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The Problem of Nutrient Pollution: Lessons from Florida's Fragmented Approach

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THE PROBLEM OF NUTRIENT POLLUTION: LESSONS FROM FLORIDA'S FRAGMENTED APPROACH

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We far too commonly produce our food in an environmentally hazardous fashion. Nutrients are an inevitable by-product of modern agriculture and, in excess amounts, can devastate aquatic ecosystems.The need for state action on the problem of nutrient pollution is immediately necessary, as a federal solution seems increasingly unlikely. Florida is a perfect embodiment of the destructive effects of nutrient pollution, but also serves as a testing ground for two conflicting state programs that address the longstanding issue. One program is largely incentive-based, but requires some affirmative actions from farmlands through limited state oversight. The other consists of a complex regulatory scheme, with

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broad state oversight, that mandates extensive affirmative actions from farmlands. This article examines each program and compares its respective impact on reducing nutrient pollution. The article concludes with important lessons that other states should consider when seeking to implement similar programs.

I. INTRODUCTION

A. SOURCES AND IMPACTS OF NUTRIENT POLLUTION

Nutrient pollution from agricultural runoff is referred to as a nonpoint source of pollution.[1] According to one estimate, nonpoint pollution accounts for fifty percent of nationwide water pollution, and is one of America's last major sources of water pollution.[2] Most nonpoint pollution comes from agricultural activities and resultant agricultural runoff.[3] Agricultural runoff consists of many pollutants, including sediments, pathogens, and pesticides.[4] The most pervasive of the pollutants from agricultural runoff are nutrients, specifically, nitrogen and phosphorus.[5]

Nitrogen and phosphorus cause plants to grow, including algae.[6] When too much nitrogen and phosphorus enter the water, it causes algae to grow faster than ecosystems can withstand.[7] Nutrient pollution can cause this rapid growth of algae, called an "algae bloom."[8] Algae blooms harm water quality, food resources, and habitats, leading to the deaths of large numbers of fish and other marine life.[9] Specifically, the blooms deplete oxygen upon which fish and other aquatic life depend to survive, creating "dead zones".[10] The effects of algae blooms are not confined to animals low on the food chain; rather, algae blooms also hurt animals higher up in the food chain, such as birds, dolphins, and manatees.[11] Harmful algae blooms can also produce toxins that cause skin irritations and hay fever-like symptoms in humans.[12]

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1. *Polluted Runoff: What is Nonpoint Source Pollution?*, U.S. ENVTL. PROT. AGENCY, http://water.epa.gov/polwaste/nps/whatis.cfm (last updated Aug. 27, 2012).

2. *See* Zdravka Tzankova, *The Difficult Problem of Nonpoint Nutrient Pollution: Could the Endangered Species Act Offer Some Relief?*, 37 WM. & MARY ENVTL. L. & POL'Y REV. 709, 746 n.203 (2013); *see also Watershed Assessment, Tracking & Environmental Results*, U.S. ENVTL. PROT. AGENCY, http://ofmpub.epa.gov/waters10/attains_nation_c y.control#STREAM /CREEK/RIVER (last updated Mar. 10, 2014).

3. Jan G. Laitos & Heidi Ruckriegle, *The Clean Water Act and the Challenge of Agricultural Pollution*, 37 VT. L. REV. 1033, 1033-34 (2013).

4. Corey Longhurst, Note, *Where is the Point? Water Quality Trading's Inability to Deal with Nonpoint Source Agricultural Pollution*, 17 DRAKE J. AGRIC. L. 175, 180 (2012).

5. *Id.*

6. *Nutrient Pollution: The Problem*, U.S. ENVTL. PROT. AGENCY, http://www2.epa.gov/nutrientpollution/problem (last updated July 2, 2013).

7. *Id.*

8. *Id.*

9. *Id.*

10. *Nutrient Pollution: The Effects: Environment*, ENVTL. PROT. AGENCY, http://www2.epa.gov/nutrientpollution/effects-environment (last updated Aug. 29, 2013).

11. *Algae Bloom Kills Sea Birds, Other Sea Life In Southern California In Record Numbers*, SCIENCEDAILY (Apr. 28, 2007), http://www.sciencedaily.com/releases/2007/0 4/070427 084149.htm.

12. *The Lake Okeechobee Pollution Crisis and the St. Lucie River and Estuary*,

B. A NATIONAL ISSUE

This article takes the position that only national reform can adequately address nutrient pollution, because the problem often transcends state lines. The Gulf of Mexico dead zone highlights the immediate need for a national solution. This is the largest documented nutrient pollution-caused dead zone, measuring at 5,840 square miles in 2013.[13] The dead zone occurs every summer when nutrient pollution, mainly from agricultural runoff,[14] flows into the Gulf of Mexico from the Mississippi River, which collects drainage from thirty-one upstream states.[15] Despite the clear need for a national solution, state governments are left to confront nutrient pollution themselves because the federal Clean Water Act largely exempts it from restriction.[16]

C. FLORIDA'S NUTRIENT POLLUTION PROBLEM

Before examining Florida's approach to nutrient pollution, it is helpful to first understand the state's interconnected aquatic ecosystem and the destructive effect that nutrient pollution has had on that ecosystem. The Lake Okeechobee Drainage Basin ("LODB") is just south of the City of Orlando.[17] Water in this basin flows south through a series of rivers and man-made canals and drains into Lake Okeechobee, the largest freshwater lake in the southeastern United States.[18] Historically, water from Lake Okeechobee moved south through the Everglades, a vast wetland that stretched up to sixty miles in width and spanned nearly eleven thousand square miles.[19] Water in the Everglades flows south like a moving river until it meets the ocean at the southern tip of the state, where fresh water mixes with salt water in the Florida Bay.[20]

The Everglades ecosystem is naturally low in nutrients, especially phosphorus.[21] Historically, most of the Everglades' water supply came from rainfall.[22]

EARTHJUSTICE (Nov. 9, 2006), http://earthjustice.org/sites/default/files/library/reports/lake-okeechobee-pollution-crisis-and-the-st-lucie-river-and-estuary.pdf. Algae blooms can also cause humans to become ill if they ingest tainted fish or drink contaminated water. *Nutrient Pollution: The Problem, supra* note 6.

