ABE 381

UF UNIVERSITY of FLORIDA
IFAS Extension

Evolution of Water Quality Regulations in the United States and Florida[1]

Kati W. Migliaccio, Yuncong Li, and Thomas A. Obreza[2]

Introduction

Water is essential to sustain life. However, not only do we all need a certain quantity of water each day, but the quality of the available water is also critical. Water quality protection in the United States evolved dramatically during the 20th century, from initially ensuring navigability of waterways to the present emphasis on protecting our natural ecosystems.

The intent of this document is to summarize U.S. water quality legislative history, Florida water quality legislation (particularly regarding Total Maximum Daily Loads), and water quality criteria. This document provides a background for understanding water quality and how it is evaluated and regulated in the U.S. with particular focus on the state of Florida.

U. S. Water Quality Legislative History

Interest in protecting U.S. waters through legislation started at the beginning of the 20th century with the Rivers and Harbors Act (RHA) of 1899. The RHA included a provision (known as the Refuse Act) that addressed the dumping of refuse into waterways (Downing et al. 2003). Although the RHA with the Refuse Act included many environmental policies, few were actively enforced.

The next significant water-related legislation was the 1948 Federal Water Pollution Control Act. This act placed responsibility for controlling water pollution on the states and primarily focused on the treatment of sewage wastes (Deason et al. 2001). Thus, early water protection efforts focused on "point sources" of pollution. (Point source pollution refers to pollution from a stationary location or fixed facility, such as a pipe, ditch, ship, or factory smokestack.)

Water quality began to receive more attention in the late 1960s due to the 1969 Cuyahoga River fire in Cleveland, Ohio, and growing public awareness of water quality decline due, in part, to Rachel Carson's book—*Silent Spring* (Carson 1962). Thus, it is not surprising that amendments to the Federal Water

1. This document is ABE 381, one of a series of the Department of Agricultural and Biological Engineering, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. First published: December 2007. Revised January 2011. Please visit the EDIS website at http://edis.ifas.ufl.edu.
2. Kati W. Migliaccio, associate professor, Agricultural and Biological Engineering Department, Tropical Research and Education Center–Homestead; Yuncong Li, professor, Soil and Water Science Department, Tropical Research and Education Center–Homestead; Thomas A. Obreza, Interim Associate Dean for Extension and Professor, Soil and Water Science Department; Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

Pollution Control Act were passed in the 1970s to improve the protection of U.S. water resources. These amendments are commonly referred to as the 1972 Clean Water Act (CWA). The CWA identified the goal of restoring waters considering their chemical, physical, and biological integrity. The CWA also set federal requirements for identifying polluted or impaired water bodies and for developing estimated loads of a particular pollutant that could be received by each water body and still meet water quality standards. This concept is often referred to as the Total Maximum Daily Load (TMDL). Additionally, the CWA gave authority to the U.S. Environmental Protection Agency (EPA) to issue permits to major pollutant dischargers and to establish national discharge limitations.

Although the CWA included many water quality measures, few were actively enforced. This lack of action led to an era of lawsuits during the 1990s when more than 35 states and environmental groups sued the EPA, alleging that it failed to fully implement requirements set forth by the CWA, such as the TMDL (Copeland 2005). Hence, additional legislation and clarification of the TMDL requirements in the CWA were developed.

Currently, the TMDL program is administered considering the 1992 TMDL regulations. Specifically (per EPA website information), states, territories, and authorized tribes must:

- submit a list of waters that are impaired and/or threatened by pollutants (often referred to as the 303(d) list);
- establish priority ranking of the listed water bodies, taking into account the severity of pollution and the designated uses of the water;
- identify waters targeted for TMDL development; and
- develop and implement TMDLs.

The EPA defines a TMDL as "the sum of allocated loads of pollutants set at a level necessary to implement the applicable water quality standards, including: waste load allocations from point sources and load allocations from nonpoint sources and natural background conditions. (Nonpoint sources are sources that are diffuse, or without a single point of origin, such as agriculture, urban, and construction sources.) A TMDL must contain a margin of safety and a consideration of seasonal variations" (USEPA 2007a). The TMDL is sometimes expressed as an equation:

$$TMDL = WLA + LA + MOS \quad (1)$$

where WLA is the waste load allocation from point sources, LA is the load allocation from nonpoint sources and natural background concentrations, and MOS is the margin of safety. MOS is used to account for uncertainties and variability in estimating WLA and LA. Often, MOS is considered to be a percentage (10 to 15%) of the WLA and LA. Others have considered conservative estimations of WLA and LA and thus described the estimated MOS as implicit due to these conservative assumptions.

