



Iowa Research Online
The University of Iowa's Institutional Repository

University of Iowa Honors Theses

University of Iowa Honors Program

Spring 2018

Perspectives of the Clean Water Rule and an Alternative Policy

Katelyn Kelley

Kelsey A. Hopkins
University of Iowa

Follow this and additional works at: http://ir.uiowa.edu/honors_theses

 Part of the [Agricultural and Resource Economics Commons](#), [Economics Commons](#), and the [Environmental Studies Commons](#)

Copyright © 2018 Katelyn Kelley and Kelsey Hopkins

Hosted by [Iowa Research Online](#). For more information please contact: lib-ir@uiowa.edu.

PERSPECTIVES OF THE CLEAN WATER RULE AND AN ALTERNATIVE POLICY

by

Katelyn KelleyKelsey A. Hopkins

A thesis submitted in partial fulfillment of the requirements
for graduation with Honors in the Economics

Hennadige Thenuwara
Thesis Mentor

Spring 2018

All requirements for graduation with Honors in the
Economics have been completed.

John Solow
Economics Honors Advisor

Perspectives of the Clean Water Rule and an Alternative Policy

Spring 2018

Kelsey Hopkins & Katelyn Kelley

Department of Economics, University of Iowa

kelsey-mccoy@uiowa.edu, katelyn-kelley@uiowa.edu

1. Abstract

In this paper, we will analyze the different approaches that the Obama administration and the Trump administration took when determining the costs and benefits of the Clean Water Rule (CWR). Our goal is to determine the priorities of each administration and the economic justifications behind those considerations. We will begin by outlining forecasted benefits from clarifying the definition of Waters of the United States (WOTUS) determined by the Army Corp of Engineers and Environmental Protection Agency (EPA). Next we will look at how the Obama administration used these findings to draft the rule, and the potential social benefits from the policy. We will conduct a similar review of the actions and priorities of the Trump administration, then compare the two analyses. Additionally, we will examine the Clean Water Rule from the perspective of the agricultural industry. This examination will include a detailed description of how this industry is impacted by the rule; we will specify what, if any, additional regulations or burdens are faced. From there, we will use a political analysis to offer an explanation for why farm lobby groups oppose the legislation. We will discuss the social costs and benefits of further regulation and present our own policy for regulation that we believe will adequately supplement or replace the Clean Water Rule and Clean Water Act (CWA). This policy will both protect the environment and preserve incentives to invest and produce. Finally, we will comment on the long-term feasibility of our policy alternative and further research that would be necessary to proceed with policy revisions.

2. Introduction: A Brief History of the Clean Water Act

The U.S. Congress created The Clean Water Act in 1972, as an amendment of the original Federal Water Pollution Control Act of 1948 to tighten U.S. water quality regulation. It

introduced more structured water pollution standards and gave the EPA authority to enforce regulations. The CWA was created to reverse the degradation of U.S. waters of which only a third were deemed fishable and swimmable prior to the implementation of the act. Before the CWA, annual wetland loss was estimated to be 460,000 acres. Annual agricultural runoff totaled roughly 2.25 billion tons of soil, including large amounts of nitrates and phosphates, which are severely detrimental to human health in large quantities. To exacerbate these water quality concerns, water treatment plants only served about 8 million people nationwide.¹

Specifically, the CWA expanded state water quality standards and introduced a permit market system to limit pollution dumping. It provided funding and regulation outlines for water treatment facility construction. Additionally, the CWA set up federal sanctions and penalties, such as fines for discharge (or point source) pollution infractions. In terms of nonpoint source pollution, the Clean Water Act is much less effective. Nonpoint pollution includes agricultural fertilizer and urban municipal runoff, as these forms are hard to trace back to specific sources. Currently, the procedures laid forth require states to identify and appropriately manage water bodies that are impacted by nonpoint sources.² However, there are no strict policy restrictions for these water bodies outlined by the CWA; instead, the federal government aids in the financial support of regulation programs and clean-up processes at the state level.

