Runoff Risk: A Decision Support Tool for Nutrient Applications

Current & Proposed Ecosystem IDSS Utilizing NWS Modeling to Help Improve the Nation's Water Quality

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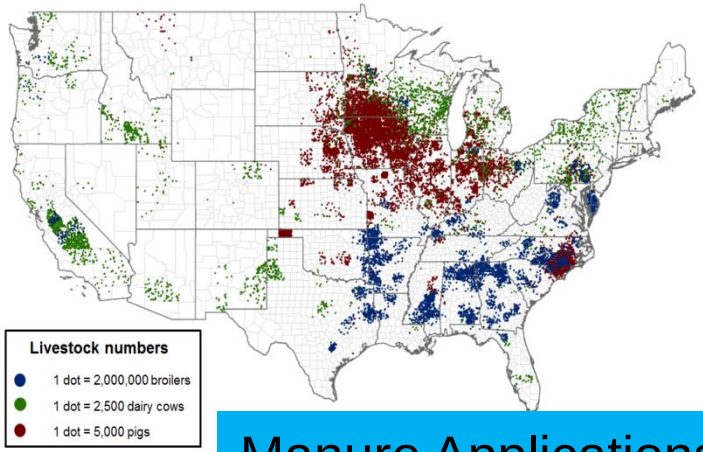
26 August 2015

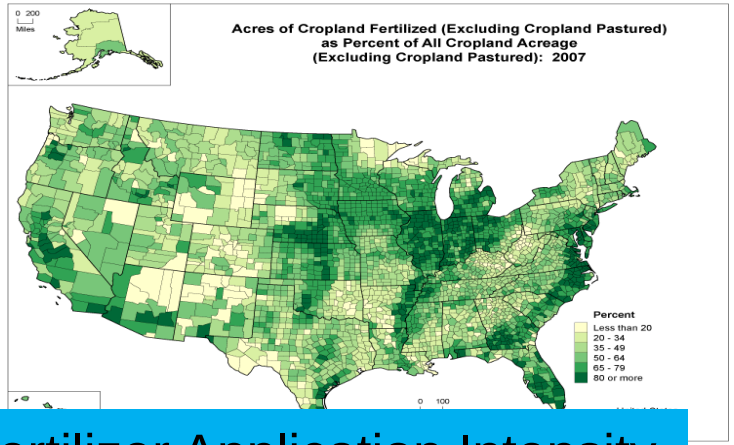
Food Production Necessary… However

- **2.2 million farms cover 20% U.S. land area**
- **$200 billion/year industry and employs 1/6 civilian workforce**

- **Significant contributor to non-point source nutrient pollution**
  - Affecting 50% U.S. streams, 78% coastal areas, 64% shallow wells
  - Creating and intensifying harmful algal blooms and hypoxic zones
  - Impacting human health, the environment, and the economy

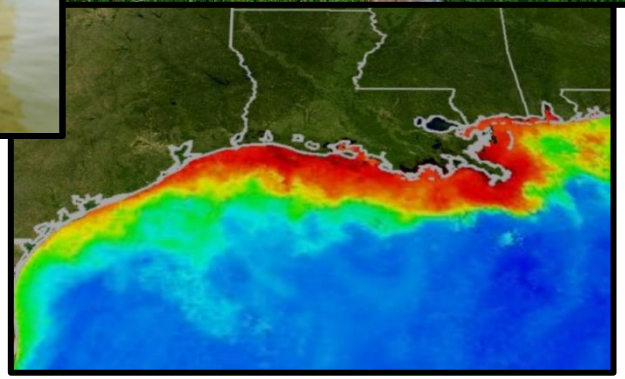


Manure Applications



Fertilizer Application Intensity

Nutrient Pollution Increasingly Identified as an Ecological Concern



Runoff Risk: What is it?

- Decision support tool for agricultural nutrient applicators
- Identifies threat of significant future runoff in both space and time
- Produced multiple times daily while modeling 10 days into future
- Developed in collaboration with states and partners to incorporate ***state specific*** application rules and guidelines
- States make an investment (time/website/management) and act as the tool owner and presenter to the public
- Fulfills strong desire/need for web/mobile based decision support tool for short-term application timing

How can the NWS help?

