Jurisdictional Failures and the Role of Nonprofits in Externality Regulation

Laura Grant[†] and Christian Langpap[‡]

[†]Robert Day School of Economics & Finance, lgrant@cmc.edu, 909.607.9841, Claremont McKenna College, 500 E. Ninth Street, Claremont, CA 91711;
[‡]Department of Applied Economics, christian.langpap@oregonstate.edu, 541.737.1473, Oregon State University, Corvallis, OR 97331.

January 2026

Abstract

When the reach of social harm exceeds the reach of political jurisdiction, regulation can fail. Nonprofits often operate across borders, aiming to fill these gaps. We provide the first evidence of this role. Our context is the U.S. Clean Water Act, wherein states have weak incentives to control pollution flowing out. Using spatially randomized water quality data and an instrument for nonprofit activity, we provide causal evidence that outcomes are worse near state borders, but local environmental nonprofits substantially mitigate these failures. Supporting cross-border nonprofits offers an alternative to top-down mandates or inter-jurisdictional bargaining.

Keywords: Public Goods, Transboundary, Externalities, Spillovers, Nonprofits

JEL Codes: H41, L31, Q53

We appreciate institutional information from Will Wheeler, comments from Ryan Abman, and feedback from participants at the 2022 Social Costs of Water Pollution, the 2023 Summer Conference of American Environmental and Resource Economists, the CMC 2023 summer research workshop, the WEA 2023 Summer Conference, and seminars at Oregon State University, the Property & Environment Research Center (PERC), the University of Oklahoma, and UC San Diego. Langpap thanks PERC for support through a Lone Mountain Fellowship.

1 Introduction

Externalities are a canonical market failure, often addressed by corrective government policies. However, this assumes regulatory authority aligns with the geographic scope of social harm. When responsibility is divided across jurisdictions that do not align with the natural boundaries of externalities, institutional gaps emerge and regulation can fail to provide socially optimal outcomes (Adler, 2005; Oates, 1972). We refer to this structural misalignment—where governments have weak incentives to address harms that primarily affect outsiders—as a *jurisdictional failure*.

Jurisdictional failures occur wherever the geographic reach of harm exceeds the reach of political authority, which occur in settings of criminal justice, environmental regulation, public health, and social policy: Policing strategies displace crime across jurisdictions, air pollution crosses country lines, pest control fails at county borders, fragmented public schooling provision occurs, and immigration policies face underinvestment (Brasington, 2003; Ciancio and García-Jimeno, 2024; Johnson et al., 2012; Ogawa and Wildasin, 2009; Sexton et al., 2007). Although each is a standard externality, failures across borders represent a second-order externality: a collective action problem among governments.

Addressing jurisdictional failures typically requires centralized mandates or voluntary interstate bargaining—both politically difficult. We hypothesize and test a third approach: nonprofit organizations that operate across borders may fill regulatory gaps where formal coordination fails. Unlike government agencies, nonprofits often align their efforts with natural systems, target neglected regions, create a mechanism for collective action, and enhance local capacity (Grant and Langpap, 2024). Yet, their ability to alleviate regulatory shortcomings is uncertain. They rely on voluntary contributions, compete for donations, set their own priorities, and coordinate informally, if at all, with local regulators (Kim, 2015; Rose-Ackerman, 1982). Using variation in water quality, enforcement, and conservation programs across jurisdictional borders, we provide the first causal evidence that nonprofits substantially mitigate these failures.

We focus on water pollution, a stark case of jurisdictional failure (Shortle and Horan, 2017). Many rivers and streams cross or define political boundaries, creating governance challenges. Under the U.S. Clean Water Act (CWA), the federal government sets national requirements and goals but delegates permitting, monitoring, and enforcement to individual states. These include setting and overseeing firms' discharge allowances (point-source pollution) and managing land use to reduce runoff (nonpoint-source pollution) (see ICWP, 2020). This misalignment between hydrological systems and political jurisdictions creates a textbook regulatory gap, resulting in spatial disparities in monitoring, enforcement, and restoration (Helland, 1998b; Helland and Whitford, 2003; Sigman, 2002).

Law requires states to monitor water quality, identify polluted waters, develop cleanup plans, and enforce permit limits. In practice, states retain broad discretion over where to monitor, how strictly to enforce, and where to target conservation programs (Evans et al., 2018; Helland, 1998a; Liu et al., 2023). This flexibility enables strategic choices that can undercut effectiveness. The law mandates comprehensive assessment, but does not specify protocols—allowing states to avoid politically sensitive or costly regions. These failures are most severe near borders, where states lack incentives to regulate pollution that flows downstream to neighboring jurisdictions (Craig, 2019; Smith and Wolloh, 2012). Fiscal constraints compound the problem, as regulatory activities compete with other spending priorities (Gray and Shimshack, 2011). Decentralization, limited accountability from federal entities, and weak cross-state coordination reinforce the mismatch between regulatory effort and environmental need.

These incentives yield testable predictions: we should observe worse water quality and weaker regulatory effort near jurisdictional borders. Indeed, previous research confirms this pattern. It arises in air quality and hazardous waste regulation (Fang et al., 2019; Fu et al., 2022; Jung et al., 2022). Under the CWA, when regulatory authorization changes from the federal government to individual states, downstream water quality declines (Gunn, 2022; Sigman, 2005) and states avoid cleanup plans near borders (Meng, 2022). Internationally, pollution is 40% higher as streams exit national borders (Sigman, 2002), and water quality drops at municipal boundaries in Brazil (Lipscomb and Mobarak, 2016). Evidence from China shows that policy reforms can reduce border pollution: greater upstream accountability cuts pollution at provincial borders (Kahn et al., 2015), and financial incentives raise emissions compliance near crossings (Chen et al., 2022; Wang et al., 2025).

We further hypothesize that local water-related nonprofits help mitigate jurisdictional failures by stepping in at the borders, where state action is weakest. Using new data, we test this. We set the stage by extending prior work to estimate effects across all waterways, moving beyond state authorization events. After assessing the upstream-downstream water quality gaps, we identify two mechanisms driving the border disparities: differences in regulatory oversight of polluting firms and conservation program implementation. In each domain, outcomes are worse near borders—by 3.5 percent for water quality disparities, and by 38 percent and 9 percent, for the mechanisms. We exploit panel variation in nonprofit presence and spending to test whether they improve conditions near borders. Nonprofits mitigate 6 to 40 percent of the border disparity, depending on the outcome tested; strong and important evidence that nonprofits can and do offset jurisditional failures.

To establish causal effects, we remedy possible selection bias in water-quality sampling using data from a US-wide, spatially randomized monitoring program. In addition, we address endogeneity of water-related nonprofit activity using total expenditures by unrelated local nonprofits as an instrument, leveraging variation in philanthropic intensity that is plausibly unrelated to environmental need.

Our contributions are twofold but unified. Both focus on coordination failures that arise when political boundaries misalign with the geography of harm, creating jurisdictional failures. First, we assess a novel approach to mitigating transboundary externalities and provide the first causal evidence that nonprofits mitigate jurisdictional failures in the public regulation of externalities. While local environmental groups have long engaged in monitoring, enforcement, and conservation, their role in improving outcomes near state borders has not been measured. We show that these groups offset regulatory shortfalls where state incentives are weakest, improving ambient environmental quality, enforcement of polluting firms, and delivery of conservation programs near borders. This advances the literatures on jurisdictional failures and on nonprofit organizations by demonstrating that civic groups fill regulatory voids where governments underprovide regulation. Second, to identify where these gaps arise and where nonprofits can matter most, we broaden the scope of the governance mismatch and spillover literature by systematically documenting disparities in water quality and regulatory effort across all U.S. state borders and over time. Prior studies focused narrowly on state authorization events or selected sites; our comprehensive mapping reveals the pervasiveness and magnitude of spatial mismatches between environmental need and state action. Together, these findings suggest that supporting cross-border nonprofit activity in places with large jurisdictional failures may offer a politically feasible complement or alternative to regulation or inter-jurisdictional bargaining.

2 Contextual Background

2.1 Clean Water Act (CWA) Implementation and Jurisdictional Gaps

The CWA provides the primary federal framework for protecting surface water quality in the United States. It sets national goals for water pollution control but delegates most implementation responsibilities to individual states. Key components include support for municipal wastewater infrastructure, permitting for industrial discharges, and programs to address diffuse runoff from land.

All states are authorized by the Environmental Protection Agency (EPA)—with the exception of Massachusetts, New Hampshire, and New Mexico—to administer the National Pollutant Discharge Elimination System (NPDES), which sets limits on pollutants discharged by point sources such as factories and wastewater treatment plants. States also manage programs to control nonpoint source pollution, such as agricultural runoff, by developing voluntary or incentive-based conservation efforts.

However, while water bodies often flow across states, regulatory authority stops at political borders. Most state boundaries reflect historical and political factors, not hydrological systems. Major rivers define some borders, but most streams and tributaries cross from one state into another.[1]

This mismatch creates institutional gaps in water governance. The CWA does not require interstate coordination of water quality standards, monitoring protocols, or enforcement priorities—even when pollution in one state affects conditions downstream. Each state sets its own goals and policies for water quality, and implementation decisions are made independently, without regard to costs or benefits to neighboring jurisdictions (Craig, 2019). Because compliance with the CWA involves opportunity costs—allocating monitoring and enforcement resources that compete with other priorities—states have limited incentive to invest effort where benefits accrue out-of-state. Strategic underinvestment is especially likely near borders, where pollution harms downstream neighbors rather than in-state residents.

[1] Instead, factors influencing U.S. state boundaries included colonial charters, land grants, treaties with Native American tribes, and congressional acts.

Some interstate compacts exist for specific watersheds, but participation is voluntary and enforcement mechanisms are weak. As a result, most transboundary water bodies lack coordinated oversight, leaving a structural void in water quality governance.

This context represents a textbook case of negative externalities in public economics: state governments have incentives to invest in environmental protection only to the extent that benefits accrue within their own borders. States exhibit wide discretion in implementing water pollution regulation, and enforcement varies meaningfully across time, space, and local political and economic conditions (Earnhart, 2004; Shimshack and Ward, 2022). This flexibility creates scope for strategic behavior—particularly in under-enforcing near borders, where downstream harms fall on other jurisdictions. It also creates opportunities for local actors—such as nonprofit organizations—to fill in where formal government effort may be weakest, including through influence on conservation program targeting or public oversight.

2.2 Environmental Nonprofit Groups

Local environmental nonprofits often focus on the geographic region impacting water bodies, such as the land area flowing to a river, rather than political jurisdictions (Grant and Langpap, 2019), enabling them to operate across state borders and potentially respond to regulatory gaps caused by jurisdictional spillovers. Many engage in activities that improve water quality. For example, the Genesee River Watch stabilizes agricultural riverbanks to reduce sediment and phosphorus loads, while the James River Association and Shenandoah Riverkeeper assist landowners in implementing forest buffers and fencing to reduce runoff.

Nonprofits also operate through indirect channels. Some conduct research to inform watershed management, others focus on outreach and public engagement through educational programs, river clean-ups, and support for voluntary conservation efforts. By providing information about government programs and building relationships with landowners, these groups may facilitate implementation of federal conservation subsidies and enhance state regulatory capacity.

Many environmental nonprofits also pursue legal and policy strategies. They lobby for stronger environmental protections, monitor permit compliance, and litigate under the

CWA to enforce regulations. For instance, the Willamette Riverkeeper samples water, investigates permit violations, and has used litigation to prompt judicial review of wastewater permits. Empirical evidence suggests such actions can increase enforcement and improve water quality *within* state borders (Grant and Langpap, 2019; Grant and Grooms, 2017).

