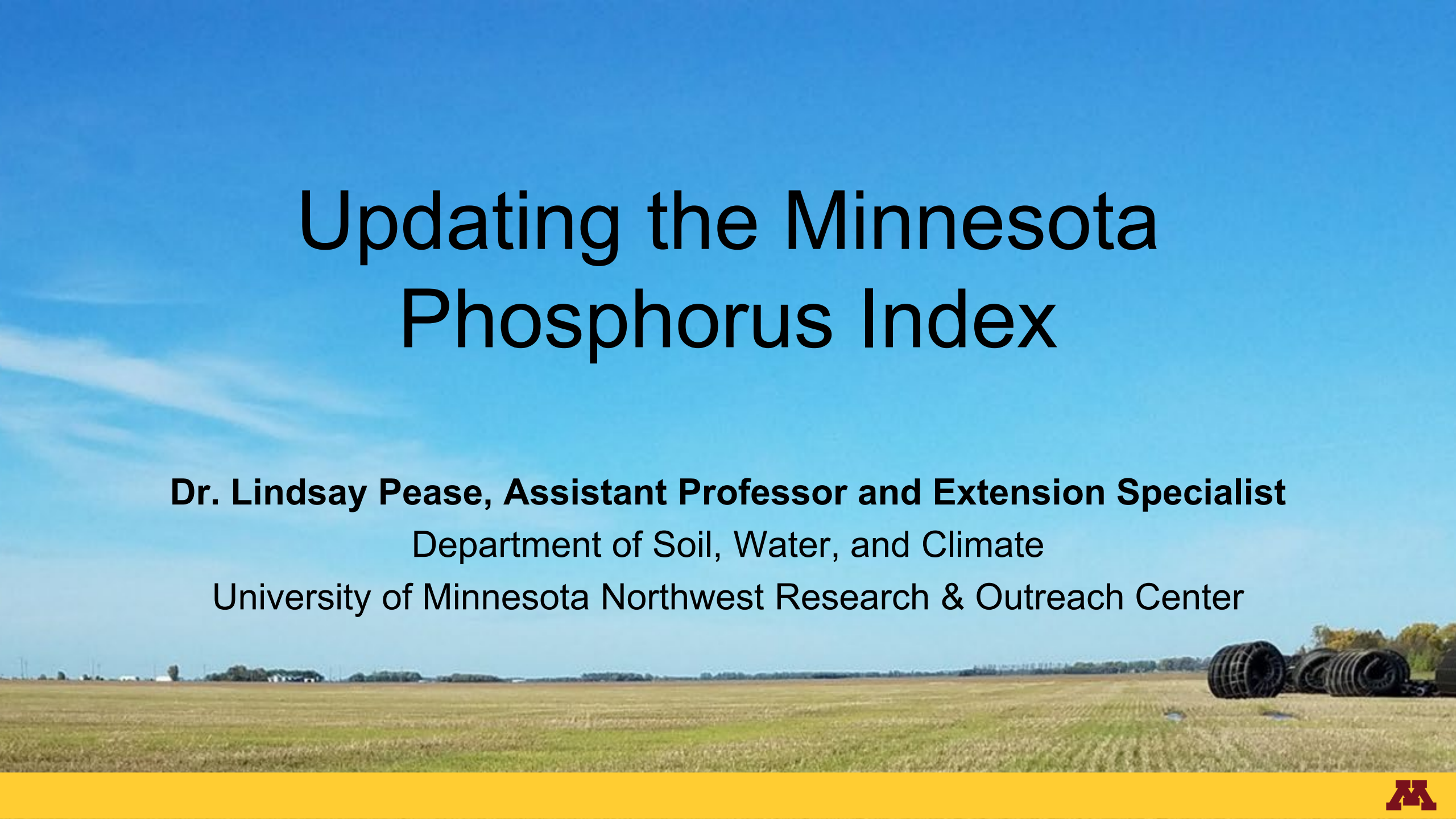
Updating the Minnesota Phosphorus Index

Dr. Lindsay Pease, Assistant Professor and Extension Specialist
Department of Soil, Water, and Climate
University of Minnesota Northwest Research & Outreach Center



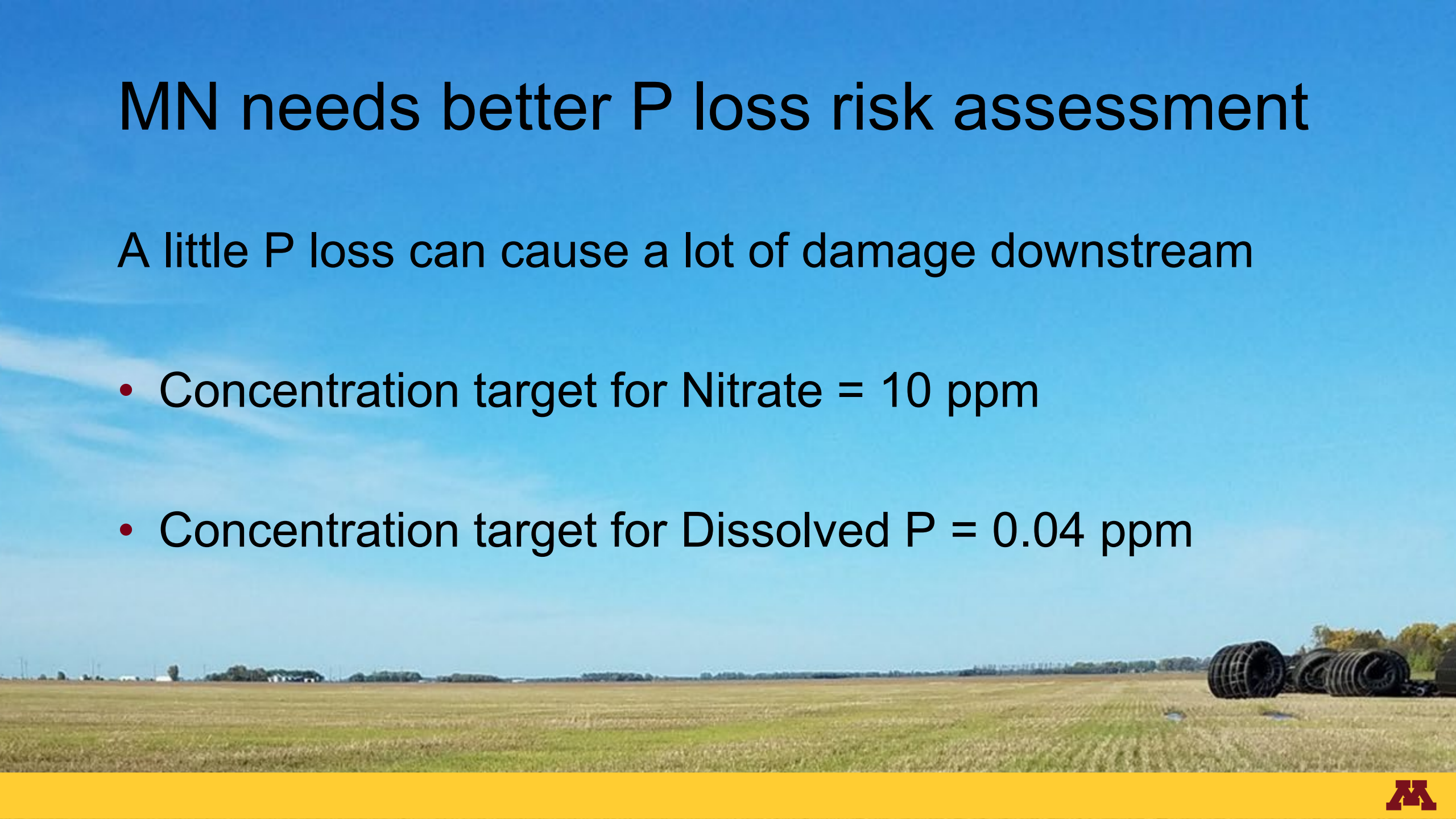
Why do we need a change?

