COMBATING NUTRIENT POLLUTION AND FLOODING WITH TMDLS IN THE MISSISSIPPI RIVER WATERSHED

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Introduction

In the summer of 2017, the Dead Zone in the Gulf of Mexico—an area with such low dissolved oxygen that it cannot sustain most aquatic life[1]—hit its peak recorded size of 8,776 square miles, the size of New Jersey.[2] Just two years later, unprecedented rainfall flooded the Midwest, causing billions of dollars in damage to agriculture and infrastructure.[3] But current efforts have been insufficient at addressing nutrient pollution and flooding in the Midwest. As climate change brings and will continue to bring extreme precipitation patterns that worsen these issues, more robust regulations of stormwater are needed to avoid further catastrophic losses.

Adopting the Chesapeake Bay total maximum daily load ("TMDL") model in the Mississippi River Basin would provide the comprehensive regulatory framework and federal oversight needed to solve the collective action problems of stormwater management through the lens of nutrient pollution reduction, as many mechanisms that reduce nonpoint source pollution also mitigate flooding.[4] This paper explores the possibility of adopting and implementing such a TMDL framework, first discussing the existing issues with nutrient pollution and flooding in the Mississippi River Basin, then explaining how the TMDL framework might be designed and implemented, and finally refuting arguments against adopting a watershed-wide TMDL.

I. Negative Externalities of Stormwater Runoff in the Midwest

When stormwater runoff crosses jurisdictional lines, stormwater management by upstream communities creates positive externalities in the form of reduced nutrient pollution and flooding for downstream communities. Upstream communities accordingly do not practice the socially optimal level of stormwater management, especially in large watersheds like the Mississippi River Basin. But nutrient pollution and flooding are already imposing huge costs on downstream communities

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[1] *Dead Zone*, NAT'L GEOGRAPHIC, https://perma.cc/E2MU-UT82.

[2] UNION OF CONCERNED SCIENTISTS, REVIVING THE DEAD ZONE 2 (2020), https://perma.cc/ELH2-B4TS; *Northern Gulf of Mexico Hypoxic Zone*, EPA, https://perma.cc/SKZ6-UT6K.

[3] John Schwartz, *A Wet Year Causes Farm Woes Far Beyond the Floodplains*, N.Y. TIMES (Nov. 21, 2019), https://perma.cc/B7JM-5RX5; *Billion-Dollar Weather and Climate Disasters*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://perma.cc/5UGQ-UMKC.

[4] *Soak Up the Rain: What's the Problem?*, EPA, https://perma.cc/WAR3-U7PX.

throughout the Midwest, and climate change brings more varied precipitation that will only make matters worse.[5] While the precipitation cannot be stopped, states and local communities can take steps to mitigate disasters[6] by slowing down stormwater and allowing the soil to absorb more rainfall.

A. *Nutrient Pollution and Eutrophication*

The Dead Zone is a hypoxic area, where water contains extremely low levels of dissolved oxygen, that forms each summer in the Gulf of Mexico along the Louisiana-Texas shoreline.[7] The Dead Zone is the second-largest hypoxic zone in the world:[8] over the past five years, its average size has been 5,380 square miles.[9] Though many factors can combine to cause hypoxia, the primary source of the Dead Zone is nutrient pollution—primarily excess nitrogen and phosphorus[10]—from human activities throughout the Mississippi River watershed.[11] Between 60 and 80 percent of the Gulf's nitrogen loading originates from farming and livestock operations, with 50 to 66 percent of that nitrogen coming from synthetic fertilizer.[12] Controlling nitrogen levels in the Gulf accordingly requires limiting the amount of nitrogen-based fertilizer that enters waterways.[13] Excess nitrogen and phosphorus leads to algal blooms that die and deplete the dissolved oxygen in bottom water as they decompose.[14] With low disolved oxygen levels, the Gulf cannot support most marine life, and the animals inhabiting it either flee or perish, creating the "Dead Zone."[15] This process, known as

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[5] Manoochehr Shirzaei et al., *Persistent Impact of Spring Floods on Crop Loss in U.S. Midwest*, 34 WEATHER & CLIMATE EXTREMES 100,392 (2021), https://www.sciencedirect.com/science/article/pii/S2212094721000815 (last visited May 18, 2022); *Climate Change Indicators: Heavy Precipitation*, EPA, https://perma.cc/K7XV-5VXU.

