longer term water quality crises and nutrient impairments in Lemon Bay, Charlotte Harbor, and the Peace and Myakka rivers.



### **2019 January: Charlotte County Water Quality Summit Convened.**

The January 29, 2019 Charlotte County Water Quality Summit confirmed the County's focus on the latest red tide and blue-green algae crisis. It is important to note that during the Summit local water quality impairments were not mentioned, nor was the importance of water quality monitoring and reporting.

Following the Water Quality Summit, the authors requested a meeting with County Administrator Sandrock to discuss the value and need for water quality monitoring, including:

- The economic and lifestyle value of the estuaries.
- The benefits of water quality monitoring in canals and tributaries.
- Criteria for an effective water quality monitoring program.

### **2019 March: Authors Present Water Quality Concerns and Ideas to County Staff.**

The authors met with Charlotte County Utilities Director Craig Rudy, Community Development Director Claire Jubb, and Public Works Project Manager Sherri Ouimet, and staff on March 11, 2019. At that time, Director Jubb was organizing a working group to develop a water quality strategy. At the meeting the authors provided a PowerPoint presentation highlighting water quality concerns and ideas for specific steps the County might take to begin addressing the water quality problems (Keller, et al, 2019).

The **Take Home Message** from the presentation is the **urgent need for adequate water quality monitoring needed to guide the Charlotte County community in efforts to protect and restore our estuaries.** Supporting information in the presentation includes:

- **Importance of Our Estuaries** – The economic and lifestyle importance of our estuaries.
- **Threats to Our Estuaries** – The scientific evidence – fisheries, seagrass and water quality – that indicates Charlotte County waters may be at the tipping point of losing recreational and sport fisheries, as well as moving towards the kind of irreversible water resource crises occurring in the Indian River Lagoon and Caloosahatchee River.
- **Comprehensive Water Quality Monitoring is the Critical First Step** – Creation of an effective water quality monitoring program must not be delayed in order to prevent irreparable damage to our economically and ecological essential estuaries.
- **Design and Components of an Effective Water Quality Monitoring Program** – Existing expertise and programs are available to build a Charlotte County program on.
- **Importance of Acting Locally** – While the pollution coming down the Caloosahatchee River and the red tide in the Gulf are important, given limited County resources, the most cost-effective and efficient approach is to focus on local solutions and actions.

More detailed discussions during the presentation included:

- **Fisheries Resiliency Concerns** – Analysis of local and state fisheries data shows that fish populations are able to recover from red tide and cold spells, over time. But populations are not able to recover from chronic water quality issues within an estuary. For example, the algae blooms fueled by excess nutrients in the Indian River Lagoon have drastically changed fisheries dynamics in that estuary. Locally, documented increasing

nutrient levels correlate with increasing frequency, size and duration of filamentous algae blooms in Upper Charlotte Harbor, Coral Creek and the Tidal Peace and Myakka Rivers. Relationships between filamentous algae blooms and fisheries populations are currently being studied by FWC Charlotte Harbor Field Laboratory fisheries scientists.

- **Local Actions Needed to Protect and Restore Estuaries** – Water quality protection and restoration is a large undertaking and must include a comprehensive set of solutions to be accomplished. The first step – implementing a water monitoring program – is needed to be able to gauge the success of the other actions. And, progress towards each of these actions must occur concurrently. Local actions must include, as a minimum:

**Local Actions Needed to Protect and Restore Our Estuaries:**

1. Implement Comprehensive Water Quality Monitoring and Reporting Program.

**Note: This is 1<sup>st</sup> step is essential to gauge the success of other actions.**

2. Improve wastewater treatment and reduce problem septic systems.
3. Improve stormwater management and reduce nutrient runoff.
4. Increase native vegetation and reduce fertilizer use.
5. Monitor reclaimed water and only use for irrigation away from surface and groundwater.
6. Participate in habitat restoration projects, including wetlands and bivalves.
7. Reduce climate change and plan for higher storms, temperatures and sea level.

- **Comprehensive Water Quality Monitoring and Reporting Program Details** – Before an effective and efficient water quality monitoring program can be implemented in a technically sound manner, the purpose, criteria and sampling locations and frequency must be defined. Components of a comprehensive water monitoring program include:

**Comprehensive Water Quality Monitoring Program Purpose and Criteria:**

**Purpose:** To collect, analyze, evaluate and provide water quality data to decisions makers and the public to direct actions to ensure the health of our estuaries.

