



# Numeric Nutrient Criteria: The Continuing Florida Saga

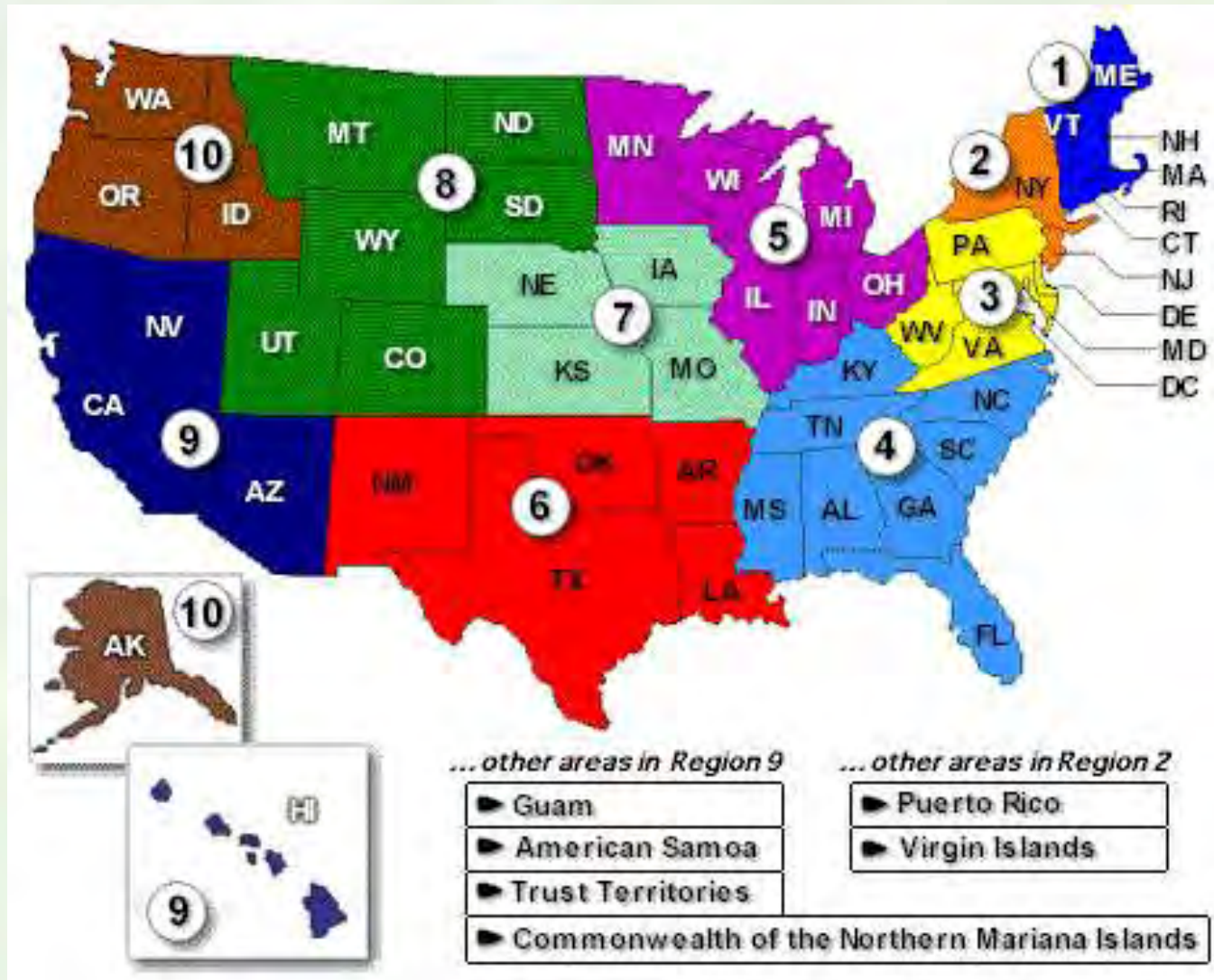
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NALMS 19<sup>th</sup> Annual Southeastern Lakes Management Conference  
May 6, 2010



# USEPA: Region IV





# Water Quality Standards

Define the goals for a waterbody

- **Designated Uses** of the waterbody (e.g. recreation, water supply, aquatic life, agriculture)
- Water quality **criteria to protect designated uses** (numeric pollutant concentrations and narrative requirements)
- An **antidegradation policy** to maintain and protect existing uses and high quality waters



# Section 303(d) of CWA

- Requires states to:
  - Develop lists of **impaired waters** (technology-based regulations and other required controls are not stringent enough to meet the water quality standards set by states)
  - Establish **priorities** for waters on the list
  - Develop **TMDLs** for waters on the 303(d) List (40C.F.R.

