Ag Retailers Leading Improvements in Resource Management for Water Quality

Toledo, OH

12 December 2013

IPNI
INTERNATIONAL PLANT NUTRITION INSTITUTE

The 4Rs for the Lake Erie Watershed

4R nutrient stewardship

Tom Bruulsema, Director, Northeast Region, IPNI

Agrium Inc.

Arab Potash Company

Belarusian Potash Company

CF Industries Holdings, Inc.

Compass Minerals Specialty Fertilizers

Incitec Pivot

International Raw Materials LTD.

Intrepid Potash, Inc.

K+S KALI GmbH

The Mosaic Company

OCP S.A.

PotashCorp

Qatar Fertiliser Company (QAFCO)

Simplot

Sinofert Holdings Limited

SQM

Toros Tarım

Uralchem

Uralkali

Formed in 2007 from the Potash & Phosphate Institute, the **International Plant Nutrition Institute** is supported by leading fertilizer manufacturers.

Its mission is to promote scientific information on responsible management of plant nutrition.

IPNI

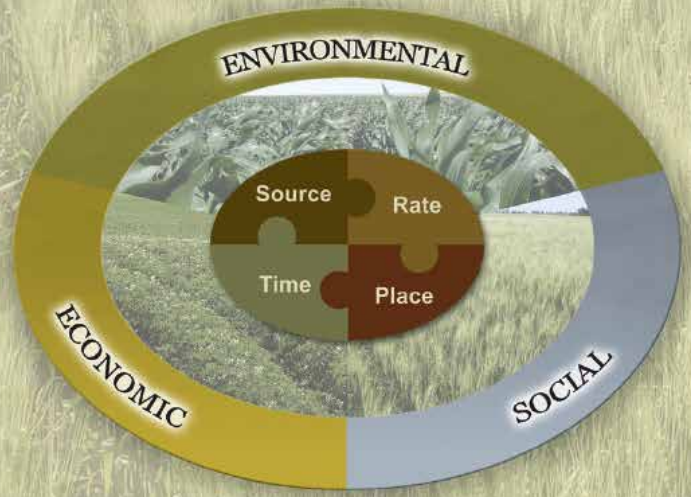
Outline

- **4R Nutrient Stewardship & Sustainability**
- **4R P Management for Lake Erie**
- *Slides: available at http://nane.ipni.net*

4R PLANT NUTRITION

A Manual for Improving the Management of Plant Nutrition

NORTH AMERICAN VERSION



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4R nutrient stewardship

http://nane.ipni.net

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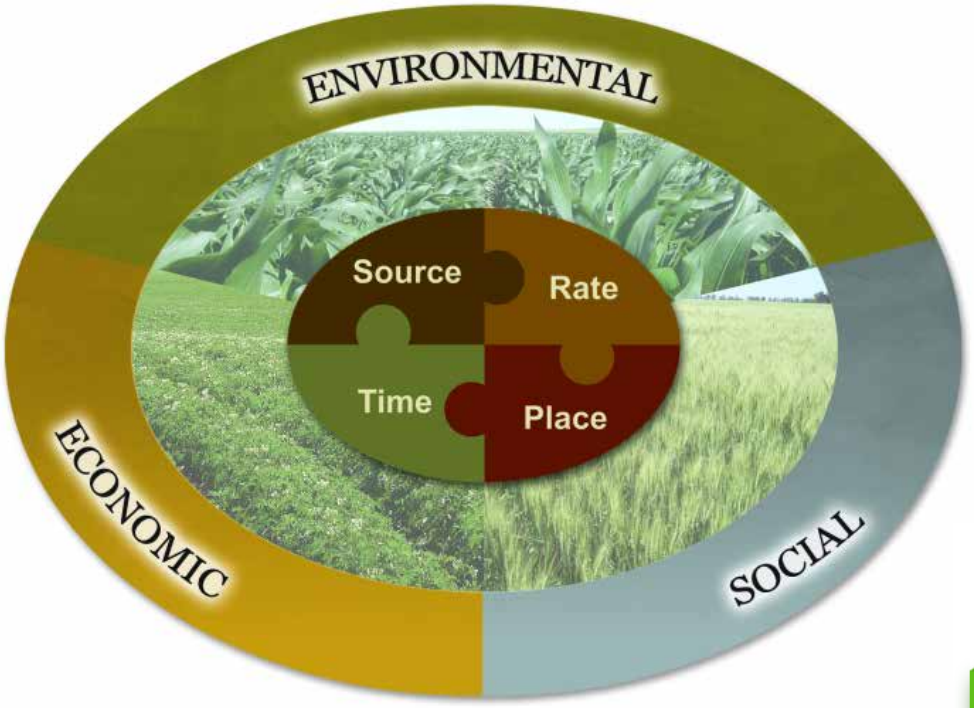
4R: “right” means sustainable



Field to Market™
The Keystone Alliance for Sustainable Agriculture

THE SUSTAINABILITY CONSORTIUM

Walmart SustainabilityHUB

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Home > How To Make A Difference > Fertilizer Optimization

How to Make a Difference - Fertilizer optimization

4R PLANT NUTRITION

4 nutrient stewardship

Stakeholders have a say on performance indicators

- Stakeholders define goals
- Indicators relate to goals
- Producers choose practices

nutrient stewardship

Producers choose practices

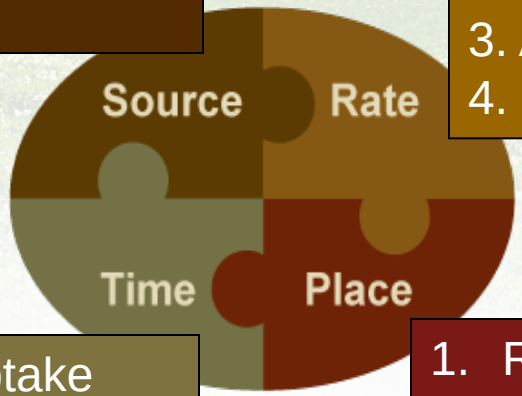
- Practices selected to suit local site-specific soil, weather, and crop conditions
- Conditions may change even on the day of application
- Local decisions preferred

nutrient stewardship

The basic scientific principles of managing crop nutrients are universal

1. Supply in plant available forms
2. Suit soil properties
3. Recognize synergisms among elements
4. Blend compatibility

1. Appropriately assess soil nutrient supply
2. Assess all available indigenous nutrient sources
3. Assess plant demand
4. Predict fertilizer use efficiency