[6] Shirzaei et al., *supra* note 5.

[7] *Northern Gulf of Mexico Hypoxic Zone*, *supra* note 2; *Hypoxia 101*, EPA, https://perma.cc/E4NX-RFLT.

[8] *What Is a Dead Zone?*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://perma.cc/ZN25-6EE9.

[9] *Northern Gulf of Mexico Hypoxic Zone*, *supra* note 2; UNION OF CONCERNED SCIENTISTS, *supra* note 2, at 2.

[10] This paper's scope is limited to means of reducing nitrogen pollution because hypoxia is more sensitive to nitrogen load reductions than reductions in phosphorus, although excess phosphorus still contributes to hypoxia and a dual nitrogen-phosphorus reduction strategy would be the most effective means of reducing hypoxia. Katja Fennel & Arnaud Laurent, *N and P as Ultimate and Proximate Limiting Nutrients in the Northern Gulf of Mexico: Implications for Hypoxia Reduction Strategies*, 15 BIOGEOSCIENCES 3121, 3122, 3129–30 (2018), https://perma.cc/4ARX-YVFJ.

[11] *What Is a Dead Zone?*, *supra* note 8; Hannah M. Hamilton & Jerry Slaff, *Larger than Average Hypoxic Area Expected for Gulf of Mexico*, U.S. GEOLOGICAL SURV. (June 3, 2020), https://perma.cc/FPT6-GQY6; SUZIE GREENHALGH & AMANDA SAUER, WORLD RES. INST., AWAKENING THE DEAD ZONE: AN INVESTMENT FOR AGRICULTURE, WATER QUALITY, AND CLIMATE CHANGE 1 (2003), https://perma.cc/55V8-EV52; *see* Fennel & Laurent, *supra* note 10, at 3122, 3129.

[12] UNION OF CONCERNED SCIENTISTS, *supra* note 2, at 5.

[13] Fennel & Laurent, *supra* note 10, at 3121–22.

[14] Hamilton & Slaff, *supra* note 11.

[15] *Id.*

eutrophication,[16] harms the ecology of the Gulf, as well as the fisheries and coastal communities and economies that depend upon them. The Dead Zone's degradation of ecosystem services and fisheries has caused estimated losses of up to $2.4 billion per year since 1980,[17] and its impacts upon shrimping, a vital economic and cultural feature of the Gulf Coast, are particularly salient.[18]

Climate change further catalyzes eutrophication through rising temperatures that support rapid algal growth and altered precipitation patterns that increase nutrient loads.[19] Higher temperatures allow certain types of hypoxia-causing algae to bloom faster, bigger, and earlier in the year, which in turn can cause more severe hypoxic episodes,[20] and climate change-induced changes in precipitation will likely be a double-edged sword. More frequent and severe storm events will raise total nutrient discharges into freshwater and coastal habitats, while frequent drought periods will simultaneously lower water levels, leading to higher nutrient loads.[21] Scientists estimate that climate change's impacts on precipitation alone will raise total nitrogen loads in the Mississippi River Basin by 18 percent by 2100 if greenhouse gas emissions continue at their current rate.[22] Offsetting this increase alone would require a greater loading reduction than upstream states' currently unmet collective target.[23]

B. *Flooding*

Climate change has brought precipitation with larger magnitudes, greater frequency, and inopportune timing that causes devastating flooding in Midwestern states.[24] In Spring 2019, unprecedented rainfall throughout the Mississippi River watershed created floods that left farmers unable to plant crops on over 13.3 million rain-soaked acres[25] and generated $22.4 billion in damage, primarily to agriculture and infrastructure.[26] Eleven years prior, the several-month-long Midwest Flood of 2008 tore through almost a dozen states—causing almost $10 billion of damage in Iowa alone and at least eleven deaths.[27] Both the 2008 and 2019 floods were, at least