Since 1972 amendments, revisions, and judicial reviews have continued to define the reach of the legislation. Originally, the Clean Water Act only had jurisdiction over a subset of all the aquatic ecosystems in the United States. This jurisdiction was decided based on the navigability of water bodies and not based on any concrete scientific definition. A water body is

¹ "A Brief History of the Clean Water Act." PBS, Public Broadcasting Service, 20 Dec. 2002, www.pbs.org/now/science/cleanwater.html.

² William L. Andreen, Water Quality Today - Has the Clean Water Act Been a Success, 55 Ala. L. Rev. 537-594 (2004).

defined as navigable if it has an ebb and flow, has been or will be used for travel, or navigable by fact (such as a large lake).³ As a result, the interpretation of the CWA has been highly disputed and it is in some cases unclear which bodies of water should fall under its jurisdiction. The Supreme Court has heard three cases questioning the reach of the CWA and has yet to reach a final resolution.

The first significant decision *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers (2001)*, rolled back the CWA's agency by finding that "the use of 'isolated' non-navigable intrastate ponds by migrating birds was not by itself a sufficient basis for the exercise of federal regulatory authority under the Clean Water Act"⁴. This decision created uncertainty as to what waters fell under the CWA's realm and introduced the idea of the CWA's jurisdiction hinging on waters that carry a "significant nexus" to navigable waters. The *Rapanos v United States (2006)* then clarified that the term "waters of the United States" encompassed non-navigable waters and that the "significant nexus" standard was the critical factor in determining the CWA's coverage.⁵

3. Clean Water Rule - "Waters of the United States"

The most recent addition is the Clean Water Rule, also defined as Waters of the United States, proposed by the Obama administration in 2015. The goal of the Clean Water Rule is to resolve jurisdictional ambiguity that resulted following the previous Supreme Court decisions in the early 2000s. Following these decisions, many parties including farmers, developers, and state and local governments, requested that new regulations be made to ease the process of identifying

³ "Legal Definition of "Traditional Navigable Waters"." US Army Corp of Engineers, www.usace.army.mil/Portals/2/docs/civilworks/regulatory/cwa_guide/app_d_traditional_navigable_waters.pdf.

⁴ "Final Environmental Assessment 'Adoption of the Clean Water Rule: Definition of Waters of the United States'". U.S. Army, Office of the Assistant Secretary of the Army of Civil Works. (2015, May 26). *Environmental Protection Agency*. February 3, 2018, from https://www.epa.gov/sites/production/files/2015-05/documents/finding_of_no_significant_impact_the_clean_water_rule_52715.pdf

⁵ "Final Environmental Assessment 'Adoption of the Clean Water Rule: Definition of Waters of the United States'" (2015)

which waters fell under the CWA's jurisdiction. The Clean Water Rule was established to make this process more predictable, consistent, and easier to understand.

The rule codifies types of water into eight groups that help to eliminate the case by case "significant nexus" argument created by the Supreme Court decisions. The categories are:

- (a)(1) All traditional navigable waters
- (a)(2) All interstate waters, including interstate wetlands
- (a)(3) The territorial seas
- (a)(4) All impoundments of waters otherwise identified as waters of the United States
- (a)(5) All tributaries of waters identified in paragraphs (a)(1) through (a)(3) above
- (a)(6) All waters adjacent to (i.e. bordering, contiguous, or neighboring) a water identified in paragraphs (a)(1) through (a)(5) above, including wetlands, ponds, lakes, oxbows, impoundments, and similar waters
- (a)(7) Prairie potholes, Delmarva and Carolina Bays, pocosins, western vernal pools in California, and Texas coastal prairie wetlands
- (a)(8) All waters situated within 100-yard floodplain of categories (a)(1) through (a)(3) above, and waters situated within 4000 feet from the high tide line or the "ordinary high water mark" of (a)(1) through (a)(5) above on a case by case basis⁶

The first four categories are unchanged from previous Clean Water Act regulations; the rule systematizes waters within categories (a)(5) through (a)(8) and establishes that each have a "significant nexus" to major U.S. waterways. Analysis done by the EPA and Army Corp of

⁶ Alexander, Laurie C. "Science at the boundaries: scientific support for the Clean Water Rule." *Freshwater Science* 34.4 (2015): 1588-1594.

