ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 131

[EPA–HQ–OW–2009–0596; FRL–9105–1]

RIN 2040–AF11

Water Quality Standards for the State of Florida's Lakes and Flowing Waters

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing numeric nutrient water quality criteria to protect aquatic life in lakes and flowing waters, including canals, within the State of Florida and proposing regulations to establish a framework for Florida to develop "restoration standards" for impaired waters. On January 14, 2009, EPA made a determination under section 303(c)(4)(B) of the Clean Water Act ("CWA" or "the Act") that numeric nutrient water quality criteria for lakes and flowing waters and for estuaries and coastal waters are necessary for the State of Florida to meet the requirements of CWA section 303(c). Section 303(c)(4) of the CWA requires the Administrator to promptly prepare and publish proposed regulations setting forth new or revised water quality standards ("WQS" or "standards") when the Administrator, or an authorized delegate of the Administrator, determines that such new or revised WQS are necessary to meet requirements of the Act. This proposed rule fulfills EPA's obligation under section 303(c)(4) of the CWA to promptly propose criteria for Florida's lakes and flowing waters.

DATES: Comments must be received on or before March 29, 2010.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OW–2009–0596, by one of the following methods:

1. *www.regulations.gov:* Follow the online instructions for submitting comments.
2. *E-mail: ow-docket@epa.gov.*
3. *Mail to:* Water Docket, U.S. Environmental Protection Agency, Mail Code: 2822T, 1200 Pennsylvania Avenue, NW., Washington, DC 20460, Attention: Docket ID No. EPA–HQ–OW–2009–0596.
4. *Hand Delivery:* EPA Docket Center, EPA West Room 3334, 1301 Constitution Avenue, NW., Washington, DC 20004, Attention: Docket ID No. EPA–HQ–OW–2009–0596. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OW–2009–0596. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov,* including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or e-mail. The *www.regulations.gov* Web site is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through *www.regulations.gov* your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, *e.g.,* CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at a docket facility. The Office of Water (OW) Docket Center is open from 8:30 until 4:30 p.m., Monday through Friday, excluding legal holidays. The OW Docket Center telephone number is (202) 566–2426, and the Docket address is OW Docket, EPA West, Room 3334, 1301 Constitution Avenue, NW., Washington, DC 20004. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744.

Public hearings will be held in the following cities in Florida: Tallahassee, Orlando, and West Palm Beach. The public hearing in Tallahassee is scheduled for Tuesday, February 16, 2010 and will be held from 1 p.m. to 5 p.m. and 7 p.m. to 10 p.m. at the Holiday Inn Capitol East, 1355 Apalachee Parkway, Tallahassee, FL 32301. The public hearing in Orlando is scheduled for Wednesday, February 17, 2010 and will be held from 1 p.m. to 5 p.m. and 7 p.m. to 10 p.m. at the Crowne Plaza Orlando Universal, 7800 Universal Boulevard, Orlando, FL 32819. The public hearing in West Palm Beach is scheduled for Thursday, February 18, 2010 and will be held from 1 p.m. to 5 p.m. and 7 p.m. to 10 p.m. at the Holiday Inn Palm Beach Airport, 1301 Belvedere Road, West Palm Beach, FL 33405. If you need a sign language interpreter at any of these hearings, you should contact Sharon Frey at 202–566–1480 or *frey.sharon@epa.gov* at least ten business days prior to the meetings so that appropriate arrangements can be made. For further information, including registration information, please refer to the following Web site: *http://www.epa.gov/waterscience/standards/rules/florida/.*

FOR FURTHER INFORMATION CONTACT: Danielle Salvaterra, U.S. EPA Headquarters, Office of Water, Mailcode: 4305T, 1200 Pennsylvania Avenue, NW., Washington, DC 20460; telephone number: 202–564–1649; fax number: 202–566–9981; e-mail address: *salvaterra.danielle@epa.gov.*

SUPPLEMENTARY INFORMATION: This supplementary information section is organized as follows:

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I. General Information

A. Executive Summary

Excess loadings of nitrogen and phosphorus, commonly referred to as nutrient pollution, are one of the most prevalent causes of water quality impairment in the United States. Anthropogenic nitrogen and phosphorus over-enrichment in many of the Nation's waters is a widespread, persistent, and growing problem. Nutrient pollution can significantly impact aquatic life and long-term ecosystem health, diversity, and balance. More specifically, high nitrogen and phosphorus loadings, or nutrient pollution, result in harmful algal blooms (HABs), reduced spawning grounds and nursery habitats, fish kills, and oxygen-starved hypoxic or "dead" zones. Public health concerns related to nutrient pollution include impaired drinking water sources, increased exposure to toxic microbes such as cyanobacteria, and possible formation of disinfection byproducts in drinking water, some of which have been associated with serious human illnesses such as bladder cancer. Nutrient problems can exhibit themselves locally or much further downstream leading to degraded lakes, reservoirs, and estuaries, and to hypoxic zones where fish and aquatic life can no longer survive.

In the State of Florida, nutrient pollution has contributed to severe water quality degradation. Based upon waters assessed and reported in the *2008 Integrated Water Quality Assessment for Florida,* approximately 1,000 miles of rivers and streams, 350,000 acres of lakes, and 900 square miles of estuaries are known to be impaired for nutrients by the State.[1] The actual number of stream miles, lake acres, and estuarine square miles of waters impaired for nutrients in Florida may be higher, as many waters currently are classified as "unassessed."

The challenge of nutrient pollution has been a top priority for Florida's Department of Environmental Protection (FDEP). Over the past decade or more, FDEP has spent over 20 million dollars collecting and analyzing data on the relationship between phosphorus, nitrogen, and nitrite-nitrate concentrations and the biological health of aquatic systems. Moreover, Florida is one of the few states that has in place a comprehensive framework of accountability that applies to both point and nonpoint sources and provides the enforceable authority to address nutrient reductions in impaired waters based upon the establishment of site-specific total maximum daily loads (TMDLs).

Despite FDEP's intensive efforts to diagnose and control nutrient pollution, substantial water quality degradation from nutrient over-enrichment remains a significant problem. On January 14, 2009, EPA determined under CWA section 303(c)(4)(B) that new or revised WQS in the form of numeric nutrient water quality criteria are necessary to meet the requirements of the CWA in the State of Florida. The Agency considered (1) the State's documented unique and threatened ecosystems, (2) the high number of impaired waters due to existing nutrient pollution, and (3) the challenge associated with growing nutrient pollution resulting from expanding urbanization, continued agricultural development, and a significantly increasing population that is expected to grow 75% between 2000 to 2030.[2] EPA also reviewed the State's regulatory nutrient accountability system, which represents an impressive synthesis of technology-based standards, point source control authority, and authority to establish enforceable controls for nonpoint source activities. However, the significant challenge faced by the water quality components of this system is its dependence upon an approach involving resource-intensive and time-consuming site-specific data collection and analysis to interpret non-numeric narrative nutrient criteria. EPA determined that Florida's reliance on a case-by-case interpretation of its narrative nutrient criterion in implementing an otherwise comprehensive water quality framework of enforceable accountability was insufficient to ensure protection of applicable designated uses. As part of the Agency's determination, EPA indicated that it expected to propose numeric nutrient criteria for lakes and flowing waters within 12 months, and for estuarine and coastal waters within 24 months, of the January 14, 2009 determination.

On August 19, 2009, EPA entered into a phased Consent Decree with Florida Wildlife Federation, Sierra Club, Conservancy of Southwest Florida, Environmental Confederation of Southwest Florida, and St. Johns Riverkeeper, committing to sign a proposed rule setting forth numeric nutrient criteria for lakes and flowing waters in Florida by January 14, 2010, and for Florida's estuarine and coastal waters by January 14, 2011, unless Florida submits and EPA approves State numeric nutrient criteria before EPA's proposal. The phased Consent Decree also provides that EPA issue a final rule by October 15, 2010 for lakes and flowing water, and by October 15, 2011 for estuarine and coastal waters, unless Florida submits and EPA approves State numeric nutrient criteria before a final EPA action.

Accordingly, this proposal is part of a phased rulemaking process in which EPA will propose and take final action in 2010 on numeric nutrient criteria for lakes and flowing waters and for estuarine and coastal waters in 2011. The two phases of this rulemaking are linked because nutrient pollution in Florida's rivers and streams affects not only instream aquatic conditions but also downstream estuarine and coastal waters ecosystem conditions. The Agency could have waited to propose estuarine and coastal downstream protection criteria values for rivers and streams as part of the second phase of this rulemaking process. However, the substantial data, peer-reviewed methodologies, and extensive scientific

[1] Florida Department of Environmental Protection. 2008. Integrated Water Quality Assessment for Florida: 2008 305(b) Report and 303(d) List Update, p. 67.

[2] *http://www.census.gov/population/projections/SummaryTabA1.pdf.*

analyses available to and conducted by the Agency to date indicate that numeric nutrient water quality criteria for estuarine and coastal waters, when proposed and finalized in 2011, may result in the need for more stringent rivers and streams criteria to ensure protection of downstream water quality, particularly for the nitrogen component of nutrient pollution. Therefore, considering the numerous requests for the Agency to share its analysis and scientific and technical conclusions at the earliest possible opportunity to allow for full review and comment, EPA is including downstream protection values for total nitrogen (TN) as proposed criteria for rivers and streams to protect the State's estuaries and coastal waters in this notice.

As described in more detail below and in the technical support document accompanying this notice, these proposed nitrogen downstream protection values are based on substantial data, thorough scientific analysis, and extensive technical evaluation. However, EPA recognizes that additional data and analysis may be available, including data for particular estuaries, to help inform what numeric nutrient criteria are necessary to protect Florida's waters, including downstream lakes and estuaries. EPA also recognizes that substantial site-specific work has been completed for a number of these estuaries. This notice and the proposed downstream protection values are not intended to address or be interpreted as calling into question the utility and protectiveness of these site-specific analyses. Rather, the proposed values represent the output of a systematic and scientific approach that was developed to be generally applicable to all flowing waters in Florida that terminate in estuaries for the purpose of ensuring the protection of downstream estuaries. EPA is interested in obtaining feedback at this time on this systematic and scientific approach. EPA is also interested in feedback regarding site-specific analyses for particular estuaries that should be used instead of this general approach for establishing final values. The Agency further recognizes that the proposed values in this notice will need to be considered in the context of the Agency's numeric nutrient criteria for estuarine and coastal waters scheduled for proposal in January of 2011.

Regarding the criteria for flowing waters for protection of downstream lakes and estuaries, at this time, EPA intends to take final action on the criteria for protection of downstream lakes as part of the first phase of this rulemaking (by October 15, 2010) and to finalize downstream protection values in flowing waters as part of the second phase of this rulemaking process (by October 15, 2011) in coordination with the proposal and finalization of numeric nutrient criteria for estuarine and coastal waters in 2011. However, if comments, data and analyses submitted as a result of this proposal support finalizing these values sooner, by October 2010, EPA may choose to proceed in this manner. To facilitate this process, EPA requests comments and welcomes thorough evaluation on the technical and scientific basis of these proposed downstream protection values, as well as information on estuaries where site-specific analyses should be used, as part of the broader comment and evaluation process that this proposal initiates.

In accordance with the terms of EPA's January 14, 2009 determination and the Consent Decree, EPA is proposing numeric nutrient criteria for Florida's lakes and flowing waters which include the following four water body types: Lakes, streams, springs and clear streams, and canals in south Florida. In developing this proposal, EPA worked closely with FDEP staff to review and analyze the State's extensive dataset of nutrient-related measurements as well as its analysis of stressor-response relationships and benchmark or modified-reference conditions. EPA also conducted further analyses and modeling, in addition to requesting an independent external peer review of the core methodologies and approaches that support this proposal.

For lakes, EPA is proposing a classification scheme using color and alkalinity based upon substantial data that show that lake color and alkalinity play an important role in the degree to which TN and total phosphorus (TP) concentrations result in a biological response such as elevated chlorophyll *a* levels. EPA found that correlations between nutrients and biological response parameters in the different types of lakes in Florida were sufficiently robust, combined with additional lines of evidence, to support stressor-response criteria development for Florida's lakes. The Agency is also proposing an accompanying supplementary analytical approach that the State can use to adjust TN and TP criteria for a particular lake within a certain range where sufficient data on long-term ambient TN and TP levels are available to demonstrate that protective chlorophyll *a* criteria for a specific lake will still be maintained and attainment of the designated use will be assured. This information is presented in more detail in Section III.B below.

Regarding numeric nutrient criteria for streams and rivers, EPA considered the extensive work of FDEP to analyze the relationship between TN and TP levels and biological response in streams and rivers. EPA found that relationships between nutrients and biological response parameters in rivers and streams were affected by many factors that made derivation of a quantitative relationship between chlorophyll *a* levels and nutrients in streams and rivers difficult to establish in the same manner as EPA did for lakes (*i.e.,* stressor-response relationship). EPA considered an alternative methodology that evaluated a combination of biological information and data on the distribution of nutrients in a substantial number of healthy stream systems. Based upon a technical evaluation of the significant available data on Florida streams and related scientific analysis, the Agency concluded that reliance on a statistical distribution methodology was a stronger and a more sound approach for deriving TN and TP criteria in streams and rivers. This information is presented in more detail in Section III.C below.

In developing these proposed numeric nutrient criteria for rivers and streams, EPA also evaluated their effectiveness for assuring the protection of downstream lake and estuary designated uses pursuant to the provisions of 40 CFR 130.10(b), which requires that WQS must provide for the attainment and maintenance of the WQS of downstream waters. For rivers and streams in Florida, EPA must ensure, to the extent that available science allows, that its nutrient criteria take into account the impact of near-field nutrient loads on aquatic life in downstream lakes and estuaries. EPA currently has evaluated the protectiveness of its rivers and streams TP criteria for lake protection and also the protectiveness of its rivers and streams TN criteria for 16 out of 26 of Florida's downstream estuaries using scientifically sound approaches for both estimating protective loads and deriving concentration-based upstream values. Of the ten downstream estuaries not completely evaluated to date, seven are in south Florida and receive TN loads from highly managed canals and waterways and three are in low lying areas of central Florida.

As noted above, EPA used best available science and data related to downstream waters and found that there are cases where the nutrient criteria EPA is proposing to protect instream aquatic life may not be stringent enough to ensure protection of aquatic life in certain downstream lakes and estuaries. Accordingly, EPA is also proposing an equation that would be used to adjust stream and river TP criteria to protect downstream lakes and a different methodology to adjust TN criteria for streams and rivers to ensure protection of downstream estuaries. These approaches as reflected in these proposed regulations and the revised criteria that would result from adjusting TN criteria for streams and rivers to ensure protection of downstream estuaries, based on certain assumptions, are detailed in Section III.C(6)(b) below. The Agency specifically requests comment on the available information, analysis, and modeling used to support the approaches EPA is proposing for addressing downstream impacts of TN and TP. EPA also invites additional stakeholder comment, data, and analysis on alternative technically-based approaches that would support the development of numeric nutrient WQS, or some other scientifically defensible approach, for protection of downstream waters. To the degree that substantial data and analyses are submitted that support a significant revision to downstream protection values for TN outlined in Section III.C(6)(b) below, EPA would intend to issue a supplemental **Federal Register** Notice of Data Availability (NODA) to present the additional data and supplemental analyses and solicit further comment and input. EPA anticipates obtaining the necessary data and information to compute downstream protection values for TP loads for many estuarine water bodies in Florida in 2010 and will also make this additional information available by issuing a supplemental **Federal Register** NODA.

Regarding numeric nutrient criteria for springs and clear streams, EPA is proposing a nitrate-nitrite criterion for springs and clear streams based on experimental laboratory data and field evaluations that document the response of nuisance algae and periphyton to nitrate-nitrite concentrations. This criterion is explained in more detail in Section III.D below.

For canals in south Florida, EPA is proposing a statistical distribution approach similar to its approach for rivers and streams, and based on sites meeting designated uses with respect to nutrients identified in four canal regions to best represent the necessary criteria to protect these highly managed water bodies. This approach is presented in more detail in Section III.E below. The Agency has also considered several alternative approaches to developing numeric nutrient criteria for canals and these are described, as well, for public comment and response.

Stakeholders have expressed concerns that numeric nutrient criteria must be scientifically sound. Under the Clean Water Act and EPA's implementing regulations, numeric nutrient standards must protect the designated use of a water (as well as ensure protection of downstream uses) and must be based on sound scientific rationale. In the case of Florida, EPA and FDEP scientists completed a substantial body of scientific work; EPA believes that these proposed criteria clearly meet the regulatory standards of protection and that they are clearly based on a sound scientific rationale.

Separate from and in addition to proposing numeric nutrient criteria, EPA is also proposing a new WQS regulatory tool for Florida, referred to as "restoration WQS" for impaired waters. This tool will enable Florida to set incremental water quality targets (uses and criteria) for specific pollutant parameters while at the same time retaining protective criteria for all other parameters to meet the full aquatic life use. The goal is to provide a challenging but realistic incremental framework in which to establish appropriate control measures. This provision will allow Florida to retain full aquatic life protection (uses and criteria) for its water bodies while establishing a transparent phased WQS process that would result in planned implementation of enforceable measures and requirements to improve water quality over a specified time period to ultimately meet the long-term designated aquatic life use. The phased numeric standards would be included in Florida's water quality regulations during the restoration period. This proposed regulatory tool is discussed in more detail in Section VI below.

Finally, EPA is including in this notice a proposed approach for deriving Federal site-specific alternative criteria (SSAC) based upon State submissions of scientifically defensible recalculations that meet the requirements of CWA section 303(c). TMDL targets submitted to EPA by the State for consideration as new or revised WQS could be reviewed under this SSAC process. This proposed approach is discussed in more detail in Section V.C below.

Overall, EPA is soliciting comments and data regarding EPA's proposed criteria for lakes and flowing waters, the derivation of these criteria, the protectiveness of the streams and rivers criteria for downstream waters, and all associated alternative options and methodologies discussed in this proposed rulemaking.

B. What Entities May Be Affected by This Rule?

Citizens concerned with water quality in Florida may be interested in this rulemaking. Entities discharging nitrogen or phosphorus to lakes and flowing waters of Florida could be indirectly affected by this rulemaking because WQS are used in determining National Pollutant Discharge Elimination System ("NPDES") permit limits. Stakeholders in Florida facing obstacles in immediately achieving full aquatic life protection in impaired waters may be interested in the restoration standards concept outlined in this rulemaking. Categories and entities that may ultimately be affected include:

Category	Examples of potentially affected entities
Industry	Industries discharging pollutants to lakes and flowing waters in the State of Florida.
Municipalities	Publicly-owned treatment works discharging pollutants to lakes and flowing waters in the State of Florida.
Stormwater Management Districts.	Entities responsible for managing stormwater runoff in Florida.

This table is not intended to be exhaustive, but rather provides a guide for entities that may be directly or indirectly affected by this action. This table lists the types of entities of which EPA is now aware that potentially could be affected by this action. Other types of entities not listed in the table could also be affected, such as nonpoint source contributors to nutrient pollution in Florida's waters. Any parties or entities conducting activities within watersheds of the Florida waters covered by this rule, or who rely on, depend upon, influence, or contribute to the water quality of the lakes and flowing waters of Florida, might be affected by this rule. To determine whether your facility or activities may be affected by this action, you should examine this proposed rule. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

C. What Should I Consider as I Prepare My Comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *http://www.regulations.gov* or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD–ROM that

you mail to EPA, mark the outside of the disk or CD–ROM as CBI and then identify electronically within the disk or CD–ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information so marked will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

1. Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date, and page number).

2. Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.

3. Explain why you agree or disagree; suggest alternatives and substitute language for your requested changes.

4. Describe any assumptions and provide any technical information and/or data that you used.

5. If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.

6. Provide specific examples to illustrate your concerns, and suggest alternatives.

7. Make sure to submit your comments by the comment period deadline identified.

D. How Can I Get Copies of This Document and Other Related Information?

1. *Docket.* EPA has established an official public docket for this action under Docket Id. No. EPA–HQ–OW–2009–0596. The official public docket consists of the document specifically referenced in this action, any public comments received, and other information related to this action. Although a part of the official docket, the public docket does not include CBI or other information whose disclosure is restricted by statute. The official public docket is the collection of materials that is available for public viewing at the OW Docket, EPA West, Room 3334, 1301 Constitution Ave., NW., Washington, DC 20004. This Docket Facility is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The Docket telephone number is 202–566–1744. A reasonable fee will be charged for copies.

2. *Electronic Access.* You may access this **Federal Register** document electronically through the EPA Internet under the "Federal Register" listings at *http://www.epa.gov/fedrgstr/.*

An electronic version of the public docket is available through EPA's electronic public docket and comment system, EPA Dockets. You may use EPA Dockets at *http://www.regulations.gov* to view public comments, access the index listing of the contents of the official public docket, and to access those documents in the public docket that are available electronically. For additional information about EPA's public docket, visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.* Although not all docket materials may be available electronically, you may still access any of the publicly available docket materials through the Docket Facility identified in Section I.D(1).

II. Background

A. Nutrient Pollution

1. What Is Nutrient Pollution?

Excess anthropogenic concentrations of nitrogen (typically in oxidized, inorganic forms, such as nitrate) [3] and phosphorus (typically as phosphate), commonly referred to as nutrient pollution, in surface waters can result in excessive algal and aquatic plant growth, referred to as eutrophication.[4] One impact associated with eutrophication is low dissolved oxygen, due to decomposition of the aquatic plants and algae when these plants and algae die. As noted above, high nitrogen and phosphorus loadings also result in HABs, reduced spawning grounds and nursery habitats for aquatic life, and fish kills. Public health concerns related to eutrophication include impaired drinking water sources, increased exposure to toxic microbes such as cyanobacteria, and possible formation of disinfection byproducts in drinking water, some of which have been associated with serious human illnesses such as bladder cancer.[5 6] Nutrient problems can manifest locally or much further downstream in lakes, reservoirs, and estuaries.

Excess nutrients in water bodies come from many sources, which can be grouped into five major categories: (1) Sources associated with urban land use and development, (2) municipal and industrial waste water discharge, (3) row crop agriculture, (4) animal husbandry, and (5) atmospheric deposition that may be increased by production of nitrogen oxides in electric power generation and internal combustion engines. These sources contribute significant loadings of nitrogen and phosphorus to surface waters causing major impacts to aquatic ecosystems and significant imbalances in the natural populations of flora and fauna.[7]

2. Adverse Impacts of Nutrient Pollution on Aquatic Life, Human Health, and the Economy

To protect aquatic life, EPA regulates pollutants that have adverse effects on aquatic life. For most pollutants, these effects are typically negative impacts on growth, reproduction, and survival. As previously noted, excess nutrients can lead to increases in algal and other aquatic plant growth, including toxic algae that can result in HABs. Increases in algal and aquatic plant growth provide excess organic matter in a water body and can contribute to subsequent degradation of aquatic communities, human health impacts, and ultimately economic impacts.

Fish, shellfish, and wildlife require clean water for survival. Changes in the environment resulting from elevated nutrient levels (such as algal blooms, toxins from HABs, and hypoxia/anoxia) can cause a variety of effects. When excessive nutrient loads change a water body's algae and plant species, the change in habitat and available food resources can induce changes affecting an entire food chain. Algal blooms block

[3] To be used by living organisms, nitrogen gas must be fixed into its reactive forms; for plants, either nitrate or ammonia.

[4] Eutrophication is defined as an increase in organic carbon to an aquatic ecosystem caused by primary productivity stimulated by excess nutrients—typically compounds containing nitrogen or phosphorus. Eutrophication can adversely affect aquatic life, recreation, and human health uses of waters.

[5] Villanueva, C.M. *et al.,* 2006. Bladder Cancer and Exposure to Water Disinfection By-Products through Ingestion, Bathing, Showering, and Swimming in Pools. *American Journal of Epidemiology,* 165(2):148–156.

[6] U.S. EPA. 2009. What Is in Our Drinking Water. United States Environmental Protection Agency, Office of Research and Development. *http://www.epa.gov/extrmurl/research/process/drinkingwater.html.* Accessed December 2009.

[7] National Research Council, 2000. Clean Coastal Waters: Understanding and Reducing the Effects of Nutrient Pollution. Report prepared by the Ocean Study Board and Water Science and Technology Board, Commission on Geosciences, Environment and Resources, National Resource Council. National Academy Press, Washington, DC; Howarth, R.W., A. Sharpley, and D. Walker. 2002. Sources of nutrient pollution to coastal waters in the United States: Implications for achieving coastal water quality goals. *Estuaries.* 25(4b):656–676; Smith, V.H. 2003. Eutrophication of freshwater and coastal marine ecosystems. *Environ. Sci. and Poll. Res.* 10(2):126–139; Dodds, W.K., W.W. Bouska, J.L. Eitzmann, T.J. Pilger, K.L. Pitts, A.J. Riley, J.T. Schloesser, and D.J. Thornbrugh. 2009. Eutrophication of U.S. freshwaters: Analysis of potential economic damages. *Environ. Sci. Tech.*. 43(1):12–19.

sunlight that submerged grasses need to grow, leading to a decline of seagrass beds and decreased habitat for juvenile organisms. Algal blooms can also increase turbidity and impair the ability of fish and other aquatic life to find food.[8] Algae can also damage or clog the gills of fish and invertebrates.[9]

HABs can form toxins that cause illness or death for some animals. Some of the more commonly affected animals include sea lions, turtles, seabirds, dolphins, and manatees.[10] More than 50% of unusual marine mortality events may be associated with HABs.[11] Lower level consumers, such as small fish or shellfish, may not be harmed by algal toxins, but they bioaccumulate toxins, causing higher exposures for higher level consumers (such as larger predator fish), resulting in health impairments and possibly death.[12] [13]

There are many examples of HAB toxins significantly affecting marine animals. For example, between March and April 2003, 107 bottlenose dolphins *(Tursiops truncatus)* died, along with hundreds of fish and marine invertebrates, along the Florida Panhandle.[14] High levels of brevetoxin (a neurotoxin), produced by a harmful species of dinoflagellate (a type of algae), were measured in all of the stranded dolphins examined, as well as in their fish prey.[15]

In freshwater, cyanobacteria can produce toxins that have been implicated as the cause of a large number of fish and bird mortalities. These toxins have also been tied to the death of pets and livestock that may be exposed through drinking contaminated water or grooming themselves after bodily exposure.[16] A recent study showed that at least one type of cyanobacteria has been linked to cancer and tumor growth in animals.[17]

Excessive algal growth contributes to increased oxygen consumption associated with decomposition, potentially reducing oxygen to levels below that needed for aquatic life to survive and flourish.[18] [19] Low oxygen, or hypoxia, often occurs in episodic "events," which sometimes develop overnight. Mobile species, such as adult fish, can sometimes survive by moving to areas with more oxygen. However, migration to avoid hypoxia depends on species mobility, availability of suitable habitat, and adequate environmental cues for migration. Less mobile or immobile species, such as oysters and mussels, cannot move to avoid low oxygen and are often killed during hypoxic events.[20] While certain mature aquatic animals can tolerate a range of dissolved oxygen levels that occur in the water, younger life stages of species like fish and shellfish often require higher levels of oxygen to survive.[21] Sustained low levels of dissolved oxygen cause a severe decrease in the amount of aquatic life in hypoxic zones and affect the ability of aquatic organisms to find necessary food and habitat. In extreme cases, anoxic conditions occur when there is a complete lack of oxygen. Very few organisms can live without oxygen (for example some microbes), hence these areas are sometimes referred to as dead zones.[22]

Primary impacts to humans result directly from elevated nutrient pollution levels and indirectly from the subsequent water body changes that occur from increased nutrients (such as algal blooms and toxins). Direct impacts include effects on human health through drinking water or consuming toxic shellfish. Indirect impacts include restrictions on recreation (such as boating, swimming, and kayaking). Algal blooms can prevent opportunities to swim and engage in other types of recreation. In areas where recreation is determined to be unsafe because of algal blooms, warning signs are often posted to discourage human use of the waters.

Highly elevated nitrogen levels, in the form of nitrate, in drinking water supplies and private wells can cause methemoglobinemia (blue baby syndrome, which refers to high levels of nitrate in a baby's blood that reduce the blood's ability to deliver oxygen to the skin and organs resulting in a bluish tinge to the skin; in severe cases methemoglobinemia can lead to coma and death).[23] Monitoring of Florida Public Water Supplies from 2004–2007 indicates that violations of nitrate maximum contaminant levels (MCL) ranged from 34–40 violations annually.[24] In addition, in the predominantly agricultural regions of Florida, of 3,949 drinking water wells analyzed for nitrate by the Florida Department of Agriculture and Consumer Services, (FDACS) and the FDEP, 2,483 (63%) contained detectable nitrate and 584 wells (15%) contained nitrate above the U.S. EPA MCL. Of the 584 wells statewide that exceeded the MCL, 519 were located in the Central Florida Ridge citrus growing region, encompassed primarily by Lake, Polk and Highland Counties.[25] Human health can also be impacted by disinfection byproducts formed when disinfectants (such as chlorine) used to treat drinking water react with organic carbon (from the algae in source waters). Some disinfection byproducts have been linked to rectal, bladder, and colon cancers; reproductive health risks; and liver, kidney, and central nervous

[8] Hauxwell, J. C. Jacoby, T. Frazer, and J. Stevely. 2001. Nutrients and Florida's Coastal Waters. Florida Sea Grant.

[9] NOAA. 2009. Harmful Algal Blooms: Current Programs Overview. National Oceanic and Atmospheric Administration. *http://www.cop.noaa.gov/stressors/extremeevents/hab/welcome.html.* Accessed December 2009.

[10] NOAA. 2009. Harmful Algal Blooms: Current Programs Overview. National Oceanic and Atmospheric Administration. *http://www.cop.noaa.gov/stressors/extremeevents/hab/welcome.html.* Accessed December 2009.

[11] WHOI. 2008. HAB Impacts on Wildlife. Woods Hole Oceanographic Institution. *http://www.whoi.edu/redtide/page.do?pid=9682.* Accessed December 2009.

[12] WHOI. 2008. Marine Mammals. Woods Hole Oceanographic Institution. *http://www.whoi.edu/redtide/page.do?pid=14215.* Accessed December 2009.

[13] WHOI. 2008. HAB Impacts on Wildlife. Woods Hole Oceanographic Institution. *http://www.whoi.edu/redtide/page.do?pid=9682.* Accessed December 2009.

[14] WHOI. 2008. Marine Mammals. Woods Hole Oceanographic Institution. *http://www.whoi.edu/redtide/page.do?pid=14215.* Accessed December 2009.

[15] WHOI. 2008. Marine Mammals. Woods Hole Oceanographic Institution. *http://www.whoi.edu/redtide/page.do?pid=14215.* Accessed December 2009.

[16] WHOI. 2008. HAB Impacts on Wildlife. Woods Hole Oceanographic Institution. *http://www.whoi.edu/redtide/page.do?pid=9682.* Accessed December 2009.

[17] Falconer, I.R., A.R. Humpage. 2005. Health Risk Assessment of Cyanobacterial (Blue-green Algal) Toxins in Drinking Water. *Int. J. Environ. Res. Public Health.* 2(1): 43–50.

[18] NOAA. 2009. Harmful Algal Blooms: Current Programs Overview. National Oceanic and Atmospheric Administration. *http://www.cop.noaa.gov/stressors/extremeevents/hab/welcome.html.* Accessed December 2009.

[19] USGS. 2009. Hypoxia. U.S. Geological Survey. *http://toxics.usgs.gov/definitions/hypoxia.html.* Accessed December 2009.

[20] ESA. 2009. Hypoxia. Ecological Society of America. *http://www.esa.org/education_diversity/pdfDocs/hypoxia.pdf.* Accessed December 2009.

[21] USEPA. 2000. Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Cod to Cape Hattaras. Environmental Protection Agency, Office of Water, Washington DC PA–822–R–00–012.

[22] Ecological Society of America. 2009. Hypoxia. Ecological Society of America, Washington, DC. *http://www.esa.org/education/edupdfs/hypoxia.pdf.* Accessed December 2009.

[23] USEPA. 2007. Nitrates and Nitrites. U.S. Environmental Protection Agency. *http://www.epa.gov/teach/chem_summ/Nitrates_summary.pdf.* Accessed December 2009.

[24] FDEP 2009. *Chemical Data for 2004, 2005, 2006, 2007 and 2008.* Florida Department of Environmental Protection. *http://www.dep.state.fl.us/water/drinkingwater/chemdata.htm.* Accessed January 2010.

[25] Southern Regional Water Program. 2010. Drinking Water and Human Health in Florida. Southern Regional Water Program, *http://srwqis.tamu.edu/florida/program-information/florida-target-themes/drinking-water-and-human-health.aspx.* Accessed January 2010.

system problems.[26] [27] Humans can also be impacted by accidentally ingesting toxins, resulting from toxic algal blooms in water, while recreating or by consuming drinking water that still contains toxins despite treatment. For example, cyanobacteria toxins can sometimes pass through the normal water treatment process.[28] After consuming seafood tainted by toxic HABs, humans can develop gastrointestinal distress, memory loss, disorientation, confusion, and even coma and death in extreme cases. Some toxins only require a small dose to cause illness or death.[29] EPA expects that by addressing protection of aquatic life uses through the application of the proposed numeric nutrient criteria in this rulemaking, risks to human health will also be alleviated, as nutrient levels that represent a balance of natural populations of flora and fauna will not produce HABs nor result in highly elevated nitrate levels.

Nutrient pollution and eutrophication can also impact the economy through additional reactive costs, such as medical treatment for humans who ingest HAB toxins, treating drinking water supplies to remove algae and organic matter, and monitoring water for shellfish and other affected resources.

Economic losses from algal blooms and HABs can include reduced property values for lakefront areas, commercial fishery losses, and lost revenue from recreational fishing and boating trips, as well as other tourism-related businesses. Commercial fishery losses occur because of a decline in the amount of fish available for harvest due to habitat and oxygen declines. Some HAB toxins can make seafood unsafe for human consumption, and can reduce the amount of fish bought because people might question if eating fish is safe after learning of the presence of the algal bloom.[30] To put the issue into perspective, consider the following estimates: For freshwater lakes, losses in fishing and boating trip-related revenues nationwide due to eutrophication are estimated to range from $370 million to almost $1.2 billion dollars and loss of lake property values from excessive algal growth are estimated to range from $300 million to $2.8 billion annually on a national level.[31]

3. Nutrient Pollution in Florida

Water quality degradation resulting from excess nitrogen and phosphorus loadings is a documented and significant environmental issue in Florida. According to Florida's 2008 Integrated Report,[32] approximately 1,000 miles of rivers and streams, 350,000 acres of lakes, and 900 square miles of estuaries are impaired for nutrients in the State. To put this in context, these values represent approximately 5% of the assessed river and stream miles, 23% of the assessed lake acres, and 24% of the assessed square miles of estuaries that Florida has listed as impaired in the 2008 Integrated Report.[33] Nutrients are ranked as the fourth major source of impairment for rivers and streams in the State (after dissolved oxygen, mercury in fish, and fecal coliforms). For lakes and estuaries, nutrients are ranked first and second, respectively. As discussed above, impairments due to nutrient pollution result in significant impacts to aquatic life and ecosystem health. Nutrient pollution also represents, as mentioned above, an increased human health risk in terms of contaminated drinking water supplies and private wells.

Florida is particularly vulnerable to nutrient pollution. Historically, the State has experienced a rapidly expanding population, which is a strong predictor of nutrient loading and associated effects, and which combined with climate and other natural factors, make Florida waters sensitive to nutrient effects. Florida is currently the fourth most populous state in the nation, with an estimated 18 million people.[34] Population is expected to continue to grow, resulting in an expected increase in urban development, home landscapes, and wastewater. Florida's flat topography causes water to move slowly over the landscape, allowing ample opportunity for eutrophication responses to develop. Similarly, small tides in many of Florida's estuaries (especially on the Gulf coast) also allow for well-developed eutrophication responses in tidal waters. Florida's warm and wet, yet sunny, climate further contributes to increased run-off and subsequent eutrophication responses.[35] Exchanges of surface water and ground water contribute to complex relationships between nutrient sources and the location and timing of eventual impacts.[36]

In addition, extensive agricultural development and associated hydrologic modifications (*e.g.,* canals and ditches) amplify the State's susceptibility to nutrient pollution. Many of Florida's inland areas have extensive tracts of agricultural lands. Much of the intensive agriculture and associated fertilizer usage takes place in locations dominated by poorly drained sandy soils and with high annual rainfall amounts, two conditions favoring nutrient-rich runoff. These factors, along with population increase, have contributed to a significant upward trend in nutrient inputs to Florida's waters.[37] High historical water quality and the human and aquatic life uses of many waterways in Florida often means that very low nutrients, low productivity, and high water clarity are needed and expected to maintain uses.

