FLORIDA LEAGUE OF CITIES, INC.

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February 19, 2013

Via Electronic Submission

Elizabeth Southerland, Director
Office of Science and Technology
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Ave., N.W.
Washington, D.C. 20460

Water Docket
U.S. Environmental Protection Agency,
Mail Code: 2822T
1200 Pennsylvania Ave., NW
Washington, DC 20460

RE: Docket ID No. EPA-HQ-OW-2010-0222; Proposed Water Quality Standards for the State of Florida's Estuaries, Coastal Waters, and South Florida Inland Flowing Waters, 77 Fed. Reg. 74,924 (Dec. 18, 2012).

Dear Director Southerland,

The Florida League of Cities, Inc. ("League") and the Florida Stormwater Association ("Association") submit the following comments in response to the U.S. Environmental Protection Agency's ("EPA") proposed water quality standards for the State of Florida's Estuaries, Coastal Waters, and South Florida Inland Flowing Waters, 77 Fed. Reg. 74,924 (Dec. 18, 2012). As detailed below, the League and Association (1) have a substantial interest in the issue, (2) support EPA's proposal to withdraw the downstream protective value ("DPV") requirements for South Florida canals, (3) request that EPA withdraw its proposed criteria for estuaries, and (4) ask that EPA withdraw its proposed criteria for coastal waters.

1. SUBSTANTIAL INTERESTS IN THE PROPOSED RULE

Per its charter, the League serves as the voice of Florida's municipalities before the legislative, executive, and judicial branches of the state and federal governments. The League is a voluntary organization whose members include over four hundred municipalities and two charter counties. On behalf of its members, the League works for the general improvement and efficient administration of municipal governance throughout Florida.

The Florida Stormwater Association (Association) is a voluntary, non-profit Florida corporation organized under subsection 501(c)(4) of the Internal Revenue Service Code. There are over 280 organizational members of FSA, primarily consisting of municipal and county governments that must obtain and comply with Municipal Separate Storm Sewer System (MS4) permits. FSA's membership also includes various water control districts, Water Management Districts, academic institutions, and consulting and engineering firms. All of our members have an interest in stormwater management and surface water quality. The Association has been actively involved in the development of water quality policy and the implementation of water quality improvement programs in Florida for the past 20 years.

Together the League, the Association, their members, and their citizens have an enduring, substantial interest in the availability of safe, clean water. To this end, many members operate their own stormwater utilities – to remove excess nutrients from the water. Some operate their own wastewater utilities – again, to remove excess nutrients from the water. And thirty-four members operate their own municipal electric utilities – to provide another essential infrastructure service. Sound nutrient regulation would support the work currently being done by League and Association members. Ill-conceived regulation would undermine this work. The League and Association thus have a substantial interest in EPA's proposed rule.

2. WITHDRAWAL OF ALL PROPOSED SOUTH FLORIDA CANAL CRITERIA

For South Florida canals, instead of setting instream criteria, EPA's proposal establishes a hierarchy for setting DPVs: simulation models, a reference condition approach, "dilution models," or Total Nitrogen ("TN") and Total Phosphorus ("TP") criteria for receiving waters. *See* 77 Fed. Reg. at 74,640 – 74,963; Volume III of the Technical Support Document. EPA further notes that it "does not intend to finalize these DPVs if the district court modifies the Consent Decree consistent with EPA's amended determination that numeric DPVs are not necessary to meet [Clean Water Act] requirements in Florida. 77 Fed. Reg. at 74,960.

The League and Association generally support any decision *not* to set instream criteria for highly channelized waters, like South Florida canals. Also, the League and Association support EPA's proposal *not* to finalize the DPVs for the reasons discussed in its proposed rule and amended determination. These positions are a reflection of the best available science, and the unique nature of South Florida canals.

In fact, EPA's own Science Advisory Board, scientists from the Florida Department of Environmental Protection's ("FDEP"), and scientists from the regulated community all agree that there is an inadequate basis to derive and establish defensible criteria for South Florida canals. Specifically, "the SAB was not convinced by the available data that nutrient criteria based on instream protection values were meaningful for man-made and managed canals." SAB, *Review of EPA's Draft Approaches for Deriving Numeric Nutrient Criteria for Florida's Estuaries,* *Coastal Waters, and Southern Inland Flowing Waters* 4-5 (July 19, 2011). The SAB further noted that South Florida "canals do provide ecosystem services, but habitat quality and flows – rather than nutrients – have the greatest influence on biological condition in these managed waters." *Id.* Similarly, FDEP could not establish scientifically defensible numeric criteria for South Florida canals, i.e., criteria set at levels where the addition of nutrients causes an imbalance or flora or fauna. *See* FDEP's NNC Rule. After considering the issue as part of a *de novo* hearing, an administrative law judge agreed with FDEP's assessment. *See Florida Wildlife Fed'n v. FDEP,* 2012 WL 2118200, *12 (Fla. Div. Admin. Hrgs. 2012). And comments provided by farmers in South Florida, as well as scientific consultants that routinely study nutrient loading in South Florida, show that South Florida's unique soils (some of which, for example, are naturally high in nitrogen) and the highly channelized nature of most waters preclude the establishment of defensible numeric nutrient criteria. *See* Comments by Florida Sugar Cane League, U.S. Sugar Corporation, Florida Crystals Corporation, and the Sugar Cane Growers Cooperative of Florida Regarding EPA's Proposed Water Quality Standards for the State of Florida's Lakes and Flowing Water, 75 Fed. Reg. 4,173 (Jan. 26, 2010).[1] As such, the League and Association ask EPA to withdraw its proposal for South Florida.

3. WITHDRAWAL OF ALL PROPOSED ESTUARY CRITERIA

The League and Association similarly urge EPA to withdraw is proposed TN, TP, and chlorophyll-a criteria for Florida's estuaries. *See* Fed. Reg. 74,951-56. EPA's proposed estuary criteria are unnecessary because Florida's estuaries are already subject to FDEP's numeric criteria, finalized nutrient total maximum daily loads ("TMDLs"), or await development of numeric criteria in accordance with a codified rulemaking schedule.[2]

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[1] It is clear from the proposed rule that EPA is not soliciting comments on its decision to exclude waters within Everglades Agricultural Area, Miccosukee and Seminole Lands, and the Everglades Protection Area. *See* 77 Fed. Reg. at 74,925 (excluding waters from the "Purpose of Regulatory Action" section), 74,925 (noting that these water fall outside the scope of this rulemaking), 74,926 (excluding waters from "Summary of Major Provisions" section), 74,927-28 (excluding specifically these waters from section titled "[w]hich water bodies are affected by this rule"), 74,962 (failing to propose instream criteria for these waters), 74,962 (asking in its "request for comment" for comments on its DPV-only approach and "on the alternative approach of deriving instream criteria for south Florida inland flowing waters *outside of the lands of the Miccosukee and Seminole Tribes, [Everglades], and EAA*") (emphasis added).

Nevertheless, the Local Governments urge EPA to consider in their entirety comments and materials submitted by the Florida Sugar Cane League, U.S. Sugar Corporation, Florida Crystals Corporation, and the Sugar Cane Growers Cooperative of Florida in response to EPA's Proposed Water Quality Standards for the State of Florida's Lakes and Flowing Water, 75 Fed. Reg. 4,173 (Jan. 26, 2010). These comments refer to, cite to, and provide materials relevant to South Florida canals beyond those now excluded by EPA.

[2] The League and Association also have concerns regarding the scientific validity of EPA's proposed estuarine criteria. As an initial matter, the League and Association note that they were unable to review the validity of EPA's modeling efforts since EPA did not provide the models used to define the effects of nutrients on estuarine endpoints. From what the League and Association could review, it is clear that the error rate for the models, as noted in Appendix C of the relevant TSD, is very high; EPA uses only U.S. Geological Service data and not the full STORET data, thus failing to consider significant data collected by the FDEP and Florida's water management districts; and EPA defines the DPVs using a simple, linear mixing model, the formula for which is erroneous, *see* Estuary TSD, Appendix B, at B-15. The League and Association share further concerns in the attachment to this comment letter. *See* **Attachment**

For example, after an extensive rule development process, on November 30, 2012, FDEP proposed numeric nutrient criteria for Perdido Bay, Pensacola Bay, Escambia Bay, St. Andrews Bay, Choctawhatchee Bay, and Apalachicola Bay. These state-promulgated standards were the product of a detailed, site-specific analysis best suited to curbing excess nutrients.[3] These proposed criteria also went unchallenged as part of the state process and now await EPA approval. So, it is clear that EPA should now withdraw its proposed criteria for these same estuaries in favor of the FDEP criteria.

The same is true for estuaries already subject to EPA-approved nutrient TMDLs. The St. Johns River Estuary, *see* Fla. Admin. Code r. 62-304.415(2), the Indian River Lagoon, *id.* r. 62-304.520(3)-(11), the St. Lucie Estuary, *id.* r. 62-304.705(1), (3), and the Caloosahatchee River Estuary, *id.* r. 62-304.800(2), all have EPA-approved TMDLs. These TMDLs reflect the best available, site-specific nutrient analysis. EPA has also approved the nutrient endpoints in each of these TMDLs as protective of designated use. *See* 33 U.S.C. § 1313(c)-(d); 40 C.F.R. § 130.7(c)(1). And now, under FDEP's nutrient rule, these nutrient TMDLs serve as the numeric nutrient criteria for the waters to which they apply. *See* Fla. Admin. Code r. 62-302.531(2)(a). Displacing these site-specific numeric endpoints protective of designated use would only undermine efforts currently being undertaken by League and Association members, among others, to implement the TMDLs. This, in turn, would result in the kind of "needless duplication" and "unnecessary delays" Congress cautioned against in the Clean Water Act. 33 U.S.C. § 1251(e).

Finally, to preserve the State's primacy in establishing water quality standards, *see id.* § 1251(b) and 1313(c), the League urges EPA to withdraw is proposed criteria for estuaries on FDEP's schedule for criteria development. Rule 62-302.532(3) of the Florida Administrative Code requires that FDEP "*shall* establish by rule or final order the estuary specific numeric interpretation of the narrative nutrient criteria for TN and TP for the remaining estuaries by June 30, 2015, subject to the provisions of Chapter 120, F.S." By all accounts, FDEP remains

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[3] FDEP extensive technical support materials are as follows: FDEP *Site-Specific Information in Support of Establishing Numeric Nutrient Criteria in Apalachicola Bay* (Oct. 2012), at http://www.dep.state.fl.us/water/wqssp/nutrients/docs/meetings/apalachicola_bay_101512.pdf; FDEP, *Site-Specific Information in Support of Establishing Numeric Nutrient Criteria for Choctawhatchee Bay* (Oct. 2012), at http://www.dep.state.fl.us/water/wqssp/nutrients/docs/meetings/choctawhatchee_bay_101512.pdf; FDEP, *Site-Specific Information in Support of Establishing Numeric Nutrient Criteria for Pensacola Bay* (Oct. 2012), at http://www.dep.state.fl.us/water/wqssp/nutrients/docs/meetings/pensacola_bay_101512.pdf; FDEP, *Site-Specific Information in Support of Establishing Numeric Nutrient Criteria for Perdido Bay* (Oct. 2012), at http://www.dep.state.fl.us/water/wqssp/nutrients/docs/meetings/perdido_bay_101512.pdf; FDEP, *Site-Specific Information in Support of Establishing Numeric Nutrient Criteria for St. Andrew Bay* (Oct. 2012), at http://www.dep.state.fl.us/water/wqssp/nutrients/docs/meetings/st_andrew_bay_101512.pdf; FDEP, *Site-Specific Information in Support of Establishing Numeric Nutrient Criteria for St. Joseph Bay* (Oct. 2012), at http://www.dep.state.fl.us/water/wqssp/nutrients/docs/meetings/st_joe_bay_101512.pdf.

