

The roles of  
environmental nonprofits  
for improving compliance

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## The Largest International Gathering of Water Protection Advocates Floats into Portland for River Rally 2012



When two bodies of water come together in a confluence, each stream provides its unique characteristics to form a more powerful entity. The same can be said of River Rally 2012, when River Network and Waterkeeper Alliance join forces to convene the largest gathering ever of clean water advocates.

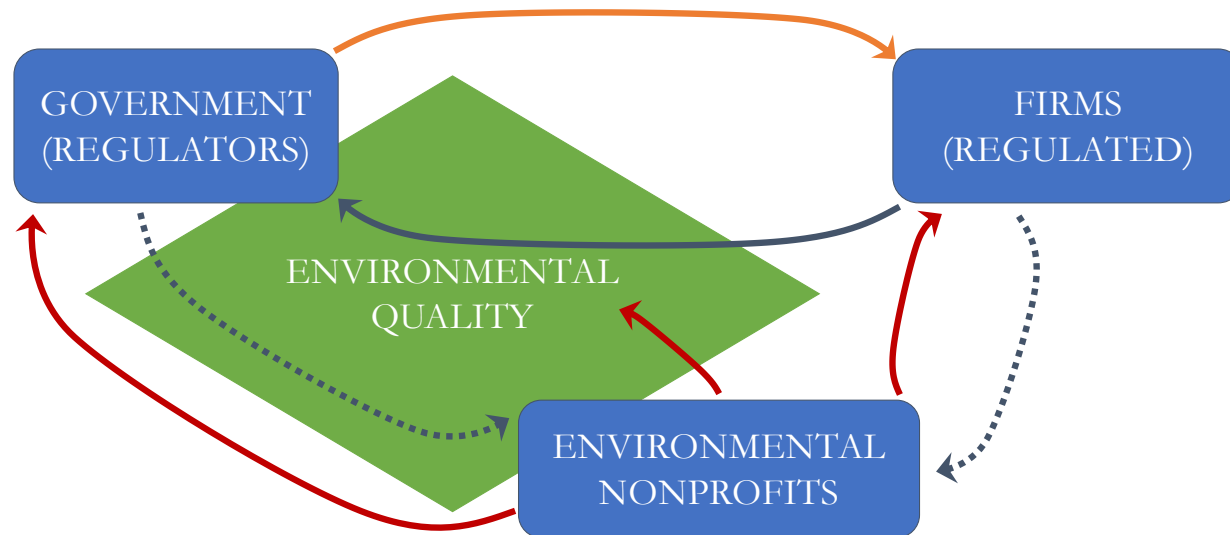
## The roles of nonprofits in water quality compliance and improvement:

- Watershed advocacy begins with the desire to improve water resources.
- Yet, the complexities of bio-physical systems, local industries, and fluctuating political pressures also impact water quality.
- Can we and how should we measure organizational effectiveness?

May 6, 2012

# Environmental quality & the regulatory context

Much attention on the interaction between the regulator and the regulated.  
An important third participant: the environmental nonprofit.



## Donations to nonprofits are significant:

- 95% of Americans give to charity.
- Total giving to charitable organizations was \$410.02 billion in 2017 (2.1% of GDP).
  - Majority comes from individuals, who gave \$286.65 billion (70%).
- Charities that focus on the Environment / Animals saw an increase of 7.2% to \$11.83 billion (~3% of all donations).

<https://givingusa.org/>

# Mechanisms for the impact of environmental nonprofits:

Anecdotes and intuition suggest that environmental groups provide important regulatory oversight...

- If states incompletely monitor or enforce, environmental nonprofits can call attention to poor water quality or bring a citizen suit.
- Alternatively, the groups can directly target firms and facilities that are out of compliance: they can contact the firms and request improvements or create negative publicity such as product boycotts.
- Many environmental nonprofits try to improve environmental quality through education, water quality monitoring, clean up, and preservation efforts.

**Yet the quantitative impact is unknown.**

# Questions

Two papers regarding the Clean Water Act:

Do water-related nonprofit groups...

increase firms' compliance?

improve water quality?