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[16] *What Is Eutrophication?*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://perma.cc/4QRP-6Q96.
[17] UNION OF CONCERNED SCIENTISTS, *supra* note 2, at 3.
[18] *Id.* at 4; Martin D. Smith et al., *Seafood Prices Reveal Impacts of a Major Ecological Disturbance*, 114 PROC. NAT'L ACAD. SCIS. 1512 (2017).
[19] Essie M. Rogers, *Adding Climate Change to the Mix: Responses of Aquatic Ectotherms to the Combined Effects of Eutrophication and Warming*, 17 BIOLOGY LETTERS 20210442 (2021), https://perma.cc/T39J-HSZL.
[20] *Id.*; *Dead Zone*, *supra* note 1.
[21] *Id.*
[22] E. Sinha et al., *Eutrophication Will Increase During the 21st Century as a Result of Precipitation Changes*, 357 SCIENCE 405, 406 (2017), https://www.science.org/doi/10.1126/science.aan2409 (last visited May 18, 2022).
[23] *Id.* at 406–07; *see* discussion *infra* Part III.B.
[24] Shirzaei et al., *supra* note 5; *Climate Change Indicators: Heavy Precipitation*, *supra* note 5.
[25] *See* Schwartz, *supra* note 3.
[26] *Id.*; *see Billion-Dollar Weather and Climate Disasters*, *supra* note 3.
[27] NAT'L WEATHER SERV., NAT'L OCEANIC & ATMOSPHERIC ADMIN., CENTRAL IOWA FLOODS OF 2008: LATE MAY THROUGH MID JUNE, 2008, at 9 (2009), https://perma.cc/27B2-HH2R; ROBERT R. HOLMES,

in part, the result of excessive, persistent precipitation.[28] Beyond catastrophic direct damages like those mentioned above, flooding also kills crops, inhibits crops' photosynthetic capacity and biomass accumulation, degrades soil quality, increases the risk of disease and pests,[29] and leads to large-scale soil loss.[30] As climate change brings more variable and extreme precipitation patterns, the need to mitigate flooding will only increase.[31]

Despite the pressing need and billions in federal financing, flooding remains "the costliest and most common natural disaster" in the nation[32] and greater remedial measures may be needed. Built flood prevention infrastructure is failing throughout the Midwest,[33] and current efforts to implement green stormwater management practices[34] are usually small in scale and are few and far between.[35]

II. Applying the Chesapeake Bay TMDL Model to the Northern Gulf and Mississippi River Watershed

A little over a decade ago, states in the Chesapeake Bay watershed faced similar nutrient pollution management issues that states and Tribes in the Mississippi River Basin face today.[36] Since the Environmental Protection Agency ("EPA") established the Chesapeake Bay TMDL in 2010,[37] water quality in the Bay has improved.[38] As current efforts to address nutrient pollution in the Mississippi

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JR., TODD A. KOENIG & KRISTA A. KARSTENSEN, U.S. GEOLOGICAL SURV., FLOODING IN THE UNITED STATES MIDWEST, 2008, at 1–3 (2010), https://perma.cc/67VG-EFUM.

[28] HOLMES, KOENIG & KARSTENSEN, *supra* note 27, at 9; Samantha Harrington, *Did Climate Change Cause Midwest Flooding?*, YALE CLIMATE CONNECTIONS (Apr. 2, 2019), https://perma.cc/G3M9-3XGH.

[29] Shirzaei et al., *supra* note 5.

[30] Tom Philpott, *The Hidden Catastrophe of the Midwest's Floods*, MOTHER JONES (Mar. 20, 2019), https://www.motherjones.com/environment/2019/03/the-hidden-catastrophe-of-the-midwests-floods (last visited May 18, 2022).

[31] *See id.*; Brian Kahn, *Farmers in the Midwest Face Decades of Recovery as Flooding Strips Away Crucial Soil*, GIZMODO (Mar. 21, 2019), https://perma.cc/AGN5-LU8F.

[32] Christine A. Klien, *Midwestern Flooding Isn't a Natural Disaster*, ATLANTIC (Mar. 21, 2019), https://perma.cc/9FJU-R65G; Laura Lightbody, *Flooding Disasters Cost Billions in 2016*, PEW CHARITABLE TRS. (Feb. 1, 2017), https://perma.cc/VWM8-N5R4.

[33] *See, e.g.*, Irwin Redlener, *The Deadly Cost of Failing Infrastructure in Historic Midwest Floods*, HILL (Apr. 5, 2019), https://perma.cc/DK2N-QQQG.

[34] *See generally* MATTHEW HOPTON ET AL., U.S. ENV'T PROT. AGENCY, GREEN INFRASTRUCTURE FOR STORMWATER CONTROL: GAUGING ITS EFFECTIVENESS WITH COMMUNITY PARTNERS (2015), https://perma.cc/72C8-U86Q.

