SERA-17 Organization to Minimize Phosphorus Losses from Agriculture
Meeting Session 2 – Phosphorus Drawdown Strategies
Tampa, FL
7 November 2013

IPNI
INTERNATIONAL
PLANT NUTRITION
INSTITUTE

An Industry Perspective on Phosphorus Stewardship Challenges

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.

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Outline – P Stewardship Challenges

1. Areas of surplus, sufficiency and need
2. Areas where loss leads to impact on algae
3. Tillage, placement and timing
4. Global reserves and resources
5. 4R research fund

- *Slides: available at http://nane.ipni.net*

4R nutrient stewardship

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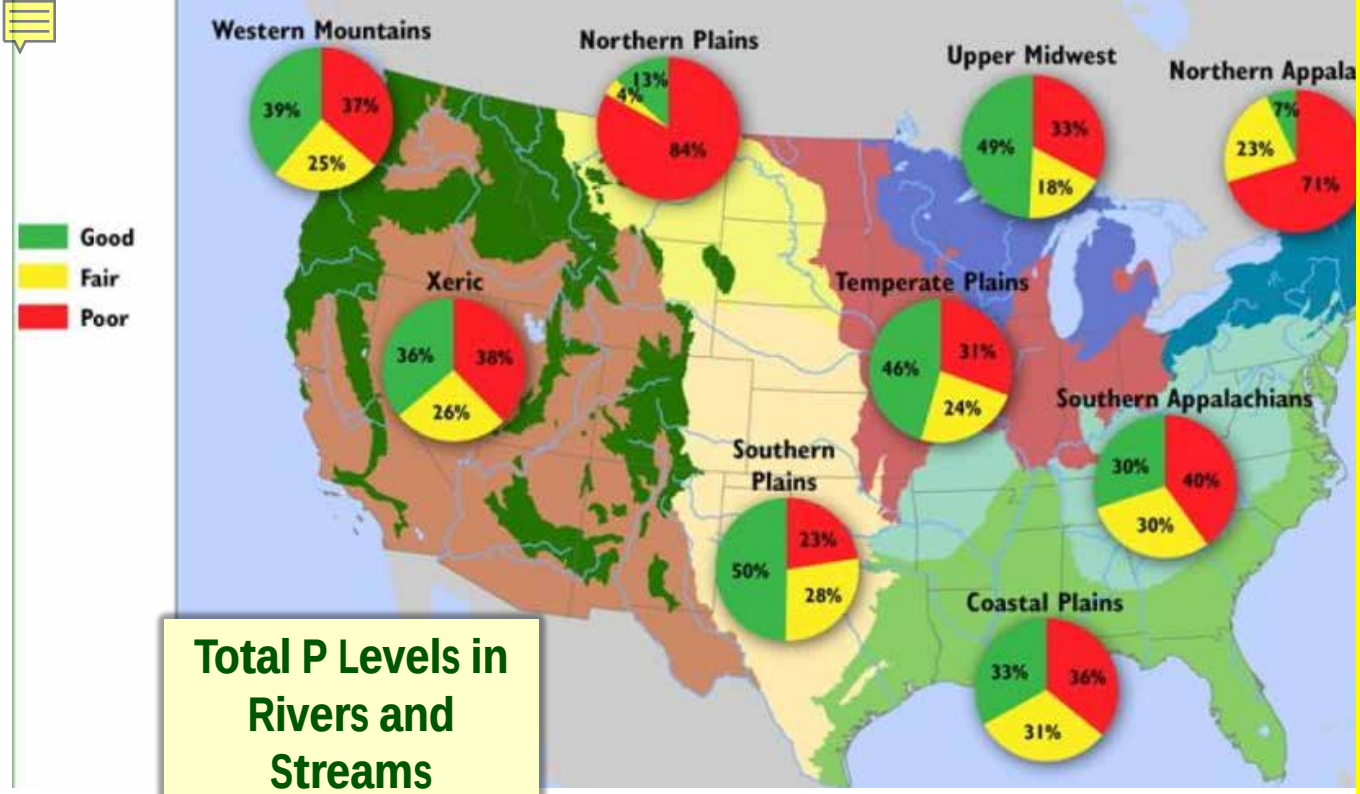
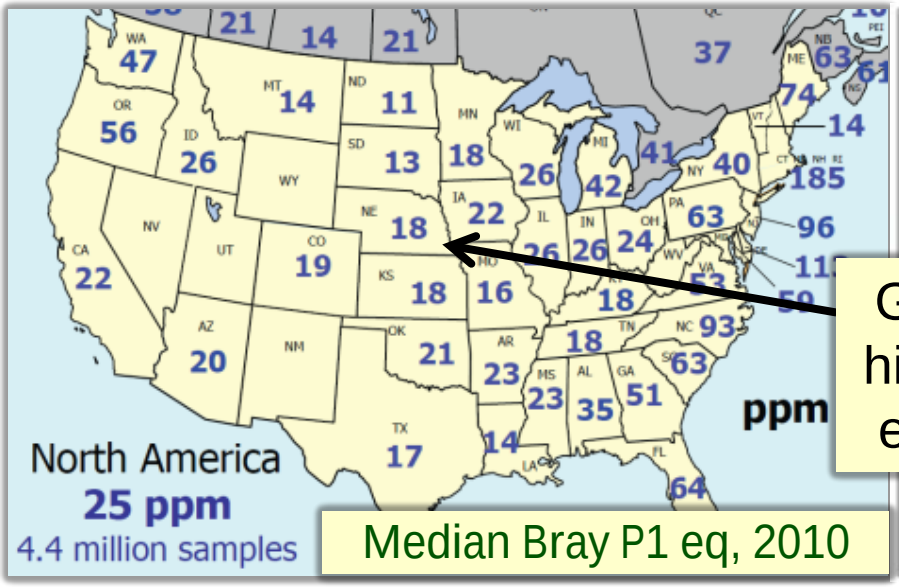