B. Statutory and Regulatory Background

Section 303(c) (33 U.S.C. 1313(c)) of the CWA directs states to adopt WQS for their navigable waters. Section 303(c)(2)(A) and EPA's implementing regulations at 40 CFR part 131 require, among other provisions, that state WQS include the designated use or uses to be made of the waters and criteria that protect those uses. EPA regulations at 40 CFR 131.11(a)(1) provide that states shall "adopt those water quality criteria

[26] USEPA. 2009. Drinking Water Contaminants. U.S. Environmental Protection Agency. Accessed *http://www.epa.gov/safewater/hfacts.html.* December 2009.

[27] CFR. 2006. *40 CFR parts 9, 141, and 142:* National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule. Code of Federal Regulations, Washington, DC. *http://www.epa.gov/fedrgstr/EPA-WATER/2006/January/Day-04/w03.htm.* Accessed December 2009.

[28] Carmichael, W.W. 2000. Assessment of Blue-Green Algal Toxins in Raw and Finished Drinking Water. AWWA Research Foundation, Denver, CO.

[29] NOAA. 2009. Marine Biotoxins. National Oceanic and Atmospheric Administration. *http://www.nwfsc.noaa.gov/hab/habs_toxins/marine_biotoxins/index.html.* Accessed December 2009.

[30] WHOI. 2008. Hearing on 'Harmful Algal Blooms: The Challenges on the Nation's Coastlines.' Woods Hole Oceanographic Institution. *http://www.whoi.edu/page.do?pid=8916&tid=282&cid=46007.* Accessed December 2009.

[31] Dodds, W.K., W.W. Bouska, J.L. Eitzmann, T.J. Pilger, K.L. Pitts, A.J. Riley, J.T. Schloesser, and D.J. Thornbrugh. 2009. Eutrophication of U.S. freshwaters: analysis of potential economic damages. *Environ.l Sci. Tech.y.* 43(1):12–19.

[32] Florida Department of Environmental Protection. 2008. Integrated Water Quality Assessment for Florida: 2008 305(b) Report and 303(d) List Update.

[33] Florida Department of Environmental Protection. 2008. Integrated Water Quality Assessment for Florida: 2008 305(b) Report and 303(d) List Update.

[34] U.S. Census Bureau. 2009. 2008 Population Estimates Ranked by State. *http://factfinder.census.gov.*

[35] Perry, W.B. 2008. Everglades restoration and water quality challenges in south Florida. *Ecotoxicology* 17:569–578.

[36] USGS. 2009. Florida Waters: A Water Resources Manual. *http://sofia.usgs.gov/publications/reports/floridawaters/.* Accessed June 9, 2009.

[37] Florida Department of Environmental Protection. 2008. Integrated Water Quality Assessment for Florida: 2008 305(b) Report and 303(d) List Update.

that protect the designated use" and that such criteria "must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use." As noted above, 40 CFR 130.10(b) provides that "In designating uses of a water body and the appropriate criteria for those uses, the state shall take into consideration the water quality standards of downstream waters and ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters."

States are also required to review their WQS at least once every three years and, if appropriate, revise or adopt new standards (CWA section 303(c)(1)). States are required to submit these new or revised WQS for EPA review and approval or disapproval (CWA section 303(c)(2)(A)). Finally, CWA section 303(c)(4)(B) authorizes the Administrator to determine, even in the absence of a state submission, that a new or revised standard is needed to meet CWA requirements. The criteria proposed in this rulemaking apply to lakes and flowing waters of the State of Florida. EPA's proposal defines "lakes and flowing waters" to mean inland surface waters that have been classified by Florida as Class I (Potable Water Supplies Use) or Class III (Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife Use) water bodies pursuant to Florida Administrative Code (F.A.C.) Rule 62–302.400, excluding wetlands, and which are predominantly fresh waters.

C. Water Quality Criteria

EPA has issued guidance for use by states when developing criteria. Under CWA section 304(a), EPA periodically publishes criteria recommendations (guidance) for use by states in setting water quality criteria for particular parameters to protect recreational and aquatic life uses of waters. When EPA has published recommended criteria, states have the option of adopting water quality criteria based on EPA's CWA section 304(a) criteria guidance, section 304(a) criteria guidance modified to reflect site-specific conditions, or other scientifically defensible methods. 40 CFR 131.11(b)(1).

For nutrients, EPA has published under CWA section 304(a) a series of peer-reviewed, national technical approaches and methods regarding the development of numeric nutrient criteria for lakes and reservoirs,[38] rivers and streams,[39] and estuaries and coastal marine waters.[40] Basic analytical approaches for nutrient criteria derivation include, but are not limited to: (1) Stressor-response analysis, (2) the reference condition approach, and (3) mechanistic modeling. The stressor-response, or effects-based, approach relates a water body's response to nutrients and identifies adverse effect levels. This is done by selecting a protective value based on the relationships of nitrogen and phosphorus field measures with indicators of biological response. This approach is empirical, and directly relates to the designated uses. The reference condition approach derives candidate criteria from distributions of nutrient concentrations and biological responses in a group of waters. Measurements are made of causal and response variables and a protective value is selected from the distribution. The mechanistic modeling approach predicts a cause-effect relationship using site-specific input to equations that represent ecological processes. Mechanistic models require calibration and validation. Each approach has peer review support by the broader scientific community, and would provide adequate means for any state to develop scientifically defensible numeric nutrient criteria.

In cases where scientifically defensible numeric criteria cannot be derived, EPA regulations provide that narrative criteria should be adopted. 40 CFR 131.11(b)(2). Narrative criteria are descriptions of conditions necessary for the water body to attain its designated use. Often expressed as requirements that waters remain "free from" certain characteristics, narrative criteria can be the basis for controlling nuisance conditions such as floating debris or objectionable deposits. States often establish narrative criteria, such as "no toxics in toxic amounts," in order to limit toxic pollutants in waters where the state has yet to adopt an EPA-recommended numeric criterion and or where EPA has yet to derive a recommended numeric criterion. For nutrients, in the absence of numeric nutrient criteria, states have often established narrative criteria such as "no nuisance algae." Reliance on a narrative criterion to derive NPDES permit limits, assess water bodies for listing purposes, and establish TMDL targets can often be a difficult, resource-intensive, and time-consuming process that entails conducting case-by-case analyses to determine the appropriate numeric target value based on a site-specific translation of the narrative criterion. Narrative criteria are most effective when they are supported by procedures to translate them into quantitative expressions of the conditions necessary to protect the designated use.

D. Agency Determination Regarding Florida

On January 14, 2009, EPA determined under CWA section 303(c)(4)(B) that new or revised WQS in the form of numeric nutrient water quality criteria are necessary to meet the requirements of the CWA in the State of Florida. Florida's currently applicable narrative nutrient criterion provides, in part, that "in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna." Florida Administrative Code (F.A.C.) 62–302–530(47)(b). EPA determined that Florida's narrative nutrient criterion alone was insufficient to ensure protection of applicable designated uses. The determination recognized that Florida has a proactive and innovative program to address nutrient pollution through a strategy of comprehensive National Pollutant Discharge Elimination System (NPDES) permit regulations, Basin Management Action Plans (BMAPs) for implementation of TMDLs which include controls on nonpoint sources, municipal wastewater treatment technology-based requirements under the 1990 Grizzle-Figg Act, and rules to limit nutrient pollution in geographically specific areas like the Indian River Lagoon System, the Everglades Protection Area, and Wekiva Springs. However, the determination noted that despite Florida's intensive efforts to diagnose and control nutrient pollution, substantial water quality degradation from nutrient over-enrichment remains a significant challenge in the State and one that is likely to worsen with continued population growth and land-use changes.

Florida's implementation of its narrative water quality criterion for nutrients is based on site-specific detailed biological assessments and analyses, together with site-by-site outreach and stakeholder engagement in the context of specific CWA-related

[38] U.S. EPA. 2000a. Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs. Office of Water, Washington, DC. EPA–822–B–00–001.

[39] U.S. EPA. 2000b. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. Office of Water, Washington, DC. EPA–822–B–00–002.

[40] U.S. EPA. 2001. Nutrient Criteria Technical Manual: Estuarine and Coastal Marine Waters. Office of Water, Washington, DC. EPA–822–B–01–003, and wetlands (U.S. EPA, 2007).

actions, specifically NPDES permits, TMDLs required for both permitting and BMAP activities, and assessment and listing decisions. When deriving NPDES water quality-based permit limits, Florida initially conducts a site-specific analysis to determine whether a proposed discharge has the reasonable potential to cause or contribute to an exceedance of its narrative nutrient water quality criterion. The State then determines what levels of nutrients would "cause an imbalance in natural populations of aquatic flora or fauna" and translates those levels into numeric "targets" for the receiving water and any other affected waters. Determining on a water-by-water basis for thousands of State waters the levels of nutrients that would "cause an imbalance in natural populations of aquatic flora or fauna" is a difficult, lengthy, and data-intensive undertaking. This work involves performing detailed site-specific analyses of the receiving water and any other affected waters. If the State has not already completed this analysis for a particular water, it can be very difficult to accurately determine in the context and timeframe of the NPDES permitting process. For example, in some cases, adequate data may take several years to collect and therefore, may not be available for a particular water at the time of permitting issuance or re-issuance.

When developing TMDLs, as it does when determining reasonable potential and deriving limits in the permitting context, Florida translates the narrative nutrient criterion into a numeric target that the State determines is necessary to meet its narrative criterion and protect applicable designated uses. This process also involves a site-specific analysis to determine the nutrient levels that would "cause an imbalance in natural populations of aquatic flora or fauna" in a particular water. Each time a site-specific analysis is conducted to determine what the narrative criterion means for a particular water body in developing a TMDL, the State takes site-specific considerations into account and devises a method that works with the available data and information.

In adopting the Impaired Waters Rule (IWR), Florida took important steps toward improving implementation of its narrative nutrient criterion by establishing and publishing an assessment methodology to identify waters impaired for nutrients. This methodology includes numeric nutrient impairment "thresholds" above which waters are automatically deemed impaired. Even when a listing is made, however, development of a TMDL is then generally required to support issuance of a permit or development of a BMAP.

Based on the considerations outlined above, EPA concluded that numeric criteria for nutrients will enable the State to take necessary actions to protect the designated uses, in a timelier manner. The resource intensive efforts to interpret the State's narrative criterion contribute to delays in implementing the criterion and therefore, affect the State's ability to provide the needed protections for applicable designated uses. EPA, therefore, determined that numeric nutrient criteria are necessary for the State of Florida to meet the CWA requirement to have criteria that protect applicable designated uses.

The combined impacts of urban and agricultural activities, along with Florida's physical features and important and unique aquatic ecosystems, made it clear that the current use of the narrative nutrient criterion alone and the resulting delays that it entails do not ensure protection of applicable designated uses for the many State waters that are either unimpaired and need protection or have been listed as impaired and require loadings reductions. EPA determined that numeric nutrient water quality criteria would strengthen the foundation for identifying impaired waters, establishing TMDLs, and deriving water quality-based effluent limits in NPDES permits, thus providing the necessary protection for the State's designated uses in its waters. In addition, numeric nutrient criteria will support the State's ability to effectively partner with point and nonpoint sources to control nutrients, thus further providing the necessary protection for the designated uses of the State's water bodies. EPA's determination is available at the following Web site: *http://www.epa.gov/waterscience/standards/rules/fl-determination.htm.*

The January 14, 2009 determination stated EPA's intent to propose numeric nutrient criteria for lakes and flowing waters in Florida within twelve months of the January 14, 2009 determination, and for estuarine and coastal waters within 24 months of the determination. EPA has also entered into a Consent Decree with Florida Wildlife Federation, Sierra Club, Conservancy of Southwest Florida, Environmental Confederation of Southwest Florida, and St. Johns Riverkeeper, committing to the schedule stated in EPA's January 14, 2009 determination to propose numeric nutrient criteria for lakes and flowing waters in Florida by January 14, 2010, and for Florida's estuarine and coastal waters by January 14, 2011. The Consent Decree also requires that final rules be issued by October 15, 2010 for lakes and flowing waters, and by October 15, 2011 for estuarine and coastal waters.

In accordance with the determination and EPA's Consent Decree, EPA is proposing numeric nutrient criteria for Florida's lakes and flowing waters with this proposed rule. As envisioned in EPA's determination, this time frame has allowed EPA to utilize the large data set collected by Florida as part of a detailed analysis of nutrient-impaired waters. In a separate rulemaking, EPA intends to develop and propose numeric nutrient criteria for Florida's estuarine and coastal waters by January 14, 2011. EPA's determination did not apply to Florida's wetlands, and as a result, Florida's wetlands will not be addressed in this rulemaking or in EPA's forthcoming rulemaking involving estuarine and coastal waters.

III. Proposed Numeric Nutrient Criteria for the State of Florida's Lakes and Flowing Waters

A. General Information

(1) Which Water Bodies Are Affected by This Proposed Rule?

The criteria proposed in this rulemaking apply to lakes and flowing waters of the State of Florida. EPA's proposal defines "lakes and flowing waters" to mean inland surface waters that have been classified as Class I (Potable Water Supplies) or Class III (Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife) water bodies pursuant to Rule 62–302.400, F.A.C., excluding wetlands, and which are predominantly fresh waters. Pursuant to Rule 62–302.200, F.A.C., EPA's proposal defines "predominantly fresh waters" to mean surface waters in which the chloride concentration at the surface is less than 1,500 milligrams per liter (mg/L) and "surface water" means water upon the surface of the Earth, whether contained in bounds created naturally, artificially, or diffused. Waters from natural springs shall be classified as surface water when it exits from the spring onto the Earth's surface.

In this rulemaking, EPA is proposing numeric nutrient criteria for the following four water body types: Lakes, streams, springs and clear streams, and canals in south Florida. EPA's proposal also includes definitions for each of these waters. "Lake" means a freshwater water body that is not a stream or other watercourse with some open contiguous water free from emergent vegetation. "Stream" means a free-flowing, predominantly fresh surface water in a defined channel, and includes rivers, creeks, branches, canals (outside south Florida), freshwater sloughs, and other similar water bodies. “Spring” means the point where underground water emerges onto the Earth’s surface, including its spring run. “Spring run” means a free-flowing water that originates from a spring or spring group whose primary (>50%) source of water is from a spring or spring group. Downstream waters from a spring that receive 50% or more of their flow from surface water tributaries are not considered spring runs. “Clear stream” means a free-flowing water whose color is less than 40 platinum cobalt units (PCU, which is assessed as true color free from turbidity). Classification of a stream as clear or colored is based on the instantaneous color of the sample. Consistent with Rule 62–312.020, F.A.C., “canal” means a trench, the bottom of which is normally covered by water with the upper edges of its two sides normally above water. Consistent with Rule 62–302.200, F.A.C., all secondary and tertiary canals wholly within Florida’s agricultural areas are classified as Class IV waters, not Class III, and therefore, are not subject to this proposed rulemaking. The classes of waters, as specified in this paragraph and as subject to this proposed rulemaking, are hereinafter referred to as “lakes and flowing waters” in this proposed rule.

The CWA requires adoption of WQS for “navigable waters.” CWA section 303(c)(2)(A). The CWA defines “navigable waters” to mean “the waters of the United States, including the territorial seas.” CWA section 502(7). Whether a particular water body is a water of the United States is a water body-specific determination. Every water body that is a water of the United States requires protection under the CWA. EPA is not aware of any waters of the United States in Florida that are currently exempted from the State’s WQS. For any privately owned water in Florida that is a water of the United States, the applicable numeric nutrient criteria for those types of waters would apply. This rule does not apply to waters for which the Miccosukee Tribe of Indians or Seminole Tribe of Indians has obtained Treatment as a State for Section 303 of the CWA, pursuant to Section 518 of the CWA.

(2) Background on EPA’s Derivation of Proposed Numeric Nutrient Criteria for the State of Florida’s Lakes and Flowing Waters

In proposing numeric nutrient criteria for Florida’s lakes and flowing waters, EPA developed numeric nutrient criteria to support a balanced natural population of flora and fauna in Florida lakes and flowing waters, and to ensure, to the extent that the best available science allows, the attainment and maintenance of the WQS of downstream waters. Where numeric nutrient criteria do not yet exist, in proposed or final form, for a water body type that is downstream from a lake or flowing water (*e.g.,* estuaries) in Florida, EPA has interpreted the currently applicable State narrative criterion, “in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna,” to ensure that the numeric criteria EPA is proposing would not result in nutrient concentrations that would “cause an imbalance in natural populations of aquatic flora or fauna” in such downstream water bodies. EPA’s actions are consistent with and support existing Florida WQS regulations. EPA used the best available science to estimate protective loads to downstream estuaries, and then used these estimates (and assumptions about the distribution of the load throughout the watershed), along with mathematical models, to calculate concentrations in upstream flowing waters that would have to be met to ensure the attainment and maintenance of the State’s narrative criterion applicable to downstream estuaries.

EPA relied on an extensive amount of Florida-specific data, collected and analyzed, in large part, by FDEP and then reviewed by EPA. EPA worked extensively with FDEP on data interpretation and technical analyses for developing scientifically sound numeric nutrient criteria for this proposed rulemaking. Because EPA is committed to ensuring the use of the best available science, the Agency submitted its criteria derivation methodologies, developed by EPA in close collaboration with FDEP experts and scientists, to an independent, external, scientific peer review in July 2009.

To support derivation of EPA’s proposed lakes criteria, EPA searched extensively for relevant and useable lake data. In this case the effort resulted in 33,622 samples from 4,417 sites distributed among 1,599 lakes statewide.

Regarding the derivation of EPA’s proposed streams criteria, EPA evaluated water chemistry data from 11,761 samples from 6,342 sites statewide in the “all streams” dataset. EPA also used data collected for linking nutrients to specific biological responses that consisted of 2,023 sample records from more than 1,100 streams.

For EPA’s proposed springs and clear streams criteria, EPA evaluated data gathered and synthesized by FDEP using approximately 50 studies including historical accounts, laboratory nutrient amendment bioassays, field surveys, and TMDL reports that document increasing patterns of nitrate-nitrite levels and corresponding ecosystem level responses observed within the last 50 years. At least a dozen of these studies were used to develop and support the proposed nitrate-nitrite criterion for spring ecosystems.

For EPA’s proposed criteria for canals for south Florida, EPA started with more than 1,900,000 observations from more than 3,400 canal sites. These were filtered for data relevant to nutrient criteria development and resulted in observations at more than 500 sites for variables (nutrient parameter data and chlorophyll *a* data). Reliance on these extensive sets of data has enabled EPA to use the best available information and science to derive robust, scientifically sound criteria applicable to Florida’s lakes and flowing waters.

Section III describes EPA’s proposed numeric nutrient criteria for Florida’s lakes, streams, springs and clear streams, and canals and the associated methodologies EPA employed to derive them. These criteria are based on sound scientific rationale and will protect applicable designated uses in Florida’s lakes and flowing waters. EPA solicits public comment on these criteria and their derivation. This preamble also includes discussions of alternative approaches that EPA considered but did not select as the preferred option to derive the proposed criteria. EPA invites public comment on the alternative approaches as well. In addition, EPA requests public comment on whether the proposed numeric nutrient criteria are consistent with Florida’s narrative criterion with respect to nutrients at Rule 62–302.530(47)(a), F.A.C., specifying that the discharge of nutrients shall be limited as needed to prevent violations of other standards. EPA seeks scientific data and information on whether, for example, nutrient criteria should be more stringent to prevent exceedances of dissolved oxygen criteria.

EPA has created a technical support document that provides detailed information regarding all methodologies discussed herein and the derivation of the proposed criteria. This document is entitled “Technical Support Document for EPA’s Proposed Rule For Numeric Nutrient Criteria for Florida’s Inland Surface Fresh Waters” (hereafter, EPA TSD for Florida’s Inland Waters) and is located at *www.regulations.gov,* Docket ID No. EPA–HQ–OW–2009–0596.

B. Proposed Numeric Nutrient Criteria for the State of Florida's Lakes

Florida's 2008 Integrated Water Quality Assessment Report[41] indicates that Florida lakes provide important habitats for plant and animal species and are a valuable resource for human activities and enjoyment. The State has more than 7,700 lakes, which occupy close to 6% of its surface area. The largest lake, Lake Okeechobee (covering 435,840 acres), is the ninth largest lake in surface area in the United States and the second largest freshwater lake wholly within the coterminous United States.[42] Most of the State's lakes are shallow, averaging seven to 20 feet deep, although many sinkhole lakes and parts of other lakes are much deeper.

Florida's lakes are physically, chemically, and biologically diverse. Many lakes are spring-fed, others are seepage lakes fed by ground water, and still others (about 20%) are depression lakes fed by surface water sources. For purposes of developing numeric nutrient criteria, EPA identified two classifications of lakes, colored lakes and clear lakes, which respond differently to inputs of TN and TP, as discussed in detail below. EPA further classified the clear lakes into clear alkaline lakes (relatively high alkalinity) and clear acidic lakes (relatively low alkalinity), which have different baseline expectations for the level of nutrients present.

(1) Proposed Numeric Nutrient Criteria for Lakes

EPA is proposing the following numeric nutrient criteria and geochemical classifications for Florida's lakes classified as Class I or III waters under Florida law (Rule 62–302.400, F.A.C.):

Long-term average lake color and alkalinity	Chlorophyll *a* [f] (μg/L) [a]	Baseline criteria [b]		Modified criteria (within these bounds) [c]	
		TP (mg/L) [a]	TN (mg/L) [a]	TP (mg/L) [a]	TN (mg/L) [a]
A	B	C	D	E	F
Colored Lakes > 40 PCU	20	0.050	1.23	0.050–0.157	1.23–2.25
Clear Lakes, Alkaline ≤ 40 PCU [d] and > 50 mg/L $CaCO_3$ [e]	20	0.030	1.00	0.030–0.087	1.00–1.81
Clear Lakes, Acidic ≤ 40 PCU [d] and ≤ 50 mg/L $CaCO_3$ [e]	6	0.010	0.500	0.010–0.030	0.500–0.900

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

[b] Baseline criteria apply unless data are readily available to calculate and apply lake-specific, modified criteria as described below in footnote c and the Florida Department of Environmental Protection issues a determination that a lake-specific modified criterion is the applicable criterion for an individual lake. Any such determination must be made consistent with the provisions in footnote c below. Such determination must also be documented in an easily accessible and publicly available location, such as an official State Web site.

[c] If chlorophyll *a* is below the criterion in column B and there are representative data to calculate ambient-based, lake-specific, modified TP and TN criteria, then FDEP may calculate such criteria within these bounds from ambient measurements to determine lake-specific, modified criteria pursuant to CWA section 303(c). Modified TN and TP criteria must be based on at least three years of ambient monitoring data with (a) at least four measurements per year and (b) at least one measurement between May and September and one measurement between October and April each year. These same data requirements apply to chlorophyll *a* when determining whether the chlorophyll *a* criterion is met for purposes of developing modified TN and TP criteria. If the calculated TN and/or TP value is below the lower value, then the lower value is the lake-specific, modified criterion. If the calculated TN and TP value is above the upper value, then the upper value is the lake-specific, modified criterion. Modified TP and TN criteria may not exceed criteria applicable to streams to which a lake discharges. If chlorophyll *a* is below the criterion in column B and representative data to calculate modified TN and TP criteria are not available, then the baseline TN and TP criteria apply. Once established, modified criteria are in place as the applicable WQS for all CWA purposes.

[d] Platinum Cobalt Units (PCU) assessed as true color free from turbidity. Long-term average color based on a rolling average of up to seven years using all available lake color data.

[e] If alkalinity data are unavailable, a specific conductance of 250 micromhos/cm may be substituted.

[f] Chlorophyll *a* is defined as corrected chlorophyll, or the concentration of chlorophyll *a* remaining after the chlorophyll degradation product, phaeophytin *a*, has been subtracted from the uncorrected chlorophyll *a* measurement.

The following section describes the methodologies EPA used to develop its proposed numeric nutrient criteria for lakes. EPA is soliciting comments and scientific data regarding the proposed criteria for lakes and their derivation. Section III.B(4) describes one alternative approach and two supplementary modifications considered by the Agency in developing this lakes proposal. EPA solicits comments and data on that approach and those modifications.

(2) Methodologies for Deriving EPA's Proposed Criteria for Lakes

The process used to develop proposed numeric nutrient criteria for a range of diverse waters begins with grouping those waters into categories that generally have a common response to elevated levels of the stressor pollutants, in this case TN and TP. The following sections provide a discussion of (1) the lake classification approach for this proposal, (2) identification of an appropriate response variable and the levels of that variable that indicate or represent healthy aquatic conditions associated with each water body classification, and (3) the concentrations of TN and TP that correspond to protective levels of the response variable, in this case, chlorophyll *a.*

EPA has recommended that nutrient criteria include both causal (*e.g.,* TN and TP) and response variables (*e.g.,* chlorophyll *a* and some measure of clarity) when establishing numeric nutrient criteria for water bodies.[43] EPA

[41] FDEP. 2008. Integrated Water Quality Assessment for Florida: 2008 305(b) Report and 303(d) List Update. Florida Department of Environmental Protection.

[42] Fernald, E.A. and E.D. Purdum. 1998. Water Resources Atlas of Florida. Tallahassee: Institute of Science and Public Affairs, Florida State University.

[43] U.S. EPA. 1998. National Strategy for the Development of Regional Nutrient Criteria. Office of Water, Washington, DC. EPA 822–R–98–002; Grubbs, G. 2001. U.S. EPA. (Memorandum to Directors of State Water Programs, Directors of Great Water Body Programs, Directors of Authorized Tribal Water Quality Standards Programs and State and Interstate Water Pollution Control Administrators on Development and Adoption of Nutrient Criteria into Water Quality Standards. November 14, 2001); Grumbles, B.H. 2007. U.S. EPA. (Memorandum to Directors of State Water Programs, Directors of Great Water Body Programs, Directors of Authorized Tribal Water Quality Standards Programs and State and Interstate Water Pollution Control Administrators on Nutrient Pollution and Numeric Water Quality Standards. May 25, 2007).

recommends causal variables, in part, to have the means to develop source control targets and, in part, to have the means to assess water body conditions with knowledge that responses can be variable, suppressed, delayed, or expressed at different locations. EPA recommends response variables, in part, to have a means to assess water body conditions that synthesize the effect of causal variables over time, recognizing the daily, seasonal, and annual variability in measured nutrient levels.[44] The ability to establish protective criteria for both causal and response variables depends on available data and scientific approaches to evaluate these data. For its lake criteria, EPA is proposing causal variables for TN and TP and a response variable for chlorophyll *a*. For water clarity, Florida has criteria for transparency and turbidity, applicable to all Class I and III waters, expressed in terms of a measurable deviation from natural background (Rules 32–302.530(67) and (69), F.A.C.). For further information on this topic, refer to EPA's TSD for Florida's Inland Waters.

Interested readers should consult EPA TSD for Florida's Inland Waters, Chapter 1: Methodology for Deriving U.S. EPA's Proposed Criteria for Lakes, for more detailed information, data, and graphs supporting the development of the proposed lake criteria.

(a) Methodology for Proposed Lake Classification

Based on analyses of geochemical influences in Florida's lakes, EPA proposes the following classification scheme for Florida lakes: (1) Colored Lakes > 40 Platinum Cobalt Units (PCU), (2) Clear Lakes ≤ 40 PCU with alkalinity > 50 mg/L calcium carbonate ($CaCO_3$), and (3) Clear Lakes ≤ 40 PCU with alkalinity ≤ 50 mg/L $CaCO_3$.

Following original work conducted by FDEP, EPA considered several key characteristics to categorize Florida's lakes and tailor numeric nutrient criteria, recognizing that different types of lakes in Florida may respond differently to nutrients. Many of Florida's lakes contain dissolved organic matter leached from surface vegetation that colors the water. More color in a lake limits light penetration within the water column, which in turn limits algal growth. Thus, in lakes with colored water, higher levels of nutrients may occur without exceeding desired algal levels. EPA evaluated the relationships between nutrients and algal responses for these waters (as measured by chlorophyll *a* concentration), which indicated that water color influences algal responses to nutrients. Based on this analysis, EPA found color to be a significant factor for categorizing lakes. More specifically, EPA found the correlations between nutrients and chlorophyll *a* concentrations to be stronger and less variable when lakes were categorized into two distinct groups based on a threshold of 40 PCU. This threshold is consistent with the distinction between clear and colored lakes long observed in Florida.[45] Different relationships between nutrients and chlorophyll *a* emerged when lakes were characterized by color, with clear lakes demonstrating greater sensitivity to nutrients as would be predicted by the increased light penetration, which promotes algal growth.

Within the clear lakes category, where color is not generally the controlling factor in algal growth, EPA evaluated alkalinity as an additional distinguishing characteristic. Calcium carbonate ($CaCO_3$), dissolved from limestone formations and calcareous soils, affects the alkalinity and pH of groundwater that feeds into lakes. Alkalinity and pH increase when water is in contact with limestone or limestone-derived soil. Limestone is also a source of TP, and lakes that are higher in alkalinity in Florida are often associated with naturally elevated TP levels. These types of lakes are often in areas of the State where the underlying geology includes limestone. The alkalinity (measured as $CaCO_3$) of Florida clear lakes ranges from zero to well over 200 mg/L. FDEP's Nutrient Criteria Technical Advisory Committee (TAC) evaluated available data from Florida lakes and concluded that 50 mg/L alkalinity as $CaCO_3$ is an appropriate threshold above which associated nutrient levels would be expected to be significantly elevated among clear lakes. EPA concluded that FDEP's proposed approach of using 50 mg/L alkalinity as $CaCO_3$ is an appropriate distinguishing characteristic in clear lakes in Florida because lakes with alkalinity ≤50 $CaCO_3$ represent a comprehensive group of lakes that may be naturally oligotrophic. Thus, EPA proposes to classify Florida clear lakes as either acidic (≤50 mg/L alkalinity as $CaCO_3$) or alkaline (>50 mg/L alkalinity as $CaCO_3$).

EPA recognizes that in certain cases FDEP may not have historic alkalinity data on record to classify a particular clear lake as either alkaline or acidic. When alkalinity data are unavailable, EPA proposes a specific conductivity threshold of 250 microSiemens per centimeter (µS/cm) as a substitute for the threshold of 50 mg/L alkalinity as $CaCO_3$. Specific conductivity is a measure of the ionic activity in water and a data analysis performed by FDEP and re-examined by EPA found that a specific conductivity threshold value of 250 µS/cm is sufficiently correlated with alkalinity to serve as a surrogate measure. Of these two measures, alkalinity is the preferred parameter to measure because it is less variable and therefore, a more reliable indicator, and also because it is a more direct measure of the presence of underlying geology associated with elevated nutrient levels.

EPA solicits comment on the proposed categorization scheme and associated thresholds used to classify Florida's lakes. Please see Section III.B(4)(b) below in which EPA invites comment on alternative lake categorization approaches that EPA considered, in particular, those approaches with respect to alkalinity classification and lakes occurring in sandhills of northwestern and central Florida.

(b) Methodology for Proposed Chlorophyll *a* Criteria

Because excess algal growth is associated with degradation in aquatic life and because chlorophyll *a* levels are a measure of algal growth, EPA is using chlorophyll *a* levels as indicators of healthy biological conditions, supportive of aquatic life in each of the categories of Florida's lakes described above. EPA found multiple lines of evidence supporting chlorophyll *a* criteria as an effective indicator of ambient conditions that would be protective of Florida's aquatic life use in lakes. These lines of evidence included trophic state of lakes, historical reference conditions in Florida lakes, and model results.

As a primary line of evidence, EPA reviewed and evaluated the Trophic State Index (TSI) information in deriving chlorophyll *a* criteria that are protective of designated aquatic life uses in Florida's lakes. The TSI quantifies the degree of eutrophication (oligotrophic, mesotrophic, eutrophic)[46] in a water body based on observed measurements of nutrients and chlorophyll *a*. These types of boundaries are commonly used in scientific literature and represent an

[44] U.S. EPA. 2000. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. Office of Water, Washington, DC. EPA–822–B–00–002.

[45] Shannon, E.E. and P.L. Brezonik. 1972. Limnological characteristics of north and central Florida lakes. *Limnol. Oceanogr.* 17(1): 97–110.

[46] Trophic state describes the nutrient and algal state of an aquatic system: Oligotrophic (low nutrients and algal productivity), mesotrophic (moderate nutrients and algal productivity), and eutrophic (high nutrients and algal productivity).

established, scientific classification system to describe current status and natural expectations for lake conditions with respect to nutrients and algal productivity.[47] EPA's review of TSI studies [48 49] indicated that in warm-water lakes such as those in Florida, TSI values of 50, 60, and 70 are associated with chlorophyll *a* concentrations of 10, 20, and 40 micrograms per liter (μg/L), respectively. Studies indicated that mesotrophic lakes in Florida have TSI values ranging from 50 to 60 and eutrophic lakes have TSI values ranging from 60 to 70. Thus a TSI value of 60 (chlorophyll *a* concentration of 20 μg/L) represents the boundary between mesotrophy and eutrophy. EPA concluded that mesotrophic status is the appropriate expectation for colored and clear alkaline lakes because they receive significant natural nutrient input and support a healthy diversity of aquatic life in warm, productive climates such as Florida, and mesotrophy represents a lake maintaining a healthy balance between benthic macrophytes (*i.e.,* plants growing on the lake bottom) and algae in such climates under such conditions. However, clear acidic lakes in Florida do not receive comparable natural nutrient input to be classified as mesotrophic, and for those lakes, EPA has developed criteria that correspond to an oligotrophic status. Oligotrophic lakes support less algal growth and have lower chlorophyll *a* levels. Studies indicate that a TSI value of 45 reflects an approximate boundary between oligotrophy and mesotrophy (corresponding to chlorophyll *a* at about 7 μg/L). EPA requests comment on these conclusions regarding oligotrophic and mesotrophic status expectations for these categories of Florida lakes.

Another line of evidence that supports EPA's proposed chlorophyll *a* criteria is historical reference conditions. Diatoms are a very common type of free-floating algae (*i.e.,* phytoplankton) that have shells or "frustules" made of silica that are preserved in the fossil record. Diatoms preserved in lake sediments can be used to infer chlorophyll *a* levels in lakes prior to any human disturbance. Paleolimnological studies [50] that examined preserved diatom frustules in Florida lake sediments indicate that historical levels of chlorophyll *a* are consistent with mesotrophic expectations derived from the TSI studies described above, with chlorophyll *a* levels falling just below the selected criterion for mesotrophic lakes. (These studies did not evaluate lakes expected to be naturally oligotrophic so there is no comparable information for those lakes).

In addition to this evidence, EPA used information from the application of a Morphoedaphic Index (MEI) model [51] that predicts nutrient and chlorophyll *a* concentrations for any lake given its depth, alkalinity, and color to support the proposed chlorophyll *a* criteria. Scientists from the St. John's Water Management District presented modeling results for various Florida lakes in each colored and clear category at the August 5, 2009 meeting of the Nutrient Criteria TAC in Tallahassee. In addition to predicting natural or reference conditions, these scientists used the model to predict chlorophyll *a* and TP concentrations associated with a 10% reduction in water transparency for a set of lakes with varying color levels and alkalinities. Because submerged aquatic vegetation is dependent on light, maintaining a lake's historic balance between algae and submerged aquatic plants requires maintaining overall water transparency. The risk of disrupting the balance between algae and submerged aquatic plants increases when reductions in transparency exceed 10%. The MEI predictions corroborated the results from lake TSI studies and investigations of paleolimnological reference conditions because natural or reference predictions (*i.e.,* a "no effect" level) were generally below selected criteria levels and 10% transparency loss predictions (*i.e.,* a "threshold effect" level) were at or slightly above selected criteria levels. EPA considered these lines of evidence to develop the proposed chlorophyll *a* criteria, discussed below by lake class:

(i) *Colored Lakes:* EPA proposes a chlorophyll *a* criterion of 20 μg/L in colored lakes to protect Florida's designated aquatic life uses. As indicated by the warm-water TSI studies discussed above, chlorophyll *a* concentrations of 20 μg/L represent the boundary between mesotrophy and eutrophy. Because mesotrophy maintains a healthy balance of plant and algae populations in these types of lakes, limiting chlorophyll *a* concentrations to 20 μg/L would, therefore, protect colored lakes in Florida from the adverse impacts of eutrophication. Paleolimnological studies of six colored lakes in Florida demonstrated natural (*i.e.,* before human disturbance) chlorophyll *a* levels in the range of 14–20 μg/L and the MEI model predicted reference chlorophyll *a* concentrations of 1–25 μg/L for a set of colored lakes in Florida. The model also predicted that concentrations of chlorophyll *a* ranging from 15–36 μg/L in individual lakes would result in a 10% loss of transparency (all but two lakes were above 20 μg/L). Because of natural variability, it is typical for ranges of natural or reference conditions to overlap with ranges of where adverse effects may begin occurring (such as the 10% transparency loss endpoint) for any sample population of lakes. In addition, these modeling results, as with any line of evidence, have uncertainty associated with any individual lake prediction. Given these considerations, EPA found that because the clear majority (eight of eleven) of lakes had predicted natural or referenced conditions below 20 μg/L chlorophyll *a* and the clear majority (nine of eleven) of lakes had predicted 10% transparency loss above 20 μg/L chlorophyll *a,* these results supported the TSI-based proposed chlorophyll *a* criterion.