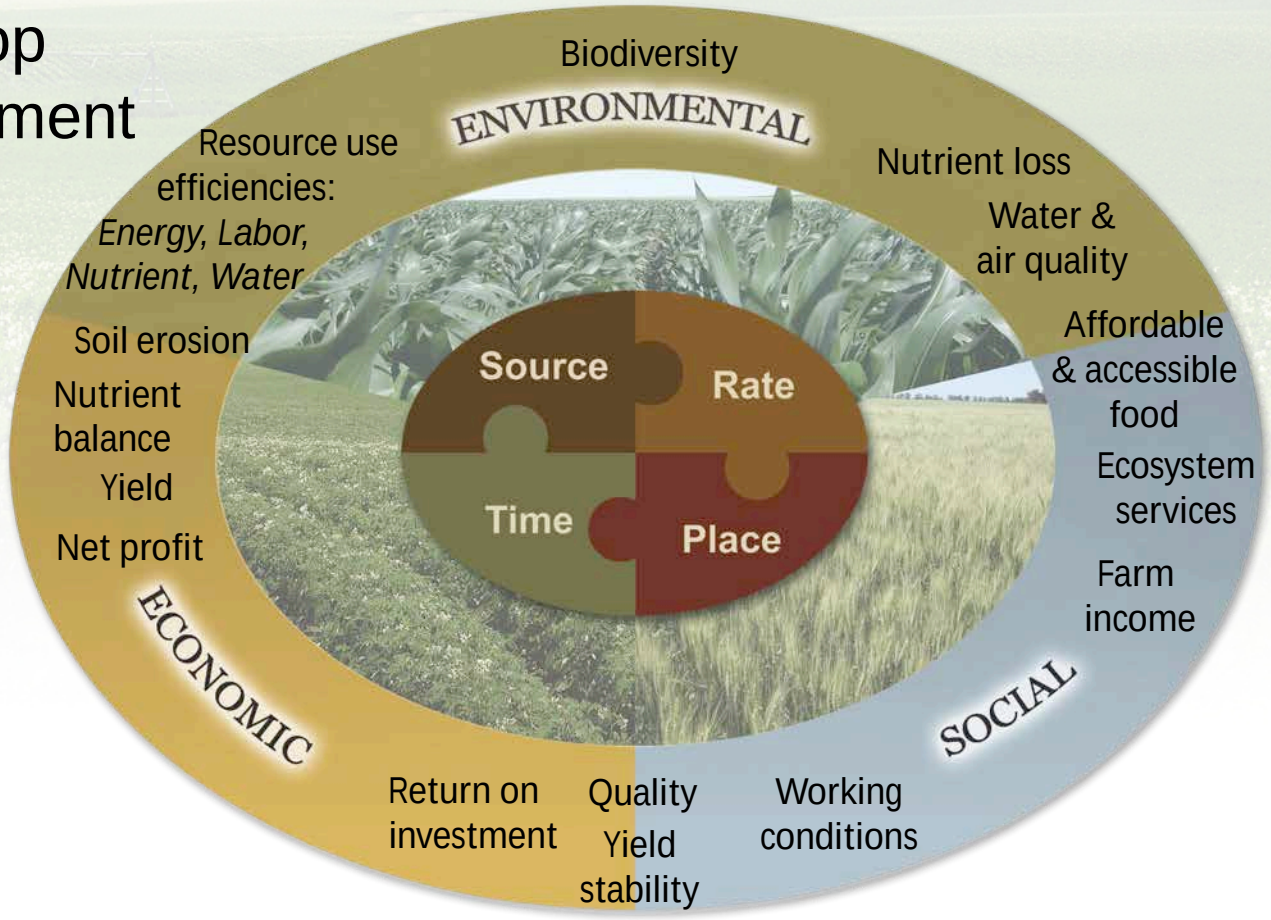


1. Assess timing of crop uptake
2. Assess dynamics of soil nutrient supply
3. Recognize timing of weather factors
4. Evaluate logistics of operations

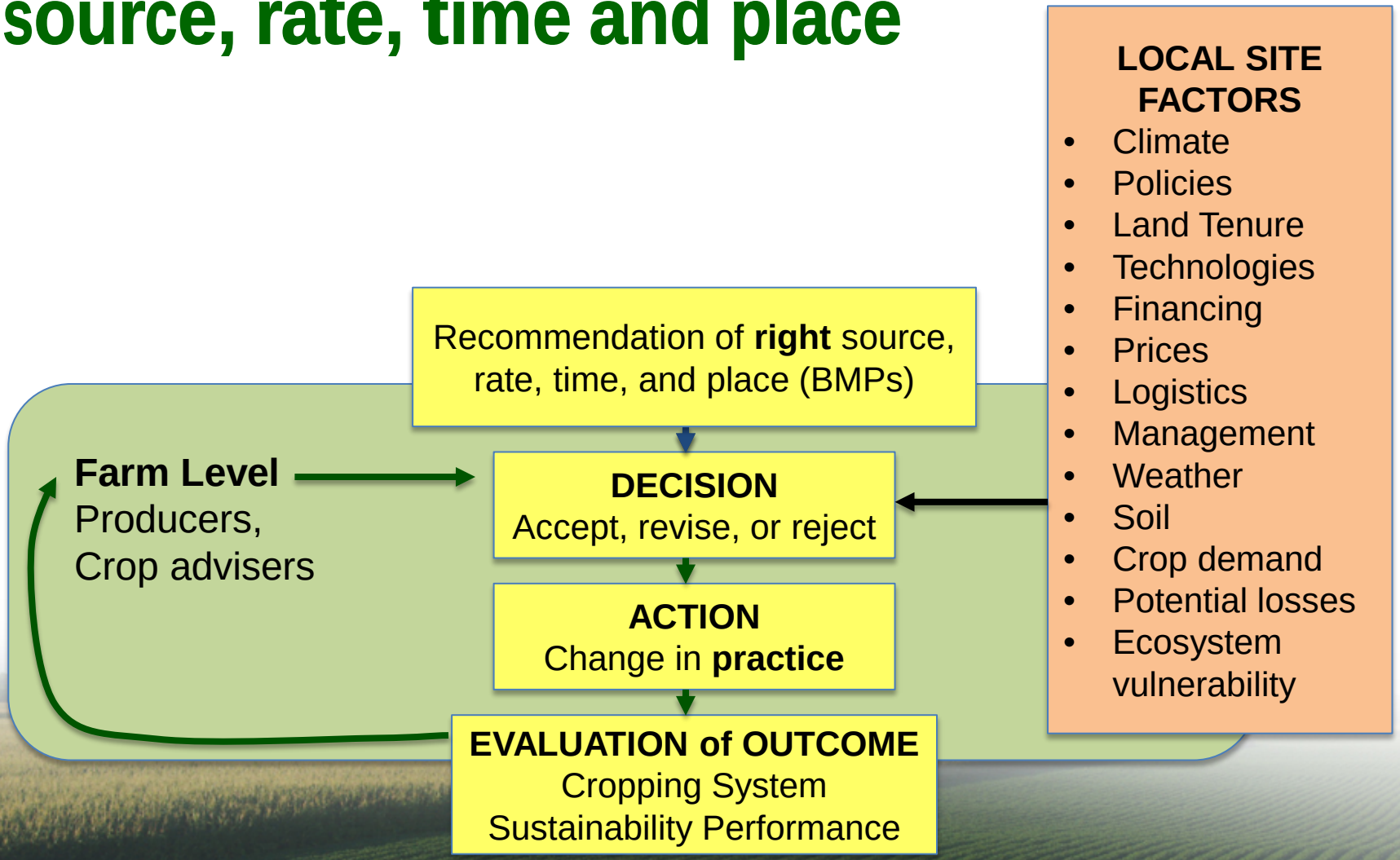
1. Recognize root-soil dynamics
2. Manage spatial variability
3. Fit needs of tillage system
4. Limit potential off-field transport

