

Nutrient Management



*Sarasota Bay Fisheries Forum
October 11, 2018*

*John Ryan, Environmental Manager
Sarasota County Stormwater Environmental Utility*

We live in a special place



Today's Topics

Nutrient Pollution

1. Natural Systems

2. Stormwater

3. Wastewater

-Effluent = Reclaimed Water

-Septic Systems

Who's Fault is It?



IT IS HARD
WALKIN'
ON THIS
STUFF.

YEP, SON,
WE HAVE MET
THE ENEMY
AND HE IS US.





Harmful Algal Blooms

Tiny Organisms with a Toxic Punch



Nutrient Pollution

Nutrient Pollution

The Problem

Sources and Solutions

The Effects

Where This Occurs

What You Can Do

Policy and Data

Harmful Algal Blooms

Harmful algal blooms are a major environmental problem in all 50 states. Red tides, blue-green algae, and cyanobacteria are examples of harmful algal blooms that can have severe impacts on human health, aquatic ecosystems, and the economy.

Algal blooms can be toxic. Keep people and pets away from water that is green, scummy or smells bad.

On this page:

- [Learn about harmful algal blooms](#)
 - [Effects](#)
 - [Causes](#)
 - [What you can do](#)
- [See infographics, videos and other multimedia](#)
- [Find partner resources](#)

Learn about harmful algal blooms

What are harmful algal blooms?



Harmful Algal Bloom (HAB)-Associated Illness



Harmful algal blooms (HABs) are the rapid growth of algae that can cause harm to animals, people, or the local ecology. A HAB can look like foam, scum, or mats on the surface of water and can be different colors. HABs can produce toxins that have caused a variety of illnesses in people and animals. HABs can occur in warm fresh, marine, or brackish waters with abundant nutrients and are becoming more frequent with climate change.



GENERAL INFORMATION
Frequently asked questions...



ILLNESS & SYMPTOMS
Signs, symptoms, and outcomes...

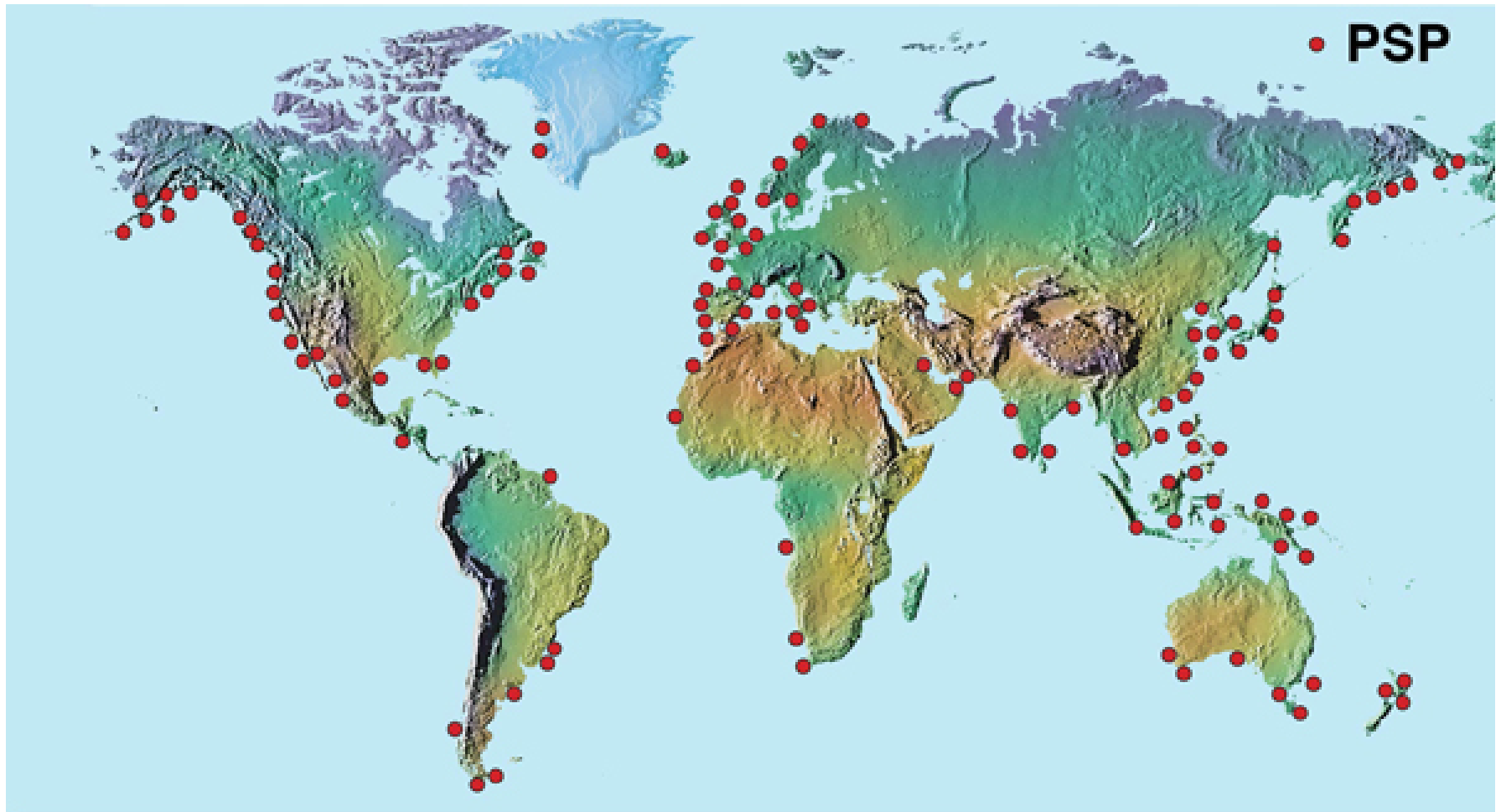


SOURCES OF EXPOSURE & RISK FACTORS
Who can get sick and how...



HABS & THE ENVIRONMENT
Factors that promote growth of HABs...

Harmful Algal Blooms



Worldwide Problems

- Harmful Algal Blooms
- Nutrient Pollution
- Depletion of Fish and Nature

NATIONAL GEOGRAPHIC NEWS

REPORTING YOUR WORLD DAILY

Thursday, October 28, 2010

MAIN ANIMAL NEWS ANCIENT WORLD ENVIRONMENT NEWS CULTURES NEWS SPACE/TECH NEWS WEIRD PHOTOS VIDEO

Big-Fish Stocks Fall 90 Percent Since 1950, Study Says

"This is because we have forgotten what we used to have," said Jeremy Jackson of the Scripps Institution of Oceanography. "We had oceans full of heroic fish—literally sea monsters. People used to harpoon three-meter long swordfish in rowboats. Hemingway's *Old Man and the Sea* was for real."