## Why water?

Water pollution remains a problem in the US, though Clean Water Act (CWA) was passed nearly 50 years ago.

Water-related nonprofit groups have characteristics amenable to empirical study:

- Operate at local watershed scale,
- homogeneous in mission,
- based throughout the US, and
- are relatively immune to state & federal pressures.

## Three areas of related literature:

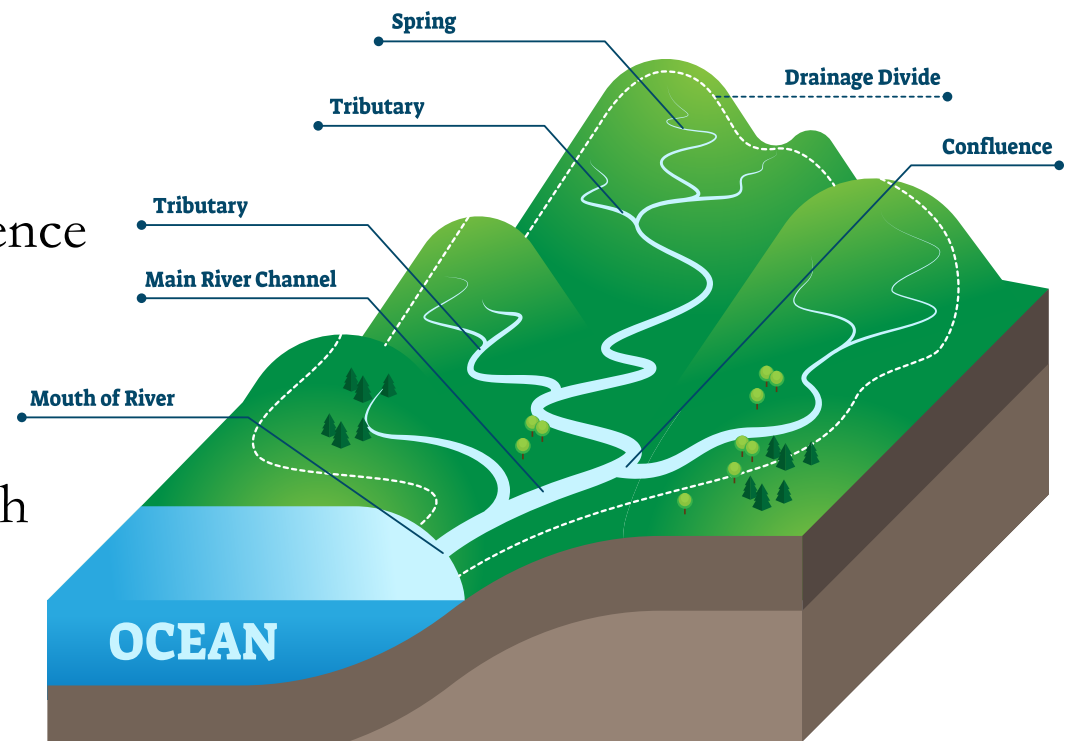
- CWA Monitoring, Enforcement, Effectiveness
  - Sigman (2005); Magat and Viscusi (1990); Shimshack and Ward (2005); Earnhart (2004); Gray and Shimshack (2011); Flatt (1997); Grooms (2012); Keiser and Shapiro (2017)
- Citizen suits and the CWA
  - Langpap and Shimshack (2010) measure the effects of citizen law suits by environmental advocacy groups on municipal water treatment plant effluent compliance.
- General nonprofit performance and functions
  - Andreoni (1993); Andreoni and Payne (2011); Heutel (2009); Monti (2010); Langpap (2007)
  - Watershed groups: Breckenridge (1998); Clark et al (2005); Koontz and Nikolic (2008); Houck (2014)



# Contribution and approach:

Provides a **direct, large-scale statistical test** of these ideas, by

1. Gathering data on the existence and spending of watershed groups.
2. Linking these data, at the watershed-level (HUC8) with
  - a. firm-level compliance data
  - b. water quality for each US watershed
3. Assessing the impacts.



## Scrape, collect & clean the data on water-related nonprofits, a.k.a., watershed groups

Obtain lists from Guidestar, River Network: nonprofit watershed groups' characteristics, location, and the Employer identification number (EIN).