The 4Rs influence performance indicators

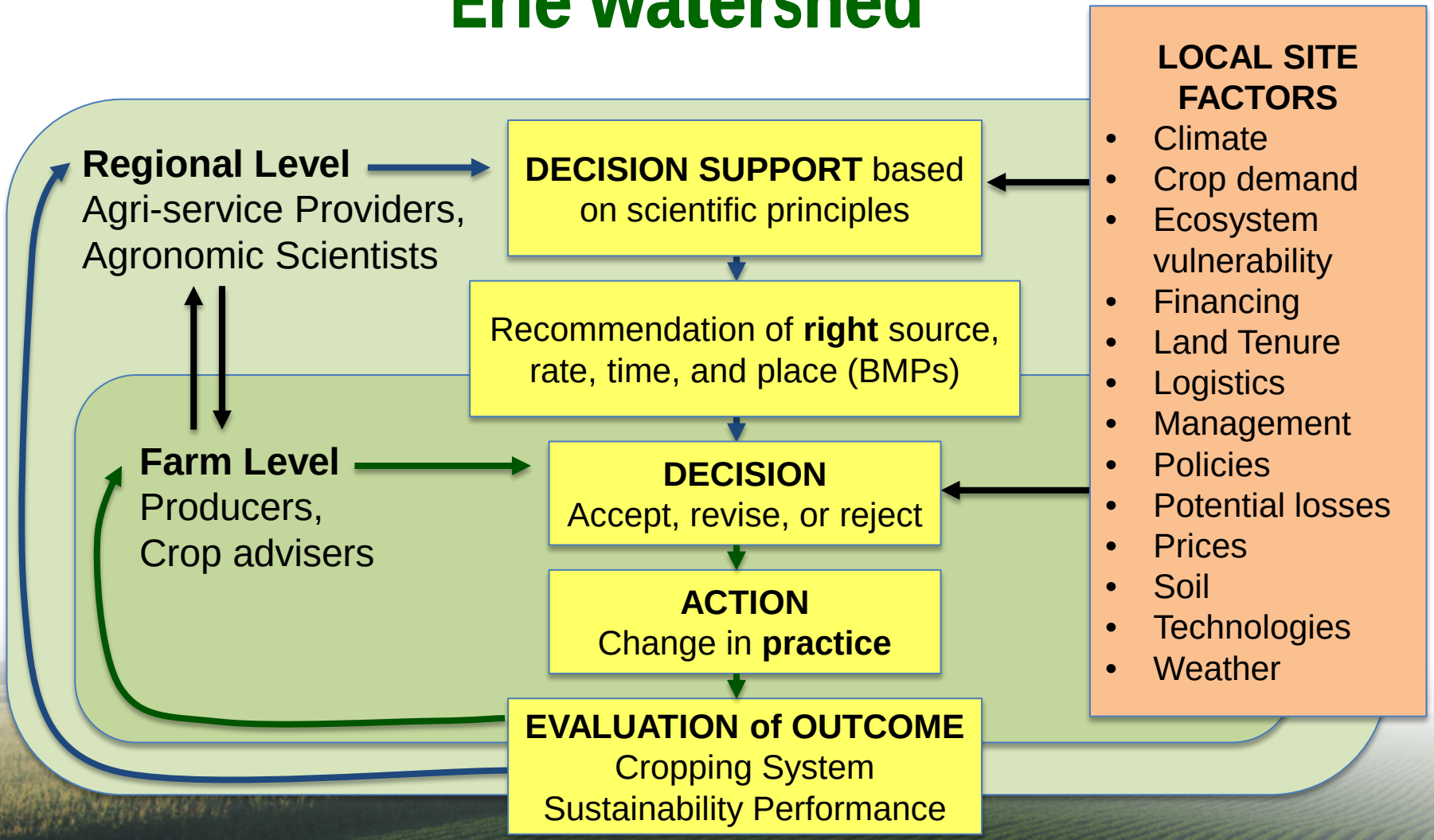
- Social, economic and environmental performance
- Influenced by crop and soil management as well
- Practical limits on what can be measured
- Stakeholders need to choose priorities