13. *Nutrient Pollution: The Effects, supra* note 10.

14. *Id.*; *Nutrient Pollution: Sources and Solutions*, ENVTL. PROT. AGENCY, http://www2.epa.gov/nutrientpollution/sources-and-solutions (last updated Aug. 29, 2013).

15. *Nutrient Pollution: The Effects, supra* note 10.

16. *See* 33 U.S.C. § 1362(14) (1977) (exempting agricultural irrigation return flows from the "point source" definition).

17. Erica Skolte, *Lake Okeechobee: Following the Flow*, U.S. ARMY CORPS OF ENGINEERS: JACKSONVILLE DISTRICT, (Sep. 6, 2013), http://www.saj.usace.army.mil/Media/NewsStories/tabid/6070/Article/18052/lake-okeechobee-following-the-flow.aspx.

18. *Id.*; *Restoring Lake Okeechobee*, S. FLORIDA WATER MGMT. DISTRICT, http://my.sfwmd.gov/portal/page/portal/xweb%20protecting%20and%20restoring/lake%20okeechobee (last visited Mar. 15, 2014).

19. *Brief History of the Everglades*, FLORIDA DEPARTMENT OF ENVTL, PROTECTION, http://www.dep.state.fl.us/evergladesforever/about/ (last updated Feb. 11, 2009).

20. *Following the Flow: An Everglades Journey*, EVERGLADES: WATER'S JOURNEY, http://theevergladesstory.org/journey/ (click on "Historic Water Flow" in the "Conceptual Water Flow" animation) (last visited Mar. 15, 2014).

21. William Orem, *Pick Your Poison: If One Pollutant Doesn't Bring Down the Everglades, Another Might*, EARTH MAGAZINE (Feb. 20, 2009, 3:16 PM), http://www.earthmagazine.org/article/pollutants-threaten-everglades-future.

22. *Id.*

Consequently, the plants and animals that inhabit the region adapted to survive in a low-nutrient, fresh water ecosystem.[23]

Beginning in the late 1800s, human development dramatically changed the landscape of the Everglades, transforming the wetland into a fraction of what it once was.[24] In the early 1900s, the Florida legislature authorized the drainage of about seven hundred thousand acres (twenty-seven percent) of the Everglades just south of Lake Okeechobee, transforming the region into agricultural land now known as the Everglades Agricultural Area ("EAA").[25] This severely disrupted the Everglades' natural southerly flow.[26] As a result of the creation of the EAA, combined with encroaching urban development, just fifty percent of the historic Everglades remain today.[27]

To facilitate drainage of land in the EAA, the state government constructed a series of interconnected canals throughout the region.[28] Eventually, agricultural runoff carrying high concentrations of phosphorus, nitrogen, and other pollutants seeped into the canals and entered the Everglades.[29] By the early 1990s, the level of phosphorus pollution in the Everglades had risen to a peak of 150 parts per billion ("ppb"), which is extraordinarily high for a system that had naturally adapted to only 10 ppb.[30] Additionally, scientific evidence shows that agricultural runoff in the EAA has contributed to significant levels of sulfates in the canals that drain into the Everglades.[31] Sulfates combine with naturally occurring mercury in the Everglades, causing it to become toxic to humans, animals, and plant life.[32]

To the north of Lake Okeechobee, projects to control flooding in the LODB destroyed marshland that had a natural capacity to filter nutrients.[33] In addition, runoff from agricultural uses, the predominant land use in the LODB, sent large amounts of phosphorus, nitrogen, and other pollutants into Lake Okeechobee.[34] The pollution in Lake Okeechobee caused massive algae blooms and oxygen-starved dead zones, which at one time covered up to forty percent of the lake's surface.[35] As a result of decades of unregulated nutrient

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23. *Id.*

24. *Id.*

25. Skolte, *supra* note 17; Forest T. Izuno, *A Brief History of Water Mgmt. in the Everglades Agricultural Area, University of Florida* (June 1989), http://edis.ifas.ufl.edu/pdffiles/AE/AE37500.pdf.

26. *See Following the Flow: An Everglades Journey*, *supra* note 20.

27. FLA. ADMIN. CODE ANN. r. 40E-63.011(1) (1992).

28. Skolte, *supra* note 17.

29. *See* 40E-63.011(2)-(3).

30. Orem, *supra* note 21.

31. William Orem et al., *Sulfur in the South Florida Ecosystem: Distribution, Sources, Biogeochemistry, Impacts, and Management for Restoration*, 35 CRITICAL REVIEWS IN ENVTL. SCI. AND TECH. 249, 262-63 (2011), *available at* http://water.usgs.gov/nrp/proj.bib/Publications/2011/orem_gilmour_etal_2011.pdf.

32. *See* Orem, *supra* note 21.

33. *See* Fla. Dep't of Envtl. Prot., *Kissimmee River Watershed*, FLORIDA'S WATER: OURS TO PROTECT, http://www.protectingourwater.org/watersheds/map/kissimmee_river/ (last visited Mar. 2, 2014).

34. *Id.*; Skolte, *supra* note 17.