The League notes that FDEP proposed the numeric nutrient criteria for North Escambia Bay through the TMDL process. Under Rule 62-302.531(1)(a) of the Florida Administrative Code, numeric endpoints established through by the TMDL serves as the numeric nutrient criteria. The League also notes that EPA proposed the exact same TMDL and report as a federal TMDL on November 30, 2012. The EPA proposal is available at http://www.epa.gov/region4/water/tmdl/florida/documents/33p_proposed_tmdl_548aa_493b_493a_pensacola_fl_donut_w.pdf.

on schedule. The League and Association ask that EPA give FDEP the chance to develop its criteria.

4. WITHDRAWAL OF ALL PROPOSED COASTAL CRITERIA

The League and Association also ask EPA to withdraw its proposed chlorophyll-a criteria for coastal waters. First, EPA has failed to show an environmental need for the criteria. EPA itself acknowledges in its proposal that "at most times, Florida coastal waters appear to be supporting balanced natural populations of aquatic flora and fauna." 77 Fed. Reg. at 74,959. In other words, Florida's implementation of its narrative criterion supports the designated use of Florida's coastal waters and thus there is no need for EPA intervention.

Second, as a matter of blackletter administrative law, any decision to finalize the proposed coastal criteria would be arbitrary and capricious since EPA has already approved chlorophyll-a criteria for coastal waters as part of Florida's Impaired Waters Rule ("IWR"). *See* EPA Determination on IWR (Feb. 19, 2008).[4] Indeed, because of litigation, EPA concluded that the IWR constituted a change in water quality standards for purposes of the Clean Water Act. *Id.* at 7-8. EPA then approved the IWR's translation of the narrative nutrient criterion into a chlorophyll-a value for Florida's coastal waters. *Id.* at 38-39. According to EPA, this translation – this new chlorophyll-a water quality standard – "protect[ed] the designated use, [was] based on a sound scientific rationale, and contain[ed] sufficient parameters or constituents to protect the designated use." *Id.* While EPA is now free to change its mind, it must do so by providing a reason for deviating from its prior final agency action, its prior approval of a different chlorophyll-a standard deemed protective of designated use. EPA fails to do so in its proposal. EPA's current proposal provides no data, research results, or other information that shows how its proposed coastal criteria would better protect designated use. Withdrawing the coastal criteria therefore seems prudent.

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As always, the League and Association thank EPA for the opportunity to provide comments. For the reasons discussed above, the League and Association ask EPA to withdraw its proposed rulemaking.

Sincerely,

Ryan Matthews
On behalf of the Florida League of Cities, Inc.

Kurt Spitzer
On behalf of the Florida Stormwater Association

Encl: Attachments / Also please refer to cited materials

[4] The document is available at: http://epa.gov/region4//water/wqs/documents/EPA_IWR_DecDoc_2-19-08.pdf

ATTACHMENT TO COMMENT LETTER BY
FLORIDA LEAGUE OF CITIES AND FLORIDA STORMWATER ASS'N

Tab	Document
1	Summary of Estuary Criteria Concerns
2	Pensacola Bay Concerns
3	Springs Coast Concerns
4	Indian River Lagoon Concerns
5	Lower St. Johns River Concerns
6	St. Lucie Concerns

Tab 1

ISSUE	Pensacola Bay	St. Andrews Bay	Springs Coast	Indian River Lagoon
Are endpoints justified?	Chl-light - ? Chl-bloom – depends upon assumptions DO – FDEP criteria? [PB1]	Chl-light - ? Chl-bloom - depends upon assumptions DO – FDEP criteria? [SAB1]	Chl-light - ? Chl-bloom - depends upon assumptions DO – FDEP criteria? [SC1]	Chl-light - ? Chl-bloom - depends upon assumptions DO – FDEP criteria? [IRL1]
Is the segmentation appropriate?	Yes	Yes	Yes	Yes
Are the data used appropriate? Any data missing from their analyses?	Yes	Yes [SAB2]	Missing SWFWMD COAST data [SC2]	Yes
Method for determining NNC – empirical vs. mechanistic	Chose mechanistic – due to lack of data	Chose mechanistic – due to lack of data [SAB3]	Chose mechanistic – due to lack of data [SC2]	Used empirical methods that are being re-evaluated [IRL2]
Model validity – watershed, hydrodynamic, WQ response	No atmospheric deposition loads; overall very poor model fit; faulty calibration acceptance process [PB2]	No atmospheric deposition loads; overall very poor model fit; faulty calibration acceptance process [SAB4]	No atmospheric deposition loads; overall very poor model fit; faulty calibration acceptance process [SC3]	PLSM model being updated and refined
Model application to derive NNC	Light insensitive to nutrients; used mechanistic model and average DO of 5 mg/L in 2 segments [PB3]	DO insensitive to nutrients; Used mechanistic model and average DO of 5 mg/L; very poor model fits	Light and DO insensitive to nutrients; Major questions regarding watershed model; Used average DO of 5 mg/L; very poor model fits	Used empirical methods – many poor model fits [IRL3]
DPVs	Complete lack of justification for the levels proposed; model issues as above	Complete lack of justification for the levels proposed; model issues as above	Complete lack of justification for the levels proposed; model issues as above	Used dilution model which has many critical assumptions [IRL4]; Regressions run on few data points

Pensacola Bay

PB1

- Coefficient relating Kd to Secchi depth has been shown to be segment-specific in Florida estuaries, instead of a constant value of 1.44 as used for all estuarine systems in the state.
- Levels of chlorophyll indicative of a bloom are set at 20 µg/L for all estuaries. Supporting documentation needs to be provided, this may well vary seasonally as well as by estuary.
- Consideration of the upcoming revisions to the state DO criteria should be made, with discussion of the saturation-based criteria.

PB2

- Watershed Model (Appendix C, Attachment 2):
    - Time series of modeled and observed DO indicate that modeled DO follows a regular annually repeating pattern, whereas the observed DO data show considerably more variation. The modeled DO range is much more confined than observed data ranges.
    - Time series of modeled and observed TSS indicate that the model overpredicts TSS values by at least 2 orders of magnitude at three of the four comparison sites.
    - Time series of modeled and observed TN indicate that the model range is much greater than the observed range in TN concentrations in three of the four comparison sites.
    - Time series of modeled and observed TP indicate that the model range is much greater than the observed range in TP concentrations in three of the four comparison sites.

- Estuarine Model (Appendix D, Attachment 2):
    - Hydrologic and pollutant loadings from atmospheric deposition directly to the water surface were not considered. These loads have been shown to account for 20-40% of TN loadings to Florida estuaries.
    - The assumption that all watershed discharges carried chl-a concentrations of 2 µg/L is unsupported.
    - It would be helpful to provide time series of modeled and measured water quality data for evaluation of appropriateness of the calibration and validation.
    - Based on the tabular comparison provided, the simulated chl-a typically underestimates the measured data.
    - Based on the tabular comparison provided, the modeled nitrate-nitrite, ammonia, and phosphate typically overestimate the measured data, often by more than 100%.
    - Based on the tabular comparison provided, the mean station modeled DO typically overestimates the measured data.
    - Based on the tabular comparison provided, the mean station modeled light attenuation typically underestimates the measured data.

PB3

- Application of Model to NNC:
    - Explanation of relationship between nutrient loadings and annual geometric mean concentrations is missing
    - There was no underlying conceptual model provided that describes the relationship between nutrient loadings, nutrient concentrations and dissolved oxygen concentrations given that chlorophyll a concentrations were meeting their targets.
    - The entire estuary was reduced so that two segments would comply with targets that may not be reasonable for those particular segments given their geomorphology.

- No depiction of model validity for critical time period when DO is most susceptible to violate criterion (i.e., summer)
- Further information should be provided on the empirical data in summary tables and graphical displays.
- Statistical relationships should be developed for those segments with sufficient data available and the results should be provided to compare with results of the mechanistic model for those segments with sufficient data.
- Uncertainty in the model results should be incorporated into the decision framework used by the EPA and expressed in the derivation for the NNC

St. Andrews Bay

SAB1

- Coefficient relating Kd to Secchi depth has been shown to be segment-specific in Florida estuaries, instead of a constant value of 1.44 as used for all estuarine systems in the state.
- Levels of chlorophyll indicative of a bloom are set at 20 µg/L for all estuaries. Supporting documentation needs to be provided, this may well vary by estuary.
- Consideration of the upcoming revisions to the state DO criteria should be made, with discussion of the saturation-based criteria.

SAB2

- Only one flow gage and one water quality site were used for calibration for the entire watershed. There are numerous other available flow and water quality sites which, if used in calibration/validation, would improve the level of comfort with the model capabilities.

SAB3

- Data were deemed insufficient to develop empirical relationships, although there appear to be many data collection locations in the St. Andrews Bay system, as indicated in Appendix D Figure D4-2.

SAB4

- Watershed Model (Appendix C, Attachment 4):
  - The modeled DO range is much more confined than observed data range.
  - Time series of modeled and observed TSS indicate that the model overpredicts TSS values by at least an order of magnitude at the comparison site.
  - Time series of modeled and observed TN and TP indicate that the model range is much greater than the observed range at the comparison site.
  - There appears to have been no consideration of the downstream flow control structure on the Deer Point Reservoir, which is the major source of freshwater to St. Andrews Bay and receives the inflow from Econfina Creek, used for flow calibration.
  - Only one water quality site was used for calibration. Why were the many other sites located in the creeks and lake discharging to St. Andrews Bay not included?

- Estuarine Model (Appendix D, Attachment 2):
  - Hydrologic and pollutant loadings from atmospheric deposition directly to the water surface were not considered. These loads have been shown to account for 20-40% of TN loadings to Florida estuaries.

- It would be helpful to provide time series of modeled and measured water quality data for evaluation of appropriateness of the calibration and validation.
- Based on the tabular comparison provided, the mean station modeled DO typically overestimates the measured data.
- Based on the tabular comparison provided, the mean station modeled TN, TSS, and light attenuation typically underestimates the measured data.
- Potential attenuation of pollutant loads in Deer Point Reservoir are not accounted for, with no calibration to water quality conditions just downstream of the reservoir to ensure that the model is appropriately responding.

Springs Coast

SC1

- Coefficient relating Kd to Secchi depth has been shown to be segment-specific in Florida estuaries, instead of a constant value of 1.44 as used for all estuarine systems in the state.
- Levels of chlorophyll indicative of a bloom are set at 20 µg/L for all estuaries. Supporting documentation needs to be provided, this may well vary by estuary.
- Consideration of the upcoming revisions to the state DO criteria should be made, with discussion of the saturation-based criteria.

SC2

- We know of an extensive monitoring program of the riverine and nearshore reaches of the Springs Coast region that extends from the Anclote River and offshore area in the south to the Withlacoochee River and offshore area in the north, the Project COAST dataset collected by Thomas Frazer, University of Florida. Monthly sampling began in 1997 and continues, with collection of hydrographic and water quality data at ten fixed stations in each of nine estuarine systems: Anclote, Pithlachascotee, Hudson, Aripeka, Weeki Wachee, Chassahowitzka, Homosassa, Crystal, and Withlacoochee. Data reporting describes long-term and seasonal patterns in chlorophyll, TN, and TP (Jacoby et al., 2011; 2009; Frazer et al., 1998). These reports provide empirical relationships derived from the data collected between chlorophyll and TN and TP. The data from these 90 relatively long-term stations since 1997 should be included in this evaluation.

  Jacoby, C.A., T.K. Frazer, and D.D. Saindon. 2009. Water quality characteristics of the nearshore Gulf coast waters adjacent to Citrus, Hernando and Levy Counties, Project COAST 1997-2008. Submitted to the Southwest Florida Water Management District.