Overall, nonprofits represent a flexible and effective alternative to formal regulation, capable of targeting neglected regions, catalyzing local action, and influencing both public and private actors.

3 Empirical Approach

We estimate the effect of environmental nonprofits on water quality by leveraging variation in monitoring locations, nonprofit activity, and the hydrological position of stream segments within states. Our analysis focuses on rivers and streams that cross U.S. state borders, comparing conditions near the point where a stream exits a state ("near-border") to conditions further upstream ("interior").

We estimate two effects. First, we measure whether water quality is systematically worse near borders, consistent with under-regulation of pollution that spills into neighboring jurisdictions. Second, we test whether the presence and activity of environmental groups attenuates this decline in water quality—what we interpret as mitigation of jurisdictional spillovers. This is a heterogeneous effect, comparing the gap between near-border and interior monitors across areas with and without active environmental groups. Proximity to the border captures potential under-provision of regulatory effort due to jurisdictional spillovers, while variation in nonprofit presence and spending captures potential mitigation. This approach allows us to test whether environmental nonprofits reduce the disparity in water quality near state borders relative to interior locations; see Figure A.1 for an illustration. The interaction between border proximity and nonprofit activity captures heterogeneity in cross-sectional exposure to spillovers and potential response.

We estimate the following model for monitoring site i in year t:

$$WQ_{it} = \nu N_i + \alpha \ln(G_{it}) + \lambda(N_i \times \ln(G_{it})) + X_{it}\boldsymbol{\beta} + L_i\theta + \gamma_s + \tau_t + s \times t + \varepsilon_{it} \quad (1)$$

The dependent variable WQ_{it} is average summer dissolved oxygen (mg/L), a standard indicator of aquatic ecosystem health. Water quality measurements come from randomly placed monitoring sites nationwide, a rare design that eliminates selection bias in where to measure.

The key explanatory variable N_i is an indicator for whether the monitor is located within 50 stream-miles of where the stream exits the state, measured along the river network. This captures areas where regulators are less likely to internalize downstream pollution costs, so we expect the coefficient ν to be negative, indicating worse water quality near jurisdictional boundaries.

The variable G_{it} is the number of water-related environmental groups—or alternatively, their logged expenditures—located near site i in year t. The coefficient α captures the effect of nonprofit activity on water quality in the state interior and is expected to be positive. The interaction term $N_i \times \ln(G_{it})$ tests whether nonprofit activity moderates near-border declines in water quality. A positive coefficient λ would indicate that nonprofits help mitigate cross-jurisdictional pollution spillovers.

The matrix X_{it} includes site-year controls: county-level demographics (population, income, education, political inclination, racial composition, unemployment, and an urban indicator), local annual temperature and precipitation, state-year CWA enforcement effort, and an indicator for whether the site is in a state participating in an interstate water-quality compact. The matrix L_i includes fixed effects for location type—near stream exit, on a state border, or interior. We include state fixed effects (γ_s), year fixed effects (τ_t), and state-specific linear time trends ($s \times t$). The error term ε_{it} captures residual variation.[2]

A potential threat to identification is that the location or intensity of environmental group activity may be endogenous to water quality. If groups tend to locate where pollution is worse, targeting areas most in need, we may underestimate their effectiveness. In this case, group activity would be negatively correlated with unobserved determinants of water

[2]We cannot include site fixed effects because the stream exit indicator is time-invariant. A site fixed effects model, while not useful for our analysis without this variable, nevertheless yields positive, significant estimates for $N_i \times \ln(G_{it})$. Spillover and mitigation estimates are robust to alternative specifications using watershed (HUC8) or county fixed effects. Results are also robust to a partialing-out lasso algorithm that flexibly selects combinations of state and year fixed effects and trends. Interior impacts are less precisely estimated in these specifications. Results are robust to excluding the state-specific trends.

quality, biasing OLS estimates downward. Conversely, if groups concentrate in cleaner, wealthier areas with more environmentally engaged residents, estimates may be biased upward. Similarly, if nonprofit spending reflects fundraising success in affluent communities, observed activity may capture baseline conditions rather than causal effects. Prior evidence suggests the former mechanism—strategic placement in high-need areas—is more prevalent (Grant and Langpap, 2019), so we expect downward bias in OLS estimates.

To address this concern, we implement an instrumental variables strategy that isolates plausibly exogenous variation in environmental group activity. Our instrument (Z_{it}) is the logarithm of total expenditures by nonprofit organizations in the same local area whose missions are unrelated to environmental quality but that provide local public goods.[3] We define this measure using the National Taxonomy of Exempt Entities (NTEE) classification system and use nonprofits in arts, culture, and humanities (category "A") and in recreation and sports (category "N").[4] These sectors are likely to be highly correlated with general patterns of community giving and nonprofit infrastructure, and thus with environmental nonprofit activity.

We design the instrument to capture variation in the capacity of local communities to support nonprofit activity while remaining orthogonal to unobserved determinants of water quality, conditional on controls. Our identifying assumption is that, conditional on covariates, charitable activity for unrelated causes is exogenous to water quality outcomes and CWA enforcement. Equivalently, Z_{it} affects dissolved oxygen levels only through its influence on environmental group location and spending. We control for local demographic and political characteristics that shape both charitable giving and environmental outcomes, including income, education, population density, employment, political leaning, and public expenditures (Kim, 2015). We probe the exclusion restriction by showing that the instrument does not predict water quality in areas without nearby environmental groups and does not predict enforcement actions, an environmental outcome not directly targeted by these groups. Results in Table A.1 are consistent with the instrument affecting water quality only through its influence on environmental group presence and activity.

Equation (1) provides the main results but includes two endogenous variables: environ-

[3] Results are robust to using mean expenditures instead of totals.

[4] We exclude subcategories of recreation groups that could directly affect water quality, such as camps (N20), parks and playgrounds (N32), fishing and hunting (N61), and water recreation (N67).

mental group activity and its interaction with stream exit proximity. We estimate two first-stage equations and use Z_{it} to instrument for $\ln(G_{it})$ and $Z_{it} \times N_i$ to instrument for $\ln(G_{it}) \times N_i$:

$$\begin{aligned} \ln(G_{it}) &= \pi_0 + \pi_1 N_i + \pi_2 Z_{it} + \pi_3 (Z_{it} \times N_i) + X_{it}\boldsymbol{\pi}_4 + L_i \pi_5 + \ldots + u_{it}, \\ \ln(G_{it}) \times N_i &= \phi_0 + \phi_1 N_i + \phi_2 Z_{it} + \phi_3 (Z_{it} \times N_i) + X_{it}\boldsymbol{\phi}_4 + L_i \phi_5 + \ldots + v_{it}. \end{aligned} \tag{2}$$

The first equation instruments for the level of environmental group activity, and the second instruments for the interaction with near-border status. Both specifications include the full set of fixed effects, weather, and demographic controls described earlier.

4 Data

Water quality data are from two sources. The National Rivers and Streams Assessments (NRSA) provides repeated, spatially randomized samples of river conditions across the United States in 2008–2009, 2013–2014, and 2018–2019. These randomized samples offer credible measurement for causal inference but cover relatively few sites and years. To improve temporal coverage, we supplement the NRSA with dissolved oxygen measurements from the Water Quality Portal (WQP), a compilation of monitoring data from federal and state agencies, tribes, and research groups. The WQP provides much broader spatial and temporal coverage but reflects strategic and event-driven sampling, which can hinder identification if used alone. To combine the strengths of both sources, we construct an annual panel of dissolved oxygen at each NRSA site by taking an inverse-distance weighted mean of WQP observations within five miles, restricted to summer months and cleaned of extreme or estimated values. This procedure yields a balanced panel with roughly 130,000 site-year water quality observations from 1989 to 2019. The resulting dataset preserves the internal validity of randomized site selection while adding the temporal depth needed for our analysis.

Data on environmental nonprofits are from the National Center for Charitable Statistics (NCCS), which records all active organizations filing annual tax forms. For each organization, the data report address, latitude and longitude, and annual revenues and expenditures. We identify water-focused groups using a comprehensive list of organizations classified under "Water Resource, Wetlands Conservation, and Management" from GuideStar, cross-referenced and supplemented with registries from the EPA and River Network, a national umbrella for water-focused organizations. We restrict the sample to local organizations by excluding parent or umbrella nonprofits, groups that operate in multiple states, and organizations with assets above the 99^{th} percentile of the distribution. As confirmed through conversations with water group directors and U.S. Geological Survey researchers, the remaining nonprofits typically serve a local territory, most often the river basin where they are located. In our final sample, we observe more than 50,000 group-year observations nationwide.

We match the location of environmental groups to NRSA monitoring sites and major CWA regulated facilities, counting the number of groups within 50 miles of each site or facility, up to the twenty nearest groups, and calculate this set's total and average expenses for each year. Each water quality monitoring site has, on average, four to five local water nonprofits nearby, highlighting dense civic coverage across U.S. watersheds.

We construct the instrumental variable by collecting additional data from NCCS on nonprofits focused on arts, culture, and humanities and on recreation and sports. As with environmental groups, we drop the largest organizations in terms of assets and use GIS to identify, for each NRSA site or CWA-regulated facility, up to the twenty nearest such nonprofits within 50 miles, summing their annual expenses. This procedure yields a site-year measure of local charitable activity for unrelated causes that varies across space and over time.

We obtain data on CWA enforcement from the EPA's Enforcement and Compliance History Online (ECHO) database. These data include facility-level information on monitoring activity and enforcement actions by state and federal regulators. We focus on state-level enforcement of major facilities, aggregated to the year level.[5] Data on U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) programs for conservation activity on private land come from the USDA's Farmers.gov database. Publicly available data report the number of contracts between landowners and government agencies at the county level for the Agricultural Management Assistance, Conservation Stewardship, Envi-

[5]Major facilities are those classified as such by the regional administrator. For instance, in California they include all facilities with design flows exceeding one million gallons per day and those with industrial pre-treatment programs. Enforcement activity at minor facilities is not tracked systematically.

ronmental Quality Incentives, and Regional Conservation Partners programs. These data are available starting in 2014, so our sample for conservation outcomes covers 2014–2019. Information on interstate water quality compacts is available from the Interstate Council on Water Policy (ICWP, 2020).

County-level controls come from several sources. Population, educational attainment for adults over age 25, and racial composition are from the U.S. Census Bureau and NBER intercensal county data. Per-capita income is from the Bureau of Economic Analysis, and unemployment rates are from the Bureau of Labor Statistics. We measure political preferences using the proportion of votes for Republican candidates in U.S. Senate races, using data from CQ Press. We obtain temperature and precipitation from the PRISM Climate Group and use GIS to match NRSA locations to summer-year measurements. Summary statistics are in Table A.2.

5 Results

Our outcome, dissolved oxygen (DO), is a measure of aquatic health. A negative sign on coefficient estimates indicates a harmful impact and a positive sign implies improved water quality. We estimate model (1) - (2) using two-stage least squares.[6] Second stage results for the key variables of interest are in the top half of Table 1. Full results are in Appendix Table A.5 and OLS results in Table A.6. Consistent with prediction, our IV estimates are larger than their OLS counterparts, suggesting that the instrumental variable strategy successfully corrects for attenuation bias from endogenous group placement.

We incorporate several environmental group activity measures by interacting group variables with the proximity to stream exit indicator. Column (1) includes an interaction with a count of the number of groups located near a monitor, and columns (2) and (3) include interactions with total and mean group expenditures near a monitor, respectively. In all three models, the estimated coefficients for the interaction terms are positive and significant, whereas the coefficient for the proximity indicator is negative and significant. This indicates that there are negative water pollution spillovers, but environmental groups,

[6]For first stage results, see Tables A.3 - A.4 in the Appendix. The instruments are significant and of expected sign.

through their presence and expenditures, mitigate these spillovers. The group activity measures, without interactions, also follow intuition and previous results in that the interior groups improve water quality. Kleibergen-Paap F-statistics suggest the instrument is relevant and there are no weak instrument concerns. Standard errors are clustered by monitor (Lipscomb and Mobarak, 2016).