(ii) *Clear, Alkaline Lakes:* EPA proposes a chlorophyll *a* concentration of 20 μg/L in clear, alkaline lakes to protect Florida's designated aquatic life uses. As noted in Section III.B(2)(a), alkalinity and TP are often co-occurring inputs to Florida lakes because of the presence of TP in limestone, which is often a feature of the geology in Florida. Clear, alkaline lakes, therefore, are likely to be naturally mesotrophic. EPA's analysis determined that aquatic life in clear, alkaline lakes is protected at similar chlorophyll *a* levels as colored lakes (at the TSI boundary between mesotrophy and eutrophy). The MEI model predicted reference chlorophyll *a* concentrations of 12–24 μg/L for a set of clear, alkaline lakes in Florida, and predicted a 10% loss of transparency when chlorophyll *a* concentrations ranged from 19–33 μg/L. Similar to the results for colored lakes, half of the clear, alkaline lakes had predicted natural or referenced conditions at or below 20 μg/L chlorophyll *a* and all but one clear,

[47] Carlson, R.E. 1977. A trophic state index for lakes. *Limnol. Oceanogr.* 22:361–369.

[48] Carlson, R.E. 1977. A trophic state index for lakes. *Limnol. Oceanogr.* 22:361–369.

[49] Salas and Martino. 1991. A simplified phosphorus trophic state index for warm water tropical lakes. *Wat. Res.* 25:341–350.

[50] Whitmore and Brenner. 2002. Paleologic characterization of pre-disturbance water quality conditions in EPA defined Florida lake regions. Univ. Florida Dept. Fisheries and Aquatic Sciences. 30 pp.

[50] Whitmore and Brenner. 2002. Paleologic characterization of pre-disturbance water quality conditions in EPA defined Florida lake regions. Univ. Florida Dept. Fisheries and Aquatic Sciences. 30 pp.

[51] Vighi and Chiaudani. 1985. A simple method to estimate lake phosphorus concentrations resulting from natural background loadings. *Wat. Res.*19:987–991.

alkaline lake had predicted 10% transparency loss above 20 μg/L chlorophyll *a.* Thus, EPA found this evidence to be supportive of the proposed chlorophyll *a* criterion. EPA solicits comment on this chlorophyll *a* criterion and the evidence EPA used to support the criterion.

(iii) *Clear, Acidic Lakes:* EPA proposes a chlorophyll *a* concentration of 6 μg/L in clear, acidic lakes to ensure balanced natural populations of flora and fauna (*i.e.,* aquatic life) in these lakes. In contrast to colored lakes and clear, alkaline lakes, this category of lakes does not receive significant natural nutrient inputs from groundwater or other surface water sources. EPA has thus based the proposed criteria on an expectation that these lakes should be oligotrophic in order to support balanced natural populations of flora and fauna. Some of Florida's clear, acidic lakes, in the sandhills in northwestern and central Florida, have been identified as extremely oligotrophic [52] with chlorophyll *a* levels of less than 2 μg/L. As discussed above, warm water TSI studies suggest a chlorophyll *a* level of approximately 7 μg/L at the oligotrophic-mesotrophic boundary.

In July 2009, FDEP proposed a chlorophyll *a* criterion for clear, acidic lakes of 9 μg/L.[53] In comments sent to EPA via e-mail in October 2009,[54] FDEP reported that the Nutrient TAC suggested in June 2009 that maintaining chlorophyll *a* below 10 μg/L in clear, acidic lakes would be protective of the designated use, because a value of < 10 μg/L would still be categorized as oligotrophic. However, EPA's review of the TSI categorization based on the work of Salas and Martino (1991) on warm water lakes indicates that a chlorophyll *a* of 10 μg/L (TSI of 50) would better represent the central tendency of the mesotrophic category rather than the oligotrophic-mesotrophic boundary. In the October 2009 comments, FDEP also presented an analysis of lake data that showed lack of correlation between an index of benthic macroinvertebrate health and chlorophyll *a* levels in the range of 5–10 μg/L as supporting evidence for a chlorophyll a criterion of 9 μg/L in clear acidic lakes. However, within this small range of chlorophyll *a,* it is not surprising that a correlation with an indicator responsive to numerous aspects of natural conditions and stressors such as benthic macroinvertebrate health would not exhibit a clear statistical relationship. Importantly, there was some evidence of meaningful distinctions within the range of 5–10 μg/L chlorophyll *a* based on endpoints more directly responsive to nutrients. In this case, the MEI model predicted reference chlorophyll *a* concentrations within the range of 1.4–7.0 μg/L (with seven of the eight values below 5 μg/L) for a set of clear, acidic lakes in Florida, and predicted a 10% loss of transparency when chlorophyll *a* concentrations ranged from 5.6–11.8 μg/L (with five of the eight values below 7 μg/L). All but one of the clear, acid lakes had predicted natural or reference conditions below 6 μg/L chlorophyll *a* and the majority (six of eight) of clear, alkaline lakes had predicted 10% transparency loss above 6 μg/L chlorophyll *a.* Given available information on reference condition and predicted effect levels, EPA adjusted the approximate oligotrophic-mesotrophic boundary value of 7 μg/L slightly downward to 6 μg/L as the proposed chlorophyll *a* criterion. For determining the proposed chlorophyll *a* criterion in the three lake categories, only in this case for clear, acid lakes did EPA use reference condition information and predicted effect levels for more than just support of the value coming from the TSI-based line of evidence, and in this case EPA deviated from that value by only 1 μg/L.

EPA specifically solicits comment on the chlorophyll *a* criterion of 6 ug/L and the evidence EPA used to support the criterion. EPA also solicits comment on whether a higher criterion of 9 ug/L, as proposed by Florida in its July 2009 proposed nutrient WQS, would be fully protective of clear acidic lakes, and the scientific basis for such a conclusion.

(c) Methodology for Proposed Total Phosphorus (TP) and Total Nitrogen (TN) Criteria in Lakes

EPA proposes TP and TN criteria for each of the classes of lakes described in Section III.B(2)(a). The proposed TP and TN criteria are based principally on independent statistical correlations between TN and chlorophyll *a,* and TP and chlorophyll *a* for clear and colored lakes in Florida. Each data point used in the statistical correlations represents a geometric mean of samples taken over the course of a year in a particular Florida lake. After establishing the protective levels of chlorophyll *a* as 20 μg/L for colored lakes and clear alkaline lakes and 6 μg/L for clear acidic lakes, EPA evaluated the data on TN and TP concentrations associated with these chlorophyll *a* levels and the statistical analyses performed by FDEP in support of the State's efforts to develop numeric nutrient criteria.

These analyses showed that the response dynamics of TN and TP with chlorophyll *a* were different for colored versus clear lakes, as would be expected because color blocks light penetration in the water column and limits algal growth. These analyses also showed that the correlation relationships for TN and TP compared with chlorophyll *a* in acidic and alkaline clear lakes were comparable, as would be expected because alkalinity does not affect light penetration. These analyses are available in EPA's TSD for Florida's Inland Waters, Chapter 1: Methodology for Deriving U.S. EPA's Proposed Criteria for Lakes.

The difference between clear, acidic and clear, alkaline lakes is that clear, alkaline lakes naturally receive more nutrients and, therefore, have an expected trophic status of mesotrophic to maintain a healthy overall production and balance of plants and algae. On the other hand, clear, acidic lakes naturally receive much lower nutrients and, therefore, have an expected trophic status of oligotrophic to maintain a healthy, but lower than mesotrophic, level of plant and algae aquatic life. Because of the different expectations for trophic condition, different chlorophyll *a* criteria are appropriate (as mentioned earlier, chlorophyll *a* is a measure of algal production). Although clear, alkaline lakes and colored lakes have the same proposed chlorophyll *a* criterion, they will have different TP and TN criteria because of the effect of color on light penetration and algal growth.

The TN and TP values EPA is proposing are based on the lower and upper TN and TP values derived from the 50th percentile prediction interval of the regression (*i.e.,* best-fit line) through the chlorophyll *a* and corresponding TN or TP values plotted on a logarithmic scale. In other words, the prediction interval displays the range of TN and TP values typically associated with a given chlorophyll *a* concentration. At any given chlorophyll *a* concentration, there will be a lower

[52] Canfield, D.E., Jr., M.J. Maceina, L.M. Hodgson, and K.A. Langeland. 1983. Limnological features of some northwestern Florida lakes. *J. Freshw. Ecol.* 2:67–79; Griffith, G.E., D.E. Canfield, Jr., C.A. Horsburgh, J.M. Omernik, and S.H. Azevedo. 1997. Lake regions of Florida. Map prepared by U.S. EPA, Corvallis, OR; available at *http://www.epa.gov/wed/pages/ecoregions/fl_eco.htm* (accessed 10/09/2009).

[53] More information on this issue is available on FDEP's Web site at *http://www.dep.state.fl.us/water/wqssp/nutrients/docs/dep_responses_100909.pdf* and included in the "External Peer Review of EPA's 'Proposed Methods and Approaches for Developing Numeric Nutrient Criteria for Florida's Inland Waters' " and EPA's TSD for Florida's Inland Waters located in the docket ID No. EPA–HQ–OW–2009–0596.

[54] FDEP document titled, "DEP's Responses to EPA's 9/16 Comment Letter." October 9, 2009. Located in the docket ID EPA–HQ–OW–2009–0596.

TN or TP value and an upper TN or TP value corresponding to this prediction interval. EPA agrees with the FDEP approach that uses the 50th percentile prediction interval because it effectively separates the data into three distinct groups. This analysis of the substantial lake data collected by Florida indicates that the vast majority of monitored lakes with nutrient levels below the lower TN or TP value have associated chlorophyll *a* values below the protective chlorophyll *a* threshold level. Similarly, the vast majority of monitored lakes with measured nutrient levels above the upper TN or TP value have associated measured chlorophyll *a* values above the protective chlorophyll *a* threshold level. Between these TN and TP bounds, however, this analysis indicates that monitored lakes are equally likely to be above or below the protective chlorophyll *a* threshold level. Setting TN and TP criteria based on the bounds of the 50th percentile prediction interval, in conjunction with lake-specific knowledge of whether the lake chlorophyll *a* threshold is met, accounts for the naturally variable behavior of TN and TP while ensuring protection of aquatic life.

EPA's proposed criteria framework sets a protective chlorophyll *a* threshold and TN and TP criteria at the lower values of the range defined by the 50th percentile prediction interval for the three different categories of lakes as "baseline" criteria. The criteria framework also provides flexibility for FDEP to derive lake-specific, modified TN and TP criteria within the bounds of the upper and lower values based on at least three years of ambient measurements where a chlorophyll *a* threshold is not exceeded. More specifically, if the chlorophyll *a* criterion for an individual lake is met for a period of record of at least three years, then the corresponding TN and TP criteria may be derived from ambient measurements of TN and TP from that lake within the bounds of the lower and upper values of the prediction interval discussed above. Both the ambient chlorophyll *a* levels as well as the corresponding ambient TN and TP concentrations in the lake must be established with at least three years worth of data. EPA's proposed rule provides that these modified criteria need to be documented by FDEP. EPA's rule, however, does not require that FDEP go through a formal SSAC process subject to EPA review and approval.

In this proposed rule, EPA specifies that in no case, however, may the modified TN and TP criteria be higher than the upper value specified in the criteria bounds, nor lower than the lower value specified in the criteria bounds. In addition to nutrients, chlorophyll *a* in a lake may be limited by high water color, zooplankton grazing, mineral turbidity, or other unknown factors. In the absence of detailed, site-specific knowledge, the upper values represent increasing risk that chlorophyll *a* will exceed its criterion value. To maintain the risk at a manageable level, the upper values are not to be exceeded. EPA requests comments on this approach. EPA also requests comment on whether the rule should specify that the modified TN and TP criteria be set at levels lower than the lower value of the criteria bounds if that is what is reflected in the outcome of the ambient-based calculation.

EPA's proposed approach for TN and TP criteria in lakes reflects the natural variability in the relationship between chlorophyll *a* concentrations and corresponding TP and TN concentrations that may exist in lakes. This variability remains even after some explanatory factors such as color and alkalinity are addressed by placing lakes in different categories based on color and alkalinity because other natural factors play important roles. Natural variability in the physical, chemical, and biological dynamics for any individual lake may result from differences in geomorphology, concentrations of other constituents in lake waters, hydrological conditions and mixing, and other factors.

This approach allows for consideration of readily available site-specific data to be taken into account in the expression of TN and TP criteria, while still ensuring protection of aquatic life by maintaining the associated chlorophyll *a* level at or below the proposed chlorophyll *a* criterion level. Because the chlorophyll *a* level in a lake is the direct measure of algal production, it can be used to evaluate levels that pose a risk to aquatic life. The scientific premise for the lake-specific ambient calculation provision for modified TN and TP criteria is that if ambient lake data show that a lake's chlorophyll *a* levels are below the established criteria and its TN and/or TP levels are within the lower and upper bounds, then those ambient levels of TN and TP represent protective conditions. Basing the ambient calculation upon at least three years worth of data is a condition set to address and account for year-to-year hydrologic variability in the derivation of modified criteria. EPA requests comment on the requirement of three years worth of data for both chlorophyll *a* and TN and TP in order to use this option. Specifically, are there situations in which less than three years of data might be adequate for an adjusted TN or TP criterion?

EPA selected the proposed TP and TN criteria based on the relationships with chlorophyll *a* described above. However, the MEI modeling results described in Section III.B(2)(b) also provide additional support for the TP criteria selection. The MEI predicted a 10% transparency loss when TP concentrations ranged from 0.053–0.098 mg/L in colored lakes (with one predicted value at 0.037 mg/L), from 0.038–0.068 mg/L in clear, alkaline lakes, and from 0.012–0.024 mg/L in clear, acidic lakes. All but one of these predicted values are within the lower and upper bounds of the proposed TP criteria. The MEI modeling results did not address TN.

(d) Proposed Criteria: Duration and Frequency

Numeric criteria include magnitude (*i.e.,* how much), duration (*i.e.,* how long), and frequency (*i.e.,* how often) components. Beginning with EPA's 2004 Integrated Report Guidance,[55] EPA has used the term "exceeding criteria" to refer to situations where all criteria components are not met. The term "digression" refers to an ambient level that goes beyond a level specified by the criterion-magnitude (*e.g.,* in a given grab sample). The term "excursion" refers to conditions that do not meet the criterion-magnitude and criterion-duration, in combination. A criterion-frequency specifies the maximum rate at which "excursions" may occur.

For the chlorophyll *a,* TN, and TP criteria for lakes, the criterion-magnitude values (expressed as a concentration) are provided in the table and the criterion-duration (or averaging period) is specified as annual. The criterion-frequency is no-more-than-once-in-a-three-year period. In addition, the long-term arithmetic average of annual geometric mean values shall not exceed the criterion-magnitude values (concentration values).

Appropriate duration and frequency components of criteria should be based on how the data used to derive the criteria were analyzed, and what the implications are for protection of designated uses given the effects of exposure at the specified criterion concentration for different periods of time and recurrence patterns. For lakes, the stressor-response relationship was based on annual geometric means for

[55] USEPA. Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act. *http://www.epa.gov/OWOW/tmdl/tmdl0103/Accessed* December 2009.

individual years at individual lakes. The appropriate duration period is therefore annual. The key question is whether this annual geometric mean needs to be met every year, or if some allowance for a particular year to exceed the applicable criterion could still be considered protective.

Data that contribute to the analysis of TSI, as well as data generated from supporting paleolimnological studies and MEI modeling, typically represent periods of time greater than a single year. Moreover, many of the models and analyses that form the basis of TSI results are designed to represent the "steady-state," or long-term stable water quality conditions. However, researchers have suggested caution in applying steady-state assumptions to lakes with long residence times.[56] In other words, the effects of spikes in annual loading could linger and disrupt the steady-state in some lakes. As a result, EPA is proposing two expressions of allowable frequency, both of which are to be met. First, EPA proposes a no-more-than-one-in-three-years excursion frequency for the annual geometric mean criteria for lakes. Second, EPA proposes that the long-term arithmetic average of annual geometric means not exceed the criterion-magnitude concentration. EPA anticipates that Florida will use its standard assessment periods as specified in Rule 62–303, F.A.C. (Impaired Waters Rule) to implement this second provision. These selected frequency and duration components recognize that hydrological variability will produce variability in nutrient regimes, and individual measurements may exceed the criteria magnitude concentrations. Furthermore, they balance the representation of underlying data and analyses based on the central tendency of many years of data (*i.e.,* the long-term average component) with the need to exercise some caution to ensure that lakes have sufficient time to process individual years of elevated nutrient levels and avoid the possibility of cumulative and chronic effects (*i.e.,* the no-more-than-one-in-three-year component). More information on this specific topic is provided in EPA's TSD for Florida's Inland Waters, Chapter 1: Methodology for Deriving U.S. EPA's Proposed Criteria for Lakes.

EPA requests comment on these proposed criteria duration and frequency expressions, and the basis for their derivation. EPA notes that some scientists and resource managers have suggested that nutrient criteria duration and frequency expressions should be more restrictive to avoid seasonal or annual "spikes" from which the aquatic system cannot easily recover, whereas others have suggested that criteria expressed as simply a long-term average of annual geometric means, consistent with data used in criteria derivation, would still be protective. EPA also requests comment on any alternative duration and frequency expressions that might be considered protective, including (1) a criterion-duration expressed as a monthly average or geometric mean, (2) a criterion-frequency expressed as meeting allowable magnitude and duration every year, (3) a criterion-frequency expressed as meeting allowable magnitude and duration in more than half the years of a given assessment period, and (4) a criterion-frequency expressed as meeting allowable magnitude and duration as a long-term average only. EPA further requests comment on whether an expression of the criteria in terms of an arithmetic average of annual geometric mean values based on rolling three-year periods of time would also be protective of the designated use.

(e) Application of Lake-Specific, Ambient Condition-Based Modified TP and TN Criteria

As described in Section III.B(2)(c), EPA is proposing a framework that uses both the upper and lower bounds of the 50th percentile prediction interval to allow the derivation of modified TP and TN lake-specific criteria to account for the natural variability in the relationship between chlorophyll *a* and TP and TN that may exist in certain lakes. The proposed rule would allow FDEP to calculate ambient modified criteria for TN and TP based on at least three years of ambient monitoring data with (a) at least four measurements per year and (b) at least one measurement between May and September and one measurement between October and April each year. If a calculated modified TN and TP criterion is below the lower value, then the lower value is the criteria. If a calculated modified TN and TP criterion is above the upper value, then the upper bound is the criteria. Calculated modified TP and TN values may not exceed criteria applicable to streams to which a lake discharges.

EPA's proposed rule provides that FDEP must document these modified criteria and establish them in a manner that clearly recognizes their status as the applicable criterion for a particular lake so that the public and all regulatory authorities are aware of its existence. However, EPA's proposed rule does not require that FDEP go through a formal SSAC process subject to EPA review and approval. (For more information on the SSAC process, please refer to Section V of this proposal). EPA believes such modified criteria do not need to go through the SSAC process because the conditions under which they are applicable are clearly stated in the proposed rule and the methods of calculation are clearly laid out so that the outcome is predictable and transparent. By providing a specific process for deriving modified criteria within the WQS rule itself, each individual outcome of this process is an effective WQS for CWA purposes and does not need separate approval by EPA.

One technical concern is the extent to which the variability in the data relating chlorophyll *a* levels to TN and TP levels truly reflects differences between lakes, as opposed to temporal differences in the conditions in the same lake. To address this issue, EPA verified that the observed variability in the supporting analysis was indeed predominantly "across lake" variability, not "within lake" variability.

Another technical concern is that there may be a time lag between the presence of high nutrients and the biological response. In a study of numerous lakes, researchers found that there was often a lag period of a few years in chlorophyll *a* response to changes in nutrient loading, but that there was correlation between chlorophyll *a* and nutrient concentrations on an annual basis.[57] The difference between nutrient loading and nutrient concentration as a function of time is related to the hydraulic retention time of a lake. EPA proposed TN and TP criteria as concentration values with an annual averaging period, so any time lag in response would not be expected to confound the derivation of modified criteria. Furthermore, EPA is proposing to require three years worth of data, which would reflect any short time lag in response.

A third technical concern is the presence of temporary or long-term site-specific factors that may suppress biological response, such as the presence of grazing zooplankton, excess sedimentation that blocks light penetration, extensive canopy cover, or seasonal herbicide use that impedes proliferation of algae. If any of these suppressing factors are removed, then nutrient levels may result in a spike in algal production above protective levels.

[56] Kenney (1998) as reported in Salas and Martino (1991).

[57] Jeppeson *et al*. 2005. Lake responses to reduced nutrient loading—an analysis of contemporary long-term data from 35 case studies. *Freshwater Biology* 50: 1747–1771.

EPA is proposing to require that the ambient calculation for modified TP and TN criteria be based on at least a three-year record of observation, and be based on representative sampling (*i.e.,* four samples per year with at least one between May and September and one between October and April) during each year. These requirements will minimize the influence of long-term site-specific factors and ensure longer-term stable conditions. EPA selected three years as a reasonable minimum length of time to appropriately account for anomalous conditions in any given year that could lead to erroneous conclusions regarding the true relationship between nutrient levels in a lake and chlorophyll *a* levels. EPA anticipates that the State would use all recent consecutive years of data on record (*i.e.,* it would not be appropriate to select three random years within a complete record over the past seven years). EPA is requiring four measurements within a year to provide seasonal representation (*i.e.,* May–September and October–April). Providing seasonal representation is important because nutrient levels can vary by season. In addition, this minimum sample size is conducive to the derivation of central tendency measurements, such as a geometric mean, with an acceptable degree of confidence. EPA is proposing that the chlorophyll *a* criterion must be met in each of the three or more years of ambient monitoring that define the record of observation for the lake to be eligible for the ambient calculation modified provision for TN and TP. EPA requests comment on whether three years of data is sufficient to establish for a particular lake that there is a fundamentally different relationship between chlorophyll *a* levels and TN and TP levels. EPA also requests comment on whether less data or a different specification would be sufficient to establish this different relationship in a particular lake, *e.g.* whether revised TN and TP ambient criteria should be allowed when the chlorophyll *a* criterion concentration has been exceeded once in three years.

Application of the ambient calculation provision has implications for assessment and permitting because the outcome of applying this provision is to establish alternate numeric TN and TP values as the applicable numeric nutrient criteria for TN and TP. For accountability and tracking purposes, the State would need to document in a publicly available and accessible manner, such as on an official State Web site, the result of the ambient calculation for any given lake. The State may wish to issue a public notification, with an opportunity to submit additional data and check calculations, to ensure an appropriate value is determined. The State may wish to publicly certify the outcome via a Secretarial order or some other official statement of intent and applicability. EPA's preference is that once modified criteria are developed, they remain the applicable criteria for the long-term. The State has the flexibility to revise the criteria, but the expectation is that they will not be a continuously moving target for implementation purposes. As an example of how the lakes criteria might work in practice, consider a colored lake which meets the chlorophyll *a* criterion. If FDEP established a modified TP criterion of 0.110 mg/L and subsequent monitoring showed levels at 0.136 mg/L, that lake would not be considered attaining the applicable criteria for CWA purposes (unless the State goes through the process of establishing a revised modified criterion).

The permitting authority would use publicly certified modified TN or TP criteria to develop water quality-based effluent limits (WQBELs) that derive from and comply with applicable WQS. In this application, the permit writer would use the modified ambient criterion, computed as described above, as the basis for any reasonable potential analysis or permit limit derivation. In this case, as in any other case, EPA expects the details to be fully documented in the permit fact sheet.

This type of ambient calculation provision based on meeting response criteria applicable to the assessed water may not be appropriate when the established TN and TP criteria are serving to maintain and protect waters downstream. To address this concern, EPA proposes that calculated TP and TN values in a lake that discharges to a stream may not exceed criteria applicable to the stream to which a lake discharges. EPA requests comment on this provision.

(3) Request for Comment and Data on Proposed Approach

EPA is soliciting comment on the approaches described in this proposal, the data underlying those approaches, and the proposed criteria. EPA will evaluate all data and information submitted by the close of the public comment period for this rulemaking with regard to nutrient criteria for Florida's lakes. For the application of the modified ambient calculation provision, EPA is seeking comment on allowing the calculation to occur one time only, based on an adequate period of record, and then holding that value as the protective TP or TN criteria for future assessment and implementation purposes. EPA is also seeking comment on whether to require an ambient chlorophyll *a* level demonstrated to be below the chlorophyll *a* threshold criterion for at least three years become the protective chlorophyll *a* criterion for a lake subject to the modified ambient calculation provision (*i.e.,* whether to require a more stringent chlorophyll *a* criterion if three years of data show that the more stringent level reflects current conditions in the lake). EPA also requests comment on whether an additional condition for being able to apply a modified criterion include continued ambient monitoring and verification that chlorophyll *a* levels remain below the protective criterion. EPA could specify that modified criteria remain in effect as long as FDEP subsequently conducts monthly (or some other periodic) monitoring of the lake to ensure that chlorophyll *a* levels continue to meet the protective criterion. If this monitoring is not conducted and documented, EPA could specify that the baseline criterion would become the applicable criterion. Among others, this provision may address concerns about whether the modified criterion adequately represents long-term hydrologic variability. Finally, EPA requests comment on the appropriate procedure for documenting and tracking the results of modified criteria that allows transparency, public access, and accountability.

(4) Alternatives Considered by EPA

During EPA's review of the available data and information for development of numeric nutrient criteria for Florida's lakes, EPA considered and is soliciting comment on an alternative approach to deriving lakes criteria from the statistical correlation plots and regression analysis. The alternative approach would use either the central tendency values or the lower values associated with the 50th percentile prediction interval for TN and TP criteria and would not include the framework to calculate modified TP and TN criteria when the chlorophyll *a* criterion is met. EPA is also seeking comments on the following two supplementary modifications that EPA considered but did not include in this proposal: (1) the use of a modified categorization of lakes in Florida; and (2) the addition of upper percentile criteria with a different exceedance frequency.

(a) Single Value Approach To Derive Lakes Criteria—Derive TN and TP Criteria Using Correlations Associated With the Regression Line or Lower Value of the 50th Percentile Prediction Interval

One alternative means of selecting TN and TP criteria is to use the regression line (central tendency) to calculate TP and TN concentrations that correlate to the proposed chlorophyll *a* criteria for each lake class. A second alternative is to use the lower value of the 50th percentile prediction interval to calculate TP and TN concentrations. Establishing TP and TN criteria using the central tendency of the regression line represents the best estimate of TN and TP associated with a protective chlorophyll *a* criterion across all lakes, but carries some risk of being overprotective for some individual lakes and under-protective for others because of the demonstrated variability of the data. On the other hand, establishing TP and TN criteria using the lower value of the 50th percentile prediction interval will likely be protective in most cases, but could be overprotective for a greater number of lakes because the data demonstrate that many lakes achieve the protective chlorophyll *a* criterion with higher levels of TN and TP. Neither approach accounts for lake-specific natural variability, apart from that accounted for by color and alkalinity classification. However, the correlated TP and TN concentrations within each lake class at these alternative statistical boundaries would result in single criteria values for TN and TP, which is an approach that water quality program managers will have more familiarity. EPA's rationale for proposing a framework that uses both the upper and lower values of the 50th percentile prediction interval to allow the derivation of modified TN and TP lake-specific criteria rather than either of these single values was to account for the natural variability in the relationship between chlorophyll *a* and TN and TP that may exist in lakes. EPA solicits comment, however, on this alternative approach of using single values for TN and TP criteria in Florida's lakes.

(b) Modification to Proposed Lakes Classification

As discussed in Section III.B(2)(a), EPA used available data to determine a classification scheme for Florida's lakes, based on a color threshold of 40 PCU and a threshold of 50 mg/L alkalinity as $CaCO_3$. In its July 2009 numeric nutrient criteria proposal, Florida considered a similar classification approach based on color and alkalinity but proposed a chlorophyll *a* criterion of 9 µg/L to protect aquatic life in clear, acidic lakes. As discussed above, EPA believes that the scientific evidence more strongly supports a chlorophyll *a* criterion of 6 µg/L to protect Florida's clear, acidic lakes that include the very oligotrophic lakes found in Florida's sandhills, principally in three areas: the Newhope Ridge/Greenhead slope north of Panama City (locally called the Sandhill Lakes region); the Norfleet/Springhill Ridge just west of Tallahassee, and Trail Ridge northeast of Gainesville.[58] However, some stakeholders have suggested that many lakes in the clear, acidic class (as currently defined) might be sufficiently protected with a chlorophyll *a* criterion of 9 µg/L. EPA believes the scientific basis for a 9 µg/L chlorophyll *a* value may be more applicable to clear acidic lakes other than those in Florida's sandhills (*i.e.,* other than those in the Sandhill Lakes region, the Norfleet/Springhill Ridge just west of Tallahassee and Trail Ridge northeast of Gainesville). To address this, EPA could separate clear, acidic lakes into two categories: one category for clear, acidic lakes in sandhill regions of Florida, and a second category for clear, acidic lakes in other areas of the State. EPA could assign the first category (clear, acidic sandhill lakes) a chlorophyll *a* criterion of 6 µg/L and the second category (clear, acidic non-sandhill lakes) a chlorophyll *a* criterion of 9 µg/L.

Alternatively, EPA could lower the defining alkalinity threshold to 20 mg/L $CaCO_3$ so that the clear, acidic lakes category would only include lakes with very acidic values and correspondingly low chlorophyll *a,* TN, and TP values. EPA's analysis of a distribution of alkalinity data from Florida's clear lakes found that lakes with alkalinity values ≥ 20 mg/L $CaCO_3$ had higher levels of nutrients and nutrient response parameters than lakes with alkalinity values < 20 mg/L $CaCO_3$. By adjusting the alkalinity threshold to 20 mg/L $CaCO_3$, EPA would be creating a smaller group of clear, acidic lakes that may be more representative of naturally more acidic, oligotrophic conditions than the proposed alkalinity threshold of 50 mg/L $CaCO_3$. EPA opted to propose a threshold of 50 mg/L $CaCO_3$ because it represents a more comprehensive group of lakes that may be naturally oligotrophic (*i.e.,* ensures protection where there may be some uncertainty). EPA solicits comment on these alternative approaches to classifying Florida's lakes. EPA also notes, as discussed previously, that FDEP recommended a criterion of 9 µg/L as being protective of all clear acidic lakes, including sandhill lakes and that the Nutrient Criteria TAC supported "less than 10 µg/L" as protective. EPA also requests comment on 9 µg/L chlorophyll *a* as being protective of all clear acidic lakes, including sandhill lakes.

[58] Griffith, G.E., D.E. Canfield, Jr., C.A. Horsburgh, J.M. Omernik, and S.H. Azevedo. 1997. Florida lake regions. U.S. EPA, Corvallis, OR. *http://www.epa.gov/wed/pages/ecoregions/fl_eco.htm.*

(c) Modification To Include Upper Percentile Criteria

EPA is considering promulgating upper percentile criteria for chlorophyll *a,* TN, and TP in colored, clear alkaline, and clear acidic lakes to provide additional aquatic life protection. Accordingly, EPA could add that the instantaneous concentration in the lake not surpass these criterion-magnitude concentrations more than 10% of the time (criterion-duration: instant; criterion-frequency: 10% of the time). EPA derived example upper percentile criteria using the observed standard deviation from the mean of lake samples meeting the respective criteria (lower values of the TN and TP ranges) within each lake class. Using this example, the calculated criteria-magnitude concentrations for chlorophyll *a,* TN, and TP respectively by lake class are: 63 µg/L, 1.5 mg/L and 0.09 mg/L for colored lakes; 48 µg/L, 1.8 mg/L and 0.05 mg/L for clear, alkaline lakes; and 15 µg/L, 0.6 mg/L and 0.02 mg/L for clear, acidic lakes.

These criteria would provide the means to protect lakes from episodic events that increase loadings for significant periods of time during the year, but are balanced out by lower levels in other parts of the year such that the annual geometric mean value is met. EPA chose not to propose such criteria because of the significant variability of chlorophyll *a,* TN, and TP, the variety of other factors that may influence levels of these parameters in the short-term, and that significant environmental damage from eutrophication is more likely when levels are elevated for longer periods of time. However, EPA solicits comment on this additional approach of promulgating upper percentile criteria for chlorophyll *a,* TN, and TP.

(5) Request for Comment and Data on Alternative Approaches

EPA is soliciting comment on the Agency's proposed approach, as well as the alternative approach to deriving numeric nutrient criteria for Florida's lakes and the supplemental modifications as described in Section III.B(4). EPA will evaluate all data and information submitted by the close of the public comment period for this rulemaking with regard to nutrient criteria for Florida's lakes.

C. Proposed Numeric Nutrient Criteria for the State of Florida's Rivers and Streams

(1) Proposed Numeric Nutrient Criteria for Rivers and Streams

EPA is proposing numeric nutrient criteria for TN and TP in four geographically distinct watershed regions of Florida's rivers and streams (hereafter, streams) classified as Class I or III waters under Florida law (Rule 62–302.400, F.A.C.).

Nutrient watershed region	Instream protection value criteria	
	TN (mg/L) [a]	TP (mg/L) [a]
Panhandle [b]	0.824	0.043
Bone Valley [c]	1.798	0.739
Peninsula [d]	1.205	0.107
North Central [e]	1.479	0.359

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

[b] Panhandle region includes the following watersheds: Perdido Bay Watershed, Pensacola Bay Watershed, Choctawhatchee Bay Watershed, St. Andrew Bay Watershed, Apalachicola Bay Watershed, Apalachee Bay Watershed, and Econfina/Steinhatchee Coastal Drainage Area.

[c] Bone Valley region includes the following watersheds: Tampa Bay Watershed, Sarasota Bay Watershed, and Charlotte Harbor Watershed.

[d] Peninsula region includes the following watersheds: Waccasassa Coastal Drainage Area, Withlacoochee Coastal Drainage Area, Crystal/Pithlachascotee Coastal Drainage Area, Indian River Watershed, Caloosahatchee River Watershed, St. Lucie Watershed, Kissimmee River Watershed, St. John's River Watershed, Daytona/St. Augustine Coastal Drainage Area, Nassau Coastal Drainage Area, and St. Mary's River Watershed.

[e] North Central region includes the Suwannee River Watershed.

The following section describes the methodology used to derive the proposed numeric nutrient criteria for streams. EPA is soliciting comments and scientific data and information regarding these proposed criteria and their derivation.

(2) Methodology for Deriving EPA's Proposed Criteria for Streams

Like other aquatic ecosystems, excess nutrients in streams increases vegetative growth (plants and algae), and changes the assemblage of plant and algal species present in the system. These changes can affect the organisms that are consumers of algae and plants in many ways. For example, these changes can alter the available food resources by providing more dead plant material versus live plant material, or providing algae with a different cell size for filter feeders. These changes can also alter the habitat structure by covering the stream or river bed with periphyton (attached algae) rather than submerged aquatic plants, or clogging the water column with phytoplankton (floating algae). In addition, these changes can lead to the production of algal toxins that can be toxic to fish, invertebrates, and humans. Chemical characteristics of the water, such as pH and concentrations of dissolved oxygen, can also be affected by excess nutrients. Each of these changes can, in turn, lead to other changes in the stream community and, ultimately, to the stream ecology that supports the overall function of the linked aquatic ecosystem.

Although the general types of adverse effects can be described, not all of these effects will occur in every stream at all times. For example, some streams are well shaded, which would tend to reduce the near-field effect of excess nutrients on primary production because light, which is essential for plant or algae growth, does not reach the water surface. Some streams are fast moving and pulses of nutrients are swiftly carried away before any effect can be observed. However, if the same stream widens and slows downstream or the canopy that provided shading opens up, then the nutrients present may accelerate plant and algal biomass production. As another example, the material on the bottom of some streams, referred to as substrate, is frequently scoured from intense rain storms. These streams may lack a natural grazing community to consume excess plant growth and may be susceptible to phytoplankton algae blooms during periods when water velocity is slower and water residence time is longer. The effects of excess nutrients may be subtle or dramatic, easily captured by measures of plant and algal response (such as chlorophyll *a*) or not, and may occur in some locations along a stream but not others.

Notwithstanding natural environmental variability, there are well understood and documented analyses and principles about the underlying biological effects of TN and TP on an aquatic ecosystem. There is a substantial and compelling scientific basis for the conclusion that excess TN and TP will have adverse effects; however, it is often unclear where precisely the impacts will occur. The value of regional numeric nutrient criteria for streams is that the substantial expenditure of time and scarce public resources to document and interpret inevitable and expected stream variability on a site-by-site, segment-by-segment basis (*i.e.,* as in the course of interpreting a narrative WQS for WQBELs and TMDL estimations) is no longer necessary. Rather, regional numeric nutrient criteria for streams allows an expedited and expanded level of aquatic protection across watersheds and greatly strengthens local and regional capacity to support and maintain State designated uses throughout aquatic ecosystems. In terms of environmental outcomes, the result is a framework of expectations and standards that is able to extend the protection needed to restore and maintain valuable aquatic resources to entire watersheds and associated aquatic ecosystems. At the same time, the ability to promulgate SSAC, as well as other flexibilities discussed in this proposal, allows the State to continue to address water bodies where substantial data and analyses show that the regional criteria may be either more stringent than necessary or not stringent enough to protect designated uses.