  Jacoby, C.A., T.K. Frazer, D.D. Saindon, S.R. Keller, and S.K. Notestein. Water quality characteristics of the nearshore Gulf coast waters adjacent to Pasco County, Project COAST 2000-2010. Submitted to the Southwest Florida Water Management District.

  Frazer, T.K., M.V. Hoyer, S.K. Notestein, D.E. Canfield, F.E. Vose, W.R. Leavens, S.B. Blitch and J. Conti. 1998. Nitrogen, phosphorus and chlorophyll relations in selected rivers and nearshore coastal waters along the Big Bend region of Florida. Final Report. Suwannee River Water Management District (SRWMD Contract No. 96/97-156) and the Southwest Florida Water Management District (SWFWMD Contract No. 96/97/157R).

SC3

- Watershed Model:

Appendix C, Attachment 11: Waccasassa

- The water quality site utilized is tidally influenced, how was this accounted for in the calibration?
- Time series of modeled and observed DO indicate that modeled DO follows a regular annually repeating pattern, whereas the observed DO data show considerably more variation, especially in the lower ranges.
- Time series of modeled and observed TSS indicate that the model overpredicts TSS values by 2 orders of magnitude.
- Time series of modeled and observed TN indicate that the model range is much greater than the observed range in TN concentrations in two of the three comparison sites.
- Time series of modeled and observed TP indicate that the high TP concentration ranges observed at one site are not replicated by the model.
- Comparison of measured and modeled TN and TP loads indicate very large annual and average errors, with considerable bias.

Appendix C, Attachment 14: Crystal

- Only the Anclote River USGS station was used for flow calibration, why were no other river gages used?
- The flow exceedence curve comparing modeled and observed flow indicates that the model overpredicts flows between the 10^{th} and 70^{th} percentile flows.
- There appears to have been no consideration of groundwater withdrawals from the Anclote watershed.
- There appears to have been no consideration of the Anclote power facility and the movement of water associated with the cooling water withdrawal from the Anclote River.

Appendix C, Attachment 15: Withlacoochee

- The flow exceedence curves for USGS 02312600, 02313000, and 02312000 show model overprediction for 80%-90% of the flow record.
- Time series of modeled and observed DO indicate that modeled DO follows a regular annually repeating pattern, whereas the observed DO data show considerably more variation. The modeled DO range is much more confined than observed data ranges.
- Time series of modeled and observed TSS indicate that the model overpredicts TSS values by 2 orders of magnitude.
- Comparison of modeled and observed TN and TP loads indicate the model overpredicts both at the comparison site with the most data (21FLGW 3513).
- There appears to have been no consideration of the downstream flow control structures on the Withlacoochee River

- Estuarine Model (Appendix D: Big Bend, Attachment 5):
  - Hydrologic and pollutant loadings from atmospheric deposition directly to the water surface were not considered. These loads have been shown to account for 20-40% of TN loadings to Florida estuaries.
  - The assumption that all watershed discharges carried chl-a concentrations of 2 µg/L is unsupported.
  - It would be helpful to provide time series of modeled and measured water quality data for evaluation of appropriateness of the calibration and validation.
  - Based on the tabular comparison provided, the simulated chl-a typically underestimates the measured data.
  - Based on the tabular comparison provided, the modeled TN typically underestimates the measured data.

- Based on the tabular comparison provided, the modeled TP typically underestimates the measured data.
- Based on the tabular comparison provided, the modeled color typically overestimates the measured data, often by more that 100%.
- Based on the tabular comparison provided, the mean station modeled light attenuation typically overestimates the measured data, often by more than 100%.
- No discussion is provided of how groundwater inflows directly to the estuarine model domain were accounted for. The Springs Coast area is known for the large number of offshore spring vents.

Indian River Lagoon

IRL1

- Coefficient relating Kd to Secchi depth has been shown to be segment-specific in Florida estuaries, instead of a constant value of 1.44 as used for all estuarine systems in the state.
- Levels of chlorophyll indicative of a bloom are set at 20 µg/L for all estuaries. Supporting documentation needs to be provided, this may well vary by estuary.
- Consideration of the upcoming revisions to the state DO criteria should be made, with discussion of the saturation-based criteria.

IRL2

- There are ample data that have been collected in Florida estuaries that have coincident measurements of Kd and Secchi disk. These data should be used to validate the model developed if these models are to be used to develop candidate NNC.
- A statistical model was used to predict depth at sampling locations. The upper 90th percentile prediction interval of the predicted depth became the depth value associated with the sample. This means that the value used is deeper than the best estimate of the model which results in a smaller Kd value required to achieve 20% of surface irradiance. The best estimate (the predicted value) not the 90th percentile prediction interval should be used.
- There should be additional evidence provided to justify the use of the final statistical models presented to develop candidate NNC.
- The decision to log transform annual geometric means needs more justification since the distribution of geometric means should be approximately normal
- Anova Tables, Goodness of fit statistics, Information Criteria, and residual plots should be provided to justify the final model selection relative to other model forms such as those without the log transformed independent variables
- Hierarchical linear mixed effects models that use the raw data should be presented for comparison to the annual geometric means

IRL3

- There is no information provided on how uncertainty in the models are propagated into the NNC
- There is little information provided on implementation, and no information provided on managing the risk of falsely declaring criteria exceedances when in fact they are just a product of natural system variability.
- Using the upper bounds of data to set NNC as was done in the IRL is not a predictive estimate of criterion values representing adverse effects or compliance with biological endpoints. This would be applicable if a reference period approach were established but there is no discussion of this approach.

IRL4

- The DPV mixing/dilution model method for TN appears to be conservative (linear), this does not seem to conform with the state of knowledge of nitrogen cycling in Florida waters.
- The DPV method seems more like straight linear interpolation than an actual dilution or mixing model
- For each sub-lagoon, regressions were based on three points in time

Tab 2

Review of EPA Proposed Estuarine Numeric Nutrient Criteria for Pensacola Bay.

This review is specific to the proposed Numeric Nutrient Criteria (NNC) for Pensacola Bay and the Downstream Protective Values (DPVs) developed for the tributary reaches of the Pensacola Bay watershed. This watershed includes nine estuarine segments, six of which define the Pensacola Bay Estuary complex which includes Escambia Bay, East Bay and Blackwater Bay, and three of which define Santa Rosa Sound.

The development of NNC for Pensacola Bay follows the broader decision framework that was used to develop NNC for estuaries throughout Florida. This framework identifies biologically relevant endpoints that demonstrate support of the estuaries designated use. These three endpoints included a measure of water clarity (the light attenuation coefficient Kd) thought to be protective of the deep edge of seagrasses in the estuary, the concentrations of chlorophyll *a* that is thought to result in a well balanced phytoplankton community, and the concentration of dissolved oxygen in the water column that is thought to be protective of both acute and chronic adverse effects.

The decision to use biologically relevant endpoints in the development of NNC is justified and there is extensive precedent for using this type of approach in establishing management level criteria in Florida estuaries. However, the specific endpoints identified in the development of NNC for Pensacola Bay likely contain at least some uncertainty as to the exact numerical expression of these endpoints that results in protection of the designated use. Further, there is the potential for the expression of these endpoints to be confounded by both physical processes and time dependent factors. For example, recently the Florida Department of Environmental Protection (FDEP) has moved away from using dissolved oxygen concentrations in establishing water quality standards due to the physical dependencies between temperature, salinity and the ability of water to hold oxygen. FDEP has recently revised these standards to be based on the theoretical oxygen saturation constant that accounts for temperature, and to a lesser extent salinity at the time of sampling. In a sense, this removes the seasonal effects on the endpoint that may bias assessments when averaging data on an annual basis as is done for the final proposed criteria. Phytoplankton community composition has also been found to have a seasonally explicit signature in Pensacola Bay as stated in section 2.2.2.4. Seasonality in the stressor response relationship can confound candidate criteria expressed based on annual averages and therefore careful consideration of the interactions between seasonal influences of flows, and temperatures should be explicitly examined and displayed as part of the NNC development process.

The development of the candidate NNC was based on the consideration of two principal analytical approaches; statistical stressor response modeling, and an integrated set of mechanistic models. For Pensacola Bay, the authors claim that data were insufficient within each segment to conduct statistical analyses and therefore relied solely on the mechanistic modeling approach to develop NNC. This statement should have been supported with a description of what data were available for each segment, with the period of record and number of observations to give the reader some more information on the empirical data and monitoring efforts in the Pensacola Bay system. In table 2-10, it states that water quality data between 1998 and 2004 were used for the estuary model development. Where these data insufficient for developing statistical models but sufficient for developing a complex mechanistic model that is representative of the entire system? In general, there was a lack of sufficient description of the available empirical data and summarization of the spatial and temporal availability of those data as well as summarization and graphical display of the intra-annual and interannual variation for the principal parameters of interest.

The derivation of the final candidate criteria for Pensacola Bay relied on driving the mechanistic model to achieve compliance with the dissolved oxygen standard thought to be protective of chronic effects to the estuarine system (i.e., daily average of 5.0 mg/l). Under existing conditions, model predictions suggested that this particular criterion was not met in two segments within the estuary; Upper Pensacola Bay (2006) and Western Santa Rosa Sound (2008). It is important to note that the other DO targets (i.e, minimum 3 hour average of 1.5 mg/l and minimum of 4.0 mg/l 90% of the time) were met under existing conditions for all segments. Further, the chlorophyll a targets were met for all segments in all years under existing conditions. The decision framework used by the EPA directs the NNC development process to be based on the most sensitive of the candidate criteria and therefore the DO of 5.0 mg/l as a daily average was used as a target and loads were reduced until the target was met.

Given that the mechanistic model was used to develop the candidate NNC, the calibration/validation statistics as described in Tables 1-7 and 1-8 of the methods section should be provided explicitly for the Pensacola Bay model. These statistics provide a level of certainty/uncertainty regarding the model predictions. There is no indication of how confident the model predictions for DO values near 5.0 mg/l were in the model verification process and therefore no confidence expressed that the model is actually capable of determining the true conditions under which the DO criterion were met. This is especially important since the DO criterion relies on a 10% exceedance frequency meaning that the conditions resulting in a criterion exceedance are likely event driven. For example, it is highly likely that the daily averages did not meet the criterion during the warmest months of the year as is supported by the discussion in section 2.2.2.3. how did the model perform under these conditions relative to the remainder of the year? More detail is required to provide the reader confidence in the utility of the model to accurately predict conditions protective of the designated use as defined by this criterion value.

There is also insufficient documentation of how the mechanistic model simulations were translated from loadings to nutrient concentration targets. The details of this process are important to understand the potential confounding effects as described above that might ultimately affect the derivation of the final NNC numerical expression. Further, there was no underlying conceptual model provided that describes the relationship between nutrient loadings, nutrient concentrations and dissolved oxygen concentrations given that chlorophyll a concentrations were meeting their targets. The mechanism by which nutrient concentrations affect dissolved oxygen in the absence of adverse phytoplankton blooms remains unexplained.

In summary, this initial review found several issues that require further explanation to be confident that the NNC are valid and reliable for use as regulatory standards for identifying impaired waters.

- Further information should be provided on the empirical data in summary tables and graphical displays. Statistical relationships should be developed for those segments with sufficient data available and the results should be provided to compare with results of the mechanistic model for those segments with sufficient data.

- The mechanistic model validation statistics should be provided, especially for the seasonally dependent parameters during the times when the criteria are most likely to be violated (i.e, summer).

- Uncertainty in the model results should be incorporated into the decision framework used by the EPA and expressed in the derivation fo the NNC.

- The details of how the mechanistic modeling simulations were translated to nutrient concentrations should be provided.