§130.7(b)(4))



# Region 4 Impaired Waterbodies (303d list)

- AL (190)
  - FL (829)
  - GA (930)
  - KY (736)
  - MS (378)
  - NC (902)
  - SC (915)
  - TN (960)
- \* National “Winner” – PA  
(6957)



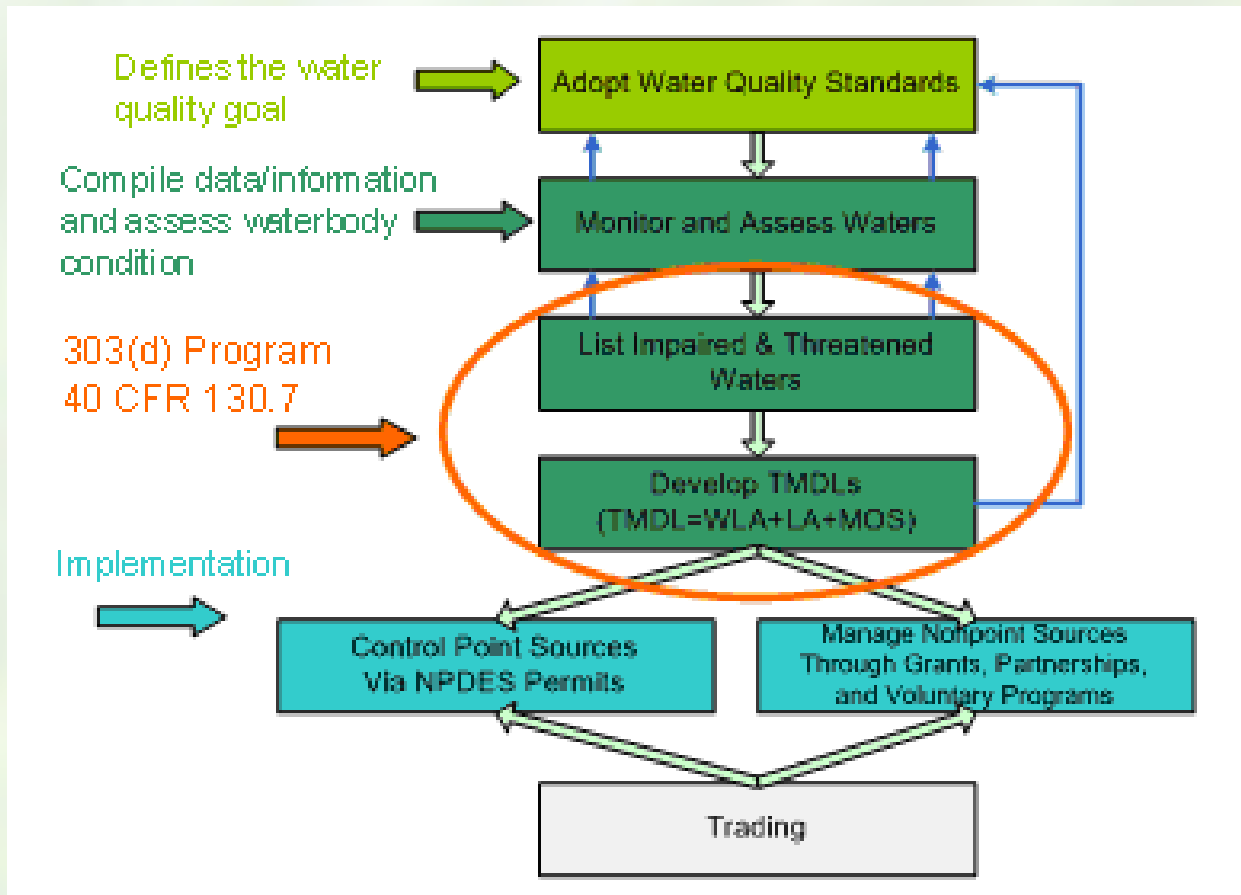
# National Impairments

- Pathogens (10,247)
- Mercury (7,966)
- Metals (other than mercury) (7164)
- Nutrients (6,900)
- Sediment (6,477)