Adaptive management refines "right" source, rate, time and place

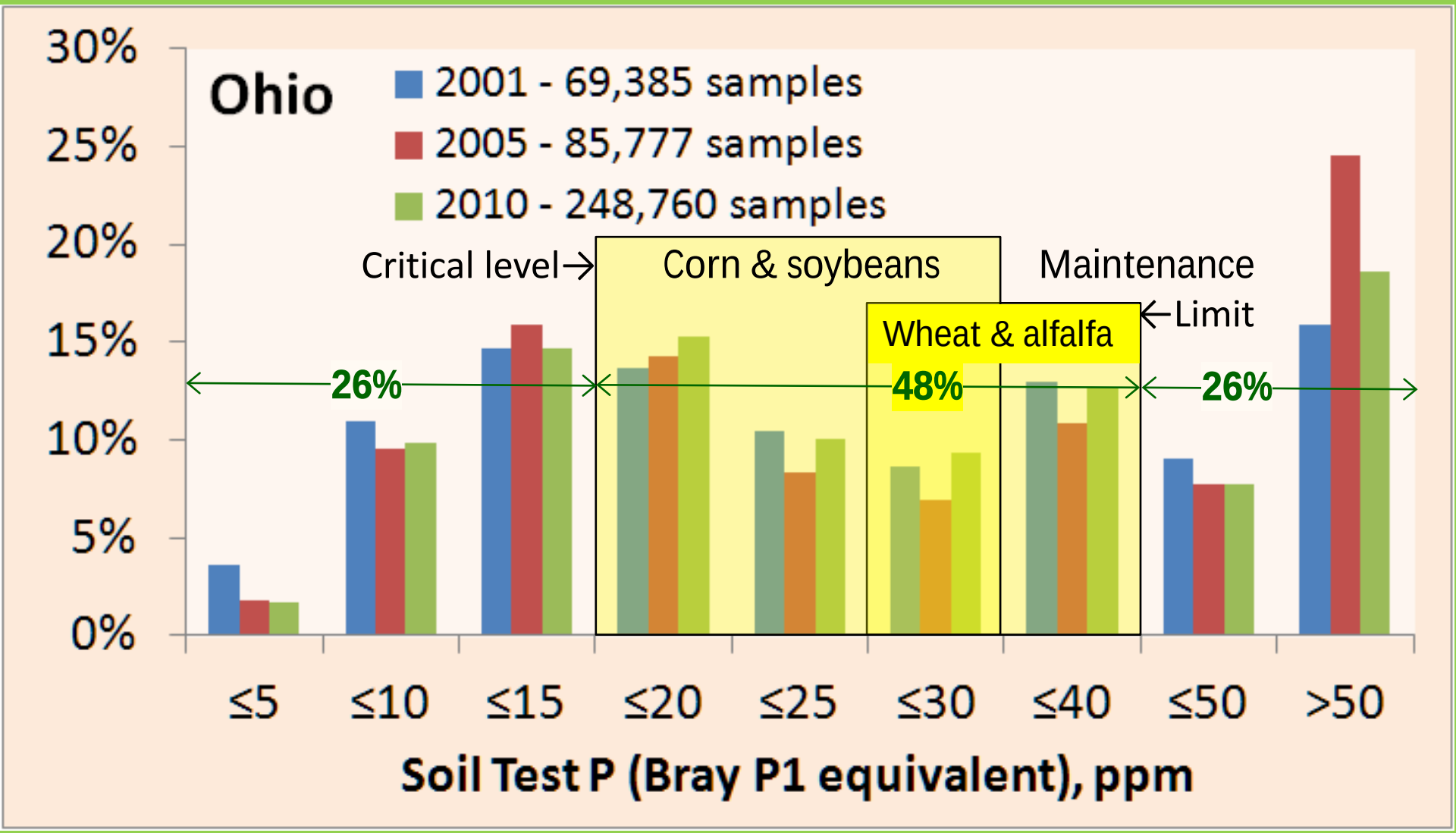


Science and logistics specific to the Lake Erie watershed



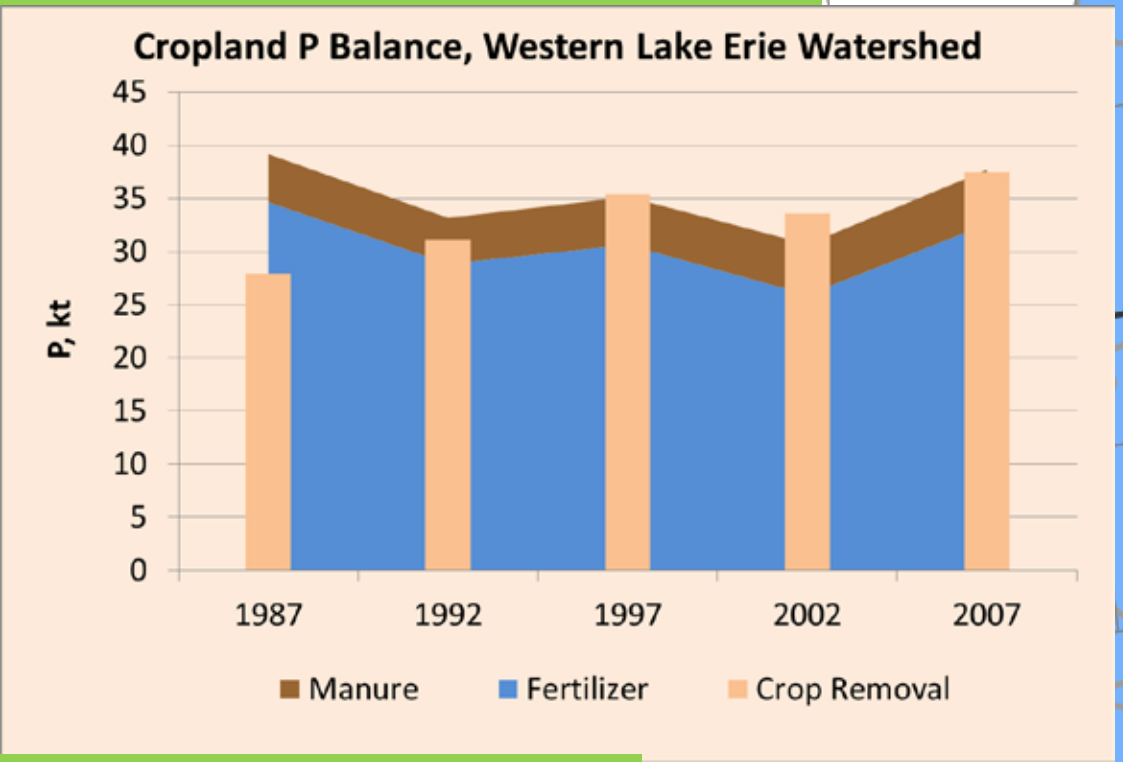
4R P management for Lake Erie watershed