Tab 3

Review of EPA Proposed Estuarine Numeric Nutrient Criteria for Springs Coast

This review is specific to the proposed Numeric Nutrient Criteria (NNC) for the Springs Coast and the Downstream Protective Values (DPVs) developed for the tributary reaches of the Springs Coast watershed. This Springs Coast includes fourteen estuarine segments, eight of which define the Springs Coast offshore estuarine reaches, and six of which the estuarine river reaches of the major tributaries: Anclote River, Pithlachascotee River, Weeki Wachee River, Chassahowitzka River, Crystal River, and Homosassa River (although the location of the Homosassa River is not shown on the map provided in Figure 2-34 of the Technical Support Document).

The development of NNC for the Springs Coast follows the broader decision framework that was used to develop NNC for estuaries throughout Florida. This framework identifies biologically relevant endpoints that demonstrate support of the estuaries designated use. These three endpoints included a measure of water clarity (the light attenuation coefficient Kd) thought to be protective of the deep edge of seagrasses in the estuary, the concentrations of chlorophyll *a* that is thought to result in a well balanced phytoplankton community, and the concentration of dissolved oxygen in the water column that is thought to be protective of both acute and chronic adverse effects.

The decision to use biologically relevant endpoints in the development of NNC is justified and there is extensive precedent for using this type of approach in establishing management level criteria in Florida estuaries. However, the specific endpoints identified in the development of NNC for the Springs Coast likely contain at least some uncertainty as to the exact numerical expression of these endpoints that results in protection of the designated use. Further, there is the potential for the expression of these endpoints to be confounded by both physical processes and time dependent factors. For example, recently the Florida Department of Environmental Protection (FDEP) has moved away from using dissolved oxygen concentrations in establishing water quality standards due to the physical dependencies between temperature, salinity and the ability of water to hold oxygen. FDEP has recently revised these standards to be based on the theoretical oxygen saturation constant that accounts for temperature and to a lesser extent salinity at the time of sampling. In a sense, this removes the seasonal effects on the endpoint that may bias assessments when averaging data on an annual basis as is done for the final proposed criteria.

The development of the candidate NNC was based on the consideration of two principal analytical approaches; statistical stressor response modeling, and an integrated set of mechanistic models. For each segment of the Springs Coast system, the authors state that the data were insufficient to derive proposed criteria, and therefore relied solely on the mechanistic modeling approach to develop NNC. This statement should have been supported with a description of what data were available for each segment, with the period of record and number of observations to give the reader some more information on the empirical data and monitoring efforts in the Pensacola Bay system. In table 2-91, it states that water quality data and municipal and industrial point source data from the Georgia Environmental Protection Division were utilized for model development, an obvious misprint. Review of Appendix D of the Technical Support Document, the Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems, indicates that the Springs Coast estuarine system was modeled as part of the Florida Big Bend Model. There was a lack of sufficient description of the available empirical data and summarization of the spatial and temporal availability of those data as well as summarization and graphical display of the intra-annual and interannual variation for the principal parameters of interest.

Review of Attachment 5 of Appendix D of the Technical Support Document indicates that not all the recent available data were utilized in mechanistic model development, and hence may not have been available for consideration when determining the viability of developing empirical relationships for criteria development. We know of an extensive monitoring program of the riverine and nearshore reaches of the Springs Coast region that extends from the Anclote River and offshore area in the south to the Withlacoochee River and offshore area in the north, the Project COAST dataset collected by Thomas Frazer, University of Florida. Monthly sampling began in 1997 and continues, with collection of hydrographic and water quality data at ten fixed stations in each of nine estuarine systems: Anclote, Pithlachascotee, Hudson, Aripeka, Weeki Wachee, Chassahowitzka, Homosassa, Crystal, and Withlacoochee. Data reporting describes long-term and seasonal patterns in chlorophyll, TN, and TP (Jacoby et al., 2011; 2009; Frazer et al., 1998). These reports provide empirical relationships derived from the data collected between chlorophyll and TN and TP. The data from these 90 relatively long-term stations since 1997 should be included in this evaluation.

Given that the mechanistic model was used to develop the candidate NNC, the goodness of fit of the calibration/validation of the mechanistic model is very important. The limited statistical comparison of means in Attachment 5 of Appendix D of the Technical Support Document does not provide assurance that seasonal patterns are replicated by the mechanistic models, or that observed interannual patterns are being successfully simulated by the mechanistic models.

Prior to requiring significant expenditure of resources on attaining the proposed criteria, sufficient technical support should be provided to ensure that appropriate responses to management actions are indicated. Based on the information provided in the Technical Support document, "…an evaluation of model sensitivity to the water quality targets applied revealed that light and DO targets were insensitive to changes in nutrients in Springs Coast" (page 192). This does not provide assurance that attainment of nutrient and chlorophyll criteria will result in achievement of DO criteria. More detail is required to provide the reader confidence in the utility of the model to accurately predict conditions protective of the designated use as defined by this criterion value.

There is no indication of how confident the model predictions for DO values near 5.0 mg/l were in the model verification process and therefore no confidence expressed that the model is actually capable of determining the true conditions under which the DO criterion were met. This is especially important since the DO criterion relies on a 10% exceedance frequency meaning that the conditions resulting in a criterion exceedance are likely event driven. More detail is required to provide the reader confidence in the utility of the model to accurately predict conditions protective of the designated use as defined by this criterion value.

Section 2.11.8 provides a table of Downstream Protection Values (DPVs) specific for numerous tributaries to the Springs Coast. Although there is little discussion of the derivation of the DPVs in this section, it is assumed that this derivation followed the mechanistic model approach provided in Section 1.6 of the Technical Support Document. If so, these DPVs are only as trustworthy as the mechanistic model results, which as noted above do not have sufficient documentation and support to be acceptable as currently provided. Again, as noted previously, an extensive dataset exists of monthly hydrographic and water quality data in the major rivers of the Springs Coast since 1997 as part of the COAST dataset which would likely prove useful in deriving appropriate DPVs for the Springs Coast.

In summary, this review found several issues that require further explanation to be confident that proposed NNC are valid and reliable for use as regulatory standards for identifying impaired waters.

- Further information should be provided on the empirical data in summary tables and graphical displays. Statistical relationships should be developed for those segments with sufficient data available and the results should be provided to compare with results of the mechanistic model for those segments with sufficient data. It should be ensured that all available data are utilized for this effort, including the COAST data.

- The mechanistic model calibration and validation statistics should be provided in more detail that just overall means for each model grid cell, especially for the seasonally dependent parameters during the times when the criteria are most likely to be violated (i.e, summer).

- Uncertainty in the model results should be incorporated into the decision framework used by the EPA and expressed in the derivation of the NNC.

References

Jacoby, C.A., T.K. Frazer, and D.D. Saindon. 2009. Water quality characteristics of the nearshore Gulf coast waters adjacent to Citrus, Hernando and Levy Counties, Project COAST 1997-2008. Submitted to the Southwest Florida Water Management District.

Jacoby, C.A., T.K. Frazer, D.D. Saindon, S.R. Keller, and S.K. Notestein. Water quality characteristics of the nearshore Gulf coast waters adjacent to Pasco County, Project COAST 2000-2010. Submitted to the Southwest Florida Water Management District.

Frazer, T.K., M.V. Hoyer, S.K. Notestein, D.E. Canfield, F.E. Vose, W.R. Leavens, S.B. Blitch and J. Conti. 1998. Nitrogen, phosphorus and chlorophyll relations in selected rivers and nearshore coastal waters along the Big Bend region of Florida. Final Report. Suwannee River Water Management District (SRWMD Contract No. 96/97-156) and the Southwest Florida Water Management District (SWFWMD Contract No. 96/97/157R).

Tab 4

BREVARD County
BOARD OF COUNTY COMMISSIONERS
FLORIDA'S SPACE COAST

NATURAL RESOURCES MANAGEMENT OFFICE
2725 Judge Fran Jamieson Way, Building A-219, Viera, FL 32940

February 15, 2013

Via Electronic Submittal

EPA Docket Center
EPA West Room 3334
1301 Constitution Avenue NW
Washington, DC 20004

Re: Comments on 40 CFR Part 131
Docket ID No. EPA-HQ-OW-2010-0222
Federal Register/Vol. 77, No. 243

Attention: Docket ID No. EPA-HQ-OW-2010-0222

We are concerned that the rules proposed by EPA to set NNC and DPVs for the Indian River Lagoon (IRL), its tidal creeks, and the adjacent coastal waters are not adequately justified, are potentially inappropriate, and may lead to unnecessary local expense and unintended ecological consequences.

Using the lower bound of empirical relationships as a target when flora and fauna did well under different (even upper bound) conditions too, may be misguided and lead to unnecessary retrofit expenses for the IRL. The statistical approach used for bloom frequency analysis in the IRL was applied inappropriately. The method used for IRL DPVs assumed linear dilution of nutrients despite nitrogen cycling being non-linear. Setting DPVs for the IRL tributaries creates a disincentive for cost-effective regional solutions and is unnecessarily redundant with NNCs set for the estuary and its tributaries. Tidal creek NNCs are not related to any meaningful biological endpoint, rather they conflict with other beneficial uses such as natural epicenters of high primary and secondary production, waterfowl impoundment management, and mosquito control impoundment management that is critical to public safety. The proposed coastal NNC ignore coastal transport processes that are a major factor along Central Florida's Atlantic Coast.

Attached for EPA's review and consideration are our comments on the proposed rule, *Water Quality Standards for the State of Florida's Estuaries, Coastal Waters, and South Florida Inland Flowing Waters*. The comments provided reflect review of the Federal Register Notice as listed above, as well as supporting documentation provided in the following two documents:

- *Technical Support Document for U.S. EPA's Proposed Rule for Numeric Nutrient Criteria for Florida's Estuaries, Coastal Waters, and South Florida Inland Flowing Waters. Volume 1: Estuaries.*
- *Technical Support Document for U.S. EPA's Proposed Rule for Numeric Nutrient Criteria for Florida's Estuaries, Coastal Waters, and South Florida Inland Flowing Waters. Volume 2: Coastal Waters*

We appreciate the opportunity to provide these comments. Please do not hesitate to contact me if you have any questions.

Sincerely,

Virginia Barker
Watershed Program Manager

Comments on 40 CFR Part 131
Docket ID No. EPA-HQ-OW-2010-0222
Federal Register / Vol. 77, No. 243
December 18, 2012

Water Quality Standards for The State of Florida's Estuaries, Coastal Waters, and South Florida Inland Flowing waters

Brevard County Natural Resources Management Office
2725 Judge Fran Jamieson Way, Building A
Viera, FL 32940

February 19, 2013

ATM
APPLIED TECHNOLOGY & MANAGEMENT

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BACKGROUND

On January 14, 2009, the U.S. Environmental Protection Agency (EPA) determined that new or revised water quality standards in the form of numeric nutrient criteria (NNC) for water quality were necessary to protect designated uses set by Florida for its Class I, Class II, and Class III waters. Effective December 30, 2009, EPA entered into a Consent Decree with Florida Wildlife Federation, the Sierra Club, the Conservancy of Southwest Florida, the Environmental Confederation of Southwest Florida, and St. Johns Riverkeeper that established a schedule for EPA to propose and promulgate NNCs for Florida lakes, flowing waters, estuaries, and coastal waters. The Consent Decree provided that if Florida submitted and EPA approved NNC for any relevant waterbodies before the dates outlined in the schedule, EPA would no longer be obligated to propose or promulgate criteria for these waterbodies. EPA requested modifications to the deadlines in the Consent Decree. Under the revised Consent Decree, EPA was required to propose NNC for estuarine and coastal waters by November 30, 2012, and finalize the NNC by September 30, 2013.