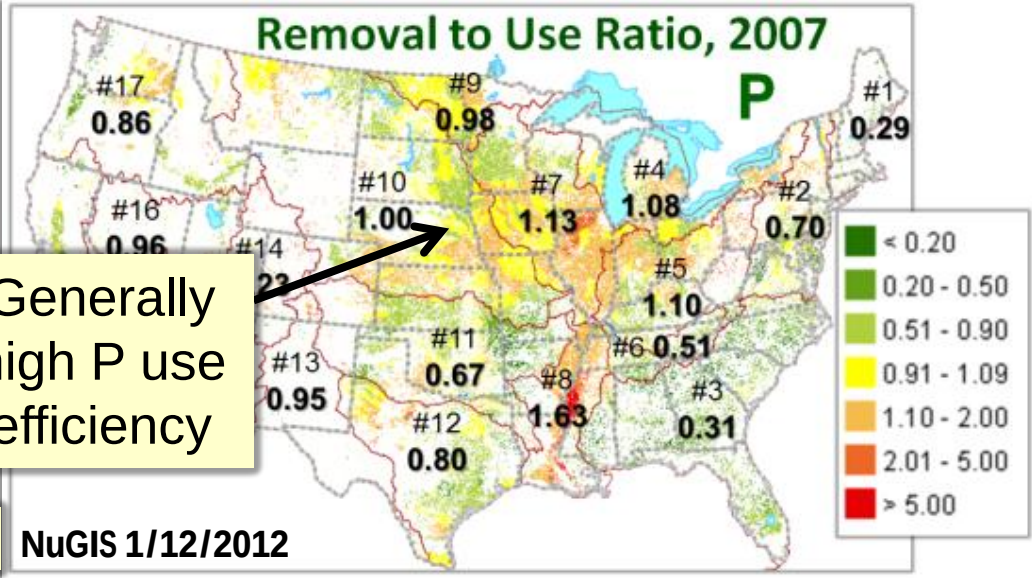
Total P Levels in Rivers and Streams

- Areas rated "poor" for WQ don't match areas of high soil test P or low PUE.
- Considerable areas of soils test below critical levels, and removal to use ratios >1 indicate drawdown.