To understand the magnitude of the spillover effects and the extent to which environmental groups mitigate them, we interpret the changes implied by estimated coefficients relative to mean DO levels and year-to-year changes. The results of these calculations are in the bottom half of Table 1. Because of the negative spillover, DO in monitors near stream exits is between 0.25 and 0.32 mg/L (3.25 - 4.17%) worse than the sample mean of 7.62 mg/L. An additional group near a monitor mitigates about 7.8% of the spillover. An additional $100,000 in total expenditures by environmental groups near a monitor mitigates 1.84% of the spillover, whereas an additional $100,000 in mean expenditures mitigates 82.9% of the spillover. However, marginal changes are not representative of the year-to-year changes in group numbers and expenditures, particularly for mean expenditures. Hence, we assess the extent to which environmental groups mitigate these spillovers by measuring the impact of an average annual change. The number of groups increases by 0.2 (7.2%) per year, which corresponds to a mitigation effect of 2.85% of the spillover effects. Total and mean expenditures increase by roughly 28% annually on average. These changes mitigate 8% and 27.5% of the negative spillover, respectively.

To provide context for these results, we conduct a back-of-the envelope welfare analysis based on total willingness to pay (WTP) to maintain water quality levels. Results are presented in Table **??**. We use estimates of WTP for hypothetical improvements in a water quality index from a meta-analysis by Johnston and Bauer (2020) based on 51 stated preference studies. We use their meta-regression coefficients to calculate a household WTP for a marginal (1 mg/L) change in dissolved oxygen of $31.27 (in 2019 dollars). We calculate the per-household loss in welfare as the decrease in DO due to the spillover (0.25 - 0.32 mg/L) multiplied by this WTP. To obtain total welfare changes we note that in our sample 37% of measurements are within 50 miles of where rivers leave states. We multiply the 128.6 million households in the U.S. in 2019 (St. Louis Federal Reserve) by this 37% near-border proportion to get 47.6 million households. Next, we multiply this number of households by the per-household welfare loss to get total welfare losses due to the spillover of between

$ 372 and $476 million. Finally, using the proportion of the spillover mitigated by typical annual increases in number of groups, total expenditures, and mean expenditures (2.9% - 27.5%), we find that environmental groups mitigate between $11.4 and $131 million of the total welfare loss.

We test the robustness of our findings to several alternative specifications. Results remain consistent when varying the definition of stream exit proximity (10–50 stream miles), incorporating lagged measures of group activity (up to two years), and excluding the three non-authorized states (MA, NH, NM); see Tables A.14 - A.20. A placebo permutation test—randomly assigning group activity—yields null effects, reinforcing that our main results are unlikely to arise by chance; see Figure A.2. Across all checks, we continue to find strong evidence of jurisdictional spillovers and nonprofit mitigation.

5.1 Heterogeneity: Group Location

The results from our main specifications indicate that environmental groups mitigate water pollution spillovers. These groups operate locally and focus on water quality in their watershed, rather than the political jurisdiction where they are located. Our hypothesis is that this enables them to straddle state borders and mitigate spillover externalities. We explore this premise by examining whether there are heterogeneous impacts based on group location. We split groups operating near the border into two categories: those operating in the same upstream state where the water quality monitor is located and those across the border in the downstream state. Then we estimate the following extension of model 1:

$$WQ_{it} = \nu N_i + \alpha ln(G_{it}) + \lambda_1 N_i \times ln(GS_{it}) + \lambda_2 N_i \times ln(GD_{it}) + X_{it}\beta + L_i\theta + \gamma_s + \tau_t + s \times t + \varepsilon_{it} \quad (3)$$

That is, we create separate variables for number of groups, total expenditures, and mean expenditures for the same state where monitor i is located (GS_{it}) and for the downstream state (GD_{it}). Then we interact these variables with the indicator for proximity to where a stream exits the state. Instrumental variables are split in the same way: total expenditures for other nonprofit groups in the same state as the monitor and in the downstream state. Results are presented in Table 2.

This model specification asks a lot of the data, as splitting group variables reduces variation and introducing additional interaction terms may increase collinearity. As a result, group mitigation is measured less precisely. We conduct a linear combination test for the sum of coefficients on the split group variables and find that, excepting mean expenditures, they are statistically significant and roughly add up to the effect of the single variables in Table 1. For number of groups and total expenditures, the estimates indicate that groups in the downstream state have a positive impact on DO at the near-border upstream monitor. Further, this effect is somewhat larger than that of groups in the same state. This suggests that downstream state groups internalize the transboundary externality, providing evidence that they straddle state borders and operate within watershed rather than political boundaries.

6 Mechanisms

To understand how nonprofits mitigate border spillovers, we examine two mechanisms: regulatory oversight of point-source polluters and implementation of nonpoint-source conservation programs.

6.1 Mechanism: Point-Source Regulatory Actions

In order to understand one potential mechanism by which groups mitigate transboundary externalities, we assess regulatory actions by state environmental agencies near where streams leave a state. State environmental agencies inspect facilities to assess compliance with their NPDES permits and enforce the CWA with penalties in cases of noncompliance. We focus on formal enforcement actions, as this provides a measure of a facility exceeding their permitted allowance of a pollutant. We hypothesize that environmental groups pressure regulators to take more enforcement action near the border than they otherwise would. We estimate models (1) and (2), replacing the dependent variable with the number of formal enforcement actions by state agencies against a facility in a year. We also add controls for overall enforcement level in the state and lagged CWA violations by the facility. Historical CWA enforcement data are reliable starting only in 1999 (Shimshack and Ward, 2022). This limits our estimation sample for these models to the years 1999−2019.[7] Second

[7]Summary statistics for data used in this model are in Appendix table A.7.

stage results for the key variables of interest are in the top half of Table 3.[8] Full results are in Appendix Table A.9. Our results are consistent with expectations: enforcement is relatively lax near borders, but groups mitigate. Environmental groups also induce more formal enforcement within the interior of states.

We explore the magnitude of these effects in the bottom half of Table 3. The number of formal state enforcement actions is lower by 37.0%–38.6% at facilities located within 50 miles of where a stream leaves the state. Enforcement actions, uncommon to begin with, are even less common near the border. This suggests lower deterrence effects of enforcement in these areas. However, environmental groups mitigate these effects. Evaluating marginal effects, an additional group reduces the negative effect on enforcement by 6.30%, and an additional $100,000 in total and mean expenditures by groups reduce the negative effect by 1.04% and 14.11%, respectively. Alternatively, a typical 5.7% increase in number of groups per year reduces the negative effect on enforcement by 2.17%. The average 22% increase in total expenditures reduces the enforcement effect by 5.8%. Finally, the average annual increase of 48% in mean expenditures reduces the enforcement spillover by 23.6%.

6.2 Mechanism: Nonpoint-Source Programs

A second mechanism by which environmental groups may mitigate transboundary water quality externalities is through their impact on efforts to address nonpoint source pollution. We use programs managed by the NRCS to assess whether there are negative externalities in their implementation and whether environmental groups mitigate resulting water quality spillovers. We focus on voluntary programs providing financial assistance for agricultural producers to implement conservation practices that address natural resource concerns, including water quality. NRCS allocates program funds to state agencies, which in turn allocate payments within their state by entering into contracts with individual landowners (Liu et al., 2023). Program administration is costly, and states may de-emphasize implementation near borders when benefits mostly accrue to neighboring states. Environmental groups could mitigate this effect by providing information to landowners and facilitating communication and negotiations with state agencies.

[8] First stage results are in tables **??** and A.8.

Program data are available only at the county level, so we examine differences in the number of contracts in counties located at borders where streams leave the state relative to other counties in the state.[9] We create a dummy variable that identifies these border counties, aggregate environmental group variables to the county level, and estimate a county-level equivalent of models (1) and (2) that also includes county demographic controls, year fixed effects, and state fixed effects.[10] Because these programs target agricultural producers, we restrict the sample to rural counties. Because many counties have zero contracts and the dependent variable is a count, we use a Poisson model. We instrument for group numbers or expenditures using the control function approach.[11] Second-stage results for key variables, shown in the top half of Table 4, are consistent with the hypothesized mechanism.[12] Full results are in Table A.13. There are fewer contracts in border counties, but environmental groups mitigate this impact.[13]

The bottom half of Table 4 shows the magnitude of these effects. There are 8.16%–9.52% fewer contracts in border counties where a stream leaves the state, suggesting less emphasis on program implementation. Environmental groups mitigate these impacts. An additional group in a county reduces this negative effect by 60%, an additional \$100,000 in total expenditures mitigates 10% of the effect, and an additional \$100,000 in mean expenditures reduces the impact by almost 89%. Because one more group and an additional \$100,000 in expenditures represent large changes, we also examine typical increases in these variables. The average annual increase of 3.4% in number of groups mitigates 3.42% of the reduction in contracts. Average increases of 27% and 26% in total and mean expenditures mitigate 21.7% and 37.5% of the negative externality, respectively.

[9]Data on payments are by obligation year rather than payment year, so they do not provide an accurate measure of program implementation. If we use payments as the dependent variable, we obtain estimates with the same signs as when using contracts, but they are not statistically significant.

[10]Summary statistics for data used in this model are in Appendix table A.10.

[11]The residuals from first-stage reduced-form models for the endogenous variables are included as regressors in the main Poisson specification.

[12]First-stage results are in Tables A.11 and A.12.

[13]Results are robust to focusing on the intensive margin by using only states or only counties with contracts.

7 Discussion and Conclusions

Governance structures often decentralize responsibility in ways that fragment the geographic scope of externalities. One manifestation is the tendency for regulatory effort to decline near jurisdictional boundaries where environmental problems and social impacts spill across political boundaries. This paper addresses the impacts of lacking coordination between U.S. states in implementing environmental regulations and environmental quality programs. Decentralized CWA implementation means that enforcement stringency and program implementation vary across and within states. Given this spatial discretion, regulators and government agencies can allow water pollution to spill over into neighboring states. Anecdotally, environmental nonprofit groups can intervene through direct water quality improvements, by pressuring regulators or polluters, and by facilitating cooperation between landowners and government agencies. We estimate models at the level of monitoring sites, CWA regulated facilities, and counties. Our empirical approach compares water quality, enforcement activity, and program implementation near state boundaries and interior regions, accounting for the presence and activity of nearby environmental groups.

Our findings add evidence to previous literature of spillovers in water quality. Significant negative spillover impacts continue to exist, at magnitudes of 5 to 12 percent. We present the first evidence that environmental groups play a role in mitigating these transboundary spillovers. Typical annual changes in number of groups and expenditures reduce the spillover by about 3 percent and 9 - 12 percent, respectively, thereby mitigating between \$11.4 and \$131 million of the resulting welfare loss. These results imply that environmental groups can straddle state jurisdictions and mitigate transboundary externalities. We also find evidence of potential mechanisms for these spillover effects and their mitigation. State formal enforcement actions are roughly 30 percent lower near where streams leave a state. However, average annual growth in number and expenditure of environmental groups reduce this negative effect on enforcement by 2 - 24 percent. There are about 9 percent fewer conservation program contracts in border counties where streams leave a state. Environmental groups mitigate this effect by 3 - 37 percent.

