Does Phosphorus Runoff affect SWCD activity selection? Evidence from Illinois

Sarah Collier, Dr. Jay Rickabaugh, Dr. Graham Ambrose, Dr. Ritwick Ghosh

North Carolina State University, Department of Public and International Affairs

Introduction

We created a model to determine the best mix of activities for a SWCD to host to best reduce P runoff. This is important because P runoff is associated with poor soil and water quality and SWCD's are poised to be influential in areas of high P runoff. Additionally, existing literature surrounding how the resources and rules we develop influence our governance effectiveness, is limited in nutrient management.

Methods

This research uses two primary data sources: 2023 SWCD activity from Illinois Association of SWCD's and 2012 HUC8 Watershed Data (Sabo et al. (2019, 2021), JGR: Biogeosciences – U.S. nitrogen and phosphorus budgets (2002–2012)) Our Generalized Least Squares Regression Model serves as an example of how, with better data, the selection of SWCD activity using runoff data can be analyzed.

We re-coded the county level data from the Illinois Association of SWCD's to encompass all activities from each SWCD. In some cases respondents classified activities in ways inconsistent with the text describing the activity. We also merged categories based on common themes.

The HUC-8 Data at the sub basin level did not need to be reorganized. Using ArcGis Geospatial Analysis, we merged county and watershed data.

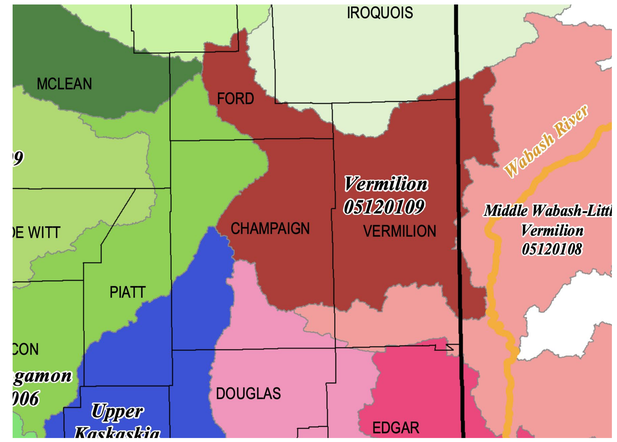
We merged the HUC8 data, the GIS data, and SWCD activity data to construct a novel dataset.

Results

• Our Model:

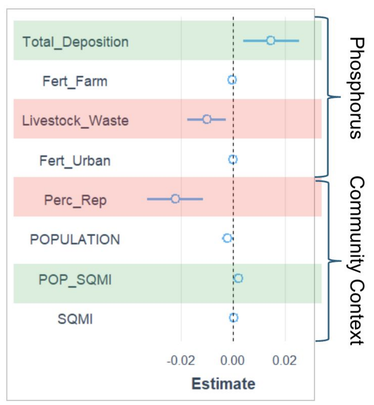
$$Outreach_i = Total\_Deposition_{ip} + Farm\_Fertilizer_{ip} + Livestock\_Waste_{ip} + Urban\_Fertilizer_{ip} + Perc\_Rep2020_i + Population_i + SqMile_i + Pop\_SqMile_i + \varepsilon$$

Where $Total\_Deposition$ is the total deposition of P as a percentage, p, of the watersheds that make up SWCD i; $Farm\_Fertilizer$, $Livestock\_Waste$, $Urban\_Fertilizer$ are the respective P sources as a percentage, p, of the watersheds that make up SWCD i, $Perc\_Rep2020$ is the republic vote share for SWCD i in the 2020 presidential election, $Population$ is the population for SWCD i, $SqMile$ is the size in square miles of SWCD i, and Pop_SqMile is the population per square mile in SWCD i.



(Illinois State Water Survey, 2018)

1.



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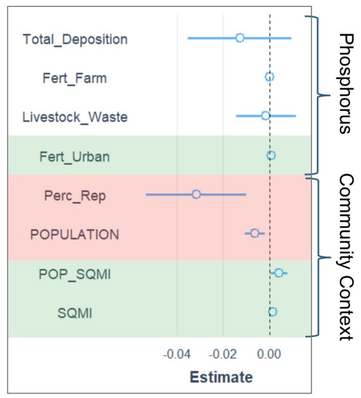

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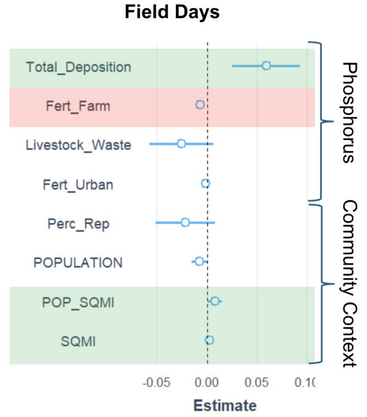

Discussion

We have come to the conclusion that the kind of problem (row crop fertilizer, urban fertilizer, livestock waste) and the kind of community each county is can predict the activity selection of the SWCD. While more work is needed, these results suggest to confirm our hypothesis.

Acknowledgements

Thank you to Dr. Anna- Maria Marshall from University of IL and Mr. Christopher Oates as well as Ms. Claire Murphey from NC State

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This material is based upon work supported by the National Science Foundation CBET-2019435.