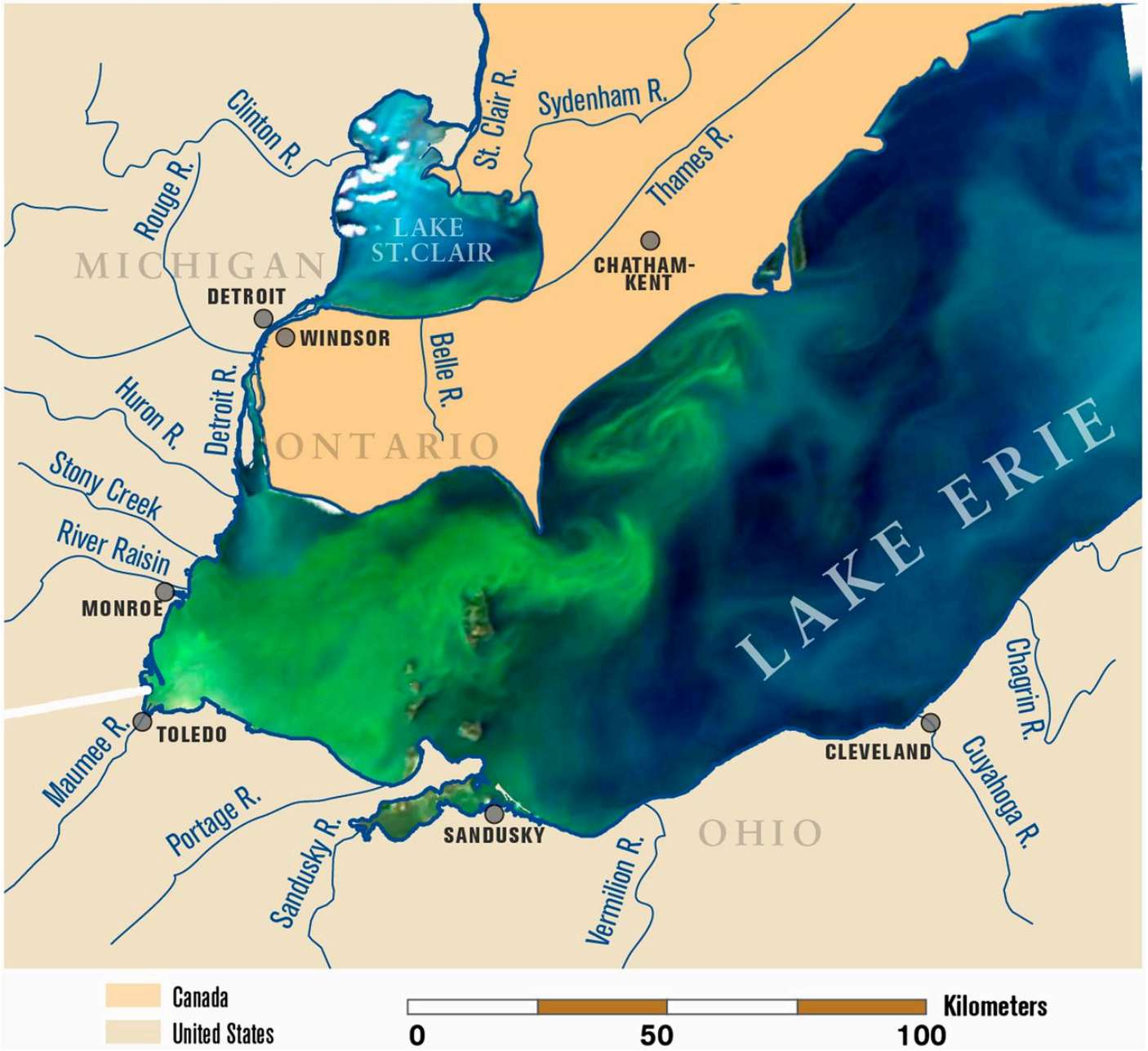
1. Growing need for P loss risk assessment in MN
2. Edge-of-field data collection has vastly improved since 2006
3. Revised Universal Soil Loss Equation (RUSLE2) trainsitioning to the Water Erosion Prediction Project (WEPP) in NRCS policies
4. Program is not user-friendly

MN needs better P loss risk assessment

A little P loss can cause a lot of damage downstream

- Concentration target for Nitrate = 10 ppm
- Concentration target for Dissolved P = 0.04 ppm





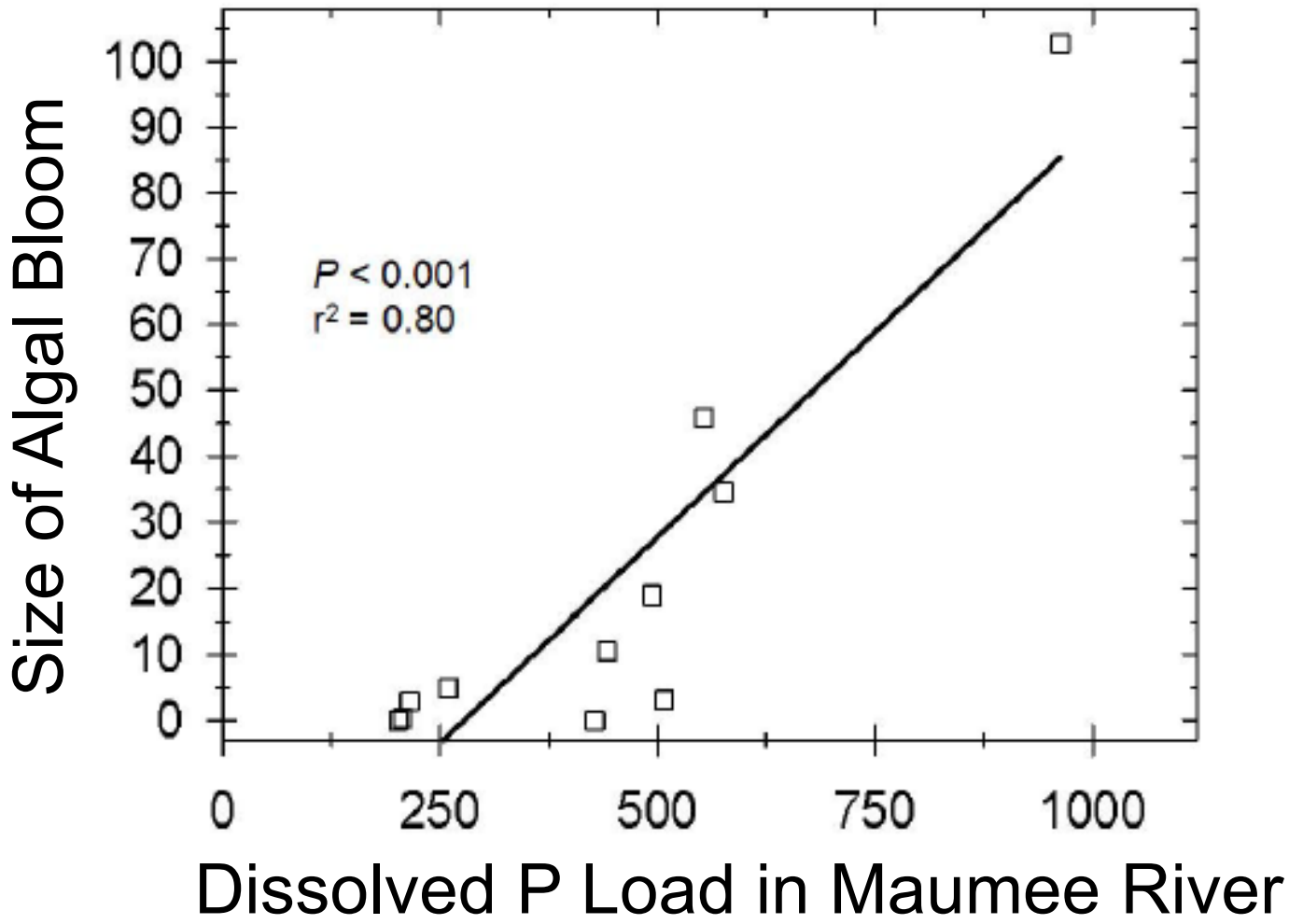
Michalak A M et al. PNAS 2013;110:6448-6452

MODIS satellite Image of Lake Erie on September 3, 2011

PNAS

“400,000 in Ohio without drinking water”
-Chicago Tribune, 8/3/14

Dissolved P Load Predicts Bloom Size



Kane et al. 2014


Ancient Roman Baths
Bath, England

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Algae covers stretch of beach on Lake Winnipeg

Beachgoers say Grand Beach was covered in green sludge on Monday

Holly Caruk · CBC News · Posted: Aug 15, 2016 9:59 PM CT | Last Updated: August 15, 2016

Photo: Harley Hudon

Photo: Monique Andrew

Photo: Gabie Tolkmitt

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Dog owners beware of slimy blue-green algae

Algae Fatal To Dogs Found In Minnesota: Health Officials

Over the last few weeks, reports of dogs dying due to blue-green algae toxicity have been reported in several states.