The Florida Department of Environmental Protection (FDEP) submitted new and revised water quality standards for review by the EPA on June 13, 2012, pursuant to section 303(c) of the Clean Water Act (CWA). These water quality standards are set out primarily in Rule 62-302 of the Florida Administrative Code (F.A.C.). FDEP also submitted amendments to Rule 62-303, F.A.C., which sets out Florida's methodology for assessing attainment of State standards. The new water quality standards included those for the following estuarine segments: Clearwater Harbor/St. Joseph Sound, Tampa Bay, Sarasota Bay, Charlotte Harbor/Estero Bay, Clam Bay, Tidal Caloosahatchee River/Ten Thousand Islands, Florida Bay, Florida Keys, and Biscayne Bay. EPA approved the provisions of these rules on November 30, 2012. Under the Consent Decree, this relieves EPA of its obligation to propose NNC for these estuaries included in the FDEP rule.

In keeping with the Consent Decree, EPA has proposed NNC for the remaining Florida estuaries (including the Indian River Lagoon), coastal waters, and south Florida inland flowing waters. EPA defines an estuary consistent with Florida's definition provided in Section 62-303.200, F.A.C. Estuaries are defined as "predominantly marine regions of interaction between rivers and nearshore ocean waters, where tidal action and river flow mix fresh and salt water." These regions include bays, mouths of rivers, and lagoons classified as Class II or Class III waterbodies. EPA defines coastal waters based on Florida's definitions and accounting for CWA jurisdiction. Coastal waters are defined as all marine waters classified as Class II or Class III waterbodies pursuant to Section 62-203.400, F.A.C., extending to 3 nautical miles from shore, that are not classified as estuaries. The proposed rule applies to tidal creeks and marine lakes as well. This proposal includes a proposed approach for deriving total nitrogen (TN) and total phosphorus (TP) criteria expressed as downstream protection values (DPVs) at the points where inland flowing waters flow into estuaries or marine waters.

The revised Consent Decree required EPA to propose numeric DPVs for Florida by November 30, 2012. To comply, EPA has proposed DPVs for waters that drain to Florida's estuaries. However, EPA has revised its determination, and proposes that NNC for downstream protection are not necessary. EPA has requested the court to modify the Consent Decree consistent with this determination, so that EPA is not required to promulgate numeric DPVs for Florida consistent with the revised determination. If the District Court does not agree with the revised determination, EPA is required to propose and promulgate numeric DPVs for Florida. If the District Court agrees with the revised determination and modifies the consent decree, EPA will not be required to propose and promulgate DPVs for Florida. Therefore, EPA's approval of the State's provisions for downstream protection will hold, despite these provisions not consisting of numeric values.

COMMENTS

The following provides comments on Federal Register Notice Volume 77, Number 243 filed under 40 CFR Part 131 entitled Water Quality Standards for the State of Florida's Estuaries, Coastal Waters, and South Florida Inland Flowing Waters (EPA, 2012a). The comments are structured based upon the primary components of interest for Brevard County:

- Estuarine NNC for the Indian River Lagoon;
- DPVs for estuarine waters;
- Proposed methods for deriving NNC for tidal creeks; and
- Proposed coastal criteria.

Comments provided reflect review of the Federal Register Notice as listed above, as well as supporting documentation provided in the following:

- Technical Support Document for U.S. EPA's Proposed Rule for Numeric Nutrient Criteria for Florida's Estuaries, Coastal Waters, and South Florida Inland Flowing Waters. Volume 1: Estuaries (TSD) (EPA, 2012b);
- Technical Support Document for U.S. EPA's Proposed Rule for Numeric Nutrient Criteria for Florida's Estuaries, Coastal Waters, and South Florida Inland Flowing Waters. Volume 2: Coastal Waters (TSD) (EPA, 2012c).

KEY COMMENTS AND RECOMMENDATIONS

1. The NNC derived for the Indian River Lagoon relied heavily on assumptions that were not adequately justified. These included the assumption used in assigning depths to the to the seagrass deep edge (90^{th}% CI + tidal range), the use of the Holmes equation to relate Secchi disk information to light attenuation (as opposed to other published estimates, e.g., Giesen,1990), and assuming that no uncertainty was propagated through the analytical process used to derive the final candidate criteria. The limitations associated with each step in the analytical pathway should be stated with justification provided.
2. Relying on chlorophyll *a* targets set at the lower bound of empirical relationships between light attenuation and chlorophyll *a* is an extremely weak analytical approach, especially given that seagrasses reached their highest acreage estimates over the same (presumed) time period. As an example, colonization depths for seagrass in 1502 and 1506 were based on 2009 estimates because those depths were the highest recorded, and yet every geometric mean chlorophyll *a* value in the dataset exceeded the determined threshold value used to derive the NNC. Therefore, it is implausible to suggest that exceedances of the resulting criterion values represent a harmful increase based on this contradiction of evidence.
3. For the resulting segments, bloom frequency analyses were used to derive the NNC. However, the model construct for this analysis using a stochastic modeling approach is flawed. While generalized linear mixed-effect models represent application of recent

advances in statistical approaches, the model was not appropriately constructed because it was set up to predict different statistics of the same distribution of chlorophyll values. This is not a stressor-response analysis.

4. The translation of chlorophyll *a* targets to NNC then relied on more stochastic modeling of the relationship between nutrients and chlorophyll *a*, with little evidence provided on the goodness of fit of the models. In the overwhelming majority of cases, the nutrient NNC values were set at the bounds of the empirical data. Setting the NNC at the upper bound suggests that the waterbody is currently meeting its designated use. However, there is no evidence to suggest that the waterbody would be adversely affected by concentrations higher than those in the empirical data. Conversely, there is no evidence that a criterion set at the lower bound would be protective of a waterbody when every value resulted in a response greater than the estimated criterion value necessary to protect designated uses. This also contradicts the observation that seagrass acreage increased substantially over the period-of-record of data collection.
5. The method used to assign DPVs for the Indian River Lagoon assumes a linear (conservative) dilution of nutrients that does not conform with the state of knowledge of nitrogen cycling in Florida waters. Further, it does not consider the differential contribution of nutrient loading into the estuary from different creeks within the system that govern the mass of nutrients reaching the estuary. Given that instream protective values will be established for each freshwater tributary and estuarine NNC are also established, there should be no need to pursue development of DPVs for the estuary.
6. The proposed methodology for deriving tidal creeks' NNC is not related to any meaningful biological endpoint. Recommendations are provided below in Item 3 (a-d) of the Specific Comments for how interim NNC might be developed until more dedicated efforts can be applied to derive meaningful numbers.
7. The proposed coastal NNC give no consideration to coastal transport processes. Chlorophyll *a* concentrations at any particular location along the coast may not have any relevance to adjacent land masses. Water quality models are needed to understand these phenomena. Further, no consideration appears to be given to how compliance with these coastal NNC values will be achieved.

SPECIFIC COMMENTS

Estuarine Numeric Nutrient Criteria for Indian River Lagoon

1. The development of NNC for the Indian River Lagoon was based on statistical stressor response modeling. The following technical issues of concern, related to the statistical modeling procedures used, were identified:
   - A statistical model was used to predict bottom depth at sampling locations. The upper 90th percentile prediction interval of the predicted depth became the depth value associated with the sample. This means that the value used is deeper than the best estimate of the model, which results in a smaller Kd value required to achieve 20 percent of surface irradiance. The best estimate (the predicted value), not the 90th percentile prediction interval, should be used to predict seagrass depth at sampling locations.
   - The coefficient relating Kd to Secchi depth has been shown to be segment-specific (Kirk 1994). Therefore, a constant Kd value of 1.44, as used for all estuarine systems in the state, is not necessarily representative of all segments.
   - There are ample data that have been collected in Florida estuaries that have coincident measurements of Kd and Secchi disk (ATM and JEI 2011). These data should be used to validate the model developed if these models are to be used to develop candidate NNC.
   - Levels of chlorophyll *a* indicative of phytoplankton blooms are set at 20 micrograms per liter (µg/L) for all estuaries. Supporting documentation needs to be provided as this may well vary by estuary.
   - In order to justify the use of the final statistical models in developing candidate NNC, additional evidence should be provided.
   - ANOVA tables, goodness-of-fit statistics, information criteria, and residual plots should be provided to justify the final model selection relative to other model forms, such as those without the log-transformed independent variables.
   - Hierarchical linear mixed-effects models that use the raw data should be presented for comparison to the annual geometric means.

- The decision to log-transform annual geometric means needs more justification since log transformation is not appropriate if the distribution of geometric means is approximately normal (as presented).
- No information is provided to explain how uncertainty in the models is addressed the NNC.
- There is little information provided on implementation of these criteria and no information provided on managing the risk of falsely declaring criteria exceedances when, in fact, they are just products of natural system variability. The regulatory cost of false positives could be highly significant.
- The bounds of data to set NNC, as was done in the Indian River Lagoon, is not a predictive estimate of criterion values representing adverse effects or compliance with biological endpoints. No cause-effect relationship is demonstrated.

Proposed Procedure for Establishing Downstream Protection Values for Indian River Lagoon

2. As discussed, EPA does not intend to finalize these DPVs if the District Court modifies the Consent Decree consistent with EPA's amended determination that numeric DPVs are not necessary to meet CWA requirements in Florida. However, if necessary, EPA will establish DPVs that are numeric TN and TP criteria for streams in Florida to protect the downstream estuarine waterbodies.

   EPA proposed a hierarchical procedure to derive DPVs that include:

   a. Water quality simulation models to derive TN and TP values;
   b. A reference condition approach based on TN and TP concentrations at the stream pour point, coincident in time with the data record from which the downstream receiving estuary segment TN and TP criteria were developed using the same data quality screens and reference condition approach;
   c. Dilution models based on the relationship between salinity and nutrient concentration in the receiving segment; and
   d. Use of the TN and TP criteria from the receiving estuary segment to which the freshwater stream discharges, in cases where data are too limited to apply the first three approaches.

The DPVs would apply at each stream's point of entry into the downstream water, referred to as the pour point of the stream. EPA defines the pour point based on FDEP's classification of predominantly fresh water equivalent to a point where salinity is expected to be 2.7 PSU.

The method used to assign DPVs for the Indian River Lagoon assumes a linear (conservative) dilution of nutrients (Item C above), which does not conform with the state of knowledge of nitrogen cycling in Florida waters. The hydrodynamic interactions between the estuary and the freshwater tributaries, and how they influence water quality, are not discussed. Failure to consider this may lead to a misinterpretation of the water quality data used and, subsequently, to development of an invalid predictive model. Further, the method does not consider the differential contribution of nutrient loading to the estuary from different creeks within the system that govern the overall mass of nutrients reaching the estuary. Given that instream protective values will be established for each freshwater tributary and estuarine NNC are also established, there should be no need to pursue development of DPVs for the estuary.

Proposed Approaches for Determining Numeric Nutrient Criteria for Tidal Creeks

3. EPA has provided a meaningful characterization of the physical, ecological, and functional attributes of tidal creeks that make these tidal creeks a critical component of Florida's ecosystems. EPA recognizes in its summary that tidal creek water quality is highly variable and dependent on tidal amplitude, watershed inputs, geomorphology, riparian vegetation, and the degree to which tidal creek ecology is affected by watershed development and physical alteration to the creek itself. The latter is an extremely important consideration in Florida, where these low gradient systems have been historically altered by mosquito ditching and flood protection efforts. EPA has also recognized that tidal creeks provide a unique and critical role as refugia and nursery areas to important fish and invertebrate species, many of which support a multi-million dollar recreational and commercial industry in Florida.

