Developing Numeric Nutrient Criteria for Southwest Florida Tidal Creeks

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Numeric Nutrient Criteria Goals

FEDERAL (EPA). *The national goals of the Clean Water Act are to "achieve, wherever attainable, water quality which provides for the protection and propagation of fish, shellfish, wildlife and recreation in and on the water"*

FLORIDA (FDEP). *Goals are to protect waters from "harmful" increase in nutrients that leads to "imbalance of flora and fauna"*

A Brief History of NNC Development in Florida

- 2009: EPA determined NNC were necessary to meet requirements of CWA
- 2010: Consent Decree set schedule for EPA to propose and promulgate NNC for all FL waters
- June 2012: FDEP submitted new WQS to EPA (including estuaries from Clearwater Harbor to Biscayne Bay).
- March, 2013: EPA and FDEP reached agreement in principle and proposed “A Path Forward”

The "Path Forward" Agreement

- EPA and FDEP reached agreement on March 15, 2013 to finalize NNC development.
- If successful, EPA would approve Florida's NNC and cease federal rulemaking.
- FDEP had to:
  - Adopt criteria for remaining estuaries.
  - Submit adopted NNC and Implementation document to EPA by August 1, 2013.
- June 28, 2013: EPA moved to modify the Consent Decree, stating there was no longer a basis for EPA to promulgate NNC.

FAC Chapter 62.302. Surface Water Quality Standards

(1). Estuary specific numeric interpretations of the narrative nutrient criterion.

*"Nutrient and nutrient response values <u>do not apply</u> to wetlands or to **tidal tributaries** that fluctuate between predominately marine and predominately fresh water during typical climatic and hydrologic conditions."* (Emphasis added)

Florida NNC for Freshwater Streams

- FDEP could not develop stressor-response relationships between nutrients and biological responses in streams
- Used a “weight of evidence” approach
  - In this case, they allowed for scenarios in which TN or TP thresholds are exceeded, but flora and faunal measures are met.
  - Streams were found to be healthy and well balanced.

Tidal creeks are expected to possess water quality characteristics that differ from freshwater systems and the open estuary. Why?

Direct connection and proximity to watershed sources of nutrients **AND** smaller volume relative to open estuary **EQUAL** relatively high nutrient and chlorophyll (and low dissolved oxygen) compared to downstream waterbodies

Where do Tidal Creeks Fall?

- We posited that tidal creeks should have NNC, and that they should be separate from those derived for freshwater streams or open estuaries that are "predominantly marine".
- However, FAC currently defines predominantly marine waters by:
  - chloride > 1500 mg/L or
  - specific conductance values ≥ to 4,580 µmhos/cm
  - which equates to a salinity of approximately 2.7 PSU
- Thus, Florida essentially "lumps" tidal creeks in with the open bay estuarine systems.

What are the differences between freshwater (stream) and estuarine thresholds in the new NNC?

NUTRIENT REGION	TN THRESHOLD	TP THRESHOLD	CHLOROPHYLL a
FRESHWATER (STREAMS)			
Peninsula	1.54 mg/L	0.12 mg/L	20.0 µg/L
West Central	1.65 mg/L	0.49 mg/L	20.0 µg/L
ESTUARINE SEGMENTS			
Roberts Bay	0.54 mg/L	0.23 mg/L	11.0 µg/L
Little Sarasota Bay	0.60 mg/L	0.21 mg/L	10.4 µg/L
Blackburn Bay	0.43 mg/L	0.21 mg/L	8.2 µg/L
Charlotte Harbor	0.67 mg/L	0.19 mg/L	6.1 µg/L
Estero Bay	0.63 mg/L	0.07 mg/L	5.9 µg/L

Florida Dissolved Oxygen Standards

- Previous Standard (Based on Concentration)
  - Freshwater: Shall not be less than 5.0 mg/L.
  - Marine: Shall not average less than 5.0 in a 24-hr period. Never less than 4.0 mg/L.
- New Standard (Based on Saturation)
  - Freshwater: No more than 10% of daily average percent saturation values shall be less than 38%
  - Marine:
    - Daily average not below 42% in more than 10% of values
    - Seven day average not below 51% more than once in any twelve week period.
    - Thirty day average not below 56% more than once per year