Myers and Worm said that the tendency in fisheries biology to use only the most recent data increased the problem of shifting baselines. These great fish are not only declining in numbers, but with intense fishing pressure they can never attain the sizes they once did. "Where detailed data are available we see that the average size of these top predators is only one-fifth to one-half of what is used to be. The few blue marlin today reach one-fifth of the weight they once had. In many cases, the fish caught today are under such intense fishing pressure, they never even have the chance to reproduce," said Myers.

A Remarkable Recovery for the Oysters of Chesapeake Bay

After being decimated by disease, pollution, and overharvesting, the Chesapeake Bay's renowned oysters are thriving once again, thanks largely to a selectively bred oyster that grows rapidly and is more resistant to pathogens.

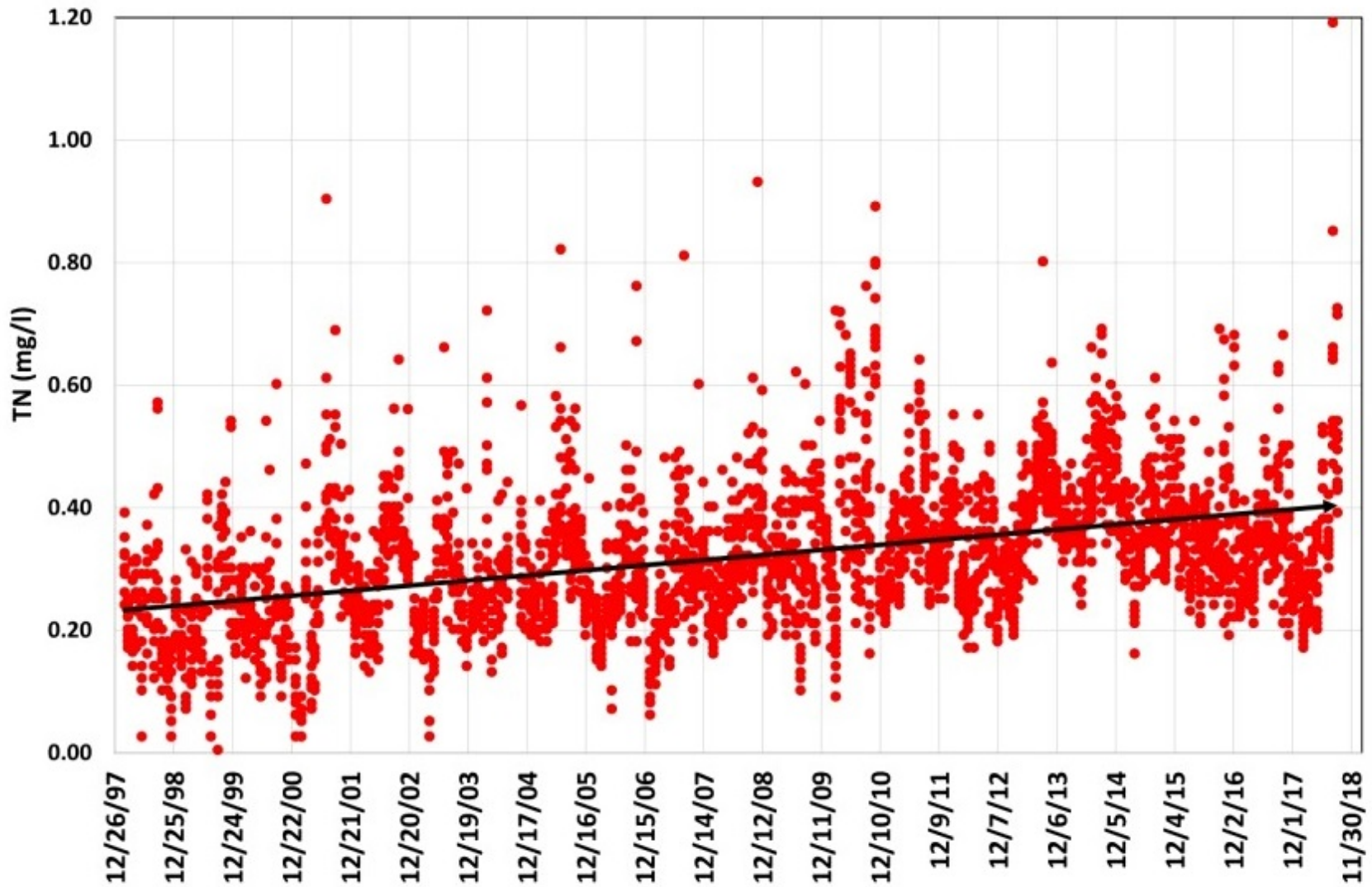
BY RONA KOBELL • MAY 14, 2015



If the world is our oyster, where are the oysters in our world? Not in the places we're used to finding them.

Louisiana once supplied most of the United States' oysters, but Hurricane Katrina and the Deepwater Horizon oil spill have [slashed the state's oyster production](#). The Pacific Northwest was the U.S.'s second-largest oyster supplier, but ocean acidification is hurting those populations. In Florida, Apalachicola Bay oyster production has fallen by two-thirds because of freshwater diversions. Globally, oyster populations are in serious trouble, with more than 90 percent of the world's oyster reefs having been lost in the past century, according to a [2011 study](#).