Use EIN to link these lists to a database from the US Internal Revenue Service (IRS) with "990 form" reporting data for each group, including yearly revenues and expenditures.



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aka MRWC  
Corvallis, OR  
www.mrwc.org

**SUMMARY**

**Mission**  
Marys River Watershed Council  
voluntary stewardship in the M



### Exempt Organizations Select Check

[Exempt Organizations Select Check Home](#)

Organizations Eligible to Receive Tax-Deductible Charitable Contributions (Pub. 78 data) - Search Results

The following list includes tax-exempt organizations that are eligible to receive tax-deductible charitable contributions. Click on the "Deductibility Status" column for an explanation of limitations on the deductibility of contributions made to different types of tax-exempt organizations.

Results are sorted by EIN. To sort results by another category, click on the icon next to the column heading for that category. Clicking on that icon a second time will reverse the sort order. Click on a column heading for an explanation of information in that column.

1-1 of 1 results Results Per Page 25  « Prev | 1-1 | Next »

EIN ▲	Legal Name (Doing Business As) ▲	City ▲	State ▲	Country ▲	Deductibility Status ▲
93-1314764	Marys River Watershed Council	Corvallis	OR	United States	PC

« Prev | 1-1 | Next »

# Data on watershed groups

We assess the growth in watershed groups:

The **number of groups** that act as stewards of local rivers more than tripled during our study period: from 500 groups in the early 1990s to over 1500 by 2010.

The **total amount of money donated** to these groups also increases through time.

# “Do Nonprofits Encourage Environmental Compliance?”

with Katherine Grooms, Southwestern University

*Journal of the Association of Environmental & Resource Economists*

(2017)

[www-journals-uchicago-edu.ccl.idm.oclc.org/doi/full/10.1086/692508](http://www-journals-uchicago-edu.ccl.idm.oclc.org/doi/full/10.1086/692508)

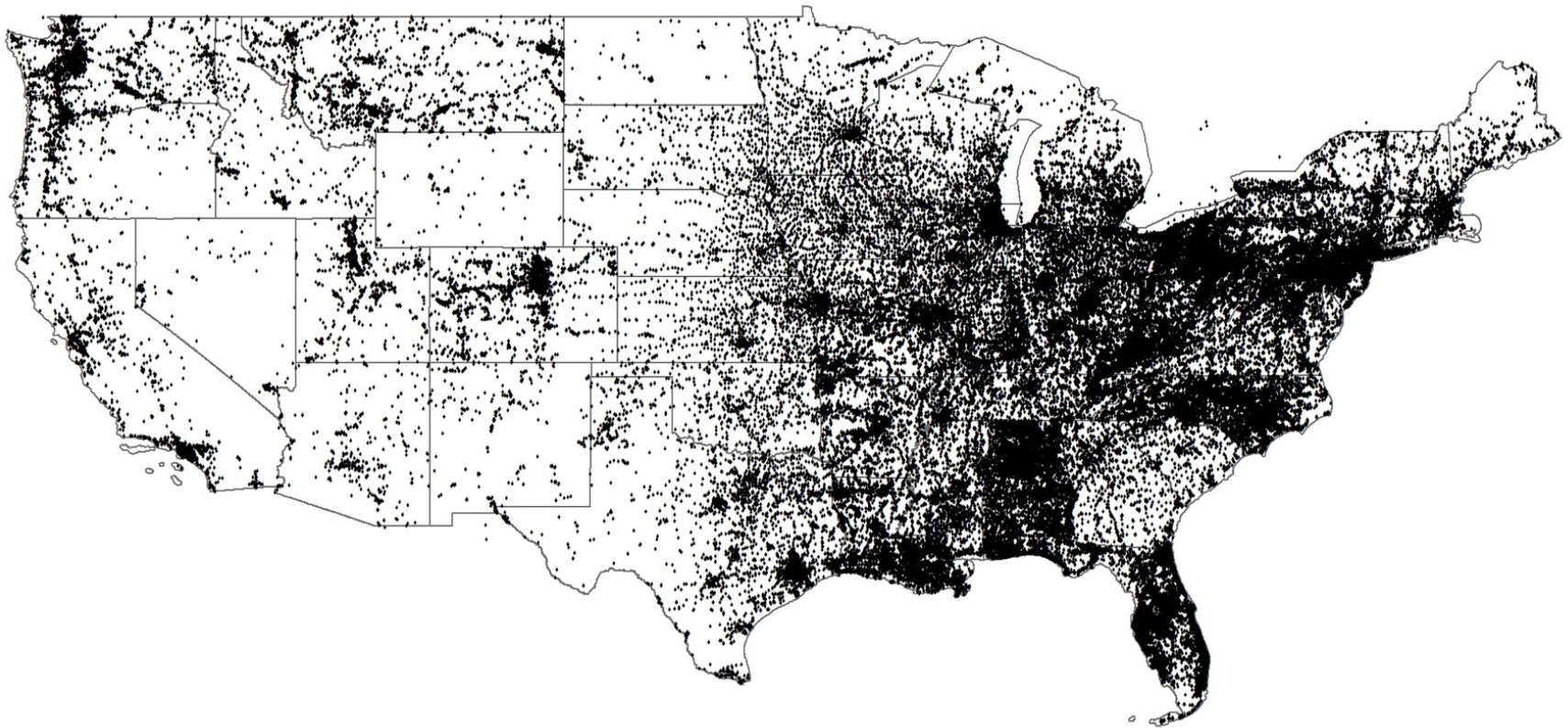
## Enforcement & compliance measures:

