Nutrient Water Quality Trading: A Market-Based Solution to Water Pollution in the Natural State*

I. INTRODUCTION

In the decades since the passage of the Clean Water Act (CWA), our nation's waters remain impaired by dangerous levels of nutrients such as phosphorous and nitrogen, which can cause serious health impacts.[1] Excess nutrients also have a substantial environmental impact on waterbodies,[2] which in turn diminishes the recreational value of these resources.[3] Efforts to control these nutrient levels place a substantial economic burden on local governments in both providing clean drinking water as well as treating wastewater.[4] The CWA's cooperative federalism approach divides sources of nutrient pollution into

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1. *The Problem*, EPA, http://www2.epa.gov/nutrientpollution/problem [https://perma.cc/9FZF-93XY]_("Nutrient pollution is one of nation's most widespread, costly and challenging environmental problems."); ARK. NAT. RES. COMM'N, 2011-2016 NONPOINT SOURCE POLLUTION MANAGEMENT PLAN 53, 54 (2012) [hereinafter NONPOINT SOURCE POLLUTION MANAGEMENT PLAN], http://www.arkansaswater.org/data/Full_NPSPlan_Document.pdf [https://perma.cc/U53K-ZXJ2].

2. *The Effects: Environment*, EPA, https://www.epa.gov/nutrientpollution/effects-environment [https://perma.cc/GW3Z-Q86V].

3. EPA, THE FACTS ABOUT NUTRIENT POLLUTION 2 (2012), https://www.epa.gov/sites/production/files/2015-03/documents/facts_about_nutrient_pollution_what_is_hypoxia.pdf [https://perma.cc/FG7D-K4VH] (noting that the U.S. economy loses close to $1 billion annually from losses in fishing and other recreational activities).

4. Kan. State Univ., *Freshwater Pollution Costs US At Least $4.3 Billion a Year*, SCI. DAILY (Nov. 17, 2008), http://www.sciencedaily.com/releases/2008/11/081112124418.htm. [https://perma.cc/DN7F-N6K8].

two categories: (1) point sources, and (2) nonpoint sources.[5] Point sources are "discrete conveyance[s]" such as the end of a pipe from an industrial facility or municipal wastewater treatment plant discharging to surface waters.[6] Nonpoint sources are every other source,[7] but most nonpoint source nutrient loads come from agricultural activities and increasing urbanization.[8] The CWA places mandatory regulations on point sources, but nonpoint source regulations are largely determined at the state level.[9]

Over the years, states have primarily addressed nonpoint source pollution by encouraging voluntary participation in federally funded programs.[10] This approach has seen limited success.[11] Because states have not made the necessary progress to reduce nutrient loads from nonpoint sources of pollution, the burden to meet water quality standards in streams impaired by nutrient pollution is met by reducing the point source's permit limits for nutrients—primarily affecting municipal wastewater treatment plants.[12] Below certain levels, further reductions from

5. 33 U.S.C. § 1362(14) (2012); *What is Nonpoint Source?*, EPA, http://www.epa.gov/polluted-runoff-nonpoint-source-pollution/what-nonpoint-source [https://perma.cc/YD8T-CBC3].

6. 33 U.S.C. § 1362(14).

7. *What is Nonpoint Source?*, *supra* note 5 (noting that a "nonpoint source" is "any source of water pollution that does not meet the legal definition of 'point source'").

8. *See id*.

9. ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY 663-66 (7th ed. 2013).

10. Lara D. Guercio, *The Struggle Between Man and Nature—Agriculture, Nonpoint Source Pollution, and Clean Water: How to Implement the State of Vermont's Phosphorous TMDL Within the Lake Champlain Basin*, 12 VT. J. ENVTL. L. 455, 466-69 (2011).

11. *See* EPA: OFFICE OF WATER, WATER QUALITY TRADING POLICY 1 (2003) [hereinafter WATER QUALITY TRADING POLICY], http://archive.epa.gov/ncer/events/calendar/archive/web/pdf/finalpolicy2003.pdf [https://perma.cc/BEG9-JMRW]. A 2000 assessment revealed that "approximately 40% of the rivers, 45% of the streams and 50% of the lakes that have been assessed still do not support their designated uses" due to uncontrolled increases in nonpoint source pollution. *Id*. Since 2014, the U.S. House of Representatives Subcommittee on Water Resources and Environment has recognized the continuing need for pollution reductions from nonpoint sources. *See The Role of Water Quality Trading in Achieving Clean Water Objectives: Hearing Before the Subcomm. on Water Res. and Env't of the H. Comm. on Transp. and Infrastructure*, 113th Cong. vi (2014).

12. WATER QUALITY TRADING POLICY, *supra* note 11, at 6-7.

point sources are no longer an economically efficient means of achieving water quality standards.[13]

In 2015, Arkansas took an important step toward addressing this inefficient approach by passing Act 335.[14] Act 335 provides legislative approval for "nutrient water quality trading programs," including the use of credits, offsets, and compliance associations.[15] This voluntary market-based approach is the first step toward a system wherein the mandatory reductions from point sources may be achieved by either purchasing credits generated by nonpoint sources that voluntarily reduce their nutrient load or through compliance associations, which facilitate trades between point sources.[16] Act 335 sets the foundation upon which a regulatory framework can be constructed to guide and encourage a voluntary market-based solution in local watersheds.[17] State regulatory agencies must now collaborate with the governor's appointed advisory panel and other stakeholders to develop a regulatory framework that will retain the economic efficiencies available through trading without unnecessarily risking those gains to costly litigation, administrative delays, or water quality degradation.[18]

This comment provides policy recommendations for developing a comprehensive nutrient water quality trading framework, which will reduce litigation risk and delayed implementation. Part II provides a background on what the CWA requires of point and nonpoint source dischargers, the United States Environmental Protection Agency's (EPA)

13. *The Role of Water Quality Trading in Achieving Clean Water Objectives*, *supra* note 11, at 1-2.

14. Act 335, 2015 Ark. Act 1512 (codified at ARK. CODE ANN. §§ 8-4-232, 233 (Supp. 2015)).

15. Act 335, 2015 Ark. Act 1512, 1514 (codified at ARK. CODE ANN. § 8-4-232(b)(1)-(2) (Supp. 2015)).

16. Act 335, 2015 Ark. Act 1512, 1514-15 (codified at ARK. CODE ANN. § 8-4-232(c)-(d) (Supp. 2015)).

17. Act 335, 2015 Ark. Act 1512 (codified at ARK. CODE ANN. §§ 8-4-232, 233).

18. *See* ARK. CODE ANN. § 8-4-215 (Supp. 2015); Am. Farm Bureau Fed'n v. EPA, 792 F.3d 281, 309-10 (3d Cir. 2015) (rejecting challenge from nonpoint sources and deferring to EPA's heightened requirements for Chesapeake Bay TMDL, which is the cornerstone of nutrient trading in the Bay); Food & Water Watch v. EPA, 5 F. Supp. 3d 62, 85 (D.D.C. 2013) (rejecting environmental group's challenge to EPA approval of multi-state nutrient trading scheme in the Chesapeake Bay because they could not establish standing or show how EPA approval of trading was "final agency action").

ongoing support of watershed-based trading programs, and the judicial developments regarding trading. Part III offers suggestions for developing a statewide trading framework by focusing on four key areas: (1) requiring participating watersheds to use numeric criteria to measure the targeted nutrient; (2) limiting trading to those watersheds with Total Maximum Daily Loads (TMDL) for nutrients; (3) prohibiting trades that are likely to result in impairment; and, most importantly, (4) determining how credits may be generated by point and nonpoint sources. This fourth area will require the advisory panel and state regulatory agencies to create rules concerning credit baselines, monitoring, uncertainty, and timing issues.[19]

II. BACKGROUND

The difficulties associated with developing localized water quality trading programs stem from the construction of the CWA. Congress's intent in passing the CWA was to eliminate all sources of water pollution—a lofty goal.[20] Congress supported this goal through mandatory federal regulations on the low-hanging fruit—point sources—but then required states to cooperate by regulating all other sources—nonpoint sources. In the years since the passage of the CWA, our nation's water has improved significantly in many regards.[21] However, as

19. EPA: OFFICE OF WASTEWATER MANAGEMENT: WATER PERMITS DIVISION, WATER QUALITY TRADING TOOLKIT FOR PERMIT WRITERS 10 (2009) [hereinafter WATER QUALITY TRADING TOOLKIT], http://www3.epa.gov/npdes/pubs/wqtradingtoolkit.pdf [https://perma.cc/5V6H-7E2F].

20. *See* 33 U.S.C. § 1251(a)(1) (2012).