The continued presence of transboundary spillover suggests the need for policy or initiatives to address the underlying externalities. This might include some of the solutions implemented elsewhere. In a liability payment system such as that implemented in China, upstream and downstream states would exchange payments depending on upstream pollution mitigation efforts and the resulting levels of water quality. Alternatively, more interstate water quality compacts could be encouraged, and in-state water basin boards could be extended across state lines to improve coordination of water quality improvement efforts. Both of these solutions might require incentives or mandates from federal regulators like the EPA, and the political feasibility of implementing such steps is not clear. Our findings on the effect of environmental nonprofits indicate an alternative, which might include supporting groups near borders with additional direct funds, such as grants from state or federal agencies, or indirectly by incentivizing donations to these groups.

References

Adler, J. H. (2005). Jurisdictional mismatch in environmental federalism. *New York University Environmental Law Journal*, 14:130.

Brasington, D. M. (2003). Snobbery, racism, or mutual distaste: What promotes and hinders cooperation in local public-good provision? *Review of Economics and Statistics*, 85(4):874–883.

Chen, S., Graff Zivin, J. S., Wang, H., and Xiong, J. (2022). Combating cross-border externalities. Working Paper 30233, National Bureau of Economic Research.

Ciancio, A. and García-Jimeno, C. (2024). The political economy of immigration enforcement: Conflict and cooperation under federalism. *Review of Economics and Statistics*, 106(6):1460–1476.

Craig, R. K. (2019). The Clean Water Act and the challenge of interjurisdictional waters. *Lewis & Clark Law Review*, 23(1):1–42.

Earnhart, D. (2004). The effects of community characteristics on polluter compliance levels. *Land Economics*, 80(3):408–432.

Evans, M. F., Gilpatric, S. M., and Shimshack, J. P. (2018). Enforcement spillovers: Lessons from strategic interactions in regulation and product markets. *The Journal of Law and Economics*, 61(4):739–769.

Fang, D., Chen, B., Hubacek, K., Ni, R., Chen, L., Feng, K., and Lin, J. (2019). Clean air for some: Unintended spillover effects of regional air pollution policies. *Science advances*, 5(4):eaav4707.

Fu, S., Viard, V. B., and Zhang, P. (2022). Trans-boundary air pollution spillovers: Physical transport and economic costs by distance. *Journal of Development Economics*, 155:102808.

Grant, L. and Langpap, C. (2019). Private provision of public goods by environmental groups. *Proceedings of the National Academy of Sciences*, 116(12):5334–5340.

Grant, L. and Langpap, C. (2024). The roles of environmental groups in economics. *Review of Environmental Economics and Policy*, 18(2):000–000.

Grant, L. E. and Grooms, K. K. (2017). Do nonprofits encourage environmental compliance? *Journal of the Association of Environmental and Resource Economists*, 4(S1):S261–S288.

Gray, W. B. and Shimshack, J. P. (2011). The effectiveness of environmental monitoring and enforcement: A review of the empirical evidence. *Review of Environmental Economics and Policy*.

Gunn, A. (2022). Cross-state water quality management in a federalist setting. Working Paper. University of Pennsylvania.

Helland, E. (1998a). The enforcement of pollution control laws: Inspections, violations, and self-reporting. *Review of Economics and Statistics*, 80(1):141–153.

Helland, E. (1998b). Environmental protection in the federalist system: The political economy of npdes inspections. *Economic Inquiry*, 36(2):305–319.

Helland, E. and Whitford, A. B. (2003). Pollution incidence and political jurisdiction: Evidence from the TRI. *Journal of Environmental Economics and Management*, 46(3):403–424.

ICWP (2020). Interstate water solutions: Lessons from the past and recommendations for the future. a look toward 2050. Technical report, Interstate Council on Water Policy. Accessed: 2024-09-29.

Johnson, S. D., GUERETTE, R. T., and Bowers, K. J. (2012). Crime displacement and diffusion of benefits. *The Oxford handbook of crime prevention*, page 337.

Johnston, R. J. and Bauer, D. M. (2020). Using meta-analysis for large-scale ecosystem service valuation: progress, prospects, and challenges. *Agricultural and Resource Economics Review*, 49(1):23–63.

Jung, J., Choi, A., and Yoon, S. (2022). Transboundary air pollution and health: Evidence from east asia. *Environment and Development Economics*, 27(2):120–144.

Kahn, M. E., Li, P., and Zhao, D. (2015). Water pollution progress at borders: The role of changes in China's political promotion incentives. *American Economic Journal: Economic Policy*, 7(4):223–242.

Kim, M. (2015). Socioeconomic diversity, political engagement, and the density of nonprofit organizations in us counties. *The American Review of Public Administration*, 45(4):402–416.

Lipscomb, M. and Mobarak, A. M. (2016). Decentralization and pollution spillovers: Evidence from the re-drawing of county borders in brazil. *The Review of Economic Studies*, 84(1):464–502.

Liu, P., Wang, Y., and Zhang, W. (2023). The influence of the environmental quality incentives program on local water quality. *American Journal of Agricultural Economics*, 105(1):27–51.

Meng, W. (2022). Beggar-thy-neighbor or free-riding? Transboundary behaviors in decentralized water pollution policies. Working Paper.

Oates, W. E. (1972). *Fiscal Federalism*. Edward Elgar Publishing.

Ogawa, H. and Wildasin, D. E. (2009). Think locally, act locally: Spillovers, spillbacks, and efficient decentralized policymaking. *American Economic Review*, 99(4):1206–1217.

Rose-Ackerman, S. (1982). Charitable giving and “excessive” fundraising. *The Quarterly Journal of Economics*, 97(2):193–212.

Sexton, S. E., Lei, Z., Zilberman, D., et al. (2007). The economics of pesticides and pest control. *International Review of Environmental and Resource Economics*, 1(3):271–326.

Shimshack, J. P. and Ward, M. B. (2022). Costly sanctions and the treatment of frequent violators in regulatory settings. *Journal of Environmental Economics and Management*, 116:102745.

Shortle, J. and Horan, R. D. (2017). Nutrient pollution: A wicked challenge for economic instruments. *Water Economics and Policy*, 3(02):1650033.

Sigman, H. (2002). International spillovers and water quality in rivers: Do countries free ride? *American Economic Review*, 92(4):1152–1159.

Sigman, H. (2005). Transboundary spillovers and decentralization of environmental policies. *Journal of Environmental Economics and Management*, 50(1):82–101.

Smith, V. K. and Wolloh, C. V. (2012). Has surface water quality improved since the Clean Water Act? Technical report, National Bureau of Economic Research.

Wang, X., Xu, M., and Chen, K. (2025). Internalizing externalities through ecological compensation: Evidence from transboundary water pollution in China. *Journal of Environmental Economics and Management*, Forthcoming.

Table 1. Effect on Water Quality

Estimated Coefficients	Number of Groups	Total Expenditures	Mean Expenditures
Near a Stream Exit, within 50 miles	-0.269***	-0.247***	-0.317***
	(0.0744)	(0.0678)	(0.103)
Near a Stream Exit * ln(Number of Groups)	0.106***		
	(0.0401)		
Near a Stream Exit * Ln(Total Expenditures)		0.0718**	
		(0.0281)	
Near a Stream Exit * ln(Mean Expenditures)			0.316**
			(0.139)
ln(Number of Groups)	0.0886**		
	(0.0363)		
ln(Total Expenditures)		0.0667**	
		(0.0272)	
ln (Mean Expenditures)			0.463**
			(0.190)
Kleibergen-Paap F-stat	235.7	187	20.31
Magnitude of Spillover and Mitigation Impacts			
Spillover – Decreased DO Relative to Mean (7.62 mg/L)	3.53%	3.25%	4.17%
Group Mitigation – Marginal	7.80%	1.84%	82.93%
Group Mitigation – Annual Change	2.85%	8.02%	27.52%

Note: 135,781 observations. We include state and year fixed effects and state trends. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table 2. Heterogeneity: Group Location - Second Stage

	(1)	(2)	(3)
Near a Stream Exit, within 50 miles	-0.206***	-0.188***	-0.208**
	(0.0725)	(0.0657)	(0.0870)
Near a Stream Exit * Ln(Number of Groups), Same State	0.0555		
	(0.0429)		
Near a Stream Exit * Ln(Number of Groups), Downst. State	0.0890**		
	(0.0404)		
Near a Stream Exit * Ln(Total Expenditures), Same State		0.0361	
		(0.0305)	
Near a Stream Exit * Ln(Total Expenditures), Downst. State		0.0567*	
		(0.0293)	
Near a Stream Exit * Ln(Mean Expenditures), Same State			0.0669
			(0.0732)
Near a Stream Exit * Ln(Mean Expenditures), Downst. State			0.0531
			(0.0490)
ln(Number of Groups)	0.128***		
	(0.0401)		
ln(Total Expenditures)		0.0965***	
		(0.0302)	
ln (Mean Expenditures)			0.730***
			(0.265)
Site in Urban Area	-0.0320	-0.0281	-0.00759
	(0.0258)	(0.0261)	(0.0295)
Educational Attainment	-0.0499	-0.103	-0.323
	(0.190)	(0.199)	(0.276)
Percent Republican Vote	0.00915	0.00198	-0.0136
	(0.0465)	(0.0464)	(0.0513)
Percent White Population	1.228***	1.285***	1.479***
	(0.0880)	(0.0866)	(0.115)
Per Capita Income	-5.38e-06***	-6.02e-06***	-8.35e-06***
	(9.70e-07)	(1.03e-06)	(1.75e-06)
Population Density	2.37e-05**	1.99e-05*	2.02e-05
	(1.13e-05)	(1.19e-05)	(1.54e-05)
Unemployment Rate	0.417	0.541	1.028*
	(0.429)	(0.440)	(0.562)
ln(Government Payments)	0.00633**	0.00600*	0.00751**
	(0.00309)	(0.00310)	(0.00324)
Formal Enforcement Actions	-0.00153***	-0.00147***	-0.00129***
	(0.000298)	(0.000294)	(0.000308)
Interstate Water Quality Compact	0.110***	0.106***	0.118***
	(0.0326)	(0.0323)	(0.0337)
Same State + Downstream State Effects	0.1445**	0.0928*	0.1200
	(0.073)	(0.051)	(0.101)
Kleibergen-Paap F-stat	175.4	127.7	9.520

Note: 133,681 observations. We include state and year fixed effects and state trends. Monitor location, precipitation, and temperature variables not shown. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Effect on Point Source State Enforcement

Estimated Coefficients	Number of Groups	Total Expenditures	Mean Expenditures
Near a Stream Exit, within 50 miles	-0.0309***	-0.0306***	-0.0320***
	(0.0104)	(0.0102)	(0.0103)
Near a Stream Exit * Ln(Number of Groups)	0.0117***		
	(0.00449)		
Near a Stream Exit * Ln(Total Expenditures)		0.00798**	
		(0.00323)	
Near a Stream Exit * Ln(Mean Expenditures)			0.0156**
			(0.00647)
ln(Number of Groups)	0.0116***		
	(0.00377)		
ln(Total Expenditures)		0.00835***	
		(0.00274)	
ln (Mean Expenditures)			0.0163***
			(0.00545)
Kleibergen-Paap F-stat	6367	4147	3526
Magnitude of Spillover and Mitigation Impacts			
Spillover – Decreased Enforcement Relative to Mean (0.08 facilities/year)	37.25%	36.97%	38.60%
Group Mitigation – Marginal	6.30%	1.04%	14.11%
Group Mitigation – Annual Change	2.17%	5.80%	23.64%

Note: 119,456 observations. We include state and year fixed effects and state trends. Robust standard errors in parentheses, clustered at facility. *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Effect on Nonpoint Source Pollution Programs