By William Bornhoft, Patch Staff
Aug 12, 2019 10:06 am CT

DOG DIES AFTER SWIMMING IN ROCHESTER'S FOSTER-AREND POND

KIM DAVID | July 12, 2019

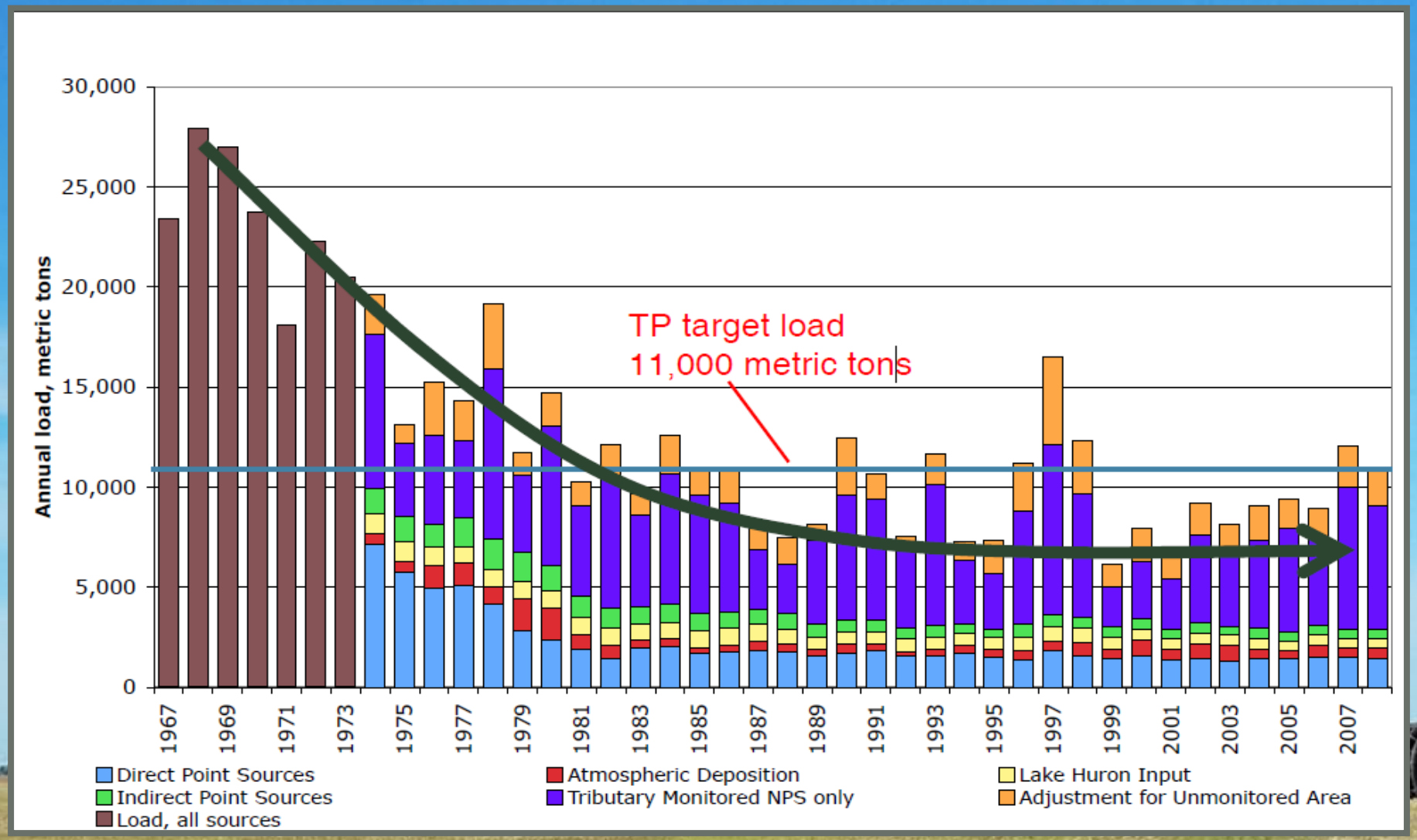
Foster-Arend Park Rochester

Photo: Harley Hudon

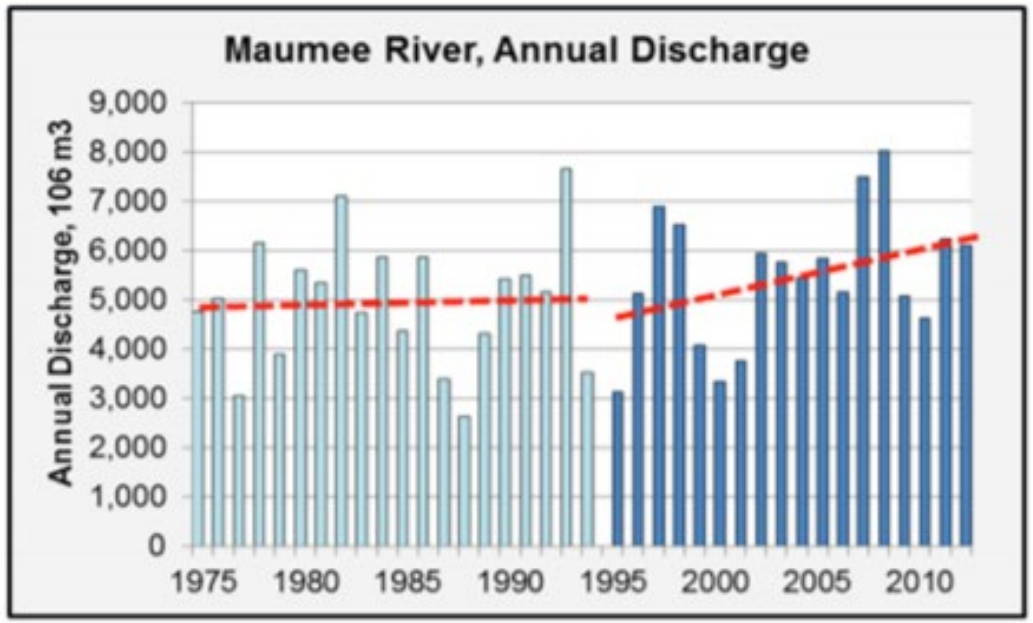
Photo: Gabie Tolkmitt

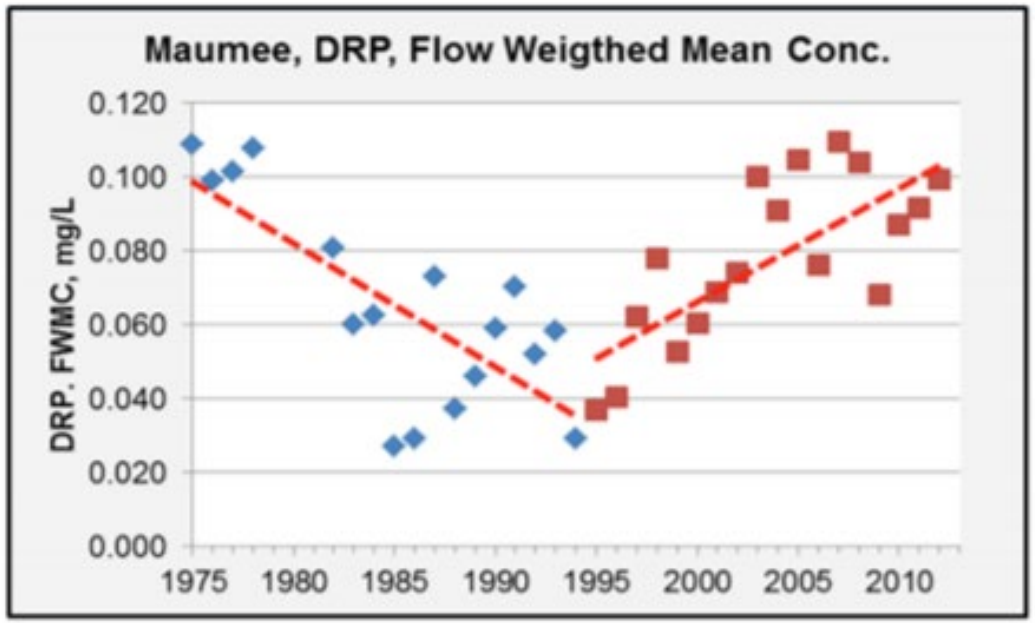

DANGER
AVOID ALL CONTACT
WITH THE WATER
ALGAL TOXINS AT UNSAFE LEVELS
HAVE BEEN DETECTED
FOR MORE INFORMATION GO TO:
WWW.OHIOALGAEINFO.COM
OR CALL 1-866-644-6224
Have fun on the water, but know that blue-green algae are in many Ohio lakes. Their toxins may be, too.