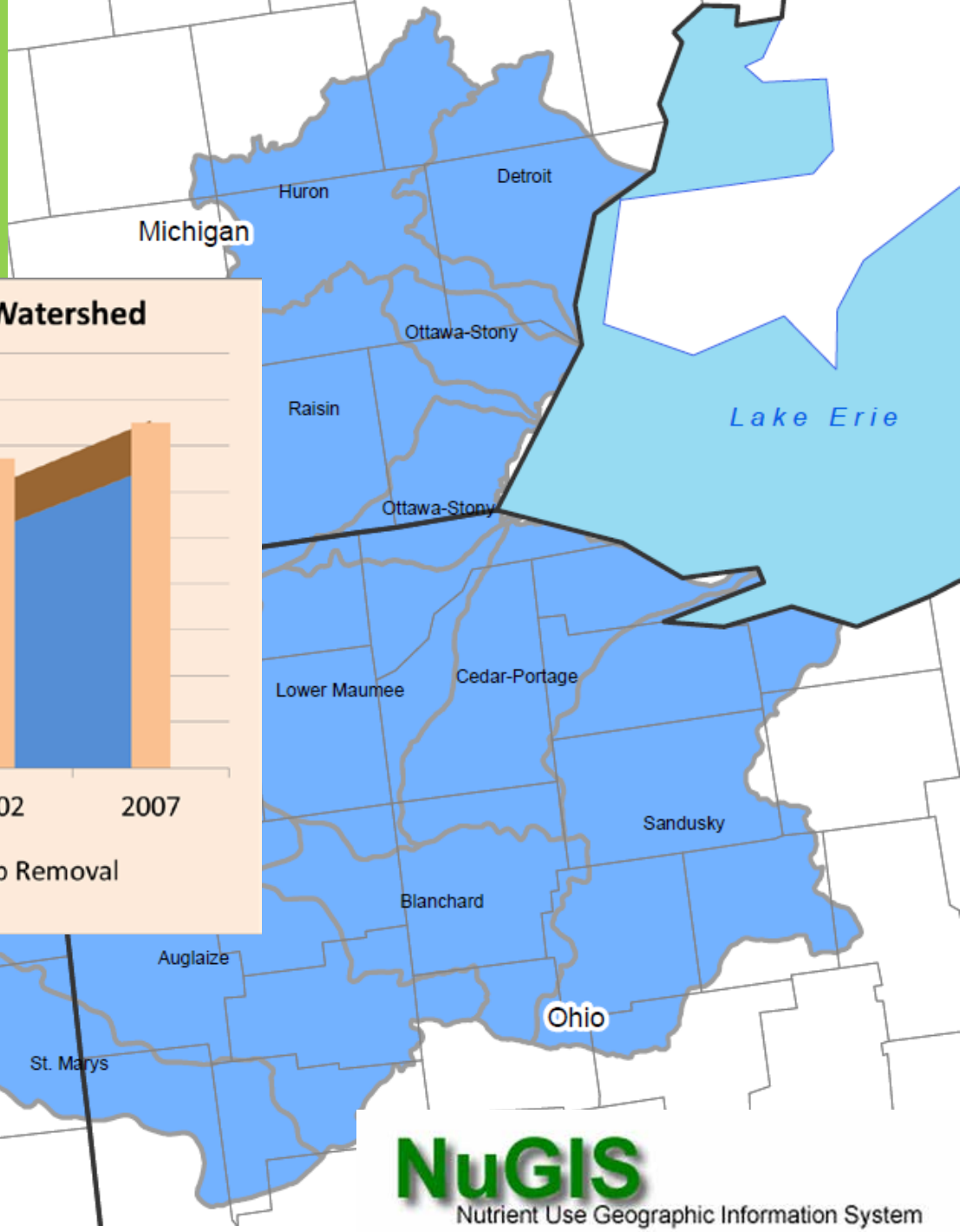
Soil test P distribution, 2001-2010



Build, maintain or drawdown as per soil test

Western Lake Erie Watershed

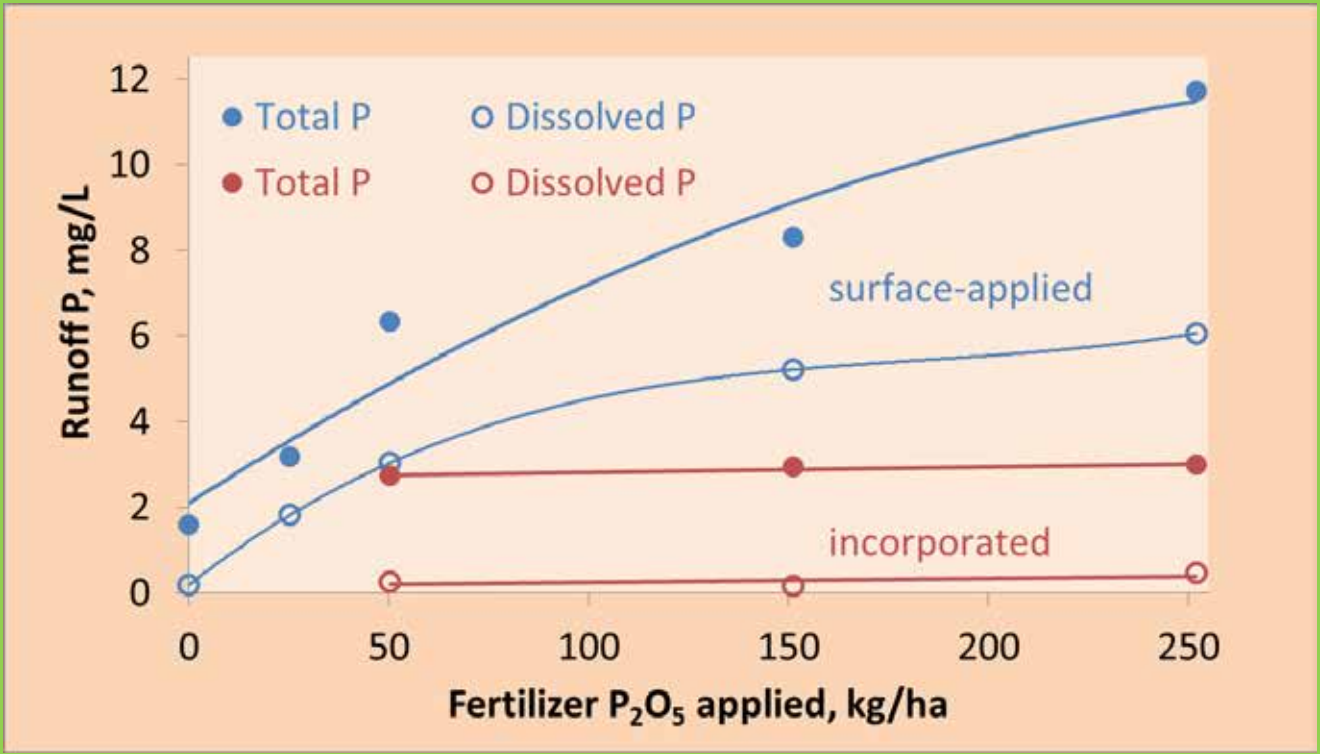




Excess rates are not the issue.