The determination of appropriate WLA and LA for a TMDL requires that the allowable load for the particular constituent be known or attainable. Thus, there must be a designated concentration or load that should not be exceeded that ensures that designated uses are being met for constituents.

The states, territories, and authorized tribes were charged with the mission to identify impaired or threatened waters and develop TMDLs as needed.

Florida Water Quality Legislation

Legislation was passed in Florida to address the TMDL mandate that was issued by the EPA, namely the 1999 Florida Watershed Restoration Act (FWRA) (s.403.067 F.S.). More detailed information on the FWRA can be found in Olexa et al. (2005). The FWRA identified methods that the Florida Department of Environmental Protection (FDEP) would use to develop and implement TMDLs.

In accordance with the FWRA, the FDEP designed a TMDL plan that divided the state into five basin groups (Figure 1). For each basin group, five development phases were identified. The five-phase cycle consists of the following: Phase 1—initial basin assessment, Phase 2—coordinated monitoring, Phase

3—data analysis and TMDL development, Phase 4—basin management plan development, and Phase 5—begin implementation of basin management plan. The five-phase cycle rotates through each basin group every 5 years (FDEP 2007).

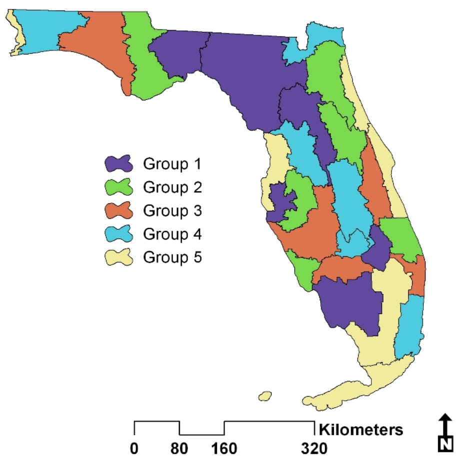

Figure 1. Five basin groups as identified by Florida Department of Environmental Protection Credits: Kati Migliaccio, 2007

FDEP is in the process of rotating among the basin groups and phases. The most current reports for this program can be obtained from the FDEP website: http://www.dep.state.fl.us.

Water Quality Criteria

U.S. water quality history and regulations have evolved due to new knowledge, public support, and growing water demands. Although these regulations are in place, their appropriate implementation depends on the ability to determine the concentration or load at which a constituent (or measured parameter) becomes a water quality pollutant.

FDEP has been involved in the process of developing water quality nutrient criteria for many years. However, Earthjustice (representing the Florida Wildlife Federation, the Conservancy of Southwest Florida, the Environmental Confederation of Southwest Florida, St. John's Riverkeeper, and the Sierra Club) felt that the process was flawed and filed a lawsuit against the EPA in 2008. In the lawsuit, Earthjustice claimed that there was an unacceptable delay by the federal government in setting limits for nutrient pollution, claimed that the EPA had previously determined that numeric nutrient criteria are necessary as described in the Federal Clean Water Act, and further argued that the EPA was obligated to promptly propose these criteria for Florida.

EPA settled the lawsuit by agreeing to propose numeric nutrient standards for lakes and flowing waters by January 2010 and for estuarine and coastal waters by January 2011. More information on this process can be found in the EDIS publication *A guide to EPA's proposed numeric nutrient water quality criteria for Florida http://edis.ifas.ufl.edu/ss528.* Because of the complexity of Florida's water ways and the variability of water quality throughout the state, this is no easy process.

Numeric nutrient criteria that are designated for water bodies will be used to assess impairment. Impairment of a water body would lead to TMDL development (as previously described). The current criteria from EPA are provided in Tables 1 to 2 (EPA, 40 CFR Part 131 [EPA-HQ-OW-2009-0596] RIN 2040-AF1) for class I (potable water supplies) and class III (recreation, propagation, and maintenance of healthy, well-balanced populations of fish and wildlife) water bodies.