35. Jeffrey Schmalz, *Pollution Poses Growing Threat to Everglades*, N.Y. TIMES, Sept. 17, 1989, *available at* http://www.nytimes.com/1989/09/17/us/pollution-poses-growing-threat-to-everglades.html?pagewanted=all&src=pm; Amy Bennett Williams, *Caloosahatchee River's Ills Start*

pollution, the lake now has phosphorus levels in excess of 240 ppb.[36] This causes the water in Lake Okeechobee to be sixty-five times more toxic than safe drinking water guidelines established by the World Health Organization.[37]

Making matters worse, in order to control devastating flooding from Lake Okeechobee, the state government constructed large canals in the late 1800s that connected the Lake to the ocean for the first time.[38] The canals lead to delicate estuaries on each side of the state.[39] When water levels in the Lake get too high, water from the Lake is discharged into these canals.[40] The nutrient-rich water empties into the estuaries, where it has wreaked havoc. In the St. Lucie River Estuary, on Florida's east coast, the discharges have devastated the ecosystem by causing large fish kills and the deaths of hundreds of manatees and dolphins.[41] The water in the estuary, once clear with a sandy bottom, is now chocolate brown with thick algae sludge covering the surface.[42]

Runoff from farmlands in the LODB and EAA is the primary cause of nutrient pollution in Lake Okeechobee and the Everglades.[43] Over ninety percent of the phosphorus entering Lake Okeechobee and the Everglades is from agricultural lands.[44] Moreover, fertilizer use on farmlands is the main source of phosphorus pollution in the LODB and EAA.[45]

Prior to 1987, the state government did nothing to restrict nutrient pollution entering the Everglades ecosystem.[46] Rather, the state was part of the problem. Water District Managers at the time pumped nutrient-rich water from EAA canals into the Everglades.[47] As a result, during the late 1980s, the state declared thousands of acres of wetland in the Everglades unable to sustain wildlife, including some of the rarest birds and other animals.[48] Fish in most parts of the

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with Lake Okeechobee, NEWS-PRESS.COM, Feb. 12, 2011, http://www.news-press.com/article/20110213/GREEN/102130392/.

36. *Lake Okeechobee Backpumping Fact Sheet*, EARTHJUSTICE, http://earthjustice.org/sites/default/files/library/factsheets/lake-okeechobee-backpumping-fact-sheet.pdf (last visited Mar. 24, 2013).

37. *Id.*

38. Fla. Dep't of Envtl. Prot., *supra* note 33.

39. *See* Lizette Alvarez, *In South Florida, a Polluted Bubble Ready to Burst*, N.Y. TIMES, Sept. 8, 2013, *available at* http://www.nytimes.com/2013/09/09/us/lake-okeechobee-in-florida-a-polluted-bubble-ready-to-burst.html; Skolte, *supra* note 17.

40. *See* Alvarez, *supra* note 39.

41. *Id.; see also* Greg Allen, *With Murky Water And Manatee Deaths, Lagoon Languishes*, Sept. 26, 2013, *available at* http://www.npr.org/2013/09/26/223037646/with-murky-water-and-manatee-deaths-lagoon-languishes.

42. Randy Gyllenhaal, *Lake Okeechobee Still Discharging Water; St. Lucie River Still Toxic*, WPBF NEWS (Aug. 7, 2013, 6:19 PM), http://www.wpbf.com/news/south-florida/treasure-coast-news/lake-okeechobee-still-discharging-water-st-lucie-river-still-toxic/-/8882916/21375198/-/r6o7ecz/-/index.html.

43. B.F. MCPHERSON ET AL., U.S. GEOLOGIC SURVEY, WATER QUALITY IN SOUTHERN FLORIDA, 1996-98, at 7 (2000), *available at* http://pubs.usgs.gov/circ/circ1207/pdf/circ1207.pdf.

44. *Lake Okeechobee Watershed Statistics*, EVERGLADES HUB, http://www.evergladeshub.com/okeechobee/watershed.htm (last visited Nov. 13, 2013); *see id.*

45. *See* MCPHERSON ET AL., *supra* note 43, at 8.

46. *See* Gail Clement, *Everglades Timeline*, EVERGLADES DIGITAL LIBRARY, http://everglades.fiu.edu/reclaim/timeline/timeline10.htm (last visited Mar. 25, 2014).

47. Schmalz, *supra* note 35.

48. *See id.*

Everglades were declared unsafe for eating due to mercury contamination.[49] The nutrient-rich water caused an explosion in non-native plant growth and algae that eliminated oxygen in the water, killing wildlife.[50] The plants, mainly cattails, were spreading at an incredible rate of four acres per day.[51] The poor water quality in the Everglades triggered a public outcry and a federal lawsuit, which set Florida on a path to finally addressing the problem of nutrient pollution.[52]

The environmental damage caused primarily by nutrient pollution in Lake Okeechobee, the Everglades, and the coastal estuaries forced the state's hand. Florida's efforts to control runoff from agricultural activities now place the state at the forefront of dealing with one of America's last major sources of water pollution. This article studies Florida's efforts to control agricultural runoff in its central-southern region, which includes the LODB and EAA. The article also points out the many shortcomings of Florida's regulatory framework, particularly in the LODB. The primary focus of this article is on the source controls Florida employs to reduce nutrient pollution from agricultural activities. Accordingly, important end controls such as Stormwater Treatment Areas ("STAs") are not discussed at length.

II. FLORIDA'S STATEWIDE SOURCE CONTROLS

Florida has a region-specific approach to regulating agricultural runoff and, as a result, entirely different policies apply to different regions. One explanation in support of this fragmented regulatory structure is that the "social, economic and environmental costs" of enforcing water quality standards statewide may outweigh the benefits.[53] Accordingly, the state policies that most pointedly address agricultural runoff independently focus on regions where runoff has been most problematic. This has resulted in significant inconsistencies between regional laws that do not necessarily make sense from a statewide policy perspective. Despite Florida's region-specific strategy, there are some state-wide policies that play a role in reducing agricultural runoff.

Florida has developed water quality standards for certain types of water bodies throughout the state. These standards are considered goals, however, and lack enforcement mechanisms.[54] In Lake Okeechobee and the Everglades, a water quality standard exists for phosphorus.[55] Curiously, as of the writing of this article, the state has not adopted water quality standards for nitrogen or sulfates for Lake Okeechobee or the Everglades.[56]

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49. *Id.*; Frank Stephenson, *Florida's Mercury Menace*, FLA ST. U. RES. IN REV. (1997), *available at* http://rinr.fsu.edu/fallwinter97/features/mercury.html.