- EPA's Enforcement and Compliance History Online (ECHO) – 334,563 permit-facility observations
- Contains:
  - Facility name, location and industry
  - Inspections, violations, and enforcement actions
  - Significant Non Compliance (SNC) type (allows us to gauge severity)
- Outcomes:
  - **The fraction of facilities in a given state-year or watershed-year:**
    - Inspected
    - In violation
    - In SNC violation
    - With enforcement action

## Enforcement & compliance summary stats:

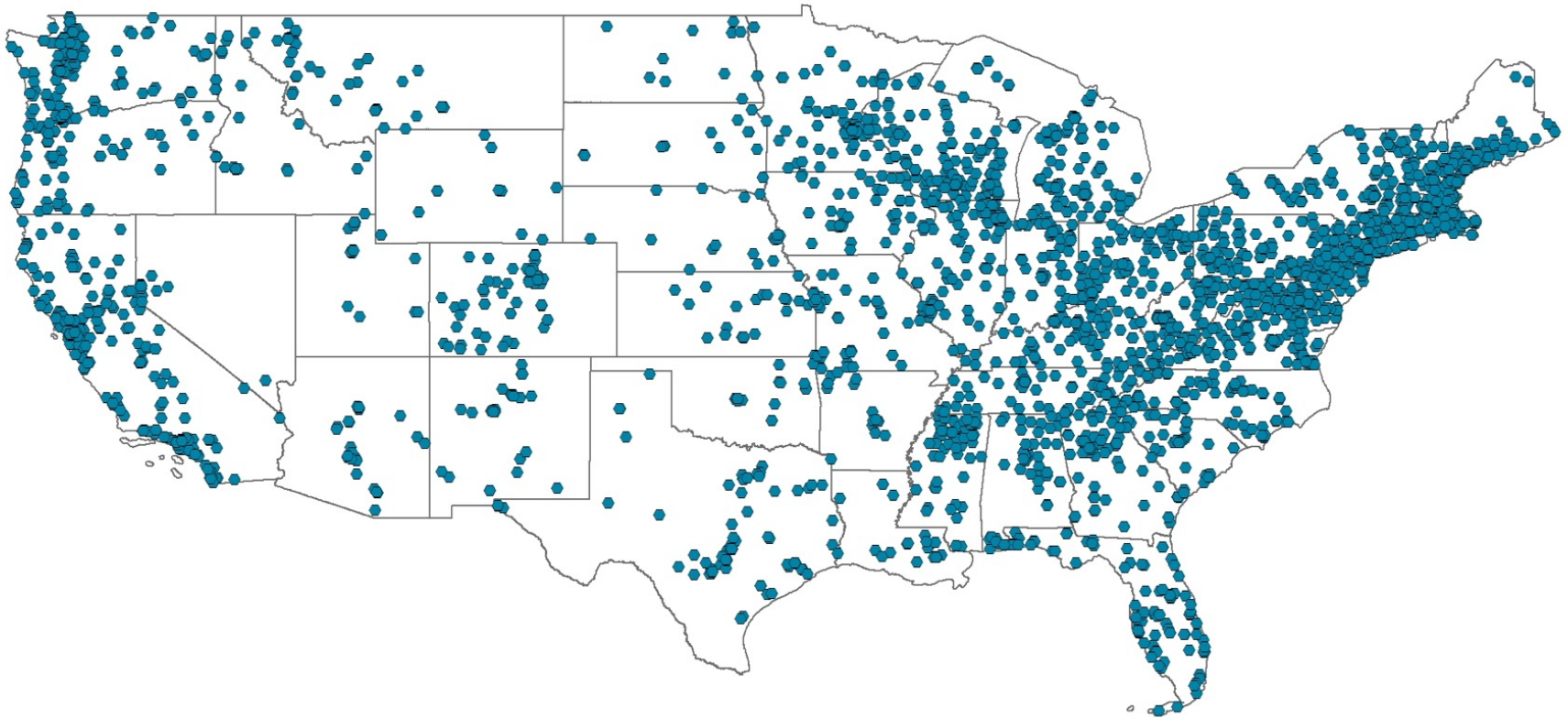
	Mean	Stdev
Total Inspections per facility	0.159	0.037
Total Violations per facility	0.376	0.187
Total Enforcement Actions per facility	0.032	0.018
Total penalties per facility	17.376	4.125
Total Facilities	8180.360	1005.000
Fraction of facilities inspected	0.084	0.017
Fraction of facilities in violation	0.049	0.010
Fraction of facilities in SNC Category I Effluent	0.020	0.004
Fraction of facilities enforced upon	0.018	0.004