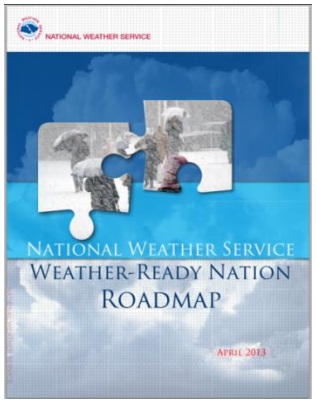
- **Real-time forecasting makes *NWS uniquely suited* to fill the void and meet the desire for national modeling support**
- **Timing of nutrient applications matters**
  - A few large events can carry most nutrients off fields
  - These significant events could negate year-long adherence to BMPs
- **Runoff Risk supplements "Right Time" guidance of 4R's**
  - Warn of risk of runoff → delay application → potentially reduce losses
  - Provides farmers with second opinion (back-up perspective)
- **Runoff Risk incorporates factors farmers already use**
  - Soil moisture, precip, snow water content, warming temps, etc.

Right Source Right Rate Right Time Right Place

Why should NWS help?

- **NOAA/NWS strategic plans and WRN address this issue**
  - Leverage current capabilities into new IDSS
  - Address water quality issues and economic impacts
  - New partnerships and national/regional/local collaboration
  - Support NOAA and NOS to reduce hypoxic zones and HABs

- **Supports the creation of Runoff Risk IDSS as a NOAA/NWS Ecological Forecast Service tool addressing nutrient pollution**