50. Schmalz, *supra* note 35.

51. *Id.*

52. *See* Katherine Mohr, *How Sweet It Isn't: Big Sugar's Power Politics and the Fate of the Florida Everglades*, 7 FLA. A & M U. L. REV. 329, 340-41 (2012); Clement, *supra* note 46.

53. FLA. ADMIN. CODE ANN. r. 62-302-300(10)(c) (2004).

54. *Id.* 62-302-300(9).

55. *Id.* 62-304-700 (2001); *id.* 62-302-540 (2005). The state is also currently working on developing a water quality standard for mercury. FLA. DEPT. ENVTL. PROT., *Florida's Statewide Mercury TMDL Fact Sheet* (Sept. 2012), *available at* http://www.dep.state.fl.us/water/tmdl/docs/mercury-tmdl-factsheet.pdf [hereinafter *TMDL Fact Sheet*].

56. FLA. ADMIN. CODE ANN. r. 62-302-530 (1990); *id.* 62-304-735 (2013).

In Lake Okeechobee, the water quality standard is expressed as a Total Maximum Daily Load (TMDL), which states that annual phosphorus discharges into the Lake should ideally be no more than 140 metric tons.[57] A TMDL is a "scientific determination of the maximum amount of a given pollutant that a surface water can absorb" without endangering human health and aquatic life.[58] In comparison, according to the Everglades' water quality standard, the Everglades' water should ideally contain no more than 10 parts per billion (ppb) phosphorus.[59] It is not clear why Florida uses different units of measurement to express phosphorus water quality standards in Lake Okeechobee and in the Everglades.

The state also has a Best Management Practices (BMP) program. The Florida Department of Agriculture and Consumer Services (FDACS) oversees and implements the program.[60] BMPs are practices adopted by FDACS that are designed to reduce the amount of fertilizers, animal waste, and other pollutants entering water bodies.[61] Such practices are intended to improve water quality while simultaneously maintaining economic productivity.[62] Farmers can choose to participate in the program by implementing BMPs on their lands.[63]

The BMP program is completely voluntary for agricultural landowners, but participation is encouraged through a number of incentives. One incentive is that the Department of Environmental Protection ("DEP") provides technical and financial assistance to those implementing BMPs.[64] Perhaps the most attractive incentive is that implementation of state-approved BMPs results in a presumption of compliance with state water quality standards.[65] As a result, the state is "not authorized to institute proceedings against the owner of the source of pollution to recover costs or damages associated with the contamination of surface water . . . caused by the pollutants."[66]

Agricultural landowners that apply over one ton of animal manure per acre each year, must do so more than thirty feet from any "wetland, lake, stream, or estuary."[67] Animal manure is a major source of nutrient pollution and is the second leading source of phosphorus pollution in the LODB and EAA.[68] Note that this rule leaves out canals entirely, exempting many agricultural lands adjacent to canals that connect to the Everglades and Lake Okeechobee.

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57. *Id.* 62-304-700 (2001).
58. FLA. DEPT. ENVTL. PROT., *supra* note 55.
59. FLA. ADMIN. CODE ANN. r. 62-302-540(4)(a) (2004).
60. Fla. Dep't of Agric. & Consumer Servs., *BMPs at a Glance*, http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy/Enroll-in-BMPs/BMPs-At-a-Glance (last updated Aug. 13, 2013).
61. *Id.*
62. *Id.*
63. FLA. STAT. § 403.067(7)(c)(2) (2013).
64. *Id.* § 373.4595(3)(c)(2)(b).
65. *Id.* § 403.067(7)(c)(3).
66. *Id.*
67. FLA. ADMIN. CODE ANN. r. 5M-3.004(3)(b)(2011).
68. *See* MCPHERSON ET AL., *supra* note 43, at 3-4.

Florida also regulates the amount of nutrients in commercial plant fertilizers sold in-state;[69] however, agricultural landowners are not prohibited from using fertilizers not in compliance with those regulations.[70] Consequently, landowners are free to purchase out-of-state fertilizers that fail to meet in-state standards.

III. SOURCE CONTROLS IN THE EVERGLADES AGRICUTURAL AREA AND LAKE OKEECHOBEE DRAINAGE BASIN

A. LAKE OKEECHOBEE DRAINAGE BASIN (LODB) SOURCE CONTROL PROGRAM

The State of Florida is divided into five Water Management Districts.[71] The South Florida Water Management District (District) is primarily responsible for administering source controls in the LODB and the EAA.[72]

Florida significantly expanded protection of the LODB in 2007 when it passed the Northern Everglades and Estuaries Protection Program (NEEPP).[73] The NEEPP recognizes the interconnectedness between Lake Okeechobee, the Everglades, and the coastal estuaries.[74] It also recognizes the destructive effect that nutrient pollution from agricultural lands in the LODB has had on these ecosystems due to the southerly flow of water in the region.[75] One of the goals of the NEEPP with respect to Lake Okeechobee is to reduce phosphorus pollution.[76] The law also addresses nutrient pollution in the coastal estuaries; however, the focus of this section is on Lake Okeechobee.