# Water Quality Based Approach of CWA

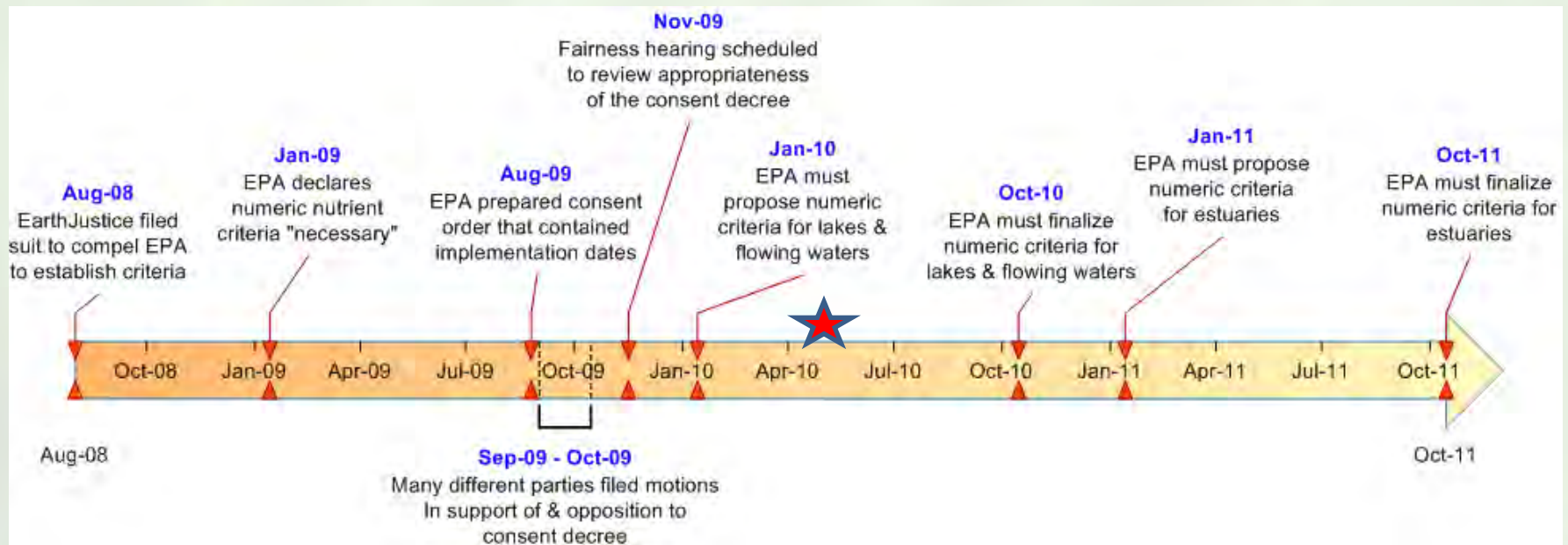
Designed to achieve the desired uses of a water