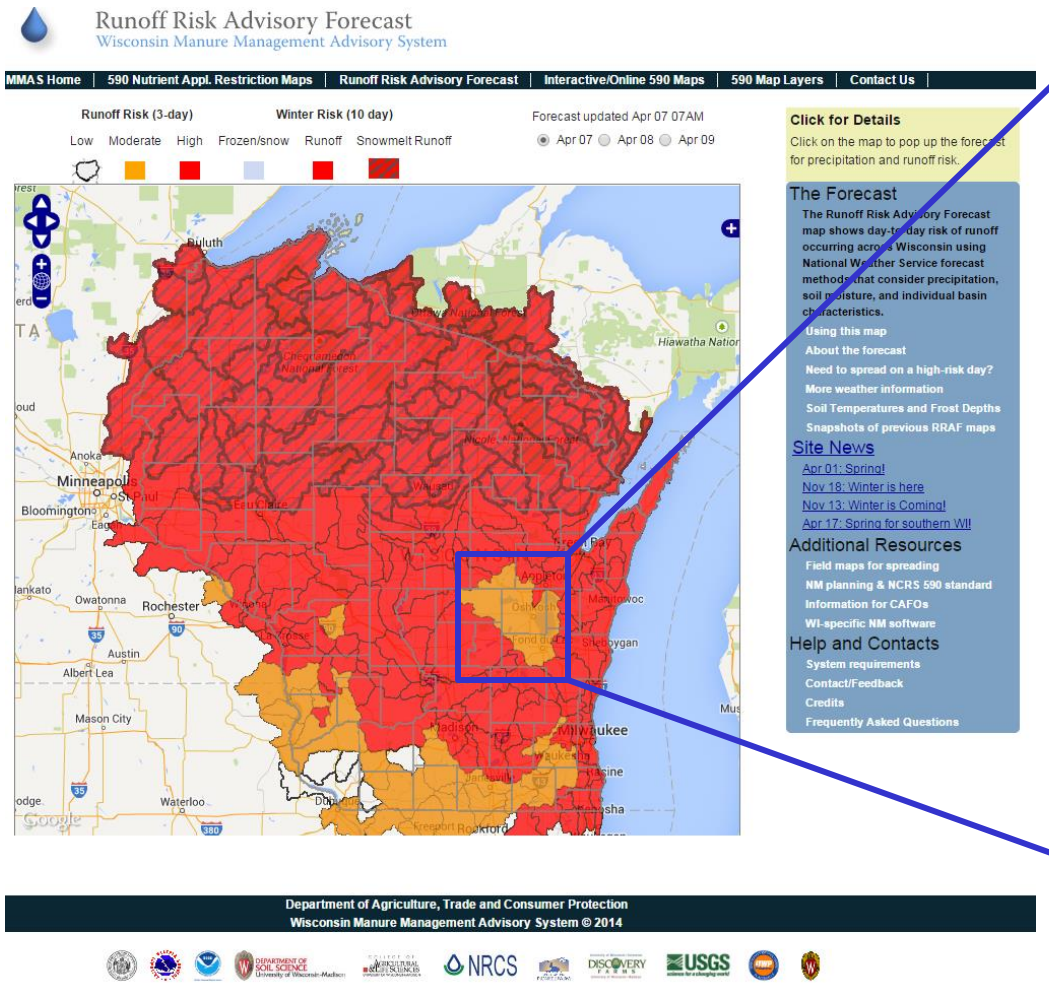


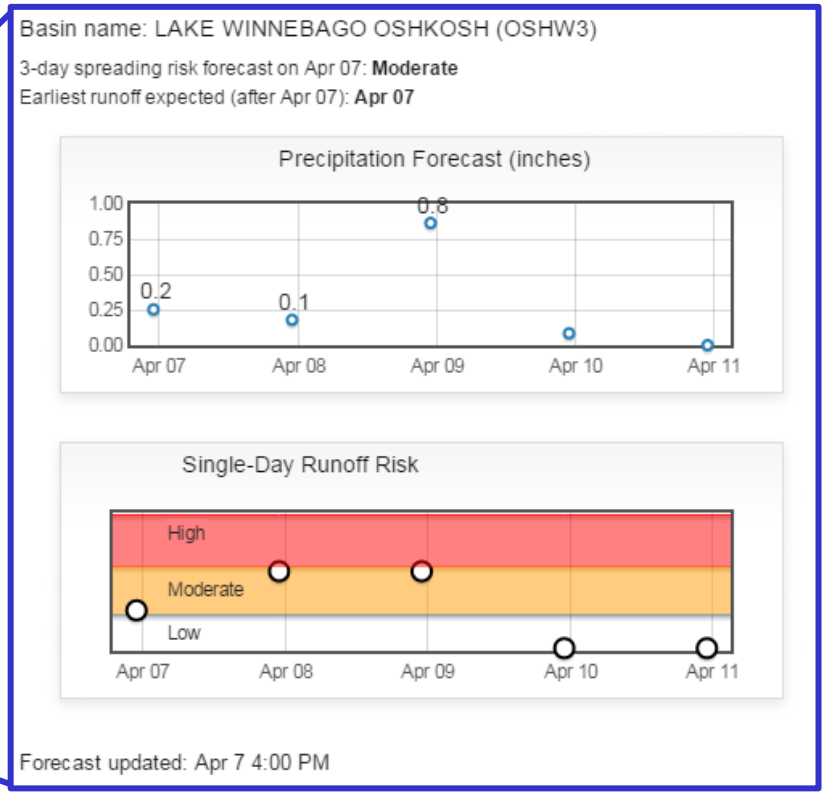
Runoff Risk in Wisconsin

- Started in 2009, Live in 2011
- DATCP built, owns, and maintains the website (Public Face)
- First generation tool uses operational lumped model
- Spatial scale has always been a concern
- RRAF conditioned by analysis with observed field runoff
- Important to communicate limitatio