In consideration of the establishment of NNC for tidal creeks, EPA has proposed two approaches. These approaches rely on established freshwater and estuarine criteria developed for adjacent waterbodies along with the mean (presumed to be long-term average) salinity of the creek. These are understandable options, given the task to develop criteria for such a diverse and variable set of ecological systems, many of which have a paucity of available empirical data. However, both options ignore a primary tenet of the Florida water quality standards that define criteria as being protective of designated uses currently defined in Florida statute and under the Clean Water Act as preventing "*an imbalance of natural populations of aquatic flora and fauna within the system.*" This interpretation was recently supported in Federal court in a statement indicating that a criterion "*would identify a harmful increase in a nutrient level – an increase that would create an imbalance in flora and fauna.*"

The approaches proposed by the EPA present no direct or conceptual relationship between the proposed criteria alternatives and biologically relevant endpoints in tidal creeks; nor are any analyses or justifications provided for the point at which a proposed criterion alternative would create an imbalance within a creek. Further, the reliance of determining a criterion based upon mean salinity of a particular tidal creek would result in criterion specific to individual systems. These values would be dependent on empirical data that are in most cases entirely lacking or based on fixed station data, which are likely not representative of the longitudinal and seasonally variable salinity gradient within the creek that drives productivity within the system. Therefore, based on the available information and without any validation of work conducted to assess the appropriateness of these approaches, the use of these approaches cannot be recommended for developing criteria for tidal creeks.

If interim numeric criteria are required for tidal creeks, the following methodology should be considered in a weight of evidence approach to develop standards specific to protecting the highly variable ecological functions within the tidal creek. Downstream Protective Values are inappropriate because tidal creeks are often higher productivity systems dependent on connectivity to lower productivity systems downstream.

a. **Operational Definition of a Tidal Creek** – The first step necessary in deriving interim NNC for tidal creeks will be to identify the population of creeks.
   - A geographic information system (GIS) desktop evaluation using hydrology data layers can serve as a starting point;
   - Inclusion and exclusion criteria should be established *a priori;*
   - Available water quality data should then be identified for all creeks.

b. **Classification** - EPA states that a classification system was not considered for tidal creek systems due to "the large variety of physical configurations and large number of small systems." On the contrary, this is precisely why a classification scheme is necessary in the development of interim tidal creek NNC. As an alternative approach to the EPA criteria, a classification system could be established to aid in the development of interim NNC for tidal creeks. A major premise of this recommendation is that physical and biological responses to nutrient conditions will depend upon differences in tidal creek geography, geology, and degree of physical alteration.

   - **Hydrology/Geomorphology/Geology** – Because tidal creeks have varying hydrologic regimes with some having instream control structures and others being naturally flowing systems, differences in hydrologic regimes will need to be accounted for in establishing NNC. Any regional differences in geomorphology or surficial soil chemistry should also be considered. Hydrology and geomorphology are confounding factors that can influence the response in tidal creeks to changes in nutrient conditions.

   - **Physical Alterations** – The degree of physical alteration can dramatically alter the assimilative capacity and hydrology of tidal creek systems and confound the development of valid and reliable criteria protective of biologically relevant endpoints. Therefore, a simple, GIS desktop evaluation is recommended to assess the level of physical alteration to candidate tidal creeks. Metrics for this evaluation can include sinuosity, development density along the shoreline of the creek, and canopy coverage where possible. This evaluation can be used along with the geographical and geological classifications to define an integrated set of tidal creek classes.

c. **Empirical Water Quality Evaluation –** Once the creeks are defined and classified, it is imperative that empirical data be evaluated. Because the criteria will be evaluated from these data, it is necessary to evaluate the empirical data in establishing the interim criteria. At a minimum, EPA should assess the data distributions, and provide some descriptive plots and statistics on empirical water quality data where available. These should include:
   - Bivariate plots of nutrients, chlorophyll *a* and dissolved oxygen concentrations;
   - Intra-annual box plots of nutrients, chlorophyll *a* and dissolved oxygen concentrations;
   - Histograms and descriptive statistics including the number of data observations, period of record, minimum, maximum, mean, percentile values, coefficient of variation (CV), etc., for the distribution of data values within a creek; and
   - Comparisons of descriptive statistics amongst the classes of tidal creeks defined earlier.

d. **Empirical Biological Data Evaluation –** While data are limited, there are some data collected on important biological endpoints for tidal creeks with respect to fish and benthic invertebrate species that are available for tidal creeks. A list of expectations should be developed for estuarine dependent indicator species known to utilize tidal creeks as primary habitat during a portion of their life cycle. For example, in Tampa Bay, there are numerous pulse recruiting fish taxa that utilize tidal creeks as nursery areas. These species spawn in nearshore coastal waters and are carried into the estuary by advective forces and often settle within tidal creeks during their juvenile life histories. The red drum, *Sciaenops ocellatus,* is one example with a predictable recruitment pattern beginning in October/November each year. Mullet recruitment follows in December/January, followed by spot and pinfish in the spring. These are examples of the diversity of taxa reliant upon tidal creeks. Given the ecological and economic significance of these species as well as others that utilize tidal creeks, efforts should be made to develop a list of expectations regarding their tidal creek habitat utilization across the estuary and among the various classes of tidal creeks developed. Literature values may be helpful in identifying some critical response endpoints for these species that could be applicable to the development of interim NNC.

Proposed Coastal Criteria

4. EPA classified Florida's coastal waters into three main areas: the Florida Panhandle, West Florida Shelf, and Atlantic Coast, which have been subdivided into a total of 71 segments (Figure 1). For the proposed rulemaking, EPA defines coastal waters as marine waters from the land margin extending up to 3 nautical miles offshore, with chloride concentrations greater than 1,500 milligrams per liter (mg/L), excluding estuaries. EPA is proposing to derive chlorophyll *a* criteria for coastal waters using remote sensing, where possible, as phytoplankton were chosen as a nutrient-sensitive biological endpoint of aquatic life use conditions. EPA is not proposing the derivation of TN and TP criteria for coastal waters due to the paucity of ambient data. EPA utilized a reference condition approach to develop the numeric criteria in terms of chlorophyll *a* for coastal waters, utilizing the 90th percentile of all annual geometric means of screened data from 1998 to 2009 to derive the criteria (EPA, 2012c).

   Of the 71 coastal segments (see Figure 1), segments 48-58 appear to be offshore of the Indian River Lagoon. The proposed coastal NNC for the segments are defined as a specific geometric mean annual chlorophyll *a* concentration, as determined by remote sensing imagery (satellite), with the exceedance allowance of only once in a 3-year period, with compliance determined to utilize the annual geometric mean (EPA, 2012c).

   There is apparently no consideration given to coastal transport in the derivation of these NNC. Chlorophyll *a* concentrations at any particular location along the coast may not have any relevance to adjacent land masses. As an example, blooms (including harmful red tides) are known to be transported from the Gulf or South Florida and enter this coastal zone in eddy currents that spin off the Gulf Stream. Water quality models are needed to understand these phenomena. No consideration appears to be given to how compliance with these coastal NNC values will be achieved.

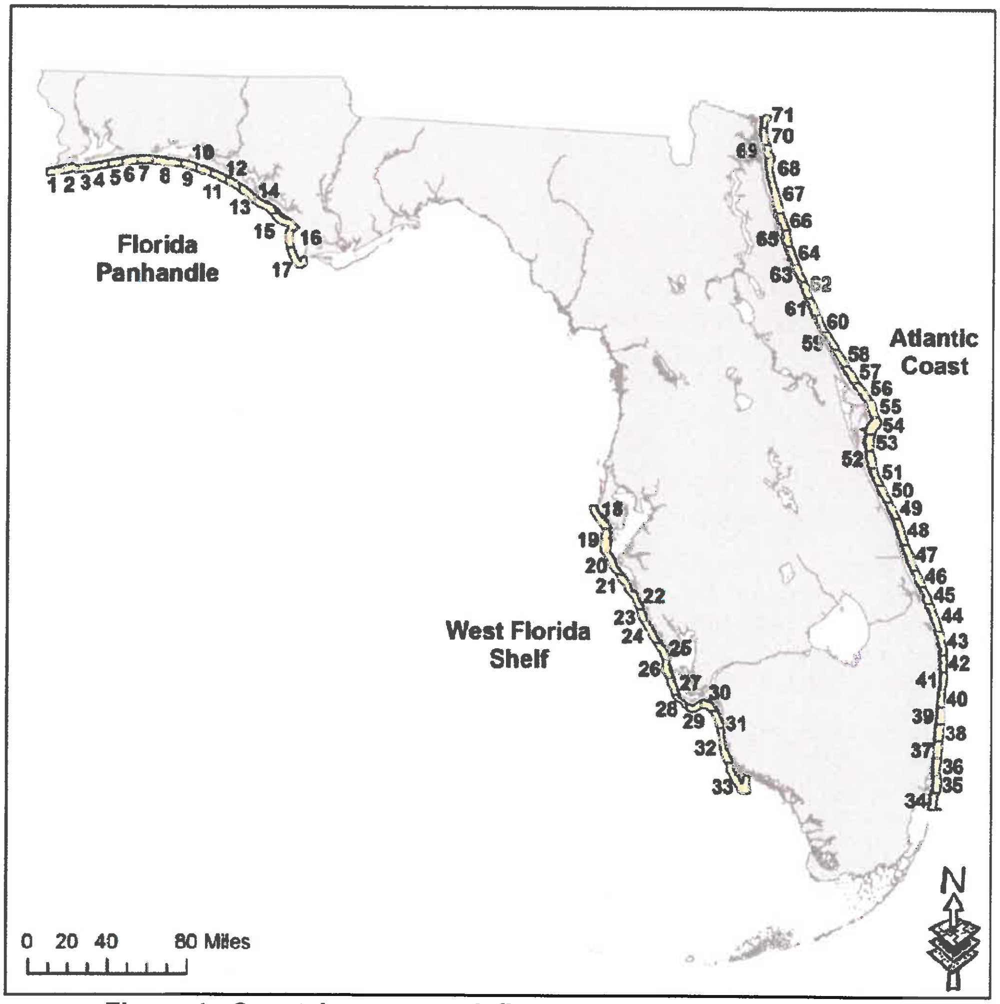

Figure 1. Coastal segments defined by EPA (from EPA, 2012c).

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Tab 5

<u>**MEMORANDUM**</u>

To: Kurt Spitzer, Florida Stormwater Association (FSA)
From: Tiffany Busby, Wildwood Consulting/Legislative and Governmental Affairs Committee
Date: January 2, 2013
Re: Feedback on proposed Environmental Protection Agency (EPA) Numeric Nutrient Criteria (NNC) for the Lower St. Johns River (LSJR) Estuary

1. Are endpoints justified?

The proposed EPA endpoints for the LSJR estuary are as described in the table below along with the endpoint of the marine section total maximum daily load (TMDL) adopted by the Florida Department of Environmental Protection (FDEP) and approved by EPA.

Table 1. Comparison of Numeric Endpoint for the LSJR Estuary

Proposal	Segment	Total Nitrogen (TN) (mg/L)	Total Phosphorus (TP) (mg/L)	Chlorophyll-a (µg/L)	Downstream Protection Values (DPVs)
2012 EPA Proposed Criteria	1801-LSJR	0.75	0.095	2.5	Freshwater TMDLs
2012 EPA Proposed Criteria	1802—"Trout River"	1.09	0.108	3.6	Freshwater TMDLs
2012 EPA Proposed Criteria	1803—"Trout River"	1.15	0.074	7.7	Freshwater TMDLs
2010 FDEP Proposed Criteria	Marine Section LSJR (WBIDs 2213A - 2213H)	TMDL nutrient loads for the marine portion of the LSJR (load based NNC) based on the dissolved oxygen (DO) site specific alternative criterion (SSAC)[1]	Not proposed (not necessary)	Not to exceed 40 µg/L more than 10% of the time (applying the freshwater section TMDL target to the marine section)	The annual TMDL TN and TP loads for the freshwater portion of the river which flows into the marine section

[1] In the Lower St. Johns, the SSAC is a minimum DO concentration of 4 mg/L and a Total Fractional Exposure to DO levels in the range of 4.0 to 5.0 mg/L of 1.0 or less over the year.