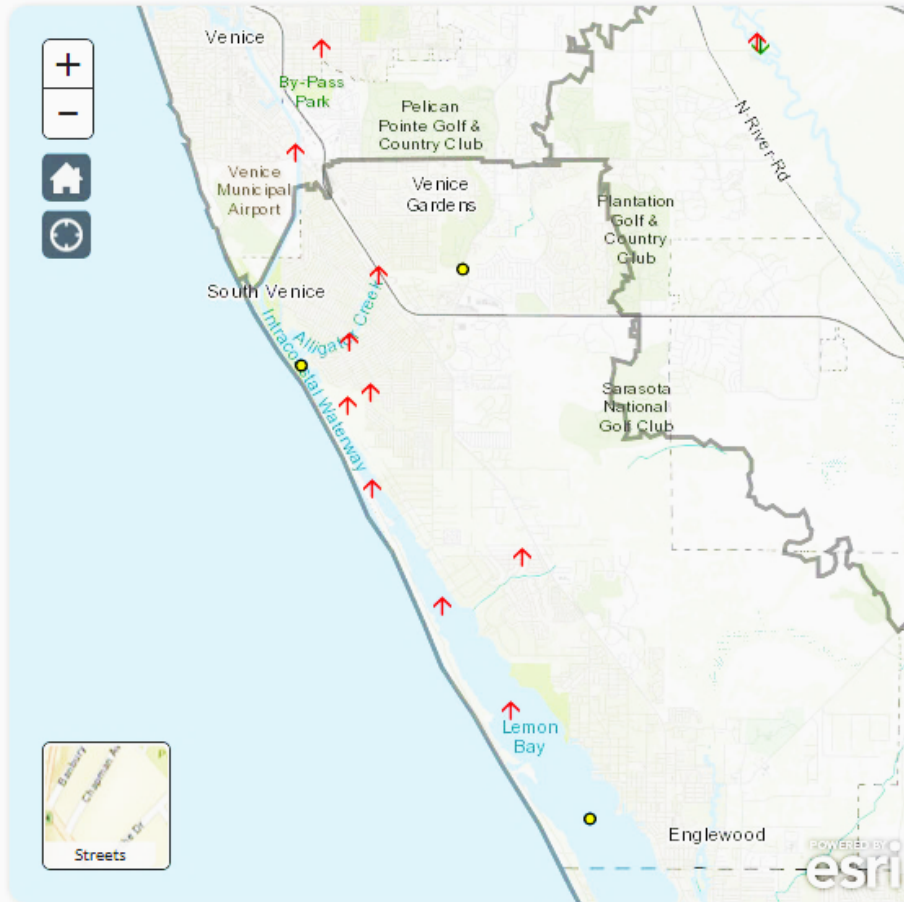
Sarasota Bay Total Nitrogen 1998 - 2018





Total Nitrogen for 10 Years, 2008 - 2017

The map below shows the trend being experienced at the long-term monitoring stations spread throughout the Sarasota County area.

Showing: Total Nitrogen for 10 Years, 2008 - 2017



Map Legend

-  Increasing Trend, Larger Rate **Declining**
-  Increasing Trend, Smaller Rate **Declining**

Sarasota Water Atlas
(website)
Water Quality Trends

Data Download
is also an option

Sarasota County Impaired Waters

Waterbody	Pollutant	Waterbody	Pollutant
Alligator Creek	Bacteria	Mud Lake Slough	Bacteria
Big Slough	Bacteria	Myakka River	Bacteria
Blackburn Bay	Nitrogen		Bacteria
Bowlees Creek	Bacteria		Bacteria
	Nutrients		Bacteria
Catfish Creek	Bacteria		Bacteria
Clower Creek	Bacteria		Bacteria
	Copper		Bacteria
	Iron		Bacteria
Cooper Creek	Bacteria		Bacteria
Cow Pen Slough	Nutrients		Nitrogen
Curry Creek	Bacteria		Nutrients
	Nutrients		Nutrients
Dona Bay	Nitrogen		Nutrients
Elligraw Bayou	Bacteria		North Creek
	Nutrients	Iron	
Forked Creek	Copper	Oglebay Creek	Nitrogen, Phosphorus, BOD
	Nutrients		Bacteria
Hatchett Creek	Bacteria	Phillippi Creek	Nitrogen, Phosphorus, BOD
Howard Creek	Bacteria		Bacteria
	Iron	Nutrients	
Hudson Bayou	Bacteria	Roberts Bay	Nitrogen
	BOD	Sarasota Bay	Bacteria
Indian Creek	Nutrients	South Creek	Bacteria
Intracoastal Waterway Venice	Nutrients	Upper Myakka Lake	Phosphorus
Lemon Bay	Bacteria	Venice Beach	Bacteria
	Nitrogen	Whitaker Bayou	Bacteria
Longboat Key	BOD		Nitrogen, Phosphorus, BOD
Matheny Creek	Bacteria	Woodmere Creek	Bacteria

Sarasota County TMDLs

Waterbody	Pollutant	Reduction
Phillippi Creek	Nitrogen	70%
	Phosphorus	70%
	BOD	70%
	Bacteria	98%
Clark Lake (Phillippi Tributary)	Nitrogen	21%
	Phosphorus	80%
Clower Creek	Bacteria	76%
Elligraw Bayou	Nitrogen	29%
	BOD	71%
	Bacteria	70%
Catfish Creek	Nitrogen	51%
North Creek	Nitrogen	47%
South Creek	Nitrogen	48%
Curry Creek	Nitrogen	63%
Alligator Creek	Nitrogen	28%
Woodmere Creek	Nitrogen	55%
Forked Creek	Nitrogen	20%
Gottfried Creek	Nitrogen	2%
	Bacteria	74%
	BOD	16%
Big Slough	Bacteria	26%
Mud Lake Slough	Bacteria	93%
Myakka River (between lakes)	Nitrogen	4%
	Phosphorus	12%
	BOD	11%
Myakka River (at Big Slough)	Nitrogen	56%
	Phosphorus	67%

Crisis in the Indian River Lagoon: Solutions for an Imperiled Ecosystem

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A parallel story is taking place on Florida's Southwest coast. Water from Lake Okeechobee and the Caloosahatchee Basin are being flushed into the Caloosahatchee

Audubon FLORIDA
Crisis in the Indian River Lagoon: Solutions for an Imperiled Ecosystem

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A parallel story is taking place on Florida's Southwest coast. Water from Lake Okeechobee and the Caloosahatchee Basin are being flushed into the Caloosahatchee River, and as with the Indian River Lagoon, the discharges are contributing to algae blooms in the Caloosahatchee Estuary's ecosystem.

In its natural state, water in the northern Kissimmee Basin meandered south to Lake Okeechobee, flowing into Everglades National Park and eventually Florida Bay. This water had very low levels of phosphorus and nitrogen.

Before human alteration to the ecosystem, the Kissimmee Valley would take six to eight months to release wet season floods into Lake Okeechobee. Now this same water drainage takes place within one month, making the Lake rise at an unnaturally rapid pace.

Fertilizer and storm water add phosphorus and nitrogen to the Okeechobee watershed. The water moves so quickly that it cannot be naturally cleaned before flowing downstream. The Indian River Lagoon and the Caloosahatchee Estuary also receive local runoff, which contribute high flows of nutrient-laden water into the estuaries.