21. William L. Andreen, *Success and Backlash: The Remarkable (Continuing) Story of the Clean Water Act*, 4 GEO. WASH. J. ENERGY & ENVTL. L. 25, 30 (2013) ("[I]mplementation of the section 404 program in the 1970s has brought about a substantial decline in the rate of wetlands loss. From the mid-1970s to the mid-1980s, wetlands losses in the conterminous United States fell to approximately 290,000 acres each year, about half of the average annual losses experienced during the twenty years before the Act was implemented."); EPA: OFFICE OF WASTEWATER MGMT., PROGRESS IN WATER QUALITY: AN EVALUATION OF THE NATIONAL INVESTMENT IN MUNICIPAL WASTEWATER TREATMENT 7 (2000) [hereinafter PROGRESS IN WATER QUALITY], https://www.epa.gov/nscep [https://perma.cc/RC67-C4Q3] ("[T]he 45 percent nationwide reduction in effluent BOD_5 loading and the 23 percent reduction in effluent BOD_U loading was achieved during a period when total population served and influent loading of BOD both increased by 35 percent!").

waterbodies become increasingly impaired by excess nutrients from nonpoint sources, states have come under greater pressure to find ways to reduce nonpoint source nutrient loads.[22] This growing issue has also put increased pressure on the federal government to do more to regulate nonpoint sources, which has led to a struggle over what EPA can require of states under the CWA to achieve the congressional mandate of eliminating water pollution.[23] Since 1996, EPA has supported state and local watershed trading programs. In recent years, EPA has offered guidance[24] and funding for state trading programs,[25] but litigation brought by both environmental and industry advocates continues to be a costly impediment to the success of several of these trading programs.[26] Without a balanced approach that encourages local trades while achieving quantifiable reductions from nonpoint sources, the alternative may be mandatory regulations extended to nonpoint sources.[27]

A. The Requirements of the Clean Water Act

In 1972, the CWA received overwhelming bipartisan support at a time when rivers caught fire and were biologically

22. *See* Mohammad O. Jazil & David W. Childs, *EPA Imposes Strict Numeric Nutrient Criteria in Florida: Background and Implications*, 43 TRENDS 6, 6 (2011).

23. *See id*. at 7; Am. Farm Bureau Fed'n v. EPA, 792 F.3d 281, 287 (3d Cir. 2015).

24. *See* WATER QUALITY TRADING POLICY, *supra* note 11; WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 1; EPA, WATER QUALITY TRADING ASSESSMENT HANDBOOK i (2004) [hereinafter WATER QUALITY TRADING ASSESSMENT HANDBOOK], https://www.epa.gov/nscep [https://perma.cc/8NCF-4SWR]; Memorandum from Nancy K. Stoner, Acting Assistant Adm'r, to Regional Administrators, Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions, at 1 (Mar. 16, 2011), http://www.epa.gov/sites/production/files/documents/memo_nitrogen_framework.pdf [https://perma.cc/2UEY-59XL].

25. 33 U.S.C. § 1329(h)(1) (2012); *see also* NONPOINT SOURCE POLLUTION MANAGEMENT PLAN, *supra* note 1, at 24.

26. *See* Food & Water Watch v. EPA, 5 F. Supp. 3d 62 (D.D.C. 2013) (rejecting environmental group's challenge to EPA's multi-state nutrient trading scheme because they could not establish standing or show how EPA approval of trading was final agency action); Am. Farm Bureau Fed'n v. EPA, 792 F.3d 281 (3d Cir. 2015) (rejecting a majority of trade association's challenges to EPA's Clean Water Act TMDL regulations and narrowly directing clarification of ambiguous terms in the act at cost of trade association).

27. *See* NONPOINT SOURCE POLLUTION MANAGEMENT PLAN, *supra* note 1, at 58.

unfit for leeches—much less fish.[28] The objective of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" by eliminating the discharge of pollutants into navigable waters by 1985 and by attaining water quality which "provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water [by 1983]."[29] In the spirit of cooperative federalism, enforcement of the CWA has been delegated to forty-six states—including Arkansas—with EPA oversight.[30]

1. *Point Sources*

Congress saw that it could achieve rapid reductions in water pollution nationwide by targeting "any discernible, confined and discrete conveyance, including but not limited to any pipe" discharging pollutants to surface waters—referred to as a "point source" in the Act.[31] Point sources are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit.[32] This permit places limits on the quantities of various pollutants the point source may discharge.[33] The limits will be the more stringent of Technology-Based Effluent Limitations (TBEL), which generally require that the best technology for a given category of dischargers be used, or Water-Quality Based Effluent Limitations (WQBEL), which are set to assure that the state water quality standards are met.[34]

The CWA also requires states to inventory waterbodies based on whether or not the waterbody is attaining its designated

28. Jennifer Latson, *The Burning River That Sparked a Revolution*, TIME (June 22, 2015), http://time.com/3921976/cuyahoga-fire/ [https://perma.cc/X9BT-A8TW]; Peter Lehner, *House Republicans Wage War on clean Water,* NATURAL RESOURCES DEFENSE COUNCIL (July 16, 2014), https://www.nrdc.org/experts/peter-lehner/house-republicans-wage-war-clean-water [https://perma.cc/5P28-6823].

29. 33 U.S.C. § 1251(a) (2012).

30. *EPA Announces Plan to "Revamp" CWA Enforcement Approach*, BEVERIDGE & DIAMOND, PC, (Oct. 16, 2009), http://www.bdlaw.com/news-705.html [https://perma.cc/28GV-BTWA]; *Enforcement Analysts*, ARK. DEP'T OF ENVTL. QUALITY, https://www.adeq.state.ar.us/water/enforcement/analysts.aspx [https://perma.cc/N8VP-JHM9].

31. *See* 33 U.S.C. § 1362(14) (2012).

32. 33 U.S.C. § 1342(a)(1) (2012).

33. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 5-6.

34. *Id*.

use—known as 303(d) lists.[35] The waterbodies that do not meet the state's designated beneficial uses based on water quality standards and their associated criteria are deemed impaired.[36] From the prioritized list of impaired waterbodies, the CWA then requires states to establish a TMDL.[37] The TMDL, known colloquially as a "pollution diet,"[38] establishes the maximum amount of a pollutant the watershed can absorb before exceeding the associated water quality standards and designated uses (e.g., fishable, swimmable, drinkable).[39] The TMDL is established by calculating the "waste load allocation" for point sources plus the "load allocation" for nonpoint sources plus a margin of safety.[40] However, only point sources are required to reduce their discharge to comply with the heightened NPDES permit restrictions that result from this TMDL analysis.[41]

2. *Nonpoint Sources*

Regulating point sources put the fire out on the Cuyahoga River and improved countless other waterbodies across the nation,[42] but excessive nutrient pollution from nonpoint sources remains a threat to the health and economic vitality of many areas of the country.[43] The nutrients of greatest concern are nitrogen and phosphorous.[44] The main sources of excess nutrients in our waterways are agriculture and increasing

35. 33 U.S.C. § 1313(d)-(e) (2012).

36. 2 U.S. ARMY CORPS OF ENG'RS, UC MERCED AND UNIVERSITY COMMUNITY PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT 4.8-16 (2008), http://opb.ucmerced.edu/sites/opb.ucmerced.edu/files/documents/vol2_deir_ucmerced_small.pdf. [https://perma.cc/XF47-9AMZ].

37. Guercio, *supra* note 10, at 457-58.

38. *Chesapeake Bay Total Maximum Daily Load (TMDL)*, EPA, https://www.epa.gov/chesapeake-bay-tmdl [https://perma.cc/5TGZ-H3ZX].

39. 33 U.S.C. § 1313(d)(C)-(D) (2012).

40. 33 U.S.C. § 1313(d)(D) (2012).

41. *See* 33 U.S.C. § 1342(k) (2012). Hypothetically, the TMDL analysis could find that nonpoint sources account for ninety-nine percent of the nutrient load to the waterway, but only the permitted point sources would be required to reduce their discharge to comply with the water quality standard.

42. PROGRESS IN WATER QUALITY, *supra* note 21, at 13; Latson, *supra* note 28.

43. EPA, THE FACTS ABOUT NUTRIENT POLLUTION, *supra* note 3, at 1-2.

44. *Id*.; Memorandum from Nancy K. Stoner, *supra* note 24.

urbanization.[45] Excess nutrients from agriculture come from animal manure and soil erosion associated with livestock and crop production. The increasing amount of impervious surfaces—roofs, roads, and parking lots—that come with expanding urbanization leads to more stormwater being directed into small streams and ditches.[46] The increased volume and velocity of water in these natural channels also leads to further soil erosion.[47] Eroded stream banks release the nutrients that have built up in that soil over decades.[48] Because the nutrient loads from nonpoint sources are the result of diffuse stormwater runoff from, for example, farm fields, and neighborhoods rather than a discrete pipe, they are considered nonpoint sources.[49] These nonpoint sources of nutrient pollution mix with point source discharges and together cause the economic and environmental harms discussed above.

The CWA leaves the regulation of nonpoint sources to the states in its cooperative federalism approach, but it clearly intends for both point and nonpoint sources of pollution to be controlled "in an expeditious manner so as to enable the goals of [the CWA] to be met . . . ."[50] Despite the CWA's federal funding provisions aimed at reducing nonpoint source

45. EPA, THE FACTS ABOUT NUTRIENT POLLUTION, *supra* note 3, at 1; NONPOINT SOURCE POLLUTION MANAGEMENT PLAN, *supra* note 1, at 58-60. The Arkansas Natural Resources Commission (ANRC) has implemented nonpoint source regulations for farmers in "nutrient surplus areas," such as Northwestern Arkansas. *Id*. at 1-2. Additionally, Concentrated Animal Feeding Operations (CAFOs) and stormwater systems for municipalities and construction sites may be required to obtain NPDES permits under changing state and federal regulations. *Id*. at 1.