Wisconsin's RRAF

Runoff Risk Advisory Forecast Updated 3 Times Per Day



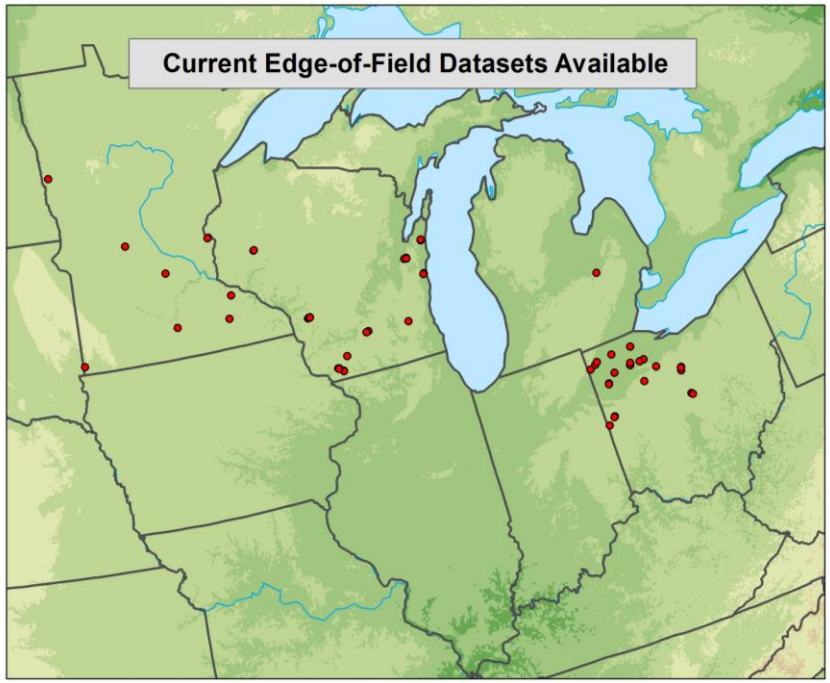


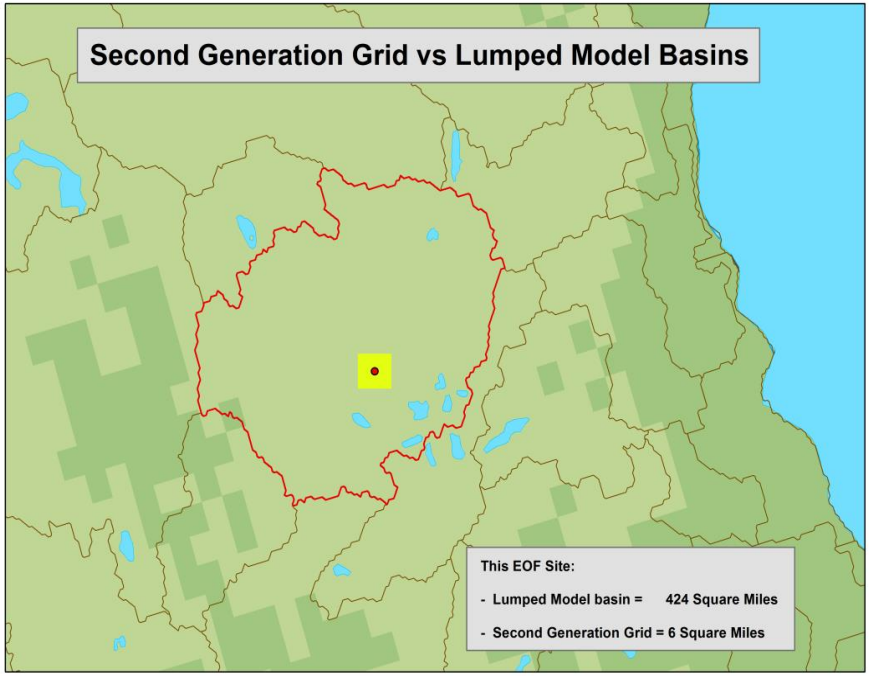
Attention, Inquiries, & Momentum

- **Wisconsin incorporated RRAF into state nutrient reduction plan**
- **Mentioned in 2014 Government Accountability Office (GAO) report on freshwater**
- **Other federal agencies are supportive and interested:**
  - Briefed senior NRCS scientists and federal HTF members
- **GLRI Priority Watershed Group**
  - New states engaged (OH and MI)
  - Funding development and expansion of 2nd generation tool