[35] John Flesher, *Battered by Floods, Midwest River Communities Try New Remedies*, DES MOINES REG. (Apr. 29, 2020), https://perma.cc/9Z55-LNNB.

[36] *See The Story of Chesapeake Bay*, MD. DEP'T OF THE ENV'T, https://perma.cc/HBJ4-TEP5.

[37] *Chesapeake Bay TMDL Fact Sheet*, EPA, https://perma.cc/B9AY-8LAK.

[38] Catherine Krikstan, *Data Show Drop in Estimated Nutrient, Sediment Loads Entering Chesapeake Bay*, CHESAPEAKE BAY FOUND. (Apr. 18, 2016), https://perma.cc/74ED-TN6S; EPA, CHESAPEAKE BAY

River and Gulf of Mexico are similarly insufficient, states and Tribes in the Mississippi River Basin and EPA should take a similar approach to the Chesapeake Bay TMDL.

A. *Congressional Action May Be Needed to Resolve Jurisdictional Issues*

The Clean Water Act ("CWA") expressly grants the EPA authority to establish enforceable TMDLs for the territorial seas, the outer limits of which extend three miles seaward of the U.S. coastline; however, it is unclear whether EPA's authority to set TMDLs extends to ocean waters farther from shore or whether any outer-ocean TMDLs would be binding on states.[39] If the CWA limits EPA's authority to establish binding ocean TMDLs to the territorial seas, then EPA can only establish effective TMDLs for the Dead Zone when and where it comes within three miles of the coastline, even though the vast majority of the Dead Zone typically falls outside of this narrow strip of coastal waters.[40] Territorial seas still provide an important regulatory hook, but limiting the TMDL to territorial seas creates a risk that EPA may be forced to delist the Gulf as an impaired water before reaching its reduction goals for the Dead Zone because EPA can only consider water quality near to shore, rather than in deeper waters where dissolved oxygen levels are often at their lowest.[41] Congress, on the other hand, does have clear jurisdiction over pollution in ocean waters up to 200 nautical miles offshore[42] and could therefore delegate EPA the authority to establish TMDLs for areas impaired by onshore pollution beyond the territorial seas. Delegating such authority could improve the nation's ability to reduce or eliminate offshore hypoxic zones, allowing for better restoration of U.S. fisheries.

B. *Setting a Watershed-Wide TMDL*

States must set EPA-approved water quality standards ("WQS") for their surface waters. WQS contain two components: designated uses and water quality criteria. Louisiana has designated its coastal waters for fish and wildlife propagation,

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PROGRESS: WASTEWATER POLLUTION REDUCTION LEADS THE WAY 1 (2016), https://perma.cc/2MBG-XGA9; Rebecca R. Murphy et al., *Nutrient Improvements in Chesapeake Bay: Direct Effect of Load Reductions and Implications for Coastal Management*, 56 ENV'T SCI. & TECH. 260, 263–65 (2022).

[39] *See* Robin Kundis Craig & Sarah Miller, *Ocean Discharge Criteria and Marine Protected Areas: Ocean Water Quality Protection Under the Clean Water Act*, 29 B.C. ENV'T AFFS. L. REV. 1, 39–40 (2001); 33 U.S.C. § 1313 (addressing "navigable waters" in the TMDL program); 33 U.S.C. § 1362(7)–(8) (defining "navigable waters" as "the waters of the United States, including the territorial seas" and "territorial seas" as extending up to three miles off the U.S. shoreline).

[40] *See Northern Gulf of Mexico Hypoxic Zone*, *supra* note 2.

[41] *See id.*

[42] *See* U.N. Convention on the Law of the Sea arts. 56(1)(b)(iii), 57, 211(5), Dec. 10, 1982, 1833 U.N.T.S. 397.

oyster propagation, and primary and secondary contact recreation, and their dissolved oxygen criteria is 5 milligrams per liter.[43]

Waters that do not meet state dissolved oxygen criteria are impaired waters under CWA Section 303, and either the state or EPA must set TMDLs for pollutants that contribute to the waterbodies' failure to meet WQS,[44] namely nitrogen and phosphorus in the Mississippi River. Although states traditionally set their own TMDLs for waterways within their borders, each state and tribal nation within the Mississippi River Watershed ("the jurisdictions"), including its tributary watersheds, should follow the Chesapeake Bay model by requesting that EPA set nitrogen and phosphorus TMDLs and allocate nutrient loads throughout the watershed.[45] Having one institution set and allocate a watershed-wide TMDL allows for a stronger, more coordinated approach to the multi-state issue of reducing nutrient pollution, combatting collective action problems.