The NEEPP requires owners or operators of nonpoint sources in the LODB to either implement FDACS-approved BMPs or interim measures.[77] In the alternative, they may conduct water quality monitoring prescribed by the District or the DEP.[78] The District has yet to implement this portion of the law, however, and is still in the process of rewriting regulations.[79] In the meantime, the BMP program has remained an entirely voluntary, incentive-based program in the LODB, as it is throughout the state.[80] There are currently no monitoring mechanisms in place ensuring that after implementation, each BMP is successful at reducing phosphorus pollution.[81] As of the writing of this article, seventy-four percent of agricultural lands in the basin participate in the voluntary BMP

69. FLA. STAT. § 576.061(1) (2013).
70. *See id.*
71. *Id.* §§ 373.069(1)(a)-(e).
72. William Baker et. al. eds., *Chapter 4: Nutrient Source Control Programs, in* 2013 SOUTH FLORIDA ENVIRONMENTAL REPORT 4-1-4-2 (2013).
73. Joyce Zhang & Bruce Sharfstein, *Chapter 8: Lake Okeechobee Watershed Protection Program, in* 2013 SOUTH FLORIDA ENVIRONMENTAL REPORT 8-7 (2013).
74. FLA. STAT. § 373.4595(1)(c) (2013).
75. *Id.* § 373.4595(1)(e).
76. *Id.* §§ 373.4595(1)(f),(g).
77. *Id.* § 373.4595(3)(c)(1)(b).
78. *Id.*
79. Baker, *supra* note 72, at 4-8.
80. *See id.*
81. *See* FLA. STAT. § 403.067(7) (2013).

program.[82]

In addition to the BMP program, in the LODB, agricultural landowners that connect to or make use of canals or other "works of the district" are generally required to obtain a permit, called a works of the district (WOD) permit.[83] The Surface Water and Improvement Management Act (SWIM) originally authorized the WOD permit program in 1989.[84] All agricultural landowners within the LODB are presumed to use or connect to the works of the district.[85] Consequently, unless expressly exempt, landowners must obtain a WOD permit in order to conduct agricultural activities on their properties.[86]

The WOD permit primarily limits the amount of phosphorus that permittees can "discharge" from their land.[87] However, the permit only limits the amount of phosphorus that property owners may release from a point on their properties.[88] Unfortunately, this program lacks effectiveness because the primary source of nutrient pollution is runoff rather than any single discernable point of discharge.[89]

The phosphorus limitations are calculated based on a goal of reducing the total phosphorus load in Lake Okeechobee to 397 metric tons annually.[90] The SWIM Act originally imposed this goal in 1989,[91] but the NEEPP seeks to achieve the TMDL goal of 140 metric tons annually for the lake.[92] The state has yet to fully implement NEEPP, however, which is why the 397 metric ton

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82. Lesley Bertolotti, et al., *Chapter 8: Lake Okeechobee Watershed Protection Program and Three-Year Update, in* 2014 SOUTH FLORIDA ENVIRONMENTAL REPORT 8-108 (2014).

83. FLA. ADMIN. CODE ANN. r. 40E-61.041(1) (1989).

84. Bertolotti, *supra* note 82, at 8-114.

85. FLA. ADMIN. CODE ANN. 40E-61.041(1) (1989).

86. *Id.*

87. *Id* r. 40E-61.381(1)-(2)(a)(1) (2006).

88. William Baker et al. eds, *Chapter 4: Nutrient Source Control Programs, in* 2014 SOUTH FLORIDA ENVIRONMENTAL REPORT 4-32 (2014).

89. Laitos & Ruckriegle, *supra* note 3, at 1036-37.

90. FLA. ADMIN. CODE ANN. r. 40E-61.020(1) (2006).

91. *Id.*

92. FL. DEPT. OF ENVIRONMENTAL PROTECTION, TOTAL MAXIMUM DAILY LOAD FOR TOTAL PHOSPHORUS LAKE OKEECHOBEE, FLORIDA 1 (2001) ("This TMDL proposes an annual load of 140 metric tons of phosphorus to Lake Okeechobee. . . . The implementation of the TMDL will follow a phased approach consistent with Section 373.4595, Florida Statutes. . . ."), *available at* http://www.dep.state.fl.us/water/tmdl/docs/tmdls/final/gp1/Lake_O_TMDL_ Final.pdf.

> It is the intent of the Legislature to protect and restore surface water resources and achieve and maintain compliance with water quality standards in the Lake Okeechobee watershed. . . and downstream receiving waters, through the phased, comprehensive, and innovative protection program set forth in this section which includes long-term solutions based upon the total maximum daily loads established in accordance with s. 403.067. . . .

FLA. STAT. § 373.4595(1)(l) (2013)

> A protection program for Lake Okeechobee that achieves phosphorus load reductions for Lake Okeechobee shall be immediately implemented as specified in this subsection. The program shall address the reduction of phosphorus loading to the lake from both internal and external sources. Phosphorus load reductions shall be achieved through a phased program of implementation. Initial implementation actions shall be technology-based, based upon a consideration of both the availability of appropriate technology and the cost of such technology, and shall include phosphorus reduction measures at both the source and the regional level.

Id. § 373.4595(3).

goal remains in effect.

State regulations require most WOD permittees to monitor the quality of the water discharged from their properties, depending on where in the LODB they are located.[93] The permittees must submit the results of this monitoring to the District on a bi-weekly basis.[94] The District may reduce the frequency of monitoring required if, after a reasonable period, the discharger consistently achieves compliance with the phosphorus limitation.[95]

The District may enforce compliance with the WOD permit, which is evaluated through on-site inspections and record review, by way of legal proceedings.[96] If a violation of the permit occurs, the District has the authority to issue administrative enforcement orders,[97] initiate court actions seeking injunctive relief and/or civil penalties of up to $10,000,[98] or seek a warrant for arrest of the violator.[99]

B. PROGRESS MADE IN THE LODB

NEEPP requires the District to monitor total phosphorus (TP) levels to determine the amount of progress made.[100] The District must calculate the TP levels based on a five-year rolling average.[101] This means that every year, the District calculates the TP load (measured in metric tons) based on the average annual load during the preceding five-year period.[102] The District uses a five-year average to calculate phosphorus loading because, in any given year, other factors may cause fluctuations, most notably climate conditions such as increased rainfall.[103] Thus, theoretically, the five-year average is less vulnerable to random chance causing skewed results. Once the five-year average is calculated, the District compares that figure with the Lake Okeechobee TMDL in order to track progress.[104]