NuGIS
Nutrient Use Geographic Information System

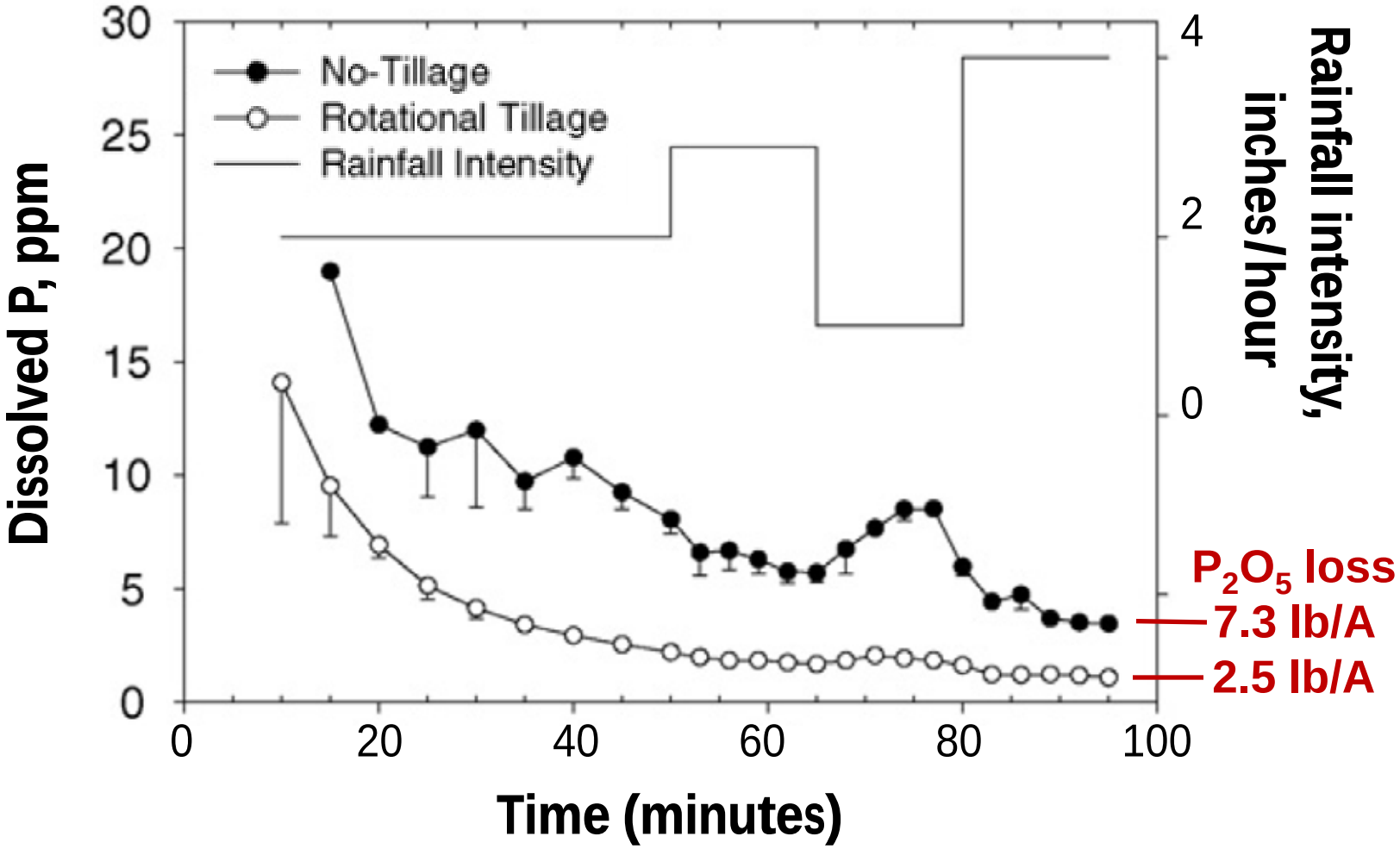
Placing P in the soil can help protect water quality in Lake Erie



Concentration of dissolved and total P in runoff from a clay loam soil in North Carolina, from artificial rainfall immediately following application of superphosphate fertilizer. Incorporation was to a depth of 5 inches by rotary tillage following application. Data from Tarkalson and Mikkelson (2004).

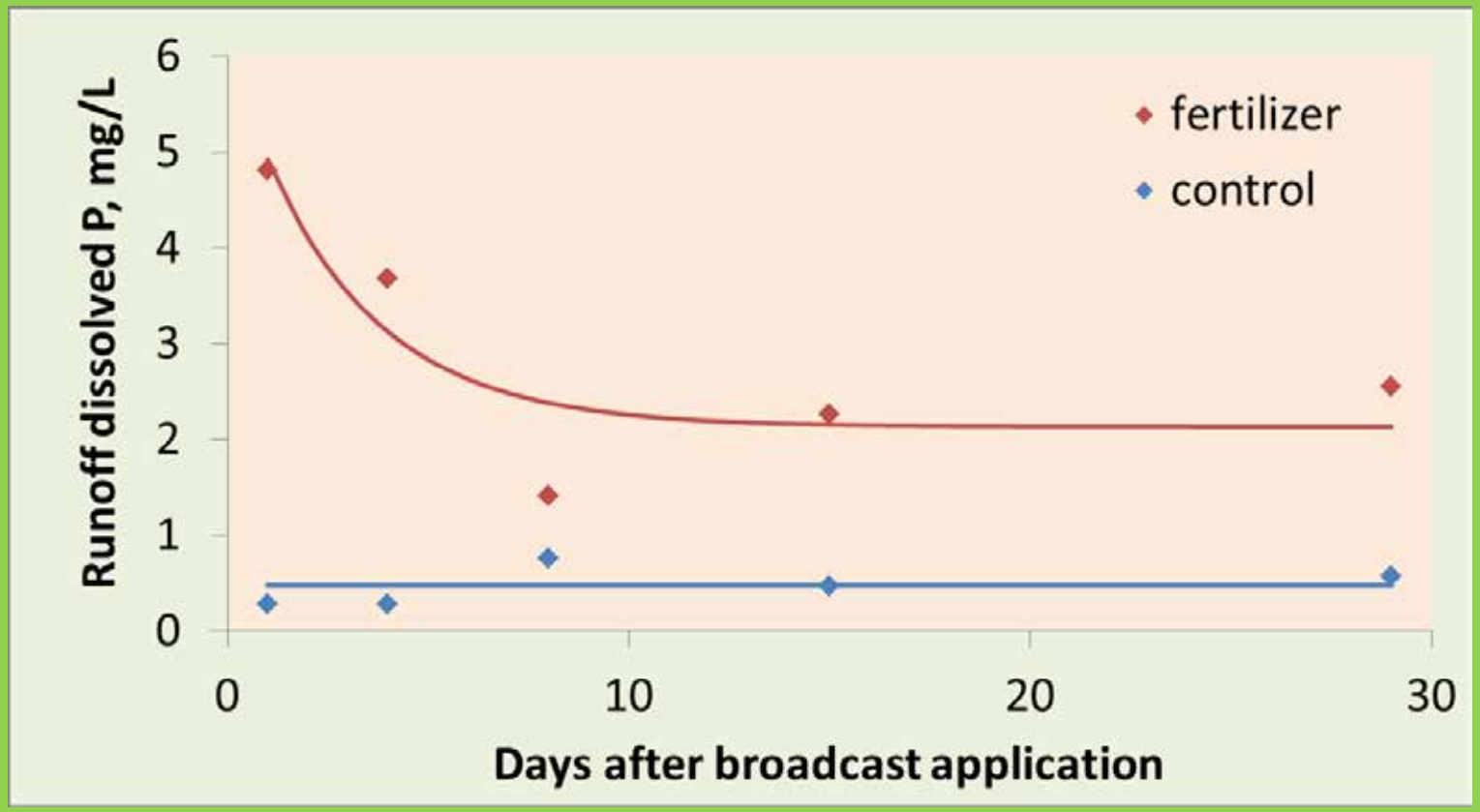
Rotational tillage & dissolved P – Waterloo, IN