# Regulated facilities in the US





# Data on watershed groups



## Estimating the impacts

- Panel data for 48 states (continental US) for 1,131 watersheds and 1,818 groups: number of watershed groups, contributions, and expenditures.
- Outcomes: inspections, compliance, enforcement.
- Land use, precipitation, voting, demographics at the watershed–year level.
- 1992 – 2007.

Results: groups appear to have “**direct**” affect, improving firms’ compliance.

- At the watershed level, **significant negative effect** on both inspections (by 0.5 percentage points) and violations, including SNC Category I violations (more than 5% reduction from the average rate).
  - No result on enforcement actions or penalties.
- Effect on firm compliance does not appear to operate through influence on regulatory channels.
- Null state-level results suggest that watershed groups have a localized effect on regulatory behavior and firm compliance.

# Implications of watershed groups on compliance

- Estimates imply 20 to 24 fewer inspections occur in each state per additional watershed group.
- Based on average costs of enforcement, state governments are saving from \$135,000 to \$270,000 annually with the help of each watershed group.
- Watershed groups reduce the need for inspections and increase firm compliance (captured by violations) at a relatively lower cost than the state.
- Moreover, for each additional group, there are eight fewer SNC violations per year, providing cleaner water.

# “Private provision of public goods by environmental groups”

with Christian Langpap, Oregon State University

*Proceedings of the National Academy of Sciences* (2019)

[www.pnas.org/content/pnas/116/12/5334.full.pdf](http://www.pnas.org/content/pnas/116/12/5334.full.pdf)

## **Glossary:**

private provision = non-governmental, provided by citizens

public goods = environmental quality

# Measure of water quality: dissolved oxygen deficiency

Dissolved oxygen deficiency (DOD) measures the deficiency in the amount of oxygen dissolved in the water and is

an overarching measure of poor water quality, as dissolved oxygen is critical for aquatic life that uses oxygen in respiration: fish, invertebrates, bacteria, and plants;

a decent proxy in determining designated uses under the CWA, with respect to “fishable and swimmable” goals & attainment,

and the water quality measure that has the most data available during our study period.