Engineers estimate that the adoption of WOTUS would preface a 2.8 to 4.6 percent increase in waters deemed jurisdictional.⁷

4. Obama Administration 2015 Clean Water Rule

In order to estimate the economic effects of WOTUS the EPA and Army Corps utilize prior CWA data and documentation, and extended the data to encompass the increase in positive jurisdictional determinations caused by the rule. They conducted this analysis using a benefits transfer approach, and evaluated the benefits using stated preference and willingness-to-pay methods. These methods rely on household surveys where respondents state how much they are willing to pay for good and services provided by the ecosystem.⁸ This approach does not take into account indirect value of ecosystem protection, such as bequest and existence values, and therefore may be understating the added societal benefit of the rule.

According to the EPA and Army Corps, the purpose of the CWR is to clarify jurisdiction and lessen ambiguity about where and why regulation is enforced. They estimate that by clarifying the rule, local and federal government bodies would save money on enforcement due to greater regulatory certainty. Benefits are also likely to accrue in the form of businesses and land developers experiencing an expedited permit process and fewer overall delays. However the greatest net benefits come from the “value of the ecosystem services provided by the waters and wetlands protected as a result of CWA requirements, such as habitat for aquatic and other species, support for recreational fishing and hunting, and flood protection”.⁹ The agencies

⁷ “Final Environmental Assessment ‘Adoption of the Clean Water Rule: Definition of Waters of the United States’” (2015)

⁸ “Economic Analysis of the EPA-Army Clean Water Rule”. U.S. Environmental Protection Agency, U.S.. (2015, May 20). Environmental Protection Agency. February 5, 2018.

⁹ Copeland, Claudia. EPA and the Army Corps Rule to Define Waters of the United States. Congressional Research Service Washington United States, 2017.

estimate that benefits derived from the clarification provided by the CWR ranges from \$350 million and \$572 million per year.¹⁰ (See Figure 1 below)

Figure 1: Obama Administration Annual Estimated Costs and Benefits to CWA Programs

	Annual Costs (FY14\$ millions) LOW	Annual Costs (FY14\$ millions) HIGH	Annual Benefits (FY14\$ millions) LOW	Annual Benefits (FY14\$ millions) HIGH
402 CAFO Administration	\$0.2	\$0.2	included below	included below
402 CAFO Implementation	\$6.1	\$6.1	\$3.8	\$6.6
402 Stormwater Administration	\$0.3	\$0.3	included below	included below
402 Stormwater Implementation	\$29.2	\$36.4	\$29.0	\$36.8
404 Permit Application	\$28.7	\$49.1	included below	included below
404 Mitigation - Wetlands	\$54.5	\$152.3	\$306.1	\$306.1
Subtotal:	\$118.8	\$244.3	\$338.9	\$349.5
311 Compliance	\$12.7	\$12.7	not quantified	not quantified
401 Administration	\$0.8	\$0.8	not quantified	not quantified
402 Pesticide General Permit Implementation	\$3.3	\$3.6	not quantified	not quantified
404 Mitigation - Streams	\$22.8	\$45.2	not quantified	not quantified

¹⁰ Copeland, 2017

TOTAL	\$158.4	\$306.6	\$338.9	\$349.5
--------------	----------------	----------------	----------------	----------------

5. Trump Administration Revisions

The current administrator of the EPA, Scott Pruitt, is reviewing and revising the Clean Water Rule to reflect the changes that the Trump administration deems necessary. This is part of a two-step process to rescind and recodify the definition of “waters of the United States,” which will in turn change which specific waters are covered under the Clean Water Act. In particular, the new proposal includes two major policy arguments. The first addresses concerns over states’ rights and whether or not the federal Supreme Court or state Supreme Courts should have the authority to make legal decisions regarding the reach of the rule. While this investigation is important, we will focus solely on the economic analysis that the Trump EPA conducted, which is based on the assumption that the 2015 economic analysis has been fully implemented.¹¹

The Trump economic analysis uses the 2015 economic analysis conducted by the Obama administration as a guideline to estimate the avoided costs and foregone benefits of repealing the 2015 CWR. The change in positive jurisdiction (of 2.6 to 4.6 percent) occurs chiefly in four sections:

