

APPENDIX B: Approval Rationale - Nutrient Thresholds in IWR

Overview:

Florida's narrative water quality standard for nutrients 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." See Florida Administrative Code (F.A.C.) rule 62-302.530(47)(b).¹ In the Impaired Waters Rule (IWR), the Florida Department of Environmental Protection (FDEP) has established quantitative thresholds of impairment used to identify water bodies that do not meet their water quality standards with respect to that narrative nutrient criterion. See F.A.C., rules 62-303.350, .351, .352, and .353. These thresholds of impairment represent a "translator"² of the narrative criterion for certain applications of the state's water quality standards, and are expressed as an increasing annual trend in trophic state index (TSI) for lakes or chlorophyll-a mean values for streams, estuaries, and open coastal waters.

The thresholds of nutrient impairment established in the IWR are "one-sided" in nature. That is, the thresholds represent upper boundary conditions above which a water

¹ At 62-302.530(47)(a), Florida's narrative water quality standard for nutrients also provides:

The discharge of nutrients shall continue to be limited as needed to prevent violations of other standards contained in this chapter. Man-induced nutrient enrichment (total nitrogen or total phosphorus) shall be considered degradation in relation to the provisions of Sections 62-302.300, 62-302.700, and 62-4.242, F.A.C.

It is not necessary to have an explicit assessment methodology for this provision, since the nutrient impairment is secondary (and in fact causes) the primary impairment. For example, in a water where nutrients are contributing to an exceedance of Florida's water quality criteria for dissolved oxygen (DO), the water would be included on the state's section 303(d) list as impaired for DO. Excess nutrients would be identified as the pollutant causing the DO impairment. Excess nutrients would not necessarily have to be identified as an impairment.

² In water quality standards, a translator identifies a process, methodology, or guidance that states or tribes will use to quantitatively interpret narrative criteria statements. Different translators may serve to quantitatively interpret narrative criteria as they are applied for different purposes as long as they share the same intended level of protection. In addition, translator mechanisms can be used to make appropriate interpretations of narrative criteria where there is uncertainty in determining a specific threshold of protection. Translators may consist of biological assessment methods (e.g., field measures of the biological community), biological monitoring methods (e.g., laboratory toxicity tests), models or formulae that use input of site-specific information/data, or other scientifically defensible methods.

body is not meeting its applicable water quality standards (unless demonstrated otherwise) and is identified as impaired (i.e., included by FDEP on the state's Verified list or in Category 5 of its integrated water quality report to EPA³). In other words, TSI or chlorophyll-a values demonstrate that there is an "imbalance" in flora and fauna such that the narrative nutrient criterion is not attained. Waters below the IWR thresholds, however, are not considered in attainment of the narrative criterion. Rather, waters with TSI or chlorophyll-a values below the threshold of impairment are considered "unassessed" (i.e., Category 3 of FDEP's Integrated Report). These waters would continue to be included in Category 3, rather than Category 1 or 2, of the Florida Integrated Report until 1) FDEP adopts and EPA approves numeric criteria for nutrients; or 2) FDEP develops other methodologies that can be used to determine that an imbalance of flora and fauna does not exist in a water body.

EPA's interpretation of the one-sided nature of the nutrient thresholds is informed by Florida's rationale for the one-sided threshold, which is described in a nine-page attachment submitted by FDEP as part of their overall 2007 IWR submission package ("Development and Application of the Nutrient Thresholds in the Impaired Waters Rule," September 14, 2007):

The IWR thresholds represent a combination of "1-sided" tests, in which values above the threshold indicate impairment, while water quality criteria are values **below** which the water is attaining standards. Water quality criteria typically include safety factors to ensure that waters attain standards when the values are below the criteria. For the case of some of the nutrient thresholds, most notably the annual average chlorophyll-a thresholds of 20 µg/L for streams and 11 µg/L for estuaries, waters with values above the thresholds are normally impaired by nutrients, but waters with annual means below the thresholds cannot conclusively be determined to meet standards.

Although FDEP appears to distinguish one-sided impairment thresholds from criteria values, EPA considers one-sided impairment thresholds to be criteria values. One-sided thresholds represent a numeric translator of the narrative nutrient criterion statement, adding magnitude and duration values to the narrative criterion statement contained in F.A.C. rule 62-302.530(47)(b). Additionally, the one-sided impairment thresholds have been established by Florida's rule-making process.