Be Alert! Avoid water that:
• looks like spilled paint
• has surface scums, mats or films
• is discolored or has colored streaks
• has green globs floating below the surface
Avoid swallowing lake water.
For more information, visit
ohioalgaeinfo.com
or call 1-866-644-6224.

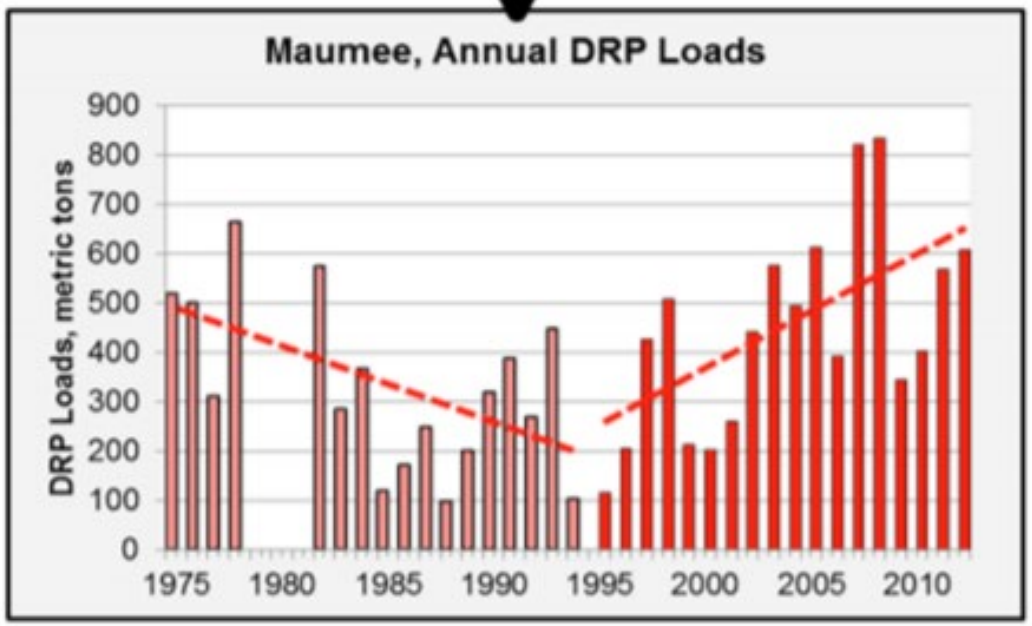
Lake Erie Eutrophication: *Historical Success*



Source: Baker and Richards, Heidelberg University



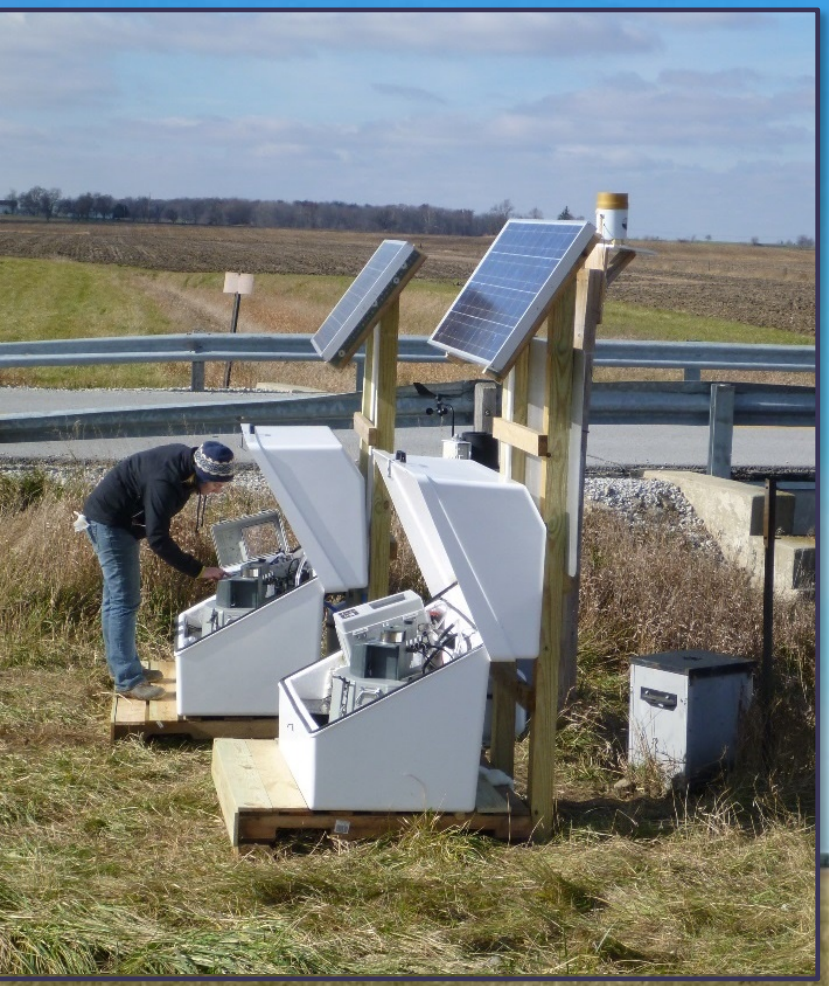




Lake Erie P Task Force Report II (2013)