Criteria are designated by watershed region:

- Panhandle West: Perdido Bay Watershed, Pensacola Bay Watershed, Chotawhatchee Bay Watershed, St. Andrew Bay Watershed, and Apalachicola Bay Watershed
- Panhandle East: Apalachee Bay Watershed and Econfina/Steinhatchee Coastal Drainage
- North Central: Suwannee River Watershed
- West Central: Peace, Myakka, Hillsborough, Alafia, Manatee, Little Manatee River Watersheds, and small, direct Tampa Bay tributary watersheds south of the Hillsborough River Watershed
- Peninsula: Waccasassa Coastal Drainage Area; Withlacoochee Coastal Drainage Area; Crystal/Pithlachascotee Coastal Drainage Area; small, direct Tampa Bay tributary watersheds west of the Hillsborough River Watershed; Sarasota Bay Watershed; small, direct Charlotte Harbor tributary watersheds south of the Peace

River Watershed; Caloosahatchee River Watershed; Estero Bay Watershed; Kissimmee River/Lake Okeechobee Drainage Area; Loxahatchee/St. Lucie Watershed; Indian River Watershed; Daytona/St. Augustine Coastal Drainage Area; St. John's River Watershed; Nassau Coastal Drainage Area; and St. Mary's River Watershed.

The annual geometric mean should not exceed the criteria for a water body more than once in a three-year period.

Future Direction of Water Quality

As more information is known and public awareness of water quality issues increases, better government programs are being developed and enforced to preserve water resources. Protecting and conserving water supplies is likely to be a dominant issue in the future due to competing water uses (e.g., growing population, energy production, agriculture, etc.) and limited water supplies. Hence, continued research and development of better water conservation practices and policies are critical to sustaining our water quantity and quality to ensure water resources' designated uses.

References

Carson, R. 1962. *Silent Spring*. Houghton Mifflin: Boston, MA.

Copeland, C. 2005. *Clean Water Act and Total Maximum Daily Loads (TMDLs) of pollutants.* CRS Report for Congress. Order Code 97-831 ENR http://digital.library.unt.edu/govdocs/crs/permalink/meta-crs-10107:1.

Deason, J. P., T. M. Schad, and G. W. Sherk. 2001. Water policy in the United States: a perspective. *Water Policy* 3:175-192.

Downing, D. M., C. Winer, and L. D. Wood. 2003. Navigating through clean water act jurisdiction: a legal review. *Wetlands* 23(3):475-493.

FDEP, 2007. *TMDL development cycle*. http://www.dep.state.fl.us/water/tmdl/cycle.htm

Migliaccio, K. W. and Y. C. Li. 2007. *Evolution of Water Quality Regulations in the United States and Florida*. ABE 381, Agricultural and Biological Engineering Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences. University of Florida. http://edis.ifas.ufl.edu/AE431.

Olexa, M. T., L. D'Isernia, L. Minton, D. Miller, and S. Corbett. 2005. *Handbook of Florida Water Regulations: Florida Watershed Restoration Act.* FE608, Food and Resource Economics Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences. University of Florida. http://edis.ifas.ufl.edu/FE608.

USEPA, 2000a. *Ambient water quality criteria recommendations, rivers and streams in nutrient ecoregion IX*. Office of Water. EPA 822-B-00-019.

USEPA, 2000b. *Ambient water quality criteria recommendations, rivers and streams in nutrient ecoregion XII*. Office of Water. EPA 822-B-00-021.

USEPA, 2001. *Fact sheet: ecoregional nutrient criteria*. Office of Water. EPA-822-F-01-010. http://www.epa.gov/waterscience/criteria/nutrient/ecoregions/files/jan03frnfs.pdf.

USEPA, 2006. *National recommended water quality criteria.* Office of Water, Office of Science and Technology 4304T.

USEPA, 2007a. Overview of current Total Maximum Daily Load – TMDL – program and regulations. http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/index.cfm.

USEPA. 2007b. Terms of Environment: Glossary, Abbreviations and Acronyms. http://www.epa.gov/OCEPAterms/.

Table 1. EPA numeric criteria for Florida streams

Watershed Region	TN (mg/L)	TP (mg/L)
Panhandle West	0.67	0.06
Panhandle East	1.03	0.18
North Central	1.87	0.30
West Central	1.65	0.49
Peninsula	1.54	0.12

Table 2. EPA numeric criteria for Florida lakes

Lake color and alkalinity	Chlorophyll-a (mg/L)	TN (mg/L)	TP (mg/L)
Colored lakes[a]	0.020	1.27	0.05
Clear lakes, high alkalinity[b]	0.020	1.05	0.03
Clear lakes, low alkalinity[c]	0.006	0.51	0.01

[a] Long-term color > 40 Platinum Cobalt Units (PCU)
[b] Long-term color ≤ 40 PCU and alkalinity > 20 mg/L $CaCO_3$
[c] Long-term color ≤ 40 PCU and alkalinity ≤ 20 mg/L $CaCO_3$