Estimated Coefficients	Number of Groups	Total Expenditures	Mean Expenditures
Stream Exit, County Level	-0.824*	-0.950**	-1.065**
	(0.454)	(0.463)	(0.494)
Border County * ln(Number of Groups)	0.571*		
	(0.297)		
ln(Number of Groups)	0.450		
	(0.471)		
Border County * ln(Total Expenditures)		0.493**	
		(0.231)	
ln(Total Expenditures)		0.341	
		(0.335)	
Border County * ln(Mean Expenditures)			0.959**
			(0.422)
ln(Mean Expenditures)			0.588
			(0.623)
First Stage F-stat – Interaction Term	181.06	123.78	85.48
First Stage F-stat – Group Number or Spending	159.18	91.33	53.97
Magnitude of Spillover and Mitigation Impacts			
Spillover – Decreased Contracts Relative to Mean (6.88)[a]	8.16%	8.91%	9.52%
Group Mitigation – Marginal	59.98%	10.04%	88.61%
Group Mitigation – Annual Change	3.42%	21.71%	37.50%

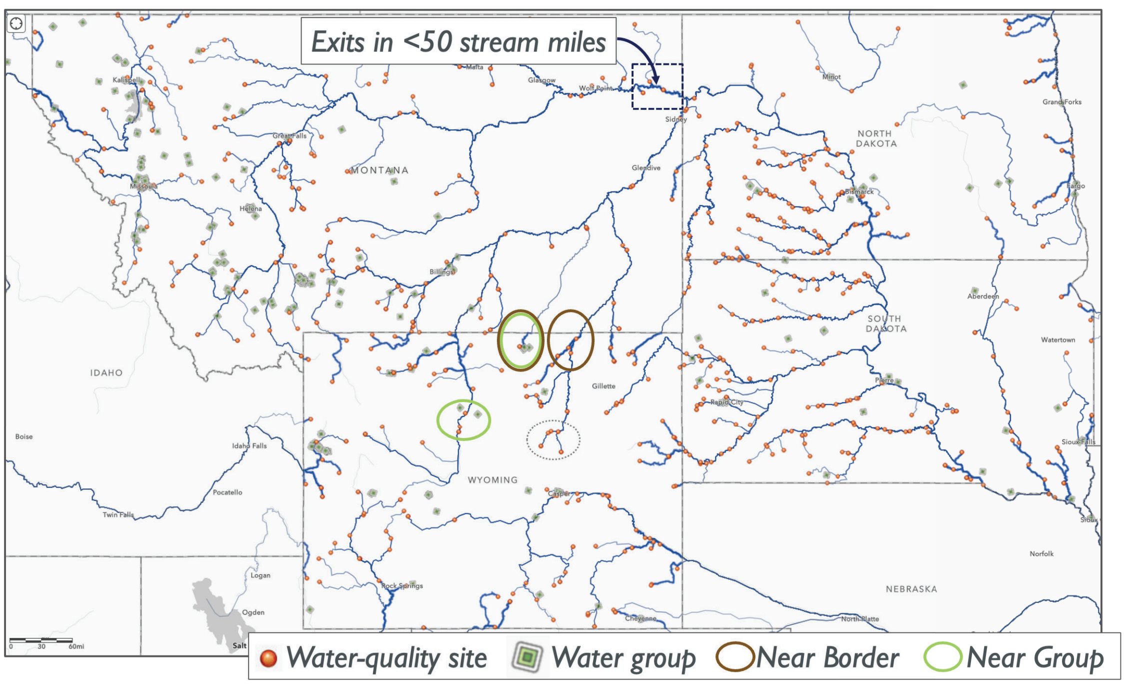
Note: 9,172 observations. [a]Mean contracts is the average count conditional on having at least on contract in the county during the sample period. Covariates at county-year level. Robust standard errors in parentheses, clustered at county. *** p<0.01, ** p<0.05, * p<0.1.

Online Appendix

A.1 More on the Empirical Strategy

Figure A.1 illustrates the setup using a four-state region. Stream segments are in blue, and darker segments indicate location within 50 miles of a state border. Monitoring sites (dots) are categorized by proximity to the border and by whether an environmental group is active nearby (quadrilaterals). The comparison contrasts water quality between near-border monitors (brown ovals) and interior, and how that gap differs in areas with nonprofit activity (green ovals) and without.

Figure A.1. Visualizing the Empirical Strategy



Note: Focus on a four state region; rivers in neighboring states omitted. Darker stream segments indicate that the water quality measure is within 50 miles of the exiting the state.

A.2 Supplementary Results

Table A.1. Exclusion Restriction

	Mean DO - Summer	Formal Enforcement Actions
Near Stream Exit (50 mi)	-0.157	-0.151
	(0.122)	(0.246)
ln(Tot. Exp. Others) * Near Stream Exit	-0.00161	0.0114
	(0.00900)	(0.0178)
ln(Tot. Exp. Other Nonprofits)	0.00686	-0.00805
	(0.00476)	(0.0115)
Observations	20,195	178,591

Note: Both specifications include all controls, state and year fixed effects, and state-specific trends. Standard errors clustered at monitor in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.2. Summary Statistics

	Near Stream Exit			Interior		
	Obs	Mean	SD	Obs	Mean	SD
Mean DO - Summer	50,503	7.52	1.39	85,278	7.68	1.43
Number of Environmental Groups	50,503	4.84	3.70	85,278	4.01	3.61
Total Exp. Env. Groups ($100,000)	50,503	14.74	18.78	85,278	12.63	19.62
Mean Exp. Env. Groups ($100,000)	50,503	1.02	1.52	85,278	1.02	1.79
Total Exp. Other Groups ($100,000)	50,503	26.62	23.51	85,278	24.89	24.00
Site in Urban Area	50,503	0.21	0.41	85,278	0.11	0.31
Educational Attainment	50,503	0.16	0.07	85,278	0.15	0.07
Percent Republican Vote	50,503	0.50	0.16	85,278	0.54	0.17
Percent White Population	50,503	0.87	0.15	85,278	0.88	0.15
Per Capita Income ($)	50,503	32,507	13,414	85,278	30,906	12,212
Population Density	50,503	298.58	876.06	85,278	123.24	292.83
Unemployment Rate	50,503	0.06	0.03	85,278	0.06	0.03
Government Payments ($)	50,503	41,647,041	53,106,294	85,278	49,784,709	49,219,522
Formal Enforcement Actions	50,503	14.77	22.59	85,278	17.59	25.68
Interstate Water Quality Compact	50,503	0.58	0.49	85,278	0.48	0.50
Stream Inside State Borders	50,503	0.00	0.06	85,278	0.02	0.13
Less Than 1 Mile to International Border	50,503	0.00	0.01	85,278	0.00	0.00
Less Than 1 Mile to Coast	50,503	0.00	0.07	85,278	0.00	0.00
Mean Summer Temperature (°F)	50,503	22.39	3.47	85,278	21.96	4.04
Total Summer Precipitation (mm)	50,503	308.03	148.02	85,278	261.62	150.22

Note: Total obs.: 135,781. 37% of observations are near stream exit.

Table A.3. First Stage: Environmental Group Variables

	ln(Number of Groups)	ln(Total Expenditures)	ln (Mean Expenditures)
ln(Tot. Exp. Others) * Near Stream Exit	-0.0243***	-0.0234**	-0.0109*
	(0.00755)	(0.0117)	(0.00563)
ln(Tot. Exp. Other Nonprofits)	0.0988***	0.131***	0.0231***
	(0.00367)	(0.00620)	(0.00323)
Near Stream Exit (50 mi)	0.356***	0.390**	0.198**
	(0.109)	(0.166)	(0.0797)
Site in Urban Area	0.137***	0.167***	-0.00260
	(0.0209)	(0.0388)	(0.0179)
ln(Government Payments)	0.00548**	0.0100***	-0.000655
	(0.00229)	(0.00384)	(0.00155)
Formal Enforcement Actions	0.000947***	0.000784***	-0.000113
	(0.000146)	(0.000262)	(0.000109)
Interstate Water Quality Compact	0.00135	-0.000615	-0.0195
	(0.0209)	(0.0319)	(0.0126)
Stream Inside State Borders	0.222**	0.311**	0.00882
	(0.0875)	(0.156)	(0.0607)
Less Than 1 Mile to International Border	-1.593***	-2.491***	-0.778***
	(0.0999)	(0.144)	(0.0625)
Less Than 1 Mile to Coast	0.169	0.871***	0.178**
	(0.114)	(0.307)	(0.0826)
Mean Summer Temperature	-0.00694	-0.0110	-0.0102***
	(0.00436)	(0.00789)	(0.00390)
Total Summer Precipitation	-7.98e-05	-0.000489**	-0.000414***
	(0.000113)	(0.000201)	(9.50e-05)
Total Summer Precipitation^2	3.40e-07***	9.54e-07***	5.79e-07***
	(1.27e-07)	(2.34e-07)	(1.11e-07)

Note: 135,781 observations. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects and state trends. Robust standard errors in parentheses, clustered at water-quality monitor. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A.4. First Stage: Environmental Group Variable × Stream Exit Indicator Interactions

	Near Stream Exit (50 mi) * Ln(Number of Groups)	Near Stream Exit (50 mi) * Ln(Total Expenditures)	Near Stream Exit (50 mi) * Ln(Mean Expenditures)
ln(Tot. Exp. Others) * Near Stream Exit	0.190***	0.273***	0.0730***
	(0.00871)	(0.0134)	(0.00639)
ln(Tot. Exp. Other Nonprofits)	-0.0286***	-0.0420***	-0.0157***
	(0.00166)	(0.00255)	(0.00107)
Near Stream Exit (50 mi)	-0.900***	-1.558***	-0.339***
	(0.124)	(0.190)	(0.0916)
Site in Urban Area	0.0645***	0.0713***	-0.00452
	(0.0158)	(0.0273)	(0.0120)
ln(Government Payments)	0.00460	0.0101**	0.00240*
	(0.00297)	(0.00454)	(0.00143)
Formal Enforcement Actions	0.000606***	0.000770***	0.000245***
	(0.000101)	(0.000187)	(7.10e-05)
Interstate Water Quality Compact	-0.0845***	-0.0611***	-0.0271***
	(0.0156)	(0.0228)	(0.00868)
Stream Inside State Borders	0.0264	0.0210	0.00860
	(0.0428)	(0.0691)	(0.0291)
Less Than 1 Mile to International Border	-1.397***	-2.232***	-0.672***
	(0.0813)	(0.124)	(0.0528)
Less Than 1 Mile to Coast	0.0369	0.745***	0.131**
	(0.0750)	(0.254)	(0.0625)
Mean Summer Temperature	-0.0127***	-0.0115***	-0.00122
	(0.00254)	(0.00430)	(0.00206)
Total Summer Precipitation	-0.000242***	-0.000198	-6.04e-05
	(7.92e-05)	(0.000130)	(5.49e-05)
Total Summer Precipitation^2	2.82e-07***	3.31e-07**	1.07e-07
	(9.00e-08)	(1.57e-07)	(6.96e-08)

Note: 135,781 observations. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects and state trends. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table A.5. Effect on Water Quality: Second Stage