CWA Section 311: Oil Spill Prevention

CWA Section 401: Certification

CWA Section 402: Stormwater Permitting, Concentrated Animal Feeding

Permitting, and Pesticide General Permit

¹¹ United States, Environmental Protection Agency. (2017, June). Economic Analysis for the Proposed Definition of "Waters of the United States" Recodification of Pre-existing Rules. Retrieved April 3, 2018, https://www.epa.gov/sites/production/files/2017-06/documents/economic_analysis_proposed_step1_rule.pdf

CWA Section 404: Permits and Stream and Wetland Mitigation

When conducting the most recent economic analysis, the EPA copied verbatim the costs and benefits estimated by the Obama administration into avoided costs and forgone benefits in all areas except Section 404 (See Figure 2 below). According to the Trump EPA “the largest and most uncertain estimates from the 2015 CWR economics analysis are associated with the benefits of the CWA 404 program.”¹² Due to this uncertainty, the Trump economic analysis left these benefits, which amounted to the bulk of benefits estimated by the Obama administration, out of their cost-benefit analysis (See Figure 2 below). This is a chief complaint of many economists, who criticized both administrations economic analyses, but particularly the aspect of the Trump economic analysis that failed to account for a majority of the benefits lost with the repeal of the 2015 rule.¹³

Figure 2: Trump Administration Annual Estimated Avoided Costs and Foregone Benefits associated with Repealing CWA Programs

	Annual Avoided Costs (FY16\$ millions) LOW	Annual Avoided Costs (FY16\$ millions) HIGH	Annual Forgone Benefits (FY16\$ millions) LOW	Annual Foregone Benefits (FY16\$ millions) HIGH
402 CAFO Administration	\$0.17	\$0.17	included below	included below
402 CAFO Implementation	\$6.21	\$6.21	\$3.9	\$6.8
402 Stormwater Administration	\$0.29	\$0.29	included below	included below

¹² Economic Analysis for the Proposed Definition of "Waters of the United States" - Recodification of Pre-existing Rules., 2017.

¹³Saiyid, A. H. (2017, June 27). EPA Water Rule Repeal Based on Sloppy Cost Analysis: Economists. Retrieved from <https://www.bna.com/epa-water-rule-n73014462367/#!>

402 Stormwater Implementation	\$29.9	\$37.3	\$29.7	\$37.7
404 Permit Application	\$29.4	\$50.2	included below	included below
404 Mitigation - Wetlands	\$55.7	\$156.0	not quantified*	not quantified*
Subtotal:	\$121.7	\$250.2	\$338.9	\$349.5
311 Compliance	\$13.0	\$13.0	not quantified	not quantified
401 Administration	\$0.8	\$0.8	not quantified	not quantified
402 Pesticide General Permit Implementation	\$3.4	\$3.7	not quantified	not quantified
404 Mitigation - Streams	\$23.3	\$46.2	not quantified	not quantified
TOTAL	\$161.2	\$313.9	\$338.9	\$349.5

***indicated benefits that were removed from 2015 Economic Analysis**

Neither of the economic analyses done by the Obama or Trump administration's are perfect; a critique of both analyses is that the estimates are based off recession-era data, which results in skewed costs and benefits. The latter EPA economic analysis "is likely the result of the the agencies' wish to move to quickly repeal the regulation following a February (2017) executive order."¹⁴ The Trump EPA failed to account for benefits stemming from the mitigation of wetland loss, labeling these as "unquantified benefits" in their analysis, where the Obama EPA estimated annual benefits of \$306.1 million. Because of this hurried political move, we

¹⁴ Saiyid, Amena (2017).

believe the Obama EA provides a more complete understanding of the potential social tradeoffs associated with the rule.