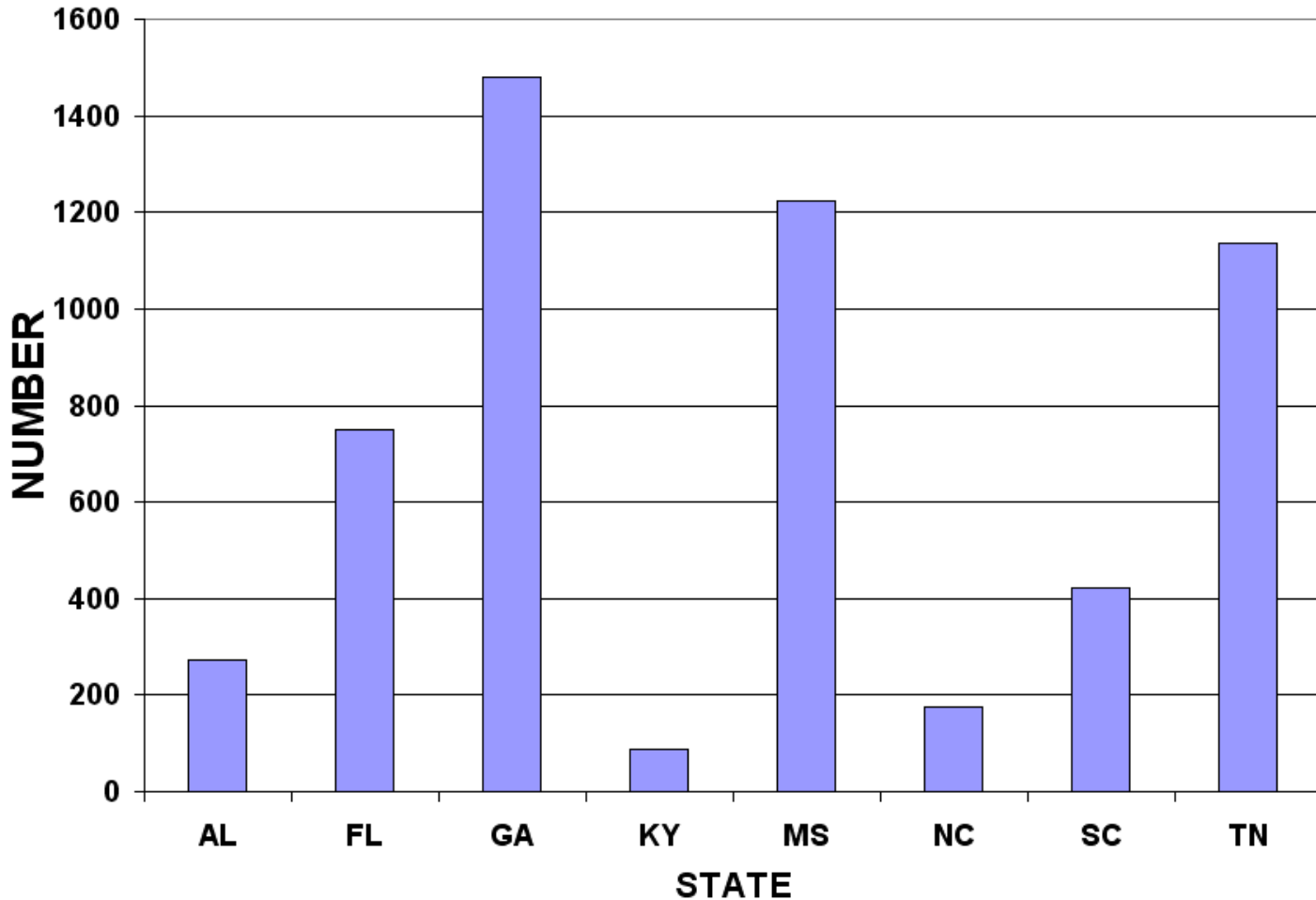
# Litigation

- > 45 legal actions nationally
- Multiple lawsuits filed in Region 4





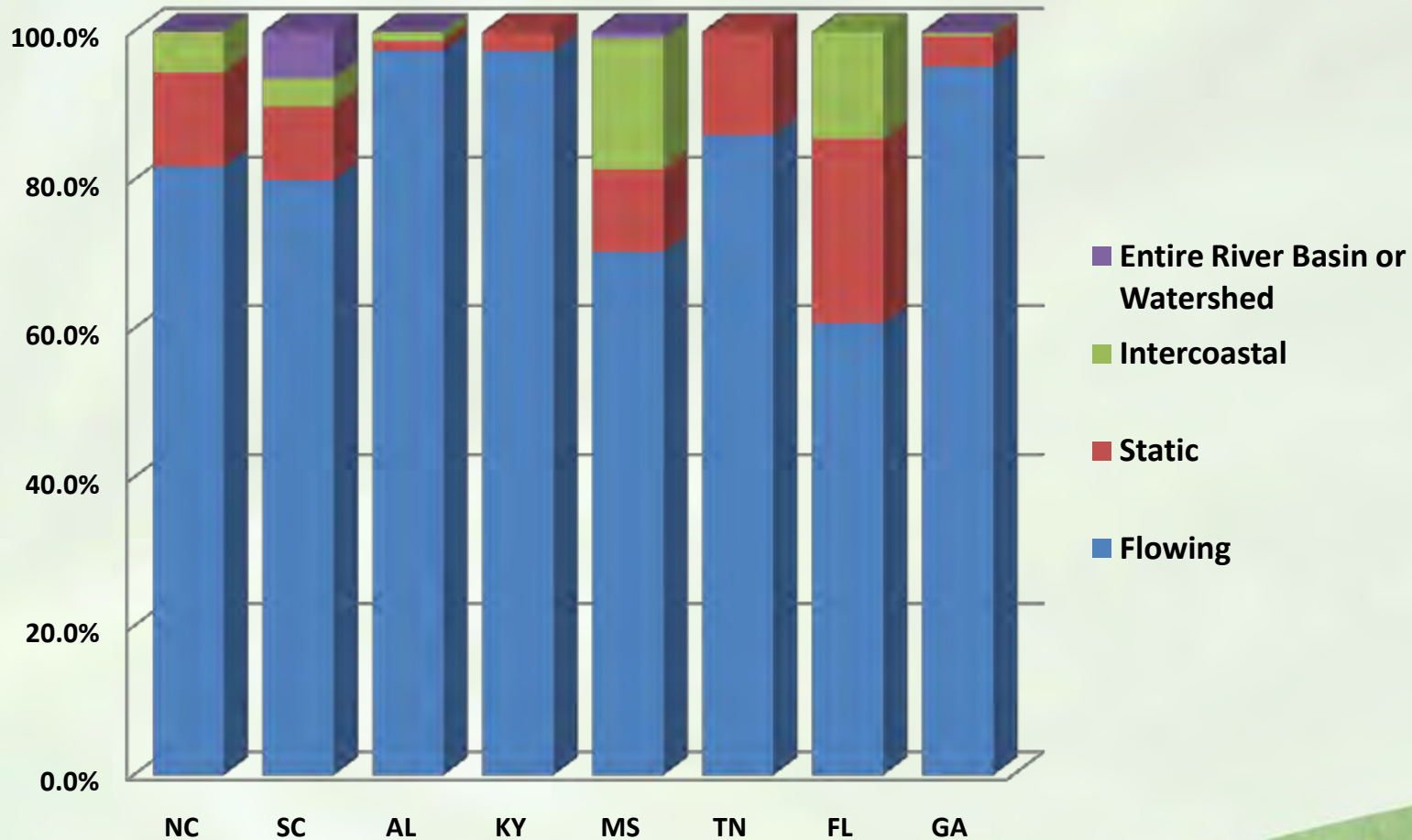
# Region 4 TMDLs by State



\* Totals including each parameter

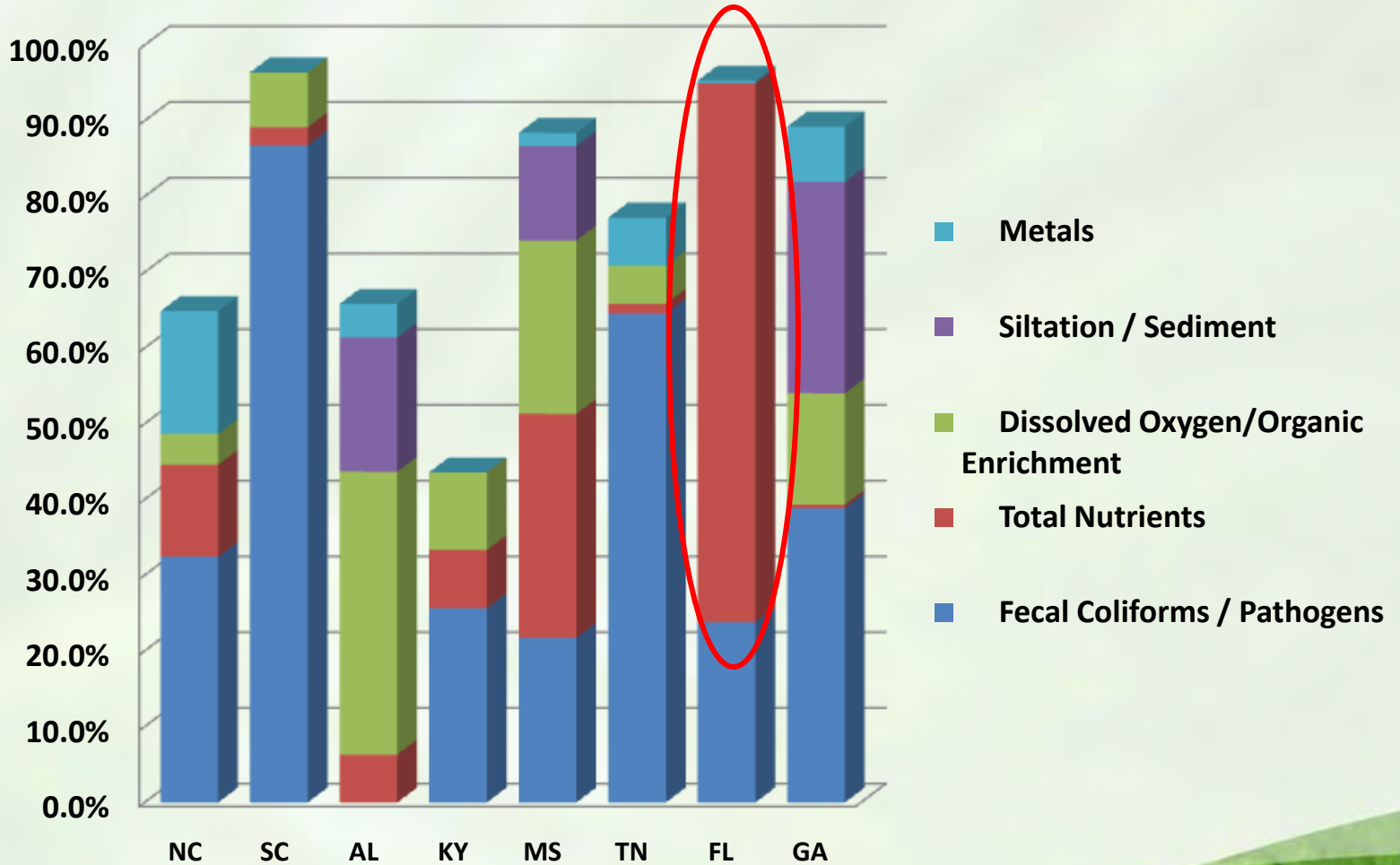


# Types of Impaired Waterbodies with Final TMDLs by State





# Top Constituents for Final TMDLs by State





# Numeric Nutrient Status



USEPA 2008



# Numeric Criteria – Status

(USEPA 2008)

Waterbody Type	N	P	Chl a
Lakes/Reservoirs	GA*, SC*	GA*, SC*	AL*, GA*, NC, SC*, TN*
Rivers/Streams		GA*	NC
Estuaries			NC
Wetlands		FL*	



