

Local manure regulations can help reduce water pollution from dairy farms

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Manure spreading on agricultural field. Credit: UW-Madison's Nutrient & Pest Management (NPM) Program

Animal agriculture is a major source of water pollution in the United States, as manure runoff carries excess nutrients into rivers and lakes.

Because of their non-point source nature, most farms are not regulated under the federal Clean Water Act. This leaves pollution control up to the states, resulting in a patchwork of different approaches that are difficult to evaluate.

A new study from the University of Illinois focuses on local manure management regulations in Wisconsin and how they affect water quality in the state.

"Wisconsin is unique, because they have allowed counties to participate in enforcement of state agricultural code without state approval. Most states have either sole state-level enforcement or allow local enforcement only with state approval. As a result, Wisconsin has more county-level participation in manure management than neighboring states, although the state still maintains enforcement authority as well," explains Marin Skidmore, assistant professor in the Department of Agricultural and Consumer Economics, part of the College of Agricultural, Consumer and Environmental Sciences at U of I. Skidmore is lead author on the paper, published in the *American Journal of Agricultural Economics*.

"That makes Wisconsin well suited as a 'test case' to analyze effectiveness of local enforcement of manure management regulations," she adds.

Wisconsin's dairy industry is an important driver of the state's economy. It is dominated by small family farms; the state is home to 7,000 farms and 1.3 million cows. Farmers spread manure as fertilizer on their fields, causing runoff nutrients to leak into nearby water sources. Water pollution also affects Wisconsin's nature-focused tourism industry, which is based on access to clean lakes, rivers and streams.

Skidmore and her co-authors conducted interviews and compiled

documents on manure management ordinances in Wisconsin counties from 2008 to 2020. To evaluate water quality, they recorded average monthly data for ammonia and phosphorous concentrations in water bodies such as rivers, streams, lakes and reservoirs, obtained from the Water Quality Portal, a comprehensive database of U.S. water quality information.

"We find encouraging evidence for the effectiveness of local enforcement of management regulations," Skidmore states. "Two aspects of local ordinances are particularly effective, leading to reductions in nutrient concentrations quite quickly, between one and three years. Both aspects align with the four R's of nutrient management—applying the right source at the right rate, right time, and right place."

The first of these rules requires all farms to draw up a nutrient management plan, regardless of whether they have a manure storage facility. The second rule addresses a subset of counties which have more restrictive rules on manure spreading based on the presence of Silurian bedrock in the area, also requiring a nutrient management plan.

"In a nutrient management plan, farmers must outline how, when, where and at what rate they are going to apply nutrients. Ideally, the plan optimizes nutrient management according to the four R's, which immediately reduces the amount of excess nutrients in the fields and the availability for runoff," Skidmore explains.

To develop a nutrient management plan, farmers must first have their soil tested, then test or estimate the nitrogen and phosphorus content in their manure. Then they must determine fertilizer needs based on crops, acreage, and soil conditions. Currently, only about one-third of Wisconsin's acres have a nutrient management plan. County agencies work with farmers to offer training and support, as well as grants to offset the costs of developing a plan.

Other parts of Wisconsin's local management regulations did not appear to have immediate effects when counties gained enforcement capacity. In fact, rules to require tillage setbacks actually resulted in a short-term spike in nutrient concentrations. Skidmore suggests the mixed results may be due to the presence of legacy nutrients that have been in the soil for decades, and long-term effects may be more encouraging.

"Our study shows that some easily implemented regulations can have a positive impact on water quality," Skidmore says. "We also show that local agencies are a valuable resource for regulation enforcement. Counties are able to address problems preemptively, before they escalate, and they can provide a quicker response. They have staff that are living and working in the communities, so they may have a different awareness than state organizations."

Skidmore suggests other U.S. states can emulate this strategy, complementing state-level involvement with local agency engagement for a flexible, adaptable approach to manure management regulations.

More information: Marin Skidmore et al, Effectiveness of local regulations on nonpoint source pollution: Evidence from Wisconsin dairy farms, *American Journal of Agricultural Economics* (2023). [DOI: 10.1111/ajae.12388](https://doi.org/10.1111/ajae.12388)

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