one day after 0-46-0 fertilizer surface applied @ 100 lb/A P_2O_5



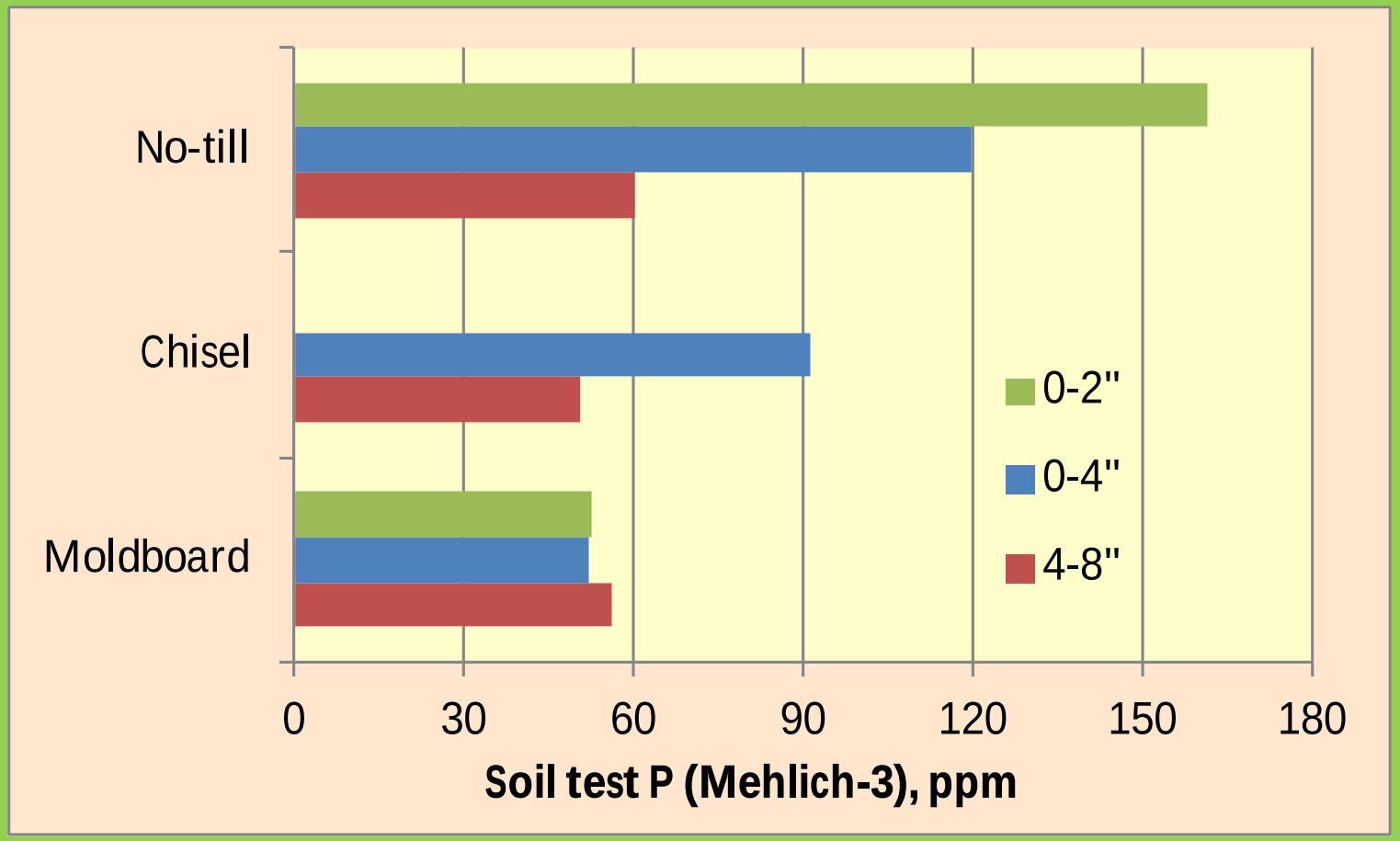
15-year no-till site, corn-soybean rotation. Tillage 12 April with "finisher" chisel plow to 6" depth. Residue cover 57% for NT and 20% for RT. Rainfall applied 22 June to 2 July. *Smith et al. 2007. Soil & Tillage Research 95:11–18*

Timing broadcast phosphorus fertilizer applications can help protect Lake Erie



Concentration of dissolved P in surface runoff from plots cropped to tall fescue during rainfall simulations that occurred 1 to 29 days after broadcast application of triple superphosphate fertilizer (Smith et al., 2007).

Soil test P stratifies when moldboard plowing stops



Soil test P distribution with depth in a long-term tillage experiment on a poorly drained Chalmers silty clay loam soil near West Lafayette, Indiana. Moldboard and chisel plots were plowed annually to a depth of 8". Data from Gál (2005) and Vyn (2000). Fertilizer P applied broadcast.

Practice	Advantages	Limitations
S – MAP or DAP R – rotation removal T – fall P – broadcast	Minimal soil compaction Allows timely planting in spring Low-cost fertilizer form Low cost of application	Risk of elevated P in runoff in late fall and winter Low N use efficiency
S – MAP or DAP R – rotation removal T – spring P – broadcast	Minimal soil compaction Better N use efficiency Low-cost fertilizer form Low cost of application	Risk of elevated P in spring runoff before incorporation Potential to delay planting Retailer spring delivery capacity
S – MAP or fluid APP R – one crop removal T – spring P – 2” x 2” band	Low risk of elevated P in runoff Most efficient use of N Less soil P stratification	Cost and practicality Potential to delay planting Retailer delivery capacity Cost of fluid versus granular P
S – MAP or DAP R – rotation removal T – fall P – banded in zone	Low risk of elevated P in runoff Maintain residue cover Allows timely planting in spring Less soil P stratification	Cost of RTK GPS guidance Cost of new equipment More time required than broadcast
S – fluid APP P – point injection	As above	As above, plus cost of fluid versus granular P

Choice of practice considers both advantages and limitations.