6. Discussing Social Marginal Costs and Benefits

After analyzing the differences in the two policies, it is our opinion that neither adequately takes into account the true social costs of water pollution. The original Clean Water Rule only slightly broadens the scope of the Clean Water Act. It had no policies to address nonpoint source pollution, which is a main contributor to nitrification of major waterways such as the Mississippi River. This nitrification and nutrient abundance has a noticeable impact on Gulf Coast fisheries, as the additional nutrients lead to extreme algae growth, and in turn, lack of oxygen in the water. The Gulf of Mexico has the largest recurring dead zone in the United States and the second largest in the world. Scientists estimate that with warming temperatures and higher rainfall averages in 2015 and 2016 that the rain and following nutrient drainage into the Gulf have caused it to increase above average growth levels.¹⁵ According to the National Oceanic and Atmospheric Administration (NOAA), the dead zone, “costs US seafood and tourism industries \$82 million each year. The impact could be devastating to the Gulf’s seafood industry, which accounts for more than 40% of the nation’s seafood.”¹⁶ As the Clean Water Rule and Clean Water Act only address point source pollution, these costs are a significant oversight.

As a result, the cost of agricultural runoff and other types of nonpoint source pollution is currently borne by consumers, not by the industry who created it. In order to appropriately

¹⁵National Oceanic and Atmospheric Administration, United States Department of Commerce, August 5, 2015. <http://www.noaanews.noaa.gov/stories2015/080415-gulf-of-mexico-dead-zone-above-average.html>

¹⁶The Nature Conservancy The Floods' Lingering Effects: New Study Shows Gulf "Dead Zone" One of the Largest on Record <https://www.nature.org/ourinitiatives/regions/northamerica/areas/gulfofmexico/explore/gulf-of-mexico-dead-zone.xml>

distribute the burden of environmental damage caused by such activities, agricultural industries, farmers, and comparable parties should be required to internalize these costs, thus shifting the social marginal cost curve leftwards and restoring market efficiency. This reorganization of costs can be achieved by taxation, permitting, fertilizer and pesticide limits, and other similar constraints.

7. The Agricultural Exemptions

A point of contention about the addition of the CWR is whether or not the agricultural industry is affected by the rule. According to the EPA and Army Corp of Engineers in the “Rule to Define ‘Waters of the United States’”, the CWR makes no changes to the established statutory and regulatory exemptions set forth by the Clean Water Act. These include: exemptions for normal farming, ranching, and silviculture activities, for permitting of agricultural stormwater discharges, and exemptions for water transfers that do not introduce pollutants directly into a waterbody.¹⁷ The Clean Water Rule actually adds additional exclusions for farming, ranching, and forestry.¹⁸ With these exemptions farmers are not held accountable for standard levels of pollutions caused by fertilizer runoff. However, farmers and other landowners remain concerned about the regulation of bodies of water on their property.

Farmers and farm lobbies are against the CWR because the definition of “significant nexus” is up to interpretation¹⁹. Scientifically it has been proven that, given enough time, all waterways are connected through ground water, surface connections, and run-off. Therefore, on a case-by-case basis, farmers’ waterways and fields may be subject to the CWR’s restrictions.

¹⁷ Copeland, Claudia. EPA and the Army Corps Rule to Define Waters of the United States. Congressional Research Service Washington United States (2017).

¹⁸ Kopocis, K. (2015, June 12). The Facts About the Clean Water Rule and Agriculture (United States, Environmental Protection Agency). <https://blog.epa.gov/blog/2015/06/clean-water-rule-and-agriculture/>

¹⁹ Waskom, R., Cooper, D. J., & Colorado State. (2017, March 01). Why farmers think the Clean Water Rule goes too far. Retrieved from <https://www.hcn.org/articles/why-farmers-and-ranchers-think-the-clean-water-rule-goes-too-far>

Specifically, the ditches used for drainage could or could not be covered under the CWR. These lobby groups fear that the definitions laid out in the Clean Water Rule paves the way for further and more strict regulations that will restrict agricultural practices²⁰.

The need for clarifications comes from several sources. The most urgent and perhaps the most obvious is to mitigate the negative effects of global climate change. Scientific research has shown that water resources are most at risk and will be the most challenging to regain once lost. Furthermore, about one in three Americans gets their drinking water from small streams and creeks that are protected under the Clean Water Rule (CWA: Streams and Wetlands Matter). The connectivity of such bodies of water has been evidenced by scientific literature.²¹ Based on the evidence collected from more than 1,200 peer-reviewed scientific studies, the health of small bodies of water and wetlands has a heavy impact on the health of larger bodies of water such as lakes, rivers, and oceans.²² There is a strong link between streams and larger downstream waters; in fact, “all tributaries streams, regardless of size or flow regime, are physically, chemically, and biologically connected to downstream rivers via channels and associated alluvial deposits.”²³ Headwater streams act as storage departments in the form of ponds, banks, and shallow aquifers and then transport collected sediments and pollutants to rivers and over time, ultimately change fundamental biochemical processes within these waters.