Lake Okeechobee's optimum water level for the ecosystem and for public safety is between 12.5 and 15.5 feet. Higher levels have drowned out as much as 70 square miles of plant communities, damaging foraging, breeding, and nesting habitats for iconic wildlife such as the endangered Everglade Snail Kite.

In addition, the 75-year-old Herbert Hoover Dike surrounding the Lake cannot tolerate very high water levels without increasing the risk of a breach. A breach of the levee would expose the nearby towns of Pahokee, South Bay, and Clewiston to dangerous flooding. The United States Army Corps of Engineers is currently repairing the levee, but completion is decades away and it is uncertain how high the water will be held once repairs are complete.

The danger from high water levels in the Lake is the reason for the increased mandatory releases to the coastal estuaries. The solution is to clean water and keep it in the ecosystem rather than discharging it to the coast.

"The estuaries' troubles this year are both a catastrophe in their own right and symptom of a larger problem — a problem that demands long term solutions" - Jane Graham, Audubon Florida Everglades Policy Associate

@AudubonFL
fl.audubon.org

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August 2013

Download: <http://bit.ly/13iasaW>

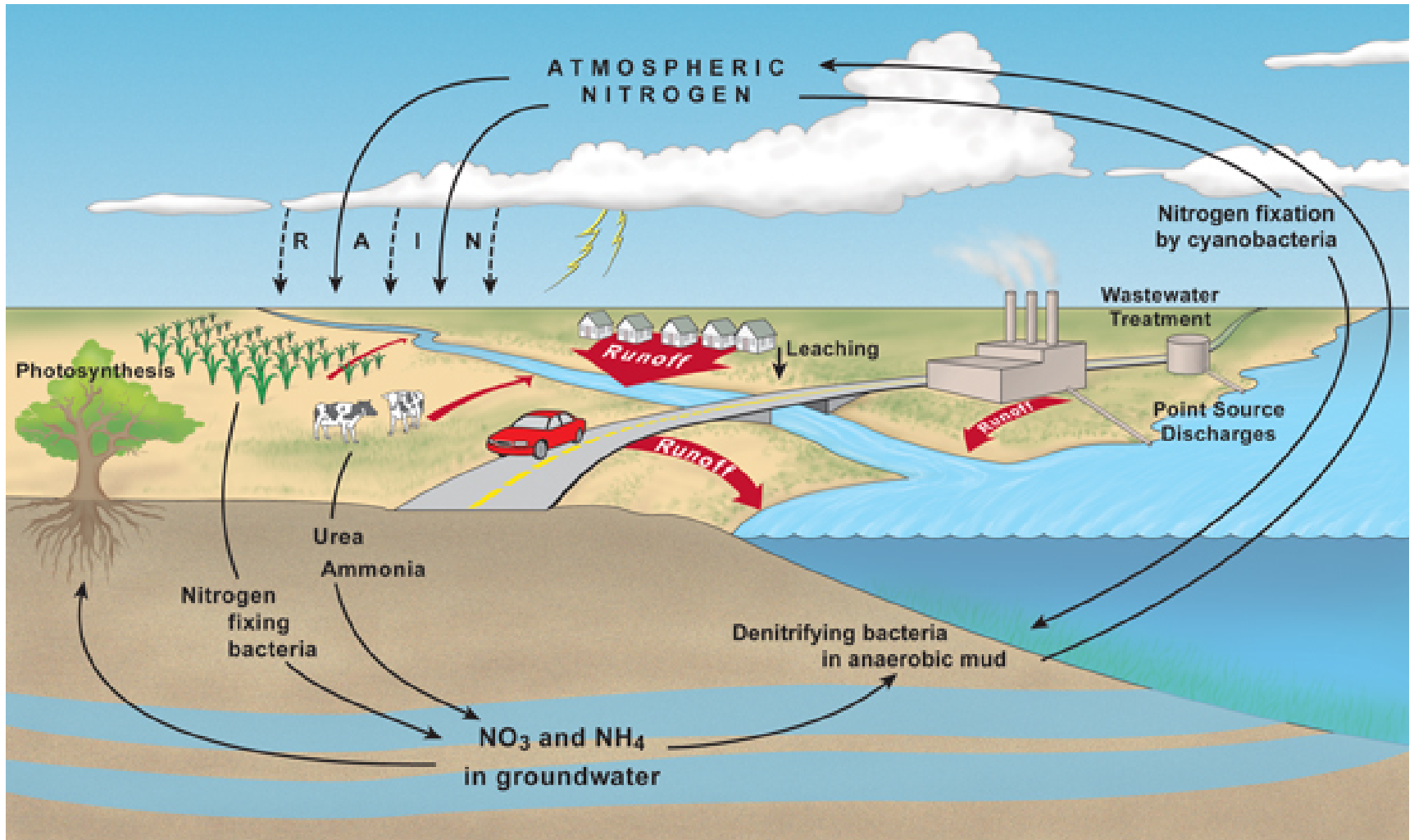
Bird Sanctuary at Risk!

The Richard T. Paul Alafia Bank Bird Sanctuary, located near Tampa, is home to 12,000 coastal birds. Sadly, it's slowly being overtaken by invasive plants. Help Audubon save this special place.

All Gifts Matched \$1-for-\$1!



Nitrogen Cycle



Nutrients create Life

What Makes an Estuary?

A diversity of mixing waters makes an estuary a unique place. This mix can be as simple as a river flowing into the sea or as complex as many rivers feeding a broad bay protected by barrier islands. An estuary varies upstream and down, and over seasons and tides as well. As a result,

an estuary is a spectrum habitats varying in salinity, water depth, water clarity, and bottom type. This range of living conditions attracts a diverse assemblage of organisms. Some are highly influential, such as reef-forming oysters, seagrasses, mangroves, and marsh grasses.

What Lives in an Estuary?

An estuary comprises many habitats, which support their own assemblages of plants and animals. Some examples of southwest Florida

estuarine species are below, organized by their preferred salinity. Lower salinities also correlate with softer bottom and reduced water clarity.