The results from the District's monitoring reveal that the phosphorous levels have only slightly decreased in the LODB. When tracking began in 1985, the five-year average TP load was 530 metric tons, whereas in 2013, the TP load measured at 451 metric tons.[105] That is only a 15 percent reduction.[106] Additionally, during the twenty-eight year tracking period, the average annual TP load exceeded the current Lake Okeechobee TMDL (140 metric tons) by an average of 349 metric tons.[107]

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93. FLA. ADMIN. CODE ANN. r. 40E-61.381(2)(a) (2013).
94. *Id.* 40E-61-381(2)(a)(1) (2006).
95. *Id.*
96. *See id.* r. 40E-61.301(1); Jodie Hansing & Chambal Pandey, *Executive Summary*, *in* S. FLA WATER MGMT. DIST., 2013 SOUTH FLORIDA ENVIRONMENTAL REPORT 7, 16-17, 21 (2013).
97. FLA. STAT. § 373.119(1) (2013).
98. *Id.* § 373.129(5) (2013).
99. FLA. ADMIN. CODE ANN. r. 40E-63.145(6)(d) (2001).
100. FLA. STAT. § 373.4595(3)(d)(1) (2013).
101. *Id.*; § 403.067(7)(a)(5).
102. *See id.* § 403.067(7)(a)(5) (2013).
103. Bertolotti, *supra* note 82, at 8-27.
104. *See id.*
105. *Id.* at 8-28.
106. *See id.*
107. *See id.* at 8-22.

C. EVERGLADES AGRICULTURAL AREA (EAA) SOURCE CONTROL PROGRAM

The source controls in the EAA, which the Everglades Forever Act (EFA) mandates, are far more rigorous than those in the LODB. As in the LODB, the state exclusively addresses phosphorus pollution in the EAA.[108] An important aspect of the EAA source control program is that landowners are collectively required to reduce TP loading by twenty-five percent compared to a baseline period (1980-88), a time before source controls were in effect.[109] The data reveals that the source controls have been instrumental in not only achieving this twenty-five percent goal, but also exceeding it considerably.[110]

Whereas, in the LODB, BMPs have been voluntary and incentive driven, in the EAA, Florida law requires BMP plans as a condition for issuance of a WOD permit.[111] The EFA requires the permittee to monitor implementation, operation, and continued effectiveness of BMPs.[112] Landowners must also create fertilization and water management plans for each crop, as well as a water management system design plan to use water more efficiently.[113] In addition, the EFA requires agricultural landowners to sponsor BMP research aimed at identifying the most effective practices for reducing phosphorus pollution.[114] The mandatory implementation of BMPs is considered the primary regulator of TP loading in the EAA.[115]

In addition to the BMP plan, landowners must monitor water quality and provide "reasonable assurances" that they are accurately documenting water discharges and TP loads.[116] Landowners must submit all monitoring results to the District.[117] Once the District receives these results, if the District determines that the permittee is out of compliance with the approved BMP plan and/or water quality monitoring plan, the District will require the permittee to achieve compliance.[118]

As in the LODB, the WOD permit also imposes a limit on phosphorus levels in water discharged into a canal. This limitation applies to water released through a "structural device or hydrologic feature,"[119] which includes runoff. In comparison, WOD permits issued in the LODB limit phosphorus only from points of discharge.[120] Again, this is an important difference because the majority of nutrient pollution comes from runoff rather than from discernible points of discharge.[121]

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108. FLA. STAT. § 373.4592(1)(d) (2013).
109. Carlos Adorisio et. al., *Status of Source Control in the ECP Basins*, *in* 2013 SOUTH FLORIDA ENVIRONMENTAL REPORT 4-20, 4-21 (William Baker et al. eds.) (2013).
110. *See* Baker, *supra* note 72, at 4-3.
111. FLA. STAT. § 373.4592(4)(f)(2)(c) (2013).
112. FLA. ADMIN. CODE ANN. r. 40E-63.136(1)(f) (2001).
113. *Id.* r. 40E-63.136(1)(d)-(e) (2001).
114. FLA. STAT. §§ 373.4592(2)(a), (4)(f)(2)(a) (2013).
115. Adorisio et. al., *supra* note 109, at 4-7.
116. FLA. ADMIN. CODE ANN. r. 40E-63.136(2) (2001).
117. *Id.* r. 40E-63.143(2)(c).
118. *Id.* r. 40E-63.145(2).
119. *Id.* r. 40E-63.102 (10); r. 40E-63.130(1).
120. Baker, *supra* note 88, at 4-32.
121. Laitos & Ruckriegle, *supra* note 3, at 1037.

The District possesses the same authority to enforce permits issued in the EAA as it does for permits issued in the LODB.[122] Pursuant to the EFA, the District can issue administrative enforcement orders, pursue court actions for injunctive relief or penalties not in excess of $10,000, and/or seek a warrant for arrest of the violator.[123]

The EFA also employs a unique and innovative tool for reducing phosphorus pollution: taxing farmlands in the EAA just for the privilege of conducting agricultural activities there.[124] This tax is called the Everglades Agricultural Privilege Tax.[125] The District taxed agricultural lands at a rate of up to $35 per acre until November, 2013, after which state law reduced the tax ceiling to $25 per acre.[126] The state uses the proceeds to pay for the Everglades Long-Term Plan,[127] which includes a wide array of water quality improvement measures aimed at ensuring that waters flowing into the Everglades achieve compliance with the 10 ppb phosphorus standard.[128] Components of the Long-Term Plan include expanding BMPs, as well as enhancing Stormwater Treatment Areas (STAs) designed to store water from the EAA in an effort to further reduce phosphorus levels.[129]