	(1)	(2)	(3)
Near Stream Exit (50 mi)	-0.269***	-0.247***	-0.317***
	(0.0744)	(0.0678)	(0.103)
Near Stream Exit (50 mi) * ln(Number of Groups)	0.106***		
	(0.0401)		
Near Stream Exit * Ln(Total Expenditures)		0.0718**	
		(0.0281)	
Near Stream Exit (50 mi) * ln(Mean Expenditures)			0.316**
			(0.139)
ln(Number of Groups)	0.0886**		
	(0.0363)		
ln(Total Expenditures)		0.0667**	
		(0.0272)	
ln (Mean Expenditures)			0.463**
			(0.190)
Site in Urban Area	-0.0318	-0.0290	-0.0101
	(0.0259)	(0.0261)	(0.0280)
ln(Government Payments)	0.00556*	0.00515*	0.00608*
	(0.00307)	(0.00309)	(0.00312)
Formal Enforcement Actions	-0.00147***	-0.00143***	-0.00135***
	(0.000297)	(0.000294)	(0.000302)
Interstate Water Quality Compact	0.106***	0.102***	0.115***
	(0.0321)	(0.0319)	(0.0331)
Stream Inside State Borders	-0.306**	-0.306**	-0.291**
	(0.125)	(0.121)	(0.119)
Less Than 1 Mile to International Border	0.363***	0.399***	0.645***
	(0.120)	(0.129)	(0.237)
Less Than 1 Mile to Coast	-0.487**	-0.580**	-0.591**
	(0.237)	(0.259)	(0.274)
Mean Summer Temperature	-0.0764***	-0.0768***	-0.0733***
	(0.00390)	(0.00387)	(0.00445)
Total Summer Precipitation	-0.000431***	-0.000417***	-0.000253
	(0.000128)	(0.000128)	(0.000155)
Total Summer Precipitation^2	-2.66e-07*	-2.93e-07*	-5.08e-07***
	(1.50e-07)	(1.50e-07)	(1.93e-07)
Kleibergen-Paap F stat.	235.7	187	20.31

Note: 135,781 observations. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects and state trends. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table A.6. Effect on Water Quality: OLS Estimates

	(1)	(2)	(3)
Near Stream Exit (50 mi)	-0.173***	-0.141***	-0.0907***
	(0.0332)	(0.0296)	(0.0243)
Near Stream Exit (50 mi) * ln(Number of Groups)	0.0536***		
	(0.0154)		
Near Stream Exit * Ln(Total Expenditures)		0.0273***	
		(0.00991)	
Near Stream Exit (50 mi) * ln(Mean Expenditures)			0.0165
			(0.0216)
ln(Number of Groups)	0.00671		
	(0.0104)		
ln(Total Expenditures)		0.0120*	
		(0.00649)	
ln (Mean Expenditures)			0.0271**
			(0.0128)
Site in Urban Area	-0.0140	-0.0134	-0.00834
	(0.0246)	(0.0246)	(0.0245)
ln(Government Payments)	0.00646**	0.00638**	0.00687**
	(0.00300)	(0.00300)	(0.00299)
Formal Enforcement Actions	-0.00136***	-0.00135***	-0.00132***
	(0.000291)	(0.000290)	(0.000291)
Interstate Water Quality Compact	0.102***	0.0992***	0.0984***
	(0.0319)	(0.0318)	(0.0318)
Stream Inside State Borders	-0.279**	-0.283**	-0.279**
	(0.125)	(0.124)	(0.125)
Less Than 1 Mile to International Border	0.130*	0.132*	0.0614
	(0.0709)	(0.0696)	(0.0650)
Less Than 1 Mile to Coast	-0.470**	-0.497**	-0.472**
	(0.226)	(0.232)	(0.224)
Mean Summer Temperature	-0.0772***	-0.0776***	-0.0778***
	(0.00385)	(0.00383)	(0.00384)
Total Summer Precipitation	-0.000457***	-0.000461***	-0.000463***
	(0.000127)	(0.000127)	(0.000127)
Total Summer Precipitation^2	-2.13e-07	-2.14e-07	-2.06e-07
	(1.48e-07)	(1.48e-07)	(1.48e-07)
R-squared	0.426	0.427	0.426

Note: 135,781 observations. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects and state trends. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table A.7. Summary Statistics - Point Source Enforcement

	Near Stream Exit		Interior	
	Mean	SD	Mean	SD
Total Enforcement - State	0.08	0.35	0.09	0.39
Number of Groups	6.20	3.81	5.92	3.92
Total Exp. Env. Groups ($100,000)	27.85	33.47	23.21	30.69
Mean Exp. Env. Groups ($100,000)	3.82	4.52	3.21	4.11
Total Exp. Other Groups ($100,000)	49.57	128.57	49.95	155.73
Enforcement of Other Facilities in State	18.98	22.39	20.43	22.53
Violations$_{t-1}$	3.07	7.96	2.99	7.94
Educational Attainment	0.18	0.06	0.16	0.07
Percent Republican Vote	0.49	0.17	0.55	0.16
Percent White Population	0.81	0.14	0.83	0.15
Per Capita Income ($)	41,126	13,807	36,142	10,527
Population Density	810.79	2,266.15	330.54	525.28
Unemployment Rate	0.06	0.02	0.06	0.02
Poverty Rate	0.14	0.05	0.15	0.06
Gross State Product ($)	616,222	555,780	479,755	454,561
Total State Expenditures on Natural Resources ($)	2,222,203	1,773,646	1,710,067	1,312,854
Annual Precipitation (mm)	98.08	33.95	91.72	33.14

Note: Total obs.: 119,456. Near stream exit obs.: 50,056. Interior obs: 69,400.

Table A.8. Point Source Enforcement First Stage: Env. Group Variable × Stream Exit

	Near Stream Exit × Ln(Number of Groups)	Near Stream Exit × Ln(Total Expenditures)	Near Stream Exit × Ln(Mean Expenditures)
ln(Tot. Exp. Others) ×	0.163***	0.232***	0.117***
Near Stream Exit (50 mi)	(0.00131)	(0.00238)	(0.00150)
ln(Tot. Exp. Other Nonprofits)	-0.00269***	-0.00266**	-7.02e-05
	(0.000623)	(0.00118)	(0.000706)
Near Stream Exit (50 mi)	-0.128***	-0.230***	-0.0743***
	(0.0193)	(0.0337)	(0.0202)
Enforcement of Other Facilities in State	-7.02e-05	-5.80e-06	2.98e-05
	(6.78e-05)	(0.000133)	(9.68e-05)
Violations$_{(t-1)}$	-0.000608	-0.00109	-0.000540
	(0.000789)	(0.00116)	(0.000647)
Gross State Product	-2.69e-07***	-5.31e-07***	-2.62e-07***
	(4.71e-08)	(8.37e-08)	(5.71e-08)
Total State Expenditures on Natural Resources	-3.22e-09*	1.14e-08***	1.31e-08***
	(1.68e-09)	(3.10e-09)	(2.37e-09)
Annual Precipitation	5.95e-05	0.00113***	0.000939***
	(0.000174)	(0.000306)	(0.000190)

Note: 119,456 observations. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects and state trends. Robust standard errors in parentheses, clustered at facility. *** p<0.01, ** p<0.05, * p<0.1.

Table A.9. Effects on Point Source State Enforcement: Second Stage

	(1)	(2)	(3)
Near Stream Exit (50 mi)	-0.0309***	-0.0306***	-0.0320***
	(0.0104)	(0.0102)	(0.0103)
Near Stream Exit (50 mi)	0.0117***		
* Ln(Number of Groups)	(0.00449)		
Near Stream Exit		0.00798**	
* Ln(Total Expenditures)		(0.00323)	
Near Stream Exit (50 mi)			0.0156**
* Ln(Mean Expenditures)			(0.00647)
ln(Number of Groups)	0.0116***		
	(0.00377)		
ln(Total Expenditures)		0.00835***	
		(0.00274)	
ln (Mean Expenditures)			0.0163***
			(0.00545)
Enforcement of Other	0.00293***	0.00293***	0.00293***
Facilities in State	(0.000303)	(0.000303)	(0.000303)
Violations$_{t-1}$	0.00570***	0.00571***	0.00570***
	(0.000452)	(0.000451)	(0.000449)
Gross State Product	3.80e-08	4.26e-08	4.46e-08
	(3.86e-08)	(3.86e-08)	(3.87e-08)
Total State Expenditures on Natural Resources	-1.66e-09	-1.95e-09	-2.26e-09
	(2.30e-09)	(2.29e-09)	(2.29e-09)
Annual Precipitation	0.000133**	0.000113*	0.000102*
	(6.15e-05)	(6.18e-05)	(6.19e-05)
Kleibergen-Paap F stat.	6367	4147	3526

Note: 119,456 observations. Covariates at county-year level. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects and state trends. Robust standard errors in parentheses, clustered at facility. *** p<0.01, ** p<0.05, * p<0.1.

Table A.10. Summary Statistics - Nonpoint Source Program Implementation

	Border Counties - Near Stream Exit		Interior Counties	
	Mean	SD	Mean	SD
Number of Contracts	0.07	0.72	0.10	0.98
Number of Groups	2.29	5.01	1.59	4.16
Total Exp. Env. Groups ($100,000)	10.02	31.87	7.65	32.34
Mean Exp. Env. Groups ($100,000)	2.16	15.10	1.56	4.90
Total Exp. Other Groups ($100,000)	49.25	150.75	44.19	213.05
Educational Attainment	0.14	0.05	0.13	0.05
Percent Republican Vote	0.59	0.18	0.63	0.17
Percent White Population	0.86	0.16	0.86	0.15
Per Capita Income ($)	42,938.39	15,000.59	40,683.35	9,972.24
Population Density	108.78	223.40	91.49	213.48
Unemployment Rate	0.05	0.02	0.05	0.02
Poverty Rate	0.16	0.07	0.16	0.06
CWA Violations	448.17	411.44	523.25	480.05

Note: Total obs.: 9,172. Obs. in border counties near stream exit: 1,376. Obs. in interior counties: 7,796.

Table A.11. Nonpoint Source Program Implementation First Stage: Environmental Group Variables

	ln(Number of Groups)	ln(Total Expenditures)	ln (Mean Expenditures)
Stream Exit County	-0.0455	0.00318	0.0254
	(0.0494)	(0.0814)	(0.0600)
ln(Tot. Exp. Others) ×	0.0127	0.0121	0.00235
Stream Exit County	(0.0207)	(0.0359)	(0.0231)
ln(Tot. Exp. Others)	0.202***	0.280***	0.154***
	(0.0118)	(0.0214)	(0.0154)
CWA Violations	-4.34e-05	-7.94e-05	-2.46e-05
	(5.89e-05)	(0.000122)	(7.53e-05)

Note: 9,172 observations. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects. Robust standard errors in parentheses, clustered at county. *** p<0.01, ** p<0.05, * p<0.1.

Table A.12. Nonpoint Source Program Implementation First Stage: Env. Group Variable × Stream Exit County

	Stream Exit County × Ln(Number of Groups)	Stream Exit County × Ln(Total Expenditures)	Stream Exit County × Ln(Mean Expenditures)
Stream Exit County	-0.177***	-0.280***	-0.0111
	(0.0473)	(0.0751)	(0.0552)
ln(Tot. Exp. Others) ×	0.379***	0.525***	0.264***
Stream Exit County	(0.0213)	(0.0353)	(0.0217)
ln(Tot. Exp. Others)	-0.0234***	-0.0309***	-0.0132***
	(0.00396)	(0.00687)	(0.00435)
CWA Violations	-0.000105	-0.000180	-7.98e-05
	(6.88e-05)	(0.000123)	(7.70e-05)

Note: 9,172 observations. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects. Robust standard errors in parentheses, clustered at county. *** p<0.01, ** p<0.05, * p<0.1.