46. Although the stormwater discharges from many cities and towns are classified as point sources, thereby required to obtain NPDES permits, the permit requirements for Municipal Separate Storm Sewer Systems (MS4) are more similar to nonpoint source regulations in that they typically do not set a nutrient discharge limit but require cities to educate the community and use BMPs to achieve pollution reductions. *See* 33 U.S.C. § 1342(p) (2012); *see also NPDES Stormwater Program*, EPA, https://www.epa.gov/npdes/npdes-stormwater-program [https://perma.cc/M56Y-2NL8].

47. *Id*.

48. ANDREW SHARPLEY, PENN STATE COLL. OF AGRIC. SCI.: AGRIC. RESEARCH & COOP. EXTENSION, MANAGING PHOSPHORUS FOR AGRICULTURE AND THE ENVIRONMENT 8 (2001), http://extension.psu.edu/plants/nutrient-management/educational/soil-fertility/managing-phosphorus-for-agriculture-and-the-environment [https://perma.cc/8B47-LASR].

49. *See What is Nonpoint Source?*, *supra* note 5.

50. 33 U.S.C. § 1251(a)(7) (2012).

pollution,[51] the effort among states to reduce nonpoint sources of pollution through voluntary adoption of best management practices (BMP) has been neither effective nor expeditious.[52]

In 1987, Congress amended the CWA to address the growing problem of nonpoint source pollution.[53] Congress changed the designation of some municipal, industrial, and construction site stormwater discharges (e.g., certain street and parking lot drainage systems) from nonpoint sources to point sources, thereby requiring some of those sources to obtain NPDES permits.[54]

The 1987 CWA Amendments also added Section 319, which requires states to identify nonpoint sources of pollution and develop management plans for bodies of water impaired by those sources.[55] However, much like its predecessor Section 208, Section 319 does not require state management programs to place any mandatory regulations on nonpoint sources, making it a largely ineffective pollution reduction tool.[56] Despite the availability of federal resources, voluntary programs encouraging BMPs have not achieved the large-scale nutrient reductions needed from nonpoint sources.[57]

To date, the most effective tool in the CWA for addressing nonpoint source pollution has been the citizen suit provision.[58] Citizen suits have compelled EPA to establish TMDLs in twenty-seven cases due to noncompliance with the CWA.[59] The TMDL establishes load allocations for point sources and nonpoint sources, which provides not only a pollutant load cap,

51. *See* 33 U.S.C. § 1329(h) (2012).

52. Robin Kundis Craig & Anna M. Roberts, *When Will Governments Regulate Nonpoint Source Pollution? A Comparative Perspective*, 42 B.C. ENVTL. AFF. L. REV. 1, 11-13 (2015).

53. *Id*. at 11.

54. *Id*.; 33 U.S.C. § 1342(p) (2012).

55. 33 U.S.C. § 1329(b) (2012). These management programs are required to identify and implement best management practices to control nonpoint source pollution. *Id*.

56. 33 U.S.C. § 1329(h) (2012); 33 U.S.C. § 1288(a)(1) (2012).

57. David Zaring, Note, *Agriculture, Nonpoint Source Pollution, and Regulatory Control: The Clean Water Act's Bleak Present and Future*, 20 HARV. ENVTL. L. REV. 515, 526-28 (1996).

58. 33 U.S.C. § 1365 (2012); Guercio, *supra* note 10, at 472 (discussing the impact citizen suits had in spurring TMDL implementation by states or EPA).

59. Guercio, *supra* note 10, at 472.

but also data on the quantity of the target pollutant that can be attributed to nonpoint sources.[60] Using this information, local watershed protection groups and the regulated point sources began developing localized water quality trading programs wherein nonpoint sources could voluntarily implement BMPs designed to reduce their load of the targeted pollutant.[61]

As states and EPA began complying with the CWA by establishing TMDLs for impaired waterbodies, point sources were required to invest in increasingly expensive technologies with diminishing marginal returns relative to cost.[62] This in turn put pressure on regulated point sources at the local level—wastewater treatment plants—to lobby their state legislators to bring nonpoint sources into the pollution reduction equation.[63] Some states have now placed mandatory regulations on nonpoint source nutrient loads, but Arkansas may be able to avoid that by implementing an effective trading program.

B. EPA Support for Water Quality Trading

In 1996, EPA promoted watershed-based trading as an innovative way of achieving water quality standards.[64] Two years later, EPA collaborated with the United States Department of Agriculture (USDA) to protect watersheds through the "Clean Water Action Plan," which would provide federal funds to local stakeholders developing programs to reduce pollution from point sources and nonpoint sources.[65] By 2003, EPA published its official Water Quality Trading Policy, which formalized its

60. 33 U.S.C. § 1313 (d)(1)(C)-(D) (2012).

61. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 2.

62. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 6.

63. *See, e.g.*, Act 335, 2015 Ark. Act 1512 (codified at ARK. CODE ANN. §§ 8-4-232, 233 (Supp. 2015)). In Arkansas, the Arkansas Water and Wastewater Managers Association (AWWMA) was instrumental in bringing about Act 335 and the alternative means of NPDES permit compliance it allows for under the umbrella of nutrient water quality trading. *A Basic History and Vision of Nutrient Trading and Act 355* 2-3 (NWA Intergovernmental Working Grp. & NWA Stakeholders, Informational White Paper, 2015), http://www.arkwwma.org/pdf/VisionOfNutrientTradingEvolutionOfAct335.pdf [https://perma.cc/53FB-8RMC].

64. Effluent Trading in Watersheds Policy Statement, 61 Fed. Reg. 4,994-01, 4995 (Feb. 9, 1996).

65. CAROL BROWNER & DAN GLICKMAN, CLEAN WATER ACTION PLAN: RESTORING AND PROTECTING AMERICA'S WATERS iii-iv (1998).

support for using trading to achieve nutrient and sediment reductions from nonpoint sources.[66] The agency then published a Water Quality Trading Assessment Handbook to provide step-by-step guidance for local stakeholders considering using water quality trading in their watershed.[67]

In 2008, EPA released an evaluation of trading programs and found that, despite efforts to promote the programs, there were significant hurdles to their success and expansion.[68] The evaluation cited ambiguity in the CWA, over-burdened permit writers, cautious legal counsel, and local conditions such as the "regulatory, economic, hydrologic, and geographic circumstances" of each watershed, as impediments to effective trading programs.[69] The agency concluded that trading "may be limited to areas where program coordinators have both a high level of interest in trading and the talent needed to shepherd stakeholders through a challenging program development and implementation process."[70] EPA's support and guidance has been consistent over the past decade, yet most states are reluctant to develop the TMDLs and nutrient criteria necessary to implement efficient and successful trading programs.[71]

C. Judicial Developments Regarding Water Quality Trading Programs

Even when trading programs receive local support and EPA approval, they remain subject to judicial scrutiny.[72] The CWA's

66. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 1. Despite this formal policy statement and numerous guidance documents, neither the CWA nor federal regulations have been amended to formally recognize trading. *See id*.

67. *See* WATER QUALITY TRADING ASSESSMENT HANDBOOK, *supra* note 24, at 5-26.

68. EPA, WATER QUALITY TRADING EVALUATION 4-1 (2008), https://www.epa.gov/sites/production/files/2015-09/documents/epa-water-quality-trading-evaluation.pdf [https://perma.cc/6W8B-YBH2].

69. *Id*.

70. *Id*.

71. *Id*.

72. *See, e.g.*, Friends of Pinto Creek v. EPA, 504 F.3d 1007, 1009 (9th Cir. 2007) (rejecting EPA approval of NPDES permit allowing for pollution offsets in a 303(d) listed stream); *cf*. *In re* Cities of Annandale & Maple Lake, 731 N.W.2d 502, 524 (Minn. 2007) (affirming state pollution control agency's issuance of NPDES permit that allowed for a new municipal wastewater treatment plant to discharge phosphorous to a phosphorous

citizen suit provision gives any citizen with standing the right to sue.[73] EPA has fought against several of these lawsuits brought by both environmental and industrial interests claiming injury from the agency's action or inaction regarding water quality trading programs.[74]

The litigation has ranged from broad claims that EPA lacks the authority under the CWA to approve any pollution-trading scheme,[75] to narrower claims challenging elements of a trading framework,[76] as well as the typical questions around whether EPA's regulatory interpretations were appropriate.[77] The threshold legal question of whether trading is allowed under the CWA appears to be supported by the deference given to regional administrators under CWA Section 402(a)(2) to issue NPDES permits that "assure compliance . . . including conditions on data and information collection, reporting, and such other requirements as he deems appropriate . . . ."[78] Allowing point sources to meet their permit requirements through trading appears to be an appropriate means of assuring compliance, but should an injury result from that scheme, plaintiffs may have standing to sue.[79] Courts have dealt with the narrower controversies by giving deference to agency interpretations where the statute is ambiguous and the agency interpretation is

impaired stream when that additional pollution would be offset by reductions from a nearby plant).

73. 33 U.S.C. § 1365(a) (2012).

74. *See, e.g.*, Am. Farm Bureau Fed'n v. EPA, 792 F.3d 281, 293 (3d Cir. 2015); Food & Water Watch v. EPA, 5 F. Supp. 3d 62, 73 (D.D.C. 2013).