# Numeric vs. Narrative?

- Regulating a nutrient like a toxin
- A line in the sand is readily understood
- Provides measureable benchmark
- “Faster” and “simpler” permitting and TMDL development
- A line in the sand (for nutrients) makes little sense scientifically
  - SSACs (TMDLs?)
- Everything is “water-body” specific



# Approaches

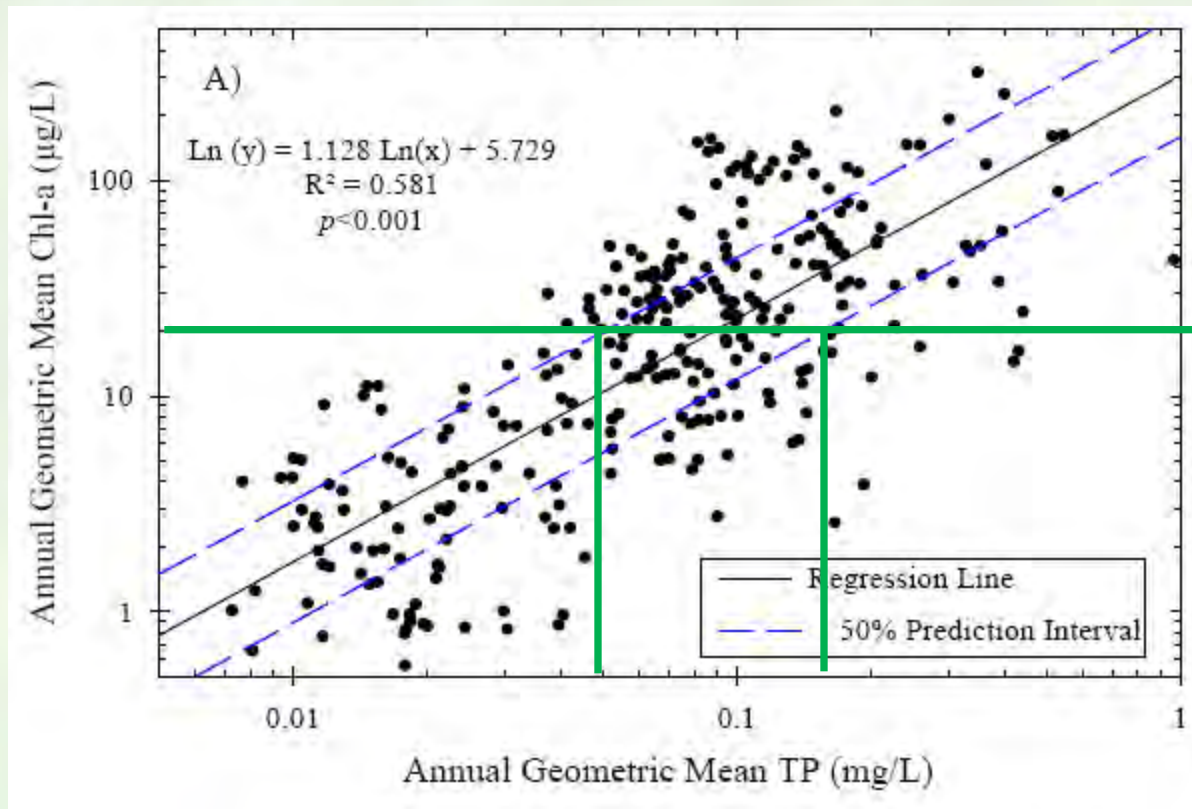
- Eco-regions
- Site-specific
- Line in the sand
- Head in the sand (or in this case, under water)





# Lake: In-stream Protection Values

Derivation of criteria value that prevents excess phytoplankton.



20 µg/L



# Lakes: In-stream Protection Values

Establish Chlorophyll *a* threshold to prevent excess algae in the form of phytoplankton.

<b>A</b>	<b>B</b>	<b>C</b>		<b>D</b>		<b>E</b>		<b>F</b>	
Long Term Average Lake Color and Alkalinity	Chlorophyll <i>a</i> <sup>f</sup> (µg/L) <sup>a</sup>	Baseline Criteria <sup>b</sup>				Modified Criteria (within these bounds) <sup>c</sup>			
		TP (mg/L) <sup>a</sup>	TN (mg/L) <sup>a</sup>	TP (mg/L) <sup>a</sup>	TN (mg/L) <sup>a</sup>	TP (mg/L) <sup>a</sup>	TN (mg/L) <sup>a</sup>	TP (mg/L) <sup>a</sup>	TN (mg/L) <sup>a</sup>
Colored Lakes > 40 PCU	20	0.050	1.23	0.050-0.157	1.23-2.25				
Clear Lakes, Alkaline ≤ 40 PCU <sup>d</sup> and > 50 mg/L CaCO <sub>3</sub> <sup>e</sup>	20	0.030	1.00	0.030-0.087	1.00-1.81				
Clear Lakes, Acidic ≤ 40 PCU <sup>d</sup> and ≤ 50 mg/L CaCO <sub>3</sub> <sup>e</sup>	6	0.010	0.500	0.010-0.030	0.500-0.900				

Criteria may be modified within these bounds if Chlorophyll *a* is attained.