# Measure of water quality: dissolved oxygen deficiency

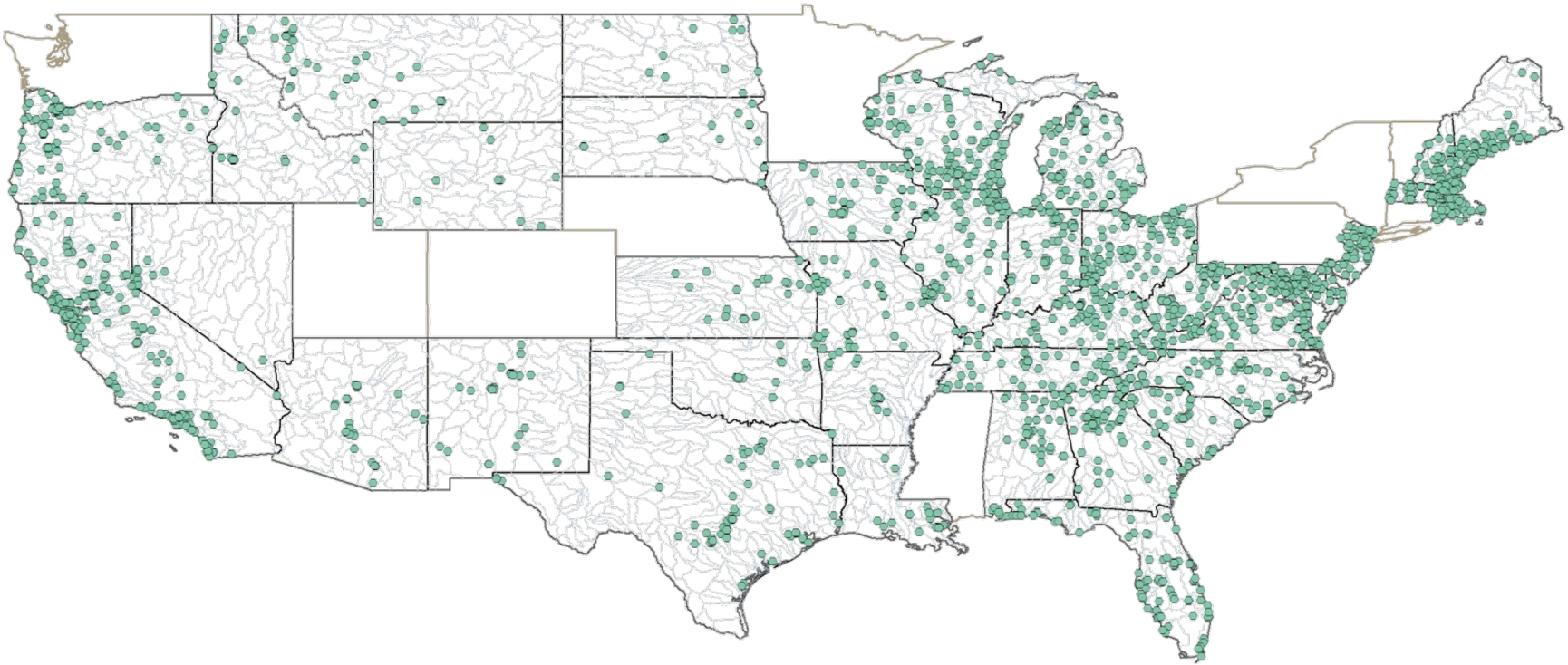
- Obtain DO measurements from the National Water Information System (USGS) and Storet (US EPA) databases.
- Convert all measures to a standard unit (mg/L).
- Use a standard formula to convert DO in mg/L to dissolved oxygen saturation (%), and calculate dissolved oxygen deficit (DOD) as  $100 - \text{DO}$  (in % saturation).
- 2,276,913 measurements during the study period.
- Aggregate by calculating yearly averages within each watershed (HUC8).