75. *See, e.g.*, *Food & Water Watch*, 5 F. Supp. 3d at 66.

76. *See Am. Farm Bureau Fed'n*, 792 F.3d at 294; *see also* Jazil & Childs, *supra* note 22.

77. *See* 40 C.F.R. § 122.4(i) (2015); *Friends of Pinto Creek*, 504 F.3d at 1011-12 (challenging agency interpretations of whether offsets would "cause or contribute to" a numeric or narrative water quality standard violation); *In re Cities of Annandale & Maple Lake*, 731 N.W.2d at 507.

78. 33. U.S.C. § 1342(a)(2) (2012).

79. *Food & Water Watch*, 5 F. Supp. 3d at 80 (dismissing complaint for lack of standing).

reasonable.[80] In spite of this litigation, states are pursuing water quality trading programs with varying results.[81]

In 2007, a divided Minnesota Supreme Court found that the state pollution control agency's interpretation of federal regulations was reasonable[82] when it decided that a new source of phosphorous in a phosphorous impaired waterbody would not "cause or contribute to the violation of water quality standards" due to an aggregate reduction from offsets.[83] A few months later, the Ninth Circuit found in *Friends of Pinto Creek v. EPA* that offsets were irrelevant because federal regulations unambiguously prohibited the issuance of permits to new sources of pollution in an impaired waterbody without first accounting for how the water quality standard would be met in a TMDL.[84]

In *Friends of Pinto Creek*, the EPA and Carlota Copper argued that the agency's NPDES permit approval was appropriate because the new discharge would be offset due to increased pollution reductions from a separate upstream point source and, therefore, would create no "detectable change in water quality."[85] The Ninth Circuit rejected this argument finding that although section 122.4(i)(2) does not prohibit

80. *See, e.g.*, Am. Farm Bureau Fed'n v. EPA, 792 F.3d 281, 294-310 (3d Cir. 2015) (analyzing agency's interpretation under the two-step test set out in Chevron U.S.A., Inc. v. Nat. Res. Def. Council, Inc., 467 U.S. 837 (1984)).

81. *See Water Quality Trading Programs*, U.S. DEP'T OF AGRIC.: OFFICE OF THE CHIEF ECONOMIST, http://www.usda.gov/oce/environmental_markets/water_trading.htm [https://perma.cc/QVG6-MAWM].

82. 40 C.F.R. § 122.4(i); *see also In re* Cities of Annandale & Maple Lake, 731 N.W.2d 502, 524 (Minn. 2007).

83. *Id.* at 524-25 (finding that regulation was ambiguous and agency interpretation was reasonable; however, dissenting justices finding federal regulation unambiguously prohibited approval of the permit).

84. 504 F.3d 1007, 1011-12 (9th Cir. 2007) (finding that EPA's NPDES permit approval violated the plain language of the federal regulation). Decades prior to the Ninth Circuit's decision in *Friends of Pinto Creek*, the Supreme Court reversed a similar finding from the Tenth Circuit in *Arkansas v. Oklahoma*, 503 U.S. 91 (1992). *Id.* at 1013-14. In *Arkansas*, the Court found that the Tenth Circuit inappropriately interjected its interpretation of the CWA that no permits could be issued to new sources that would contribute to a water quality violation, but only because neither party raised the issue and deference to EPA's approval was appropriate where there would be no "detectable change in water quality." *Id.* at 1013.

85. *Friends of Pinto Creek*, 504 F.3d at 1013 (quoting Arkansas v. Oklahoma, 503 U.S. 91 (1992)).

NPDES permit approval to new sources discharging into impaired streams, it does require "(1) . . . *sufficient remaining pollutant load allocations* to allow for the discharge; and (2) [that] existing dischargers into that segment are subject to *compliance schedules* designed to bring the segment into compliance with applicable water quality standards."[86] The court held that the purpose of section 122.4(i)(2) was not merely "to show a lessening of pollution, but to show how the water quality standards will be met if [the new source] is allowed to discharge pollutants into the impaired waters."[87] The Ninth Circuit vacated and remanded EPA's permit.[88] The Supreme Court denied requests for certiorari, despite the Ninth Circuit's conflict with Minnesota's Supreme Court.[89] If Arkansas relies on the Ninth Circuit's precedent when developing its water quality trading program, then any new sources discharging nutrient pollution to a nutrient impaired waterway will have to be accounted for in a TMDL. The availability of trading, however, could alleviate some of the burden imposed by the pollution restrictions required of point sources under a TMDL.

As courts require states and EPA to comply with the CWA by ordering the implementation of TMDLs, the interest in trading schemes grows.[90] In thirty-eight of the states where environmentalists sought compliance with the Act's TMDL requirement, twenty-two states were ordered to work with EPA to establish TMDLs for thousands of impaired waterbodies.[91] In recent years, important TMDL litigation has centered on what EPA can require in establishing or approving a state's TMDL for an impaired waterbody.[92]

86. *Id*. at 1013.
87. *Id*. at 1014.
88. *Id*. at 1017.
89. *Id*.
90. Am. Farm Bureau Fed'n v. EPA, 792 F.3d 281, 290 (3d Cir. 2015).
91. CLAUDIA COPELAND, CRS REPORT FOR CONGRESS: CLEAN WATER ACT AND TOTAL MAXIMUM DAILY LOADS (TMDLS) OF POLLUTANTS 2-3 (2008), http://nationalaglawcenter.org/wp-content/uploads/assets/crs/97-831.pdf [https://perma.cc/9G2H-3JBW].
92. *See Am. Farm Bureau Fed'n*, 792 F.3d at 287; *see also* Food & Water Watch v. EPA, 5 F. Supp. 3d 62, 66 (D.D.C. 2013).

In the 2013 case *Food & Water Watch v. EPA*,[93] environmental advocates argued that EPA's approval of a TMDL, which allowed for water quality trading as a means for attaining established water quality standards, would lead to pollution "hotspots" in the watershed and diminish their members' use and enjoyment of the watershed.[94] The D.C. District Court dismissed plaintiffs' claim on procedural grounds because they lacked standing due to the fact that EPA's approval of a TMDL that *allowed* for trading pollution credits was not a final agency action, as required under the Administrative Procedure Act (APA).[95] The court reasoned that EPA approved trading as a tool that could be used to meet permit requirements—but was not an agency requirement.[96] Furthermore, the court found that the plaintiffs suffered no "actual or imminent" harm as a result of the approved trading programs.[97] Agency action will be final and the injury will be actual or imminent only if the agency approves trades or offsets that can be proven to create hotspots or some other harm.[98]

In 2015, the Third Circuit applied *Chevron* deference to EPA's interpretation of the CWA's TMDL requirement.[99] In *American Farm Bureau Federation*, the court found that the words "total maximum daily load" were ambiguous;[100] thus, *Chevron* deference was appropriate and the agency's interpretation was deemed reasonable in light of Congressional intent.[101] EPA interpreted the CWA "to require publication of a comprehensive framework for pollution reduction in a given body of water."[102] The American Farm Bureau Federation argued that in establishing a TMDL, EPA could do nothing

93. *Food & Water Watch*, 5 F. Supp. 3d at 62.

94. *Id*. at 73-74.

95. 5 U.S.C. § 704 (2006); *Food & Water Watch*, 5 F. Supp. 3d at 81-85.

96. *Food & Water Watch*, 5 F. Supp. 3d at 82.

97. *Id*. at 74-75.

98. *Id*. at 73-74, 81-82.

99. Am. Farm Bureau Fed'n v. EPA, 792 F.3d 281, 294-309 (3d Cir. 2015). *See generally* Chevron U.S.A., Inc. v. Nat. Res. Def. Council, Inc., 467 U.S. 837 (1984) (articulating the appropriate standard to use when reviewing an agency's construction of a statute it administers).

100. *See Am. Farm Bureau Fed'n*, 792 F.3d at 297-98.

101. *See id*. at 301-06.

102. *Id*. at 288.

more than calculate a numeric value identifying the maximum pollution loads in a waterbody and then leave the state to decide what actions—if any—would be taken to meet the TMDL.[103] The Third Circuit found that EPA's interpretation of its role in establishing TMDLs did not infringe on states' rights when requiring them to outline how the TMDL would be met and what the state would do if the TMDL were not met.[104]

These judicial developments, along with EPA guidance, establish guideposts for developing Arkansas's nutrient water quality trading program. Admittedly, these guideposts leave much to be desired in terms of clarity and finality. However, they remain important markers in the historical development of water quality trading worthy of analysis when creating Arkansas's new regulatory framework.

III. DEVELOPING A FRAMEWORK FOR NUTRIENT WATER QUALITY TRADING

In order for water quality trading programs to succeed in Arkansas, the way in which these programs are viewed by environmental advocates, regulatory agencies, and regulated parties must change. Trading cannot continue to be characterized as pay-to-pollute by the environmental community.[105] Whether the regulated point source pays for advanced technology to meet the water quality standard, pays for BMPs at a nonpoint source, or contracts for point source trades to achieve the same—or greater—reduction, the reduction will have a cost. It is simply a question of how much the point source must pay and whether the water quality standard can be achieved through nonpoint source trades. Point sources have achieved great reductions in nutrient discharges under the CWA regulations over the past forty years, but the objectives of the

103. *Id*. at 297-99.