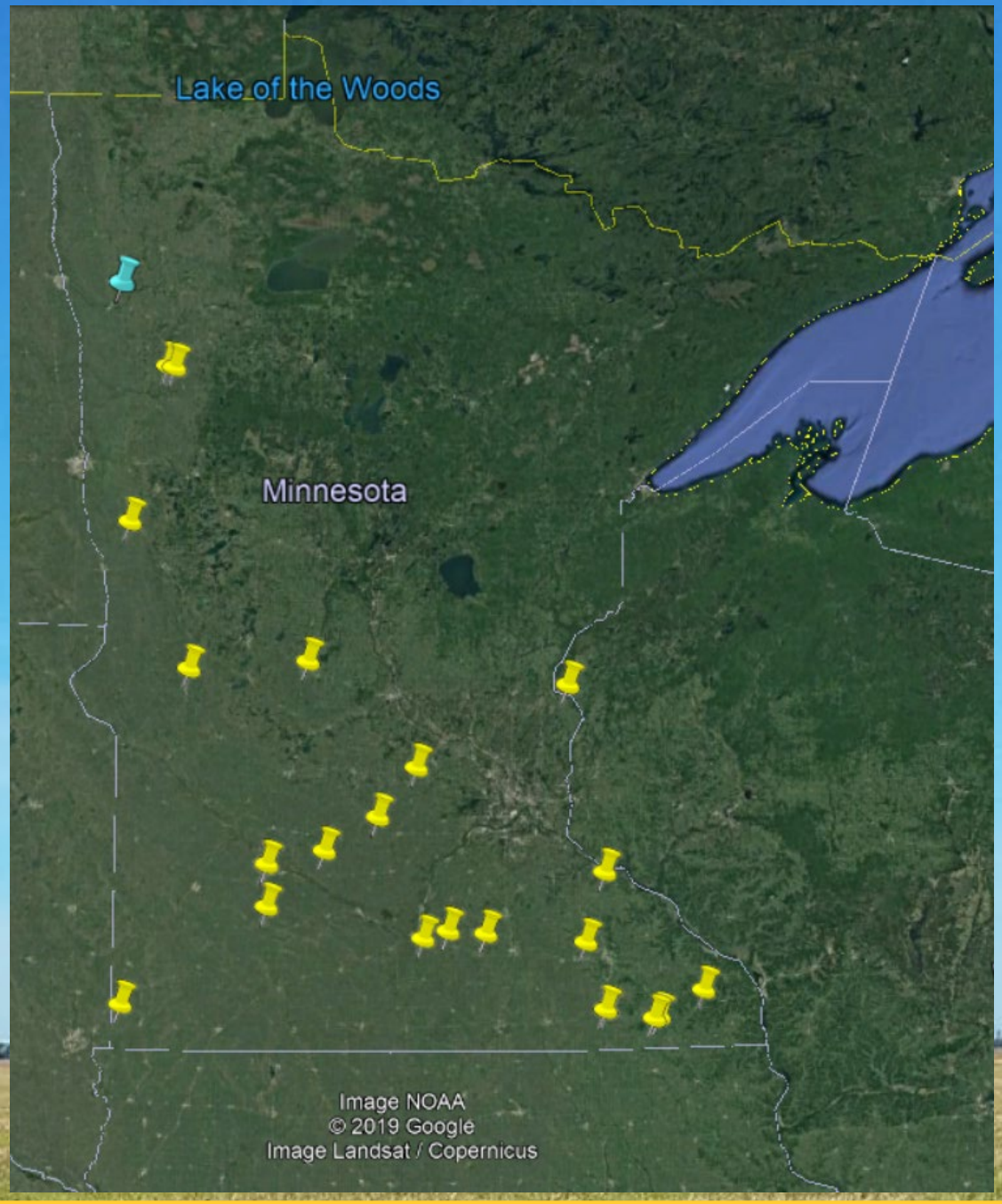
Edge-of-Field Data Collection

On-farm Field Sites



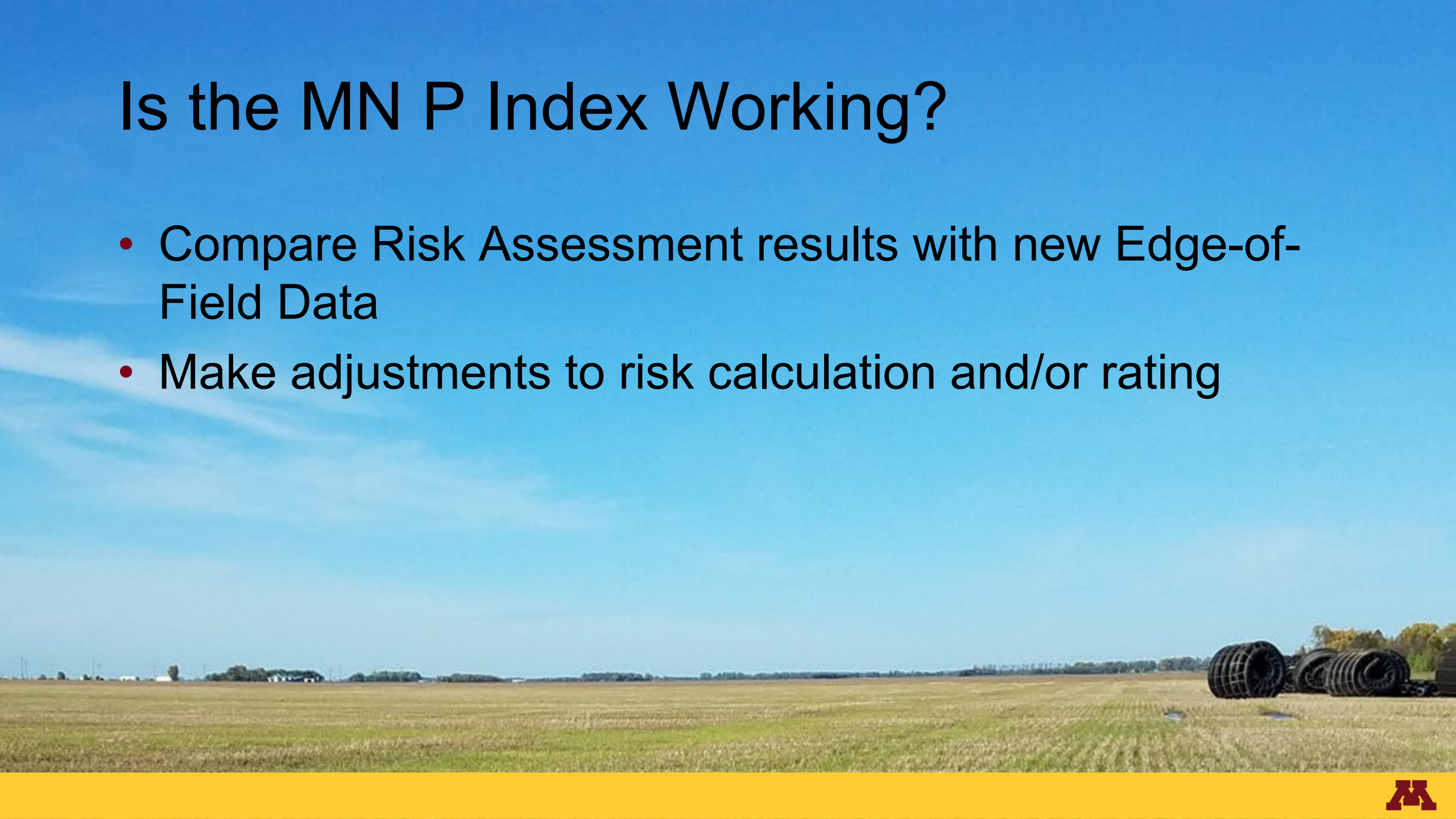
Surface Runoff

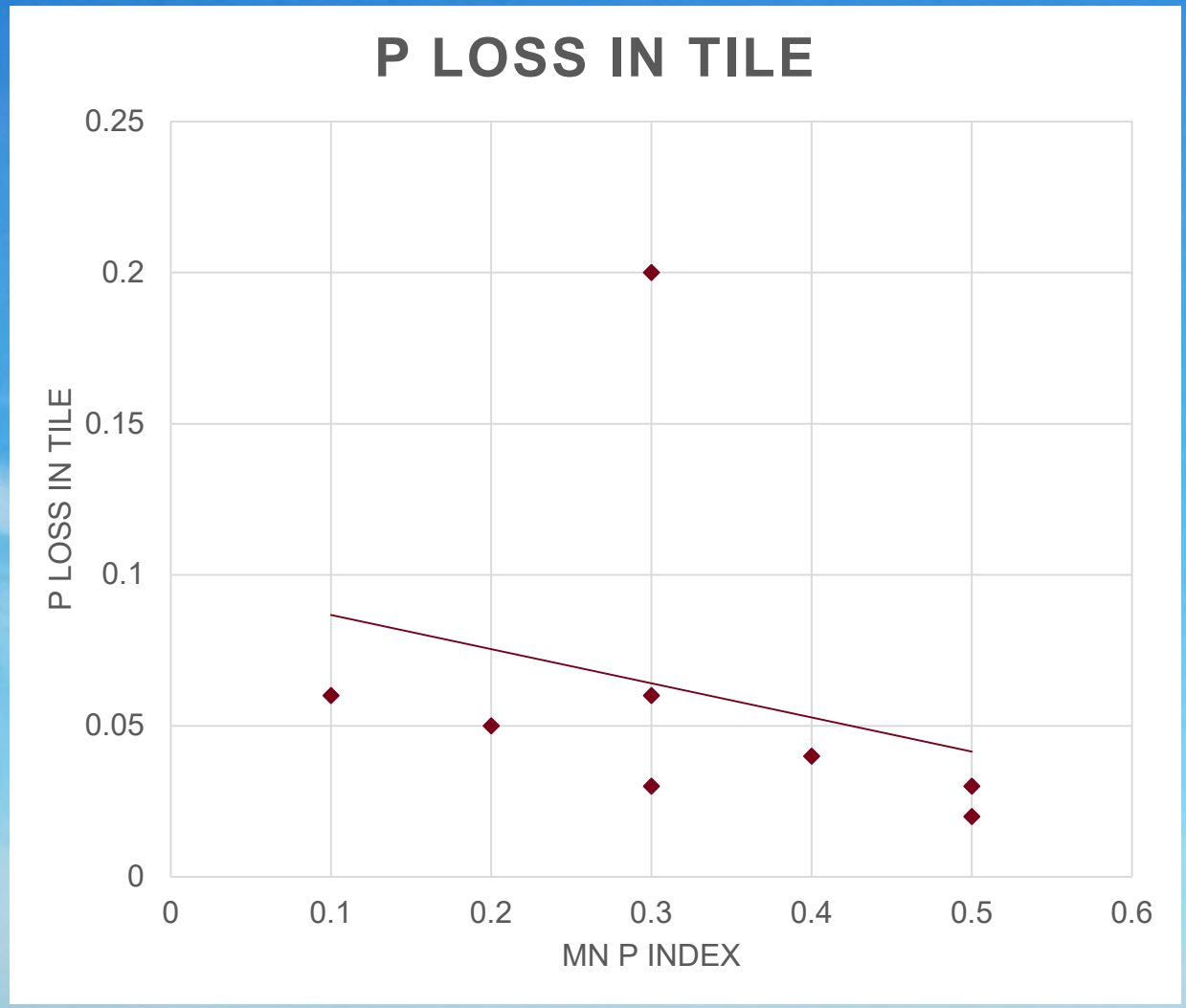
Subsurface Drainage

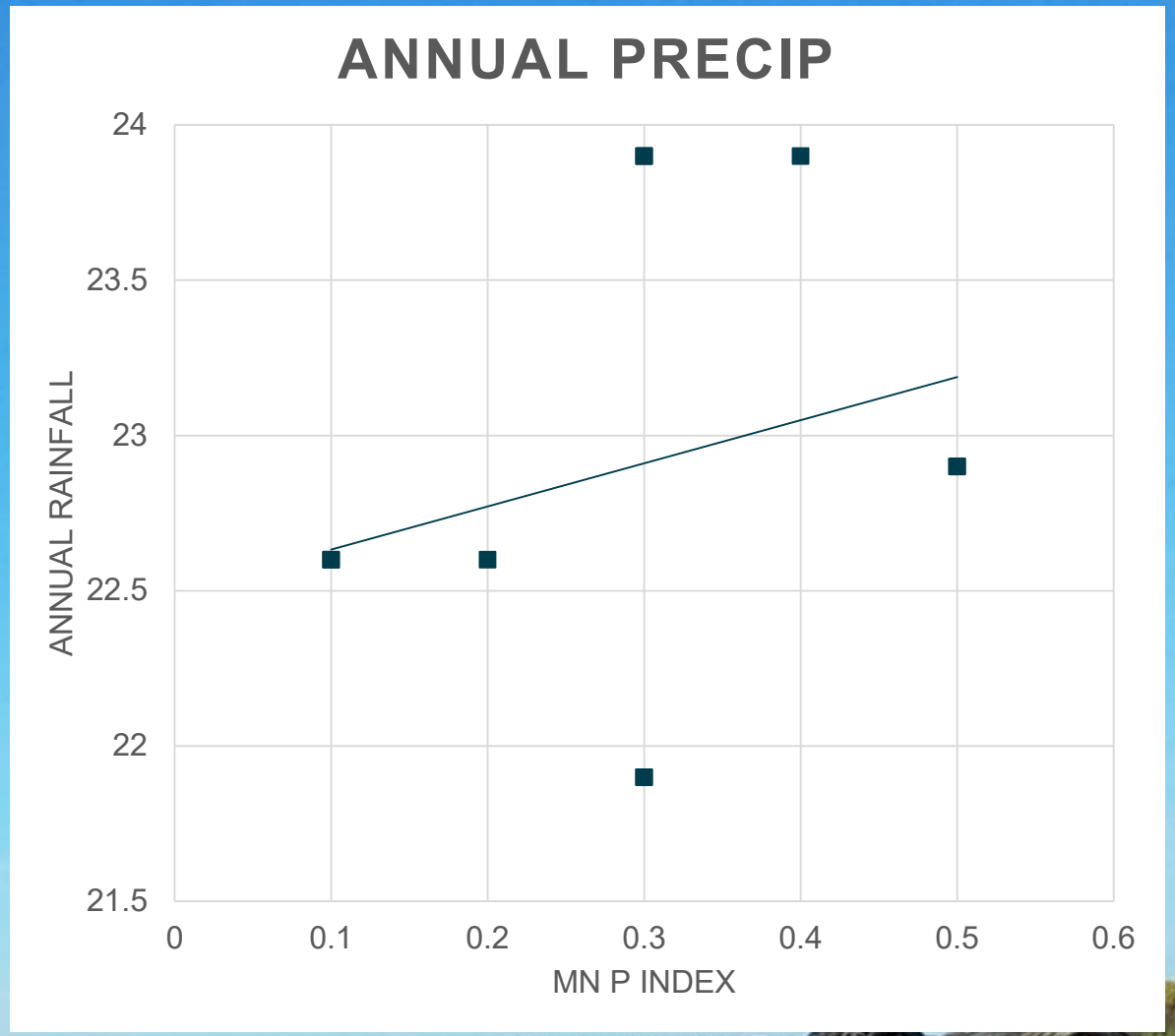

Lake of the Woods
Minnesota
Image NOAA
© 2019 Google
Image Landsat / Copernicus

Is the MN P Index Working?

- Compare Risk Assessment results with new Edge-of-Field Data
- Make adjustments to risk calculation and/or rating