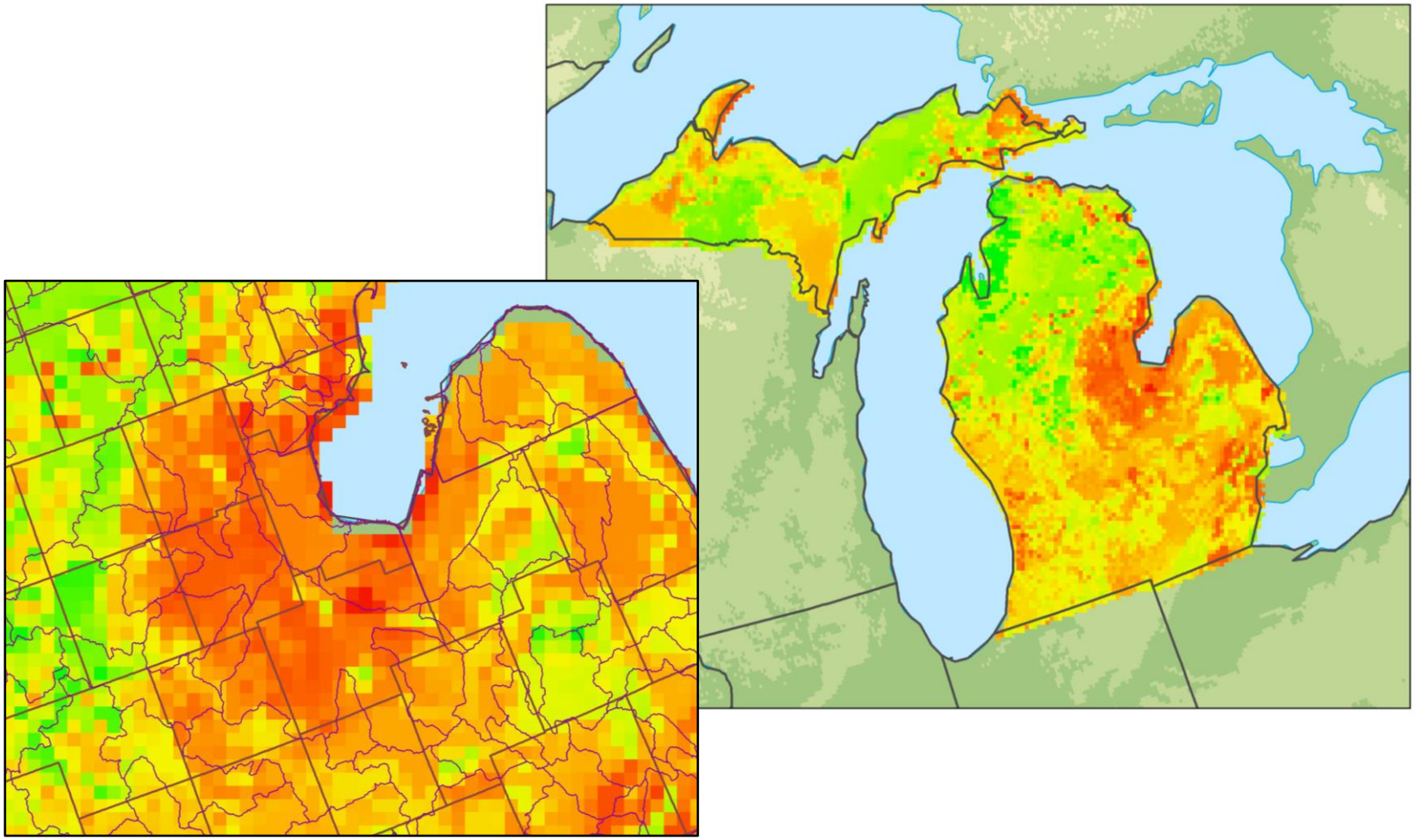
Second Generation RRAF

- **Transition from lumped model to distributed (4km x 4km grid)**
  - Spatial scale was a concern: 300 mi^2 → 6 mi^2
  - Requires new model setup, all new analysis
  - Collecting more edge-of-field runoff data