While the IWR only identifies "impairment thresholds" (upper boundary conditions for TSI and chlorophyll-a above which a water body is considered impaired),

³ Several sections of the CWA require states to report on the quality of their waters. EPA has recommended that states provide a single water quality monitoring and assessment report (the Integrated Report) that combines these requirements, including the section 303(d) list or impaired waters list. Currently only waters listed in Category 5 of FDEP's Integrated Report are included on Florida's section 303(d) list.

and does not identify “attainment thresholds,” it also provides for case-by-case assessment of water bodies that fall below the impairment threshold. Specifically, F.A.C. rule 62-303.350 allows for other information (aside from a threshold) to be used to determine if an imbalance in flora or fauna exists:

Trophic state indices (TSIs) and annual mean chlorophyll-a values shall be the primary means for assessing whether a water should be assessed further for nutrient impairment. Other information indicating an imbalance in flora or fauna due to nutrient enrichment, including, but not limited to, algal blooms, excessive macrophyte growth, decrease in the distribution (either in density or areal coverage) of seagrasses or other submerged aquatic vegetation, changes in algal species richness, and excessive diel oxygen swings, shall also be considered.

In addition, the IWR's verified list methodology allows for the development of site-specific thresholds that better represent the levels at which nutrient impairments occur:

A water shall be placed on the verified list for impairment due to nutrients if there are sufficient data from the last five years preceding the planning list assessment, combined with historical data...to meet the data sufficiency requirements of rule 62-303.350(2), F.A.C. If there are insufficient data, additional data shall be collected as needed to meet the requirements. Once these additional data are collected, the Department shall determine if there is sufficient information to develop a site-specific threshold that better reflects conditions beyond which an imbalance in flora or fauna occurs in the water segment. If there is sufficient information, the Department shall re-evaluate the data using the site-specific thresholds. If there is insufficient information, the Department shall re-evaluate the data using the thresholds provided in rule 62-303.351-.353, F.A.C., for streams, lakes, and estuaries, respectively. (F.A.C. rule 62-303.450).

Considered together, F.A.C. rules 62-303.350 and .450 provide sufficient flexibility to utilize additional information where available, maintain the flexibility inherent in the narrative criterion statement, and ensure that water bodies not meeting their water quality standards for nutrients are properly identified, regardless of whether or not the impairment threshold is exceeded. This flexibility is Florida’s intent, as evidenced in the attachment submitted by FDEP as part of their 2007 IWR submittal document (“Development and Application of the Nutrient Thresholds in the Impaired Waters Rule,” September 14, 2007):

...the Department acknowledged that the default thresholds developed for different waterbody types could not possibly address all the potential expressions of nutrient impairment in all waters. Chapter 62-303, F.A.C., includes additional thresholds designed to protect oligotrophic waters, an option to determine site-specific thresholds, and a provision that maintained the flexibility of the narrative criteria. This makes the various listing thresholds complex, but ensures they are fully protective for all State surface waters.

Regulatory Basis for Review:

The regulatory basis for approval of “one-sided” impairment thresholds comes from adherence to the principles stated under 40 C.F.R. § 131.11. That is, states and tribes must adopt criteria that protect the designated use, and such criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use. These requirements apply to numerical criteria, narrative criteria, and criteria based upon bio-monitoring methods. If a state elects to supplement their narrative criteria with quantitative translators, then these specific procedures are expected to adequately perform the tasks expressed by the words of the narrative for the specific functions identified. In the case of a “one-sided” threshold of impairment for assessment purposes, the translator is expected to:

- (1) Have a basis in science that relates the measurements specified by the procedure to the desired condition or adverse effect to be avoided, as described by the narrative;
- (2) Effectively separate waters into groups where (a) protection of the use is clearly threatened or impaired and (b) where protection of the use is uncertain (thresholds set too high may not be effective because they exclude waters that are clearly threatened or impaired and call into question the remaining applicability of the narrative; on the other hand, thresholds set too low may ultimately be deemed protective, yet serve no useful purpose in discriminating data or waters into appropriate categories in the State/Tribal Integrated Report);
- (3) Utilize the proper parameters and constituents to achieve the objectives set forth above.

Nutrient Thresholds for Lakes, Streams, Estuaries, and Open Coastal Waters:

F.A.C. rules 62-303.351, .352, and .353 contain the thresholds for placing streams, lakes, estuaries, and open coastal waters on the planning list of potentially impaired waters. The thresholds for each water body type are outlined below, along with the technical basis for each threshold, as described in FDEP’s attachment.

Lakes:

For nutrients in lakes, Florida has established a threshold of impairment based on an increasing trend in TSI. TSI usually relies on Secchi depth, chlorophyll, and total phosphorus to describe a lake’s trophic status. Florida’s TSI, however, includes total nitrogen as a third indicator, rather than Secchi depth, as Secchi depth can be misleading given the existence of dark-water lakes and estuaries in the state. The Florida-specific TSI (based on chlorophyll-a, total nitrogen, and total phosphorus concentrations) was determined based on a regression analysis of data from 313 Florida lakes, and was adjusted so that a chlorophyll-a concentration of 20 µg/L was equal to a TSI value of 60. An annual average TSI of 60 was then set as the threshold for nutrient impairment for

most lakes (those with a color higher than 40 platinum cobalt units) because phytoplankton populations often switch to communities dominated by blue-green algae at chlorophyll-a levels above 20 µg/L. In other words, lakes or lake segments will be included on the planning list for nutrients if the annual mean TSI exceeds 60 (unless paleolimnological information indicates the lake would naturally score greater than 60).