May not be modified above applicable stream criteria in outflow from lake.

<sup>a</sup> Concentration values are based on annual geometric mean not to be surpassed more than once in a three-year period. In addition, the long-term average of annual geometric mean values shall not surpass the listed concentration values. (Duration = annual; Frequency = not to be surpassed more than once in a three-year period or as a long-term average).



# Flowing Waters: In-stream Protection Values

Nutrient Watershed Region	Instream Protection Value Criteria	
	TN (mg/L) <sup>a</sup>	TP (mg/L) <sup>a</sup>
Panhandle <sup>b</sup>	0.824	0.043
Bone Valley <sup>c</sup>	1.798	0.739
Peninsula <sup>d</sup>	1.205	0.107
North Central <sup>e</sup>	1.479	0.359

<sup>a</sup> Concentration values are based on annual geometric mean not to be surpassed more than once in a three-year period. In addition, the long-term average of annual geometric mean values shall not surpass the listed concentration values. (Duration = annual; Frequency = not to be surpassed more than once in a three-year period or as a long-term average).

## South Nutrient Watershed Region

	Chlorophyll <i>a</i> (µg/L) <sup>a</sup>	Total Phosphorus (TP) (mg/L) <sup>a, b</sup>	Total Nitrogen (TN) (mg/L) <sup>a</sup>
Canals	4.0	0.042	1.6

<sup>b</sup> Applies to all canals within the Florida Department of Environmental Protection's South Florida bioregion, with the exception of canals within the Everglades Protection Area (EvPA) where the TP criterion of 0.010 mg/L currently applies.





# Streams: Downstream Protection Values

## Protection of Downstream Lakes

$$[\text{TP}]_s = \frac{1}{c_f} [\text{TP}]_L (1 + \sqrt{\tau_w})$$

where

$[\text{TP}]_s$  is the total phosphorus (TP) downstream lake protection value, mg/L

$[\text{TP}]_L$  is applicable TP lake criterion, mg/L

$c_f$  is the fraction of inflow due to all streamflow,  $0 \leq c_f \leq 1$

$\tau_w$  is lake's hydraulic retention time (water volume divided by annual flow rate)

The term  $(1 + \sqrt{\tau_w})$  expresses the net phosphorus loss from the water column (e.g., via settling of sediment-sorbed phosphorus) as a function of the lake's retention time.

(B) The preset values for  $c_f$  and  $\tau_w$ , respectively, are 0.5 and 0.2. The State may

### Using Default Values

Colored Lakes:  $[\text{TP}]_s = 0.12$  mg/L

Colored/Alkaline Lakes:  $[\text{TP}]_s = 0.073$  mg/L

USEPA 2010



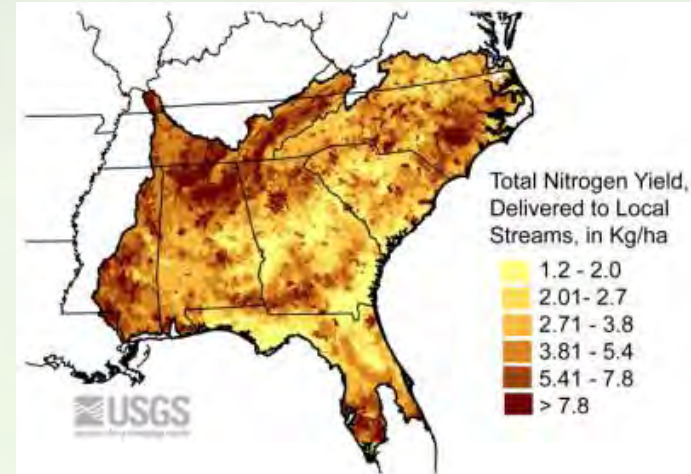
# Streams: Downstream Protection Values

## Protection of Downstream Estuaries

$$\bar{C}_i = kL_{est} \frac{1}{Q_w F_i},$$

and where the terms are defined as follows for a specific or ( $i^{\text{th}}$ ) stream reach:

- $\bar{C}_i$  maximum flow-averaged nutrient concentration for a specific (the  $i^{\text{th}}$ ) stream reach consistent with downstream use protection (i.e., the DPV)
- $k$  fraction of all loading to the estuary that comes from the stream network resolved by SPARROW
- $L_{est}$  protective loading rate for the estuary, from all sources
- $\bar{Q}_w$  combined average freshwater discharged into the estuary from the portion of the watershed resolved by the SPARROW stream network
- $F_i$  fraction of the flux at the downstream node of the specific ( $i^{\text{th}}$ ) reach that is transported through the stream network and ultimately delivered to estuarine receiving waters (i.e. Fraction Delivered).