As mentioned earlier, to effectively apply this well understood and documented science, EPA has recommended that nutrient criteria include both causal (*e.g.,* TN and TP) and response variables (*e.g.,* chlorophyll *a* and some measure of clarity) for water bodies.[59] EPA recommends causal variables, in part, to have the means to develop source control targets and, in part, to have the means to assess stream condition with knowledge that responses can be variable, suppressed, delayed, or expressed at different locations. EPA recommends response variables, in part, to have a means to assess stream condition that synthesizes the effect of causal variables over time, recognizing the daily, seasonal, and annual variability in measured nutrient levels.[60]

The ability to establish protective criteria for both causal and response variables depends on available data and scientific approaches to evaluate these data. Whereas, there are data available for water column chlorophyll *a* (phytoplankton) and algal thickness on various substrates (periphyton) for certain types of streams in Florida, there are currently no available approaches to interpret these data to infer scientifically supported thresholds for these nutrient-specific response variables in Florida streams. Additionally, in previously published guidance,[61] EPA has recommended water clarity as a response variable for numeric nutrient criteria because algal density in a water column results in turbidity, and thus a related decrease in water clarity can serve as an indicator of excess algal growth. For water clarity, Florida has criteria for transparency and turbidity, applicable to all Class I and III waters, expressed in terms of a measurable deviation from natural background (32–302.530(67) and (69), F.A.C.). Therefore, EPA is not proposing criteria for any response variable in Florida's streams at this time, however, EPA will consider additional data that becomes available during the comment period. One approach for deriving criteria for water quality variables such as a measure for water clarity or chlorophyll *a,* could be to apply a statistical distribution approach to a population of streams for each of the proposed NWRs. This approach is further described in previous EPA guidance.[62]

For Florida streams, EPA has determined that there are sufficient available data on TN and TP concentrations with corresponding information on biological condition for a wide variety of stream types that can be used to derive numeric nutrient criteria for those causal variables. EPA used multiple measures of stream condition (or metrics) that describe the biological condition of the benthic invertebrate community. EPA then coupled the stream condition metrics with associated measurements of TN and TP concentrations to provide the basis for deriving causal variable numeric nutrient criteria.

EPA's proposed instream numeric nutrient criteria for Florida's streams are based upon EPA's evaluation of data on TN and TP levels in rivers and streams that have been carefully evaluated by FDEP, and subsequently by EPA, on a site-specific basis and identified as biologically healthy. EPA's approach results in numeric criteria that are protective of the streams themselves. EPA has determined, however, that these instream values may not always be protective of the designated uses in downstream lakes and estuaries. Therefore, EPA has also developed an approach for deriving TN and TP values for rivers and streams to ensure the protection of downstream lakes and estuaries. This approach is discussed in Section III.C(6).

(a) Methodology for Stream Classification: EPA's Nutrient Watershed Regions (NWRs)

EPA classified Florida's streams north of Lake Okeechobee by separating watersheds with a substantially different ratio of TN and TP export into Nutrient Watershed Regions (NWR). The resulting regions reflect the inherent differences in the natural factors that contribute to nutrient concentrations in streams (*e.g.,* geology, soil composition, and/or hydrology). Reliance on a watershed-based classification approach reflects the understanding that upstream water quality affects downstream water quality. This watershed classification also facilitates the ability to address the effects of TN and TP from streams to downstream lakes or estuaries in the same watershed.

EPA's classification approach results in four watershed regions: the Panhandle, the Bone Valley, the Peninsula, and the North Central (for a map of these regions, refer to the EPA TSD for Florida's Inland Waters or the list of watersheds in the table above). These four regions do not include the south Florida region (corresponding to FDEP's Everglades Bioregion) that is addressed separately in Section III.E which sets out EPA's proposed numeric nutrient criteria for canals in south Florida. All flowing waters in this region are either a canal or a wetland.

When classifying Florida's streams, EPA identified geographic areas of the State as having phosphorus-rich soils and geology, such as the Bone Valley and the northern Suwannee River watershed. As indicated above, the Bone Valley region and the Suwannee River watersheds are classified in this proposal as separate NWRs because it is well established that the naturally phosphorus-rich soils in these areas significantly influence stream phosphorus concentrations in these watersheds. EPA would expect from a general ecological standpoint that the associated aquatic life uses, under these naturally-occurring, nutrient-rich conditions, would be supported. The Agency requests comment on this particular classification decision (regions based on phosphorus-rich soils), as well as an alternate classification approach that would not separate out the phosphorus-rich watersheds described in this notice. The latter approach is similar to the approach proposed by EPA, but would not result in separate NWRs for the Bone Valley and/or North Central. Rather these NWRs would be integrated within the other NWRs.

(b) The Use of the Stream Condition Index as an Indicator of Biologically Healthy Conditions

For EPA's proposed approach, the Agency utilized a multi-metric index of benthic macroinvertebrate community composition and taxonomic data known as the Stream Condition Index (SCI) developed by FDEP to assess the

[59] U.S. EPA. 1998. National Strategy for the Development of Regional Nutrient Criteria. Office of Water, Washington, DC. EPA 822–R–98–002; Grubbs, G. 2001. U.S. EPA. (Memorandum to Directors of State Water Programs, Directors of Great Water Body Programs, Directors of Authorized Tribal Water Quality Standards Programs and State and Interstate Water Pollution Control Administrators on Development and Adoption of Nutrient Criteria into Water Quality Standards. November 14, 2001); Grumbles, B.H. 2007. U.S. EPA. (Memorandum to Directors of State Water Programs, Directors of Great Water Body Programs, Directors of Authorized Tribal Water Quality Standards Programs and State and Interstate Water Pollution Control Administrators on Nutrient Pollution and Numeric Water Quality Standards. May 25, 2007).

[60] U.S. EPA. 2000. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. Office of Water, Washington, DC. EPA–822–B–00–002.

[61] U.S. EPA. 2000. Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs. Office of Water, Washington, DC. EPA–822–B–00–001; U.S. EPA. 2000. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. Office of Water, Washington, DC. EPA–822–B–00–002; U.S. EPA. 2001. Nutrient Criteria Technical Manual: Estuarine and Coastal Marine Waters. Office of Water, Washington, DC. EPA–822–B–01–003.

[62] U.S. EPA. 2000. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. Office of Water. 4304. EPA–822–B–00–002.

biological health of Florida's streams.[63] Of the metrics that comprise the SCI, some decrease in response to human disturbance-based stressors, such as excess nutrients; for example, (1) total taxa richness, (2) richness of Ephemeroptera (mayflies), (3) richness of Plecoptera (stoneflies), (4) percentage of sensitive taxa, and (5) percentage of filterers and suspension feeders. Other metrics increase in response to human disturbance-based stressors; for example, percent of very tolerant taxa (*e.g.,* Genera *Prostoma, Lumbriculus*) and percent of the dominant taxa (*i.e.,* numerical abundance of the most dominant taxon divided by the total abundance of all taxa).

The SCI was developed by FDEP in 2004, with subsequent revisions in 2007 to reduce the variability of results. In order to ensure that data are produced with the highest quality, field biologists and lab technicians must follow detailed Standard Operating Procedures (SOPs) and additional guidance for sampling and data use provided through a FDEP document entitled "Sampling and Use of the Stream Condition Index (SCI) for Assessing Flowing Waters: A Primer (DEP–SAS–001/09)." Field biologists must pass a rigorous audit with FDEP, and laboratory taxonomists are regularly tested and must maintain greater than 95% identification accuracy.

EPA considered two lines of evidence in determining the SCI range of scores that would indicate biologically healthy systems. The first line of evidence was an evaluation of SCI scores in streams considered by FDEP to be least-disturbed streams in Florida. A statistical analysis balanced the probability of a stream being included in this reference set with the probability of a stream not being included in this reference set, and indicated that an SCI score of 40 was an appropriate threshold. SCI scores range from 1 to 100 with higher scores indicating healthier biology.

A second line of evidence was the result of an expert workshop convened by FDEP in October 2006. The workshop included scientists with specific knowledge and expertise in stream macroinvertebrates. These experts were asked to individually and collectively evaluate a range of SCI data (*i.e.,* macroinvertebrate composition and taxonomic data) and then assign those data into one of the six Biological Condition Gradient (BCG)[64] categories, ranging from highly disturbed (Category 6) to pristine (Category 1). EPA analyzed the results of these categorical assignments using a proportional odds regression model[65] that predicts the probability of an SCI score occurring within one of the BCG categories by overlapping the ranges of SCI scores associated with each category from the individual expert assignment. The results of the analysis provided support for identifying a range of SCI scores that minimized the probability of incorrectly assigning a low quality site to a high quality category, and incorrectly assigning a high quality site to a low quality category, using the collective judgment of expert opinion. The results indicated a range of SCI scores of 40–44 to represent an appropriate threshold of healthy biological condition. Please refer to the EPA TSD for Florida's Inland Waters for more information on such topics as EPA's estimates of the Type I and Type II error associated with various threshold values. Thus, two very different approaches yielded comparable results. A subsequent EPA statistical analysis indicated that nutrient conditions in Florida streams within different regions remain essentially constant within an SCI score range of 40–50 providing further support for a selection of 40 as a threshold that is sufficiently protective for this application. The resulting TN and TP concentrations associated with a SCI score of 40 versus 50 did not represent a statistical difference and 40 was more in line with other lines of evidence for a SCI score threshold.

(c) Methodology for Calculating Instream Protection Values: The Nutrient Watershed Region Distribution Approach

EPA evaluated several methodologies, including reference conditions and stressor-response relationships, to develop values that protect designated uses of Florida streams instream. EPA analyzed stressor-response relationships in Florida streams based on available data, but, as mentioned above, did not find sufficient scientific support for their use in the derivation of numeric nutrient criteria for Florida streams. More specifically, EPA was not able to demonstrate a sufficiently strong correlation between the biological response indicators (*e.g.,* chlorophyll *a,* periphyton biomass, or SCI) and TN or TP concentrations. Thus, the Agency could not confidently predict a specific biological response (such as an SCI score) for an individual stream solely from the associated stream measurements of TN or TP concentrations.

There may be several reasons why empirical relationships between field-derived data of nutrient stressor and biological response variables show a relatively weak correlation. First, the relationship between nutrient concentrations and a biological response, such as algal growth, can be confounded by the presence of other stressors. For example, other stressors, such as excessive scour could cause low benthic invertebrate diversity, as measured by the SCI, even where nutrients are low. Excessive scour could also suppress a biological response (such as chlorophyll *a* or periphyton biomass) when nutrients are high. Another reason for stressor-response relationships with low correlations is that algal biomass accumulation is difficult to characterize because dynamic conditions in an individual stream can allow algae to accumulate and be removed rapidly, which is difficult to capture with periodic monitoring programs.

As an alternative to the stressor-response approach, EPA analyzed the TN and TP concentrations associated with a healthy biological condition in streams, and examined the statistical distributions of these data in order to identify an appropriate threshold for providing protection of aquatic life designated uses. To derive the instream protection values under this approach, EPA first assembled the available nutrient concentrations and biological response data for streams in Florida. EPA used FDEP's data from the IWR and STORET[66] databases and identified sites where SCI scores were 40 and higher. EPA further screened these sites by cross-referencing them with Florida's CWA section 303(d) list for Florida and excluded sites with identified nutrient impairments or dissolved oxygen impairments associated with elevated nutrients. EPA grouped the remaining sites (hereafter, biologically healthy sites) according to its nutrient watershed regions (Panhandle, Bone Valley, Peninsula, and North Central). For each nutrient watershed region, EPA compiled nutrient data (TN and TP

[63] The SCI method was developed and calibrated by FDEP. See "Fore et al. 2007. Development and testing biomonitoring tools for macroinvertebrates in Florida streams (Stream Condition Index and BioRecon). Final report to Florida Department of Environmental Protection" and the EPA TSD for Florida's Inland Waters for more information on the SCI.

[64] Appendix H in "Fore et al. 2007. Development and testing biomonitoring tools for macroinvertebrates in Florida streams (Stream Condition Index and BioRecon). Final report to Florida Department of Environmental Protection".

[65] See the EPA TSD for Florida's Inland Waters for more information on the proportional odds regression model.

[66] FL IWR and STORET can be found at: *http://www.dep.state.fl.us/WATER/STORET/INDEX.HTM.*

concentrations) associated with the biologically healthy sites, and calculated distributional statistics for annual average TN and TP concentrations.

The second step in deriving instream protection values was to further characterize the distribution of TN and TP among biologically healthy sites. Specifically, EPA calculated the number of biologically healthy sites within integer log-scale ranges of TN and TP concentrations, as well as the cumulative distribution. These nutrient distributions from biologically healthy sites in each nutrient watershed region are represented on a log-scale because concentration data are typically log-normally distributed. A log-normal distribution is skewed, with a mode near the geometric mean rather than the arithmetic mean.

The third step in deriving instream protection values was to determine appropriate thresholds from these distributions for providing protection of aquatic life designated uses. Selection of a central tendency of the distribution (*i.e.,* the median or geometric mean of a log-normal distribution) would imply that half of the biologically healthy sites are not attaining their uses. In contrast, an extreme upper end of the distribution (*e.g.,* the 90th or 95th percentile) may be the most likely to be heavily influenced by extreme event factors that are not representative of typically biologically healthy sites. This might be the case because the upper tail of the distribution might reflect a high loading year (landscape and/or atmospheric), and/or lack of nutrient uptake by algae (in turn due to a myriad of physical and biological factors like scour, grazing, light limitation, other pollutants). Thus, this tail of the distribution may just represent the most nutrient "tolerant" among the sites. Another possibility is that these streams may experience adverse effects from nutrient enrichment that are not yet reflected in the SCI score. A reasonable choice for a threshold is one which lies just above the vast majority of the population of healthy streams. This choice is reasonable because it reflects a point where most biologically healthy sites will still be identified as attaining uses, but avoids extrapolations into areas of the distribution characterized by only a few data points (as would be the case for the 90th or 95th percentile). When a threshold is established as a water quality criterion, sites well below that threshold might be allowed to experience an increase in nutrient levels up to the threshold level. There is little assurance that biologically healthy sites with nutrient concentrations well below the 90th or 95th percentile would remain biologically healthy if nutrient concentrations increased to those levels because relatively few sites with nutrient concentrations as high as those at the 90th or 95th percentile are demonstrated to be biologically healthy.

The range between the 25th and 75th percentiles, or inter-quartile range, is a common descriptive statistic used to characterize a distribution of values. For example, statistical software packages typically include the capability to display distributions as "box and whisker" plots, which very prominently identify the inter-quartile range. The inter-quartile range of a log normal distribution spans a smaller range of values than the inter-quartile range of a distribution of the data evenly spread across the entire range of values. This means that the further a value goes past the 75th percentile of a log normal distribution, the less representative it is of the majority of data (in this case, less representative of biologically healthy sites). Within the inter-quartile range of a log normal distribution, the slope of the cumulative frequency distribution will be the greatest. The 75th percentile represents a reasonable upper bound of where there is the greatest confidence that biologically healthy sites will be represented. Beyond the inter-quartile range (*i.e.,* below the 25th percentile and above the 75th percentile), there is a greater chance that measurements may represent anomalies that would not correspond to long-term healthy conditions in the majority of streams. Based on this analysis, EPA concluded that the 75th percentile represents an appropriate and well-founded protective threshold derived from a distribution of nutrient concentrations from biologically healthy sites. EPA solicits comment on its analysis of what constitutes a protective threshold.

(d) Proposed Criteria: Duration and Frequency

Aquatic life water quality criteria contain three components: Magnitude, duration, and frequency. For the TN and TP numeric criteria for streams, the derivation of the criterion-magnitude values is described above and these values are provided in the table in Section III.C(1). The criterion-duration of this magnitude is specified in *footnote a* of the streams criteria table as an annual geometric mean. EPA is proposing two expressions of allowable frequency, both of which are to be met. First, EPA proposes a no-more-than-one-in-three-years excursion frequency for the annual geometric mean criteria for lakes. Second, EPA proposes that the long-term arithmetic average of annual geometric means not to exceed the criterion-magnitude concentration. EPA anticipates that Florida will use their standard assessment periods as specified in Rule 62–303, F.A.C. (Impaired Waters Rule) to implement this second provision. These proposed duration and frequency components of the criteria are consistent with the data set used to derive these criteria, which applied distributional statistics to measures of annual geometric mean values from multiple years of record. EPA has determined that this frequency of excursions will not result in unacceptable effects on aquatic life as it will allow the stream ecosystem enough time to recover from an occasionally elevated year of nutrient loadings. The Agency requests comment on these proposed duration and frequency components of the stream numeric nutrient criteria.

EPA notes that some scientists and resource managers have suggested that nutrient criteria duration and frequency expressions should be more restrictive to avoid seasonal or annual "spikes" from which the aquatic system cannot easily recover, whereas others have suggested that criteria expressed as simply a long-term average of annual geometric means, consistent with data used in criteria derivation, and would still be protective. EPA requests comment on alternative duration and frequency expressions that might be considered protective, including (1) a criterion-duration expressed as a monthly average or geometric mean, (2) a criterion-frequency expressed as meeting allowable magnitude and duration every year, (3) a criterion-frequency expressed as meeting allowable magnitude and duration in more than half the years of a given assessment period, and (4) a criterion-frequency expressed as meeting allowable magnitude and duration as a long-term average only. EPA further requests comment on whether an expression of the criteria in terms of an arithmetic average of annual geometric mean values based on rolling three-year periods of time would also be protective of the designated use.

(3) Request for Comment and Data on Proposed Approach

EPA is soliciting comments on the approaches taken by the Agency to derive these proposed criteria, the data underlying those approaches, and the proposed criteria specifically. EPA is requesting that the public submit any other scientific data and information that may be available related to nutrient concentrations and associated biological responses in Florida's streams. EPA is soliciting comment specifically on the selection of criteria parameters for TN and TP; the proposed classification of streams into four regions based on aggregated watersheds; and the conclusion that the proposed criteria for streams are protective of designated uses and adequately account for the spatial and temporal variability of nutrients. In addition, EPA requests comment on folding the Suwannee River watershed in north central Florida into the larger Peninsula NWR (*i.e.,* not having a separate North Central region) or, alternatively, making a smaller North Central region within Hamilton County alone where the highest phosphorus-rich soils are located, with the remainder of the North Central becoming part of the Peninsula Region.

(4) Alternative Approaches Considered by EPA

During EPA's review of the available data and information for derivation of numeric nutrient criteria for Florida's streams, EPA also considered an alternative approach for criteria derivation. EPA is specifically requesting comment on a modified reference condition approach called the benchmark distribution approach, as described below.

(a) Benchmark Distribution Approach

EPA's previously published guidance has recommended a variety of methods to derive numeric nutrient criteria.[67] One method, the reference condition approach, relies on the identification of reference waters that exhibit minimal impacts from anthropogenic disturbance and are known to support designated uses. The thresholds of nutrient concentrations where designated uses are in attainment are calculated from a distribution of the available associated measurements of ambient nutrient concentrations at these reference condition sites.

EPA is seeking comment on a modified reference condition approach, which was developed by FDEP and is referred to as the benchmark distribution approach. The benchmark approach relies on least-disturbed sites rather than true reference, or minimally-impacted, sites. The benchmark distribution is a step-wise procedure used to calculate distributional statistics of TN and TP from identified least-disturbed streams.

(i) Identification of Least-Disturbed Streams

FDEP identified benchmark stream sites in the following step-wise manner (1) compiled a list of sites with low landscape development intensity using FDEP's Landscape Development Intensity Index,[68] (2) eliminated any sites on Florida's CWA section 303(d) list of impaired waters due to nutrients, as well as certain sites impaired for dissolved oxygen, where the State determined the dissolved oxygen impairment was caused by nutrients, (3) eliminated any sites with nitrate concentrations greater than FDEP's 0.35 mg/L proposed nitrate-nitrite criterion in order to reduce the possibility of including sites with far-field human disturbance from groundwater impacts, (4) eliminated sites known by FDEP district scientists to be disturbed, (5) eliminated potentially erroneous data through outlier analysis, (6) verified sites using high resolution aerial photographs, and (7) verified a random sample of the sites in the field.

(ii) Calculation of Benchmark Distribution Approach and Selection of Percentiles From the Benchmark Distribution

FDEP selected either the 75th or 90th percentile of the benchmark distribution approach from FDEP's proposed nutrient regions (75th percentile—Bone Valley; 90th percentile—Panhandle, North Central, Northeast, and Peninsula). FDEP's rationale for selecting either the 75th or 90th percentiles was based on the degree of certainty regarding the benchmark sites reflecting least-disturbed conditions and a probability (10% for the 90th percentile) of falsely identifying a least-disturbed site as being impaired for nutrients.

With this approach, the distribution of available annual geometric means of nutrient concentrations for the benchmark sites within the regional classes of streams is calculated. To compute the numeric criteria for the causal variables, TN, and TP, EPA is seeking comment on whether the 75th or 90th percentile of the benchmark distribution for each nutrient stream region should be selected. As mentioned above, the rationale for selecting either the 75th or 90th percentiles is based on the degree of certainty regarding the benchmark sites reflecting least-disturbed conditions and a probability of falsely identifying a least-disturbed site as being impaired for nutrients or vice-versa. In cases where data are more limited for a given nutrient region (*i.e.,* in the Bone Valley there were only four sites), the 75th percentile may be more appropriate because the 90th percentile may not be sufficiently robust (*i.e.,* may be highly sensitive to a few data points). In other cases, the 90th percentile may be more appropriate when there is a more extensive data set. For further information, please refer to EPA's TSD for Florida's Inland Waters, Chapter 2: Methodology for Deriving U.S. EPA's Proposed Criteria for Streams.

In evaluating whether to propose this approach, EPA determined that a considerable amount of uncertainty remained whether this approach would result in a list of benchmark sites that represented truly least-disturbed conditions. Specifically, EPA is concerned that nutrient concentrations at these sites may reflect anthropogenic sources (*e.g.,* sources more than 100 meters away from and/or 10 kms upstream of the segment), even if the sites appear least-disturbed on a local basis. EPA is particularly concerned that several benchmark sites in the FDEP dataset appear to have a high potential to be affected by fertilizations associated with forestry activities. FDEP provided an analysis in which FDEP concluded that this is not likely.[69] EPA solicits comment on this issue and more generally on whether the benchmark sites identified by FDEP in its July 2009 proposal are an appropriate set of least-disturbed sites on which to base the criteria calculations.

(5) Request for Comment and Data on Alternative Approach

EPA is soliciting comment on the alternative to deriving numeric nutrient criteria for Florida's streams as described in Section III.C(4).

(6) Protection of Downstream Lakes and Estuaries

Two key objectives of WQS are: First, to protect the immediate water body to which a criterion initially applies and, second, to ensure that criteria provide for protection of downstream WQS affected by flow of pollutants from the upstream water body. *See* 40 CFR 131.11 and 131.10(b). EPA WQS regulations reflect the importance of protecting downstream waters by requiring that upstream WQS "provide for the attainment and maintenance of the water quality standards of

[67] U.S. EPA. 2000. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. Office of Water. 4304. EPA–822–B–00–002.

[68] A quantitative, integrated measure of the degree of human landscape disturbance within 100 meters on either side of a specified stream reach and extending to 10 kilometers upstream of the same stream reach.

[69] FDEP document titled, "Responses to Earthjustice's Comments on the Department's Reference Sites." Draft October 2, 2009. Located in the docket ID EPA–HQ–OW–2009–0596.

downstream waters." 40 CFR 131.10(b). Thus, in developing numeric nutrient criteria for Florida, EPA considered both instream aquatic conditions and downstream aquatic ecosystem needs. In addressing the issue of how, if at all, instream criteria values need to be adjusted to assure attainment of downstream standards, EPA necessarily examined the WQS for downstream lakes and estuaries. For lakes, this analysis starts with the numeric nutrient criteria proposed in this notice. For estuaries, this notice proposes an analytical approach to determine the loadings that a particular estuary can receive and still assure attainment and maintenance of the State's WQS for the estuary (*i.e.,* a protective load). An approach is then proposed for translating those downstream loading values into criteria levels in the contributing watershed stream reaches in a manner that ensures that the protective downstream loadings are not exceeded.

In connection with both lakes and estuaries, EPA fully recognizes that there are a range of important technical questions and related significant issues raised by this proposed approach for developing instream water quality criteria that are protective of downstream designated uses. With regard, in particular, to the protection of estuaries, the Agency is working closely with FDEP to derive estuarine numeric nutrient criteria for proposal and publication in 2011. Even though estuarine numeric nutrient criteria will be developed in 2011, there is already a substantial body of information, science, and analysis that presently exists that should be considered in determining flowing water criteria that are protective of downstream water quality.

The substantial data, peer-reviewed methodologies, and extensive scientific analyses available to and conducted by the Agency to date indicate that numeric nutrient criteria for estuaries, when proposed and finalized in 2011, may result in the need for more stringent rivers and streams criteria to ensure protection of downstream water quality, particularly for the nitrogen component of nutrient pollution. Therefore, considering the numerous requests for the Agency to share its analysis and scientific and technical conclusions at the earliest possible opportunity to allow for full review and comment, EPA is including downstream protection values for TN as proposed criteria for rivers and streams to protect the State's estuaries in this notice.

As described in more detail below and in EPA's TSD for Florida's Inland Waters accompanying this notice, these proposed nitrogen downstream protection values are based on substantial data, thorough scientific analysis, and extensive technical evaluation. However, EPA recognizes that additional data and analysis may be available for particular estuaries to help inform what water quality criteria are necessary to protect these waters. EPA also recognizes that substantial site-specific work (including some very sophisticated analyses in the context of certain TMDLs) has been completed for a number of these estuaries. This notice and the proposed downstream protection values are not intended to address or be interpreted as calling into question the utility and protectiveness of these site-specific analyses. Rather, the proposed values represent the output of a systematic and scientific approach that may be generally applicable to all flowing waters in Florida that terminate in estuaries for the purpose of ensuring the protection of downstream estuaries. EPA is interested in obtaining feedback at this time on this systematic and scientific approach. The Agency further recognizes that the proposed values in this notice will need to be considered in the context of the Agency's numeric nutrient criteria for estuaries scheduled for proposal in January of 2011. At this time, EPA plans to finalize any necessary downstream protection values for nitrogen in flowing waters as part of the second phase of this rulemaking process in coordination with the proposal and finalization of numeric criteria for estuarine and coastal waters in 2011. However, if comments, data and analyses submitted as a result of this proposal support finalizing such values sooner, by October 2010, EPA may choose to proceed in this manner. To facilitate this process, EPA requests comments and welcomes thorough evaluation on the need for and the technical and scientific basis of these proposed downstream protection values as part of the broader comment and evaluation process that this proposal initiates.

EPA believes that a detailed consideration and related proposed approach to address protection of downstream water quality in this proposal is necessary for several reasons, including (1) water quality standards are required to protect downstream uses under Federal regulations at 40 CFR 131.10(b), meaning also for prevention of impairment; (2) it may be a relevant consideration in the development of any TMDLs, NPDES permits, and Florida BMAPs that the State completes in the interim period between the final rule for Florida lakes and flowing waters in October 2010 and a final rule for Florida estuarine and coastal waters in October of 2011; and (3) perhaps most importantly, it is essential for informing and supporting a transparent and engaged public consideration, evaluation, and discussion on the question of what existing information, tools, and analyses suggest regarding the need to ensure protection of downstream waters. The Agency continues to emphasize its interest in and request for additional information, further analysis, and any alternative technically-based approaches that may be available to address protection of downstream water quality. EPA also reiterates its commitment to a full evaluation of all comments received and notes the ability to issue a NODA to allow a full public review should significant new additional information and analysis become available as part of the comment period.

In deriving criteria to protect designated uses, as noted above, Federal WQS regulations established to implement the CWA provide WQS must provide for the protection of designated uses in downstream waters. In the case of deriving numeric nutrient criteria for streams in Florida, EPA's analyses reflected in this notice indicate that the proposed criteria values for instream protection of streams may not fully protect downstream lakes and downstream estuaries. EPA's proposed criteria for lakes are, in some cases, more stringent than the proposed criteria for streams that flow into the lakes. For estuaries, EPA's analyses of protective loads delivered to a specific estuary, and the corresponding expected concentration values for streams that flow into that estuary, indicate the proposed criteria for instream protection may not always be sufficient to provide for the attainment and maintenance of the estuarine WQS. For more detailed information, please consult EPA's TSD for Florida's Inland Waters, Chapter 2: Methodology for Deriving U.S. EPA's Proposed Criteria for Streams.

To address each of these issues, EPA is proposing first, for lakes, an equation that allows for input of lake characteristics to determine the concentration in flowing streams that is needed to attain and maintain the receiving lake's designated use and protective criteria. Second, for estuaries, EPA is proposing an approach for identifying the total nutrient loads a particular estuary can receive and still attain and maintain the State's designated use for the water body.

Third, also for estuaries, the Agency is proposing a methodology to derive protective concentration values for the instream criteria where necessary to assure that downstream estuarine loads are not exceeded. The following sections provide a more detailed explanation of the proposed downstream protective approach for lakes and then for estuaries.

(a) Downstream Protection of Lakes

EPA is proposing an equation to relate a lake TP concentration criterion to the concentration needed to be met in incoming streams to support the lake criterion. EPA proposes to apply the resulting stream concentration as the applicable criterion for all stream segments upstream of the lake. EPA used a mathematical modeling approach to derive this equation, with allowable input of lake-specific characteristics, to calculate protective criteria necessary to assure attainment and maintenance of the numeric lake nutrient criteria in this proposal. More specifically, EPA started with a phosphorus loading model equation first developed by Vollenweider.[70] EPA assumed that rainfall exceeds evaporation in Florida lakes and that all external phosphorus loading comes from streams. EPA considers the first assumption reasonable given the rainfall frequency and volume in Florida. The second assumption is reasonable to the extent that surface runoff contributions are far greater than groundwater or atmospheric sources of TP in Florida lakes. EPA requests comment on both these assumptions. After expressing these assumptions in terms of the mathematical relationships among loading rates, stream flow, and lake and stream concentrations, EPA derived the following equation to relate a protective lake criterion to a corresponding protective stream concentration:

$$[TP]_S = \frac{1}{c_f}\,[TP]_L\left(1+\sqrt{\tau_w}\right)$$

where:

$[TP]_S$ is the total phosphorus (TP) downstream lake protection value, mg/L

$[TP]_L$ is applicable TP lake criterion, mg/L

c_f is the fraction of inflow due to all stream flow, $0 \le c_f \le 1$

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

The term

$$\left(1+\sqrt{\tau_w}\right)$$

expresses the net phosphorus loss from the water column (*e.g.* via settling of sediment-sorbed phosphorus) as a function of the lake's retention time

This model equation requires input of two lake-specific characteristics: The fraction of inflow due to stream flow and the hydraulic retention time. Water in a lake can come from a combination of groundwater sources, rainfall, and streams that flow into it. Using the model equation above, the calculated stream TP criterion to protect a downstream lake will be more stringent for lakes where the portion of its volume coming from streams flowing into it is the greatest. In addition, the calculated stream TP criterion to protect a downstream lake will be more stringent for lakes with short hydraulic retention times (how long water stays in a lake) because the longer the water stays in the lake, the more phosphorus will settle out in the underlying lake sediment.

Because lake-specific input values may not always be readily available, EPA is providing preset values for percent contribution from stream flow and hydraulic retention time. In Florida lakes, rainfall and groundwater sources tend to contribute a large portion of the total volume of lake water. In fact, only about 20% of the more than 7,000 Florida lakes have a stream flowing into them,[71] with the rest entirely comprised of groundwater and rainwater sources. EPA evaluated representative values for percent contribution from stream flow[72] and hydraulic retention time,[73] and selected 50% stream flow contribution and 0.2 years (about two and a half months) retention time as realistic and representative preset values to provide a protective outcome for Florida lakes, in the absence of site-specific data. Using these preset values, streams that flow into colored lakes would have a TP criterion of 0.12 mg/L, and streams that flow into clear, alkaline lakes would have a TP criterion of 0.073 mg/L, with respect to downstream lake protection. In the Peninsula NWR, this compares to a 0.107 mg/L TP stream criterion protective of instream designated uses. EPA's proposed rule does offer the flexibility to use site-specific inputs to the Vollenweider equation for fraction of inflow from streamflow and hydraulic retention time, as long as data supporting such inputs are sufficiently robust and well-documented.

EPA carefully evaluated use of a settling/loss term for phosphorus in the model equation. Florida lakes tend to be shallow, and internal loadings to the lake water (*e.g.* from re-suspension of settled phosphorus after storms that stir up lake sediment) may be substantial. A more detailed model might be able to simulate this phenomenon mechanistically, but would likely require substantial site-specific data for calibration. For this reason, EPA chose to use the model formulation above. EPA considered a simpler alternative to exclude the settling/loss term from the above equation, or even to reverse the sign on the settling/loss term so that it becomes a net source term, perhaps with the inclusion of a default multiplier. However, EPA did not have sufficient information to conclude that such a conservative approach was necessary as a general application to all Florida lakes. EPA remains open and receptive to comment on these alternatives or other technically sound and protective approaches. EPA's supporting analyses and detailed information on this downstream lake protection methodology are provided in the accompanying TSD for Florida's Inland Waters, Chapter 2: Methodology for Deriving U.S. EPA's Proposed Criteria for Streams.

The same processes that occur in lakes and affect lake water phosphorus concentration may also occur in streams that feed lakes and affect stream water phosphorus concentrations. These processes include sorption to stream bed sediments, uptake into biota, and release into the water column from decaying vegetation. EPA took into consideration these processes when deciding whether it would be appropriate to add a term to the model equation to account for phosphorus loss or uptake within the streams in deriving stream criteria for downstream lake protection. However, the net result of these processes is nutrient spiraling, whereby nutrients released upstream gradually propagate downstream at a rate slower than that of the moving water, and cycle into and out of the food chain in the process. Over the short term, the result may be water concentrations that decrease in the downstream direction. However, unlike for nitrogen, there are no long-term phosphorus net removal processes at work in streams. Phosphorus adsorbed to sediment particles is eventually

[70] Vollenweider, R.A. 1975. Input-output models with special reference to the phosphorus loading concept in limnology. Schweizerische Zeitschrift fur Hydrologie. 37: 53–84; Vollenweider, R.A. 1976. Advances in differing critical loading levels for phosphorus in lake eutrophication. Mem. Ist. Ital. Idrobid. 33:53:83.

[71] Fernald, E.A. and E.D. Purdum. 1998. Water Resources Atlas of Florida. Tallahassee: Institute of Science and Public Affairs, Florida State University.

[72] Gao, X. 2006. Nutrient and Unionized Ammonia TMDLs for Lake Jesup, WBIDs 2981 and 2981A. Prepared by Florida Department of Environmental Protection, Division of Water Resource Management, Bureau of Watershed Management, Tallahassee, FL.

[73] Steward, J.S. and E.F. Lowe. In Press. General empirical models for estimating nutrient load limits for Florida's estuaries and inland waters. *Limnol. Oceanogr.* 55: (in press).

carried downstream with the sediment, and phosphorus taken up by plants is eventually returned to the flowing water. Over the long term, upstream phosphorus inputs are in equilibrium with downstream phosphorus outputs. Recognizing this feature of stream systems and the conservative nature of phosphorus in aquatic environments, EPA concluded that it was not appropriate to include a phosphorus loss term that would apply to streams as they progress toward a downstream lake. For further information, please refer to EPA's TSD for Florida's Inland Waters, Chapter 2: Methodology for Deriving U.S. EPA's Proposed Criteria for Streams.

EPA requests comment on the need for additional instream criteria to protect uses in downstream lakes. EPA further requests comment on the model equation approach presented here to protect downstream lakes, and also requests comment on use of an alternative model such as one with a negative or zero settling term (*i.e.,* set $(1+\sqrt{\tau_w})$ in the equation above either equal to zero or with the plus sign switched to a minus sign). EPA also requests comment on whether and how to address direct surface runoff into the lake. Where this input is substantial and land use around the lake indicates that phosphorus input is likely, EPA believes it may be appropriate to include this water volume contribution as part of the fraction of inflow considered to be streamflow to be protective and consistent with the assumption of no loading from sources other than streamflow. EPA specifically requests comment on use of the Land Development Index (LDI) as an indicator of how to treat this inflow, examination of regional groundwater phosphorus levels to see if a zero TP input from this source is appropriate, and potential development of regionally-specific preset values as inputs to the equation. In addition, EPA requests comment on the potential to develop a corollary approach for nitrogen.

