FLORIDA WILDLIFE FEDERATION

Affiliated With National Wildlife Federation

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COMMENTS ON EPA'S DRAFT GUIDANCE DOCUMENT
EMPIRICAL APPROACHES FOR NUTRIENT CRITERIA
By
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I am President and CEO of the Florida Wildlife Federation (FWF), a position which I have held for the past 22 years. I completed my undergraduate degree at Duke University with dual majors in Zoology and History, and received my Master's Degree from North Carolina State University in Wildlife Biology.

Florida Wildlife Federation is a statewide non-profit conservation and education organization which is headquartered at 2545 Blairstone Pines Drive, Tallahassee, Florida, 32301, the Federation has approximately 13,000 members statewide. The Federation's mission includes the preservation, management, and improvement of Florida's water resources and its fish and wildlife habitat. The Federation represents its members in state and federal litigation brought to preserve and protect Florida's rivers, lakes, and estuaries. A substantial part of that litigation has been to enforce Clean Water Act requirements that would serve to protect Florida's water resources from excessive nutrient pollution.

For example, the Federation has participated on behalf of its members in legal and administrative challenges to defend and otherwise support rules that protect Lake Okeechobee from excessive nutrient pollution. In 1998, the Federation brought a civil action against the Environmental Protection Agency ("EPA") which resulted in a Consent Decree that required the agency to promulgate total maximum daily loads ("TMDLs") for nutrients in Lake Okeechobee and the Northern Tributaries of the Lake (*Florida Wildlife Federation, Inc. et al v. United States Environmental Protection Agency*, No. 4:98CV356-WS (N.D. Fla., Tallahassee Division, April 22, 1998)). The Federation later brought an administrative challenge against the Florida Department of Environmental Protection ("DEP") regarding TMDLs developed by DEP for the Northern Tributaries. The administrative law judge in that case held that DEP had arbitrarily and capriciously applied the "reference stream" approach in developing nutrient criteria for the Northern Tributaries of Lake Okeechobee (*Florida Wildlife Federation, Inc. et al v. Florida Department of Environmental Protection,* No. 03-3532RP (Fla. Div. of Administrative Hearings, March 22, 2005)). The Federation is currently involved in a challenge to EPA's Final TMDL for nutrients in the Lake Okeechobee tributaries and in a citizen suit brought to enforce EPA's mandatory duty to set numeric nutrient criteria for Florida's waters.

It has been repeatedly demonstrated that the addition of nutrients, which in Florida is most often associated with agricultural runoff, stormwater runoff, and human and animal wastes, has both direct and indirect adverse impacts on biological communities. (Stevenson, 2007; Robertson *et al.*, 2008). Those adverse biological impacts, which include explosive algae growth, negatively impact water body health and interferes with the designated uses of those water bodies such as recreation, fishing, swimming, and use as potable water supplies.

The most defensible approach to developing nutrient criteria, and one which is being advocated by EPA, is to establish cause and effect relationships between nutrients (stressors) and valued ecological attributes. I support this approach because it establishes a correlative relationship between nutrients and valued ecological attributes and is also linked to the maintenance of designated uses of water bodies.

II. ESTABLISHING THRESHOLDS

Excessive nutrient pollution of Florida's waters is most visibly demonstrated by explosive growths of cyanobacteria. Toxic algae outbreaks are becoming increasingly common in Florida's waters and nationwide. (USGS, 2006). Attached to these comments are photographs of recent algae outbreaks in Florida. They include a photograph of an algae bloom that is occurring on the St. John's River in Jacksonville even as these comments are being written. A public health advisory is in effect. A similar outbreak in 2005, dubbed "The Green Monster" by local press, completely shut down boat traffic in the City of Jacksonville. In establishing thresholds for nutrient pollution, EPA should consider all lines of evidence, including those developed using the tried and true statistical methodologies in the document under review.

III. SEASONALITY

Algae blooms happen in nutrient laden, slowly moving, hot waters. They do not occur year round and might not occur every year. However, when they do occur they are not merely an aesthetic issue. Cyanobacteria blooms cause taste and odor problems in drinking water and when mixed with disinfection chemicals, create disinfection byproducts that are tetragenic and mutagenic. (Hudnell, 2006). Toxic blooms create serious public health threatens and can sicken and even kill wildlife. A methodology needs to be developed with the goal of eliminating these blooms which obviously impair designated uses. Attached to these comments are photographs of a toxic algae bloom on the Caloosahatchee River in Southwest Florida. This bloom shut down a drinking water plant which serves 30,000 people. The threshold set for numeric nutrient criteria must ensure that such blooms do not happen. Therefore, EPA should not be looking at measures of central tendencies because that does not capture the conditions which cause these blooms to occur.

IV. REFERENCE STREAM APPROACH

The reference stream approach, which is contained in earlier EPA guidance, is one of line of evidence that can and should be pursued. However, its application in Florida was the subject of litigation by Florida Wildlife Federation and the results of that litigation revealed certain

inherent dangers in relying upon the numbers produced by this approach without examining all the other lines of evidence including those recommended in the EPA document under review.