High salinity — from seawater to moderately brackish waters



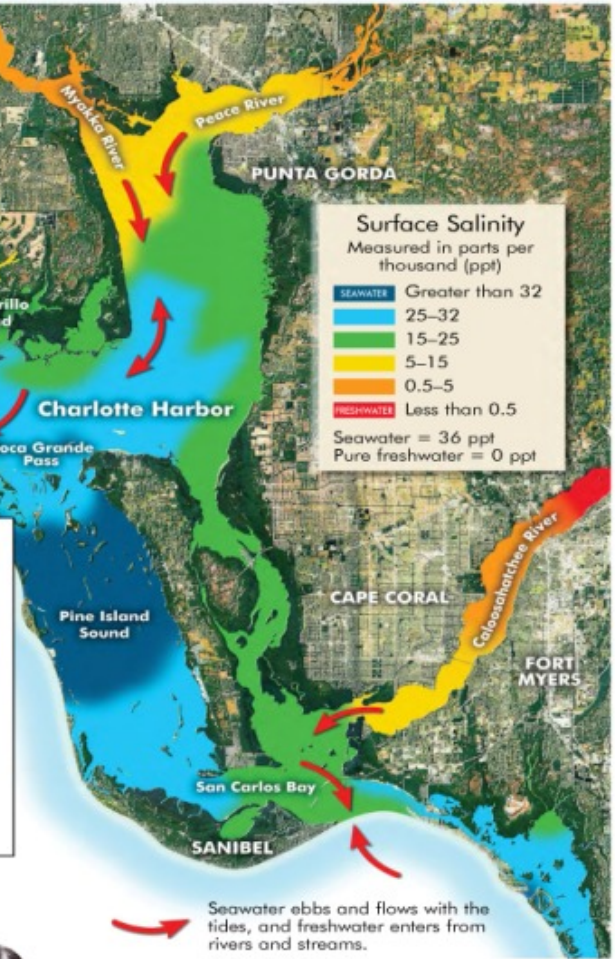
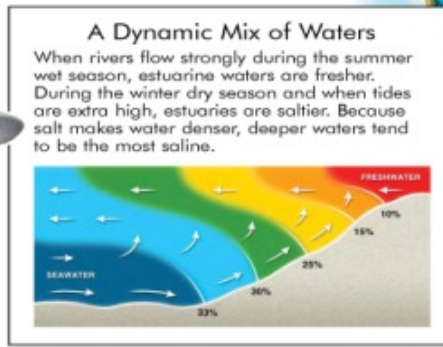
Wide ranging salinity — from seawater (or sometimes saltier) to freshwater



Moderate salinity — a brackish mix of freshwater and saltwater



Low salinity — from brackish to fresh waters



Seawater ebbs and flows with the tides, and freshwater enters from rivers and streams.

This salinity map of the Charlotte Harbor region depicts a typical condition in spring. Seasonal fluctuation in salinity comes from changes in rainfall and river flows. Monthly changes come from the Moon's influence on gulf tides.

Unless out of balance

*Depleted Natural Systems
Can Only Produce Algae*



Every waterbody needs plants



Let nature do the work for you

- Plants will take up nutrients
- Provide habitat for birds and fish
- Convert nutrients into desirable living things

Herbicides convert living plants into chemical nutrients that flow downstream to feed more algae

Canals offer potential



Kissimmee River, Florida



Singapore



Seoul



Stream Restoration is happening all over the world.

Why not us?



Los Angeles



No place for nutrients to become life

What is Stormwater?

Clean

- Starts as Rain

Huge Volume

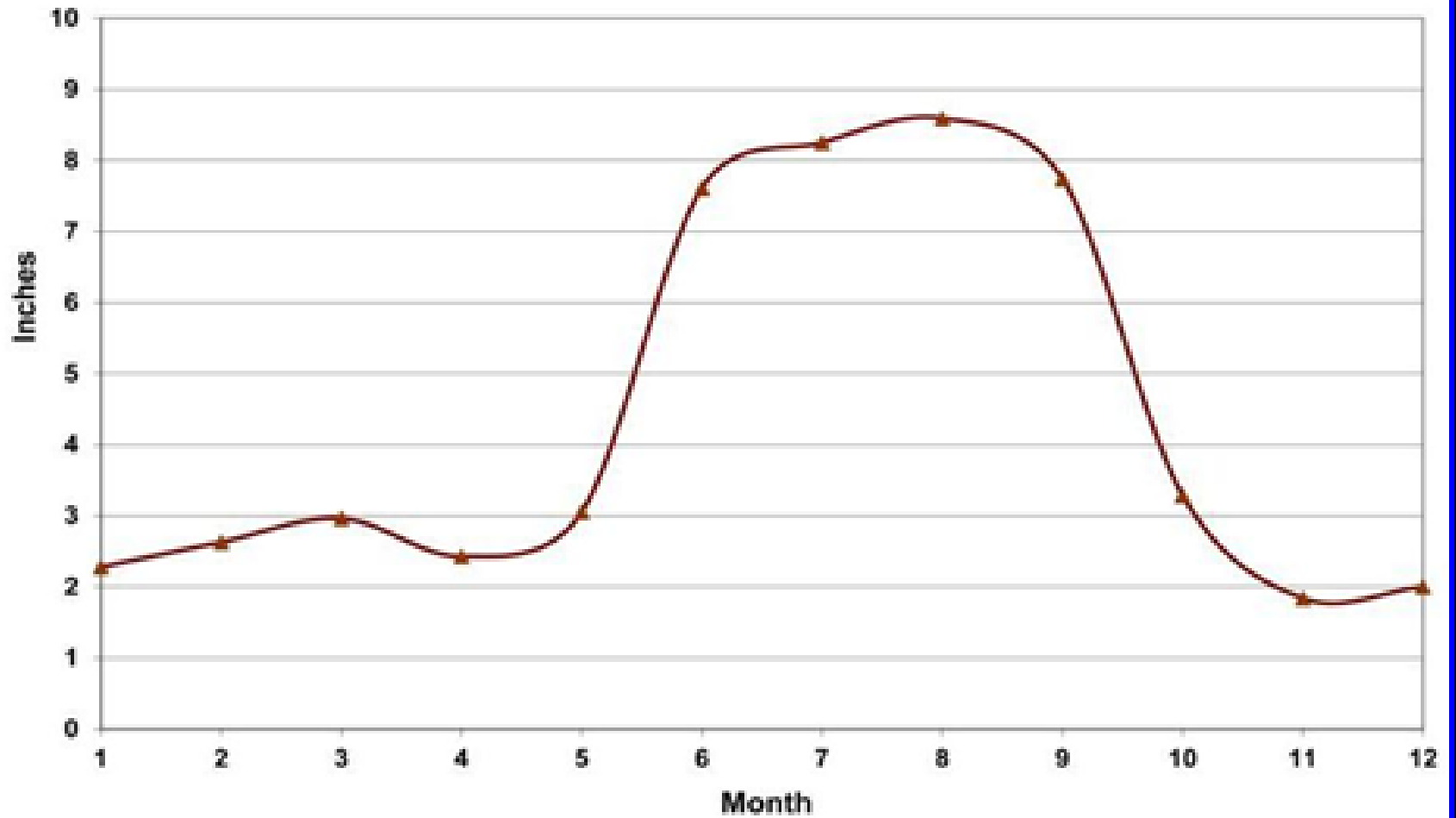
- 681 billion gallons rain/year in Sarasota County
- Picks up pollution as it flows
- Low concentration
- Adds up to a lot of pollutant load
- Volume increases with more impervious
- Ponds only 40% effective in removing nitrogen