Table A.13. Effects on Nonpoint Source Pollution Programs: Second Stage

	(1)	(2)	(3)
Stream Exit County	-0.824*	-0.950**	-1.065**
	(0.454)	(0.463)	(0.494)
Border County * ln(Number of Groups)	0.571*		
	(0.297)		
ln(Number of Groups)	0.450		
	(0.471)		
Border County * ln(Total Expenditures)		0.493**	
		(0.231)	
ln(Total Expenditures)		0.341	
		(0.335)	
Border County * ln(Mean Expenditures)			0.959**
			(0.422)
ln(Mean Expenditures)			0.588
			(0.623)
CWA Violations	-0.000368	-0.000329	-0.000341
	(0.00101)	(0.00106)	(0.00104)
First St. F stat - Interaction Term	181.06	123.78	85.48
First St. F stat - Group Number or Spending	159.18	91.33	53.97

Note: 9,172 observations. Covariates at county-year level. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. Robust standard errors in parentheses, clustered at county. We include state and year fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

A.3 Sensitivity

Table A.14. Sensitivity - Water Quality: Distance to Border - Number of (#) Groups

	(1)	(2)	(3)	(4)	(5)
Near Stream Exit (10 mi)	-0.164*				
	(0.0959)				
Near Stream Exit (10 mi) * ln(# Groups)	0.0367				
	(0.0484)				
Near Stream Exit (20 mi)		-0.256***			
		(0.0842)			
Near Stream Exit (20 mi) * ln(# Groups)		0.102**			
		(0.0439)			
Near Stream Exit (30 mi)			-0.338***		
			(0.0864)		
Near Stream Exit (30 mi) * ln(# Groups)			0.127***		
			(0.0461)		
Near Stream Exit (40 mi)				-0.233***	
				(0.0815)	
Near Stream Exit (40 mi) * ln(# Groups)				0.0743*	
				(0.0440)	
Near Stream Exit (50 mi)					-0.269***
					(0.0744)
Near Stream Exit (50 mi) * ln(# Groups)					0.106***
					(0.0401)
ln(# Groups)	0.108***	0.102***	0.0984***	0.0967***	0.0886**
	(0.0381)	(0.0379)	(0.0370)	(0.0367)	(0.0363)
ln(Government Payments)	0.00564*	0.00568*	0.00540*	0.00572*	0.00556*
	(0.00306)	(0.00307)	(0.00309)	(0.00307)	(0.00307)
Formal Enforcement Actions	-0.00143***	-0.00144***	-0.00143***	-0.00145***	-0.00147***
	(0.000296)	(0.000296)	(0.000297)	(0.000297)	(0.000297)
Interstate Water Quality Compact	0.0942***	0.0992***	0.101***	0.101***	0.106***
	(0.0320)	(0.0321)	(0.0320)	(0.0321)	(0.0321)
Stream Inside State Borders	-0.310**	-0.297**	-0.291**	-0.302**	-0.306**
	(0.126)	(0.127)	(0.123)	(0.123)	(0.125)
Less Than 1 Mile to International Border	0.313**	0.383***	0.438***	0.341***	0.363***
	(0.126)	(0.119)	(0.125)	(0.122)	(0.120)
Less Than 1 Mile to Coast	-0.449*	-0.482**	-0.467**	-0.473**	-0.487**
	(0.236)	(0.238)	(0.234)	(0.232)	(0.237)
Mean Summer Temperature	-0.0783***	-0.0776***	-0.0765***	-0.0770***	-0.0764***
	(0.00381)	(0.00386)	(0.00388)	(0.00386)	(0.00390)
Total Summer Precipitation	-0.000468***	-0.000454***	-0.000438***	-0.000451***	-0.000431***
	(0.000128)	(0.000128)	(0.000128)	(0.000128)	(0.000128)
Total Summer Precipitation^2	-2.40e-07	-2.54e-07*	-2.61e-07*	-2.46e-07*	-2.66e-07*
	(1.49e-07)	(1.49e-07)	(1.49e-07)	(1.49e-07)	(1.50e-07)
Kleibergen-Paap F stat.	245.2	256.0	221.1	239.7	235.7

Note: 135,781 observations. Estimates for some covariates not shown: Urban Site, Education, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table A.15. Sensitivity - Water Quality: Distance to Border - Total Expenditures

	(1)	(2)	(3)	(4)	(5)
Near Stream Exit (10 mi)	-0.148*				
	(0.0848)				
Near Stream Exit (10 mi) * ln(Total Expend)	0.0188				
	(0.0324)				
Near Stream Exit (20 mi)		-0.238***			
		(0.0780)			
Near Stream Exit (20 mi) * ln(Total Expend)		0.0694**			
		(0.0313)			
Near Stream Exit (30 mi)			-0.313***		
			(0.0795)		
Near Stream Exit (30 mi) * ln(Total Expend)			0.0865***		
			(0.0329)		
Near Stream Exit (40 mi)				-0.216***	
				(0.0740)	
Near Stream Exit (40 mi) * ln(Total Expend)				0.0481	
				(0.0305)	
Near Stream Exit (50 mi)					-0.247***
					(0.0678)
Near Stream Exit * Ln(Total Expend)					0.0718**
					(0.0281)
ln(Total Expend)	0.0800***	0.0768***	0.0738***	0.0726***	0.0667**
	(0.0284)	(0.0283)	(0.0276)	(0.0275)	(0.0272)
Site in Urban Area	-0.0266	-0.0293	-0.0275	-0.0256	-0.0290
	(0.0259)	(0.0260)	(0.0260)	(0.0260)	(0.0261)
Kleibergen-Paap F stat.	195.5	195.0	174.8	189.0	187.0

Note: 135,781 observations. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table A.16. Sensitivity - Water Quality: Distance to Border - Mean Expenditures

	(1)	(2)	(3)	(4)	(5)
Near Stream Exit (10 mi)	-0.164*				
	(0.0893)				
Near Stream Exit (10 mi) * ln(Mean Expend)	0.0599				
	(0.118)				
Near Stream Exit (20 mi)		-0.267***			
		(0.0972)			
Near Stream Exit (20 mi) * ln(Mean Expend)		0.249*			
		(0.133)			
Near Stream Exit (30 mi)			-0.362***		
			(0.115)		
Near Stream Exit (30 mi) * ln(Mean Expend)			0.351**		
			(0.162)		
Near Stream Exit (40 mi)				-0.259**	
				(0.101)	
Near Stream Exit (40 mi) * ln(Mean Expend)				0.194	
				(0.136)	
Near Stream Exit (50 mi)					-0.317***
					(0.103)
Near Stream Exit (50 mi) * ln(Mean Expend)					0.316**
					(0.139)
ln (Mean Expend)	0.493**	0.494**	0.496**	0.471**	0.463**
	(0.194)	(0.195)	(0.197)	(0.190)	(0.190)
Site in Urban Area	-0.0113	-0.0112	-0.00639	-0.00776	-0.0101
	(0.0271)	(0.0276)	(0.0281)	(0.0274)	(0.0280)
ln(Government Payments)	0.00648**	0.00666**	0.00619**	0.00650**	0.00608*
	(0.00305)	(0.00310)	(0.00315)	(0.00309)	(0.00312)
Formal Enforcement Actions	-0.00126***	-0.00126***	-0.00123***	-0.00130***	-0.00135***
	(0.000299)	(0.000300)	(0.000303)	(0.000300)	(0.000302)
Interstate Water Quality Compact	0.104***	0.108***	0.109***	0.109***	0.115***
	(0.0325)	(0.0328)	(0.0330)	(0.0328)	(0.0331)
Stream Inside State Borders	-0.290**	-0.287**	-0.278**	-0.286**	-0.291**
	(0.124)	(0.124)	(0.117)	(0.118)	(0.119)
Less Than 1 Mile to International Border	0.521***	0.639***	0.726***	0.583***	0.645***
	(0.199)	(0.214)	(0.249)	(0.224)	(0.237)
Less Than 1 Mile to Coast	-0.513*	-0.576**	-0.586**	-0.560**	-0.591**
	(0.266)	(0.274)	(0.277)	(0.265)	(0.274)
Mean Summer Temperature	-0.0742***	-0.0738***	-0.0735***	-0.0734***	-0.0733***
	(0.00426)	(0.00437)	(0.00442)	(0.00435)	(0.00445)
Total Summer Precipitation	-0.000279*	-0.000276*	-0.000267*	-0.000279*	-0.000253
	(0.000149)	(0.000151)	(0.000154)	(0.000151)	(0.000155)
Total Summer Precipitation^2	-4.85e-07***	-4.89e-07***	-4.91e-07**	-4.77e-07**	-5.08e-07***
	(1.84e-07)	(1.87e-07)	(1.91e-07)	(1.86e-07)	(1.93e-07)
Kleibergen-Paap F stat.	22.91	22.55	19.94	21.62	20.31

Note: 135,781 observations. Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table A.17. Sensitivity - Water Quality: Lagged Effects - Number of (#) Groups

	(1)	(2)	(3)	(4)	(5)
Near Stream Exit (50 mi)	-0.259***	-0.241***	-0.173***	-0.130**	-0.126**
	(0.0682)	(0.0682)	(0.0639)	(0.0626)	(0.0627)
Near Stream Exit (50 mi) * Ln(# Groups)$_{(t-1)}$	0.104***				
	(0.0374)				
Near Stream Exit (50 mi) * Ln(# Groups)$_{(t-2)}$		0.0975**			
		(0.0380)			
Near Stream Exit (50 mi) * Ln(# Groups)$_{(t-3)}$			0.0600*		
			(0.0362)		
Near Stream Exit (50 mi) * Ln(# Groups)$_{(t-4)}$				0.0385	
				(0.0361)	
Near Stream Exit (50 mi) * Ln(# Groups)$_{(t-5)}$					0.0372
					(0.0367)
Ln(# Groups)$_{(t-1)}$	0.0628*				
	(0.0360)				
Ln(# Groups)$_{(t-2)}$		0.0584			
		(0.0365)			
Ln(# Groups)$_{(t-3)}$			0.0442		
			(0.0368)		
Ln(# Groups)$_{(t-4)}$				0.0727*	
				(0.0381)	
Ln(# Groups)$_{(t-5)}$					0.0162
					(0.0375)
Site in Urban Area	-0.0258	-0.0252	-0.0213	-0.0206	-0.0121
	(0.0257)	(0.0256)	(0.0255)	(0.0256)	(0.0255)
ln(Government Payments)	0.00558*	0.00930***	0.0121***	0.0168***	0.0144***
	(0.00324)	(0.00330)	(0.00327)	(0.00332)	(0.00351)
Formal Enforcement Actions	-0.00142***	-0.00137***	-0.000991***	-0.000608**	-0.000395
	(0.000293)	(0.000291)	(0.000292)	(0.000294)	(0.000288)
Interstate Water Quality Compact	0.0952***	0.0742**	0.174***	0.316***	0.00718
	(0.0313)	(0.0308)	(0.0320)	(0.0387)	(0.203)
Stream Inside State Borders	-0.301**	-0.303**	-0.304**	-0.331**	-0.325**
	(0.124)	(0.127)	(0.126)	(0.129)	(0.129)
Less Than 1 Mile to International Border	0.327***	0.301**	0.217*	0.223*	0.114
	(0.118)	(0.118)	(0.117)	(0.115)	(0.114)
Less Than 1 Mile to Coast	-0.478**	-0.484**	-0.478**	-0.495**	-0.476**
	(0.236)	(0.234)	(0.229)	(0.231)	(0.224)
Mean Summer Temperature	-0.0772***	-0.0777***	-0.0776***	-0.0789***	-0.0794***
	(0.00384)	(0.00381)	(0.00379)	(0.00381)	(0.00386)
Total Summer Precipitation	-0.000392***	-0.000422***	-0.000450***	-0.000424***	-0.000452***
	(0.000127)	(0.000126)	(0.000127)	(0.000127)	(0.000127)
Total Summer Precipitation^2	-3.03e-07**	-2.70e-07*	-2.15e-07	-2.31e-07	-1.67e-07
	(1.47e-07)	(1.47e-07)	(1.46e-07)	(1.46e-07)	(1.46e-07)
Observations	133,667	131,191	128,510	125,803	122,825
Kleibergen-Paap F stat.	229.1	234.5	240.6	237.8	237.9