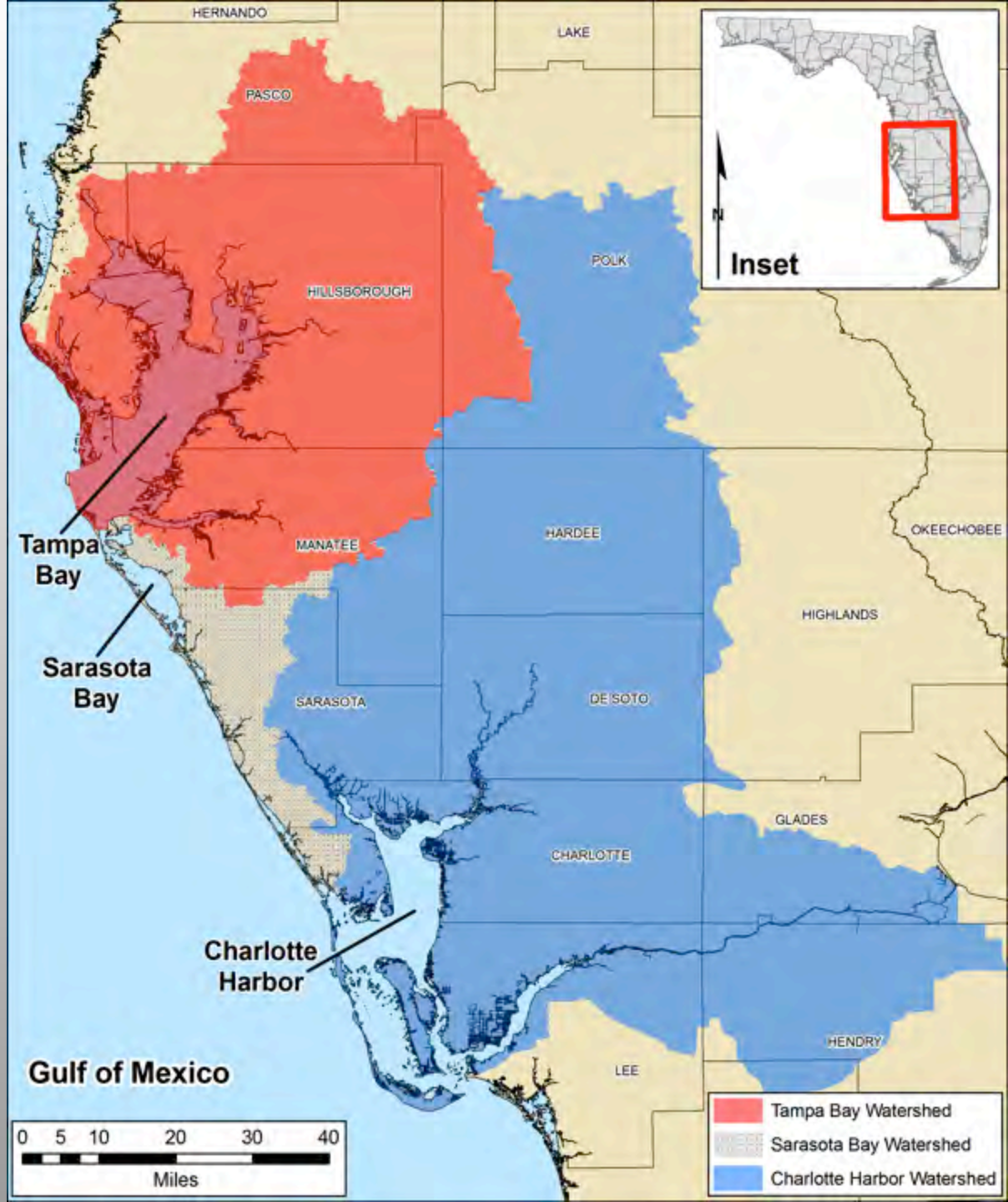
Why Should the NEPs Care About Tidal Creek Nutrient Criteria?

- TBEP
  - Bay Habitat Action Plan: "Develop restoration and protection goals and targets for tidal streams and creeks in the Tampa Bay system."
- SBEP
  - Fisheries / Living Resources Action Plan: "Improve tributary habitats with special emphasis on juvenile life stages."
- CHNEP
  - Water Quality Degradation: "Develop WQ criteria that are protective of living resources."