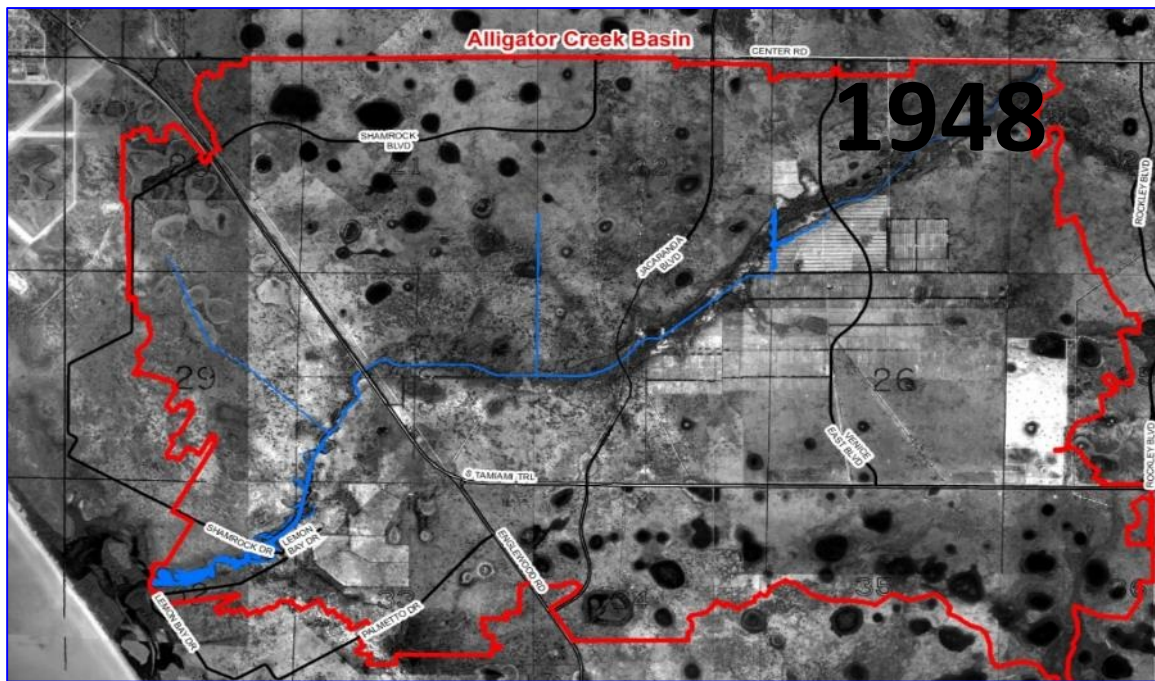
Statewide Stormwater Rule Proposed in 2009

Nutrients Post-Construction = Natural Condition

- Treatment Train removes nutrients as flows from one BMP to the next
 - Wet detention
 - Stormwater harvesting
 - Green roofs
 - Cistern systems
 - Pervious pavement
 - Bio-filtration
 - Retention
 - Exfiltration

Sarasota County Rainfall Average





Undeveloped Land

- No runoff in dry season
- Soaked in
- Puddles



Developed Land

- Roofs
- Roads
- Parking Lots
- Sidewalks
- All rain makes runoff
- Even dry season

What You Can Do



- Rain Barrels
- Flexi-Pave
- Pervious Pavers
- Bioswales
- Swales



Save the Swales

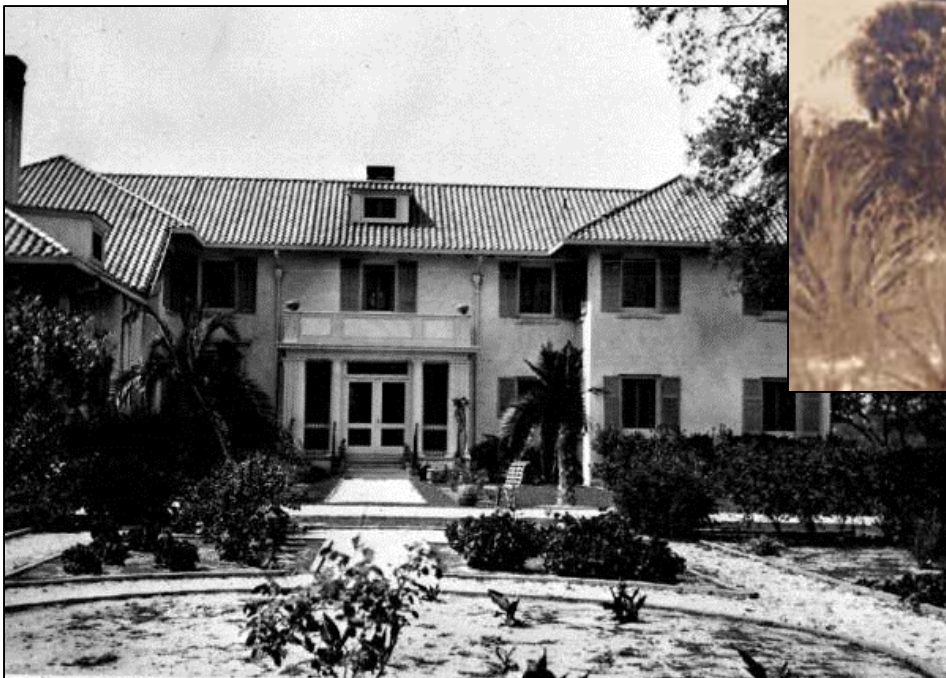


2010 Study comparing Swale Drainage to Curb Drainage

Mean Estimated Load (kg) in Surficial Runoff per acre*year			
Analyte	Curb and Gutter	Swale	Percent Reduction
Total Nitrogen	9.6	0.69	93%
Total Phosphorus	1.53	0.27	82%