In earlier guidance EPA recommended use of a "reference stream" approach to develop numeric nutrient criteria. This approach has two parts. First, a set of minimally impacted reference streams in an ecoregion is selected, the nutrient data connected with those streams is collected, and a determination is made of the 75 percentile of that data. This number is then compared to the 25 percentile of nutrient data collected for all streams in that ecoregion. Should the numbers coincide EPA recommends that the threshold be set at that number. If the numbers do not coincide, additional lines of evidence should be evaluated and determination made as to what percentile would be protective of designated uses. The Florida Department of Environmental Protection has advocated at least part of this approach in developing nutrient criteria for Florida streams. FWF's litigation with FDEP over the nutrient thresholds this methodology produced exposed the weaknesses of this approach which I believe is highly problematic if the numbers obtained are not confirmed by other means.

First, the methodology assumes that minimally impacted streams exist in an ecoregion. That is not the case in Florida or in many other states where nutrient pollution (both agricultural and urban) is longstanding and pervasive. Second, the approach may not capture many sources of pollution which are not readily available in aerial photographs or even in site visits. For example, because Florida is topographically flat and is subject to frequent and intense rainfalls, runoff must be channeled off agricultural lands into the nearest waterbody usually through channels dug through its riparian border. Because agricultural runoff is not legally a "point source" of pollution under the Clean Water Act, these many discharge points, often carrying heavily nutrient laden water, do not show up as a "source" of pollution. Additionally, Florida, has many Karst regions where water flows underground through limestone formations that provide channels for underground flow. As a result, nutrient laden waste water that is deposited on the ground has a direct underground path to springs. (Stevenson, 2007). Third, there is always a question concerning the choice of data. For example, Florida rejects the use of data more than ten years old which means that perfectly good data that may have been collected at a time when an area was less developed (which would have the effect of producing a lower nutrient criteria) is arbitrarily being removed from the data set. Florida's historical data set for total phosphorus, (Odum, 1953), indicates that historically total phosphorus in streams similar to those used in Florida's reference stream data set for streams of the Florida Peninsula was an order of magnitude less than what is currently being found by the Department of Environmental Protection. (FDEP, 2009).

V. STATISTICAL TOOLS

The Empirical Approaches for Nutrient Criteria Derivation provides appropriate guidance for selecting stressor response variables. As explained above, in Florida the most acute and immediate problem are toxic algae blooms that are becoming more frequent and are appearing in more water bodies. Thus, the selection Chlorophyll a would be most immediately appropriate as a response variable and the EPA approach confirms that conclusion. There is abundant data, especially in Florida with which to examine the relationships between nutrients and Chlorophyll a, which abundance provides the foundation for the use of statistical tools.

Before those tools are used, simple scatter plots confirm the conclusions from the literature that demonstrates the nexus between high nutrient loading and biological responses, including increases in algae. In general, the conditional probability approach is obviously appropriate for use in deriving nutrient criteria under the Clean Water Act. Responses are affected by other non-nutrient variables, so that conditional probability expresses the risk of environmental or ecological impairment given a nutrient concentration higher than a criterion value.

The matter of differing relationships between nutrient concentrations and environmental/ecological response varies somewhat by ecoregion because of geologic, climatic, and water chemistry variations. However, the EPA Empirical approach need not seek absolute homogeneity because substantial differences between regions can be identified in the data distributions. Moreover, opponents to the empirical approach seek delay through extreme exactitude that is not science but more often ultimately policy driven.

The proposed methodologies for assessing the strength of causal relationships are thoroughbred main-stream statistical methods that have been established and used in science and industry for decades. The availability of more robust applications has become possible with larger data sets and faster and powerful computers. Laboratory testing has confirmed the conceptual models of the effect of nutrients on water bodies. However, the nature of field data that other variables tend to reduce the apparent strength of the causal relationships. Expectations about correlation coefficients and the percent of variation in the response variable explained by the stressor variable must be realistic and comport with the standards used in the scientific community. The EPA Empirical approach does that.

The other statistical methods – propensity score analysis and structural equation models – are appropriate additional lines of analysis that add quantitative support to the analytical process. Moreover, the use of simple linear regression, quantile regression, logistic regression, and bivariate models is pure main-stream methodology appropriately used by EPA. The same is true of multiple linear regression, non-parametric changepoint analysis, and discontinuous regression models.

However, these statistical tools are a major line of evidence that should be considered in conjunction with other evidence.

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Robertson, D.M., B.M. Weigel, and D.J. Graczk, 2008. Nutrient Concentrations and Their Relations to the Biotic Integrity of Nonwadeable Rivers in Wiconsin: U.S. Geological Survey Professional Paper 1754.

USGS, 2008 "HAB Briefing Sheet."

Arlington Boat Ramp off of University Blvd. in Jacksonville during 2005 St. Johns River Bloom Event (Photograph courtesy of Neil Armingeon, St. Johns Riverkeeper).

Exhibit

B2

***Microcystis* Bloom in Caloosahatchee River at Olga, Florida approximately a mile and a half west of the Franklin Lock, south side of the river, October 14, 2005 (Photo Courtesy of Richard Solveson).**

Exhibit

C1

Anabaena **Algae Bloom in Caloosahatchee River at Franklin Lock, June 17, 2008**
(Photo Courtesy of John Cassani).

Exhibit

D1

Anabaena **Algae Bloom in Caloosahatchee River at Franklin Lock showing Olga Water Treatment Plant, June 17, 2008. (Photo Courtesy of John Cassani).**

Exhibit

D2

Leon County Website: October 2007 Presentation - Lake Munson Update.
(Accessible at: www.leoncountyfl.gov/PUBWORKS/Engineering/Stormwater_Management/Lake%20Munson%20Update%2010.1.07.pdf).

Exhibit

H2