This rule expanded the reach of current regulations to smaller bodies of water, including streams and creeks on private property. It has been met with fierce political opposition by conservative groups and farm lobbies. Concerns include increased costs and overreach of the

²⁰ Waskom, R., Cooper, D.J., & Colorado State (2017)

²¹ “Final Environmental Assessment ‘Adoption of the Clean Water Rule: Definition of Waters of the United States’” (2015)

²² “Clean Water Rule: Streams and Wetlands Matter.” EPA, Environmental Protection Agency, 9 Feb. 2017, archive.epa.gov/epa/cleanwaterrule/clean-water-rule-streams-and-wetlands-matter.html.

²³ Alexander, Laurie C. "Science at the boundaries: scientific support for the Clean Water Rule." *Freshwater Science* 34.4 (2015): 1588-1594.

government into the private lives and properties of citizens. Currently, the CWR is tied up in the courts and has been blocked by the Trump administration. As per the executive order released from the White House on February 28, 2017, the Clean Water Rule is under review by the Trump administration's EPA and the Army for Civil Works to ensure that "the Nation's navigable waters are kept free from pollution, while at the same time promoting economic growth, minimizing regulatory uncertainty, and showing due regard for the roles of the Congress and the States under the Constitution."²⁴ If and when the CWR is finally through the review process, it is unlikely that it will have the same structure and scope that the Obama administration originally put forth. It is probable that further legislation and amendments will be necessary in the future to continue the process of reversing and preventing U.S. water pollution.

8. With Agriculture Exempt, Why are Farmers Still Concerned?

Per the guidelines outlined in the Clean Water Act, agriculture that does not contribute to point-source pollution is exempt from regulation. Farmers do not face any additional permitting costs or regulatory processes under the Clean Water Rule. Therefore, it makes sense to explore the question: Why are farmers still concerned about the Clean Water Rule? From a strictly financial aspect, there is no effect on agriculture, so we can infer that farmers are concerned from a social or political perspective.

Under part of the Clean Water Rule, the EPA has the power to determine that any water body within 4,000 feet of a tributary is a significant nexus, and therefore it would be subject to those regulations. In Iowa, this corresponds to potentially 97% of the state falling under the

²⁴ 82 FR 12497 Presidential Executive Order on Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the "Waters of the United States" Rule. (2017, February 28).

Clean Water Rule, subject to a case-by-case review by the EPA.²⁵ Ultimately, the actual area of land that will end up regulated by the CWR would be a tiny fraction of this figure, but numbers like these carry a significant shock value.

Politically, rural American farmers have traditionally leaned towards a more conservative stance on most political issues. Along with the conservative viewpoint comes the belief that a smaller government body without much power is superior to big government for the average citizens' welfare. Thus, the lobbying on behalf of the farmers and agricultural industry against the Clean Water Rule may stem from fear of this potential future "over-regulation." Regulatory bodies, though usually put into place with good intentions, can become costly and inefficient.

9. An Alternative Policy

In the process of studying and understanding the political controversy and the economic tools used in the Clean Water Rule, we have determined our own policy recommendations that we think minimize environmental damage, market inefficiency, and social costs, while maximizing social benefits. Our proposal rests in the scientific proof that all waterways, regardless of size or place, will eventually connect, either above or below ground. We are operating under the belief that the social cost of water pollution is more extreme than the Obama and Trump administrations estimate it to be. Therefore, it would be necessary to impose stricter regulations, additional permitting processes, monetary penalties for pollution infractions, or a combination of these options.