*Grassy Swales:
Water soaks in and never makes it to the storm drain
No flow means no pollution
Resembles natural flow pattern*

*Sandy Soil
- not very fertile*



*Today these
landscapes are lush*

Keep our Bay
BLUE not GREEN

skip the fertilizer
June 1 - Sept. 30



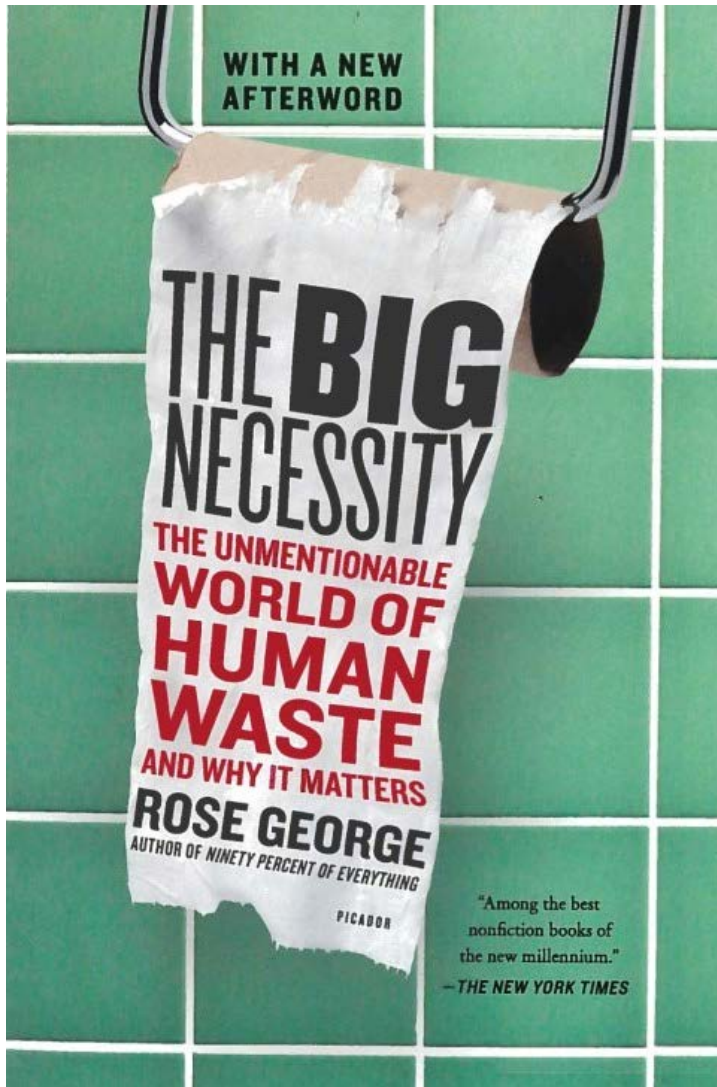


pick it up!
THERE IS NO
POOP FAIRY

What is Wastewater?

- Dirty
- Much less volume than Stormwater
(12B gal/year)
- Raw Sewage **30 mg/l Nitrogen**
- Secondary Treatment **20 mg/l Nitrogen**
- Advanced Treatment **<3 mg/l Nitrogen**
- Streams **1 to 2 mg/l Nitrogen**
- Sarasota Bay **0.4 mg/l Nitrogen**

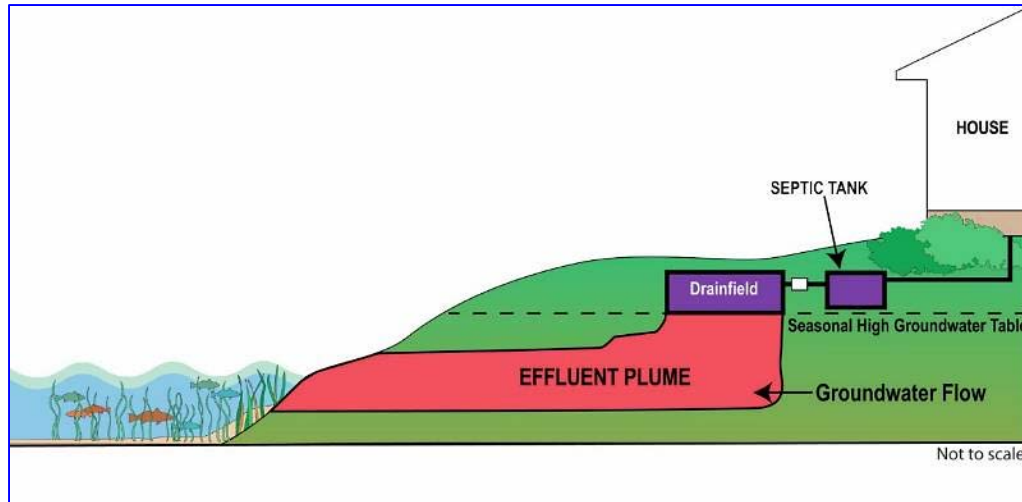
Disease Prevention



This is why the Liberian waiter laughed at me. He thought that I thought a toilet was my right, when he knew it was a privilege.

It must be, when **2.6 billion people don't have sanitation**. I don't mean that they have no toilet in their house and must use a public one with queues and fees. Or that they have an outhouse, or a rickety shack that empties into a filthy drain or pigsty. All that counts as sanitation, though not a safe variety. The people who have those are the fortunate ones. **Four in ten people have no access to any latrine, toilet, bucket, or box. Nothing.** Instead, they defecate by train tracks and in forests. They do it in plastic bags and fling them through the air in narrow slum alleyways. If

Septic Systems



Nutrient removing septic systems are an option

- Cost more \$\$

Careers Contact Us

 **SOUTH FLORIDA**
WATER MANAGEMENT DISTRICT

WHO WE ARE OUR WORK DOING BUSINESS WITH US COMMUNITY & RESIDENTS

Home >> News >> [OP ED 2018 0220 PETERSON SLE IRL SEPTIC](#)

Guest Column: Local Communities Must Step Up to Address Septic Pollution to St. Lucie River, Indian River Lagoon

NOTE: This guest column by SPWMD Governing Board member Melanie Peterson appeared in the February 2018 Issue of [Martin County Currents](#).

