Numeric Nutrient Standards for the State of Florida

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How are nutrients regulated now?

- **Current, general "narrative" standard:**
  "[I]n no case shall nutrient concentrations of body of water be altered so as to cause an imbalance in natural populations of flora or fauna." (Generally, relates to concentrations of nitrogen and phosphorus compounds and the potential for algae blooms).

Currently enforced through:

- Water-Quality Based Effluent Limits (WQBELs) in permits, under existing permit system for point sources (the NPDES program). Permit limits may require maximum concentrations or mass loadings.
- For waters designated as "impaired" under the Total Maximum Daily Load (TMDL) program, reductions are encouraged and required under a variety of programs through "basin management action plans." Typically, a WQBEL will set a loading rate for total nitrogen and total phosphorus, and loading reductions are required for point sources (industry, public wastewater treatment plants) and nonpoint sources (stormwater, agricultural).
- Outside of CAFOs, agricultural sources are regulated indirectly, through BMP requirements and the TMDL program.

SAMPLE CONDITIONS, LOW NUTRIENTS

Weeki Wachee Springs, 1950s, <1 mg/l Nitrates

SAMPLE CONDITIONS, ELEVATED NUTRIENTS (2001)

Weeki Wachee Springs, 2001, 7 mg/l Nitrates

What are the economic consequences of numeric nutrient standards?

- Difficult to determine with certainty until the numbers are final. However, proposed numeric criteria are likely to be extremely over-protective.
- If adopted, will have drastic consequences for wastewater utilities. It is likely that a combination of biological treatment and reverse osmosis will be required in order to achieve compliance, which will lead to high capital costs and high ongoing energy costs. Projected direct capital costs for 10 MGD WWTP: $134 - $161 M. Projected annual energy costs to operate a 15 MGD reverse osmosis plant in Clay County: 2.3M/year.
- Existing standards for comparative purposes:
  - AWT Standards, Grizzle-Figg Act: 3 mg/l TN, 1mg/l TP
- Range of concentrations that may result based on existing guidance, general ranges for streams:
  - LOWER RANGE: TP, .017 mg/l (Panhandle); TN, .435 mg/l (Panhandle)
  - UPPER RANGE (outside of Bone Valley): TP, .359 mg/l (North Central); TN, 1.73 (outside of Panhandle)
- Likely nitrate-nitrite standard that may result for “clear streams” (less than 40 PCU): .35 mg/l
- Effects on agribusiness: unknown.

Where does the initiative for numeric nutrient standards come from?

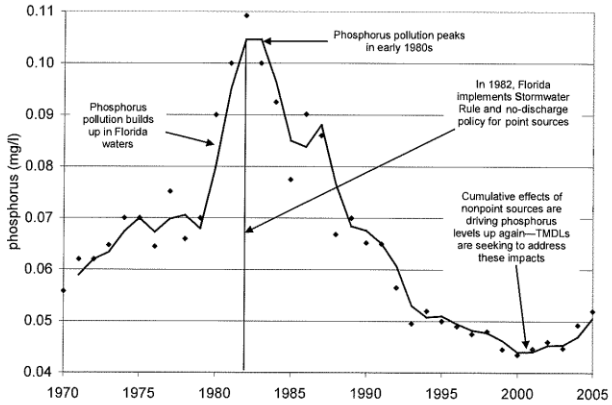
- 1998, EPA, National Strategy for the Development of Regional Nutrient Criteria
- Under the Clean Water Act, EPA has the discretionary duty to determine that a new or revised water quality standard is necessary for a state to meet the requirements of the Clean Water Act. If it makes that determination, EPA has a mandatory duty to adopt a new standard.
- Since 1998, EPA had approved DEP's approach to study the numeric standards. DEP made extensive efforts to adopt defensible standards based on dose-response relationships.
- 2008 Lawsuit, Florida Wildlife Federation v. EPA. Theory: EPA had already determined that numeric nutrient standards are necessary for the State of Florida.
- Following that lawsuit, in January 2009, EPA made a formal determination that numeric nutrient standards are necessary for the State of Florida.
- Following that formal determination, EPA entered into a consent decree with the environmental groups, establishing a schedule for the adoption of numeric nutrient criteria.
- Agricultural and industry groups, who intervened in that lawsuit, have pending cross-claims against EPA to challenge the validity of EPA's determination. If that relief is granted, EPA would be without authority to adopt standards for the State of Florida.

What is the schedule for adopting numeric nutrient standards for Florida?

- Deadline for EPA to propose numeric nutrient standards for lakes and flowing waters: January 14, 2010.
- Deadline for EPA to propose final rule on numeric nutrient standards, lakes and flowing waters: October 15, 2010.
- Deadline for EPA to propose numeric nutrient standards for coastal waters and estuaries: January 14, 2011.
- Deadline for EPA to propose final rule on numeric standards for coastal waters and estuaries: October 15, 2011.

Is this really necessary?

Figure 3. Phosphorus Trends in Florida Waters, 1970–2005
(based on 733,000 measurements from 3,330 waterbodies)



and activities associated with implementing approved Comprehensive Conservation and Management Plans (CCMPs) under the National Estuary Program (NEP) established by Section 320 of the CWA.

