# Agricultural Decision Support

Photo by Todd Marsee, Michigan Sea Grant

Agricultural fertilizers applied just before a heavy rainfall can wash away into local waterways, costing farmers money and causing serious water quality problems. A collaborative effort led by the NOAA National Weather Service has produced a decision support tool to help farmers determine the best time to apply fertilizers based on weather forecasts and soil moisture conditions.

CIGLR and our partners are working with the National Weather Service to improve the accuracy of Runoff Risk decision support tools and evaluate its effectiveness for improving water quality, with the goal of providing farmers with an easy-to-implement nutrient management practice that maximizes profit while protecting water quality.
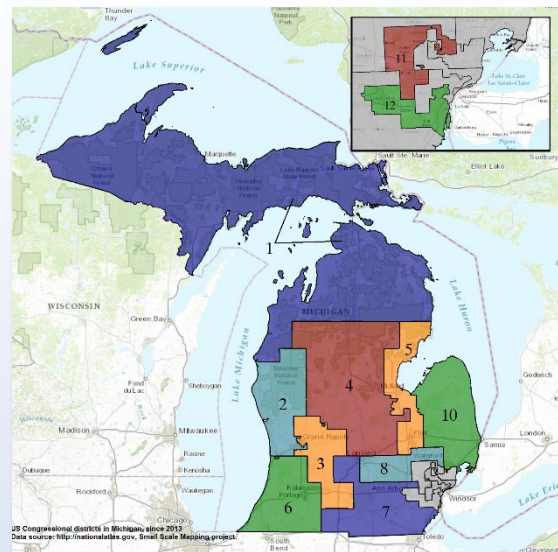
*Map of Michigan Congressional districts with substantial agricultural activity*

- The Great Lakes region generates $14.5 billion in agricultural revenue each year, including sales of crops and livestock.
- Excessive nutrient runoff is significantly degrading water quality in all the Great Lakes, with the exception of Lake Superior.
- Agricultural runoff has been implicated in the proliferation of harmful algal blooms and hypoxia, or "dead zones," in Lake Erie.
- Implementing best management practices to ensure appropriate fertilizer application can significantly reduce fertilizer runoff.
- Decision support systems provide farmers with data-driven tools to take a smart farming approach, reducing labor, limiting fertilizer use, minimizing environmental impact, and maximizing yields.

Nutrient pollution costs the US over $2 billion per year in drinking water treatment, property values, lost recreation, and recovery of threatened and endangered species. In Lake Erie, runoff from agricultural fields is the major source of nitrogen and phosphorus pollution. 70% of the agricultural nutrients washing into Lake Erie are from commercial fertilizer application, while 30% are from animal manure.

Photo by US Department of Agriculture

Current Research & Outcomes

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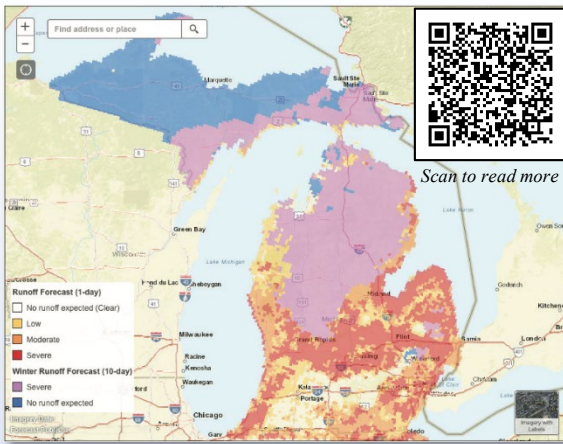
Runoff Risk decision support tools are real-time forecasts developed by the NOAA National Weather Service. They warn farmers of unsuitable conditions for fertilizer application up to 10 days in advance of high-risk runoff events.

- Operational Runoff Risk tools, developed through a collaborative effort with the National Weather Service and Great Lakes states, offer real-time forecasting guidance about when to avoid applying fertilizers due to the likelihood of a runoff event.
- Runoff Risk tools are currently available in four Great Lakes states: MI, MN, OH, WI.
- The next generation of Runoff Risk tools are being developed to use output from the NOAA National Water Model. The improved tools will feature finer-scale forecasts and continuous improvements, allowing farmers to see future conditions in their local area and plan applications more precisely.
- Other watershed models are being used to evaluate potential water quality benefits of using Runoff Risk in Lake Erie watersheds.

Research & Management Needs

- Engagement with fertilizer applicators to better understand their needs and maximize their use of the Runoff Risk tools.
- Research to determine the agricultural, economic, and environmental impacts of the tool on reducing the amount of nutrients reaching stressed water bodies, such as Lake Erie.
- Support for the development and coordination of Runoff Risk Decision Support in other Great Lakes states (NY, IN, IL).

Fertilizer is typically applied during winter and spring, which are the riskiest times of year for runoff from rain and snowmelt. Runoff from only a few large events can be a significant proportion of annual nutrient losses from agricultural areas. Understanding farmers' information needs and creating tools to meet them will help farmers get the timing right to keep their nutrients on the land.

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