EPA is open to alternative technically-supported approaches based on best available data that offer the ability to address lake-specific circumstances. The Agency recognizes that more specific information may be readily available for individual lakes which could allow the use of alternative approaches such as the BATHTUB model.[74] The Agency welcomes comment and technical analysis on the availability and application of these models. In this regard, EPA requests comment on whether there should be a specific allowance for use of alternative lake-specific models where demonstrated to be protective and scientifically defensible based upon readily and currently available data, and whether use of such alternatives should best be facilitated through use of the SSAC procedure described in Section V.C.

(b) Downstream Protection of Estuaries

(i) Overview

EPA is proposing a methodology for calculation of applicable criteria for streams that flow into estuaries and provide for their protection. The proposed methodology would allow the State to utilize either (1) EPA's downstream protection values (DPVs), or (2) the EPA DPV methodology utilizing EPA's estimates of protective loading to estuaries but with the load re-distributed among the tributaries to each estuary, or (3) an alternative quantitative methodology, based on scientifically defensible approaches, to derive and quantify the protective load to each estuary and the associated protective stream concentrations. The DPV methodology with a re-distributed load may be used if the State provides public notice and opportunity for comment. To use an alternative technical approach, based on scientifically defensible methods to derive and quantify the protective load to each estuary and the associated protective stream concentrations, the State must go through the process for a Federal SSAC as described in Section V.C. In some cases, the substantial and sophisticated analyses and scientific effort already completed in the context of the TMDL process may provide sufficient support for a SSAC. In such circumstances, EPA encourages FDEP to submit these through the SSAC process and EPA looks forward to working with FDEP in this process.

EPA's approach to developing nutrient criteria for streams to protect downstream estuaries in Florida involves two separate steps. The first step is determining the average annual nutrient load that can be delivered to an estuary without impairing designated uses. This is the protective load. The second step is determining nutrient concentrations throughout the network of streams and rivers that discharge into an estuary that, if achieved, are expected to result in nutrient loading to estuaries that do not exceed the protective load. These concentrations, called "downstream protection values" or DPVs, depend on the protective load for the receiving estuary and account for nutrient losses within streams from natural biological processes. In this way, higher DPVs may be appropriate in stream reaches where a significant fraction of either TN or TP is permanently removed within the reach before delivery to downstream receiving waters. EPA's approach utilizes results obtained from a watershed modeling approach called SPAtially Referenced Regressions on Watershed attributes, or SPARROW.[75] The specific model that was used is the South Atlantic, Gulf and Tennessee (SAGT) regional SPARROW model.[76] EPA selected this model because it provided the information that was needed at the appropriate temporal and spatial scales and it applies to all waters that flow to Florida's estuaries.[77] SPARROW was developed by the United States Geological Survey (USGS) and has been reviewed, published, updated and widely applied over the last two decades. It has been used to address a variety of scientific applications, including management and regulatory applications.[78] In order to fully understand EPA's methodology for developing DPVs, it is useful to understand how the approach utilizes results from SPARROW, as well some aspects of how SPARROW works.

[74] Kennedy, R.H., 1995. *Application of the BATHTUB Model to Selected Southeastern Reservoirs.* Technical Report EL–95–14, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. Walker, W.W., 1985. *Empirical Methods for Predicting Eutrophication in Impoundments; Report 3, Phase II: Model Refinements.* Technical Report E–81–9, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

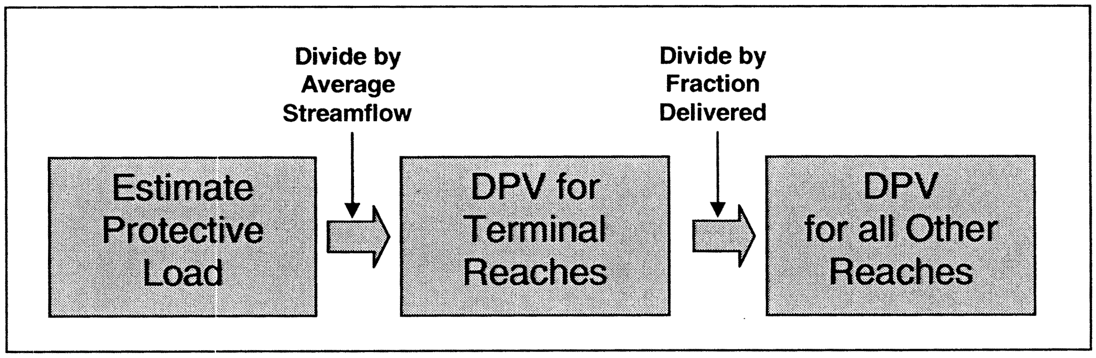
Walker, W.W., 1987. *Empirical Methods for Predicting Eutrophication in Impoundments; Report 4, Phase III: Applications Manual.* Technical Report E–81–9, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

[75] *http://water.usgs.gov/nawqa/sparrow.*

[76] Hoos, A.B., and G. McMahon. 2009. Spatial analysis of instream nitrogen loads and factors controlling nitrogen delivery to stream in the southeastern United Sates using spatially referenced regression on watershed attributes (SPARROW) and regional classification frameworks. *Hydrological Processes.* DOI: 10.1002/hyp.7323.

[77] Hoos, A.B., S. Terziotti,, G. McMahon, K. Savvas, K.C. Tighe, and R. Alkons-Wolinsky. 2008. Data to support statistical modeling of instream nutrient load based on watershed attributes, southeastern United States, 2002: U.S. Geological Survey Open-File Report 2008–1163, 50 p.

[78] USGS SPARROW publications Web site: *http://water.usgs.gov/nawqa/sparrow/intro/pubs.html.*



The remaining discussion focuses on TN, for which EPA has already computed DPVs. The approach for computing DPVs for TP from estimates of the protective TP load is expected to be essentially the same as for TN. However, there is some question as to whether the same approach used to determine the protective TN load will also apply to TP. EPA requests comment on this issue.

(ii) EPA Approach to Estimating Protective Nitrogen Loads for Estuaries

The first step in EPA's approach is to narrow the range of possible values. The protective TN load is expected to vary widely among Florida estuaries because they differ significantly in their size and physical and biological attributes. For example, well flushed estuaries are able to receive higher TN loading without adverse effect compared to poorly flushed estuaries. EPA recognized that it may be possible to narrow this initially very broad range of possible protective loads using one consistent approach, and then consider whether additional information might enable a further reduction in uncertainty. EPA is soliciting credible scientific evidence that may improve these estimates and further reduce uncertainty surrounding the proposed protective loads. The most useful evidence would provide a scientific rationale, an alternative estimate of the protective load, and an associated confidence interval for the estimate. For further information, please refer to EPA's TSD for Florida's Inland Waters, Chapter 2: Methodology for Deriving U.S. EPA's Proposed Criteria for Streams.

EPA first narrowed the range of possible protective loads by establishing an estimate of current loading as an upper bound. Most of Florida's estuaries are listed as impaired to some extent by nutrients or nutrient-related causes. Florida's 1998 CWA section 303(d) verified list of impaired waters under the Impaired Waters Rule (FAC 62–303) identify many estuaries or estuary segments that are impaired by nutrients, chlorophyll *a,* or low dissolved oxygen. Many or most estuaries have reduced water clarity and substantial loss of seagrass habitats. The National Estuarine Eutrophication Assessment [79] reports that current conditions are poor for many estuaries in Florida. This information implies that current levels of TN loading are at least an upper limit for the protective load and likely exceed the protective load in many estuaries.

EPA used the SAGT–SPARROW regional watershed model to estimate current loading to each estuary in Florida. While nitrogen loads have been estimated from monitored gauge stations in many stream and rivers, a large fraction of Florida streams and watersheds are not gauged and thus load estimates were not previously available. An approach was needed to spatially extrapolate the available measurements of loading to obtain estimates of loading for all streams including those in unmonitored watersheds or portions of watersheds. The SAGT SPARROW model provided these estimates for all Florida estuarine watersheds. The SPARROW modeling approach utilizes a multiple regression equation to describe the relationship between watershed attributes (*i.e.,* the predictors) and measured instream nutrient loads (*i.e.,* the responses). The statistical methods incorporated into SPARROW help explain instream nutrient water quality data (*i.e.,* the mass flux of nitrogen) as a function of upstream sources and watershed attributes. The SAGT–SPARROW model utilized period of record monitored streamflow and nutrient water quality data from Florida and across the SAGT region for load estimation. SAGT–SPARROW also used extensive geospatial data sets describing topography, land-use, climate, and soil characteristics, nitrogen loading for point sources in Florida obtained from EPA's permit compliance system, and estimates of nitrogen in fertilizer and manure from county-level fertilizer sales, census of agriculture, and population estimates. TN load estimates explain 96% of the variation in observed loads from monitoring sites across the region with no spatial bias at Florida sites.[80] A more thorough description of the SAGT–SPARROW model, the data sources, and analyses are found in the EPA TSD for Florida's Inland Waters and in USGS publications.[81]

EPA further narrowed the range of possible protective loads by establishing the background load as a lower bound. EPA recognizes that a measure of natural background TN loading is the true lower limit, yet EPA recognizes also that some level of anthropogenic nutrient loading is acceptable, difficult to avoid, and unlikely to cause adverse biological responses. The current TN load minus the fraction of TN loading estimated to result from anthropogenic sources is used as an estimate of the background TN load. EPA used the SAGT–SPARROW regional watershed model to estimate background loading. SAGT–SPARROW empirically associates 100% of the measured nutrient loading into one of five classes (fertilizer, manure, urban, point sources, and atmospheric). EPA recognizes that some watershed models define more types of sources, according to their modeling objectives; however, it is important to recognize that these are

[79] Bricker, S., B. Longstaff, W. Dennison, A. Jones, K. Boicourt, C. Wicks and J. Woerner, 2007. Effects of nutrient enrichment in the Nation's estuaries: A decade of change. NOAA Coastal Ocean Program Decision Analysis Series No. 26. National Centers for Coastal Ocean Science, Silver Spring, MD 322.

[80] Hoos, A.B., and G. McMahon. 2009. Spatial analysis of instream nitrogen loads and factors controlling nitrogen delivery to stream in the southeastern United Sates using spatially referenced regression on watershed attributes (SPARROW) and regional classification frameworks. *Hydrological Processes.* DOI: 10.1002/hyp.7323.

[81] Hoos, A.B., S. Terziotti,, G. McMahon, K. Savvas, K.C. Tighe, and R. Alkons-Wolinsky. 2008. Data to support statistical modeling of instream nutrient load based on watershed attributes, southeastern United States, 2002: U.S. Geological Survey Open-File Report 2008–1163, 50 p.

source classes, not sources, and that 100% of the measured loading is accounted for explicitly or implicitly by SPARROW in terms of these source classes.

The class termed "atmospheric" reflects all loading that cannot be empirically attributed to causal variables associated with the other classes. EPA used the estimate for this class of loading as the background TN load. EPA recognizes that the SPARROW-estimated "atmospheric" load includes anthropogenic contributions associated with regional-scale nitrogen emissions and does not represent pre-industrial or true "natural" background loading. The "atmospheric" source term from SPARROW is also not equal to atmospheric nitrogen deposition as measured by the National Atmospheric Deposition Program (NADP). To properly interpret the TN load attributed to the "atmospheric" source term in SPARROW, it is useful to recognize that SPARROW is a nonlinear regression model that seeks to explain measured TN loads in streams and rivers in terms of a series of explanatory variables. The atmospheric term is in all cases less, and often much less, than the measured deposition because not all the nitrogen deposited to the landscape is transported to streams, and not all of the nitrogen transported in streams reaches estuaries. The atmospheric source term from SPARROW excludes all the loading associated with both local anthropogenic nitrogen sources and factors contributing to increased transport of nitrogen from all sources (*e.g.,* impervious surfaces). Therefore, EPA expects that reasonable values for the protective TN load are not likely to be less than these values.

The protective TN load should be less than the current load and greater than the background load. Although this recognition may appear to be trivial, it is important. EPA estimates that TN loads to estuaries across Florida vary approximately 25-fold (~2 to 50 grams of nitrogen per square meter of estuary area). However, the ratio of the current load to the background load varies only between 1.7 and 5; for most estuaries, the range is between 2 and 4. Alternatively stated, current TN loads, which include local anthropogenic nitrogen sources, are two to four-fold higher than the background loads which do not include those sources. Thus, for any specific estuary, there is a relatively narrow range between the upper and lower bounds of potential protective loads.

EPA acknowledges that not all the TN entering estuaries comes directly from the streams within its watershed. In some estuaries, direct atmospheric nitrogen deposition to the estuary surface may be an important source of TN loading to the estuary. Similarly, point sources such as industrial or wastewater treatment plant discharges directly to the estuary can be significant. In general, these sources are most significant when the ratio of watershed area to estuary area is relatively small compared to other estuaries (*e.g.,* St. Andrew Bay, Sarasota Bay). In a few cases in Florida, point source loads directly to the estuary account for a large fraction of the aggregate load from all sources.

As a second step, EPA sought to further reduce the range of possible protective loading values by considering additional evidence. One line of evidence EPA considered is previous estimates of protective loads. These have been developed as part of TMDLs for Florida estuaries or as part of Florida's Pollutant Load Reduction Goal or PLRG program. The scientific approaches utilized for TMDLs and PLRGs vary from simple to sophisticated and have recommended TN loading reductions between 3% and 63%, with a median of 38%. Higher reductions are typically associated with portions of estuaries currently receiving higher anthropogenic loading. Unfortunately, these analyses have not been completed for all of Florida's estuaries. Steward and Lowe (2009) [82] showed that the TN loading limits suggested by TMDLs and PLRGs for a variety of aquatic ecosystems in Florida, including estuaries, could be statistically related to water residence time for the receiving water. EPA evaluated these relationships as an additional line of evidence for estimating protective TN loads for estuaries. EPA found these relationships to confirm in most cases, but not all, that the loading limits were likely between the bounds EPA previously established using SPARROW. However, the limits of uncertainty associated with the relationship were nearly as large as those already established. Nonetheless, the models provide additional support for EPA's estimates of protective estuary loads, but no further refinement of the estimates.

Another approach to considering existing TMDLs and PLRGs is to consider directly the loading rate reductions recommended from those efforts, the median of which is 38% in Florida. This percent TN reduction is similar to the scientific consensus for several well-studied coastal systems elsewhere (*e.g.,* Chesapeake Bay, northern Gulf of Mexico) which have been subjected to increased TN loads from known anthropogenic sources. EPA recognizes that the magnitude of anthropogenic TN loads varies across Florida estuaries and that applying a uniform percent reduction across all estuaries does not account for the variable extent of anthropogenic loads and could lead to estimates below background load. An alternative approach is to assume that the appropriate loading reduction is proportional to the magnitude of anthropogenic enrichment. Thus, EPA suggests that protective TN loading may be estimated by assuming that the anthropogenic component of TN loading should be reduced by a constant fraction.

As a result, EPA computed the protective TN load by reducing the current TN load by one half of the anthropogenic contribution to that load. EPA's protective load estimates are on average 25% less than current TN loading (range = 5 to 40%), consistent with most TMDLs and PLRGs for Florida estuaries.

EPA developed protective TN loads for 16 estuarine water bodies in Florida for the purpose of computing DPVs for streams that are protective of uses in the estuarine receiving waters. EPA did not develop loading targets for the seven estuarine water bodies in south Florida (Caloosahatchee, St. Lucie, Biscayne Bay, Florida Bay, North and South Ten Thousand Islands, and Rookery Bay), because requisite information related to TN loading from the highly managed canals and waterways cannot be derived from SAGT–SPARROW and were not available otherwise, and three in central Florida (coastal drainage areas of the Withlacoochee River, Crystal-Pithlachascotee River and Daytona-St. Augustine) because EPA is still evaluating appropriate protective loads and the flows necessary to derive DPVs.

EPA notes that some stakeholders, including FDEP staff,[83] have raised

[82] Steward, J.S. and E.F. Lowe. 2010. General empirical models for estimating nutrient load limits for Florida's estuaries and inland waters. *Limnology and Oceanography 55(1):433–445.*

[83] For further information on concerns raised by FDEP regarding the use of SPARROW, refer to "Florida Department of Environmental Protection Review of SPARROW: How useful is it for the purposes of supporting water quality standards development?," "Assessment of FDEP Panhandle Stream proposed benchmark numeric nutrient criteria for downstream protection of Apalachicola Bay," and "Analysis of Proposed Freshwater Stream Criteria's Relationship to Protective Levels in the Lower St. Johns River Based on the Lower St. Johns River Nutrient TMDL." located in EPA's docket ID No. EPA–HQ–OW–2009–0596.

concerns about the suitability of the SAGT SPARROW to address downstream protection of estuaries and have suggested alternative models and approaches that have been applied for several of Florida's larger estuaries and their watersheds. These concerns include known limitations of the SPARROW model, particularly related to inadequate resolution of complex hydrology in several parts of the State. EPA also recognizes this limitation and as a result, has not used SAGT SPARROW to propose protective loads and associated downstream protection values for ten estuaries and their watersheds in Florida. EPA acknowledges that other approaches and models may also provide defensible estimates of protective loads.

Among the technical concerns that stakeholders including FDEP staff have raised are that: (1) SPARROW is useful for general pattern, but the large scale calibration lead to large errors for specific areas, (2) SPARROW only utilizes four source inputs, and (3) SPARROW was calibrated to only one year's worth of data. As presented in the above sections, but to briefly reiterate here: (1) SPARROW is calibrated across a larger area, but it utilizes a large amount of Florida site-specific data and it explains 96% of the variation in observed loads from monitoring sites, (2) SPARROW accounts for all sources, but groups them into four general categories, and (3) SPARROW uses available data from the 1975–2004 period at monitored sites. This last concern may be confused with the technical procedure of presenting loading estimates as "detrended to 2002". This procedure accounts for long-term, inter-annual variability to ensure that long-term conditions and trends are represented. The year 2002 was selected as a baseline because it has the best available land use/land cover information available, but the loading estimates, in fact, represent a long-term condition representative of many years of record. EPA encourages technical reviewers to consult with the technical references cited in this section for the complete explanations of technical procedures.

EPA requests comment on its use of the SPARROW model to derive protective loads for downstream estuaries, as well as data and analyses that would support alternate methods of deriving downstream loads, or alternate methods of ensuring protection of designated uses in estuaries. For estuaries where sophisticated scientific analyses have been completed, relying on ample site-specific data to derive protective loads in the context of TMDLs, EPA encourages FDEP to submit resulting alternative DPVs under the SSAC process.

(iii) Computing Downstream Protection Values (DPVs)

Once an estimate of protective TN loads is derived, EPA developed a methodology for computing DPVs, for streams that, if achieved, are expected to result in an average TN loading rate that does not exceed the protective load. EPA's methodology, which is used as the narrative translator, allows for the fraction of the protective TN loading contributed from each tributary within the watershed of an estuary to be determined by the fraction of the total freshwater flow contributed by that tributary. The DPV is specified as an average TN concentration, which is computed by dividing the protective TN load by the aggregate average freshwater inflow from the watershed. This approach results in the same DPV for each stream or river reach that terminates into a given estuary.

EPA's methodology accounts for instream losses of TN. EPA recognizes that not all the TN transported within a stream network will ultimately reach estuaries. Rather, some TN is permanently lost from streams. This is not the same as reversible transformations of TN, such as algal uptake. Losses of TN are primarily associated with bacterially-mediated processes in stream sediments that convert biologically available nitrogen into inert N_2 gas, which enters the atmosphere (a process called denitrification). This occurs more rapidly in shallow streams and at almost negligible rates in deeper streams and rivers. EPA refers to the fraction of nitrogen transported in streams that ultimately reaches estuaries as the "fraction delivered." Estimates of the fraction delivered in Florida are less than 50% in streams very distant from the coast, but is between 80 and 100% in approximately half the stream reaches in Florida's estuarine watersheds.

EPA's approach relies on estimating the fraction of TN delivered to downstream estuaries. Measuring instream loss rates at the appropriate time and space scale is exceedingly difficult, and it is not possible to do State-wide. EPA is not aware of other models or data suitable to estimating nitrogen losses in streams across the State of Florida. EPA obtained estimates from the SAGT–SPARROW model,[84] which is possibly the best generally applicable approach to obtaining these estimates. One reason is that SPARROW estimates watershed-scale instream losses at the annual time scales across the entire region. Estimates of instream losses are modeled in SPARROW using a first-order decay rate as a function of time-of-travel in the reach. The inverse exponential relationship is consistent with scientific understanding that nitrogen losses decrease with increasing stream size and with results from experimental reach-scale studies using a variety of methods.[85] EPA recognizes that stream attributes other than reach time-of-travel or size may influence instream loss rates and though the SPARROW model did not include these, the lack of spatial bias in model residuals suggests that inclusion of other potential subregional-scale or State-wide stream attributes may not improve modeled instream loss estimates.

EPA developed and applied this methodology to compute DPVs for every stream reach in each of 16 estuarine watersheds starting with estuarine-specific estimates of the protective load. These estuarine watersheds align with the Nutrient Watershed Regions (NWR) used to derive instream protection values (IPVs). It is important to note that the scale at which protective loads and DPVs were derived is smaller than for IPVs (*i.e.,* 16 estuarine watersheds vs. 4 nutrient watershed regions). EPA's recognition that some fraction of nitrogen transported in streams is retained or assimilated before reaching estuarine waters help ensure that the DPVs are not overprotective of downstream use in any particular estuary.

In determining TN DPVs, EPA considered the contribution of TN inputs from wastewater discharged in shoreline catchments directly to the estuary. EPA found these point source inputs to be significant (> 5% of total loading) in three (St. Andrew's Bay, St. Marys, St. John's) of the 16 estuaries. However, for the purpose of computing stream reach DPVs for a given estuarine watershed, EPA considered only those TN loads delivered from the estuarine watershed stream network and did not

[84] Hoos, A.B., and G. McMahon. 2009. Spatial analysis of instream nitrogen loads and factors controlling nitrogen delivery to streams in the southeastern United States using spatially referenced regression on watershed attributes (SPARROW) and regional classification frameworks. *Hydrological Processes.* DOI: 10.1002/hyp.7323.

[85] Bohlke, J.K., R.C. Antweiler, J.W. Harvey, A.E. Laursen, L.K. Smith, R.L. Smith, and M.A. Voytek. 2009. Multi-scale measurements and modeling of Denitrification in streams with varying flow and nitrate concentration in the upper Mississippi River basin, USA. *Biogeochemistry* 93: 117–141. DOI 10.1007/s10533–008–9282–8.

include TN inputs from wastewater discharged in shoreline catchments directly to an estuary because these loads do not originate from upstream sources. However, point sources loads directly to the estuary would need to be considered in developing TMDLs based on estuary-specific criteria.

EPA's computation of DPVs using estimates of protective loading for each estuary and the fraction-delivered to estuaries is shown by equation (1):

$$\bar{C}_i = kL_{est}\frac{1}{Q_W F_i}, \qquad (1)$$

where the terms are defined as follows for a specific or (ith) stream reach:

$\bar{C}_i$ maximum flow-averaged nutrient concentration for a specific (the ith) stream reach consistent with downstream use protection (*i.e.,* the DPV)

k fraction of all loading to the estuary that comes from the stream network resolved by SPARROW

L_{est} protective loading rate for the estuary, from all sources

$\bar{Q}_W$ combined average freshwater discharged into the estuary from the portion of the watershed resolved by the SPARROW stream network

F_i fraction of the flux at the downstream node of the specific (ith) reach that is transported through the stream network and ultimately delivered to estuarine receiving waters (*i.e.,* Fraction Delivered).

Note that the quantity kLest is equal to the loading to the estuary from sources resolved by SPARROW. For the purposes of practical implementation, EPA classified each stream water body (*i.e.,* Water Body Identification or "WBID" using the FDEP term) according to the estuarine receiving water and one of six categories based on the fraction of TN delivered (0 to 50%, 51–60%, 61–70%, 71–80%, 81–90%, and 91–100%). For each category, the upper end of the range was utilized to compute the applicable DPV for streams in the category, resulting in a value that will be protective. This approach reduces the number of unique DPVs from thousands to less than 100. Because the stream network utilized by the SAGT–SPARROW watershed model (ERF1) does not recognize all of the smaller streams in Florida (*i.e.,* it is on a larger scale), EPA mapped WBIDs to the applicable watershed-scale unit, or "incremental watersheds," of the ERF1 reaches, assigning to each WBID the fraction of TN delivered estimated for the ERF1 reach whose incremental watershed includes the WBID. Where the WBID includes portions of the incremental watersheds of more than one ERF1 reach, EPA computed a weighted-average based on the proportion of WBID area in the watershed of each ERF1 reach.

Given an even distribution of reaches within each 10% interval, EPA's "binning" approach to the fraction-delivered estimates results in a 5% to 10% margin of safety for the average reach in each range (closer to 10% for the lower fraction-delivered ranges). Potentially larger margins are possible within the 0 to 50% range, where the fraction delivered might be 20%, but the DPV would be computed assuming a fraction delivered of 50%. However, only one watershed in Florida for which EPA is proposing DPVs, the St. Johns River, has a substantial number of reaches estimated to have less than 50% TN delivered to estuarine waters. The SAGT–SPARROW watershed model estimates that 17% of the stream reaches in the St. Johns watershed are in this category, with about half the reaches delivering nearly 50% of TN and a substantial number delivering only 20% of TN. Given EPA's DPV for terminal reaches in the St. Johns watershed, however, the DPV for reaches with a fraction delivered less than 50% will be higher than the IPV, and therefore, will not apply. EPA requests comment on the binning approach for calculating DPVs, which allows for a relatively simple table of DPVs to be presented as compared to using the actual estimate of fraction TN delivered to calculate a DPV unique to each WBID using formula (1), above.

At this time, EPA has not calculated protective TP loads for Florida's estuaries or DPVs for TP. However, advances in the application of regional watershed models, such as SPARROW, that address the sources and terrestrial and aquatic processes that influence the supply and transport of TP in the watershed and delivery to estuaries are currently in advanced stages of development.[86] EPA anticipates obtaining the necessary data and information to compute TP loads for the estuarine water bodies in Florida in 2010 and could make this additional information available by issuing a supplemental **Federal Register** Notice of Data Availability (NODA), which would also be posted in the public docket for this proposed rule. EPA intends to derive proposed protective loads and DPVs for TP using an analogous approach as used for TN DPVs. EPA expects the approach will recognize that TP, like TN, is essential for estuarine processes but in excess will adversely impact aquatic life uses.

(iv) EPA Downstream Protection Values (DPVs)

The following criteria tables and corresponding DPVs for a given stream reach category have been geo-referenced to specific WBIDs which are managed by FDEP as the principal assessment unit for Florida's surface waters. To see where the criteria are geographically applicable, refer to EPA's TSD for Florida's Inland Waters, Appendix B–18: In-Stream and Downstream Protection Value (IPV/DPV) Tables with DPV Geo-Reference Table to Florida WBIDs.

River/stream reach category—percent delivered to estuary [4]	(mg L^{-1})		TP (mg L^{-1})	
	TN IPV [5]	TN DPV [6]	TP IPV [7]	TP DPV [8]
Perdido Bay Watershed [PH] (EDA Code: [1] G140x) Protective TN Load for the Estuary: [2]: 847,520 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	*NR*	*NR*	0.043	*TBD*
50.1–60.0%	*NR*	*NR*	0.043	*TBD*
60.1–70.0%	*NR*	*NR*	0.043	*TBD*
70.1–80.0%	*NR*	*NR*	0.043	*TBD*
80.1–90.0%	0.824	0.34	0.043	*TBD*
90.1–100%	0.824	0.30	0.043	*TBD*

[86] Hoos, A.B., S. Terziotti, G. McMahon, K. Savvas, K.C. Tighe, and R. Alkons-Wolinsky. 2008. Data to support statistical modeling of instream nutrient load based on watershed attributes, southeastern United States, 2002: U.S. Geological Survey Open-File Report 2008—1163, 50 p.

River/stream reach category—percent delivered to estuary [4]	(mg L^{-1})		TP (mg L^{-1})	
	TN IPV [5]	TN DPV [6]	TP IPV [7]	TP DPV [8]
Pensacola Bay Watershed [PH] (EDA Code: [1] G130x) Protective TN Load for the Estuary: [2] 4,388,478 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	*NR*	*NR*	0.043	*TBD*
50.1–60.0%	*NR*	*NR*	0.043	*TBD*
60.1–70.0%	*NR*	*NR*	0.043	*TBD*
70.1–80.0%	*NR*	*NR*	0.043	*TBD*
80.1–90.0%	0.824	0.48	0.043	*TBD*
90.1–100%	0.824	0.43	0.043	*TBD*
Choctawhatchee Bay Watershed [PH] (EDA Code: [1] G120x) Protective TN Load for the Estuary: [2] 2,875,861 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	*NR*	*NR*	0.043	*TBD*
50.1–60.0%	*NR*	*NR*	0.043	*TBD*
60.1–70.0%	*NR*	*NR*	0.043	*TBD*
70.1–80.0%	0.824	0.48	0.043	*TBD*
80.1–90.0%	0.824	0.43	0.043	*TBD*
90.1–100%	0.824	0.39	0.043	*TBD*
St. Andrew Bay Watershed [PH] (EDA Code: [1] G110x) Protective TN Load for the Estuary: [2] 310,322 kg y^{-1} Protective TP Load for the Estuary: [3] TBDK				
Less than 50%	0.824	0.48	0.043	*TBD*
50.1–60.0%	*NR*	*NR*	0.043	*TBD*
60.1–70.0%	*NR*	*NR*	0.043	*TBD*
70.1–80.0%	0.824	0.30	0.043	*TBD*
80.1–90.0%	0.824	0.27	0.043	*TBD*
90.1–100%	0.824	0.24	0.043	*TBD*
Apalachicola Bay Watershed [PH] (EDA Code: [1] G100x) Protective TN Load for the Estuary: [2] 10,971,582 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	0.824	0.91	0.043	*TBD*
50.1–60.0%	*NR*	*NR*	0.043	*TBD*
60.1–70.0%	0.824	0.65	0.043	*TBD*
70.1–80.0%	0.824	0.57	0.043	*TBD*
80.1–90.0%	0.824	0.51	0.043	*TBD*
90.1–100%	0.824	0.46	0.043	*TBD*
Apalachee Bay Watershed [PH] (EDA Code: [1] G090x) Protective TN Load for the Estuary: [2] 2,539,883 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	*NR*	*NR*	0.043	*TBD*
50.1–60.0%	*NR*	*NR*	0.043	*TBD*
60.1–70.0%	*NR*	*NR*	0.043	*TBD*
70.1–80.0%	0.824	0.67	0.043	*TBD*
80.1–90.0%	0.824	0.59	0.043	*TBD*
90.1–100%	0.824	0.53	0.043	*TBD*
Econfina/Steinhatchee Coastal Drainage Area [PH] (CDA Code: [1] G086x) Protective TN Load for the Estuary: [2] 185,301 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	*NR*	*NR*	0.043	*TBD*
50.1–60.0%	*NR*	*NR*	0.043	*TBD*
60.1–70.0%	*NR*	*NR*	0.043	*TBD*
70.1–80.0%	*NR*	*NR*	0.043	*TBD*
80.1–90.0%	0.824	0.41	0.043	*TBD*
90.1–100%	0.824	0.37	0.043	*TBD*
Suwannee River Watershed [NC] (EDA Code: [1] G080x) Protective TN Load for the Estuary: [2] 5,421,050 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	*NR*	*NR*	0.359	*TBD*
50.1–60.0%	*NR*	*NR*	0.359	*TBD*
60.1–70.0%	1.479	0.78	0.359	*TBD*

River/stream reach category—percent delivered to estuary [4]	(mg L⁻¹)		TP (mg L⁻¹)	
	TN IPV [5]	TN DPV [6]	TP IPV [7]	TP DPV [8]
70.1–80.0%	1.479	0.69	0.359	*TBD*
80.1–90.0%	1.479	0.61	0.359	*TBD*
90.1–100%	1.479	0.55	0.359	*TBD*
Waccasassa Coastal Drainage Area [PN] (CDA Code: [1] 078x) Protective TN Load for the Estuary: [2] 433,756 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	*NR*	*NR*	0.107	*TBD*
50.1–60.0%	*NR*	*NR*	0.107	*TBD*
60.1–70.0%	*NR*	*NR*	0.107	*TBD*
70.1–80.0%	*NR*	*NR*	0.107	*TBD*
80.1–90.0%	1.205	0.45	0.107	*TBD*
90.1–100%	1.205	0.40	0.107	*TBD*
Withlacoochee Coastal Drainage Area [PN] (CDA Code: [1] G076x) Protective TN Load for the Estuary: [2] TBD Protective TP Load for the Estuary: [3] TBD				
Less than 50%	1.205	*TBD*	0.107	*TBD*
50.1–60.0%	1.205	*TBD*	0.107	*TBD*
60.1–70.0%	1.205	*TBD*	0.107	*TBD*
70.1–80.0%	1.205	*TBD*	0.107	*TBD*
80.1–90.0%	1.205	*TBD*	0.107	*TBD*
90.1–100%	1.205	*TBD*	0.107	*TBD*
Crystal/Pithlachascotee Coastal Drainage Area [PN] (CDA Code: [1] G074x) Protective TN Load for the Estuary: [2] TBD Protective TP Load for the Estuary: [3] TBD				
Less than 50%	1.205	*TBD*	0.107	*TBD*
50.1–60.0%	*NR*	*TBD*	0.107	*TBD*
60.1–70.0%	*NR*	*TBD*	0.107	*TBD*
70.1–80.0%	*NR*	*TBD*	0.107	*TBD*
80.1–90.0%	1.205	*TBD*	0.107	*TBD*
90.1–100%	1.205	*TBD*	0.107	*TBD*
Tampa Bay Watershed [BV] (EDA Code: [1] G070x) Protective TN Load for the Estuary: [2] 1,289,671 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	1.798	1.11	0.739	*TBD*
50.1–60.0%	1.798	0.93	0.739	*TBD*
60.1–70.0%	1.798	0.80	0.739	*TBD*
70.1–80.0%	1.798	0.70	0.739	*TBD*
80.1–90.0%	1.798	0.62	0.739	*TBD*
90.1–100%	1.798	0.56	0.739	*TBD*
Sarasota Bay Watershed [BV] (EDA Code: [1] G060x) Protective TN Load for the Estuary: [2] 155,576 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	*NR*	*NR*	0.739	*TBD*
50.1–60.0%	*NR*	*NR*	0.739	*TBD*
60.1–70.0%	*NR*	*NR*	0.739	*TBD*
70.1–80.0%	*NR*	*NR*	0.739	*TBD*
80.1–90.0%	*NR*	*NR*	0.739	*TBD*
90.1–100%	1.798	0.54	0.739	*TBD*
Charlotte Harbor Watershed [BV] (EDA Code: [1] G050w) Protective TN Load for the Estuary: [2] 2,710,107 kg y^{-1} Protective TP Load for the Estuary: [3] TBD				
Less than 50%	NR	NR	0.739	*TBD*
50.1–60.0%	1.798	1.58	0.739	*TBD*
60.1–70.0%	1.798	1.35	0.739	*TBD*
70.1–80.0%	1.798	1.18	0.739	*TBD*
80.1–90.0%	1.798	1.05	0.739	*TBD*
90.1–100%	1.798	0.95	0.739	*TBD*

River/stream reach category—percent delivered to estuary [4]	(mg L^{-1})		TP (mg L^{-1})	
	TN IPV [5]	TN DPV [6]	TP IPV [7]	TP DPV [8]
Indian River Watershed [PN] (EDA Code: [1] S190x) **Protective TN Load for the Estuary: [2] 463,724 kg y^{-1}** **Protective TP Load for the Estuary: [3] TBD**				
Less than 50%	*NR*	*NR*	0.107	*TBD*
50.1–60.0%	*NR*	*NR*	0.107	*TBD*
60.1–70.0%	*NR*	*NR*	0.107	*TBD*
70.1–80.0%	1.205	0.87	0.107	*TBD*
80.1–90.0%	1.205	0.77	0.107	*TBD*
90.1–100%	1.205	0.69	0.107	*TBD*
Caloosahatchee River Watershed [PN,#] (EDA Code: [1] G050a) **Protective TN Load for the Estuary:** [2] TBD **Protective TP Load for the Estuary:** [3] TBD				
Less than 50%	1.205	*TBD*	0.107	*TBD*
50.1–60.0%	1.205	*TBD*	0.107	*TBD*
60.1–70.0%	1.205	*TBD*	0.107	*TBD*
70.1–80.0%	1.205	*TBD*	0.107	*TBD*
80.1–90.0%	1.205	*TBD*	0.107	*TBD*
90.1–100%	1.205	*TBD*	0.107	*TBD*
St. Lucie River Watershed [PN,#] **(EDA Code:** [1] S190x) **Protective TN Load for the Estuary: [2] TBD** **Protective TP Load for the Estuary:** [3] TBD				
Less than 50%	1.205	*TBD*	0.107	*TBD*
50.1–60.0%	1.205	*TBD*	0.107	*TBD*
60.1–70.0%	1.205	*TBD*	0.107	*TBD*
70.1–80.0%	1.205	*TBD*	0.107	*TBD*
80.1–90.0%	1.205	*TBD*	0.107	*TBD*
90.1–100%	1.205	*TBD*	0.107	*TBD*
Kissimmee River Watershed [PN,^] **Protective TN Load for the Estuary:** [2] TBD **Protective TP Load for the Estuary:** [3] TBD				
Less than 50%	1.205	*TBD* [9]	0.107	*TBD* [9]
50.1–60.0%	1.205	*TBD* [9]	0.107	*TBD* [9]
60.1–70.0%	1.205	*TBD* [9]	0.107	*TBD* [9]
70.1–80.0%	1.205	*TBD* [9]	0.107	*TBD* [9]
80.1–90.0%	1.205	*TBD* [9]	0.107	*TBD* [9]
90.1–100%	1.205	*TBD* [9]	0.107	*TBD* [9]
St. John's River Watershed; [PN] (EDA Code: [1] S180x) **Protective TN Load for the Estuary:** [2] 4,954,662 kg y^{-1} **Protective TP Load for the Estuary: [3] TBD**				
Less than 50%	1.205	1.41	0.107	*TBD*
50.1–60.0%	1.205	1.17	0.107	*TBD*
60.1–70.0%	1.205	1.00	0.107	*TBD*
70.1–80.0%	1.205	0.88	0.107	*TBD*
80.1–90.0%	1.205	0.78	0.107	*TBD*
90.1–100%	1.205	0.70	0.107	*TBD*
Daytona/St. Augustine Coastal Drainage Area [PN] (CDA Code: [1] S183x) **Protective TN Load for the Estuary:** [2] TBD **Protective TP Load for the Estuary:** [3] TBD				
Less than 50%	*NR*	*TBD*	0.107	*TBD*
50.1–60.0%	*NR*	*TBD*	0.107	*TBD*
60.1–70.0%	*NR*	*TBD*	0.107	*TBD*
70.1–80.0%	*NR*	*TBD*	0.107	*TBD*
80.1–90.0%	1.205	*TBD*	0.107	*TBD*
90.1–100%	1.205	*TBD*	0.107	*TBD*
Nassau Coastal Drainage Area [PN] (CDA Code: [1] S175x) **Protective TN Load for the Estuary:** [2] 131,389 kg y^{-1} **Protective TP Load for the Estuary:** [3] TBD				
Less than 50%	1.205	0.59	0.107	*TBD*
50.1–60.0%	*NR*	*NR*	0.107	*TBD*
60.1–70.0%	*NR*	*NR*	0.107	*TBD*

River/stream reach category—percent delivered to estuary [4]	(mg L^{-1})		TP (mg L^{-1})	
	TN IPV [5]	TN DPV [6]	TP IPV [7]	TP DPV [8]
70.1–80.0%	*NR*	*NR*	0.107	*TBD*
80.1–90.0%	1.205	0.33	0.107	*TBD*
90.1–100%	1.205	0.30	0.107	*TBD*
St. Mary's River Watershed [PN] (EDA Code: [1] S170x) **Protective TN Load for the Estuary:** [2] 562,644 kg y^{-1} **Protective TP Load for the Estuary:** [3] TBD				
Less than 50%	*NR*	*NR*	0.107	*TBD*
50.1–60.0%	*NR*	*NR*	0.107	*TBD*
60.1–70.0%	*NR*	*NR*	0.107	*TBD*
70.1–80.0%	1.205	0.43	0.107	*TBD*
80.1–90.0%	1.205	0.38	0.107	*TBD*
90.1–100%	1.205	0.34	0.107	*TBD*

Footnotes associated with this table:

[1] Watershed delineated by NOAA's Coastal Assessment Framework and associated Florida Department of Environmental Protection's estuarine and coastal water body identifier (WBID).