One specific policy consideration we believe warrants more attention is a system of tradable pollution permits, similar to the cap and trade system of carbon abatement. This system

²⁵ Iowa Farm Bureau (2016, January 12). Maps starkly display potential impact of WOTUS rule. <https://www.iowafarmbureau.com/Article/Maps-starkly-display-potential-impact-of-WOTUS-rule>

allows each firm to reduce pollution in the most cost effective way while lowering overall runoff. The policy should form regional boundaries, such as county lines, to segment the population into manageable groups for trade, monitoring, and enforcement. If a region should exceed their pollution limits, fines will be in place that force the agricultural industry to internalize the extra societal costs, which collectively punishes the polluters. This strategy and the risk of collective punishment would hold every party within each region accountable to one another. We feel this would be a very strong incentive toward self-policing and active pollution reduction that the Clean Water Act is currently lacking. To ease the agricultural industry into these new regulations, the EPA should offer government funded educational opportunities for farmers to co-adapt and co-learn strategies to reduce pollution.

Our policy suggestions would significantly increase social welfare as a consequence of an optimal level of pollution. However, the effects of tradable permits for water pollution are complex, and while there has not been significant implementation of such a policy, there are a few localized examples. Combating pollution in the Chesapeake Bay has been a challenge since the 1980s. The EPA and several of the states surrounding the bay created the Chesapeake Bay Agreement in 1987 to reduce nutrients in the bay by 40%.²⁶ Trading permits to maintain the optimal level of reduction is a significant aspect to the agreement and because the bay affects multiple states, each one is responsible for regulation and enforcement respectively. With funding from the U.S. Department of Agriculture to assist these states in creating tradeable permit markets²⁷, the Chesapeake's dead zone was all but gone by the summer of 2016²⁸. Similar

²⁶ Kraemer, R. Andreas; Eleftheria Kampa; Eduard Interwies. "The Role of Tradable Permits in Water Pollution Control" Ecologic, Institute for International and European Environmental Policy, Berlin. (2004).

²⁷ Wheeler, Tim. "Federal grants to boost Bay pollution trading efforts." Baltimoresun.com. August 27, 2012. <http://www.baltimoresun.com/features/green/blog/bal-bmg-federal-grants-to-boost-bay-pollution-trading-efforts-20120823-story.htm>

²⁸ Shapiro, Ari, and Sam Gringlas. "Chesapeake Bay Dead Zones Are Fading, But Proposed EPA Cuts Threaten Success." NPR. June 28, 2017. <https://www.npr.org/2017/06/28/534539755/chesapeake-bay-dead-zones-are-fading-but-proposed-epa-cuts-threaten-success>.

markets within the farming industry can be used to reduce pollution in important American rivers and lakes. Small groups, such as states, or even counties, should be responsible for the vitality of these tradeable markets and punishment if the regional quotas are not met. Tradable permits allow firms to pollute at the optimal level according to their own marginal costs, making this type of regulation less restrictive than a simple quota or tax. Further study about how these markets would impact the agricultural industry is necessary to weigh the costs of hindering production with the overall gain in social welfare from pollution reduction.

Successfully combating nonpoint source pollution in U.S. surface water will take a combined effort between federal and local agents. Tradable permits allow for a “cost-effective allocation of environmental effort across alternative sources without environmental regulators knowing the abatement costs of individual agents.”²⁹ Designated regions should create these localized tradeable permit markets for the best possible management and enforcement. These additions to the Clean Water Act could help improve water quality throughout the U.S. and increase overall social welfare.

10. Discussion

In the long run, our policy alternative would result in increased social benefit through the reduction of water pollution. However, in order to attain this increased social benefit, the United States would need to move away from its current political atmosphere. Obstruction by political lobbying of polluters has been a main obstacle for environmental policy. As such, the likelihood that a cap-and-trade system for water pollution will be implemented is slim. A shift in public

²⁹ Kraemer, R. Andreas; Eleftheria Kampa; Eduard Interwies. “The Role of Tradable Permits in Water Pollution Control” Ecologic, Institute for International and European Environmental Policy, Berlin. (2004).

opinion towards a more progressive viewpoint, one that places a higher value on the environment, would first be necessary, and looking forward, a deeper investigation into the estimated monetary impact of this cap-and-trade policy. It is clear that further evaluation of this proposal is necessary to determine its feasibility.