Note: Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table A.18. Sensitivity - Water Quality: Lagged Effects - Total Expenditures

	(1)	(2)	(3)	(4)	(5)
Near Stream Exit (50 mi)	-0.238***	-0.223***	-0.161***	-0.121**	-0.118**
	(0.0618)	(0.0619)	(0.0579)	(0.0566)	(0.0563)
Near Stream Exit * Ln(Total Expend)$_{(t-1)}$	0.0710***				
	(0.0262)				
Near Stream Exit * Ln(Total Expend)$_{(t-2)}$		0.0674**			
		(0.0268)			
Near Stream Exit * Ln(Total Expend)$_{(t-3)}$			0.0411		
			(0.0257)		
Near Stream Exit * Ln(Total Expend)$_{(t-4)}$				0.0254	
				(0.0257)	
Near Stream Exit * Ln(Total Expend)$_{(t-5)}$					0.0258
					(0.0260)
Ln(Total Expend)$_{(t-1)}$	0.0474*				
	(0.0269)				
Ln(Total Expend)$_{(t-2)}$		0.0439			
		(0.0272)			
Ln(Total Expend)$_{(t-3)}$			0.0335		
			(0.0276)		
Ln(Total Expend)$_{(t-4)}$				0.0545*	
				(0.0285)	
Ln(Total Expend)$_{(t-5)}$					0.0123
					(0.0281)
Site in Urban Area	-0.0233	-0.0229	-0.0196	-0.0188	-0.0111
	(0.0258)	(0.0257)	(0.0255)	(0.0257)	(0.0254)
ln(Government Payments)	0.00548*	0.00875***	0.0122***	0.0173***	0.0146***
	(0.00322)	(0.00328)	(0.00322)	(0.00327)	(0.00349)
Formal Enforcement Actions	-0.00140***	-0.00138***	-0.00101***	-0.000633**	-0.000394
	(0.000292)	(0.000292)	(0.000295)	(0.000297)	(0.000289)
Interstate Water Quality Compact	0.0914***	0.0715**	0.175***	0.317***	0.0139
	(0.0312)	(0.0308)	(0.0320)	(0.0387)	(0.203)
Stream Inside State Borders	-0.299**	-0.301**	-0.303**	-0.331***	-0.324**
	(0.121)	(0.124)	(0.124)	(0.127)	(0.128)
Less Than 1 Mile to International Border	0.336***	0.308**	0.208*	0.211*	0.107
	(0.121)	(0.121)	(0.114)	(0.111)	(0.109)
Less Than 1 Mile to Coast	-0.556**	-0.557**	-0.529**	-0.546**	-0.502**
	(0.255)	(0.253)	(0.243)	(0.245)	(0.232)
Mean Summer Temperature	-0.0777***	-0.0781***	-0.0778***	-0.0790***	-0.0795***
	(0.00381)	(0.00377)	(0.00376)	(0.00378)	(0.00383)
Total Summer Precipitation	-0.000383***	-0.000411***	-0.000436***	-0.000397***	-0.000452***
	(0.000126)	(0.000126)	(0.000127)	(0.000127)	(0.000127)
Total Summer Precipitation^2	-3.21e-07**	-2.88e-07**	-2.36e-07	-2.70e-07*	-1.72e-07
Observations	133,667	131,191	128,510	125,803	122,825
Kleibergen-Paap F stat.	185.3	186.5	188.1	193.7	201.4

Note: Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table A.19. Sensitivity - Water Quality: Lagged Effects - Mean Expenditures

	(1)	(2)	(3)	(4)	(5)
Near Stream Exit (50 mi)	-0.301***	-0.280***	-0.198**	-0.167**	-0.137*
	(0.0922)	(0.0909)	(0.0774)	(0.0765)	(0.0707)
Near Stream Exit (50 mi) * Ln(Mean Expend)$_{(t-1)}$	0.316**				
	(0.130)				
Near Stream Exit (50 mi) * Ln(Mean Expend)$_{(t-2)}$		0.302**			
		(0.132)			
Near Stream Exit (50 mi) * Ln(Mean Expend)$_{(t-3)}$			0.189		
			(0.117)		
Near Stream Exit (50 mi) *Ln(Mean Expend)$_{(t-4)}$				0.145	
				(0.121)	
Near Stream Exit (50 mi) * Ln(Mean Expend)$_{(t-5)}$					0.118
					(0.115)
Ln(Mean Expend)$_{(t-1)}$					
	(0.182)				
Ln(Mean Expend)$_{(t-2)}$		0.331*			
		(0.183)			
Ln(Mean Expend)$_{(t-3)}$			0.251		
			(0.183)		
Ln(Mean Expend)$_{(t-4)}$				0.364*	
				(0.187)	
Ln(Mean Expend)$_{(t-5)}$					0.0998
					(0.177)
Site in Urban Area	-0.00834	-0.00906	-0.00988	-0.00749	-0.00677
	(0.0270)	(0.0266)	(0.0258)	(0.0263)	(0.0250)
ln(Government Payments)	0.00562*	0.00808**	0.0123***	0.0183***	0.0151***
	(0.00317)	(0.00332)	(0.00316)	(0.00321)	(0.00342)
Formal Enforcement Actions	-0.00138***	-0.00146***	-0.00110***	-0.000730**	-0.000436
	(0.000299)	(0.000311)	(0.000318)	(0.000317)	(0.000302)
Interstate Water Quality Compact	0.101***	0.0769**	0.176***	0.314***	0.0167
	(0.0320)	(0.0314)	(0.0323)	(0.0391)	(0.205)
Stream Inside State Borders	-0.281**	-0.278**	-0.283**	-0.302**	-0.317**
	(0.118)	(0.120)	(0.121)	(0.123)	(0.125)
Less Than 1 Mile to International Border	0.533**	0.485**	0.330*	0.358**	0.156
	(0.215)	(0.210)	(0.187)	(0.182)	(0.163)
Less Than 1 Mile to Coast	-0.571**	-0.570**	-0.537**	-0.555**	-0.503**
	(0.269)	(0.265)	(0.251)	(0.254)	(0.235)
Mean Summer Temperature	-0.0754***	-0.0760***	-0.0763***	-0.0763***	-0.0791***
	(0.00415)	(0.00408)	(0.00395)	(0.00407)	(0.00390)
Total Summer Precipitation	-0.000255*	-0.000295**	-0.000331**	-0.000261*	-0.000427***
	(0.000148)	(0.000147)	(0.000152)	(0.000152)	(0.000136)
Total Summer Precipitation^2	-5.00e-07***	-4.51e-07**	-3.75e-07**	-4.54e-07**	-2.09e-07
	(1.86e-07)	(1.84e-07)	(1.89e-07)	(1.91e-07)	(1.65e-07)
Observations	133,667	131,191	128,510	125,803	122,825
Kleibergen-Paap F stat.	18.98	18.94	17.63	18.48	20.26

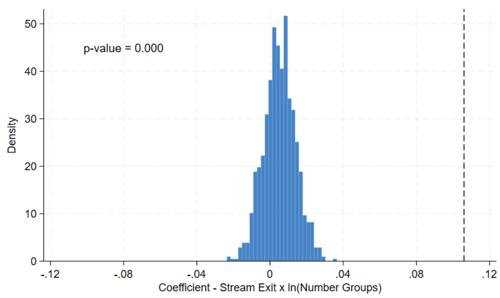
Note: Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

Table A.20. Sensitivity - Water Quality: Authorized States

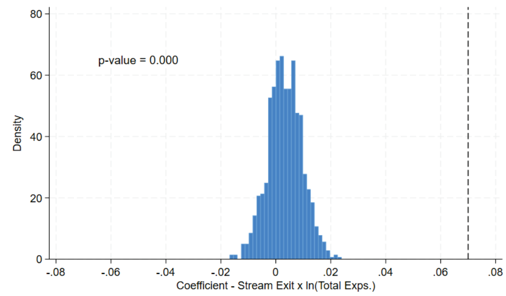
	(1)	(2)	(3)
Near Stream Exit (50 mi)	-0.255***	-0.234***	-0.302***
	(0.0751)	(0.0683)	(0.103)
Near Stream Exit (50 mi) * ln(Number of Groups)	0.101**		
	(0.0409)		
Near Stream Exit * Ln(Total Expenditures)		0.0684**	
		(0.0286)	
Near Stream Exit (50 mi) * ln(Mean Expenditures)			0.302**
			(0.139)
ln(Number of Groups)	0.0777**		
	(0.0378)		
ln(Total Expenditures)		0.0583**	
		(0.0282)	
ln (Mean Expenditures)			0.398**
			(0.185)
Site in Urban Area	-0.0149	-0.0122	0.00520
	(0.0268)	(0.0269)	(0.0284)
ln(Government Payments)	0.00626	0.00543	0.00906*
	(0.00486)	(0.00489)	(0.00498)
Formal Enforcement Actions	-0.00148***	-0.00143***	-0.00136***
	(0.000297)	(0.000294)	(0.000301)
Interstate Water Quality Compact	0.124***	0.120***	0.134***
	(0.0327)	(0.0326)	(0.0337)
Stream Inside State Borders	-0.336***	-0.334***	-0.318***
	(0.127)	(0.124)	(0.121)
Less Than 1 Mile to International Border	0.336***	0.369***	0.584**
	(0.121)	(0.130)	(0.233)
Less Than 1 Mile to Coast	-0.482**	-0.567**	-0.575**
	(0.237)	(0.258)	(0.270)
Mean Summer Temperature (°F)	-0.0759***	-0.0762***	-0.0729***
	(0.00406)	(0.00402)	(0.00447)
Total Summer Precipitation (mm)	-0.000378***	-0.000369***	-0.000222
	(0.000131)	(0.000130)	(0.000156)
Total Summer Precipitation^2	-3.58e-07**	-3.80e-07**	-5.71e-07***
	(1.51e-07)	(1.51e-07)	(1.92e-07)
Kleibergen-Paap F stat.	225.4	182.6	22.26

Estimates for some covariates not shown: Educational Attainment, Percent Republican Vote, Percent White Population, Per Capita Income, Population Density, Poverty Rate, and Unemployment Rate. We include state and year fixed effects and state trends. Robust standard errors in parentheses, clustered at water-quality monitor. *** p<0.01, ** p<0.05, * p<0.1.

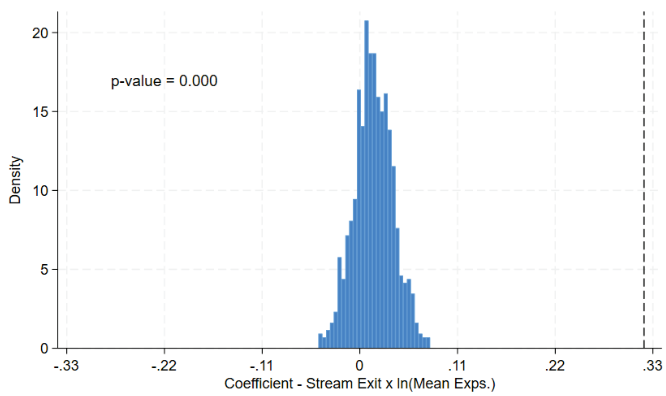
Figure A.2. Permutation Test



(a) Number of Groups



(b) Total Expenditures



(c) Mean Expenditures

Note: Histograms of the distribution of coefficients from 1,000 separate regressions. The p-value in each figure is for the null hypothesis that the coefficient estimated in the main specification is obtained purely by chance (equal to zero). The vertical line denotes the estimated coefficient.