Project Goal Statement

"To develop management level criteria to protect the biological integrity of tidally influenced creeks in Southwest Florida from anthropogenically induced harmful increases in nutrients."

Collective Watersheds of the three contiguous SW Florida National Estuary Programs



The SW Florida Coastal Eco-region is Homogeneous With Regard to:

Physiography	Gulf Coastal Lowlands	Cooke, 1939
Geography	Western Flatlands	Davis, 1943
Coastal Classification	West-Central Barrier Chain	Davis, 1997
Geology	Coastal Lowlands	Puri & Vernon, 1964
Exposed Aquifer	Surficial	Miller, 1990
Environmental Geology	Shelly Sand and Clay	Kautz et al.,1998
Soils	Spodosols	Carlisle, 1981
Sediments	Holocene Quartz Sand	Hayes, 1975
Marine Geology	Peorian	Wilhelm & Ewing, 1972
Shoreline Type	Sandy Coast	Johnson & Barbour, 1990
Wave Climate	Low	Tanner, 1960
Tides	Mixed	Provost, 1973

From Estevez, MML Tidal Creek Workshops

… And Also With Respect to

Tides	Microtidal	Nummedal et al., 1977
Sea Level Rise	Eustatic-Dominated	National Academy, 1987
Climate	Sub-humid meso-thermal	Henry, 1998
Hurricane Risk	17.5 Percent	NOAA/NWC, 2002
Hydrology	SWCFGW Basin	Estevez et al., 1991
River Type	Sand-Bottomed	Beck, 1965
River Type	Blackwater	Nordlie, 1990
Terrestrial Botany	Pine Flatwoods	Abrahamson & Hartnett, 1990
Marine Botany	Tropical	Earle, 1969
Marine Zoology	Transitional	Collard & D'Asaro, 1973
Ecoregion	SW Florida Flatwoods	Barbour et al., 1996