[2] Estimated TN load delivered to the estuary protective of aquatic life use. These estimates may be revised pursuant to the EPA final rule for numeric nutrient criteria for Florida's estuaries and coastal waters (October 2011).

[3] Estimated TP load delivered to the estuary protective of aquatic life use. These estimates are currently under development. Preliminary estimates may be revised pursuant to the EPA final rule for numeric nutrient criteria for Florida's estuaries and coastal waters (October 2011).

[4] River/Stream reach categories within each estuarine watershed are linked spatially to a specific FDEP water body identifier (WBID). See Appendix B–18 of the "Technical Support Document for EPA's Proposed Rule for Numeric Nutrient Criteria for Florida's Inland Surface Fresh Waters."

[5] Instream Protection Value (IPV) is the TN concentration protective of instream aquatic life use.

[6] Downstream protection values (DPVs) are estimated TN concentrations in the river/stream reach that meet the estimated TN load, protective of aquatic life use, delivered to the estuarine waters. These estimates may be revised pursuant to the EPA final rule for numeric nutrient criteria for Florida's estuaries and coastal waters (October 2011).

[7] Instream Protection Value (IPV) is the TP concentration protective of instream aquatic life use.

[8] Downstream protection values (DPVs) are estimated TP concentrations in the river/stream reach that meet the estimated TP load, protective of aquatic life use, delivered to the estuarine waters. These estimates are currently under development. Preliminary estimates may be revised pursuant to the EPA final rule for numeric nutrient criteria for Florida's estuaries and coastal waters (October 2011).

[9] EPA's proposed TN and TP criteria for colored lakes (>40 PCU) are 1.2 and 0.050 mg L^{-1}, respectively.

Estimated TN and TP loads protective of aquatic life in the Caloosahatchee and St. Lucie River estuaries, and in turn estimated TN and TP concentrations that would meet those protective loads, could not be calculated using EPA's downstream protection approach. An alternative downstream protection approach will be proposed in EPA's proposed rule for FL estuaries (January 2011).

^ Kissimmee River watershed does not have an EDA or CDA code because it does not drain directly to an estuary or coastal area, but rather indirectly through Lake Okeechobee and the south Florida canal system.

A protective TN and TP load for Lake Okeechobee has not been calculated, however, a TMDL is in effect for TP. EPA's proposed colored lake criteria (> 40 PCU) could be used to develop DPVs for TN and TP for the Kissimmee watershed (see footnote 9).

[LO] DPVs to be based on protective TN and TP loads for Lake Okeechobee. EPA's proposed colored lake criteria (>40 PCU) could be used to develop DPVs for TN and TP for the Kissimmee watershed (see footnote 9).

[NR] There are no stream reaches present in this watershed that have a percent-delivered within this range and thus criteria are not applicable.

[PH] Panhandle Nutrient Watershed Region.

[BV] Bone Valley Nutrient Watershed Region.

[PN] Peninsula Nutrient Watershed Region.

[NC] North Central Nutrient Watershed Region.

[TBD] To be determined.

(v) Application of DPVs for Downstream Estuary Protection

The following discussion further explains the conceptual relationship between IPVs and DPVs for stream criteria. EPA developed IPVs to protect the uses that occur within the stream itself at the point of application, such as protection of the benthic invertebrate community and maintenance of a healthy balance of phytoplankton species. In contrast, EPA developed DPVs for streams to protect WQS of downstream waters. EPA derived DPVs in Florida streams by distributing the protective load from the aggregate stream network identified for each downstream estuary (that is protective of estuarine conditions) across the watershed in proportion to the amount of flow contributed by each stream reach. EPA's approach also accounts for attenuation of nutrients (or loss from the system) as water travels from locations upstream in the watershed to locations near the mouth of the estuary.

When comparing an IPV and DPV that are each deemed to apply to a particular stream segment, the more stringent of the two values is the numeric nutrient criterion that would need to be met when implementing CWA programs. Water bodies can differ significantly in their sensitivity to nutrients in general and to TN specifically. Although not universally true, freshwaters are generally phosphorus-limited and thus more sensitive to phosphorus enrichment because nitrogen is present in excess. Enriching freshwaters with phosphorus does not usually drive these systems into nitrogen limitation but can simply encourage growth of nitrogen-fixing algal species which can convert atmospheric nitrogen into ammonia. Conversely, estuaries are more often nitrogen limited and thus more sensitive to adverse impacts from nitrogen enrichment. As a result, it is not at all surprising that DPVs for TN in Florida are often less than the corresponding IPVs.

Adjustments to DPVs are possible with a redistribution approach, which revises the original uniform assignment of protective downstream estuarine loadings across the estuarine drainage area using the DPV methodology, or by revising either the protective load delivered to the downstream estuary and/or the equivalent DPVs using a technical approach of comparable scientific rigor and the Federal SSAC procedure described in section V.C of this notice.

Re-distributing the allocation of protective loading within an estuarine drainage area, or subset of an estuarine drainage area, is appropriate and protective because the total load delivered to the mouth of the estuary would still meet the protective load. DPVs may be a series of values for each reach in the upstream drainage area such that the sum of reach-specific incremental loading delivered to the estuary equals the protective loading rate taking into account that downstream reaches must reflect loads established for upstream reaches. Adjustments to DPVs may also factor in additional nutrient attenuation provided by already existing landscape modifications or treatment systems, such as constructed wetlands or stormwater treatment areas, where the attenuation is sufficiently documented and not a temporary condition. Unlike re-allocation of an even distribution of loading, these types of adjustments, as well as other site-specific information on alternative fractions delivered, would require use of the SSAC procedure under this proposal. EPA requests comment on whether these adjustments should be allowed to occur in the implementation of the re-allocation process rather than as a SSAC.

A technical approach of comparable scientific rigor will include a systematic data driven evaluation and accompanying analysis of relevant factors to identify a protective load delivered to the estuary. An acceptable alternate numeric approach also includes a method to distribute and apply the load to streams and other waters within the estuarine drainage area in a manner that recognizes conservation of mass and makes use of a peer-reviewed model (empirical or mechanistic) of comparable or greater rigor and scientific defensibility than the USGS SPARROW model. To use an alternative technical approach, the State must go through the process for a Federal SSAC procedure as described in Section V.C.

EPA requests comment on the DPV approach, the technical merit of the estimated protective loadings, and the technical merit of the method for calculating stream reach values. EPA also requests comment on other scientifically defensible approaches for ensuring protection of designated uses in estuaries. At this time, EPA plans to take final action with respect to downstream protection values for nitrogen as part of the second phase of this rulemaking process in coordination with the proposal and finalization of numeric standards for estuarine and coastal waters in 2011. However, if comments, data and analyses submitted as a result of this proposal support finalizing these values sooner, by October 2010, EPA may choose to proceed in this manner. To facilitate this process, EPA requests comments and welcomes thorough evaluation on the technical and scientific basis of these proposed downstream protection values as part of the broader comment and evaluation process that this proposal initiates.

D. Proposed Numeric Nutrient Criteria for the State of Florida's Springs and Clear Streams

(1) Proposed Numeric Nutrient Criteria for Springs and Clear Streams

Springs and their associated spring runs in Florida are a unique class of aquatic ecosystem, highly treasured for their biological, economic, aesthetic, and recreational value. Globally, the largest number of springs (per unit of area), occur in Florida; Florida has over 700 springs and associated spring runs. Many of the larger spring ecosystems in Florida have likely been in existence since the end of the last major ice age (approximately 15,000 to 30,000 years ago). The productivity of the diverse assemblage of aquatic flora and fauna in Florida springs is primarily determined by the naturally high amount of light availability of these waters (naturally high clarity).[87] As recently as 50 years ago, these waters were considered by naturalists and scientists to be some of the most unique and exceptional waters in the State of Florida and the Nation as a whole.

In Florida, springs are also highly valued as a water resource for human use: people use springs for a variety of recreational purposes and are interested in the intrinsic aesthetics of clear, cool water emanating vigorously from beneath the ground. A good example of the value of springs in Florida is the use of the spring boil areas that have sometimes been modified to encourage human recreation (bathing or swimming).[88]

Over the past two decades, scientists have identified two significant anthropogenic factors linked to adverse changes in spring ecosystems that have the potential to permanently alter Florida's spring ecosystems. These are: (1) Pollution of groundwater,[89] principally with nitrate-nitrite, resulting from human land use changes, cultural practices, and explosive population growth; and (2) simultaneous reductions in groundwater supply from human withdrawals.[90] Pollution associated with human activities is one of the most critical issues affecting the health of Florida's springs.[91]

Excess nutrients, in particular excess nitrogen, seep into the soils and move to groundwater.[92] When in excess, nutrients lead to eutrophication of groundwater-fed springs, allowing algae and invasive plant species to displace native plants, which in turn results in an ecological imbalance.[93] Excessive growth of nuisance algae and noxious plant species in turn result in reduced habitat and food sources for native wildlife,[94] excess organic carbon production, accelerated decomposition, and lowered quality of the floor or "bottom" of springs and spring runs, all of which adversely impact the overall health and aesthetics of Florida's springs.

Adverse impacts on the overall health of Florida's springs have been evident over the past several decades. Within the last 20–30 years, observations at

[87] Brown M.T., K. Chinners Reiss, M.J. Cohen, J.M. Evans, P.W. Inglett, K. Sharma Inglett, K. Ramesh Reddy, T.K. Fraze, C.A. Jacoby, E.J. Phlips, R.L. Knight, S.K. Notestein, R.G. Hamann, and K.A. McKee. 2008. Summary and Synthesis of the Available Literature on the Effects of Nutrients on Spring Organisms and Systems. *http://www.dep.state.fl.us/springs/reports/files/UF_SpringsNutrients_Report.pdf,* University of Florida, Gainesville, Florida.

[88] Scott, T.M., G.H. Means, R.P. Meegan, R.C. Means, S.B. Upchurch, R.E. Copeland, J. Jones, T. Roberts, and A. Willet. 2004. Springs of Florida. Bulletin No, 66. Florida Geological Survey. Tallahassee, FL. 677 pp.

[89] Katz, B.G., H.D. Hornsby, J.F. Bohlke and M.F. Mokray. 1999. Sources and chronology of nitrate contamination in spring water, Suwannee River Basin, Florida. U.S. Geological Survey Water-Resources Investigations Report 99–4252. Reston, VA.

[90] Brown M.T., K. Chinners Reiss, M.J. Cohen, J.M. Evans, P.W. Inglett, K. Sharma Inglett, K. Ramesh Reddy, T.K. Fraze, C.A. Jacoby, E.J. Phlips, R.L. Knight, S.K. Notestein, R.G. Hamann, and K.A. McKee. 2008. Summary and Synthesis of the Available Literature on the Effects of Nutrients on Spring Organisms and Systems. *http://www.dep.state.fl.us/springs/reports/files/UF_SpringsNutrients_Report.pdf,* University of Florida, Gainesville, Florida.

[91] Ibid.

[92] Katz, B.G., H.D. Hornsby, J.F. Bohlke and M.F. Mokray. 1999. Sources and chronology of nitrate contamination in spring water, Suwannee River Basin, Florida. U.S. Geological Survey Water-Resources Investigations Report 99–4252. Reston, VA.

[93] Doyle, R.D. and R.M. Smart. 1998. Competitive reduction of noxious *Lyngbya wollei* mats by rooted aquatic plants. Aquatic Botany 61:17–32.

[94] Stevenson, R.J., A. Pinowska, A. Albertin, and J.O. Sickman. 2007. Ecological condition of algae and nutrients in Florida springs: The Synthesis Report. Prepared for the Florida Department of Environmental Protection. Tallahassee, FL. 58 pp.

Bonn, M.A. and F.W. Bell. 2003. Economic Impact of Selected Florida Springs on Surrounding Local Areas. Report prepared for the Florida Department of Environmental Protection. Tallahassee, FL.

several of Florida's springs suggest that nuisance algae species have proliferated, and are now out-competing and replacing native submerged vegetation. Numerous biological studies have documented excessive algal growth at many major springs. In some of the more extreme examples, such as Silver Springs and Weeki Wachee Springs, algal mat accumulations have become over three feet thick.[95,96]

As a result of human-induced land use changes, cultural practices, and explosive population growth, there has been an increase in the level of pollutants, especially nitrate, in groundwater over the past decades.[97] Because there is no geologic source of nitrogen in springs, all of the nitrogen emerging in spring vents originates from that which is deposited on the land. Historically, nitrate concentrations in Florida's spring discharges were thought to have been around 0.05 mg/L or less, which is sufficiently low to restrict growth of algae and vegetation under "natural" conditions.[98]

Regions where springs emanate in Florida have experienced unprecedented population growth and changes in land use over the past several decades.[99] With these changes in population and growth came a transfer of nutrients, particularly nitrate, to groundwater. Of 125 spring vents sampled by the Florida Geological Survey in 2001–2002, 42% had nitrate concentrations exceeding 0.50 mg/L and 24% had concentrations greater than 1.0 mg/L.[100] Similarly, a recent evaluation of water quality in 13 springs shows that mean nitrate-nitrite levels have increased from 0.05 mg/L to 0.9 mg/L between 1970 and 2002. Overall, data suggest that nitrate-nitrite concentrations in many spring discharges have increased from 10 to 350 fold over the past 50 years, with the level of increase closely correlated with anthropogenic activity and land use changes within the karst regions of Florida where springs predominate.

As nitrate-nitrite concentrations have increased during the past 20 to 50 years, many Florida springs have undergone adverse environmental and biological changes. According to FDEP, there is a general consensus in the scientific community that nitrate is an important factor leading to the observed changes in spring ecosystems, and their associated biological communities. Nitrogen, particularly nitrate-nitrite, appears to be the most problematic nutrient problem in Florida's karst region.[101]

Because nitrate-nitrite has been linked to many of the observed detrimental impacts in spring ecosystems, there is an immediate need to reduce nitrate-nitrite concentrations in spring vents and groundwater. A critical step in achieving reductions in nitrate-nitrite is to develop a numeric nitrate-nitrite criterion for spring systems that will be protective of these unique and treasured resources.[102]

To protect springs and clear streams and to provide assessment levels and restoration goals for those that have already been impaired by nutrients, EPA is proposing numeric nutrient criteria for the following parameter for Florida's springs and clear streams (< 40 PCU) classified as Class I or III waters under Florida law (Rule 62–302.400, F.A.C.):

> Nitrate (NO_3)+Nitrite (NO_2) shall not surpass a concentration of 0.35 mg/L as an annual geometric mean more than once in a three-year period, nor surpassed as a long-term average of annual geometric mean values.

In addition to the nitrate-nitrite criterion, TN and TP criteria developed for streams on a watershed basis are also applicable to clear streams. *See* Section III.C(1) "Proposed Numeric Nutrient Criteria for the State of Florida's Rivers and Streams" for the table of proposed TN and TP criteria that would apply to clear streams located within specific watersheds.

(2) Methodology for Deriving EPA's Proposed Criteria for Springs and Clear Streams

EPA's proposed nitrate-nitrite criterion for springs and clear streams are derived from a combination of FDEP laboratory data, field surveys, and analyses which include analyses conducted to determine the stressor response-based thresholds that link nitrate-nitrite levels to biological risk in springs and clear streams. These data document the response of nuisance algae, *Lyngbya wollei* and *Vaucheria sp.,* and periphyton to nitrate-nitrite concentrations. Please refer to EPA's TSD for Florida's Inland Waters, Chapter 3: Methodology for Deriving U.S. EPA's Proposed Criteria for Springs and Clear Streams.

As described in Section III.C(2), the ability to establish protective criteria for both causal and response variables depends on available data and scientific approaches to evaluate these data. EPA has not undertaken the development of TP criteria for springs because phosphorus has historically been present in Florida's springs, given the State's naturally phosphorus-rich geology, and the lack of an increasing trend of phosphorus concentrations in most spring discharges. EPA is not proposing chlorophyll *a* and clarity criteria due to the lack of available data for these response variables in spring systems. Furthermore, scientific evidence examining the strong relationship between rapid periphyton survey data (measurements of the thickness of algal biomass attached to substrate rather than free-floating) and nutrients in clear streams (those with color <40 PCU and canopy cover ≤ 40% which are comparable to most waters found in springs and spring runs) show that benthic algal thickness is highly dependent on nitrogen parameters (TN and total inorganic nitrogen), as opposed to phosphorus. In addition,

[95] Pinowska, A., R.J. Stevenson, J.O. Sickman, A. Albertin, and M. Anderson. 2007. Integrated interpretation of survey for determining nutrient thresholds for macroalgae in Florida Springs: Macroalgal relationships to water, sediment and macroalgae nutrients, diatom indicators and land use. Florida Department of Environmental Protection, Tallahassee, FL.

[96] Stevenson, R.J., A. Pinowska, and Y.K. Wang. 2004. Ecological condition of algae and nutrients in Florida springs. Florida Department of Environmental Protection, Tallahassee, FL.

[97] Scott, T.M., G.H. Means, R.P. Meegan, R.C. Means, S.B. Upchurch, R.E. Copeland, J. Jones, T. Roberts, and A. Willet. 2004. Springs of Florida. Bulletin No, 66. Florida Geological Survey. Tallahassee, FL. 677 pp.

[98] Maddox, G.L., J.M. Lloyd, T.M. Scott, S.B. Upchurch and R. Copeland. 1992. Florida's Groundwater Quality Monitoring Program—Background Hydrochemistry. Florida Geological Survey Special Publication 34. Tallahassee, FL.

[99] Katz, B.G., H.D. Hornsby, J.F. Bohlke and M.F. Mokray. 1999. Sources and chronology of nitrate contamination in spring water, Suwannee River Basin, Florida. U. S. Geological Survey Water-Resources Investigations Report 99–4252. Reston, VA.

Brown M.T., K. Chinners Reiss, M.J. Cohen, J.M. Evans, P.W. Inglett, K. Sharma Inglett, K. Ramesh Reddy, T.K. Fraze, C.A. Jacoby, E.J. Phlips, R.L. Knight, S.K. Notestein, R.G. Hamann, and K.A. McKee. 2008. Summary and Synthesis of the Available Literature on the Effects of Nutrients on Spring Organisms and Systems. *http://www.dep.state.fl.us/springs/reports/files/UF_SpringsNutrients_Report.pdf,* University of Florida, Gainesville, Florida.

[100] Scott, T.M., G.H. Means, R.P. Meegan, R.C. Means, S.B. Upchurch, R.E. Copeland, J. Jones, T. Roberts, and A. Willet. 2004. Springs of Florida. Bulletin No, 66. Florida Geological Survey. Tallahassee, FL. 677 pp.

[101] Brown M.T., K. Chinners Reiss, M.J. Cohen, J.M. Evans, P.W. Inglett, K. Sharma Inglett, K. Ramesh Reddy, T.K. Fraze, C.A. Jacoby, E.J. Phlips, R.L. Knight, S.K. Notestein, R.G. Hamann, and K.A. McKee. 2008. Summary and Synthesis of the Available Literature on the Effects of Nutrients on Spring Organisms and Systems. *http://www.dep.state.fl.us/springs/reports/files/UF_SpringsNutrients_Report.pdf,* University of Florida, Gainesville, Florida.

[102] Brown M.T., K. Chinners Reiss, M.J. Cohen, J.M. Evans, P.W. Inglett, K. Sharma Inglett, K. Ramesh Reddy, T.K. Fraze, C.A. Jacoby, E.J. Phlips, R.L. Knight, S.K. Notestein, R.G. Hamann, and K.A. McKee. 2008. Summary and Synthesis of the Available Literature on the Effects of Nutrients on Spring Organisms and Systems. *http://www.dep.state.fl.us/springs/reports/files/UF_SpringsNutrients_Report.pdf,* University of Florida, Gainesville, Florida.

EPA is proposing to apply the nitrate-nitrite criteria derived for springs to clear streams as a measure to gauge anthropogenic contributions to TN. EPA is not currently proposing criteria for clarity and chlorophyll *a* for clear streams due to the lack of scientific evidence supporting the relationship between these response variables and nutrients. Clear streams show weak relationships between nutrients and chlorophyll *a,* as opposed to color streams where phytoplankton responses occur more readily than periphyton growth. Please refer to EPA's TSD for Florida's Inland Waters, Chapter 3: Methodology for Deriving U.S. EPA's Proposed Criteria for Springs and Clear Streams.

(a) Derivation of Proposed Nitrate-Nitrite Criteria

EPA's goal in deriving nitrate-nitrite criteria for Florida springs and clear streams is to ensure that the criteria will preserve the ecosystem structure and function of Florida's springs and clear streams. EPA reviewed Florida data, FDEP's approach and analyses, and FDEP's proposed nitrate-nitrite criterion for springs and clear streams and has concluded that the FDEP approach and the values FDEP derived represent a scientifically sound basis for the derivation of these criteria. FDEP evaluated results from laboratory scale dosing studies, data from in-situ algal monitoring, real-world surveys of biological communities and nutrient levels in Florida springs, and data on nitrate-nitrite concentrations found in minimally-impacted reference locations.

FDEP analyzed laboratory data[103] that evaluated the growth response of nuisance algae to nitrate addition. FDEP's analysis showed that *Lyngbya wollei* and *Vaucheria sp.* reached 90% of their maximum growth at 0.230 mg/L and 0.261 mg/L nitrate-nitrite, respectively. FDEP also reviewed long-term field surveys that examined the response of nuisance algae, periphyton, and eutrophic indicator diatoms to nitrate-nitrite concentration.[104] The results showed a sharp increase in abundance and/or biomass of the nuisance algae, periphyton, and diatoms at 0.44 mg/L nitrate-nitrite.

FDED also reviewed the field surveys used to develop TMDLs for Wekiva River and Rock Spring Run to evaluate the relationship between the observed excessive algal growth and imbalance in aquatic flora with measurements of nutrients in these particular systems. FDEP found that taxa indicative of eutrophic conditions increased significantly with increasing nitrate-nitrite concentrations above approximately 0.35 mg/L.

Based on its review of a combination of this laboratory and field data, FDEP concluded that significant alterations in community composition (eutrophic indicator diatoms), in combination with an increase in periphyton cell density and biomass, clearly demonstrate that a nitrate-nitrite level in the range between 0.23 mg/L (the laboratory threshold) and 0.44 mg/L (the field study derived value associated with the upper bound nitrate-nitrite concentration where substantial observed biological changes were apparent) is the amount of nitrate-nitrite associated with an imbalance of aquatic flora in spring systems.[105]

FDEP conducted further statistical analyses of the available data from the multiple lines of evidence, applied an appropriate safety factor to ensure that waters would not reach the nitrate-nitrite levels associated with "substantial observed biological changes," and averaged the results to arrive at a final protective threshold value for nitrate-nitrite in springs and clear streams of 0.35 mg/L. Based on the discussion above and corresponding analysis in the TSD for Florida's Inland Waters, EPA has concluded that this value was derived in a scientifically sound manner, appropriately considering the available data, and appropriately interpreting the multiple lines of evidence. Accordingly, EPA is proposing 0.35 mg/L nitrate-nitrite as a protective criterion for aquatic life in Florida's springs and clear streams.

(b) Proposed Criteria: Duration and Frequency

EPA is proposing a duration and frequency expression of an annual geometric mean not to be surpassed more than once in a three-year period to be consistent with the expressions of duration and frequency for other water body types (*e.g.,* lakes, streams, canals) for TN and TP and for the same reasons EPA selected a three-year period for those waters. Second, EPA proposes that the long-term arithmetic average of annual geometric means not exceed the criterion-magnitude concentration. EPA anticipates that Florida will use its standard assessment periods as specified in Rule 62–303, F.A.C. (Impaired Waters Rule) to implement this second provision. EPA has determined that this frequency of excursions should not result in unacceptable effects on aquatic life as it will allow the springs and clear streams aquatic systems enough time to recover from an occasionally elevated year of nutrient loadings. The Agency requests comment on these proposed duration and frequency expressions of the springs and clear streams numeric nutrient criteria.

EPA also considered as an alternative, expressing the criterion as a monthly median not to be surpassed more than 10% of the time. Stated another way, the median value over any given calendar month shall not be higher than the criterion-magnitude value in more than one out of every ten months. It is appropriate to express a monthly criterion as a median because the median is less susceptible to outliers than the geometric mean. This is particularly important when dealing with small sample sizes. This alternative is consistent with the expression that FDEP proposed in July 2009 for its State rule and the expression in the TSD for Florida's Inland Waters that EPA sent out for external scientific peer review in July 2009. The rationale for this alternative is that field data indicate that the response in springs is correlated to monthly exposure at the criterion-magnitude concentration value and a 10% frequency of excursions is a reasonable and fully protective allowance given small sample sizes in any given month (*i.e.,* the anticipated amount of data that will be available for assessment purposes in the future). The clear streams nitrate-nitrite criterion was derived by FDEP based on multiple lines of evidence, with the primary lines of evidence being mesocosm dosing experiments and field studies. These two main studies were conducted by FDEP over very different time frames. One set of mesocosm studies was conducted by FDEP for periods just under one month (*i.e.,* 21 to 28 days), while another, the algal biomass field survey, was conducted over an 18-year period and was analyzed using four to five year averaging periods.[106] While lab

[103] Stevenson, R.J., A. Pinowska, A. Albertin, and J.O. Sickman. 2007. Ecological condition of algae and nutrients in Florida springs: The Synthesis Report. Prepared for the Florida Department of Environmental Protection. Tallahassee, FL. 58 pp.

Cowell, B.C. and C.J. Dawes. 2004. Growth and nitrate-nitrogen uptake by the cyanobacterium *Lyngbya wollei.* J. *Aquatic Plant Management* 42: 69–71.

[104] Gao, X. 2008. Nutrient TMDLs for the Wekiva River (WBIDs 2956, 2956A, and 2956C) and Rock Springs Run (WBID 2967). Florida Department of Environmental Protection, Tallahassee, Florida.

[105] Mattson, R.A., E.F. Lowe, C.L. Lippincott, D. Jian, and L. Battoe. 2006. Wekiva River and Rock Springs Run Pollutant Load Reduction Goals. St. Johns River Water Management District, Palatka, Florida.

[106] Gao, X. 2008. Nutrient TMDLs for the Wekiva River (WBIDs 2956, 2956A, 2956C) and Rock

studies indicate that algal communities can respond to excess nitrate-nitrite over a short period of time, the mesocosm and other dosing studies indicate that this response occurs on the order of a month, which might support a monthly expression of the criterion.[107] However, there is no evidence to suggest that the responses observed within a month under controlled lab settings equate to impairment of the designated use in conditions experienced in State waters. Please refer to EPA's TSD for Florida's Inland Waters, Chapter 3: Methodology for Deriving U.S. EPA's Proposed Criteria for Springs and Clear Streams.

The 10% excursion frequency would recognize that in most cases the monthly "median" would actually be based on a single sample, given that most springs are only sampled monthly at the most. A 10% excursion frequency may be considered a reasonable and fully protective allowance given small sample sizes in any given month, essentially requiring that the monthly median nitrate-nitrate concentrations thought to be fully supportive of relevant designated uses be met 90% of the time.

EPA requests comment on these proposed criteria duration and frequency expressions, and the basis for their derivation. EPA notes that some scientists and resource managers have suggested that nutrient criteria duration and frequency expressions should be more restrictive to avoid seasonal or annual "spikes" from which the aquatic system cannot easily recover, whereas others have suggested that criteria expressed as simply a long-term average of annual geometric means, consistent with data used in criteria derivation, would still be protective. EPA requests comment on alternative duration and frequency expressions that might be considered protective, including (1) a criterion-duration expressed as a monthly average or geometric mean, (2) a criterion-frequency expressed as meeting allowable magnitude and duration every year, (3) a criterion-frequency expressed as meeting allowable magnitude and duration in more than half the years of a given assessment period, and (4) a criterion-frequency expressed as meeting the allowable magnitude and duration as a long-term average only. EPA further requests comment on whether an expression of the criteria in terms of an arithmetic average of annual geometric mean values based on rolling three-year periods of time would also be protective of the designated use.

(3) Request for Comment and Data on Proposed Approach

EPA believes the proposed nutrient criterion for springs and clear streams in this rule are protective of the designated aquatic life use of these waters in Florida. EPA is soliciting comment on the approach FDEP used and EPA adopted to derive nitrate-nitrite criterion for springs and clear streams, including the data and analyses underlying the proposed criterion. EPA is seeking additional, readily-available, pertinent data and information related to nutrient concentrations or nutrient responses in springs and clear streams in Florida. EPA is also soliciting views on other potential, scientifically sound approaches to deriving protective nitrate-nitrite criterion for springs and clear streams in Florida.

(4) Alternative Approaches: Nitrate-Nitrite Criterion for All Waters as an Independent Criterion

EPA is soliciting comment on the environmental benefits associated with deriving a nitrate-nitrite criterion for all waters covered by this proposal (*i.e.,* all streams, lakes, and canals), in addition to the other proposed nutrient criteria for those water bodies. Adoption of a nitrate-nitrite criterion for waters other than springs and clear streams could be useful from an assessment and management perspective. Florida could use nitrate-nitrite data to identify increasing trends that may indicate the need for more specific controls of certain nitrogen enrichment sources. In cases where waters are impaired for either TN, nitrate-nitrite, or both TN and nitrate-nitrite, FDEP could use the nitrate-nitrite data to potentially target discharges of anthropogenic origin given their relative source contribution to nitrogen enrichment.

This alternative approach, which would involve EPA deriving nitrate-nitrite criteria for all waters or alternatively applying 0.35 mg/L nitrate-nitrite to all waters, could provide additional protection for aquatic life designated uses. The alternative approach would also eliminate the need for FDEP to characterize streams as clear or not. Deriving and applying a nitrate-nitrite criterion to all waters would reduce the likelihood of excess loading of the specific anthropogenic components of TN to colored waters. However, these colored streams may be less likely to show an observed response to nitrate-nitrite due to the presence of tannins that block light penetration. Thus, the presence of color in streams may confound the relationship that produced the 0.35 mg/L nitrate-nitrite criterion.

E. Proposed Numeric Nutrient Criteria for South Florida Canals

(1) Proposed Numeric Nutrient Criteria for South Florida Canals

There are thousands of miles of canals in Florida, particularly in the southeastern part of the State. Canals are artificial waterways that are either the result of modifications to existing rivers or streams, or waters that have been created for various purposes, including drainage and flood control (stormwater management), irrigation, navigation, and recreation. These canals also allow for the creation of many waterfront home sites in Florida. Ecosystems that existed in rivers and streams prior to their modification into canals are altered. These changes can affect fish and wildlife and plant growth, as further explained in the following paragraphs. Newly created canals may have a tendency to fill with aquatic plants. Canals in south Florida vary greatly in size and depth. They can be anywhere from a few feet wide and a few feet deep to hundreds of feet wide and as deep as 30–35 feet.

South Florida canals vary in their hydrology and behavior due to their size, function, and seasonality. Shallow canals with slow water flow have poor turnover of water and little flushing. Large canals also may have low flow and turnover during the dry season. In contrast, during the wet season these same large canals are flowing systems that quickly move large volumes of water, as they were designed to accomplish. Excess nutrients in canals in combination with poor water circulation and decreased levels of dissolved oxygen, can lead to accelerated eutrophication and adverse impacts on other forms of aquatic life such as fish and other aquatic animals. In these canals, the accumulation of decaying organic matter on the canal bottom can also adversely impact healthy aquatic ecosystems.

South Florida canals are highly managed waterways. Some canals are prone to an over-abundance of aquatic plants. Without regular and frequent management, dense vegetation can clog the waterways making navigation difficult and slowing the movement of water through the canal system. This can interfere with flood control, boating, and fishing. Aquatic plants (like plants in the terrestrial environment) respond

Springs Run (WBID 2967). Florida Department of Environmental Protection, Tallahassee, Florida.

[107] Stevenson, R.J., A. Pinowska, A. Albertin, and J.O. Sickman. 2007. Ecological condition of algae and nutrients in Florida springs: The Synthesis Report. Prepared for the Florida Department of Environmental Protection. Tallahassee, FL. 58 pp.

and grow when fertilized with nutrients such as phosphorus and nitrogen, and thus nutrient runoff into canals is likely a significant contributor to both nuisance algal blooms and clogging of canal systems by aquatic plants.

EPA is proposing numeric nutrient criteria for the following parameters and geographic classifications in south Florida, for canals classified as Class III waters under Florida law (Rule 62–302.400, F.A.C.). The proposed and alternative approaches described herein would not apply for TP in canals within the Everglades Protection Area (EvPA) since there is an existing TP criterion of 0.010 mg/L that currently applies to the marshes and adjacent canals within the EvPA (Rule 62–302.540, F.A.C.).

	Chlorophyll *a* (µg/L) [a]	Total phosphorus (TP) (mg/L) [a b]	Total nitrogen (TN) (mg/L) [a]
Canals	4.0	0.042	1.6

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

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

The following sections detail the methodology EPA used to develop the proposed numeric nutrient criteria for canals in south Florida, and request comment on the proposed criteria and their derivation. In addition, EPA is providing details of two alternative options for deriving canal criteria values that EPA considered and is soliciting comments on these alternatives.

(2) Methodology for Deriving EPA's Proposed Criteria for South Florida Canals

Based on the available information for canals, EPA determined that the most scientifically sound way to derive protective numeric nutrient criteria for south Florida's canals is to use a similar approach to what EPA used to derive numeric nutrient criteria for streams. That is, EPA chose a nutrient concentration distribution-based approach using data from only those canals that have been determined to support the applicable designated use. EPA used existing water quality assessments and identified canals that have been determined to be impaired for nutrients. Data for those canals were excluded from the larger data set in order to create a set of data representing canals attaining the designated use of aquatic life, according to FDEP's assessment decisions. For further information, please refer to EPA's TSD for Florida's Inland Waters, Chapter 4: Methodology for Deriving U.S. EPA's Proposed Criteria for Canals.