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4R Research Fund
environmental, social, economic impacts

- Established by the fertilizer industry to support research on 4R sustainability impact across North America.
- **Meta-analysis:** Total of $300,000 in 2014.
- **Measurement:** Total of $500,000/year, 2014-2019.
- For additional information: www.nutrientstewardship.com/funding

Summary
Make Lake Erie 4Rs part of your business

- Raise your awareness
  - Sustainability initiatives in your supply chain
  - 4R Plant Nutrition Manual
- Stakeholder concern for lessening loss of dissolved P
  - Right source, rate, time and place to keep P in the soil
- Embrace the principles
  - Use the logo
  - Public commitment
  - Consider 4R Certification

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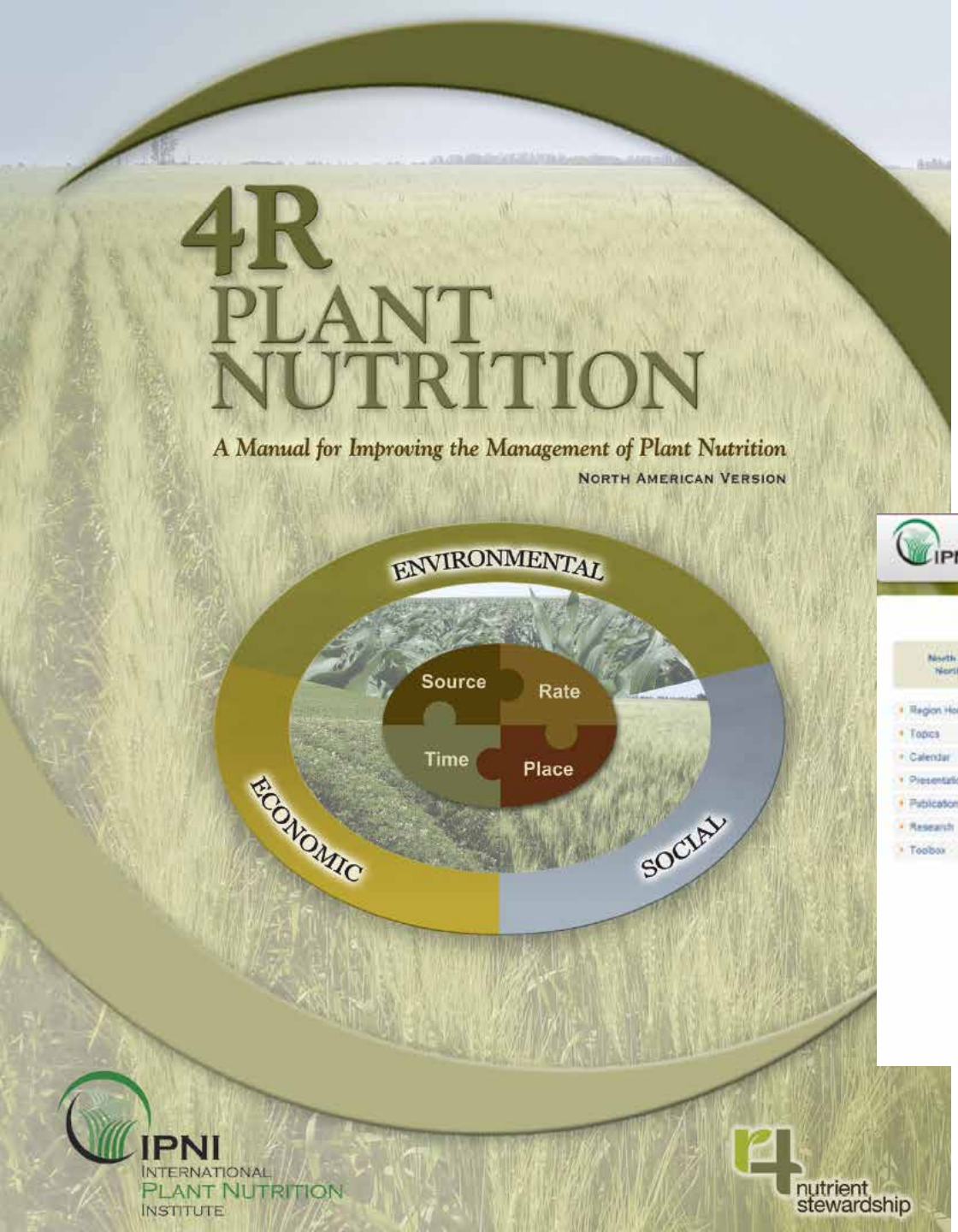

Thank you

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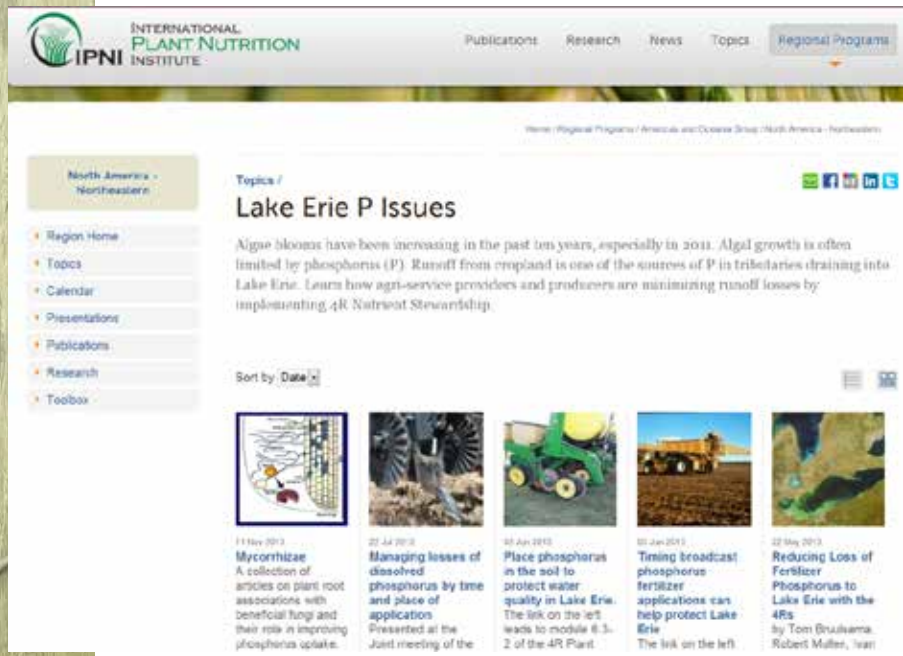

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