Because of the great diversity and productivity of Florida lakes, some lakes have natural background TSI values that are higher than 60, while other lakes are naturally oligotrophic and have significantly lower natural background TSIs. In recognition of this natural variation, the IWR allows for the use of a lower TSI threshold of 40 in very clear, oligotrophic lakes (those with a mean color less than 40 platinum cobalt units), unless paleolimnological information indicates the lake was naturally greater than 40.

In addition, lakes or lake segments will be placed on the planning list for nutrients if data indicate that annual mean TSIs have increased over the assessment period, or the annual mean TSI has increased by more than 10 units over historical values. FDEP recognizes that changes from a baseline condition in an important measure of primary production can often be indicative of a change in the balance of flora and fauna. As such, this relative comparison threshold provides a level of protection for individual lakes that cannot be obtained through application of general threshold values.

Streams:

For nutrients in streams, Florida has proposed establishing a combination of a narrative threshold (“algal mats are present in sufficient quantities...”) and two chlorophyll-a thresholds. The first chlorophyll-a threshold states that mean chlorophyll-a values may not increase more than 50% over historical values for two or more consecutive years. When comparing changes in chlorophyll-a values to historical levels, historical levels are based on the lowest five-year average for the period of record. To calculate a five-year average, there must be annual means from at least three years of the five-year period. This is a conservative impairment threshold for streams with naturally low chlorophyll-a levels, and is very protective for oligotrophic streams. FDEP recognizes that changes from a baseline condition in an important measure of primary production can often be indicative of a change in the balance of flora and fauna. As such, this relative comparison threshold provides a level of protection for individual streams that cannot be obtained through application of general threshold values.

The second threshold (20 µg/L) is more protective for streams with naturally high chlorophyll-a concentrations. In these cases, a supplement to the baseline comparison is useful because variability and lack of a trend emerging from collected data could mask levels of primary production that exceed those associated with natural flora and fauna balance. To establish this upper bound, FDEP evaluated historical chlorophyll-a data from state streams and determined the 90th percentile for state streams was approximately 23 µg/L. The slightly lower threshold of 20 µg/L was selected to be somewhat more conservative, and represents an upper bound at which the state can confidently conclude

the waters are impaired. This upper percentile threshold is based on professional judgment from experience in evaluating conditions in Florida streams.

Estuaries and Open Coastal Waters:

The impairment thresholds for estuaries and open coastal waters are similar to those for streams, although there is no narrative provision (similar to the narrative provision for streams described above) and the upper bound for estuaries is 11 µg/L, rather than 20 µg/L. This level is based on an evaluation conducted under contract to FDEP that found that a median annual chlorophyll-a concentration of 11 µg/L reflected the breakpoint for highly eutrophic estuaries. FDEP established the threshold as a mean, rather a median, to make the threshold more environmentally protective (the average is more sensitive to algal blooms than the median).

Delisting Procedures:

F.A.C. rule 62-303.720 outlines the conditions under which a water body may be de-listed from the planning and verified lists. For the verified list, rule 62-303.720(2)(j) provides that, for waters listed based on nutrient impairment, “the water shall be de-listed if it does not meet the listing thresholds in Rule 62-303.450 F.A.C., for three consecutive years.” EPA understands this to mean that waters de-listed from the verified list are not considered either “unimpaired” or “not meeting water quality standards” but, rather, are considered “unassessed.” In these instances, newer data express significant uncertainty as to whether the waters are impaired.

Typically, data used to assess waters will be compared to numeric criteria as opposed to one-sided impairment thresholds. In such cases, a delisting decision will be made where data show that pollutant concentrations are below the numeric criteria and, therefore, the condition that was the basis for listing no longer exists. . Similarly, in the case of one-sided impairment thresholds, a delisting decision will be made where data show that pollutant concentrations are below the impairment thresholds and, therefore, the condition that was the basis for listing no longer exists. Because the threshold is one-sided, however, the water is considered “unassessed” rather than “unimpaired.”

Conclusion:

EPA has determined that the one-sided impairment thresholds for streams, lakes, estuaries, and coastal waters established in the 2007 IWR constitute new or revised water quality standards. When taken into account with the processes outlined in the IWR that allow for use of additional information where available, the thresholds enhance the function of the existing narrative criterion to protect the designated uses of all water bodies in the State for the purposes of determining impairment, and meet the requirements of 40 C.F.R. § 131.11 as outlined above.