Key elements of the survey are as follows:

- *Facilities must be publicly owned and operated,*
- *Costs represent capital needs (operating and maintenance costs are not represented), and*
- *Costs must be documented.*

Historically, the costs have been interpreted as representing 20-year design needs, but more recently, since the 1996 survey, costs have been documented by planning and design documents representing horizons of 10 years or less.

The survey is conducted every four years, and the results are published in the *Clean Watersheds Needs Survey Report to Congress*. The 2004 survey is available at http://www.epa.gov/owm/mtb/cwns/2004rtc/toc.htm. ***Table 3*** provides Florida's survey results.

How could EPA go about developing numeric standards?

- **A “dose-response” relationship could be described by a model (*e.g.,* bio-criteria), which in turn would link nutrient concentrations to the relative risk of environmental harm. DEP has supported the “dose-response approach”, since it establishes a cause/effect relationship between nutrients and valued ecological attributes, and is directly linked to maintaining designated uses.**

- **If a "dose-response" approach does not work, EPA has recommended a “reference site approach.” In this approach, concentration data are collected from relatively pristine water bodies, and the results are compiled. The standard is set at an upper percentile value (75-90%) to represent a level of nutrient concentration that would inherently protect aquatic life. In other words, the higher range of concentrations in pristine streams would be used as an arbitrary benchmark.**
  - **To translate: assume a bell curve showing nutrient concentrations for a set of pristine streams. The standard is set at the seventy-five percent mark of that bell curve, or at some higher percentage.**
- **One other approach is referred to as the “all streams” approach. This approach is similar to the reference stream approach, but the database includes all streams in the region, and the standard is set at the lower end of the range (i.e., 25 %). In other words, 75% of Florida waters will be deemed impaired for nutrients, regardless of their current condition.**

What are the shortcoming in the use of the dose-response approach?

I. After extensive study and efforts by FDEP, with some qualifications, it did not work.

"Proposed Methods and Approaches for Developing Numeric Nutrient Criteria for Florida's Inland Waters" (EPA 2009)

[Discussing efforts to develop numeric standards based on stressor-response relationships]

> The results of the analyses generally indicate that many of the biological measures evaluated exhibit a significant adverse response to anthropogenic nutrient enrichment. However, **the statistical relationships between the biological response variables and nutrient levels are weak, and DEP could not identify specific thresholds for establishing numeric nutrient criteria from the analyses.** The direct and indirect adverse effects of nutrient enrichment on biological communities have been demonstrated repeatedly under controlled conditions (Stevenson et al. 2007). **The analyses did not show strong statistical relationships between nutrients and these effects. This may be because the biological responses can be confounded by numerous other factors (including low residence time for uptake) and confounding variables under real world conditions found in natural streams**. This is especially true for Florida streams, which can range from:

- • crystal clear spring fed streams with low nutrient levels and high conductivity, to
- • highly colored streams fed by wetlands with an abundance of organic nitrogen, to
- • streams that exhibit naturally high phosphorus levels resulting from geologic phosphate deposits lying near the surface, to
- • streams that can be any combination of the above.
- ["Proposed Methods" at 71]

Additional commentary on dose-response approach (EPA/DEP):

- [Summarizing various analyses on a stress-response approach]:

- **The results of the analyses generally indicate that many of the biological measures evaluated exhibit a statistically significant adverse response to nutrient enrichment, however, the relationships between the biological response variables and nutrient levels were confounded by numerous other factors such as color, pH conductivity, and canopy cover.** The confounding effects of these other variables result in weak statistical relationships between measures of the biological communities and nutrient levels. While DEP believes the effect of nutrients on the biological communities is not clear enough to be used as the sole basis for establishing numeric nutrient criteria, the observed relationships between nutrients and the various biological measures demonstrate the need for nutrient criteria to prevent adverse biological effects in Florida streams.

- ["Proposed Methods" at 84]

Maybe the reference stream approach would work?

- [Introductory comments to discussion of benchmark methods]:

- One disadvantage of using the benchmark approach is that it does not identify the specific nutrient levels at which biological impairment occurs. For this reason, it cannot be concluded a priori that adverse effects on aquatic life actually occur at concentrations above these values.

- ["Proposed Methods" at 85] (Introductory comments to benchmark methods)

Summary of technical shortcomings in current approach

- Because of overall failure in dose-response approach, there is no identified cause and effect relationship between nutrient impairment and any specific range of range of concentrations.
- Without a cause-and-effect relationship, how can any general range of numeric standards make sense?
- Correlation does not necessarily indicate causation
- Inadequate analysis on the effect of known and unknown confounding variables (water color, canopy cover, pH, conductivity, grazing patterns).

Conclusion: Potential Outcomes

- Current challenges to EPA determination; potential future challenge to EPA proposed criteria under Federal APA
- Potential adoption of standards by State of Florida; potential challenges under Florida APA
- Unknown how EPA regulations, if they go into effect, will account for existing efforts under TMDL program and how exceptions may be made based on site-specific conditions
- Unknown how EPA regulations, if they go into effect, may be enforced against non-point sources.