Having EPA set the TMDL does not mean states should have no input into how EPA allocates nutrient loading. In allocating the TMDL, EPA should consider states' watershed implementation plans ("WIPs") that detail their feasible nutrient reduction amounts, as well as models that account for how various factors, such as distance, can affect how much of a state's nutrient pollution actually reaches the Gulf.

The jurisdictions can then decide how they wish to meet their EPA-set TMDL requirements. Due to the importance of reducing nitrogen loading to the success of mitigating the Dead Zone, the jurisdictions would be practically required to regulate agricultural runoff to meet TMDLs, as agriculture is the predominate source of the Gulf's nitrogen pollution. In this indirect way, EPA can ensure better regulation of nonpoint source agricultural pollution, a land-use power traditionally belonging to the states, while maintaining states' autonomy to decide what specific regulatory vehicles work best for them.

C. *Accountability Framework*

EPA and the jurisdictions can implement the TMDL through a four-pronged accountability framework also borrowed from the Chesapeake Bay model. These elements demonstrate the reasonable assurance provisions of the TMDL pursuant to the CWA and include: (1) WIPs, (2) two-year milestones, (3) EPA's tracking and assessment of restoration progress, and (4) specific federal actions if jurisdictions do not meet their commitments.[46] Creating third-party monitoring and pre-set federal consequences for non-compliance helps address the collective action problems that states face when they seek to make multi-state agreements on their own.

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[43] *See* LA. ADMIN. CODE tit. 33, pt. IX, § 1123, Table 3 (2016), https://perma.cc/Z9K6-A9TM.
[44] 33 U.S.C. § 1313(d)(2); *see, e.g.*, *Chesapeake Bay TMDL Fact Sheet*, *supra* note 37.
[45] *Developing the Chesapeake Bay TMDL*, EPA, https://perma.cc/Y3S3-GGAK.
[46] *Id.*

III. ADDRESSING COUNTERARGUMENTS AND CONCERNS

A. *Avoiding Paternalism*

Even though the TMDL would be a federally imposed pollution cap, its framework has multiple safeguards against paternalism. First, as community buy-in is essential to the success and fairness of any policy, the adoption of a watershed-wide TMDL model for the Mississippi River Basin should be preceded by a request from the jurisdictions that EPA implement such a TMDL. Waiting for an invitation allows EPA to avoid imposing an unwanted or unhelpful regulatory scheme. Second, EPA's role in the TMDL process would be limited to establishing a TMDL and allocating loading amongst the jurisdictions, while jurisdictions themselves decide exactly how to realize their required nutrient load reductions. Finally, rather than taking away power, the TMDL's federally enforceable limits give states the ability to cooperate in a situation where, without federal consequences, it would be difficult to maintain a level playing field without free riding.

B. *The TMDL Would Not Be Duplicative of Existing Efforts*

Current efforts to address nutrient pollution in the Mississippi River Basin would benefit from the enhanced regulatory framework of a watershed-wide TMDL. Since 1997, the Mississippi River/Gulf of Mexico Hypoxia Task Force ("Task Force") has created national strategies to reduce the size, duration, and severity of hypoxia in the Gulf.[47] The U.S. Department of Agriculture also launched the Mississippi River Basin Healthy Watersheds Initiative ("MRBI") in 2009 to use voluntary Farm Bill programs to help farmers improve water quality.[48] However, the Task Force and MRBI have been ineffective in eliminating, or even shrinking, the Dead Zone, as there have been no noticeable reductions in nutrient loading into the Gulf since 2001.[49] Even the Task Force's 20 percent nitrogen and phosphorus load reduction target is woefully insufficient to meet its goal of limiting the five-year mean size of the Dead Zone to 1930.5 square miles.[50] Scientists estimate that nitrogen and phosphorus loads must decrease by around 48 percent to reach the Task Force's hypoxic zone reduction goal under current conditions,[51] and with climate change-induced precipitation changes exacerbating future nutrient loading, that number could climb as high as 62 percent for nitrogen loads.[52] Just as the Chesapeake Bay jurisdictions