## Estimating the impacts

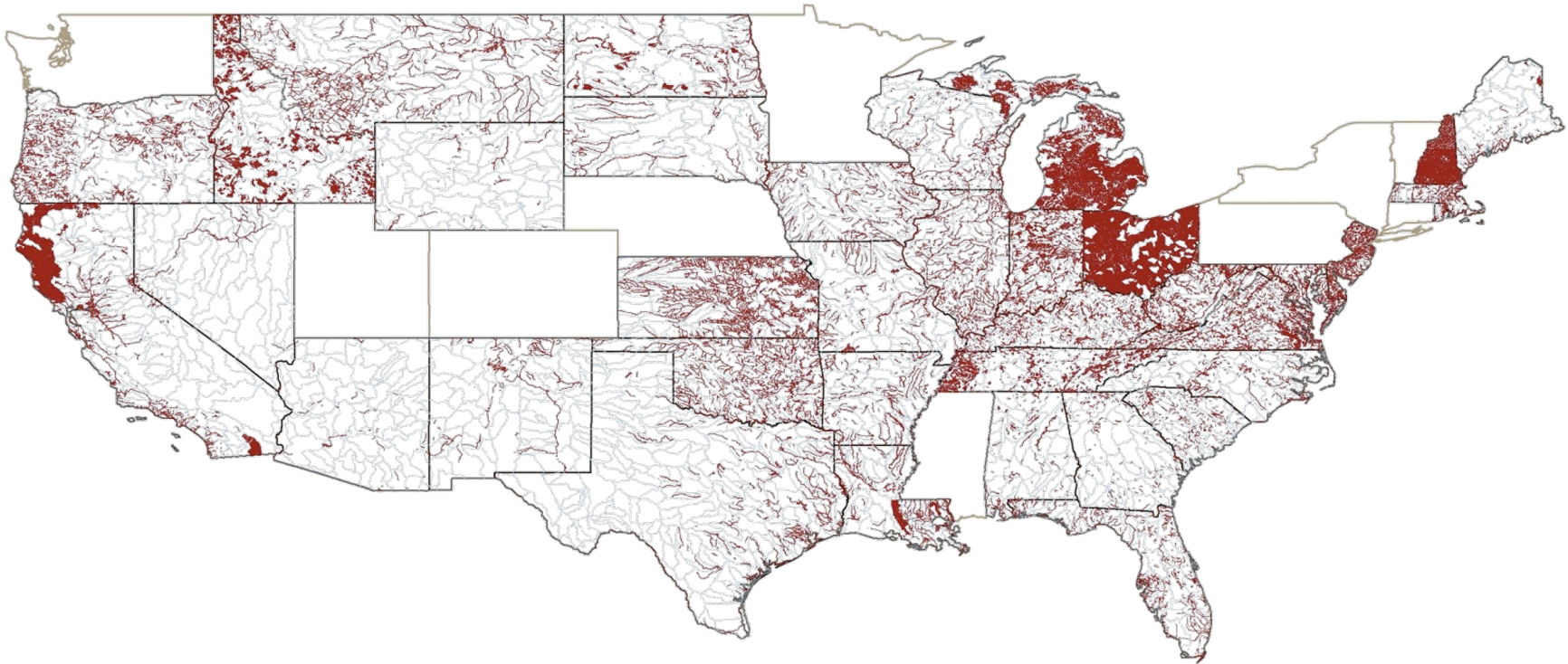
- Panel data for 48 states (continental US) for 1,131 watersheds and 1,333 groups.
- Yearly DOD averages, proportion of stream segments attaining “fishable” and “swimmable”, number of watershed groups, contributions, and expenditures, violations, land use, precipitation, voting, demographics at the watershed–year level.
- 1996 – 2008.



# Data on watershed groups



# Impaired segments from 303(d) list



## Estimating the impacts

- Water groups do not locate randomly across watersheds.
- Indeed, they seem to locate where water quality is relatively poor, which may also lead to more contributions and higher expenditures.
  - implies more groups leads to worse water quality
- Thus, we match “treated” watersheds with similar “control” watersheds:
  - Treated watersheds:** least one group during the period: 592 watersheds.
  - Control watersheds:** no groups in the entire period: 1,695 watersheds.