The St. Lucie River and Estuary in Martin County and the Indian River Lagoon are replete with natural beauty and recreational opportunities to be enjoyed by residents and visitors year-round. Unless, of course, it was during one of the 184 times the Florida Department of Health had to issue "No Swimming" advisories for beaches and other swimming spots in Martin County since 2002. The culprit - unsafe levels of bacteria in the water that can make people sick. Shedding some light on the cause are two recent peer-reviewed papers by Harbor Branch Oceanographic Institute, which point to the source of this beach-closing bacteria as septic system pollution.

Florida studies show nutrients coming from septic systems

- Indian River Lagoon
- Springs
- Florida Keys

Phillippi Creek Septic System Replacement Program

- 10,000 septics connected to central sewer
- More than 2 Million gallons per day NOT discharged under ground by septics

- 33 small wastewater treatment plants connected
- More than 7 Million gallons per day NOT discharged under ground

Expensive! \$120,000,000

Public Notice of Pollution

Florida Department of Environmental Protection

<https://floridadep.gov/pollutionnotice>

- Submit or Update Notice
- Subscribe to Receive Notifications
- View Submitted Notices

The screenshot shows the website for the Florida Department of Environmental Protection's Public Notice of Pollution. The page features a blue header with the DEP logo and navigation links for 'About DEP', 'How Do I...', 'Divisions', 'Air', 'Lands', 'Parks & Rec', 'Waste', and 'Water'. A search bar is located in the top right corner. The main content area is titled 'Public Notice of Pollution' and includes a sub-header 'FDDEP > DEP > Public Notice of Pollution'. The page is divided into two columns. The left column contains the following text: 'Protecting Florida's pristine environment is the Department of Environmental Protection's top priority. Pursuant to Section 402.077, F.S., the Department is establishing a method for regulated entities to submit Public Notices of Pollution for reportable releases. Additionally, the Department is making available to the public all notices received to date as well as offering an e-mail subscription service for interested parties to be informed of notices submitted for their area of interest. Reporting entities should be aware that, while submission of a notice through this website complies with the requirements of Section 402.077, F.S., it does not relieve them of any obligation to report to the [State Water Office](#). [Submit or Update Notice](#) While the preferred method for reporting is to use the link above, you may also report via email using the [Pollution Notice Form](#) and e-mailing it to pollution.notice@fla.state.gov. If you wish to receive notifications whenever a notice is submitted to the Department, you may sign up for our notification list below. [Subscribe to Receive Notifications](#) To view any notices that have been submitted under this statute, please click the link below. [View Submitted Notices](#) An archival listing of all notices submitted prior to July 1, 2017 can be found below:

- 01-03-2017 - 06-30-2017
- 06-28-2016 - 12-31-2016

The right column is titled 'Quick Links' and contains the following links:

- [Submit or Update Notice of Pollution](#)
- [Subscribe to Receive Notifications](#)
- [View Submitted Notices](#)
- [Section 402.077, F.S.](#)
- [Pollution Notice Form](#)
- [About Public Notice of Pollution](#)

Do Something – Work Together



South Gators, Riverview High, Suncoast
Waterkeepers, Sarasota Bay Watch, Sarasota
Bay Estuary Program, Sarasota County

Call Mollie!

- Plant a Shoreline
- Install a rain barrel
- Pervious Driveway
- Build a swale



Mollie Holland
NEST Coordinator
(941) 861-0672
mkholland@scgov.net

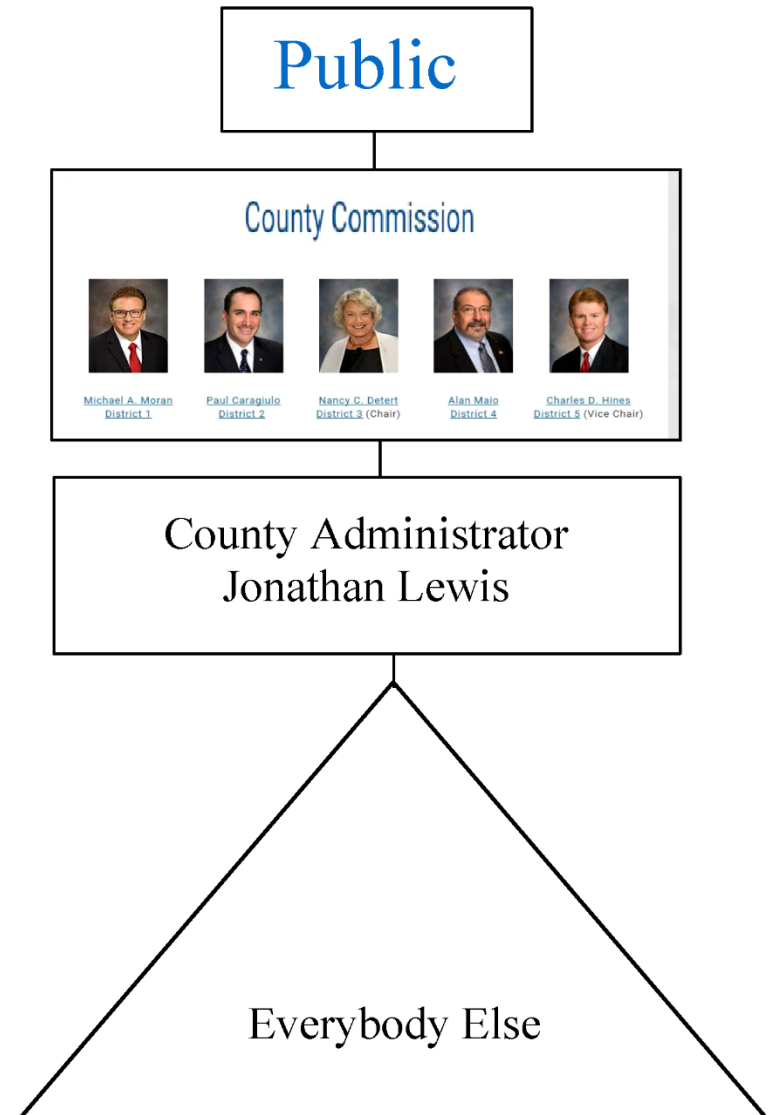
*It's her job to help
You*

Citizen Leaders

- Saved Caspersen Beach
- Made Total Maximum Daily Loads happen
 - Require cleanup of polluted bodies of water
 - Sued EPA 1998
 - Driving force in Florida today
- Recycling referendum
- Amendment 1
- Environmentally Sensitive Lands Program

Civics 101

- Participate!
- It's the American Way



Count Your Blessings



Why Not Phosphorus?