The structure of the privilege tax provides incentives for reductions in phosphorus loads flowing into EAA canals.[130] Farmers receive tax credits for annual reductions in phosphorus from their land.[131] To qualify for a credit, a land's total phosphorus reductions must exceed twenty-five percent compared to phosphorus levels in 1993, the baseline year.[132] State law provides that a tax credit worth sixty-five cents per acre is due for each percentile reduction achieved above twenty-five percent.[133]

Tax credit savings must not cause the privilege tax to fall below $24.89 per acre, which is the "minimum tax."[134] A landowner who reduces phosphorus by at least forty-five percent automatically qualifies for minimum tax treatment.[135] Similarly, agricultural lands that grow only vegetables automatically qualify for minimum tax treatment.[136] The tax credit program effectively ended on December 1, 2013, when the tax ceiling was reduced from $35 per acre to $25 per acre.[137] Consequently, at the time of this article, the incentive structure of the

122. *See* FLA. ADMIN. CODE ANN. r. 40E-63.145(6) (2001).
123. *Id.*
124. FLA. STAT. § 373.4592(6)(a) (2013).
125. *Id.*
126. *Id.* §§ 373.4592(6)(c)(1), (6)(a).
127. *Id.* § 373.4592(6)(c)(6).
128. FLA. ADMIN. CODE ANN. r. 62-302.540(4)(a) (2005); S. FLA. WATER MGMT. DIST., EVERGLADES AREA TRIBUTARY BASINS LONG-TERM PLAN FOR ACHIEVING WATER QUALITY GOALS ES-6, 8 (2003), *available at* http://my.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/executivesummary_0.pdf (last visited Mar. 26, 2014).
129. FLA. ADMIN. CODE. ANN. r. 62-302.540(2)(b), (h) (2005).
130. *See* FLA. STAT. § 373.4592(6)(c)(2) (2013).
131. *See Id.* § 373.4592(6)(c).
132. *Id.* § 373.4592(6)(c)(3).
133. *Id.*
134. *Id.* § 373.4592(6)(c)(4).
135. *Id.* § 373.4592(6)(c)(5).
136. *Id.* § 373.4592(6)(d)(1).
137. *Id.* §§ 373.4592(6)(c)(1), (6)(c)(6).

tax credit no longer exists, and all agricultural lands will receive the same tax treatment.[138]

D. PROGRESS MADE IN THE EAA

The 2014 South Florida Environmental Report provides for both annual measurements and a five-year trend analysis of TP loading in the EAA[139] The EAA source control program meets the twenty-five percent phosphorus reduction goal once the average yearly TP load is at least twenty-five percent less than the average annual load during the baseline period.[140] The report adjusts the average baseline TP load to reflect rainfall variability, which affects the amount of phosphorus entering the canals.[141] For 2013, the average TP load was 154 metric tons, whereas the baseline period, adjusted for increased rainfall, was 263 metric tons.[142] That is a forty-one percent reduction, which greatly exceeds the twenty-five percent mark.[143]

To accurately compare progress in the EAA with progress in the LODB, this article considers the same methodology as applied to both regions. In the LODB, a five-year average calculation does not adjust for rainfall variability.[144] Applying the same methodology to the EAA, the five-year baseline average (1981-85) was 242 metric tons.[145] The five-year average from 2009-2013 was 112 metric tons.[146] This is roughly a fifty-four percent reduction, whereas the equivalent methodology in the LODB revealed only a fifteen percent reduction.[147] It is beyond the scope of this article to determine whether the substantial phosphorus reduction in the EAA directly relates to the state's source control programs there. Nonetheless, the significant reduction of phosphorus in the EAA shows that the source control programs might be effective. In contrast, the limited source controls and market-based BMP program in the LODB have failed to produce meaningful results.

Despite considerable progress in reducing phosphorus pollution at the source level, the phosphorus levels in EAA canals are still much too high to allow the water to drain into the Everglades untreated. The current phosphorus levels are at 141 ppb, whereas the water quality standard is only 10 ppb.[148] This is why the state has constructed a number of STAs that store the water from the

138. *Id.* § 373.4592(6)(c)(4).

139. Carlos Adorisio et al., *Status of Source Control in the ECP Basins, in* 2014 SOUTH FLORIDA ENVIRONMENTAL REPORT, 4-11 to 12 (2014).

140. *See Id.* § 373.4592(6)(c)(3).

141. *See* Adorisio et al., *supra* note 139 at 4-11 n.2.

142. *Id.* at 4-11 tbl.4.3.

143. *Id.*

144. FLA. STAT. § 403.067(7)(a)(5) (2013).

145. *See* Adorisio et al., *supra* note 139, at 4-11 to 12.

146. *Id.* at 4-11.

147. Bertolotti, *supra* note 82, 8-35.

148. FLA. ADMIN. CODE ANN. r. 62-302-540(4)(a) (2014); Adorisio et al., *supra* note 139, at 4-11.

canals before releasing it into the Everglades.[149] The STAs incorporate vegetation that naturally expunges phosphorus from the water.[150] As a result of the source control efforts and the STAs, current phosphorus levels in water flowing into the Everglades have dropped from a peak level of 150 ppb to 30 ppb.[151]

IV. SHORTFALLS OF FLORIDA'S APPROACH TO AGRICULTURAL RUNOFF

A. GAPS IN THE LAW

It is odd that Florida focuses so much attention on reducing phosphorus pollution in Lake Okeechobee and the Everglades, yet does not address nitrogen whatsoever. Such lack of attention to nitrogen reduction happens despite the fact that at least two state administrative agencies have released studies concluding that nitrogen pollution in the state, particularly in Lake Okeechobee, is as significant a threat to ecosystem health as phosphorus pollution.[152] Thus, it is no wonder the state has created TMDLs for nitrogen in the St. Lucie and Caloosahatchee Estuaries, [153] where the excess water of Lake Okeechobee is released.[154]

Furthermore, Florida has not addressed sulfate loading in the EAA and Lake Okeechobee, which is a well-documented cause of toxic mercury pollution.[155] Sulfates from agricultural runoff combine with naturally occurring mercury, causing the mercury to become toxic to humans, animals, and plant life.[156] The state is in the administrative process of finalizing a TMDL for mercury.[157] However, the legislature must authorize new source controls to require agricultural landowners to reduce sulfate loading and thus decrease toxic mercury pollution.