## Results: watershed groups decrease DOD

- Baseline change: DOD decreased by 2.6% per year on average.
- An additional water group in a watershed in the preceding year is associated with a DOD reduction of 0.27 relative to a control watershed with no water groups.
  - A 1.76% reduction in DOD for the average watershed.
- A \$100,000 increase in total contributions to groups in a watershed (roughly 10% relative to the mean) is associated with a DOD reduction of 0.0043.
  - a 2.81% reduction for the average watershed.
- A \$100,000 increase in total group expenditures in a watershed (roughly 7% relative to the mean) is associated with a DOD reduction of 0.0018.
  - a 2.60% reduction for the average watershed.

## Results: watershed groups make waters more fishable and swimmable

Outcomes based on goals from the Clean Water Act:

- Protection & propagation of fish (“fishable”): minimum 4.99 mg/l DO.
- Recreation in and on the water (“swimmable”): minimum 6.47 mg/l DO.
- Baseline: percentage of swimmable and fishable water bodies increased by 1.2% and 0.4% per year on average.

Each additional group increases the proportion of swimmable and fishable by 0.52 and 0.28 percentage points, respectively.

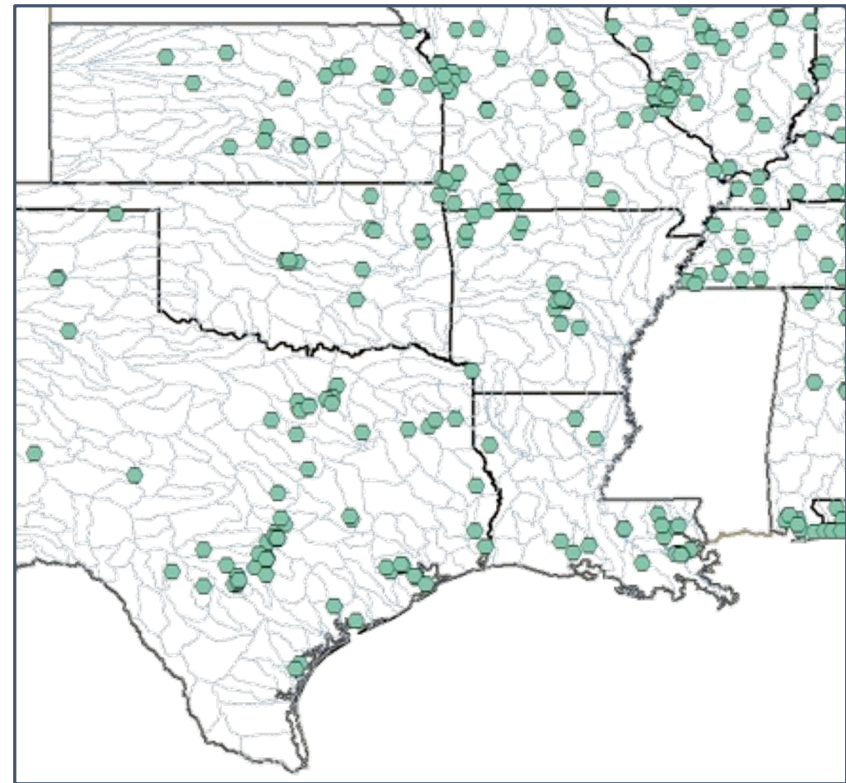
- For swimmable: 0.81% increase relative to the mean.
- For fishable: 0.32% increase relative to the mean.

# Implications of watershed groups on compliance

- Increased presence of water groups or increased group contributions and expenditures have positive impacts on water quality.
- Proportion swimmable  $\sim 80\%$ , proportion fishable  $\sim 92\%$ .
- Change in water quality is a slow moving process and significant improvements have been achieved over time, which means there is not much scope for further large improvements.
- Over our study period DOD decreased by roughly  $2.6\%$  per year, while proportion swimmable and fishable increased by  $1.2\%$  and  $0.3\%$  per year, respectively.
- Relative to these changes, the impact of water groups measured here is significant.

## Preview of future work: can watershed groups limit inter-jurisdictional spillovers?

- Previous work shows that states have **worse water quality near borders** with rivers flowing into neighboring states (Sigman 2005).
- Explore the extent that watershed groups located upstream or downstream of borders alleviate this issue, relative to having no groups near borders.



Thank you.