104. *Id*. at 301-06.

105. *See* Zach Corrigan, *The Case Against Water Quality Trading*, 30 NAT. RESOURCES & ENV'T 15, 16-17 (2015).

CWA cannot be met by controlling point sources alone.[106] For instance, in many municipalities it is no longer economically efficient to require ever-greater phosphorous or nitrogen reductions from point sources (primarily wastewater treatment plants) while exempting nonpoint sources (primarily agricultural land and urban centers).[107]

Nutrient water quality trading will provide an opportunity for nonpoint sources to voluntarily reduce their contribution to the nutrient pollution problem. In return, point sources may purchase credits that will be generated by the nonpoint source's reduction. When the cost for nonpoint sources to generate credits is lower than the cost of investing in advanced technology at the point source, the point source will purchase the nonpoint source's credits thereby creating a Nutrient Water Quality Trading market.[108] Technological advancements such as using Geospatial Information Systems (GIS) to apply nutrients to agricultural land more efficiently,[109] or using proven BMPs to reduce the amount of nutrients leaching into waterbodies[110] coupled with advanced modeling and monitoring, are making it easier to verify the nutrient reductions from nonpoint sources.[111]

106. *Id*. at 15-17.

107. Presentation, Billy Ammons & Heath Ward, City of Fayetteville, Nutrient Trading and Act 335: A Short History and Progress Report (undated) (on file with author) (showing cost of reducing phosphorous from a nonpoint source to be approximately $300,000 versus the cost of equal reductions from point source technology upgrades to be approximately $18,000,000); Letter from Lioneld Jordan, City of Fayetteville, Ark. Mayor, to Dr. Al Armendariz, EPA Region 6 Admin'r 4 (Oct. 12, 2011), https://www3.epa.gov/region6/water/npdes/illinoisriverwatershed/documents/correspondence/cty-of-fayetteville-commit-to-waterquality-oct12-2011.pdf [https://perma.cc/PA9N-Y43F] (stating that planned point source reductions would cost $90-100 million in capital upgrades with questionable environmental benefit); *The Role of Water Quality Trading in Achieving Clean Water Objectives*, *supra* note 11, at 10-11 (citing the cost of point source reductions as at least two to three times greater than reductions from nonpoint sources).

108. *See The Role of Water Quality Trading in Achieving Clean Water Objectives*, *supra* note 11, at 3, 5, 11.

109. STATE OF ARK., ARKANSAS WATER PLAN: NUTRIENT REDUCTION STRATEGY 13-14, http://arkansaswaterplan.org/references/ar_nutrient_reduction_strategy101014.pdf [https://perma.cc/7LHG-DA7Y].

110. *See* IOWA STATE UNIV. SCI. TEAM, IOWA NUTRIENT REDUCTION STRATEGY 4-5 (2013), http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/NRS2-141001.pdf [https://perma.cc/H3FJ-ZNLV].

111. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 130. However, advancements in modeling and monitoring still do not provide 100% accuracy; watersheds are dynamic systems, which means uncertainty is inherent. *See* UNIV. OF ARK. DIV. OF

The certainty of these quantifications will likely never be as accurate as the measurements from the end of a point source pipe, but there are methods of accounting for this uncertainty, which make nutrient trading a cost-effective strategy for meeting water quality standards.[112]

Similarly, regulated point sources must change the way they view the CWA's TMDL requirement. Historically, a TMDL meant that the state or EPA would analyze and allocate phosphorous loads for both point and nonpoint sources, then require only point sources to reduce their load in order to meet the water quality standard.[113] It still does.[114] However, with a trading program in place, point sources will be able to achieve that reduction by purchasing less costly credits generated by nonpoint sources or other point sources. The TMDL analysis is an essential starting point for understanding load allocations among all sources, which provides a foundation for this market-based solution.[115] Although EPA has approved trading schemes in watersheds without a TMDL, those trades must be approved on a case-by-case basis, supported by TMDL-like analysis, and then included in the point source's NPDES permit.[116] Any trading flexibility lost due to the establishment of a TMDL is counterbalanced by greater load allocation certainty. Greater certainty will make potential market participants more comfortable entering the market and regulatory agencies more

AGRIC.: PUB. POLICY CTR., THE ROLE OF NONPOINT SOURCE MODELS IN WATERSHED MANAGEMENT 1, 3-4, https://www.uaex.edu/publications/pdf/FSPPC112.pdf [https://perma.cc/8N5P-JBWR].

112. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 30-33.

113. *Program Overview: Total Maximum Daily Loads (TMDL)*, EPA, https://www.epa.gov/tmdl/program-overview-total-maximum-daily-loads-tmdl [https://perma.cc/6FLZ-J2RL].

114. *See id*.

115. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 33 (supporting assertion that TMDLs were essential to EPA's 2003 Water Quality Trading Policy and generally make trading more feasible).

116. WATER QUALITY TRADING POLICY, *supra* note 11, at 6; *see, e.g.*, City of Fayetteville, Ark. Res. No. 59-06 (Mar. 21, 2006), http://www2.adeq.state.ar.us/downloads/WebDatabases/PermitsOnline/NPDES/SpecialReports/AR0020010_Resolution%20No.%2059-06_20060321.pdf [https://perma.cc/7B5L-LSVS]. Although this Agreement was not technically a trade and was not created using TMDL-like analysis, it does exemplify ADEQ's willingness to approve permits where nonpoint source reductions account for some portion of the point source's requisite reductions. *Id*.

likely to approve trading schemes, which in turn creates greater market efficiency. None of this is possible without an updated regulatory framework, which allows trading programs to function as a viable tool.

The difficulty for all parties lies in the details of structuring a program so that adequate checks are in place on the economic incentives to trading such that water quality standards are met. Ultimately, the CWA requires point sources to make reductions that will meet water quality standards.[117] Even in an approved trading program, if the standard is not met due to economically efficient though ineffective trades, the point source remains potentially liable for meeting the water quality standard.[118]

Despite the challenges involved, Arkansas has the benefit of drawing on previous EPA decisions, court precedents, and the successes or failures of other watersheds over the past thirty years to guide development of its regulatory framework. By addressing the legally contentious aspects of nutrient trading, the administrative rulemaking process can result in a regulatory framework that satisfies the CWA's mandates while encouraging cost-effective trades.[119] This will be a very detail-specific process, but it will provide trading efficiency, verifiable reductions, and require buy-in from all interested parties, which will minimize litigation-risk. Important aspects of this framework should include: (1) the importance of numeric criteria for nutrients in those watersheds engaging in trading; (2) limitations on trades in watersheds without TMDLs for nutrients; (3) an express prohibition on trades that result in water quality impairments; and (4) clear requirements for how point and nonpoint sources may generate tradable credits.

Act 335 brought about a collaborative approach to developing a nutrient trading program in Arkansas, starting with the appointment of an advisory panel.[120] The advisory panel,

117. *See* 33 U.S.C. § 1251 (2006).

118. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 5- 6.

119. *See, e.g.*, 25 PA. CODE § 96.8 (2016) (establishing the use of offsets and tradable credits from pollution reduction activities in the Chesapeake Bay Watershed); *see also* WASH. ADMIN. CODE § 173-201A-450 (2015).

120. *See* Act 335, 2015 Ark. Act 1512, 1515-17 (codified at ARK. CODE ANN. § 8-4-233 (Supp. 2015)); Press Release, Governor Asa Hutchinson Announces Appointments

appointed by Governor Asa Hutchinson, is made up of nine members representing specified interests, including NPDES permitees with valuable insight into how this regulatory framework may affect their operations.[121] The advisory panel will offer essential stakeholder input, but the agency employees who are paid by the state for their experience and expertise in administering the state's water quality regulations should take an active role in developing this framework as well. Working together, the stakeholders should address: (1) the criteria used for limiting nutrient pollution; (2) the need for TMDLs in watersheds seeking to trade; (3) how to avoid hotspots and impairments caused by trading; and (4) the specific requirements for sources seeking to generate tradable credits.

A. The Necessity of Numeric Criteria for Nutrients

Deciding whether to use narrative or numeric criteria is a fundamental step in developing the regulations needed to encourage local trading programs. The criteria to be used for individual pollutants are generally set by the state, and can be either narrative or numeric.[122] Most states continue to use narrative criteria to determine whether a waterbody is nutrient impaired.[123] However, allocations based on narrative criteria are inherently more subjective than those based on numeric criteria.[124] Moving toward numeric criteria for nutrients satisfies

(July 1, 2015), http://governor.arkansas.gov/press-releases/detail/governor-asa-hutchinson-announces-appointments-150701 [https://perma.cc/TFH7-Y6DC].

121. Act 335, 2015 Ark. Act 1512, 1515 (codified at ARK. CODE ANN. § 8-4-233(a) (Supp. 2015)).

122. 33 U.S.C. § 1314(a)(1) (2012).

123. *See State Progress Toward Developing Numeric Nutrient Water Quality Criteria for Nitrogen and Phosphorus*, EPA, http://cfpub.epa.gov/wqsits/nnc-development/ [https://perma.cc/JHJ4-E59A].