From Estevez, MML Tidal Creek Workshops

Features of SW Florida Tidal Creeks

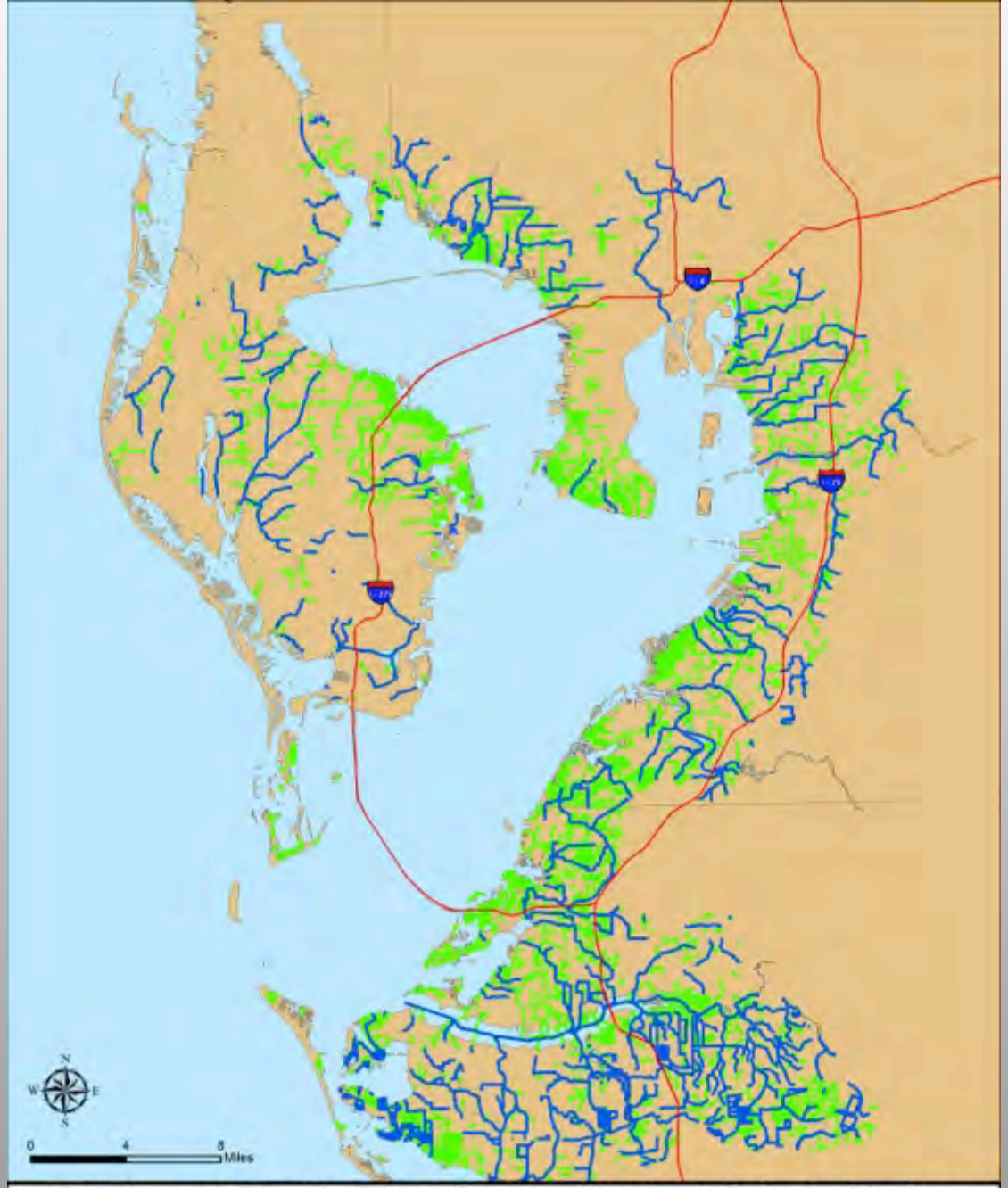
- Mangroves are the dominant shoreline vegetation
- Most are relatively narrow (25 – 50 m across) and short
- Generally highly colored with reduced water clarity (devoid of seagrass)
- Productivity is linked to benthic algal over water-column phytoplankton
- Dissolved oxygen (DO) routinely falls below current state standards (although DO does not appear to limit fish abundance or richness)
- Currently a lack of empirical data to establish stressor-response relationships

Fisheries Information from SW Florida Tidal Creeks

- Over 150 taxa of fish and invertebrates.
- At least 24 species of economic value (spot, mullet, red drum, penaeid shrimp, blue crabs).
- Common snook use tidal creeks as a nursery during their juvenile stage.
- Higher fish densities relative to adjacent bay and tidal river habitats (especially juvenile snook).

Population of SW Florida Tidal Creeks

- Used hydrography to guide selection of the population of tidal creeks.
  - 1:24,000
  - 1:100,000
- 306 Creeks were identified from the 1:100,000 NHD data set from all three estuaries.



Southwest Florida Tidal Creeks Nutrient Criteria Project

National Hydrography Dataset

NHD 1:100,000 — NHD 1:24,000

Map Publication #1303 004

Southwest Florida Tidal Creeks Nutrient Criteria Project

National Hydrography Dataset

NHD 1:100,000 NHD 1:24,000

Map Publication #1303 016

Southwest Florida Tidal Creeks Nutrient Criteria Project

National Hydrography Dataset

NHD 1:100,000 NHD 1:24,000

Map Publication #1303 029

Project Elements

1. Develop a definition of tidal creeks
2. Refine the conceptual model(s) used to develop estuarine NNC
3. Identify specific data needs and methods (physical parameters, nutrients, response variables and fish communities)
4. Creek selection. Develop a classification scheme to assist in the selection of 16 creeks for sampling

Project Elements (Cont.)

5. Sampling Design

   Consider temporal and spatial variability with respect to hydrology, tidal influence, nutrient condition and ecological response

6. Data Collection. (Began November 18th)
7. Data Analysis Approaches. Follow those approaches used in establishing NNC in SW Florida estuaries
8. Propose a Uniform Assessment Tool for Developing NNC in Tidal Creeks
9. Make Recommendations for Implementation and Compliance Assessment

Additional Project Elements

- FDEP: Continuous dissolved oxygen metering in a subset of nine study creeks
- USF: Zooplankton and hyperbenthos monitoring in a subset of six Tampa Bay tidal creeks

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