Additionally, while the twenty-five percent phosphorus reduction goal in the EAA has been instrumental to the success of the source control program,[158] the goal is simply unambitious. Why not achieve a higher goal, perhaps seventy-five percent? The water in the Everglades still has three times the phosphorus

149. *Treatment, Best Practices and Increased Water Storage*, S. FLA. WATER MGMT. DISTRICT, http://www.sfwmd.gov/portal/page/portal/xweb%20protecting%20and%20restoring/water%20quality%20stormwater%20treatment%20areas (last visited Mar. 9, 2014).

150. *Id.*

151. Orem, *supra* note 21.

152. *See* Water Quality Standards for the State of Florida's Lakes and Flowing Waters, 75 Fed. Reg. 75762, 75768-69 (Dec. 6, 2010); ANTHONY C. FEDERICO ET AL., TECHNICAL PUBLICATION #81-2, 24 (1981), *available at* http://www.sfwmd.gov/portal/page/portal/pg_grp_tech_pubs/portlet_tech_pubs/dre-128.pdf.

153. Baker, *supra* note 72, at 4-32.

154. FLA. STAT. 373.4595(3)(b)(2)(g).

155. *See* Curtis D. Pollman & Donald M. Axelrad, *Modeling Sulfate and Gambusia Mercury Relationships in the Everglades*, *in* 2013 SOUTH FLORIDA ENVIRONMENTAL REPORT, 3B-30 to 31.

156. *See* Orem, *supra* note 21.

157. Pollman & Axelrad, *supra* note 156, at 3B-2.

158. *See* News Release, S. Fla. Water Mgmt. Dist., Phosphorous Reductions Continue to Improve Everglades Water Quality (July 15, 2013), *available at* http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/nr_2013_0715_phosphorus_reduction.pdf.

content compared to the Everglades water quality standard.[159] Even worse, the water in canals throughout the EAA contains fourteen times more phosphorus than that standard.[160] While the EAA programs have achieved commendable success for the region, the state must do more to control phosphorus at the source level in order to realistically meet the Everglades' stringent 10 ppb phosphorus standard.

B. ARBITRARY DIFFERENCES BETWEEN REGIONAL LAWS

The stark differences between the source control programs administered in the EAA and LODB beg the question: why treat interconnected ecosystems so dissimilarly? There seems to be no logical answer. Yet, one may speculate that the state legislature passed separate laws for each region at different times, each law reflecting different legislative priorities. Consequently, the treatment of agricultural lands within an interconnected ecosystem is enormously inconsistent. The state imposes taxes in the EAA for the privilege of conducting agricultural activities there, whereas no such taxes exist for the LODB. BMPs are mandatory in the EAA, but are voluntary in the LODB. There is a mandatory goal for phosphorus reduction in the EAA, albeit an unambitious one, while no such goal exists for the LODB. In the future, states crafting laws to address the problem of agricultural runoff would be wise to create a more uniform and sensible system.

The NEEPP is a step in the right direction towards reducing the arbitrary differences between source controls in the EAA and LODB. It incorporates into the WOD program a more stringent goal of reducing phosphorus loading in the LODB (140 metric tons rather than the current 360 tons).[161] This is a much-needed change. On the other hand, the NEEPP stops short of expressly mandating all farms in the LODB to implement BMPs by providing other alternatives, though the EAA mandates BMPs.[162] Furthermore, the LODB imposes no privilege tax, unlike the EAA. Time will tell whether the NEEPP, when fully implemented, will achieve results for the LODB similar to those the EAA has achieved through its source controls.

V. CONCLUSION

Despite the senseless contrast between the approaches to agricultural runoff Florida has employed in the EAA and LODB, a unique opportunity exists to test the effectiveness of two very different ways of tackling nutrient pollution. On one hand, in the LODB, the state has employed an incentive-based approach with limited regulatory oversight. On the other hand, the approach used in the EAA involves primarily regulatory oversight, in addition to some market-based incentives in the form of tax credits.

As this article demonstrates, the lesson to learn is that meaningful results require laws with so-called 'teeth.' Voluntary, incentivized BMPs in the LODB

159. Orem, *supra* note 21.

160. *See* FLA. ADMIN. CODE ANN. r. 62-302-540(4)(a) (2014); Adorisio et al., *supra* note 139, at 4-11.

161. *See* FLA. STAT. § 373.4595(3) (2013); Baker et al., *supra* note 72, at 4-8.

162. FLA. STAT. § 373.4595(3)(c)(1)(b) (2013).

make environmental responsibility simply a business decision, as opposed to a requirement as it is in the EAA. Additionally, mandating a phosphorus reduction goal has proved quite effective in the EAA, which has exceeded its goal by nearly twofold. No such goal exists for the LODB. Furthermore, agricultural privilege taxation in the EAA is an innovative tool that may have been instrumental in further reducing phosphorus levels there. Overall, it is not difficult to see why the EAA has been considerably more successful than the LODB in reducing phosphorus levels in agricultural runoff.

The EAA source control program serves as a model for other states to consider when developing their own programs. State and local governments in Florida and elsewhere should expand on the EAA model by imposing greater restrictions where necessary. An ideal program should incorporate enforceable water quality standards for nutrients in addition to phosphorus, such as nitrogen and sulfates. Furthermore, with regard to mandatory reduction goals, states should set the bar high rather than settle for an arbitrarily low goal such as the one adopted for the EAA. At a time when federal oversight of agricultural runoff is largely absent, states themselves must confront America's last major source of water pollution. The time for action is now, or else we face the inevitable disappearance of once thriving ecosystems that many of us take for granted.