124. *See, e.g.*, Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas, Ark. Pollution Control and Ecology Comm'n Reg. No. 2 § 2.509, http://www.sos.arkansas.gov/rulesRegs/Arkansas%20Register/2011/Oct11Reg/0.14.00.10-005.pdf [https://perma.cc/3X53-Z2C4]. A typical narrative nutrient criteria looks like this: "Materials stimulating algal growth shall not be present in concentrations sufficient to cause objectionable algal densities or other nuisance aquatic vegetation or otherwise impair any designated use of the waterbody." *Id*. Whereas the numeric criteria for Chlorophyll-a in Beaver Lake is more finite:

Beaver Lake*:

the CWA's Section 304 requirement that EPA develop water quality criteria based on the latest scientific knowledge.[125]

EPA has consistently pushed states to adopt numeric criteria for nutrients[126] and the absence of numeric criteria could result in state or federal regulators rejecting a proposed trading program because of the additional complexity involved in interpreting narrative criteria.[127] Advances in technology make reliable numeric criteria for nutrients possible.[128] Narrative criteria are used by trading programs in some jurisdictions, but permit writers must take extra precautions to comply with federal regulations requiring "reasonable potential" analysis of whether nutrient loads may exceed the state's narrative criteria.[129] Although some jurisdictions have developed trading

Chlorophyll-a (ug/L)** = 8; Secchi Transparency (m)*** = 1.1.

*These standards are for measurement at the Hickory Creek site over the old thalweg, below the confluence of War Eagle Creek and the White River in Beaver Lake.

**Growing season geometric mean (May - October).

***Annual Average.

See E-mail from Angela N. Danovi, Projects Manager, Ozarks Water Watch Found., to Doug Szenher (May 8, 2013, 4:01 CST) (on file with author). Although numeric criteria are commonly used to measure pollutants such as metals in Arkansas, the quasi-numeric Chlorophyll-a criteria implemented for Beaver Lake is the first numeric criterion in the state to address nutrient pollution. *See id*.

125. *See* 33 U.S.C. § 1314(a) (2012).

126. *See* Memorandum from Nancy K. Stoner, *supra* note 24, at 2-3 (citing history of EPA encouraging states to implement numeric criteria for nutrients and their importance for developing effective trading programs); *see also* Sarah T. Babcock, *Nutrient Trading as Clean Water Strategy in the Interstate Context*, AM. BAR ASS'N: SECTION OF ENVTL. LITIG. (July 23, 2015), http://apps.americanbar.org/litigation/committees/environmental/articles/summer2015-0615-nutrient-trading-clean-water-strategy-interstate-context.html [https://perma.cc/RYM9-MGJC].

127. *See* ARK. DEP'T ENVTL. QUALITY, INTEGRATED WATER QUALITY MONITORING ASSESSMENT REPORT III-25 (2014), http://www2.adeq.state.ar.us/water/branch_planning/303d/pdfs/integrated_wqmar_20140401.pdf [https://perma.cc/X5JF-3QAB]; *see also* EPA REGION III, LOCAL WATER QUALITY PROTECTION WHEN USING CREDITS FOR NPDES PERMIT ISSUANCE AND COMPLIANCE 8-9 (2014), http://www.epa.gov/sites/production/files/2015-07/documents/localwaterqualitytm20140306pg.pdf [https://perma.cc/7VTW-AU5R].

128. *See Technical Support for Numeric Nutrient Criteria Development*, EPA, http://www2.epa.gov/nutrient-policy-data/technical-support-numeric-nutrient-criteria-development [https://perma.cc/U87A-AMKS].

129. *See* 40 C.F.R. § 122.44(d)(1)(i) (2015).

programs around narrative criteria,[130] it is clear that numeric criteria provide greater certainty when developing TMDLs and trading programs. This makes program approval more likely and creates a clear market demand—based on a numeric value—that can be satisfied by credits incorporated into a point source's NPDES permit.

B. Limit Trading to Watersheds with TMDLs for Nutrients

With set numeric criteria for nutrients, the state can more easily prioritize a list of nutrient-impaired waters as required by the CWA.[131] TMDLs should be developed in those watersheds eager to trade. Data from the TMDL can then be used to set the NPDES permit limits, which will be used as the pollution caps that drive trading.[132] Most existing trading programs use pollution caps established under a TMDL to drive demand for credits.[133]

Although EPA supports pre-TMDL trading, if the watershed fails to attain the water quality standard through offsets or trading, then a TMDL will be established. This will result in a new trading baseline.[134] In the case of nonpoint sources seeking to generate tradable credits from their BMPs, the nonpoint source must first comply with all regulatory management requirements, thereby meeting the baseline.[135] However, if a TMDL must be established, then the load

130. Rena Steinzor et al., *Accountability: Water Quality Trading in the Chesapeake Bay* 12 (Ctr. for Progressive Reform, Briefing Paper No. 1205, May 2012), http://www.progressivereform.org/articles/WQT_1205.pdf [https://perma.cc/XMW5-WBJT] (finding that two of the seven Chesapeake Bay states have some numeric nutrient criteria though the majority continue to use narrative criteria).

131. *See* 33 U.S.C. § 1313(d)(1)(A), (C) (2012).

132. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 4-6; *see also* Am. Farm Bureau Fed'n v. EPA, 792 F.3d 281, 289 (3d Cir. 2015) (recognizing the "pollution caps" established by CWA's TMDL and permit requirements).

133. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 8.

134. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 5 (finding trading baseline is the regulatory requirement that must be met before any additional nutrient discharge reductions will be available as tradable credits).

135. *See* EPA, WATER QUALITY TRADING SCENARIO: NONPOINT SOURCE CREDIT EXCHANGE 33, https://www3.epa.gov/npdes/pubs/wqtradingtoolkit_nps-credit-exchange.pdf [https://perma.cc/ED5S-4PKU].

allocations among nonpoint sources and point sources will be set, and "the reductions made to generate credits for pre-TMDL trading may no longer be adequate to generate credits under the TMDL."[136] This new baseline may be problematic for the present market participants.[137] Trading under a TMDL provides the greatest certainty for market participants, but pre-TMDL trading could be used to "bridge[] the time from when a water is listed as nutrient impaired to the time the TMDL is complete."[138]

The details of Arkansas's nutrient water quality trading program could be included in the TMDL or NPDES permit on a case-by-case basis in conjunction with a Watershed Implementation Plan (WIP).[139] For instance, the Chesapeake Bay TMDL acknowledges state plans to comply with the TMDL cap and allow for population and industry growth by using offsets from non-point sources.[140] EPA has supported water quality trading programs in the Chesapeake Bay "as long as they are established and implemented in a manner consistent with the CWA, its implementing regulations, and EPA's 2003 Water Quality Trading Policy[141] and 2007 Water Quality Trading Toolkit for NPDES Permit Writers."[142] Acknowledging the approved trading guidelines in a TMDL is more efficient than relying on the permit writer to analyze the validity of trades on an individual basis. The Chesapeake Bay TMDL goes on to expressly prohibit trading that would "cause or contribute to an exceedance of [Water Quality Standards] in either receiving segments or anywhere else in the Bay watershed," or "that

136. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 5.

137. *See id*. (providing that a TDML will be set if pre-TDML does not achieve required water quality standards, but the reductions made for the pre-TMDL may not be adequate under the newly developed TMDL); Alexandra Dapolito Dunn, *Water Quality Trading: Bringing Market Forces to Bear in Watersheds*, 17 NAT. RESOURCES & ENV'T. 137, 138 (2002).

138. MINN. POLLUTION CONTROL AGENCY, PRE-TOTAL MAXIMUM DAILY LOAD PHOSPHOROUS TRADING PERMITTING STRATEGY 1 (2008), http://www.pca.state.mn.us/index.php/view-document.html?gid=10762 [https://perma.cc/LEU3-64FN]; WATER QUALITY TRADING POLICY, *supra* note 11, at 7.

139. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 7.

140. *See* EPA, CHESAPEAKE BAY TMDL 10-1 (2010), http://www2.epa.gov/sites/production/files/2014-12/documents/cbay_final_tmdl_section_10_final_0.pdf [https://perma.cc/S6ZG-29R9].

141. *Id*. at 10-3.

142. *Id*.

would delay or weaken implementation of the Bay TMDL, that is inconsistent with the assumptions and requirements of the TMDL, or that would cause the combined point source and nonpoint source loadings covered by a trade to exceed the applicable loading cap established by the TMDL."[143]

C. Prohibit Trading that Results in Impairment

The most common argument against trading is that it will result in "hotspots."[144] In the water quality context, a "hotspot" is a waterbody segment with "locally high loadings of pollutants."[145] High levels of nutrient pollution can cause increased algal blooms, which impact the aesthetic value of the lake or stream, can cause fish kills, or even result in toxic drinking water.[146] EPA's Trading Policy expressly prohibits trades that are likely to result in hotspots.[147] The concern stems from the fact that trading may allow point sources to continue discharging pollutants at their current level or increase their discharge, which might create hotspots of nutrient pollution because the pollution reduction was made somewhere else in the watershed.[148] Allowing point sources to trade nutrient reductions with any nonpoint source in the watershed could result in the nonpoint source BMPs mostly being located downstream from the point sources. The higher water quality below the BMPs would then dilute the waste load from the point sources enough to comply with the TMDL.[149] However, the

143. *Id*.