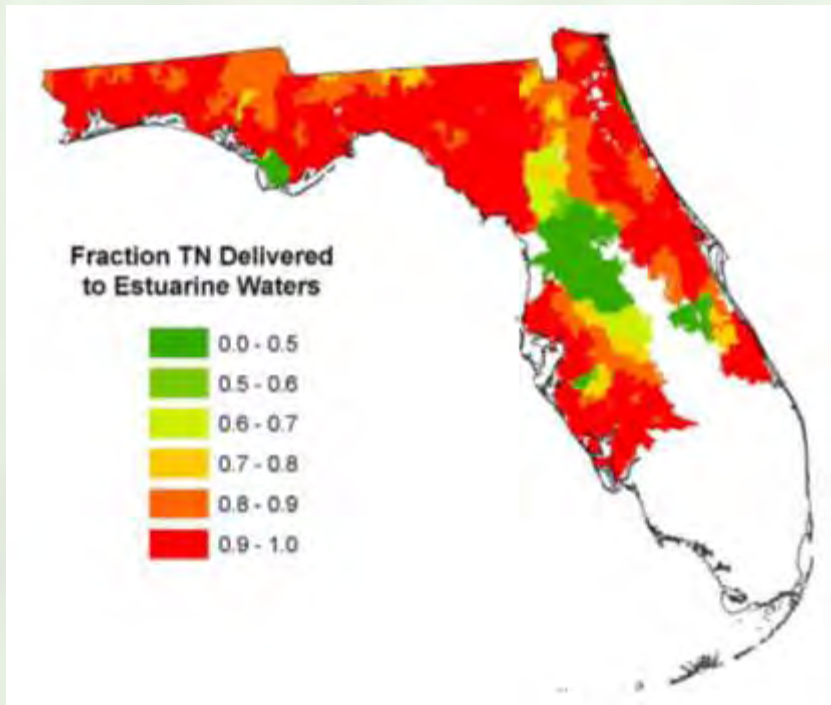


USEPA 2010



# Streams: Downstream Protection Values

## Protection of Downstream Estuaries



Estuary Drainage Area	TN Criteria at > 90% Delivered
Perdido Bay	0.30 mg/L
Pensacola Bay	0.43
Choctawhatchee Bay	0.43
St. Andrews Bay	0.24
Apalachicola Bay	0.46
Apalachee Bay	0.53
Suwannee River	0.55
Waccasassa Coastal	0.40
Tampa Bay	0.56
Sarasota Bay	0.54
Charlotte Harbor	0.95
Indian River	0.69
St. Johns River	0.70
Nassau Coastal	0.30
St. Mary's River	0.34

USEPA 2010



# Comments?

**“In our opinion, the proposed USEPA numeric nutrient criteria are not scientifically defensible.”**

Roger Bachman, Ph.D.

Daniel Canfield, Ph.D.

Mark Hoyer, current NALMS president

From UF's comments submitted to the administrative record  
(April 2010)

# Unintended Consequences



- FDEP analyses show that 80% of reference streams would not meet the proposed criteria

Florida Today, Dec 2009



# Unintended Consequence

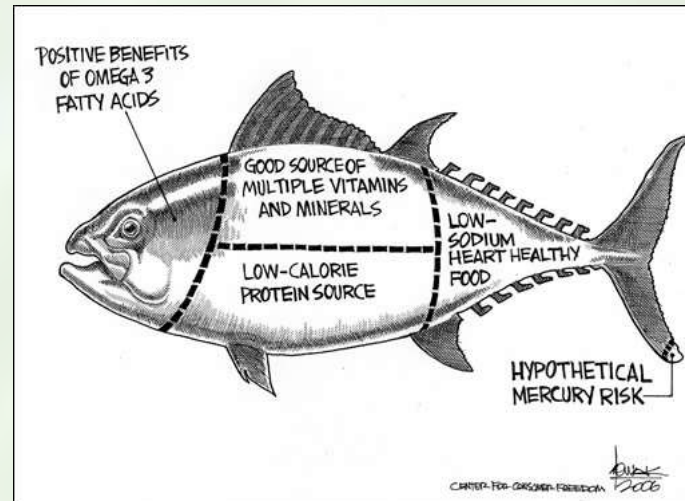
- “Water wars” to include quality, not only quantity
  - More than state boundaries
  - Communities “upstream”
- “Good data haunting Florida”
  - 800,000+ data points
  - Other state monitoring programs
  - More will be necessary for SSACs





# Some Evolving Issues

- Stormwater Source, TMDLS and Implementing NPDES Permits
- Downstream Protective Criteria
- Estuary Wildcards
- Litigation
- Water Reuse
- Mercury
- Emerging Contaminants





# Questions?



Emerging Impairment:

- Fire?