11. Conclusion

Upon reviewing the CWA and CWR, we can see that government intervention and regulation is essential to mitigate the social costs of pollution and increase social benefits. Politically, however, there are different considerations and oppositions taken into account when determining these costs and benefits. As such, the Obama and Trump administrations differ in their approaches to the CWR, and when the two analyses are compared, it is easy to see the differences. Approaches taken by the respective administration may stem from political lobbying on behalf of groups like the agricultural industry, though upon investigating why farmers oppose the CWR, there appears to be no concrete monetary reason. Instead, the fear of potential future over-regulation has fueled the agricultural industry's concerns about the CWR. When choosing the best way to move forward with policy revisions, we suggest a cap-and-trade permit system to better capture the externalities of water pollution. While further investigation is necessary, we have determined that this is one potential solution to the problem of nonpoint source water pollution.

References

- 82 FR 12497 Presidential Executive Order on Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the “Waters of the United States” Rule. February 28, 2017.
- “A Brief History of the Clean Water Act.” PBS, Public Broadcasting Service, December 20, 2002. www.pbs.org/now/science/cleanwater.html.
- Alexander, Laurie C. "Science at the boundaries: scientific support for the Clean Water Rule. *Freshwater Science* 34.4, 2015: 1588-1594.
<https://www.journals.uchicago.edu/doi/abs/10.1086/684076>
- Copeland, Claudia. EPA and the Army Corps Rule to Define Waters of the United States. Congressional Research Service Washington United States, 2017.
- “Clean Water Rule: Streams and Wetlands Matter.” EPA, Environmental Protection Agency, 9 February 2017.
archive.epa.gov/epa/cleanwaterrule/clean-water-rule-streams-and-wetlands-matter.html.
- “Economic Analysis of the EPA-Army Clean Water Rule”. U.S. Environmental Protection Agency, U.S.. May 20, 2015. Environmental Protection Agency.
https://www.epa.gov/sites/production/files/2015-06/documents/508-final_clean_water_rule_economic_analysis_5-20-15.pdf
- “Final Environmental Assessment ‘Adoption of the Clean Water Rule: Definition of Waters of the United States’”. U.S. Army, Office of the Assistant Secretary of the Army of Civil Works. 2015, May 26. *Environmental Protection Agency*.
https://www.epa.gov/sites/production/files/2015-05/documents/finding_of_no_significant_impact_the_clean_water_rule_52715.pdf
- Iowa Farm Bureau. “Maps starkly display potential impact of WOTUS rule.”, January 12, 2016.
<https://www.iowafarmbureau.com/Article/Maps-starkly-display-potential-impact-of-WOTUS-rule>
- Kraemer, R. Andreas; Eleftheria Kampa; Eduard Interwies. “The Role of Tradable Permits in Water Pollution Control” *Ecologic*, Institute for International and European Environmental Policy, Berlin. 2004. <https://www.ecologic.eu/13004>
- “Legal Definition of “Traditional Navigable Waters”.” US Army Corp of Engineers,
www.usace.army.mil/Portals/2/docs/civilworks/regulatory/cwa_guide/app_d_traditional_navigable_waters.pdf.

- Saiyid, A. H. "EPA Water Rule Repeal Based on Sloppy Cost Analysis: Economists". June 27, 2017. <https://www.bna.com/epa-water-rule-n73014462367/#!>
- Shapiro, Ari, and Sam Gringlas. "Chesapeake Bay Dead Zones Are Fading, But Proposed EPA Cuts Threaten Success." NPR. June 28, 2017. <https://www.npr.org/2017/06/28/534539755/chesapeake-bay-dead-zones-are-fading-but-proposed-epa-cuts-threaten-success>.
- United States, Environmental Protection Agency. Economic Analysis for the Proposed Definition of "Waters of the United States" Recodification of Pre-existing Rules. June 2017. https://www.epa.gov/sites/production/files/2017-06/documents/economic_analysis_proposed_step1_rule.pdf
- Wheeler, Tim. "Federal grants to boost Bay pollution trading efforts." Baltimoresun.com. August 27, 2012. <http://www.baltimoresun.com/features/green/blog/bal-bmg-federal-grants-to-boost-bay-pollution-trading-efforts-20120823-story.htm>
- William L. Andreen, Water Quality Today - Has the Clean Water Act Been a Success, 55 Ala. L. Rev. 537-594, 2004. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=554803