The proposed EPA endpoints appear to have used (as one of several endpoints) interpretations of the DO levels set by the Florida SSAC for the LSJR marine section. EPA states that they used the freshwater TMDLs based on achieving health chlorophyll-a levels as adequate protection for downstream marine waters. They also state that they used the watershed loading model [pollutant load screening model (PLSM) and Quality Integrated Compartment Model (CE-QUAL-ICM)] and the hydrodynamics model [Environmental Fluid Dynamics Code (EFDC)] used for the TMDLs to establish their proposed NNC concentrations. It is not certain based on my cursory review what EPA used specifically from the model outputs to establish the criteria (mean, median, geometric mean, etc.). Based on a conversation with the St. Johns River Water Management District (SJRWMD) staff that developed these models, the proposed concentrations are “in the ball park” of the concentrations they would expect as outputs from their TMDL models.

Therefore, the overall conclusion is that the proposed numeric targets are based on the LSJR SSAC and the TMDL targets, but they are concentration, not load, based. It is not well-established that a TP concentration is necessary, since the marine section is nitrogen limited.

2. Is the segmentation appropriate?

- EPA Section 1801 approximately corresponds to a portion of the meso-polyhaline riverine section and the marine section WBIDs 2213A and 2213B.
- EPA “Trout River” Section 1802 approximately represents marine section WBIDs 2213C and 2213D
- EPA “Trout River” Section 1803 approximately represents the oligohaline lacustrine section, marine section WBIDs 2213E, 2213F and 2213G.

While the precise segmentation does not completely correspond to the TMDL approach, the three segments proposed basically correspond to the marine section WBIDs in the TMDL. The map in the TSD (figure 2-62), however, is badly mislabeled with the sections listed as the “Lower,” “Middle,” and “Upper” SJR while the map is of the Lower St. Johns River Marine Section only.

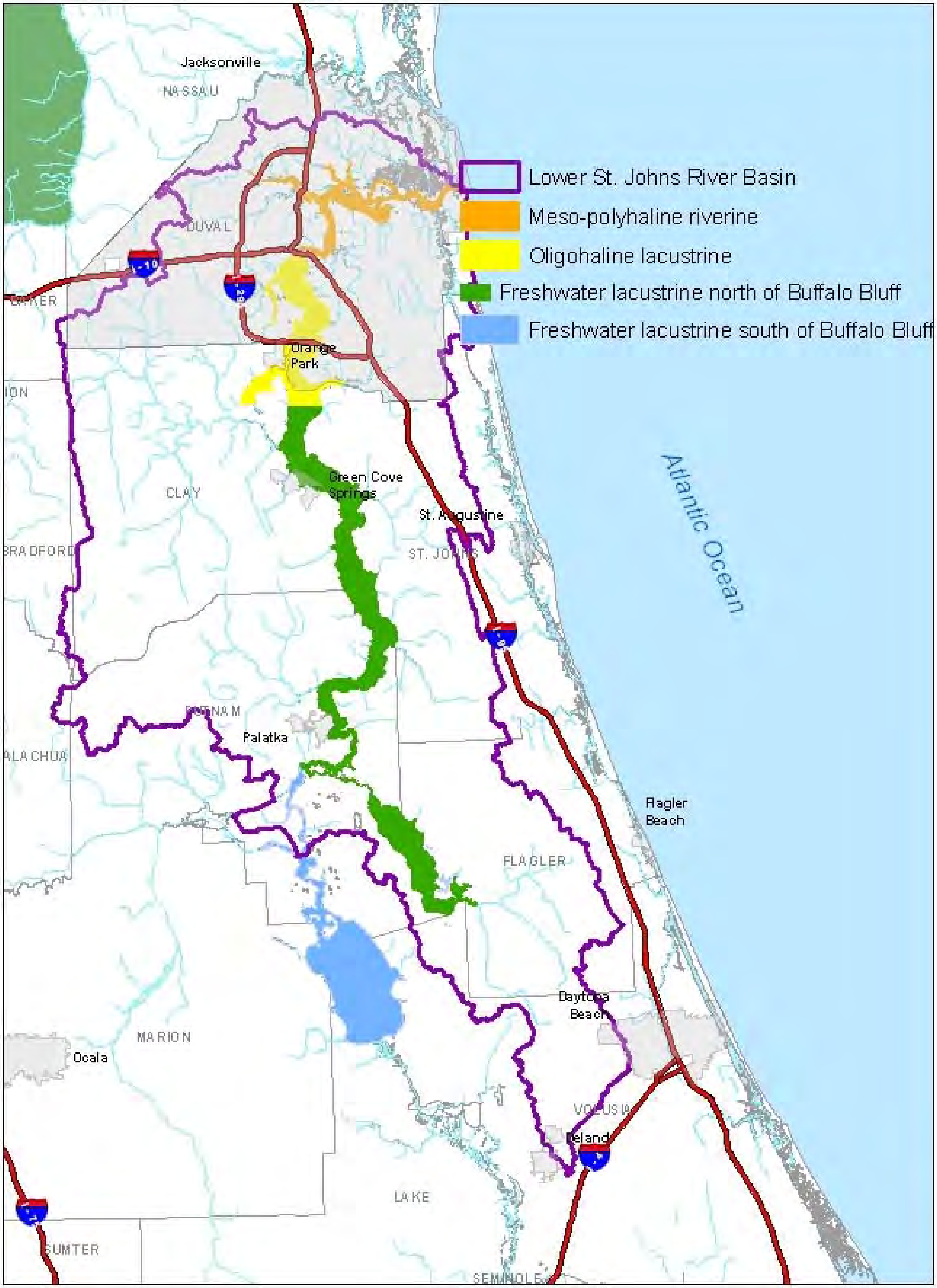
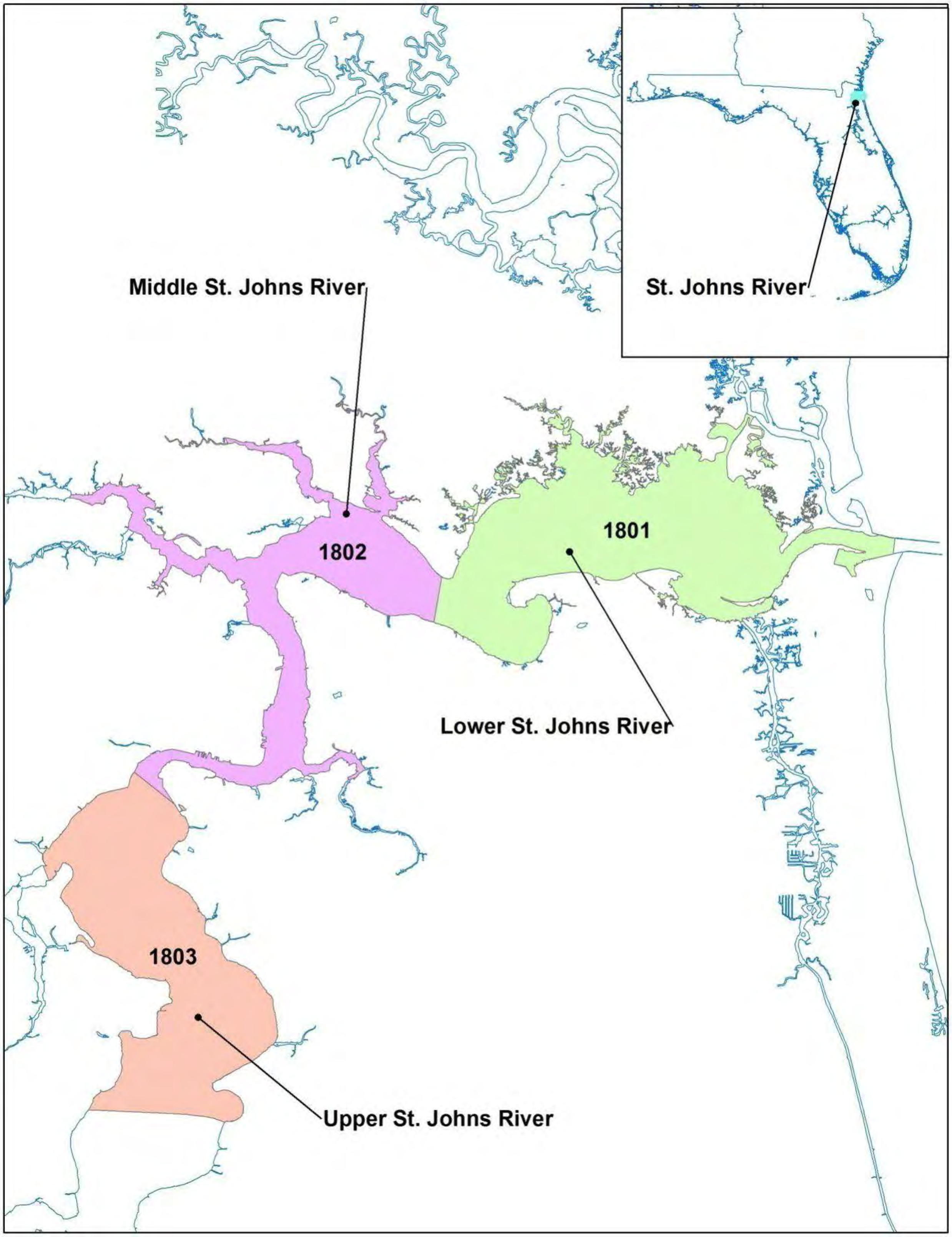


Figure 1. Ecological zones of the LSJR, SJRWMD, 2010.



Mislabeled EPA map (Figure 2-62) from the Technical Support Document, Volume 1 (2012).

3. **Method for determining NNC; Model validity – watershed, hydrodynamic, WQ response; Model application to derive NNC**

The stated methods were that the mechanistic TMDL models were used and the TMDL targets were applied as one of several lines of evidence. A statistical analysis did not reveal a strong relationship to the DO endpoint but did support chlorophyll-a endpoints of 6.1 µg/L, 8.5 µg/L, and 8.4 µg/L for segments 1801, 1802, and 1803, respectively, which are higher than the proposed criteria. Through evaluation of chlorophyll-a and DO targets, EPA found that both the chlorophyll-a and DO targets were met under the 1995–1999 loads. The values under mechanistic modeling represent the 90th percentile annual geometric mean nutrient concentrations from the 1995–1999 modeled nutrient loads.

EPA used the mechanistic modeling results to set the criteria and used the statistical analysis of the chlorophyll-a data to corroborate the mechanistic model results (Table 2-161 in the TSD, Volume 1).

4. **DPVs**

It was stated in the EPA documentation that the freshwater TMDL targets were applied to protect the downstream marine waters, although a table to DPVs for marine waters, based on the mechanistic models, is provided in the TSD and it is unclear how these will be applied (Table 2-162).

Tab 6

Feedback on Proposed EPA NNC for the St. Lucie Estuary

Background

In November 2012, the Environmental Protection Agency (EPA) issued numeric nutrient criteria (NNC) for estuaries in Florida not specified in the FDEP NNC. Included in the list of water bodies considered in the EPA NNC was the St. Lucie Estuary (See Figure 1). For this area, FDEP has produced a TMDL (October 2008) and site-specific information in support of NNC for this area (August 2010). Provided below is a comparison of these documents.