144. *See* Sean Blacklocke & Ben Dziegielewski, *The U.S. Environmental Protection Agency's Water Quality Trading Policy: New Opportunities for Environmental Advocacy Groups?*, 3 AWRA HYDROLOGY & WATERSHED MGMT. TECHNICAL COMMITTEE 1, 8, 9 (2005), http://www.awra.org/committees/techcom/watershed/pdfs/0301WU.pdf [https://perma.cc/QTZ6-V683].

145. *See* WATER QUALITY TRADING ASSESSMENT HANDBOOK, *supra* note 24, at 6.

146. *See* Jeff Stone, *Health Advisories Issued for Cyanotoxins*, 28 ARK. DRINKING WATER UPDATE 3, 3 (2015), http://www.healthy.arkansas.gov/programsServices/environmentalHealth/Engineering/drinkingWater/Documents/Publications/Newsletters/Summer2015.pdf [https://perma.cc/S2QJ-EQFL]; *see also Nutrient Pollution: Harmful Algal Blooms*, EPA, https://www.epa.gov/nutrientpollution/harmful-algal-blooms [https://perma.cc/CE2S-C84D].

147. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 4, 7.

148. *See* WATER QUALITY TRADING ASSESSMENT HANDBOOK, *supra* note 24, at 17.

149. *See id*. at 17.

segments between the point sources and the nonpoint source BMPs could create hotspots that impair the water's designated use (e.g., drinking, fishing, and swimming).[150]

Because permit compliance is measured only at the point source, nutrient reductions from trading should occur upstream from the permitted point source in order to avoid hotspots.[151] EPA acknowledged the potential hotspot issue in its Water Quality Trading Policy, stating that "EPA does not support any use of credits or trading activity that would cause an impairment of existing or designated uses, adversely affect water quality at an intake for drinking water supply or that would exceed a cap established under a TMDL."[152] More recently, Region 3 of the EPA addressed this concern by concluding "the generator of the credit should be upstream of the buyer or user of the credit, as a way to minimize the risk of water quality impairment in the water between the two sources."[153]

If data shows that point sources are creating hotspots caused by their downstream trading activity, it may result in costly litigation.[154] Trading programs should avoid this litigation risk by limiting point sources to trading with upstream sources. This limitation may significantly reduce the number of potential market participants[155] but will ensure compliance with the law.

D. Requirements for Sources Seeking to Generate Credits

150. *See id*. at 15-16 (stating that a hotspot is a waterbody segment with "locally high loadings of pollutants and illustrating that longer segments between sources accumulate more pollutants); *see also* Stone, *supra* note 143 (explaining that high concentrations of cyanotoxins would make water toxic and unsafe to drink).

151. *See id*. at 15-16.

152. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 7.

153. EPA REGION III, LOCAL WATER QUALITY PROTECTION WHEN USING CREDITS FOR NPDES PERMIT ISSUANCE AND COMPLIANCE, *supra* note 124, at 7.

154. Corrigan, *supra* note 104, at 18 (finding "hotspots" to be among several potential weaknesses in state trading programs which may be ripe for litigation); *see, e.g*., Food & Water Watch v. EPA, 5 F. Supp. 3d 62, 73 (D.D.C. 2013).

155. *See, e.g*., GEOSYNTEC CONSULTANTS, NUTRIENT TRADING IN MISSOURI: CRITICAL POLICY FACTORS AND PROGRAM RECOMMENDATIONS 8, 33-35 (2013), http://www.mocorn.org/wp-content/uploads/2012/09/CIG_Nutrient-Trading-in-Missouri_Feb2013.pdf [https://perma.cc/X24A-JWHC].

1. *The Role of Baselines*

The baseline is the regulatory minimum that potential market participants—point source or nonpoint source—must meet before being eligible to generate credits.[156] Only nutrient reductions in excess of the established baseline will be available for trading.[157] Every unit of phosphorous the point source eliminates beyond its Technology Based Effluent Limitation or Water Quality Based Effluent Limitation will generate a water quality credit. Similarly, every unit of phosphorous or nitrogen removed from a nonpoint source beyond the state's regulatory requirements will be eligible for a water quality credit. Because nonpoint sources are not subject to NPDES permits and state regulatory requirements on nonpoint sources are limited, the potential supply of credits from nonpoint sources is greater than that available from most point sources.[158]

Arguably, the opportunities created by trading are inconsistent with the CWA goal that "best" technology requirements will incentivize advances in technology to the point of zero discharges.[159] The problem with this goal is that it only incentivizes advances in pollution reduction technologies for point sources, which are not the primary sources of nutrient pollution. While trading could create a disincentive to "best" technology advancements for existing point sources, it will, on the other hand, create incentives for technological advances for nonpoint sources.[160] Then again, the opportunity for point-to-point trading may also increase the incentive among point sources to invest in advanced treatment technology.

2. *Point Source Generated Credits*

Point source credits may be generated through over-control.[161] Typically, new facilities entering the watershed are able to incorporate the most advanced technology, which allows

156. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 4-5.

157. *See id*. at 5.

158. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 1; *See* WATER QUALITY TRADING ASSESSMENT HANDBOOK, *supra* note 24, at 9-10 (Figure 2.2).

159. 33 U.S.C. § 1311(b) (2012).

160. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 1.

161. *See* WATER QUALITY TRADING ASSESSMENT HANDBOOK, *supra* note 24, at 22.

them to discharge nutrients below their permit limit.[162] Any facility that maintains their nutrient discharge below their permit limit may trade the surplus with facilities that exceed their permit limit.[163] The point source to point source trade is the most "straightforward, easily measurable, and directly enforceable" option available under a trading program.[164] The point source seller will enter into a contractual trade agreement with another point source buyer in the same watershed.[165] This agreement will then be incorporated into each facility's NPDES permit.[166] The point source to point source trade can also be transmitted through a point source credit exchange where multiple point sources in a watershed can buy or sell credits as needed.[167] These exchanges hold credits no longer than the reconciliation period corresponding with the effluent type.[168] When available, point source to point source trading can be an economically efficient option with little uncertainty.[169] However, credits from point source over-control are rarely available and far more expensive than nonpoint source credits due to the high cost of technologies capable of removing ever-smaller amounts of phosphorous or nitrogen.

3. *Nonpoint Source Generated Credits*

Alternatively, nonpoint source to point source trades can be a cost-effective means of achieving the same or greater nutrient reductions required to meet the point source's permit limit.[170] The difficulty in trading with nonpoint sources is that they are not as straightforward or easily quantified. This is where the state's regulatory framework should provide clear requirements for nonpoint sources generating credits, which would not

162. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 15.

163. *See* WATER QUALITY TRADING ASSESSMENT HANDBOOK, *supra* note 24, at 22.

164. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 15.

165. *Id*.

166. *Id*.

167. *Id*. at 16-17.

168. *Id*. at 34-37. Reconciliation periods can be thought of as the shelf life or expiration date of any given nutrient reduction credit. *Id*. The length of the reconciliation period will depend on the type of pollutant being traded. *Id*.

169. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 15.

170. *See id*. at 17-18.

otherwise occur. By establishing a framework that addresses the concerns around monitoring, the uncertainty of pollutant reductions, and the timing of BMP-generated nonpoint source credits, the regulations can ensure both legal compliance and consistency among trading programs across the state.

4. *Quantification and Monitoring*

The choice of monitoring method is an important scientific and policy determination that needs to be addressed in statewide guidance or regulation. As with each of these important decisions, consideration must be given to more than economic efficiency and political expediency in order to gain EPA approval and avoid costly litigation. Monitoring is a federal requirement for point source permit compliance and must also be addressed when generating water quality credits from nonpoint sources that benefit the regulated point source.[171] Fortunately, Arkansas has a relatively advanced network of water quality monitoring stations currently in place[172] and the University of Arkansas employs some of the top scientists in the field.[173]

Establishing an equivalency between the quantity of nutrients reduced by point source dischargers and edge-of-field reductions from nonpoint sources is not exact. Nonpoint source reductions can be quantified using three techniques: (1) modeling; (2) pre-determined BMP efficiencies; or (3) direct monitoring.[174] Pre-determined BMP efficiencies based on best available scientific data are a practical starting point for nonpoint source trading, but greater accuracy comes from site-

171. *See, e.g.*, N.Y. STATE DEP'T OF ENVTL. CONSERVATION, FINAL PHASE I: NUTRIENT AND SEDIMENT WATER QUALITY IMPROVEMENT AND PROTECTION PLAN 120 (2010), http://www.dec.ny.gov/docs/water_pdf/finalphaseiwip.pdf [https://perma.cc/H649-TSLB].

172. *See* ARK. DEP'T ENVTL. QUALITY, INTEGRATED WATER QUALITY MONITORING ASSESSMENT REPORT, *supra* note 124, at III-1.

173. *See, e.g.*, UNIV. OF ARK. DIV. OF AGRIC.: PUB. POLICY CTR., THE ROLE OF NONPOINT SOURCE MODELS IN WATERSHED MANAGEMENT, *supra* note 110, at 4.