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[47] *History of the Hypoxia Task Force*, U.S. ENV'T PROT. AGENCY, https://perma.cc/S8NV-NK96.
[48] *Mississippi River Basin Healthy Watersheds: 2019 Progress Report*, NAT. RES. CONSERV. SERV., U.S. DEP'T AGRIC., https://perma.cc/J4Q6-LQZS.
[49] Fennel & Laurent, *supra* note 10, at 3122.
[50] *Tracking Outcomes and Metrics to Measure Progress*, EPA, https://perma.cc/FC52-QVMJ; MISSISSIPPI RIVER/GULF OF MEXICO WATERSHED NUTRIENT TASK FORCE, ACTION PLAN FOR REDUCING, MITIGATING, AND CONTROLLING HYPOXIA IN THE NORTHERN GULF OF MEXICO 9 (2001), https://perma.cc/AF7R-M7FN.
[51] Fennel & Laurent, *supra* note 10, at 3129–30.
[52] Sinha et al., *supra* note 22, at 406–07.

were largely unsuccessful in reducing nutrient pollution until EPA set a watershed-wide TMDL,[53] the Gulf will likely also require federal intervention under the CWA to provide the robust and coordinated regulatory framework needed to solve the multi-state of hypoxia in the Gulf.

C. *Mitigating Consequences to the Agriculture Industry*

Setting a stringent nitrogen TMDL could harm the agriculture industry, despite the concurrent soil quality and flood mitigation benefits it may bring. To address these concerns, states should take care to ensure that they focus agricultural nitrogen pollution mitigation efforts on practices that will benefit both farms and downstream fisheries.[54] For more costly pollution mitigation measures, states should work to ensure farmers have access to either state or federal funding that alleviates some of the costs of implementing these new practices. Downstream communities that receive the bulk of benefits from the Mississippi River Basin TMDL could also provide some program funding for nutrient pollution mitigation efforts. Reducing compliance costs for farmers and ranchers will also help to prevent passing on increased production costs to consumers. If government officials expect food costs to rise significantly due to the TMDL program, Congress and state and local governments should work to expand eligibility for and benefits from government food assistance programs to minimize any inequitable impacts on low-income households.

Realistically, the government and downstream communities cannot cover all compliance costs for farmers and ranchers; however, it may be beneficial for farmers to face additional costs that internalize some of the environmental and downstream economic costs of unsustainable food production. While this may disadvantage farms that pollute heavily, it may simultaneously give a competitive advantage to farms that utilize more sustainable practices and revitalize the fishing industry in the Gulf.

D. *Political Feasibility*

Although at this moment in time, a Mississippi River Basin TMDL probably is not politically feasible, with concerted efforts it could be realistic in the near future. To improve public perception in the Midwest, proponents of a TMDL could seek to re-frame messaging surrounding the TMDL. Proponents should research what issues are most important to those who would be subject to the TMDL, ensure their interests are addressed in TMDL plans, and educate the public accordingly. For example, if residents of Iowa are highly concerned about flooding, TMDL proponents in the state could focus on emphasizing the flood resiliency and mitigation benefits of certain practices that Iowa might require under its WIP and how they would benefit farmers throughout the state. Garnering support will also hopefully become easier as the effects of climate change become more difficult to ignore and implementing "green,"

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[53] *See The History of Chesapeake Bay Cleanup Efforts*, CHESAPEAKE BAY FOUND., https://perma.cc/N4GA-DVH6.

[54] UNION OF CONCERNED SCIENTISTS, *supra* note 2, at 2–3.

or nature-based, stormwater management solutions become increasingly economically beneficial.

Conclusion

Although a Mississippi River Basin TMDL likely is currently politically infeasible and may even require additional express Congressional authorization, its many benefits make the watershed-wide TMDL an ideal to strive toward. Indeed, the Chesapeake Bay TMDL has proven itself to be highly effective in addressing the collective action problems of nutrient pollution while maintaining state autonomy, and the similar situation in the Mississippi River Basin suggests that, with a favorable political climate, a Mississippi River Basin TMDL would find similar success. Perhaps if political will to take environmental measures to address these problems increases in the Mississippi River Watershed in the wake of the worsening effects of climate change, so too will political will to adopt a strong federal regulatory framework for stormwater like the Chesapeake Bay TMDL.