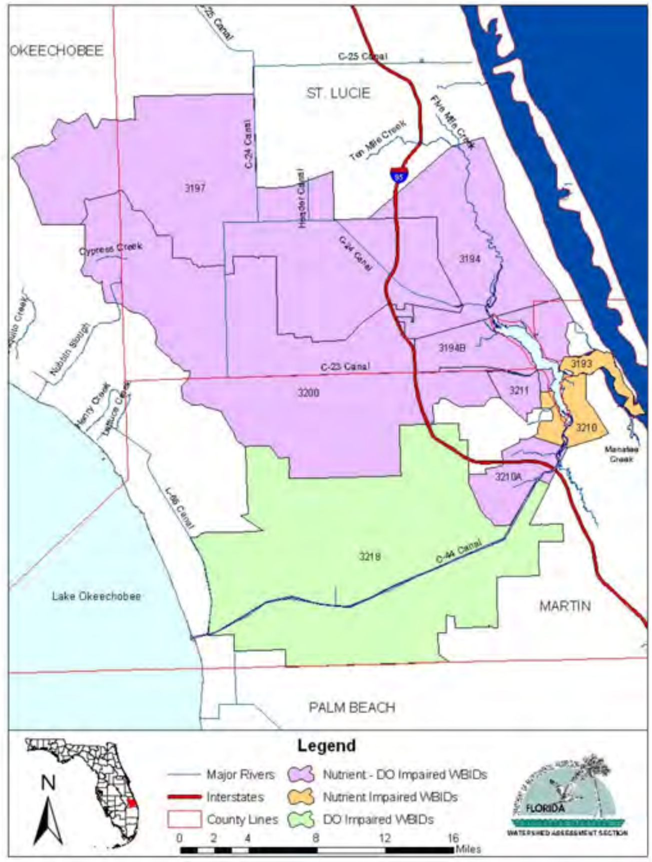


Figure 1 - Verified Impaired WBIDs for the St. Lucie Basin (from FDEP, Oct 2008)

FDEP TMDL Report (October 2008)

The TMDL Report identifies that for the St. Lucie Estuary (SLE), the North SLE (WBID 3194B) and South SLE (WBID 3210) are impaired by nutrients. The North SLE (WBIDs 3194 and 3194B) is also impaired for dissolved oxygen (DO) with the causative pollutant identified as high TN or TP. To address all of the impairments, FDEP adopted nutrient criteria of 0.72 mg/l for TN and 0.081 mg/l for TP. No Chlorophyll-a criteria were included, although the TN and TP target concentrations were set so that the IWR estuarine Chlorophyll-a did not exceed 11 µg/l and the fluctuation in DO due to diurnal algal activity is minimized.

FDEP Site-Specific Information in Support of Establishing NNC in the St. Lucie Estuary (August 2010)

In support of the setting of estuarine criteria by Florida, this document provided a summary of studies done in the St. Lucie area including the TMDL report. In short, the document concluded that the applicable criteria should be those recommended by the TMDL.

EPA NNC for Estuaries (40 CFR Part 131, December 18, 2012)

EPA's version of the NNC for this area is listed in Table III.B-1 on page 74952. The criteria ranges are 0.58 to 1.22 mg/l for TN, 0.045 to 0.197 mg/l for TP and 5.3 to 8.9 µg/l for Chlorophyll-a. Although EPA acknowledges the FDEP TMDL report, the technical analysis (documented in Appendix C Attachment 19: Indian River of the Technical Support Document) based the recommended NNC on deterministic modeling to protect three biological endpoints: light levels to maintain historical depth of seagrass colonization, chlorophyll a concentrations associated with balanced algal biomass and sufficient DO to maintain aquatic life (40 CFR 131, page 74939).

The overall model used (known as the Indian River Model) extended from southern Volusia County to Palm Beach County and included a total of 5 USGS stations for calibration and validation. For the St. Lucie River, the only nearby station used for validation was 02277600 for flow and 21FLLOX55 for water quality. The model simulated the annual flows at 02277600 (Loxahatchee River) reasonably well but underestimated the summer storm flows by as much as 15 percent. For the water quality simulation, of note is the simulation of TSS for the Loxahatchee River: the measured values did not exceed 50 mg/l from 1997 to 2005, yet the simulated values exceeded 300 mg/l. The simulation of TN and TP for the Loxahatchee River (shown on page C19-44) show that TN appears to be under-simulated (predicted lower than measured) by as much as 100 percent and TP is represented in a scale that minimizes the comparison. Figures C19-63 and 64 in the Appendix show that the modeled TN and TP loads were almost always underestimated by the model. This is confirmed by Tables C19-22 and 23 which indicate that for the 10-year simulation the percent errors were -38.9% for TN and -34.5% for TP, respectively. EPA states that these errors for calibration are considered “very good”.

Comparison

The inset table provides a comparison of the proposed EPA NNC and FDEP TMDL. It is clear that the EPA proposal did not use the TMDL targets although the range of proposed NNC surround Florida’s except for Chlorophyll-a. It appears that the EPA proposed criteria and FDEP criteria are based on 2 of the same endpoints (i.e., Chlorophyll-a concentrations are sufficient DO values. EPA’s criteria add the endpoint of light penetration for grassbeds and FDEP’s do not (although the Site-Specific Information for this area identifies loss of grassbeds as a problem).

Table 1 - Comparison of EPA and FDEP Proposed NNC

Proposal	Segment	Total Nitrogen (TN - mg/l)	Total Phosphorus (TP - mg/l)	Chlorophyll-a (µg/l)	Downstream Protection Values
2012 EPA Proposed Criteria	1401 - Lower St. Lucie	0.58	0.045	5.3	Based on dilution model using NNC
2012 EPA Proposed Criteria	1402 - Middle St. Lucie	0.90	0.120	8.4	Based on dilution model using NNC
2012 EPA Proposed Criteria	1403 - Upper St. Lucie	1.22	0.197	8.9	Based on dilution model using NNC
2010 FDEP Criteria [1]	All Esturarine Segments	0.72	0.081	11.0	TMDL

Conclusions

The summary of the EPA’s NNC is concluded with a consideration of 7 questions.

Are the endpoints justified? FDEP’s and EPA’s appear to be somewhat consistent. The biggest difference is that while FDEP noted the loss of grassbeds as a problem, they did not use light penetration to set a Chlorophyll-a target. Furthermore, while EPA used a regression analysis to estimate the light penetration from Chlorophyll-a, turbidity and color (Appendix B, page B-4), they did not accurately simulate turbidity (note that it is not explained how TSS and turbidity is related, nor how EPA considered color in these simulations).

Is the segmentation appropriate? To a large degree, EPA's segmentation mimics FDEP's. However, for the model segmentation, there is not enough information (i.e., scale is too small) to provide a comparison.

Are the data used appropriate? Any data missing from their analysis? EPA used only USGS data. There are significant data available from SFWMD that were ignored.

Method for determining NNC – Empirical or Mechanistic? EPA uses a mechanistic (also referred to as deterministic) methodology to set the NNC for the St. Lucie Estuary.

Model Validity – watershed, hydrodynamic, WQ response? As noted above, the model domain spread from south Volusia County to north Palm Beach County using the data from only 2 flow and water quality stations for calibration and3 more added for validation. Examination of their definition of calibration was illustrated in tables comparing the measured and simulated annual TN and TP loads. Table 2 shows a range of % error for the calibration and validation sites. It can be seen that EPA averaged the percent error for the years where annual data were available. For station 21FLWPB20010706 (South Prong of St. Sebastian River near Sebastian), annual errors ranged from 38.4 percent to -49.2 percent with an average of -18.2, which is considered "Very Good" (VG). This methodology is not valid. It is essentially stating, for example, that a sine curve is the same as a straight line because the differences between the line and sine curve average to zero. Based on these data, the model works for a variation of -58.1 percent and 249.0 percent of the measured values – setting of standards based on this range is unsupportable.

Table 2 - Simulated and Measured TN and TP Loads

Station:	21FLSJWMIRLTPM		21FLWPB20010706		21FLSJWMIRLVMC		21FLLOX55		21FLWPB28010532	
Year	TN % Error	TP % Error	TN % Error	TP % Error	TN % Error	TP % Error	TN % Error	TP % Error	TN % Error	TP % Error
1997							(27.3)	(19.3)		
1998							(45.6)	(48.1)		
1999					142.7	97.4	(39.0)	(7.7)		
2000					177.0	67.5	(33.1)	(8.5)		
2001					78.0	303.0	(58.1)	(32.4)		
2002					120.5	(38.0)	(29.8)	(52.0)	12.3	(33.8)
2003	47.6	38.4	(30.1)	(51.8)	85.9	(26.8)	(44.4)	(39.2)		
2004	(22.9)	(49.2)			94.8	(46.9)	(39.0)	(45.9)		
2005	10.3	(15.6)			118.2	(25.6)	(17.2)	(20.4)		
2006	1.1	(18.9)			249.0	83.7				
2007	102.9	27.0			143.2	(15.0)				
2008	62.3	(20.1)							0.4	(11.2)
2009										
Average	24.1	(18.2)	(30.1)	(51.8)	120.8	(9.1)	(38.9)	(34.5)	5.4	
EPA Rating	VG	VG	VG	G	F	VG	VG	VG	VG	VG

Model application to derive NNC? EPA used the LSPC model for watershed loading. The EFDC model was used for the receiving water temperature and elevations and WASP7 model was used for Chlorophyll-a, DO, BOD, TN, TP, ammonia, Nitrate + Nitrite and TSS. For the LSPC model, it appears that 119 subwatersheds were used to define the runoff for the entire domain. Due to the scale of the maps, it is not possible to identify the number of subwatersheds in the St. Lucie area; however, a rough estimate is 20 based on the interconnectivity of the canals. In a flat, coastal environment such as this, more subwatersheds are needed. Also, it is not clear how EPA addressed the discharges from Lake Okeechobee – they may have done so, but it is not clearly described in the documents. Finally, as noted previously, calibration and validation was not done well with wide variation in model results. EPA states (Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds, page C-39) that percent errors of 40 to 90 percent were considered "good" and errors up to 40 percent were considered "very good" – these values are not consistent with common practice nor are they acceptable to even EPA in review of TMDLs. This type of variation means that the criteria derived are not precise, nor do they lead to reasonable consideration of cause and effect.

Downstream protection values? Appendix B of the Technical Support Document provides the description of the process to define downstream protection values (DPVs). Although the DPV results are not provided for review, EPA states that a mixing/dilution model was used to consider the DPVs. The model is a simple, conservative mixing process which mixes freshwater inputs with target nutrient concentrations. For the purposes of the analysis, freshwater salinity was assumed to be 2.7 PSU (practical salinity unit; same as parts per thousand) and estuarine salinity was assumed to be 36 PSU. The DPV was calculated as:

$$DPV = \frac{(TN_{crit} - TN_{sea})}{(S_{seg} - S_{sea})}(2.7 - S_{sea}) + TN_{sea}$$

This equation is based on a linear derivation (y=mx + b):

$$Y = \frac{(Y_1 - Y_0)}{(X_1 - X_0)}(X - X_0) + Y_0$$

where Y is the DPV, X is the salinity of the segment in question, (X_0, Y_0) is the point representing the ocean (sea), and (X_1, Y_1) is the point representing the criteria for freshwater. Therefore, the ocean is represented by the point (36, 0.14) and the freshwater criterion is represented by the point (2.7, 0.58). The point that needs to be determined is $(S_{seg}$, DPV). In the formula defined by EPA, however, the X and X_1 have been reversed. Therefore, the equation should be:

$$DPV = \frac{(TN_{crit} - TN_{sea})}{(2.7 - S_{sea})}(S_{seg} - S_{sea}) + TN_{sea}$$

Segment Salinity	DPV
2.7	0.58
4.0	0.56
6.0	0.54
8.0	0.51
10.0	0.48
12.0	0.46
14.0	0.43
16.0	0.40
18.0	0.38
20.0	0.35
22.0	0.32
24.0	0.30
26.0	0.27
28.0	0.25
30.0	0.22
32.0	0.19
34.0	0.17
36.0	0.14

This formula results in the values in the inset for the example. At the ocean, with salinity 36, the TN should be 0.14 mg/l and at the inflow with freshwater, the TN should be the criteria (0.58 mg/l). Therefore, this corrected formula rings true. Therefore, it appears that the equation used by EPA for DPV formulation is incorrect.