174. *See, e.g.*, WILLAMETTE P'SHIP, IN IT TOGETHER: A HOW-TO REFERENCE FOR BUILDING POINT-NONPOINT WATER QUALITY TRADING PROGRAMS: DESIGNING AND OPERATING A TRADING PROGRAM (PART 2 OF 3) 20-21 (2012), http://willamettepartnership.org/wp-content/uploads/2014/09/In-It-Together-Part-2_2012-07-30.pdf [https://perma.cc/W9EN-YP52].

specific monitoring, which can be developed over time.[175] Modeling can be an effective method of tracking nutrient load reductions from nonpoint sources, and with the advancements in technology modeling is becoming the preferred method of monitoring.[176] Direct monitoring, while the most accurate method, is also the most costly, and thus less often used in trading programs.[177]

5. *Uncertainty Ratios*

After using the best scientific data available to quantify the nutrient reduction from a given BMP, any remaining uncertainty can be accounted for using an uncertainty ratio. These ratios are commonly used in established trading programs and are encouraged as a means for ensuring effective pollutant reductions by both EPA and USDA.[178] Unfortunately, as with limiting the generation of credits to upstream sources, uncertainty ratios will further increase the cost of credits generated from nonpoint sources.[179] However, using a conservative 2:1 or 3:1 uncertainty ratio can still be a cost effective option. In fact, trading could remain cost effective with a 10:1 ratio in some instances.[180] Fortunately, decades of research provide adequate certainty that BMPs generating water quality credits can be accurately valued using a smaller than 10:1 uncertainty ratio.[181] As methods of quantifying BMP nutrient load reductions continue to improve, the value and supply of potential nonpoint source credits will increase.

175. *Id*. at 21.

176. *Id*. at 20.

177. *Id*. at 21.

178. *See* WATER QUALITY TRADING ASSESSMENT HANDBOOK, *supra* note 24, at 16.

179. *See, e.g*., GEOSYNTEC CONSULTANTS, NUTRIENT TRADING IN MISSOURI: CRITICAL POLICY FACTORS AND PROGRAM RECOMMENDATIONS, *supra* note 152, at 7-8, 33-35.

180. *See supra* note 106.

181. *See, e.g*., IOWA STATE UNIV. SCI. TEAM, IOWA NUTRIENT REDUCTION STRATEGY, *supra* note 109, at 5 ("[T]he [phosphorus] management strategies of cover crops (50% reduction) and conversion of all tillage to no-till (39% reduction) have the potential to substantially reduce [phosphorus] loss. Converting all acres of intensive tillage (<20% residue) to conservation tillage (>30% residue) would potentially reduce [phosphorus] loss by 11%. Injecting or banding of [phosphorus] within current no-till acres has little potential impact on [phosphorus] loss (<1%).").

Nonpoint to point trading programs will further incentivize these improvements by creating a market for more accurate data.

6. *Timing*

The timing of trades is another foundational issue that should be addressed in the state's framework. Concerns around timing focus on the point at which credits generated by nonpoint sources may be used by the point source to meet their permit requirements.[182] For instance, anticipated credits generated by a nonpoint source partner will not be available until the BMP has been implemented and verified. Once verified, the credits generated may only be used during the same compliance period. So, if the point source compliance period for phosphorous is one month, then a point source can purchase credits from nonpoint sources that are generated during that month. Permitting guidance provides for longer averaging periods, such as an annual rather than monthly average, to address seasonality concerns associated with nonpoint source trading.[183] This allowance can be made if the permit writer determines that "monthly average, weekly average, or maximum daily limitations" are "impracticable" when calculating nutrient reduction averaging periods.[184] If, however, Arkansas's trading framework favors economic efficiency over compliance with the CWA's mandates, EPA could expand its oversight of the Arkansas Department of Environmental Quality's (ADEQ) issuance of NPDES permits as it did after Act 964 was passed in 2013.[185]

D. Water Quality Management Plan and Watershed Implementation Plans

Arkansas's regulatory framework will provide broad program guidance, but the CWA requires states to implement water quality management plans at the local level.[186] These

182. *See* WATER QUALITY TRADING TOOLKIT, *supra* note 19, at 35.

183. *Id*.

184. *Id*. at 37.

185. Letter from William K. Honker, Water Quality Prot. Div. Director, to Ryan Benefield, Ark. Dept. of Envtl. Quality Deputy Dir. (Aug. 28, 2013) (on file with author).

186. *See* 40 C.F.R. § 130.6(c)(3) (2006).

management plans may provide a useful platform for integrating water quality trading programs at the local level.

Watershed Implementation Plans (WIPs) have been developed by local and regional watershed organizations[187] along with state governments across the nation as a framework for implementing programs to attain water quality standards.[188] They are an outgrowth of the CWA's requirement that states develop ongoing water quality management plans.[189] In its Final Water Quality Trading Policy, EPA acknowledged the importance of using WIPs developed from the state's Water Quality Management Plan when developing a trading program.[190] WIPs should build off the state's statutory or regulatory framework. The most advanced implementation plans have been developed and approved by EPA in the states under the Chesapeake Bay TMDL.[191] Not all state WIPs are as stringent as those developed by the Bay states, but each should contain nine key elements: (1) identify causes and sources of pollution, (2) determine load reductions needed, (3) develop management measures, (4) identify technical and financial assistance needed, (5) develop information/education component, (6) develop implementation schedule, (7) develop interim milestones to track implementation, (8) develop criteria to measure progress toward meeting watershed goals, and (9) develop monitoring component.[192] WIPs must ultimately receive approval from the Regional EPA office.[193]

187. *See, e.g.*, *Chesapeake Bay Watershed Implementation Plans (WIPs)*, EPA, https://www.epa.gov/chesapeake-bay-tmdl/chesapeake-bay-watershed-implementation-plans-wips [https://perma.cc/4EWB-XLG9].

188. *See, e.g.*, *Watershed Implementation Plans (WIPs)*, MO. DEP'T OF ENVTL. QUALITY, https://www.deq.state.ms.us/mdeq.nsf/page/WMB_WIPs?OpenDocument [https://perma.cc/AS87-CQVB]; *Implementing Maryland's Action Plan: Building Local Partnerships to Meet Bay Restoration Goals*, MD. DEP'T OF THE ENV'T, http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Pages/WIP_Implementation.aspx [https://perma.cc/43M2-HB4C].

189. 33 U.S.C. § 1313(d)-(e) (2012).

190. *See* WATER QUALITY TRADING POLICY, *supra* note 11, at 6; *see also* 33 U.S.C. § 1313(d)-(e) (discussing water quality standards and implementation plans); 40 C.F.R. § 130.6 (2015) (discussing Water Quality Management Plans).

191. *See Chesapeake Bay Watershed Implementation Plans (WIPs)*, *supra* note 184.

192. *See* EPA, A QUICK GUIDE TO DEVELOPING WATERSHED PLANS TO RESTORE AND PROTECT OUR WATERS 3 (2013), https://www.epa.gov/sites/production/files/2015-12/documents/watershed_mgmnt_quick_guide.pdf [https://perma.cc/3EV8-YXTV];

E. Memorandum of Understanding

The successful implementation of these plans first requires buy-in from multiple state agencies, which can be achieved through a Memorandum of Understanding (MOU).[194] The MOU defines the roles and responsibilities of each agency based on the mutual goal of attaining water quality standards in the watershed.[195] Depending on the watershed boundaries, the MOU may require interstate agency collaboration.[196] Once the state has established the roles and responsibilities of the various agencies, the focus can turn to establishing baselines, what can be traded, credit values for particular BMPs, credit terms, and other important details specific to the particular watershed implementation plan.

IV. CONCLUSION

Arkansas has taken an important first step toward reducing nutrient pollution from nonpoint sources across the state by passing Act 335 to allow trading. The framework that is being developed now will determine whether trading provides economic and environmental benefits to local communities or leads to costly litigation while the damages of nonpoint source pollution continue to grow.

Nutrient water quality trading can work. Once the framework is in place, small-scale, pilot programs would be a good first step. The patience, diligence, and creativity of all participants will be essential to the long-term success of this new approach to pollution reduction. The environmental impacts and economic costs associated with reducing nutrient loads from point sources alone is well documented. Our current regulatory

NONPOINT SOURCE POLLUTION MANAGEMENT PLAN, *supra* note 1, at 11-19; *Watershed Implementation Plans (WIPs)*, *supra* note 185.

193. *Polluted Runoff: Nonpoint Source Pollution: 319 Grant: Current Guidance*, EPA, https://www.epa.gov/polluted-runoff-nonpoint-source-pollution/319-grant-current-guidance [https://perma.cc/VU5S-KMBY].

194. *See* N.Y. STATE DEP'T OF ENVTL. CONSERVATION, FINAL PHASE II: WATERSHED IMPLEMENTATION PLAN 31-32 (2013), http://www.dec.ny.gov/docs/water_pdf/finalphaseiiwip.pdf [https://perma.cc/MH4P-V6MJ].

195. *See id*.

196. *See id*.

scheme has failed to prevent some lakes and streams from becoming unfit for fishing or swimming, and it is becoming increasingly costly to treat for drinking water. Once the regulatory framework is in place, Arkansas's nutrient water quality trading program could provide a market-based solution that moves The Natural State toward cleaner lakes and streams while making progress towards the primary objective of the CWA: eliminating water pollution from all sources.

NATHAN R. FINCH