**Criteria:**

1. Adequate sampling frequency, locations and parameters of estuaries and waterways to describe current and changing water quality conditions.
2. Routine reporting of field and laboratory analysis results to agencies responsible for interpreting, evaluating and presenting results.
3. Routine review of water quality reports by staff with adequate authority, knowledge and understanding to be able to direct actions based on results.
4. Readily available access to understandable reports are provided to the public and elected officials in a timely manner, such as the USF Water Atlas.

- **Conclusions and Discussions from the Presentation** – are summarized below:

**Water Quality Presentation Conclusions and Discussion:**

1. We have a water quality crisis – many of our waters are already impaired.
2. If we delay action, our valuable estuaries will be at greater risk.
3. Water quality prevention is more effective and less expensive than restoration.
4. The first step is to establish a comprehensive local water quality monitoring and reporting program.

5. The water quality program needs to include adequate sampling, understandable interpretation and routine reporting of results to people with authority to implement corrective actions.
6. Water quality results also need to be made readily available in an understandable way to the public and elected officials.
7. We encourage the County to invest in the staff and partnerships needed to accomplish this critical step towards protecting our invaluable estuaries as soon as possible before irreversible damage occurs.
8. Community Affairs Director Jubb explained that the County has made water quality monitoring a priority and these ideas presented will be useful to the task force as it moves forward.
9. The authors are available to assist the County with creating the capacity to effectively manage our local estuary and waterways water quality.
10. It is important to keep the momentum going for the County to address water quality issues through budget, organizational and staffing processes.

**2019 April: Authors, Commissioner Deutsch and Administrator Sandrock Discuss Water.**

Commissioner Deutsch scheduled a meeting April 26, 2019 with County Administrator Sandrock and the authors to discuss water quality concerns, including a budget estimate for creating a new water quality office. Commissioner Deutsch opened the meeting by sharing his increased understanding of the importance of our estuaries – especially to the fisheries – and increased priority for protecting and improving water quality. The authors re-emphasized the value of our estuaries to our economy and lifestyle, making their conservation worth any cost.

During the meeting, Administrator Sandrock stated that many Commissioners, Administrators and staff are in agreement with four of the authors' conclusions:

- We have a water quality crisis in the making – many of our waters are already impaired.
- If we delay action, our valuable estuaries will be at greater risk.
- Prevention is more effective and less expensive than restoration.
- The first step is to establish a comprehensive local water quality monitoring and reporting program.

The County has formed a task force to develop a strategy to address water quality problems. The authors restated the need to further educate elected officials, decision-makers and the general public about the values, threats and impairments to our local estuaries and waterways.

The authors suggested that the gravity of the local water quality crisis might be better addressed by the County investing in additional staff and partnerships, rather than adding tasks to existing staff workloads, under existing organizational structures. This could be accomplished by creating a County Office of Water Quality that oversees and coordinates water quality monitoring and reporting. The Office could benefit from strategic partnerships with the FDEP Charlotte Harbor Aquatic Preserves, and Coastal and Heartland National Estuary Partnership (CHNEP). These organizations share interests and access to scientific information which could be utilized by the County Office of Water Quality.

The authors also provided budget estimates for an Office of Water Quality, based on information from Sarasota County, including a manager's salary, staff and operations funding.

Additional discussions at the meeting include:

- The authors suggested it may take action by County leadership to initiate the organizational changes needed to create local capability for managing our water quality effectively. Creating a much needed Office of Water Quality to augment existing Public Works and Utilities programs will take dedicated and skillful leadership, backed by significant resources. Changing organizational structures, paradigms and budgets is challenging, but the water quality crisis calls for the most effective approaches available.
- The authors asked how they could support the County's efforts to create an effective water quality program. Administrator Sandrock's suggestion to join the County water quality task force was enthusiastically received by the authors – who look forward to being included in follow-up meetings.
- The authors concluded from the meeting that:
  1. Water quality is a stated “*top down*” priority for the County.
  2. Understanding and addressing organizational impediments to creating an effective County water quality monitoring and management program need to be improved.
  3. Sufficient financial support for enhancing the County's water quality monitoring and management capabilities needs to be budgeted.
  4. Additional expertise, including from the authors, needs to be actively included in the County's water quality task force.

### **2019 June: Board of County Commissioners Budget Workshop Includes Water Quality Goals.**

The County's 2019-2021 Budget Workshop was held June 18, 2019 (Charlotte County, 2019).