P LOSS IN TILE
0.25
0.2
0.15
0.1
0.05
0
P LOSS IN TILE
0
0.1
0.2
0.3
0.4
0.5
0.6
MN P INDEX


ANNUAL PRECIP
24
23.5
23
22.5
22
21.5
ANNUAL RAINFALL
0
0.1
0.2
0.3
0.4
0.5
0.6
MN P INDEX

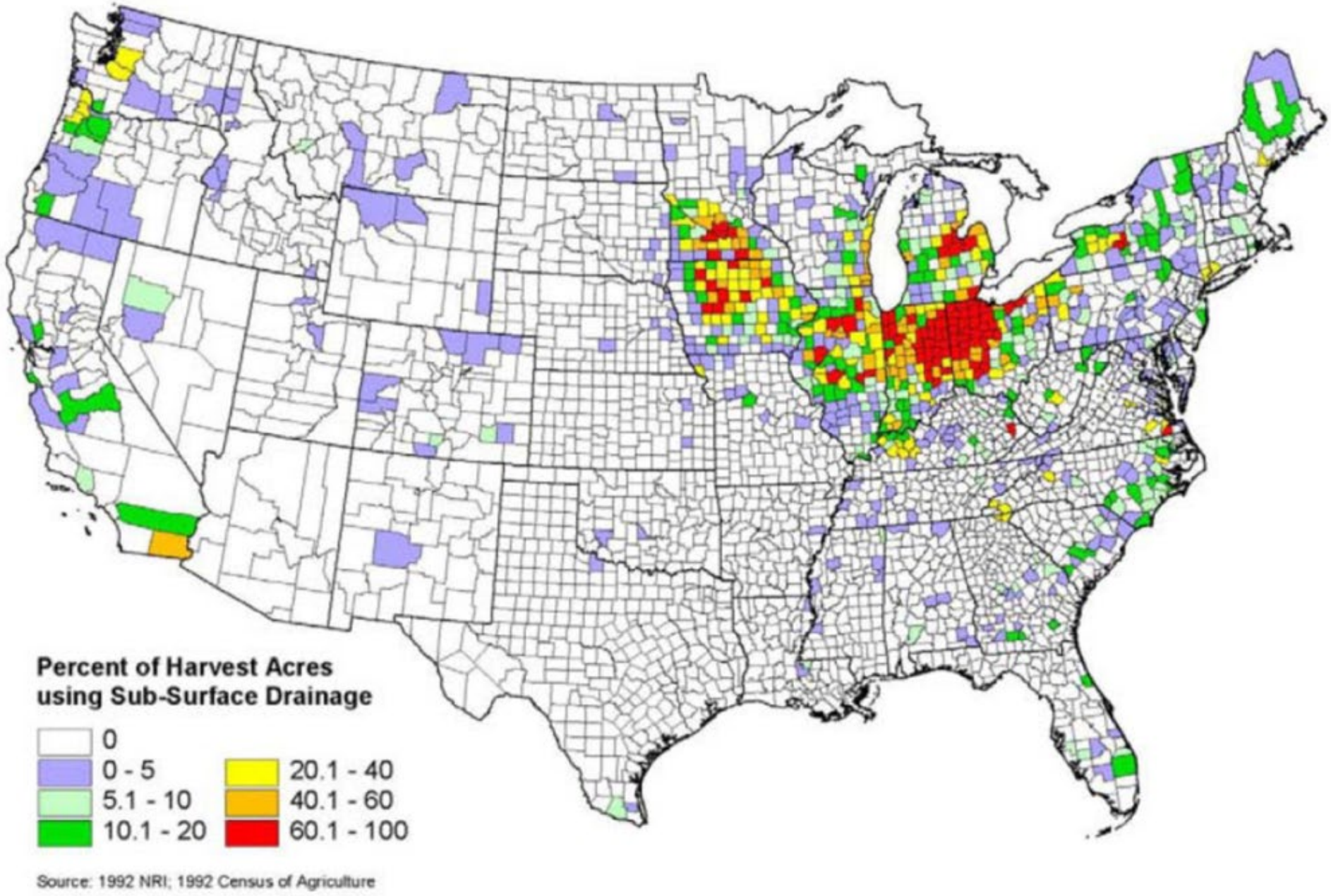
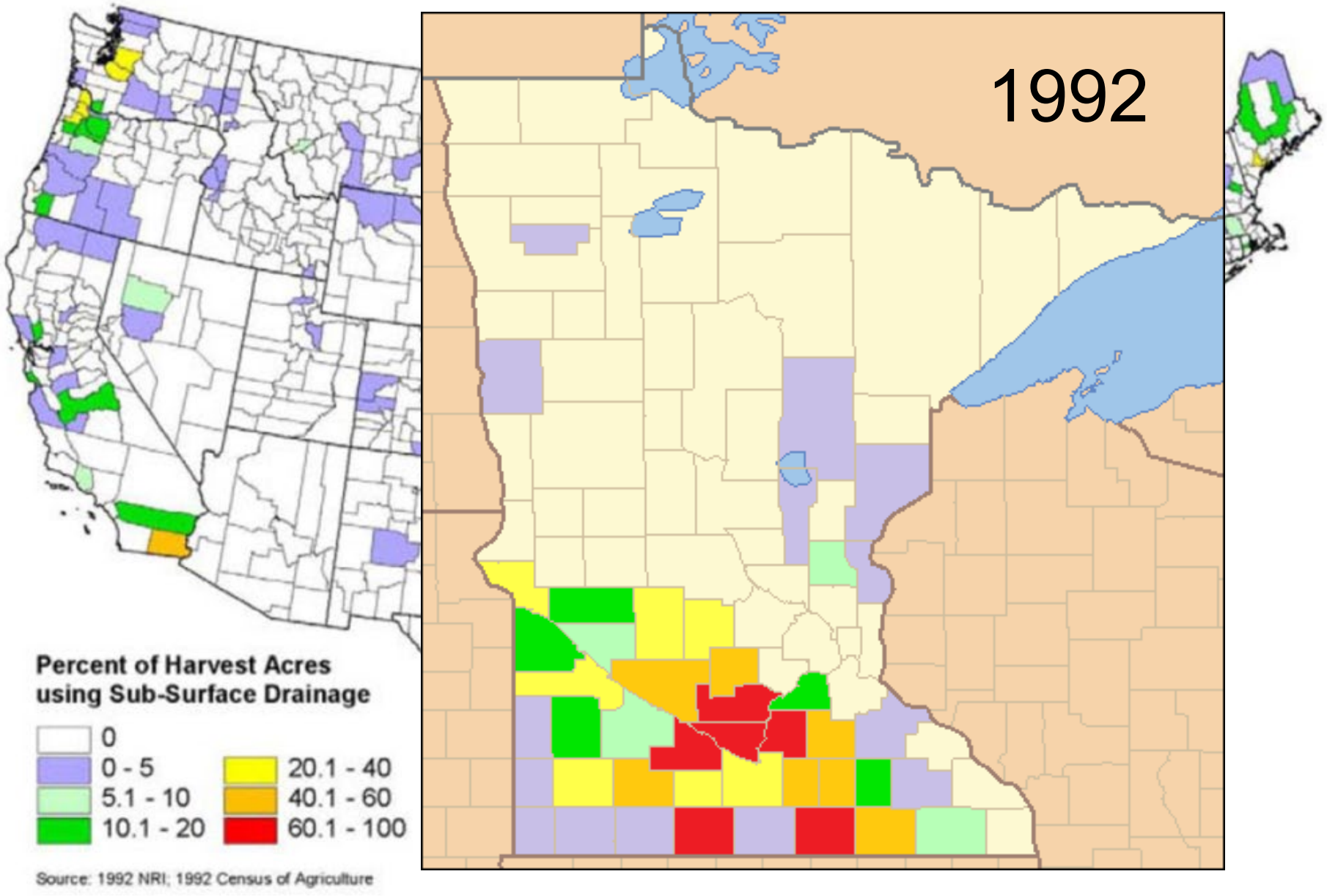


Figure 28 — Percent of harvest acres in the United States using subsurface drainage in 1992. (NRI Census of Agriculture, 1992)