(a) Derivation of Proposed Numeric Nutrient Criteria for South Florida Canals

EPA derived numeric nutrient criteria for south Florida canals for two causal variables, TN and TP, and one response variable, chlorophyll *a.* In contrast to EPA's proposed criteria for Florida's streams, EPA concluded that there was a sufficient scientific basis for a chlorophyll *a* criterion for south Florida canals. EPA considered chlorophyll *a* to be an appropriate indicator of nutrient impairment in canals on the basis of the observed seasonal flow regimes, particularly during the relatively drier winter months when flows are relatively lower and canal water residence time is relatively higher (as compared to wetter, summer months). Furthermore, EPA found evidence that canals are susceptible to impairment due to excessive chlorophyll *a* based on the number of canals on Florida's CWA section 303(d) list with chlorophyll *a* cited as the parameter of concern. EPA analyzed the range of chlorophyll *a* concentrations in canals and found that 12% of chlorophyll *a* concentration observations occurred at 10 µg/L or higher and 5% of chlorophyll *a* concentration observations occurred at 20 µg/L or higher. As a point of reference, Florida has chlorophyll *a* thresholds of 20 as the numeric interpretations of its narrative nutrient criteria for streams and 11 µg/L for estuaries/open coastal waters, respectively, in its Impaired Waters Rule (IWR) (Rules 62–303.351 and 62–303.353, F.A.C.). Thus, EPA included chlorophyll *a* as a nutrient criterion to protect canal aquatic life designated uses from an unacceptable biological response to excess nutrients.

EPA employed a statistical distribution approach for deriving numeric nutrient criteria for south Florida canals. Specifically, EPA computed statistical distributions and descriptive statistics (*e.g.,* quartiles, mean, standard deviation) of TN, TP, and chlorophyll *a* concentrations from data derived at canal sites across south Florida that are not on the impaired waters list for Florida. EPA has determined that the criteria derived from a distribution of canal data from canals with no evidence of nutrient impairment are appropriate and protective of designated uses.

As described in detail in Section III.C(2)(c), EPA concluded that the 75th percentiles of the respective TN, TP, and chlorophyll *a* distributions would yield values that would ensure that aquatic life designated uses would be protected in south Florida canals. A reasonable choice is one that lies just above the vast majority of the population. The 75th percentile represents such a point on the distribution of TN, TP, and chlorophyll *a* values.

(b) Other Data and Analyses Conducted and Considered by EPA in the Derivation of Proposed Numeric Nutrient Criteria for South Florida Canals

EPA undertook extensive analyses and considered a variety of data and methods for deriving numeric nutrient criteria for Florida's canals. Although EPA derived the proposed values based on the approach outlined in the section above, EPA also factored into its decision-making process the results of these other analyses as additional lines of evidence.

One line of additional evidence is based on an evaluation of the stressor-response relationship between chlorophyll *a* levels in canals and TN and TP levels using a variety of statistical tools. A second line of evidence is based on a consideration of the distribution of chlorophyll *a* measurements, TN measurements, and TP measurements from all canals, impaired and not impaired. Nutrient concentrations at the lower end of these distributions were compared to the concentration that the stressor-response analysis determined to be associated with canals with no evidence of nutrient impairment. The third line of evidence is based on a consideration of the distribution of chlorophyll *a,* TN, and

TP values from only those canals considered to be minimally impacted by nutrient-related pollution. EPA considered each of these lines of evidence in deriving the numeric nutrient criteria for canals.

Because soil or substrate type at the bottom of a canal can influence the nutrient cycling and relationships between the observed biological response and the TP and TN levels in canals, EPA used data on soil types in south Florida along with knowledge of the Everglades Agricultural Area (EAA) and the Everglades Protection Area (EvPA) to subdivide the canal areas for criteria derivation. Thus the first step in these other analyses was to group canals and canal data by soil type. The four groupings consist of histosol and entisol soils of the EAA; histosol and entisol soils of the EvPA; spodosol and alfisol soils and areas west of the EvPA and EAA (hereafter, West Coast); and spodosol, entisol and alfisol soils and areas east of the EvPA and EAA (hereafter East Coast).

EPA then sorted canal data (provided by FDEP, Miami-Dade County, and the South Florida Water Management District) into the four canal groupings. EPA screened the data to ensure the exclusion of the following: (1) Sites without relevant data (*e.g.,* nitrogen, phosphorus, chlorophyll *a*), (2) sites influenced by marine waters, (3) sites within Class IV canals or Lake Okeechobee, (4) data not originating within a canal, (5) data with questionable units, and (6) outlier data. Data were organized by canal regions and year. Each site occurring near the border of a region and/or WBID was visually inspected using geographic information system (GIS) tools to ensure the correct placement of those sites. Local experts were also consulted by EPA. EPA analyzed the resulting regionalized data using statistical distribution and regression analyses. EPA undertook its additional analyses using these canal (and data) groupings.

EPA's analysis of the distribution of chlorophyll *a* values in each of the four groupings of canals (using data from impaired and unimpaired sites) indicated that the lower percentile (*i.e.,* 25th percentile) ranged from 1.9 to 2.2 µg/L for chlorophyll *a* in the EvPA, West Coast, and East Coast, and was 6.3 µg/L for the EAA. EPA's analysis of the distribution of TN values in each of the four groupings of canals indicated that the lower percentile (*i.e.,* 25th percentile) ranged from 0.8 to 1.4 mg/L for the EvPA, West Coast, and East Coast and was 2.1 mg/L for the EAA. EPA's analysis of the distribution of TP values in each of the four groupings of canals indicated that the lower percentile (*i.e.,* 25th percentile) ranged from 0.013 to 0.023 mg/L for the EvPA, West Coast, and East Coast and was 0.048 mg/L for the EAA canals.

In an effort to consider chlorophyll *a,* TN, and TP values in canals minimally impacted by nutrient pollution, EPA identified canal sites surrounded by the EvPA in the east and the Big Cypress National Preserve in the west and considered the distribution of chlorophyll *a,* TN and TP values for these sites. Although EPA acknowledges that these sites have not been thoroughly vetted for biological condition, EPA believes that because they are remote and surrounded by wetlands, that these canal sites represent sites with the lowest impact from human activities. The upper percentile values (*i.e.,* the 75th percentile) from the distributions of chlorophyll *a,* TN and TP values for these lower impact sites are 3.4 µg/L for chlorophyll *a,* 1.3 mg/L for TN and 0.018 mg/L for TP.

When considering the results of these additional analyses and comparing these results to the outcome of EPA's analysis of TN, TP, and chlorophyll *a* concentrations from data derived at canal sites across south Florida that are not on the impaired waters list for Florida, it is clear that EPA's proposed criteria for canals are similar to those derived from alternative approaches and therefore, represent a reasonable integration of these multiple lines of evidence. For further information, please refer to EPA's TSD for Florida's Inland Waters, Chapter 4: Methodology for Deriving U.S. EPA's Proposed Criteria for Canals.

(c) Proposed Criteria: Duration and Frequency

Aquatic life water quality criteria contain three components: magnitude, duration, and frequency. For the TN and TP numeric criteria for canals, the derivation of the criterion-magnitude values is described above and these values are provided in the table in Section III.E(1). The criterion-duration for this magnitude (or averaging period) is specified in *footnote a* of the canals criteria table as an annual geometric mean. EPA is proposing two expressions of allowable frequency, both of which are to be met. First, EPA proposes a no-more-than-one-in-three-years excursion frequency for the annual geometric mean criteria for canals. Second, EPA proposes that the long-term arithmetic average of annual geometric means not exceed the criterion-magnitude concentration. EPA anticipates that Florida will use their standard assessment periods as specified in Rule 62–303, F.A.C. (Impaired Waters Rule) to implement this second provision. These proposed duration and frequency components of the criteria are consistent with the data set used to derive the criteria that contained data from multiple years of record, all seasons, and a variety of hydrologic conditions. EPA has determined that this frequency of excursions should not result in unacceptable effects on aquatic life as it will allow the canal aquatic system enough time to recover from an occasionally elevated year of nutrient loadings. The Agency requests comment on these proposed duration and frequency expressions of the canal numeric nutrient criteria.

EPA notes that some scientists and resource managers have suggested that nutrient criteria duration and frequency expressions should be more restrictive to avoid seasonal or annual "spikes" from which the aquatic system cannot easily recover, whereas others have suggested that criteria expressed as simply a long-term average of annual geometric means, consistent with data used in criteria derivation, would still be protective. EPA requests comment on alternative duration and frequency expressions that might be considered protective, including (1) a criterion-duration expressed as a monthly average or geometric mean, (2) a criterion-frequency expressed as meeting allowable magnitude and duration every year, (3) a criterion-frequency expressed as meeting allowable magnitude and duration in more than half of the years of a given assessment period, and (4) a criterion-frequency expressed as meeting the allowable magnitude and duration as a long-term average only. EPA further requests comment on whether an expression of the criteria in terms of an arithmetic average of annual geometric mean values based on rolling three-year periods of time would also be protective of the designated use.

(3) Request for Comment and Data on Proposed Approach

EPA believes the proposed numeric nutrient criteria for south Florida canals in this rule are protective of the designated uses, consistent with CWA section 303(c)(2)(A) and 40 CFR 131.11(a)(1). EPA solicits comment on the approaches taken by the Agency in this proposal, the data underlying those approaches, and the proposed criteria. EPA is seeking other pertinent scientific data and information that are readily available related to nutrient concentrations or nutrient responses in Class III canals in south Florida.

EPA is soliciting comment specifically on the selection of criteria parameters for TN, TP, and chlorophyll *a;* development of criteria for Class III canals across south Florida; and the conclusion that the proposed criteria for Class III canals are protective of designated uses and adequately account for the spatial and temporal variability of nutrients.

(4) Alternative Approaches for Comment

EPA is requesting comments and views on the advantages and disadvantages of alternative approaches to deriving protective criteria for south Florida canals. These approaches include: (1) A stressor-response approach (based on data from all canals or canals grouped by soil type), and (2) methodologies that have been employed to develop nutrient targets in an EPA-proposed TMDL for dissolved oxygen and nutrients.[108]

As previously described in Section III.E(2)(b), EPA considered the underlying soil type of south Florida canals as a possible basis for geographic classification. Analysis of the underlying soil types, indicated by STATSGO,[109] led EPA to identify the following four canal regions: Everglades Agricultural Area (EAA) comprised of histosol and entisol soils, EvPA comprised of histosol and entisol soils, areas west of the EvPA and EAA, or West Coast, comprised of spodosol and alfisol soils, and areas east of the EvPA and EAA, or East Coast, comprised of spodosol, entisol, and alfisol soils.

Subsequent to classification, the proposed statistical distribution-based approach or the alternatives to the proposed approach described in the following sections could be used to derive numeric nutrient criteria by canal region for any or all of the proposed criteria (*i.e.,* TN, TP, and chlorophyll *a*) provided that sufficient data are available.

(a) Stressor-Response Approach

EPA considered two statistical analyses for assessing the stressor-response relationship between nutrients and biological response. In contrast to the proposed option, which included only data from sites with no evidence of nutrient impairment, the stressor-response analyses included all data regardless of whether sites were associated with WBIDs that have been determined to be impaired. EPA conducted linear and quantile regression analyses between chlorophyll *a,* TP, and TN on a regional and aggregated regional basis. EPA used the linear regression model as a statistical tool to predict the chlorophyll *a* response based on matched chlorophyll *a* and TN and TP data. Similarly, quantile regression was used to analyze the matched nutrient and chlorophyll *a* data. In this application, quantile regression was used to predict the 90th percentile of the distribution of chlorophyll *a* concentration at a given concentration of TN or TP.

To apply either statistical approach for developing numeric nutrient criteria for TP or TN, EPA would need to identify the concentration of chlorophyll *a* that would be protective of the designated use for these canal systems. One approach would be to use EPA's proposed chlorophyll *a* criterion of 4.0 μg/L for canals to derive the TN and TP criteria from stressor-response relationships.

(b) Calculation of TP Criteria for the Everglades Agricultural Area (EAA) Using a Downstream Protection Approach

EPA considered using the methodologies described in the EPA-proposed TMDL[110] for dissolved oxygen and nutrients to develop numeric nutrient criteria, specifically TP, for portions of the EAA. These methodologies are described in the TMDL in Section 4.2.2.1 of the TMDL document, "Approach #1: Estimate STA inflow loads resulting in WQS in downstream waters", and Section 4.2.2.2 of the TMDL document, "Approach #2: Simple modeling approach." The first approach takes into account the downstream criterion of the EvPA and the performance of the stormwater treatment areas (STAs). Based on these considerations, inflowing TP concentrations within the EAA to the STAs were derived to meet the downstream EvPA TP criterion of 0.010 mg/L. The second approach used a model that extrapolated natural background TP concentrations, based on land use changes, for specific WBIDs within the EAA. These approaches could support the derivation of numeric nutrient criteria for TP within the EAA region. Approach #1 would result in a TP concentration of 0.10 mg/L, while Approach #2 would result in a TP concentration of 0.087 mg/L.

(5) Request for Comment and Data on Alternative Approaches

The alternatives for Class III south Florida canal criteria in this proposed rule represent alternative approaches given the availability of data in the State of Florida to date and are consistent with the requirements of both the CWA and EPA's implementing regulations. EPA is soliciting comment on the alternative approaches considered by the Agency in this proposal, the data underlying those approaches, and the proposed alternatives themselves, including criteria expressed as an upper percentile maxima not to be exceeded more than 10% of the time in one year, similar to those discussed for lakes. For further information on the upper percentile criteria for canals, refer to EPA's TSD on Florida's Inland Waters, Chapter 4: Methodology for Deriving U.S. EPA's Proposed Criteria for Canals. EPA is seeking other pertinent data and information related to nutrient concentrations or nutrient responses in Class III canals in south Florida.

F. Comparison Between EPA's and Florida DEP's Proposed Numeric Nutrient Criteria for Florida's Lakes and Flowing Waters

To date, Florida has invested significant resources in its statewide nutrient criteria effort, and has made substantial progress toward developing numeric nutrient criteria. For several years, FDEP has been actively working with EPA on the development of numeric nutrient criteria and EPA has worked extensively with FDEP on data interpretation and technical analyses for developing EPA's recommended numeric nutrient criteria proposed in this rulemaking.

On January 14, 2009, EPA formally determined that numeric nutrient criteria were necessary to protect Florida's lakes and flowing waters and should be developed by January 14, 2010. FDEP, independently from EPA, initiated its own State rulemaking process to adopt numeric nutrient water quality criteria protective of Florida's lakes and flowing waters. According to FDEP, the State initiated its rulemaking process to facilitate the assessment of designated use attainment for Florida's waters and to provide a better means to protect its waters from the adverse effects of nutrient over-enrichment. Florida established a technical advisory committee, which met over a number of years, to help develop its proposed numeric nutrient criteria. The State also held several public workshops to solicit

[108] Proposed Total Maximum Daily Load (TMDL) for Dissolved Oxygen and Nutrient in the Everglades. Prepared by U.S. EPA Region 4. September 2007.

[109] State Soil Geographic (STATSGO) database provided by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS).

[110] Proposed Total Maximum Daily Load (TMDL) for Dissolved Oxygen and Nutrient in the Everglades. Prepared by U.S. EPA Region 4. September 2007.

comment on the draft WQS. While FDEP was progressing with its State rulemaking, EPA moved forward to develop Federal numeric nutrient criteria for Florida's lakes and flowing waters, consistent with EPA's January 14, 2009 determination and based on the best available science.

Most recently, in July 2009, FDEP solicited public comment on its proposed numeric nutrient criteria for lakes and flowing waters. In October 2009, FDEP decided not to bring the draft criteria before the Florida Environmental Regulation Commission (ERC), as had been previously scheduled. FDEP did not make any final decisions as to whether it might be appropriate to ask the ERC to adopt the criteria or some portions of the criteria at a later date.

As described in Section III., EPA is proposing numeric nutrient criteria for the following four water body types: Lakes, streams, springs and clear streams, and canals in south Florida. Given that FDEP has made its proposed numeric nutrient criteria available to the public via its Web site (*http://www.dep.state.fl.us/water/wqssp/nutrients/index.htm*), it is worth providing a comparative overview between the criteria and approaches that EPA is proposing in this rulemaking and the criteria and approaches FDEP had initially proposed. Both EPA and FDEP developed numeric criteria recognizing the hydrologic and spatial variability of nutrients in Florida's lakes and flowing waters. As FDEP indicated on its Web site, FDEP's preferred approach is to develop cause and effect relationships between nutrients and valued ecological attributes, and to establish nutrient criteria based on those cause and effect relationships that ensure that the designated uses of Florida's waters are protected and maintained. As described in EPA's guidance, EPA also recommends this approach when scientifically defensible data are available. Where cause and effect relationships could not be demonstrated, however, both FDEP and EPA relied on a distribution-based approach to derive numeric nutrient criteria protective of applicable designated uses.

To set numeric nutrient criteria for lakes, EPA, like FDEP, is proposing a classification scheme using color and alkalinity based upon substantial data that show that lake color and alkalinity play an important role in the degree to which TN and TP concentrations result in a biological response such as elevated chlorophyll *a* levels. EPA and FDEP both found that correlations between nutrients and response parameters were sufficiently robust to use for criteria development in Florida's lakes. EPA is proposing the same chlorophyll *a* criteria for colored lakes and clear alkaline lakes as FDEP proposed, however, EPA is proposing a lower chlorophyll *a* criterion for clear acidic lakes. EPA, like FDEP, is also proposing an accompanying supplementary analytical approach that Florida can use to adjust general TN and TP lake criteria within a certain range where sufficient data on long-term ambient TN and TP levels are available to demonstrate that protective chlorophyll *a* criteria for a specific lake will still be maintained and attainment of the designated use will be assured.

Lake class	EPA proposed criteria			Florida proposed criteria		
	Chl *a*, μg/L	TN, mg/L	TP, mg/L	Chl *a*, μg/L	TN, mg/L	TP, mg/L
Colored Lakes > 40 PCU	20	1.23–2.25	0.050–0.157	20	1.23–2.25	0.05–0.157
Clear Lakes, Alkaline ≤ 40 PCU and > 50 mg/L $CaCO_3$	20	1.00–1.81	0.030–0.087	20	1.00–1.81	0.03–0.087
Clear Lakes, Acidic ≤ 40 PCU and ≤ 50 mg/L $CaCO_3$	6	0.500–0.900	0.010–0.030	9	0.85–1.14	0.015–0.043

To set numeric nutrient criteria for streams, FDEP recommended a statistical distribution approach based on "benchmark sites" identified in five nutrient regions (five regions for TP and two regions for TN), given that FDEP determined cause and effect relationships to be insufficiently robust for establishing numeric thresholds. FDEP relied on the use of a narrative criterion to protect downstream waters. EPA also concluded that a scientifically defensible cause and effect relationship could not be demonstrated with the available data and that a distribution-based approach was most appropriate. However, EPA considered an alternative approach that evaluated a combination of biological information and data on the distribution of nutrients in a substantial number of healthy stream systems to derive scientifically sound TN and TP criteria for streams.

The respective criteria for instream protection of Florida's streams derived using EPA's recommended approach and FDEP's recommended approach are comparable.

EPA nutrient watershed regions	EPA proposed instream criteria		Florida nutrient watershed regions	FL proposed instream criteria	
	TN (mg/L)	TP (mg/L)		TN (mg/L)	TP (mg/L)
Panhandle	0.824	0.043	Panhandle	0.820	0.069
Bone Valley	1.798	0.739	Bone Valley	1.730	0.415
Peninsula	1.205	0.107	Peninsula	....	0.116
North Central	1.479	0.359	North Central	....	0.322
			Northeast	....	0.101

In terms of protecting downstream waters, EPA used best available science and data related to downstream waters and found that there are cases where the numeric nutrient criteria EPA is proposing to protect instream aquatic life may not be stringent enough to ensure protection of WQS for aquatic life in certain downstream lakes and estuaries. Accordingly, EPA is proposing an equation to be used to adjust stream TP criteria to protect downstream lakes, and a different methodology to adjust TN criteria for streams to ensure protection of WQS for downstream estuaries. In cases where a stream first flows into a lake and then flows out from the lake into another lake or estuary, the portion of the stream that exits the lakes needs to comply with the downstream protection values for estuaries, assuming that is the terminal reach.

EPA is proposing the same nitrate-nitrite causal variable criterion for springs and clear streams as proposed by FDEP. For canals in south Florida, EPA is proposing a statistical distribution approach based on sites meeting designated uses with respect to nutrients (*i.e.,* not identified as impaired by FDEP) identified in four canal regions. FDEP did not propose numeric nutrient criteria for canals in its rulemaking.

Please refer to Section IV. Under What Conditions Will Florida Be Removed From a Final Rule for information on how State-adopted and EPA-approved WQS could become effective under the CWA 303(c).

G. Applicability of Criteria When Final

EPA's proposed numeric nutrient criteria for Florida's lakes and flowing waters will be effective for CWA purposes 60 days after publication of final criteria and will apply in addition to any other existing CWA-effective criteria for Class I or Class III waters already adopted by the State and submitted to EPA (and for those adopted after May 30, 2000, approved by EPA). EPA requests comment on this proposed effective date. FDEP establishes its designated uses through a system of classes and Florida waters are designated into one of several different classes. Class III waters provide for healthy aquatic life and safe recreational use. Class I waters include all the protection of designated uses provided for Class III waters, and also include protection for designated uses related to drinking water supply. Class I and III waters, together with Class II waters that are designated for shellfish propagation or harvesting, comprise the set of Florida waters that meet the goals articulated in section 101(a)(2) of the CWA and the waters for which EPA is proposing criteria. Pursuant to the schedule set out in EPA's January 2009 determination, Class II waters will be addressed in rulemaking in January 2011. For water bodies designated as Class I and Class III predominately fresh waters, any final EPA numeric nutrient criteria will be applicable CWA water quality criteria for purposes of implementing CWA programs including permitting under the NPDES program, as well as monitoring and assessment based on applicable CWA WQS and establishment of TMDLs.

The proposed criteria in this rule, if and when finalized, would be subject to Florida's general rules of applicability in the same way and to the same extent as are other State-adopted and/or federally-promulgated criteria for Florida waters. *See* proposed 40 CFR 131.43(d)(2). For example, Florida regulations at Rule 62–4.244, F.A.C. authorize mixing zones when deriving effluent limitations for discharges of pollutants to Florida waters. These regulations would apply to permit limitations implementing the criteria in this rule. This proposal includes some additional language on mixing zone requirements to help guide Florida in developing and applying mixing zone policies for nutrient criteria. Specifically, EPA provides that the criteria apply at the appropriate locations within or at the boundary of the mixing zones; otherwise the criteria apply throughout the water body including at the point of discharge into the water body. *See* proposed 40 CFR 131.43(d)(2)(i). Likewise, EPA includes proposed regulatory language specifying that Florida use an appropriate design flow condition, one that matches the proposed criteria duration and frequency, for use in deriving permit limits and establishing wasteload and load allocations for a TMDL. *See* proposed 40 CFR 131.43(d)(2)(ii).

In addition, EPA recognizes that Florida regulations include provisions for assessing whether waters should be included on the list of impaired waters pursuant to section 303(d) of the CWA. *See* Rule 62–303, F.A.C. The Impaired Waters Rule, or IWR, sets out a methodology to identify waters that do not meet the State's WQS and, therefore, are required to be included on CWA section 303(d) lists. The current IWR does not address how to assess waters based on EPA's proposed numeric nutrient criteria. The numeric nutrient criteria in any final rule, nevertheless, will be applicable WQS that must be addressed when the State assesses waters pursuant to CWA section 303(d).

EPA proposes language in this rulemaking that acknowledges the IWR procedures and their function, specifying that those procedures apply where they are consistent with the level of protection provided by the proposed criteria. *See* proposed 40 CFR 131.43(d)(2)(iii). Some IWR provisions, which describe the sufficiency or reliability of information necessary for the State to make an attainment decision, do not change the level of protection afforded Florida waters. These are beyond the scope of WQS under CWA section 303(c). Other provisions of the IWR may provide some additional detail relevant to assessment, such as the number of years worth of data assessed for a particular listing cycle submittal, which should be consistent with the level of protection provided with the proposed criteria. Should any IWR provisions apply a different level of protection than the Federal criteria when making attainment decisions based on proposed criteria, EPA would expect to take appropriate action to ensure that the States' CWA section 303(d) list of impaired waters includes all waters not attaining the Federal criteria.

IV. Under What Conditions Will Federal Standards Be Either Not Finalized or Withdrawn?

Under the CWA, Congress gave states primary responsibility for developing and adopting WQS for their navigable waters. *See* CWA section 303(a)–(c). Although EPA is proposing numeric nutrient criteria for Florida's lakes and flowing waters, Florida continues to have the option to adopt and submit to EPA numeric nutrient criteria for the State's lakes and flowing waters consistent with CWA section 303(c) and implementing regulations at 40 CFR part 131. Consistent with CWA section 303(c)(4), if Florida adopts and submits numeric nutrient criteria and EPA approves such criteria as fully satisfying the CWA before publication of the final rulemaking, EPA will not proceed with the final rulemaking for those waters for which EPA approves Florida's criteria.

Pursuant to 40 CFR 131.21(c), if EPA does finalize this proposed rule, the EPA promulgated WQS would be applicable WQS for purposes of the CWA until EPA withdraws the federally-promulgated standard. Withdrawing the Federal standards for the State of Florida would require rulemaking by EPA pursuant to the requirements of the Administrative Procedure Act (5 U.S.C. 551 *et seq.*). EPA would undertake such a rulemaking to withdraw the Federal criteria only if and when Florida adopts and EPA approves numeric nutrient criteria that fully meet the requirements of section 303(c) of the CWA and EPA's implementing regulations at 40 CFR part 131.

If EPA finalizes the proposed restoration standard provision (discussed in Section VI below), that provision would be adopted into regulation and would allow Florida to establish interim designated uses with associated water quality criteria, while maintaining the full CWA section 101(a)(2) aquatic life and/or recreational designated use of the water as the ultimate goal. EPA may proceed to promulgate numeric nutrient criteria for Florida together with or separate from EPA's proposed restoration standards provision, depending on the comments received on that proposal.

V. Alternative Regulatory Approaches and Implementation Mechanisms

A. Designating Uses

Under CWA section 303(c), states shall adopt designated uses after taking "into consideration the use and value of water for public water supplies, protection and propagation of fish, shellfish, and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation." Designated uses "shall be such as to protect the public health or welfare, enhance the quality of water and serve the purposes of [the CWA]." CWA section 303(c)(1). EPA's regulation at 40 CFR 131.3(f) defines "designated uses" as "those uses specified in water quality standards for each water body or segment whether or not they are being attained." Under 40 CFR 131.10, EPA's regulation addressing "Designation of uses", a "use" is a particular function of, or activity in, waters of the United States that requires a specific level of water quality to support it. In other words, designated uses are a state's concise statements of its management objectives and expectations for each of the individual surface waters under its jurisdiction.

In the context of designating uses, states often work with stakeholders to identify a collective goal for their waters that the state intends to strive for as it manages water quality. States may evaluate the attainability of these goals and expectations to ensure they have designated appropriate uses (*see* 40 CFR 131.10(g)). Consistent with CWA sections 101(a)(2) and 303(c)(2)(A), 40 CFR 131.2 provides that states "should, wherever attainable, provide water quality for the protection and propagation of fish, shellfish, and wildlife and for recreation in and on the water." Where states do not designate those uses, or remove those uses, they must demonstrate that such uses are not attainable consistent with 40 CFR 131.10(g). States may determine, based on a UAA, that attaining a designated use is not feasible and propose to EPA to change the use and/or the associated pollutant criteria to something that is attainable. This action to change a designated use must be completed in accordance with EPA regulations (see 40 CFR 131.10(g) and (h)).

Within the framework described above, states have discretion in designating uses. EPA's proposed numeric nutrient criteria for lakes and flowing waters would apply to those waters designated by FDEP as Class I (Potable Water Supplies) or Class III (Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife). If Florida removes the Class I or Class III designated use for any particular water body ultimately affected by this rule, and EPA finds that removal to be consistent with CWA section 303(c) and the regulations at 40 CFR part 131, then the federally-promulgated numeric nutrient criteria would not apply to that water body. Instead, the nutrient criteria associated with the newly designated use would apply to that water body. FDEP has recently restarted an effort to refine the State's current designated use classifications. As this process continues, EPA expects that the State may find some instances where this particular discussion may be relevant and useful as the refinement of uses is investigated further.

Where states can identify multiple waters with similar characteristics and constraints on attainability, EPA interprets the Federal WQS regulation to allow states to conduct a "categorical" use attainability analysis (UAA) under 40 CFR 131.10(g) for such waters. This approach may reduce data collection needs, allowing a single analysis to represent many sites. To use such an approach, however, the State would need to have enough information about each particular site to reliably place each site into a broader category and Florida would need to specifically identify each site covered by the analysis. Florida may wish to consider such an approach for certain waters, such as a network of canals with similar hydrologic and morphological characteristics, which can be characterized as a group and where the necessary level of protection may differ substantially from other lakes or flowing waters within the State.

B. Variances

A variance is a temporary modification to the designated use and associated water quality criteria that would otherwise apply to the receiving water. A variance is based on a UAA and identifies the highest attainable use and associated criteria during the variance period. Typically, variances are time-limited (*e.g.,* three years), but renewable. Modifying the designated use for a particular water through a variance process allows a state to limit the applicability of a specific criterion to that water and to identify an alternative designated use and associated criteria to be met during the term of the variance. A variance should be used instead of removal of a use where the state believes the standard can be attained in a short period of time. By maintaining the standard rather than changing it, the state ensures that further progress will be made in improving water quality and attaining the standard. A variance may be written to address a specified geographical coverage, a specified pollutant or pollutants, and/or a specified pollutant source. All other applicable WQS not specifically modified by the variance would remain applicable (*e.g.,* any other criteria adopted to protect the designated use). State variance procedures, as part of state WQS, must be consistent with the substantive requirements of 40 CFR part 131. A variance allows, among other things, NPDES permits to be written such that reasonable progress is made toward attaining the underlying standards for affected waters without violating section 402(a)(l) of the Act, which requires that NPDES permits must meet the applicable WQS. *See also* CWA section 301(b)(1)(C).

For purposes of this proposal, EPA is proposing criteria that apply to use designations that Florida has already established. EPA believes that the State has sufficient authority to use its adopted and EPA-approved variance procedures with respect to modification of their Class I or Class III uses as it pertains to any federally-promulgated nutrient criteria. For this reason, EPA is not proposing a Federal variance procedure.

C. Site-Specific Criteria

A site-specific criterion is an alternative value to a statewide, or otherwise applicable, water quality criterion that meets the regulatory test of protecting the designated use and having a basis in sound science, but is tailored to account for site-specific conditions. Site-specific alternative criteria (SSAC) may be more or less stringent than the otherwise applicable criteria. In either case, because the SSAC must protect the same designated use and must be based on sound science (*i.e.,* meet the requirement of 40 CFR 131.11(a)), there is no need to modify the designated use or conduct a UAA. SSAC may be appropriate when additional scientific consideration can bring added precision or accuracy to express the necessary level or concentration of a water quality parameter that is protective of the designated use.

Florida has adopted procedures for developing and adopting SSAC in its WQS regulations at Florida Administrative Code (Rule 62–302.800, F.A.C.). Florida's Type I SSAC procedure is intended to address site-specific situations where a particular water body cannot meet the applicable water quality criterion because of natural conditions. *See* Rule 62–302.800(1). Florida's Type II SSAC procedure is intended to address site-specific situations other than natural conditions where it can be established that an alternative criterion from the broadly applicable criteria established by the State is protective of a water's designated uses. *See* Rule 62–302.800(1), F.A.C. Florida's Type II procedure is primarily intended to address toxics but there is no limitation in its use for other parameters, except for certain parameters identified by FDEP, including nutrients. *See* Rule 62–302.800(2). Florida's regulations currently do not allow use of Type II procedures for nutrient criteria development because the State currently does not have broadly applicable numeric nutrient criteria for State waters. Rather, the current narrative criterion for nutrients is implemented by translating it into numeric loads or concentrations on a case-by-case basis. EPA's proposed rule would not affect Florida's Type I or Type II SSAC procedures.

EPA believes that there would be benefit in establishing a specific procedure in the Federal rule for EPA adoption of SSAC. In this rulemaking, EPA is proposing a procedure whereby the State could develop a SSAC and submit the SSAC to EPA with supporting documentation for EPA's consideration. The State SSAC could be developed under either the State SSAC procedures or EPA technical processes as set out more fully below. EPA elected to propose this approach because this procedure maintains the State in a primary decision-making role regarding development of SSAC for State waters. The procedure that EPA is proposing would also allow the State to submit a proposed SSAC to EPA without having to first go through the State's rulemaking process.

The proposed procedure would provide that EPA could determine that the SSAC should apply in lieu of the generally applicable criteria promulgated pursuant to this rule. The proposed procedures provide that EPA would solicit public comment on its determination. Because EPA's rule would establish this procedure, implementation of this procedure would not require withdrawal of federally-promulgated criteria for affected water bodies in order for the SSAC to be effective for purposes of the CWA. EPA has promulgated similar procedures for EPA granting of variances and SSACs in other federally-promulgated WQS.

EPA also considered technical processes necessary to develop protective numeric nutrient criteria on a site-specific basis. To complete a thorough and successful analysis to develop numeric nutrient SSAC, EPA expects the State to conduct, or direct applicants to the State to conduct, a variety of supporting analyses. For the instream protection value (IPV) for streams, this analysis would, for example, consist of examining both indicators of longer-term response to multiple stressors such as benthic macroinvertebrate health, as determined by Florida's Stream Condition Index (SCI) and indicators of shorter-term response specific to nutrients, such as periphyton algal thickness or chlorophyll *a* levels. The former analysis will help address concerns that a potential nutrient effect is masked by other stressors (such as turbidity which can limit light penetration and primary production response to nutrient response), whereas the latter analysis will help address concerns that a potential nutrient effect is lagging in time and has not yet manifested itself. Indicators of shorter-term response generally would not be expected to exhibit a lag time.

It will also be important to examine a stream system on a watershed basis to ensure that a SSAC established for one segment does not result in adverse effects in nearby segments. For example, a shaded, relatively swift flowing segment may open up to a shallow, slow moving, open canopy segment that is more vulnerable to adverse nutrient impacts. Empirical data analysis of multiple factors affecting the expression of response to nutrients and mechanistic models of ecosystem processes can assist in this type of analysis. It will also be necessary to ensure that a larger load allowed from an upstream segment as a result of a SSAC does not compromise protection on a downstream segment that has not been evaluated.

The intent of this discussion is to illustrate a process that is rigorous and based on sound scientific rationale, without being inappropriately onerous to complete. Corollary analyses for a lake, spring or clear stream, or canal situation would need to be pursued for a SSAC on those systems.

In addition to the procedure that EPA is proposing, Florida always has the option of submitting State-adopted SSAC as new or revised WQS to EPA for review and approval under the CWA section 303(c). There is no bar to a state adopting new or revised WQS for waters covered by a federally-promulgated WQS. For any State-adopted SSAC that EPA approves under section 303(c) of the Act, EPA would also have to complete federal rulemaking to withdraw the Federal WQS for the affected water body before the State SSAC would be the applicable WQS for the affected water body for purposes of the Act. As discussed above, Florida WQS regulations currently do not authorize the State to adopt nutrient SSAC except where natural conditions are outside the limits of broadly applicable criteria established by the State (Rule 62–302.800, F.A.C.).

This proposed SSAC process would also not limit EPA's authority to promulgate SSAC in addition to those developed by the State under the process described in this rule. The proposed rule recognizes that EPA always has the authority to promulgate through rulemaking SSAC for waters that are subject to federally-promulgated water quality criteria.

D. Compliance Schedules

A compliance schedule, or schedule of compliance, refers to "a schedule of remedial measures included in a 'permit,' including an enforceable sequence of interim requirements * * * leading to compliance with the CWA and regulations." 40 CFR 122.2. In an NPDES permit, WQBELs are effluent limits based on applicable WQS for a given pollutant in a specific receiving water (*See* NPDES Permit Writers Manual, EPA–833–B–96–003, December, 1996). In addition, EPA regulations provide that schedules of compliance are to require compliance "as soon as possible."

Florida has adopted a regulation authorizing compliance schedules, and that regulation is not affected by this proposed rule (Rule 62–620.620(6), F.A.C.). The regulation provides, in part, for schedules providing for compliance "as soon as sound engineering practices allow, but not later than any applicable statutes or rule deadline." The complete text of the Florida rules concerning compliance schedules is available at *https://www.flrules.org/gateway/RuleNo.asp?ID=62-620.620*. Florida is, therefore, authorized to grant compliance schedules under its rule for WQBELs based on federally-promulgated criteria.