The three Economic and Community Development Bold Goals are to:

- Add affordable housing.
- Improve water quality.
- Increase secondary education enrollment.

Betsy Calvert from the Charlotte Sun Newspaper reported on the meeting June 22, 2019 in the article titled “*How oysters can help our economy: Charlotte leaders discuss ways to make community stronger.*” (Calvert, 2019).

**Positive outcomes** from the Budget Workshop include:

- **Water quality is now a County budget priority** – It is important to see water quality as an equal economic goal with affordable housing and higher education.
- **Educating community leaders is recognized as a step towards improving water quality** – The public and County decision-makers need a better understanding of the urgency, severity, causes and solutions to our water quality problems. Awareness is the key to action.

**Challenges remaining** following the Budget Workshop include:

- **The County must acknowledge that our estuaries and waterways are in crisis** – During the presentation, the concept of the “*estuary*” was not a focal point, nor was their impaired status. Without recognition of the severity of the water quality problems, or the County’s responsibility for resolving them, our economy, lifestyle and waterways remain at serious risk.
- **Though the County pays for some water sampling and analyses, it does not have a comprehensive water quality monitoring and reporting system** – Given its limited water quality monitoring, reporting and interpretation capabilities, the County cannot evaluate the extent or sources of water quality pollutants within its estuaries and waterways. This makes implementing effective solutions very challenging and costly.
- **Existing water quality monitoring programs could augment additional County monitoring efforts** – Before implementing additional water quality monitoring, the County must consider other existing County, regional and state monitoring efforts to avoid duplication and fill gaps. These include: Public Works, Utilities, FDEP Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN), CHNEP Coastal Charlotte Harbor Monitoring Network (CCHMN) and others. Data from these programs is used to determine which waters are impaired for what parameters.
- **Preventing water quality problems is cheaper than clean up** – For example, oyster (and other shellfish) restoration can be used to reduce turbidity in the water column, on a small scale, short term basis. While shellfish restoration serves as 1 restoration tool, reducing sediment and nutrient runoff from the land before it reaches waterways is much more cost-effective over a larger geographic and time scale. But first the problems must be identified so prevention can be implemented.
- **Reducing as many nutrient sources as possible, as soon as possible, using a variety of methods and programs is paramount** – Because of increasing urbanization, impervious surface area, wastewater sources, stormwater runoff, rainfall flashiness, storms and water temperatures, our estuaries and waterways are receiving nutrient loads that are increasing faster than our attempts to curtail them. To avoid further, irreversible loads to our waters, we must identify all sources, through well designed monitoring, and use all available voluntary and regulatory tools to stop the pollutants at their source.
- **State water quality standards could serve as effective County water quality goals** – The Budget Workshop goal of improving water quality by 5% is a commendable goal. However, it is difficult to measure success towards the goal because it doesn’t include specific waterways, parameters or time periods. The state standards that exist for the most important water quality parameters (Appendix A), as well as supporting state assessments of local water bodies, could serve as quantifiable water quality goals. Meeting state standards benefits our local economy and lifestyle, avoids FDEP intervention through the TMDL process – and supports healthy fishery populations.
- **Rigorous efforts are needed to include key partners in County water quality working groups** – Sharing existing data, knowledge and expertise would allow the County to move toward comprehensive water management in the most cost-effective and efficient way, while avoiding duplication of efforts. Important partners that were not at

the Budget Workshop include the FDEP Charlotte Harbor Aquatic Preserves (CHAPs), CHNEP and the SWFWMD. The FDEP CHAPs program manages the estuaries throughout Charlotte County for the public benefit of future generations and routinely collects extensive water quality and seagrass data. The CHNEP is tasked with protecting the estuaries and watersheds throughout Charlotte County. The CHNEP coordinates the monthly Coastal Charlotte Harbor Monitoring Network and supports public access to a variety of data through the CHNEP Water Atlas (<http://chnep.wateratlas.usf.edu/>). The Water Atlas is a valuable tool for evaluating water quality. SWFWMD is responsible for implementing the Charlotte Harbor SWIM plan and habitat restoration.

- **These challenges could most effectively be addressed by creating a County Office of Water Quality** – A unified program with dedicated expertise, staff, funding and authority could cross Departmental lines, coordinate water monitoring and management efforts, work with partners and educate the public and community leaders to achieve the greatest improvement in water resources conditions over the shortest time period for the least cost, ensuring the long term sustainability of our essential estuaries, economy and lifestyle.