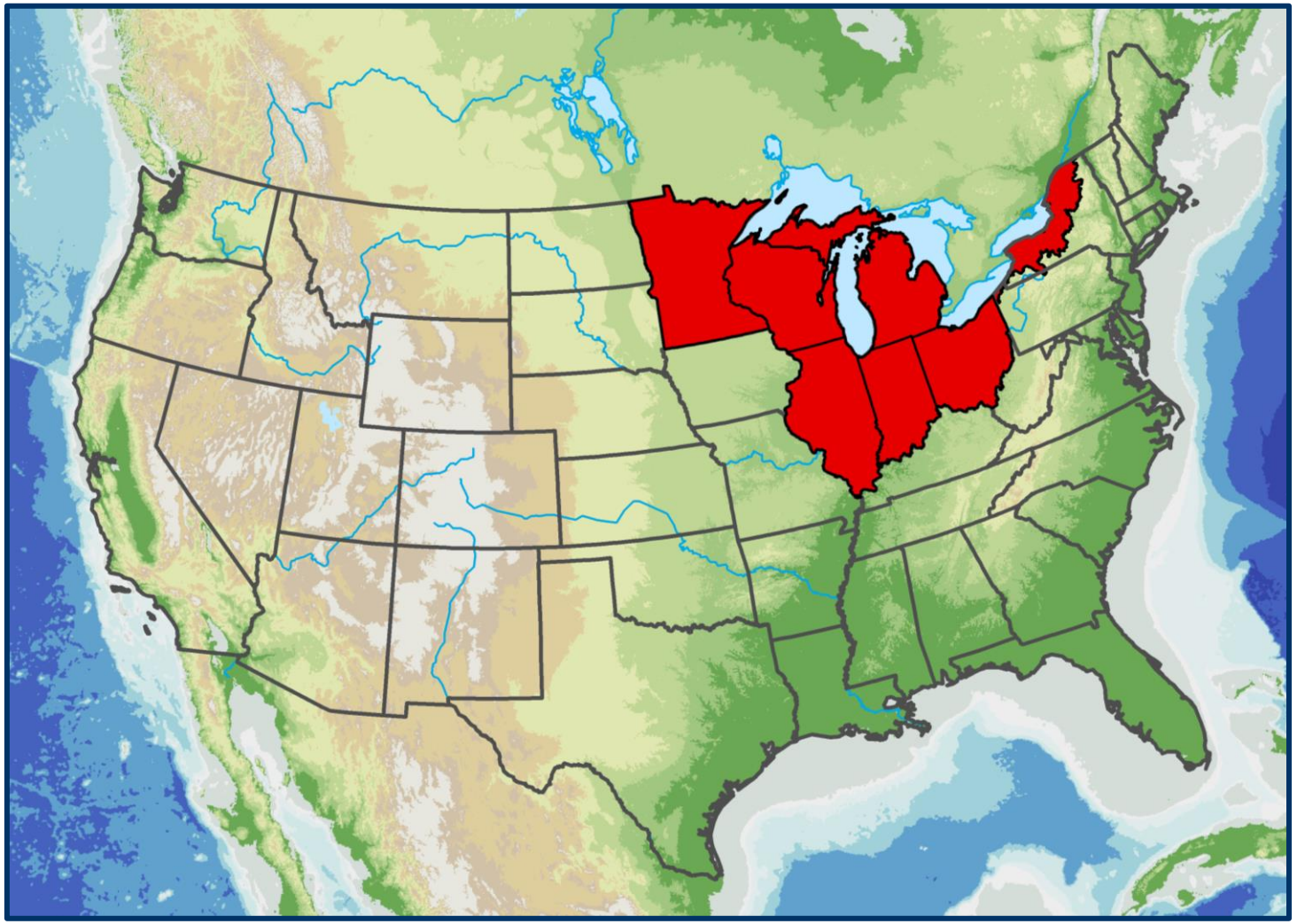




Second Generation Mock-up



Proposed Expansion via GLRI



Collaboration Growing & Essential

Established

THE UNIVERSITY of WISCONSIN MADISON

DISCOVERY FARMS WISCONSIN

USGS
science for a changing world

DISCOVERY FARMS MINNESOTA

USDA ars
United States Department of Agriculture
Agricultural Research Service

Ohio Department of Agriculture

THE OHIO STATE UNIVERSITY

NRCS
Natural Resources Conservation Service

Sea Grant
Michigan

Sea Grant
Ohio Sea Grant College Program

MICHIGAN STATE UNIVERSITY EXTENSION

Starting

Key Points

- **First-of-its-kind real-time DSS focused on timing of any surface applied manure and fertilizer to reduce ag-field nutrient losses**
- **Meets numerous initiatives and goals in NOAA/NWS strategic plans**
- **Multi-agency collaboration with state led working groups and state investment, ownership, and delivery**
  - State ownership and delivery required due to state specific rules for applications
- **Increasing demand for this type of tool by increasingly sophisticated users and state agencies**
- **Requires little effort to incorporate into daily farming routine/ management could produce positive impact:**
  - More efficient fertilizer usage = save money
  - Decrease nutrient loads = improve environment

More Information

- **Wisconsin RRAF**
  - Google “Wisconsin RRAF”
    - *www.manureadvisorysystem.wi.gov/app/runoffrisk*
  - Background Information
    - *NOAA Tech Report NWS 55*
    - *http://docs.lib.noaa.gov/noaa_documents/NWS/TR_NWS/*
- **Further Questions & Comments**
  - Dustin Goering *(dustin.goering@noaa.gov)*
  - Steve Buan *(steve.buan@noaa.gov)*