VI. Proposed Restoration Water Quality Standards (WQS) Provision

As described above, many of Florida's waters do not meet the water quality goals established by the State and envisioned by the CWA because of excess amounts of nutrients. In some cases, restoring these waters could take many years to achieve, especially where there is a large difference between current water quality conditions and the nutrient criteria levels necessary to protect aquatic life. In such cases, Florida may conclude that restoration programs will not result in waters attaining their designated aquatic life use (and associated numeric nutrient criteria) for a long period of time.

EPA's current regulations provide that a state may remove a designated use if it meets certain requirements outlined at 40 CFR 131.10. Under this provision, if the State demonstrates that a designated use is not attainable it may conduct a use attainability analysis (UAA) to revise the designated use to reflect the highest attainable aquatic life use, even though that use may not meet the CWA section 101(a)(2) goal.[111] Another option that states use to address situations for an individual discharger is a discharger-specific variance.[112] Neither of these approaches may be optimal or appropriate solutions if a state determines that certain waters cannot attain aquatic life uses due to excess nutrient in the near term.

Based on numerous workshops, meetings, conversations and day-to-day interactions with state environmental managers, EPA understands that states interested in restoring impaired water may desire the ability to express, in their WQS, successive time periods with incrementally more stringent designated uses and criteria that ultimately result in a designated use and criteria that reflect a CWA section 101(a)(2) designated use. Such an approach would allow the state and stakeholders necessary time to take incremental steps to achieve interim WQS as they move forward to ultimately attain a CWA section 101(a)(2) designated use. Some states have used variances to provide such time in their WQS. However, variances are typically time limited (*e.g.,* three years) and discharger-specific and do not address the challenges of pursuing reductions from a variety of sources across a watershed. In addition, Federal regulations are not explicit in requiring that states pursue feasible (*i.e.* attainable) progress toward achieving the highest attainable use when implementing a variance. Variances also often lack specific milestones and a transparent set of expectations for the public, dischargers, and stakeholders.

EPA seeks comment on this approach to providing Florida with an explicit regulatory mechanism for directing state efforts to achieve incremental progress in a step-wise fashion, applicable to all sources, as a part of its WQS. The proposed regulatory mechanism described in this section applies only to WQS for nutrients in Florida waters subject to this proposed rule.

A "restoration water quality standard" under EPA's proposed rule would be a WQS that Florida could adopt for an impaired water. Under EPA's proposal, the State would retain the current designated use as the ultimate designated use (*e.g.* providing for eventual attainment of a full CWA section 101(a)(2) designated use and the associated criteria). However, under the restoration standard approach proposed in this rule, the State would also adopt interim less stringent designated uses and criteria that would be the basis for enforceable permit requirements and other control strategies during the prescribed timeframes. These interim uses could be no less stringent than an existing use as defined in 40 CFR 131.3, and would have to meet the requirements of 40 CFR 131.10(h)(2). The State would need to demonstrate that the interim uses and criteria, as well as the timeframe, are based on a UAA evaluation of what is attainable and by when. These interim designated uses and criteria and the applicable timeframes would all be incorporated into the State WQS on a site-specific basis, as would be any other designated use change or adoption of site-specific criteria.

For example, a restoration WQS for nutrients for an impaired Class I or Class III colored lake in Florida may take the form of the following for a lake whose current condition represents severely impaired aquatic life with chlorophyll *a* = 40 mg/L, TN = 2.7 mg/L, and TP = 0.15 mg/L:

Time	*Chl a*	TN	TP	Designated Use Description
Year 0–5	35	2.4	0.10	Moderately Impaired Aquatic Life.
Year 6–10	25	1.45	0.06	Slightly Impaired Aquatic Life.
Year 11	20	1.2	0.05	Full Aquatic Life Use.

Including such revised interim designated uses and criteria within the regulations could support efforts by Florida to formally establish enforceable long-term plans for different watersheds or stream reaches to attain the ultimate designated use and the associated criteria. At the same time, the State would be able to ensure that its WQS explicitly reflect the attainable designated uses and water quality criteria to be met at any given time, consistent with the CWA and implementing regulations.

Restoration WQS would provide in the Federal regulations the framework for authorizing the State of Florida to adopt restoration WQS for nutrients, along with maintaining the availability of other tools (*e.g.,* variances and compliance schedule provisions), which provide flexibility regarding permitting individual dischargers. Restoration WQS would require a full public participation process to assure transparency as well as the opportunity for different parties to work together, exchange information and determine what is actually attainable within a particular time frame. Going through this process would provide Florida with a transparent set of expectations to push its waters towards restoration in a realistic yet verifiable manner.

In this notice, EPA proposes restoration WQS as a clear regulatory pathway for the State of Florida to adjust the Class I and Class III designated uses (and associated nutrient criteria) of waters impaired by nutrients that is intended to promote active restoration, maintain progressive improvement, and ensure accountability. This approach would provide the State of Florida with the flexibility to adopt revised designated uses and criteria under a set of specific regulatory requirements.

[111] Clean Water Act section 101(a)(2) states that it is a national goal for water quality, wherever attainable, to provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the water

[112] A variance is a temporary modification to the designated use and associated water quality criteria that would otherwise apply. It is based on a use attainability demonstration and targets achievement of the highest attainable use and associated criteria during the variance period.

Under this proposal, the interim designated uses and criteria would be the basis for NPDES permits during the applicable period reflecting the fact that the restoration WQS introduces the critical element of time as part of the complete WQS. This is intended to allow imposition of the maximum feasible point source controls and nonpoint source nutrient reduction strategies to be phased in within the overall context of restoration activities within the watershed. By reflecting how it expects the existing poor quality of its waters to incrementally improve to achieve longer-term WQS goals, Florida could create the flexibility to explore more innovative ways to reach the requirements of the next phase, thus possibly reducing costs or allowing new approaches to resolve complex technological issues, and maximizing transparency with the public during each phase. These waters, however, would still be considered impaired for CWA assessment and listing purposes because the ultimate designated use and criteria would be part of the restoration WQS and would not yet be met.

The restoration standards would be Florida WQS revisions that would go through the process of first being adopted under State law and then approved by EPA. This proposal would include eight requirements for the development of a restoration WQS for nutrients:

1. It must be demonstrated that it is infeasible to attain the full CWA section 101(a)(2) aquatic life designated use during the time periods established for the restoration phases with a UAA based on one of the factors at 40 CFR 131.10(g).

2. The highest attainable designated use and numeric criteria that apply at the termination of the restoration WQS (*i.e.,* the ultimate long-term designated use and numeric criteria to be achieved) must be specified and this use is to include, at a minimum, uses that are consistent with the CWA section 101(a)(2) uses.

3. Interim restoration designated uses and numeric water quality criteria, with each based on achieving the maximum feasible progress during the applicable phase as determined in the UAA, must be established.

4. Specific time periods for each restoration phase must be established. The length of each phase must be based on the UAA demonstration of when interim uses can be attained on a case-specific basis. Interim restoration designated uses and numeric water quality criteria must reflect the highest attainable use during the time period of the restoration phase. The sum of these times periods may not exceed twenty years.

5. The spatial extent to which the restoration WQS will apply (*e.g.,* how far downstream the restoration WQS would apply) must be specified. EPA notes the importance of continuing to meet the requirements for protection of downstream WQS as expressed in section 40 CFR 131.10(b). Adopting restoration WQS upstream of another impaired water may mean the State should also consider restoration WQS for the downstream water.

6. The regulatory requirements for public participation and EPA review and approval whenever revising its WQS must continue to be met. Specifically, a restoration WQS may not include interim uses less stringent than a use that is an "existing use" as defined in 40 CFR 131.3 or that do not meet the requirements of 40 CFR 131.10(h)(2).

7. The State must include in its restoration WQS that if the water body does not attain the interim designated use and numeric water quality criteria at the end of any phase, the restoration WQS will no longer be in effect and the designated use and criteria that was to become effective at the end of the final restoration phase will become immediately effective unless Florida adopts and EPA approves a different revised designated use and criteria.

8. The State must provide that waters for which a restoration WQS is adopted will be recognized as impaired for the purposes of listing impaired waters under section 303(d) of the CWA until the final use is attained.

Under this proposal, EPA would require Florida to adopt the ultimate highest attainable designated use and criteria along with multiple phases reflecting the stepwise improvements in water quality between the initial effective date and when they expect to meet the ultimate highest attainable use as a single restoration WQS package. As with any revision to an aquatic life use, Florida would be required to demonstrate that the ultimate highest attainable designated use cannot be attained during the restoration period, based on one of the factors at 40 CFR 131.10(g)(1)–(6) (*i.e.,* through a UAA). EPA would review the WQS and all supporting documents before approving the restoration WQS.

At the beginning of the first restoration phase, the State would identify current conditions and establish the principle that there can be no further degradation. WQS for the first restoration phase should reflect the outcomes of all controls that can be implemented within the first restoration phase. Additionally, EPA expects that the interim restoration designated use and numeric criteria that are attainable at the end of the restoration phase apply at the beginning of each phase as well as throughout the phase. For each phase, the State would adopt interim designated uses and numeric water quality criteria that reflect achieving the maximum feasible progress. At the end of the first phase, EPA would expect the water body to be meeting the first interim designated use and water quality criteria.

At the beginning of the second phase, the next (more stringent) interim designated use and water quality criteria would go into effect as the applicable WQS that the State would use to direct the next set of control actions. At the conclusion of the second phase, the next (more stringent) interim designated use and water quality criteria would become the applicable WQS. This process would repeat with each subsequent phase. Permit limits written during the restoration phases would include effluent limits as stringent as necessary to meet the applicable interim designated uses and numeric water quality criteria. In constructing each restoration phase (*i.e.* duration and interim designated use and numeric water quality criteria), EPA will require the maximum feasible progress. This means that necessary control actions that would improve water quality and can be implemented within the first phase must be reflected in the interim targets for the first restoration phase. This would include all technology-based requirements for point sources, and cost-effective and reasonable BMPs for nonpoint sources. For treatment upgrades to point sources, EPA expects careful scrutiny of technology that has been successfully implemented in comparable situations and presumes that this is feasible. EPA further expects careful scrutiny of all existing and new technology that will help achieve the ultimate highest attainable use.

EPA recognizes that circumstances may change as controls are implemented and that new information may indicate that the timeframes established in the restoration WQS are too lengthy or possibly unrealistically short. If this is the case, the state has the discretion under 40 CFR 131.10 to conduct a new UAA and revise the interim targets in its restoration WQS after a full public process and EPA approval. However, there is a significant burden on the state to demonstrate what changed to alter the initial analysis and associated expectations for what was attainable for that phase. EPA would expect such a revision only if there was significant new information that demonstrated that a different schedule and/or set of interim standards represents the maximum feasible progress towards the final designated use and criteria.

If at the end of a phase, the water body is not meeting interim targets, then the restoration WQS would no longer be applicable. In such a case, the applicable WQS would be the ultimate highest attainable use and associated criteria unless the state adopted and submitted for EPA approval a revised WQS. This would help ensure that there would be no delay in implementing control measures. Alternatively, EPA considered an option of allowing the subsequent restoration phases to become applicable on the schedule adopted in the restoration WQS and as supported by the original UAA demonstration, even if the interim use and criteria are not fully achieved on schedule. This might have the advantage of encouraging the adoption of ambitious interim goals in the initial restoration standards, and would allow continued orderly progress towards achievement of the final use and criterion even where an interim step was not fully attained. EPA solicits comment on this alternative approach.

To develop restoration WQS for numeric nutrient criteria, EPA would expect that the state identify waters in need of restoration, produce an inventory of point and nonpoint sources within the watershed, and evaluate current ambient conditions and the necessary reductions to achieve the numeric criteria. The next part of the process would involve determining the combinations of control strategies and management practices available, how likely they are to produce results, and the resources needed to implement them. At this point, the State would be in a good position to determine how much pollution reduction is likely to be attainable under what timeframes. The State could use this information to establish the time periods for each restoration phase consistent with the maximum feasible and attainable progress toward meeting the numeric criteria, establish interim restoration designated uses and water quality criteria, and make the necessary demonstration that it is infeasible to attain the long-term designated use during the time periods established and that the interim phases reflect the highest attainable uses and associated criteria.

For excess nutrient pollution, the contributors to nutrient pollution could include publicly-owned treatment works (POTWs), industrial dischargers, urban and agricultural runoff, atmospheric deposition, and septic systems. Restoration WQS might reflect in an early phase, for example, all feasible short-term POTW treatment upgrades and a schedule to select, fund, and implement longer term nutrient reduction technologies, while aggressively pursuing reductions in nonpoint source runoff. This might include specific plans and a schedule to develop and implement innovative alternative approaches, such as trading programs, where appropriate.

In Florida, many of the steps described above occur in the context of Basin Management Action Plans (BMAPs). FDEP describes BMAPs as:

> * * *the "blueprint" for restoring impaired waters by reducing pollutant loadings to meet the allowable loadings established in a Total Maximum Daily Load (TMDL). It represents a comprehensive set of strategies—permit limits on wastewater facilities, urban and agricultural best management practices, conservation programs, financial assistance and revenue generating activities, etc.—designed to implement the pollutant reductions established by the TMDL. These broad-based plans are developed with local stakeholders—they rely on local input and local commitment—and they are adopted by Secretarial Order to be enforceable.

(*http://www.dep.state.fl.us/Water/watersheds/bmap.htm*) Florida has adopted BMAPs for the Hillsborough River Basin, Lower St. John's River, Log Branch, Orange Creek, and Upper Ocklawaha, and has plans for others to follow. To the extent necessary, FDEP could potentially use aspects of the BMAP process and plans such as these to help form the basis for restoration WQS.

In summary, the WQS program is intended to protect and improve water quality and WQS are meant to guide actions to address the effects of pollution on the Nation's waters. The reality is that as more assessments are being done and TMDLs are being contemplated, and as new criteria are developed and considered, EPA and states face questions about what pollution control measures will meet the WQS, how long it might take, and whether it is feasible to attain the WQS established to meet the goals of the Act. These questions are often difficult to answer because of lack of data, lack of knowledge, and lack of experience in attempting restoration of waters. Stakeholders and co-regulators alike have expressed a desire for ways to pursue progressive water quality improvement and evaluate those improvements to gain the data, knowledge, and experience necessary to ultimately determine the highest attainable use. In response, EPA has been investigating the best ways to use UAAs and related tools to make progress in identifying and achieving the most appropriate designated use.

EPA requests comments on the usefulness of the "restoration WQS" proposal for Florida. EPA requests comment on how restoration WQS will operate in conjunction with listing impaired waters, and establishing NPDES permit limitations, and nonpoint source control strategies, as well as how these requirements should be reflected in regulatory language. EPA also requests comment on the proposed 20-year limit on the schedule to attain the final use and criteria. EPA also requests comments on how a restoration WQS process would be coordinated with the TMDL program and whether the transparency and review procedures for the two approaches, including the conditions under which a State or EPA would be required to develop a TMDL, are comparable. EPA also requests comment on any unintended adverse consequences of this approach for any of its water quality programs. Finally, EPA requests comment on potential definitions of "maximum feasible progress."

VII. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review

Under Executive Order (EO) 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under EO 12866 and any changes made in response to OMB recommendations have been documented in the docket for this action.

This proposed rule does not establish any requirements directly applicable to regulated entities or other sources of nutrient pollution. Moreover, existing narrative water quality criteria in State law already require that nutrients not be present in waters in concentrations that cause an imbalance in natural populations of flora and fauna in lakes and flowing waters in Florida.

B. Paperwork Reduction Act

This action does not impose an information collection burden under the provisions of the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* Burden is defined at 5 CFR 1320.3(b). It does not include any information collection, reporting, or record-keeping requirements.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of this action on small entities, small entity is defined as: (1) A small business as defined by the Small Business Administration's (SBA) regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise that is independently owned and operated and is not dominant in its field.

Under the CWA WQS program, states must adopt WQS for their waters and must submit those WQS to EPA for approval; if the Agency disapproves a state standard and the state does not adopt appropriate revisions to address EPA's disapproval, EPA must promulgate standards consistent with the statutory requirements. EPA also has the authority to promulgate WQS in any case where the Administrator determines that a new or revised standard is necessary to meet the requirements of the Act. These state standards (or EPA-promulgated standards) are implemented through various water quality control programs including the NPDES program, which limits discharges to navigable waters except in compliance with an NPDES permit. The CWA requires that all NPDES permits include any limits on discharges that are necessary to meet applicable WQS.

Thus, under the CWA, EPA's promulgation of WQS establishes standards that the State implements through the NPDES permit process. The State has discretion in developing discharge limits, as needed to meet the standards. This proposed rule, as explained earlier, does not itself establish any requirements that are applicable to small entities. As a result of this action, the State of Florida will need to ensure that permits it issues include any limitations on discharges necessary to comply with the standards established in the final rule. In doing so, the State will have a number of choices associated with permit writing. While Florida's implementation of the rule may ultimately result in new or revised permit conditions for some dischargers, including small entities, EPA's action, by itself, does not impose any of these requirements on small entities; that is, these requirements are not self-implementing. Thus, I certify that this rule will not have a significant economic impact on a substantial number of small entities.

EPA has prepared an analysis of potential costs associated with meeting these standards.[113] EPA's analysis uses the criteria proposed by FDEP in July 2009 as a baseline against which to estimate the incremental costs of meeting the standards in this proposal. The baseline costs of meeting Florida's proposed standards are estimated to be $102 to $130 million per year. The incremental costs, over and above these baseline costs, of meeting the standards in this NPRM are estimated to be $4.7 to $10.1 million per year. This analysis assumes that most of these costs would fall on non-point sources and the categories of point sources that would be primarily affected are municipal wastewater treatment plants and industrial and general dischargers.[114] EPA estimates the incremental costs for these two categories of dischargers, including small entities, at about $1 million per year.

D. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Public Law 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on state, local, and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that may result in expenditures to state, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation of why that alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed under section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

This proposed rule contains no Federal mandates (under the regulatory provisions of Title II of the UMRA) for state, local, or tribal governments or the private sector. The State may use these resulting water quality criteria in implementing its water quality control programs. This proposed rule does not regulate or affect any entity and, therefore, is not subject to the requirements of sections 202 and 205 of UMRA.

EPA determined that this proposed rule contains no regulatory requirements that might significantly or uniquely affect small governments. Moreover, WQS, including those proposed here, apply broadly to dischargers and are not uniquely applicable to small governments. Thus, this proposed rule is not subject to the requirements of section 203 of UMRA.

E. Executive Order 13132 (Federalism)

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. EPA's authority and responsibility to promulgate Federal WQS when state standards do not meet the requirements of the CWA is well established and has been used on various occasions in the past. The proposed rule would not substantially affect the relationship between EPA and the states and territories, or the distribution of power or responsibilities between EPA and the various levels of government. The proposed rule would not alter Florida's considerable discretion in implementing these WQS. Further, this proposed rule would not

[113] Refer to Docket ID EPA–HQ–OW–2009–0596.

[114] EPA was not able to estimate costs for municipal stormwater systems because the need for incremental controls is uncertain.

preclude Florida from adopting WQS that meet the requirements of the CWA, either before or after promulgation of the final rule, thus eliminating the need for Federal standards. Thus, Executive Order 13132 does not apply to this proposed rule.

Although section 6 of Executive Order 13132 does not apply to this action, EPA had extensive communication with the State of Florida to discuss EPA's concerns with the State's nutrient water quality criteria and the Federal rulemaking process. In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and state and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175 (Consultation and Coordination With Indian Tribal Governments)

Subject to the Executive Order 13175 (65 FR 67249, November 9, 2000) EPA may not issue a regulation that has tribal implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by tribal governments, or EPA consults with tribal officials early in the process of developing the proposed regulation and develops a tribal summary impact statement. EPA has concluded that this action may have tribal implications. However, the rule will neither impose substantial direct compliance costs on tribal governments, nor preempt Tribal law.

In the State of Florida, there are two Indian tribes, the Seminole Tribe of Florida and the Miccosukee Tribe of Indians of Florida, with lakes and flowing waters. Both tribes have been approved for treatment in the same manner as a state (TAS) status for CWA sections 303 and 401 and have federally-approved WQS in their respective jurisdictions. These tribes are not subject to this proposed rule. However, this rule may impact the tribes because the numeric nutrient criteria for Florida will apply to waters adjacent to the tribal waters.

EPA has contacted the tribes to inform them of the potential future impact this proposal could have on tribal waters. A meeting with tribal officials has been requested to discuss the draft proposed rule and potential impacts on the tribes. EPA specifically solicits additional comment on this proposed rule from tribal officials.

G. Executive Order 13045 (Protection of Children From Environmental Health and Safety Risks)

This action is not subject to EO 13045 (62 FR 19885, April 23, 1997) because it is not economically significant as defined in EO 12866, and because the Agency does not believe the environmental health or safety risks addressed by this action present a disproportionate risk to children.

H. Executive Order 13211 (Actions That Significantly Affect Energy Supply, Distribution, or Use)

This rule is not a "significant energy action" as defined in Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

I. National Technology Transfer Advancement Act of 1995

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law 104–113, section 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.,* materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. The NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

J. Executive Order 12898 (Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations)

Executive Order (EO) 12898 (59 FR 7629 (Feb. 16, 1994)) establishes Federal executive policy on environmental justice. Its main provision directs Federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule does not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it would afford a greater level of protection to both human health and the environment if these numeric nutrient criteria are promulgated for Class I and Class III waters in the State of Florida.

List of Subjects in 40 CFR Part 131

Environmental protection, water quality standards, nutrients, Florida.

Dated: January 14, 2010.

Lisa P. Jackson,

Administrator.

For the reasons set out in the preamble, EPA proposes to amend 40 CFR part 131 as follows:

PART 131—WATER QUALITY STANDARDS

1. The authority citation for part 131 continues to read as follows:

Authority: 33 U.S.C. 1251 *et seq.*

Subpart D—[Amended]

2. Section 131.43 is added as follows:

§ 131.43 Florida.

(a) *Scope*. This section promulgates numeric nutrient criteria for lakes, streams, springs, canals, estuaries, and coastal waters in the State of Florida. This section also contains provisions for site-specific criteria.

(b) *Definitions*—

(1) *Canal* means a trench, the bottom of which is normally covered by water with the upper edges of its two sides normally above water, excluding all secondary and tertiary canals, classified as Class IV waters, wholly within Florida's agricultural areas.

(2) *Clear stream* means a free-flowing water whose color is less than 40 platinum cobalt units (PCU).

(3) *Lake* means a freshwater water body that is not a stream or other watercourse with some open contiguous water free from emergent vegetation.

(4) *Lakes and flowing waters* means inland surface waters that have been classified as Class I (Potable Water Supplies) or Class III (Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife) water bodies pursuant to Rule 62–302.400, F.A.C., excluding wetlands, and are predominantly fresh waters.

(5) *Nutrient watershed region* means an area of the State, corresponding to coastal/estuarine drainage basin and differing geographical conditions

affecting nutrient levels, as delineated in the Technical Support Document for EPA's Proposed Rule for Numeric Nutrient Criteria for Florida's Inland Surface Fresh Waters.

(6) *Predominantly fresh waters* means surface waters in which the chloride concentration at the surface is less than 1,500 milligrams per liter.

(7) *Spring* means the point where underground water emerges onto the Earth's surface, including its spring run.

(8) *Spring run* means a free-flowing water that originates from a spring or spring group whose primary (>50%) source of water is from a spring or spring group.

(9) *State* shall mean the State of Florida, whose transactions with the U.S. EPA in matters related to this regulation are administered by the Secretary, or officials delegated such responsibility, of the Florida Department of Environmental Protection (FDEP), or successor agencies.

(10) *Stream* means a free-flowing, predominantly fresh surface water in a defined channel, and includes rivers, creeks, branches, canals (outside south Florida), freshwater sloughs, and other similar water bodies.

(11) *Surface water* means water upon the surface of the earth, whether contained in bounds created naturally or artificially or diffused. Water from natural springs shall be classified as surface water when it exits from the spring onto the Earth's surface.

(c) Criteria for Florida waters—

(1) *Criteria for lakes.* The applicable criterion for chlorophyll *a,* total nitrogen (TN), and total phosphorus (TP) for lakes within each respective lake class is shown on the following table:

Long-term average lake color and alkalinity	Chlorophyll *a* [f] (µg/L) [a]	Baseline criteria [b]		Modified criteria (within these bounds) [c]	
		TP (mg/L) [a]	TN (mg/L) [a]	TP (mg/L) [a]	TN (mg/L) [a]
A	B	C	D	E	F
Colored Lakes > 40 PCU	20	0.050	1.23	0.050–0.157	1.23–2.25
Clear Lakes, Alkaline ≤ 40 PCU [d] and > 50 mg/L $CaCO_3$ [e]	20	0.030	1.00	0.030–0.087	1.00–1.81
Clear Lakes, Acidic ≤ 40 PCU [d] and ≤ 50 mg/L $CaCO_3$ [e]	6	0.010	0.500	0.010–0.030	0.500–0.900

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

[b] Baseline criteria apply unless data are readily available to calculate and apply lake-specific, modified criteria as described below in footnote c and the Florida Department of Environmental Protection issues a determination that a lake-specific modified criterion is the applicable criterion for an individual lake. Any such determination must be made consistent with the provisions in footnote c below. Such determination must also be documented in an easily accessible and publicly available location, such as an official State Web site.

[c] If chlorophyll *a* is below the criterion in column B and there are representative data to calculate ambient-based, lake-specific, modified TP and TN criteria, then FDEP may calculate such criteria within these bounds from ambient measurements to determine lake-specific, modified criteria pursuant to CWA section 303(c). Modified TN and TP criteria must be based on at least three years of ambient monitoring data with (a) at least four measurements per year and (b) at least one measurement between May and September and one measurement between October and April each year. These same data requirements apply to chlorophyll *a* when determining whether the chlorophyll *a* criterion is met for purposes of developing modified TN and TP criteria. If the calculated TN and/or TP value is below the lower value, then the lower value is the lake-specific, modified criterion. If the calculated TN and TP value is above the upper value, then the upper value is the lake-specific, modified criterion. Modified TP and TN criteria may not exceed criteria applicable to streams to which a lake discharges. If chlorophyll *a* is below the criterion in column B and representative data to calculate modified TN and TP criteria are not available, then the baseline TN and TP criteria apply. Once established, modified criteria are in place as the applicable WQS for all CWA purposes.

[d] Platinum Cobalt Units (PCU) assessed as true color free from turbidity. Long-term average color based on a rolling average of up to seven years using all available lake color data.

[e] If alkalinity data are unavailable, a specific conductance of 250 micromhos/cm may be substituted.

[f] Chlorophyll *a* is defined as corrected chlorophyll, or the concentration of chlorophyll *a* remaining after the chlorophyll degradation product, phaeophytin *a*, has been subtracted from the uncorrected chlorophyll *a* measurement.

(2) *Criteria for streams.*

(i) The applicable instream protection value (IPV) criterion for total nitrogen (TN) and total phosphorus (TP) for streams within each respective nutrient watershed region is shown in the following table:

Nutrient watershed region	Instream protection value criteria	
	TN (mg/L) [a]	TP (mg/L) [a]
Panhandle [b]	0.824	0.043
Bone Valley [c]	1.798	0.739
Peninsula [d]	1.205	0.107
North Central [e]	1.479	0.359

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

[b] Panhandle region includes the following watersheds: Perdido Bay Watershed, Pensacola Bay Watershed, Choctawhatchee Bay Watershed, St. Andrew Bay Watershed, Apalachicola Bay Watershed, Apalachee Bay Watershed, and Econfina/Steinhatchee Coastal Drainage Area.

[c] Bone Valley region includes the following watersheds: Tampa Bay Watershed, Sarasota Bay Watershed, and Charlotte Harbor Watershed.

[d] Peninsula region includes the following watersheds: Waccasassa Coastal Drainage Area, Withlacoochee Coastal Drainage Area, Crystal/Pithlachascotee Coastal Drainage Area, Indian River Watershed, Caloosahatchee River Watershed, St. Lucie Watershed, Kissimmee River Watershed, St. John's River Watershed, Daytona/St. Augustine Coastal Drainage Area, Nassau Coastal Drainage Area, and St. Mary's River Watershed.

[e] North Central region includes the Suwannee River Watershed.

(ii) *Criteria for protection of downstream lakes.*

(A) The applicable total phosphorus criterion-magnitude for a stream that flows into downstream lakes is the more stringent of the value from the preceding table in paragraph (c)(2)(i) of this section or a downstream lake protection value derived from the following equation to protect the downstream lake:

$$[TP]_S = \frac{1}{c_f}[TP]_L\left(1+\sqrt{\tau_w}\right)$$

where:

$[TP]_S$ is the total phosphorus (TP) downstream lake protection value, mg/L

$[TP]_L$ is applicable TP lake criterion, mg/L

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

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

The term

$$\left(1+\sqrt{\tau_w}\right)$$

expresses the net phosphorus loss from the water column (*e.g.,* via settling of sediment-sorbed phosphorus) as a function of the lake's retention time.

(B) The preset values for c_f and τ_w, respectively, are 0.5 and 0.2. The State may substitute site-specific values for these preset values where the State determines that they are appropriate and documents the site-specific values in an easily accessible and publicly available location, such as an official State Web site.

(iii) *Criteria for protection of downstream estuarine waters.*

(A) The applicable criteria for a stream that flows into downstream estuary is the more stringent of the values from the preceding table in paragraph (c)(2)(i) of this section or downstream protection values derived from the following equation to protect the downstream estuary. EPA's preset DPVs are listed in the Technical Support Document (TSD) for Florida's Inland Waters located at *www.regulations.gov,* Docket ID No. EPA–HQ–OW–2009–0569, and calculated for each stream reach as the average reach-specific concentration ($\bar{C}_i$) equal to the average reach-specific annual loading rate (L_i) divided by the average reach-specific flow ($\bar{Q}_i$) where:

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

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

$\bar{C}_i$ maximum flow-averaged nutrient concentration for a specific (the i^{th}) stream reach consistent with downstream use protection (*i.e.,* the DPV)

k fraction of all loading to the estuary that comes from the stream network resolved by SPARROW

L_{est} protective loading rate for the estuary, from all sources

$\bar{Q}_w$ combined average freshwater discharged into the estuary from the portion of the watershed resolved by the SPARROW stream network

F_i fraction of the flux at the downstream node of the specific (i^{th}) reach that is transported through the stream network and ultimately delivered to estuarine eceiving waters (*i.e.* Fraction Delivered).

DPVs may not exceed other criteria established for designated use protection in this section, nor result in an exceedance of other criteria for other water quality parameters established pursuant to Rule 62–302, F.A.C.

(B) The State may calculate alternative DPVs as above for $\bar{C}_i$ except that L_i is determined as a series of values for each reach in the upstream drainage area such that the sum of reach-specific incremental loading rates equals the target loading rate to the downstream water protective of downstream uses, taking into account that downstream reaches must reflect loads established for upstream reaches. Alternative DPVs may factor in additional nutrient attenuation provided by already existing landscape modifications or treatment systems, such as constructed wetlands or stormwater treatment areas. For alternative DPVs to become effective for Clean Water Act purposes, the State must provide public notice and opportunity for comment.

(C) To use an alternative technical approach of comparable scientific rigor to quantitatively determine the protective load to the estuary and associated protective stream concentrations, the State must go through the process for a Federal site-specific alternative criterion pursuant to paragraph (e) of this section.

(3) *Criteria for springs, spring runs, and clear streams.* The applicable nitrate-nitrite criterion is 0.35 mg/L as an annual geometric mean not to be surpassed more than once in a three year period, nor surpassed as a long-term average of annual geometric mean values. In addition to this nitrate-nitrite criterion, criteria identified in paragraph (c)(2) of this section are applicable to clear streams.

(4) *Criteria for south Florida canals.* The applicable criterion for chlorophyll *a,* total nitrogen (TN), and total phosphorus (TP) for canals within each respective canal geographic classification area is shown on the following table:

	Chlorophyll a (µg/L) [a]	Total phosphorus (TP) (mg/L) [a b]	Total nitrogen (TN) (mg/L) [a]
Canals	4.0	0.042	1.6

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

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

(5) *Criteria for estuaries.* [Reserved]

(6) *Criteria for coastal waters.* [Reserved]

(d) *Applicability.*

(1) The criteria in paragraphs (c)(1) through (4) of this section apply to surface waters of the State of Florida designated as Class I (Potable Water Supplies) or Class III (Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife) water bodies pursuant to Rule 62–302.400, F.A.C., excluding wetlands, and apply concurrently with other applicable water quality criteria, except when:

(i) State regulations contain criteria which are more stringent for a particular parameter and use;

(ii) The Regional Administrator determines that site-specific alternative criteria apply pursuant to the procedures in paragraph (e) of this section;

(iii) The State adopts and EPA approves a water quality standards variance to the Class I or Class III designated use pursuant to § 131.13 that meets the applicable provisions of State law and the applicable Federal regulations at § 131.10; or

(iv) The State adopts and EPA approves restoration standards pursuant to paragraph (g) of this section.

(2) The criteria established in this section are subject to the State's general rules of applicability in the same way and to the same extent as are the other federally-adopted and State-adopted numeric criteria when applied to the same use classifications.

(i) For all waters with mixing zone regulations or implementation procedures, the criteria apply at the appropriate locations within or at the boundary of the mixing zones; otherwise the criteria apply throughout the water body including at the point of discharge into the water body.

(ii) The State shall use an appropriate design flow condition, where necessary, for purposes of permit limit derivation or load and wasteload allocations that is consistent with the criteria duration and frequency established in this section (*e.g.,* average annual flow for a criterion magnitude expressed as an average annual geometric mean value).

(iii) The criteria established in this section apply for purposes of determining the list of impaired waters pursuant to section 303(d) of the Clean Water Act, subject to the procedures adopted pursuant to Rule 62–303, F.A.C., where such procedures are consistent with the level of protection provided by the criteria established in this section.

(e) *Site-specific alternative criteria.*

(1) Upon request from the State, the Regional Administrator may determine that site-specific alternative criteria shall apply to specific surface waters in lieu of the criteria established in paragraph (c) of this section. Any such determination shall be made consistent with § 131.11.

(2) To receive consideration from the Regional Administrator for a determination of site-specific alternative criteria, the State must submit a request that includes proposed alternative numeric criteria and supporting rationale suitable to meet the needs for a technical support document pursuant to paragraph (e)(3) of this section.

(3) For any determination made under paragraph (e)(1) of this section, the Regional Administrator shall, prior to making such a determination, provide for public notice and comment on a proposed determination. For any such proposed determination, the Regional Administrator shall prepare and make available to the public a technical support document addressing the specific surface waters affected and the justification for each proposed determination. This document shall be made available to the public no later than the date of public notice issuance.

(4) The Regional Administrator shall maintain and make available to the public an updated list of determinations made pursuant to paragraph (e)(1) of this section as well as the technical support documents for each determination.

(5) Nothing in this paragraph (e) shall limit the Administrator's authority to modify the criteria in paragraph (c) of this section through rulemaking.

(f) *Effective date.* All criteria will be in effect [date 60 days after publication of final rule].

(g) *Restoration Water Quality Standards (WQS).* The State may, at its discretion, adopt restoration WQS to allow attainment of a designated use over phased time periods where the designated use is not currently attainable as a result of nutrient pollution but is attainable in the future. In establishing restoration WQS, the State must:

(1) Demonstrate that the designated use is not attainable during the time periods established for the restoration phases based on one of the factors identified in § 131.10(g)(1) through (6);

(2) Specify the designated use to be attained at the termination of the restoration period, as well as the criteria necessary to protect such use, provided that the final designated use and corresponding criteria shall include, at a minimum, uses and criteria that are consistent with CWA section 101(a)(2) ;

(3) Establish interim restoration designated uses and water quality criteria, that apply during each phase that will result in maximum feasible progress toward the highest attainable designated use and the use identified in paragraph (g)(2) of this section. Such interim uses and criteria may not provide for further degradation of a water body and may be revised prior to the end of each phase in accordance with §§ 131.10 and 131.20 and submitted to EPA for approval;

(4) Establish the time periods for each restoration phase that will result in maximum feasible progress toward the highest attainable use and the designated use identified in paragraph (g)(2) of this section, except that the sum of such time periods shall not exceed twenty years from the initial date of establishment of the restoration WQS under this section;

(5) Specify the spatial extent of applicability for all affected waters;

(6) Meet the requirements of §§ 131.10 and 131.20; and

(7) Include, in its State water quality standards, a specific provision that if the interim restoration designated uses and criteria established under paragraph (g)(3) of this section are not met during any phased time period established under paragraph (g)(4) of this section, the restoration WQS will no longer be applicable and the designated use and criteria identified in paragraph (g)(2) of this section will become applicable immediately.

(8) Provide that waters for which a restoration water quality standard is adopted will be recognized as impaired for the purposes of listing impaired waters under section 303(d) of the CWA until the use designated identified in paragraph (g)(2) of this section is attained.

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