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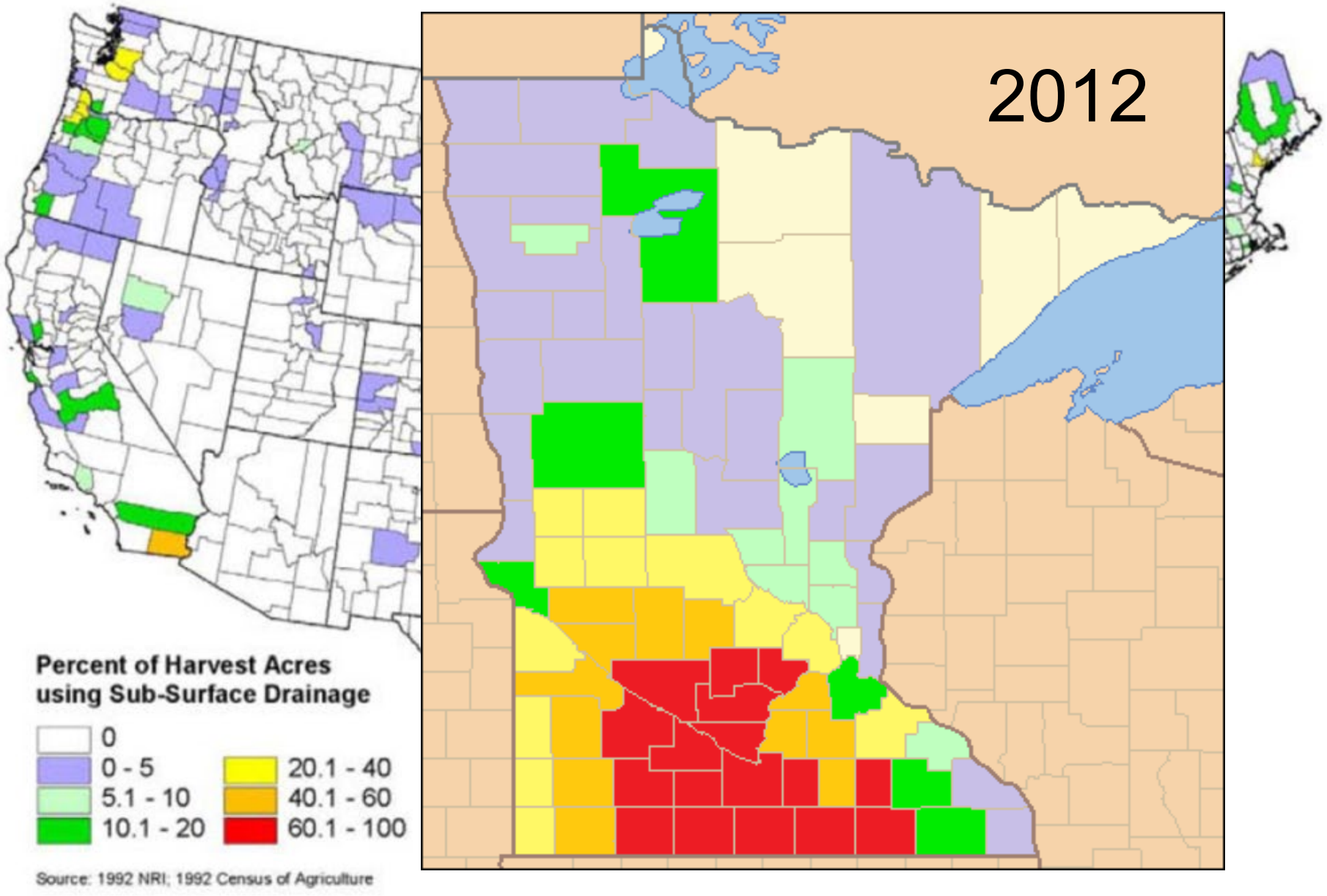
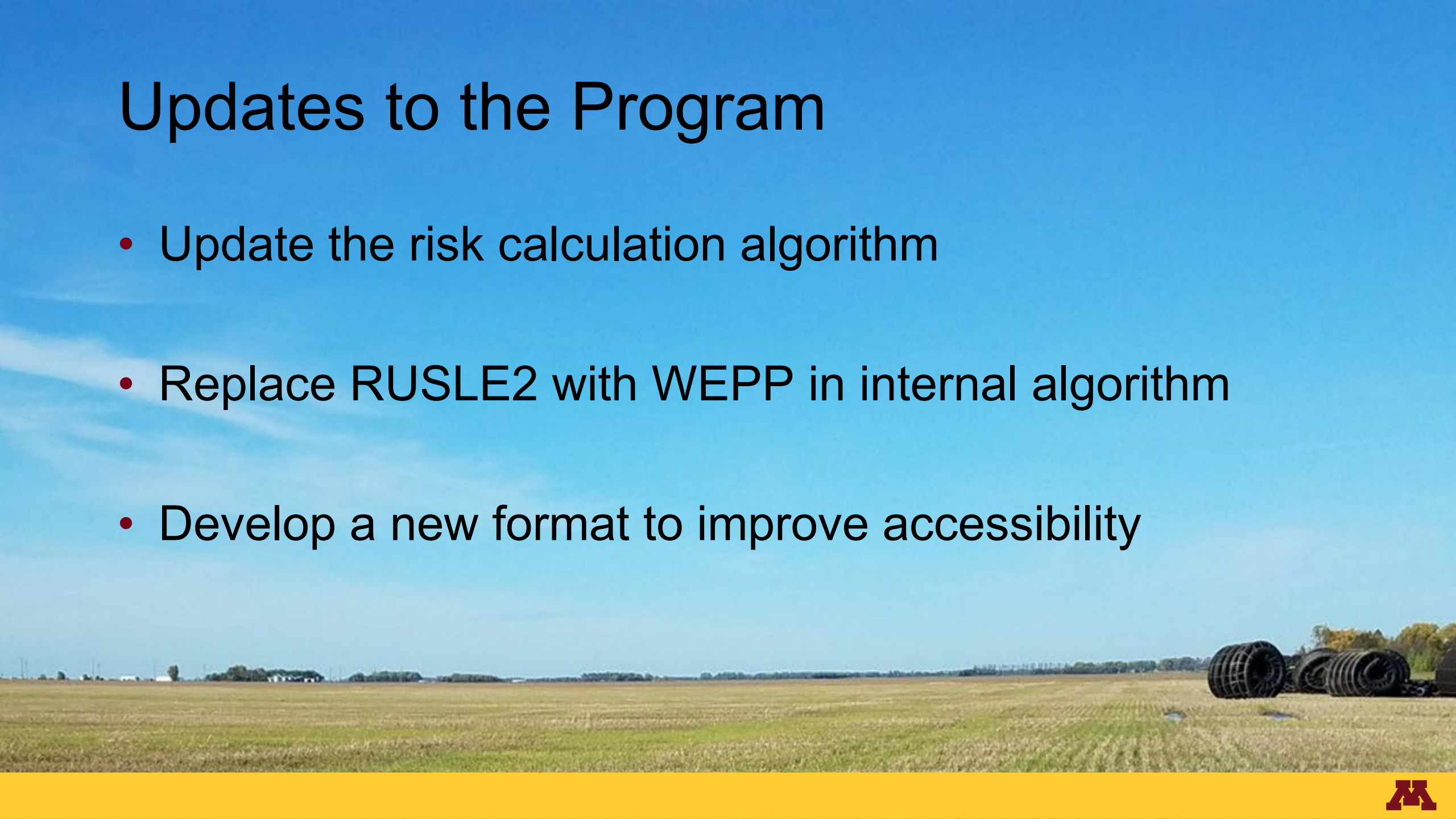


Figure 28 — Percent of harvest acres in the United States using subsurface drainage in 1992. (NRI Census of Agriculture, 1992)

Updates to the Program

- Update the risk calculation algorithm
- Replace RUSLE2 with WEPP in internal algorithm
- Develop a new format to improve accessibility



What's Next?

- MN P Index Assessment (Ongoing)
- Redevelopment of algorithm and program (Spring through Fall 2020)
- Roll out of MN P Index (Winter 2021)
  - In-person training sessions
  - Online training materials

4R Principles of Nutrient Stewardship

RIGHT SOURCE

Matches fertilizer type to crop needs.

RIGHT RATE

Matches amount of fertilizer to crop needs.

RIGHT TIME

Makes nutrients available when crops need them.

RIGHT PLACE

Keeps nutrients where crops can use them.

Image from: nutrientstewardship.org

Soil test phosphorus (P) Interpretation Classes and associated extracted-P concentrations used in Minnesota.

	Minnesota STP Category				
Extractant	Very Low	Low	Medium	High	Very High
	---------- ppm P extracted ----------				
Bray-P	0-5	6-11	12-15	16-20	21+
Olsen-P	0-3	4-7	8-11	12-15	16+

Phosphorus Management

- Don’t use your soil as a bank
- Over-application of P fertilizer isn’t economical

To reduce loss risk:

- Fertilize for each crop
- Band or incorporate P fertilizer

Project Team

Department of Soil, Water, and Climate

- Dr. Lindsay Pease
- Dr. Melissa Wilson
- Dr. Daniel Kaiser
- Dr. Paulo Pagliari
- Graduate student Heidi Reitmeier

Funding through UMN MAES Rapid Agricultural Response Fund

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