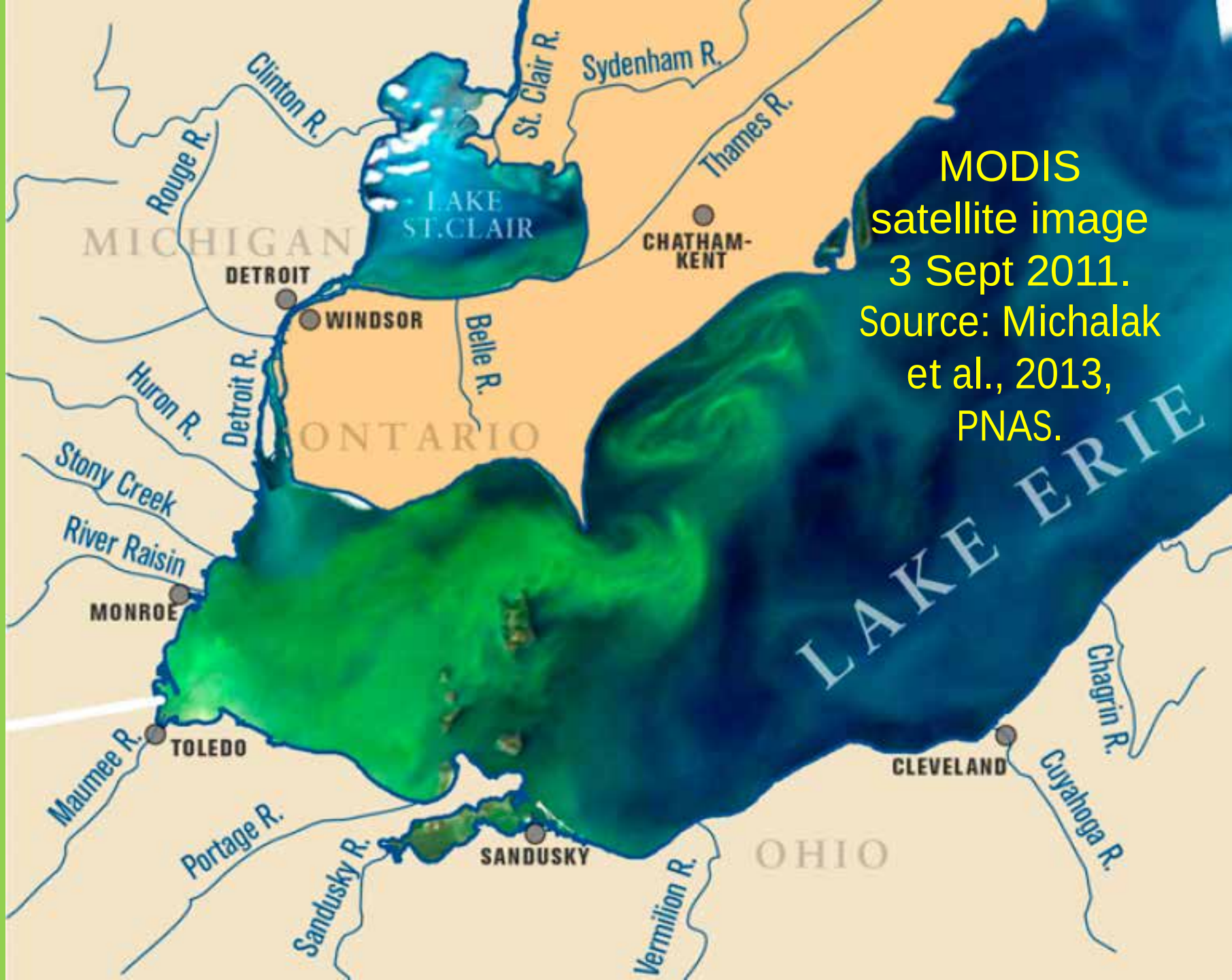


Median Bray P1 eq, 2010

Generally high P use efficiency

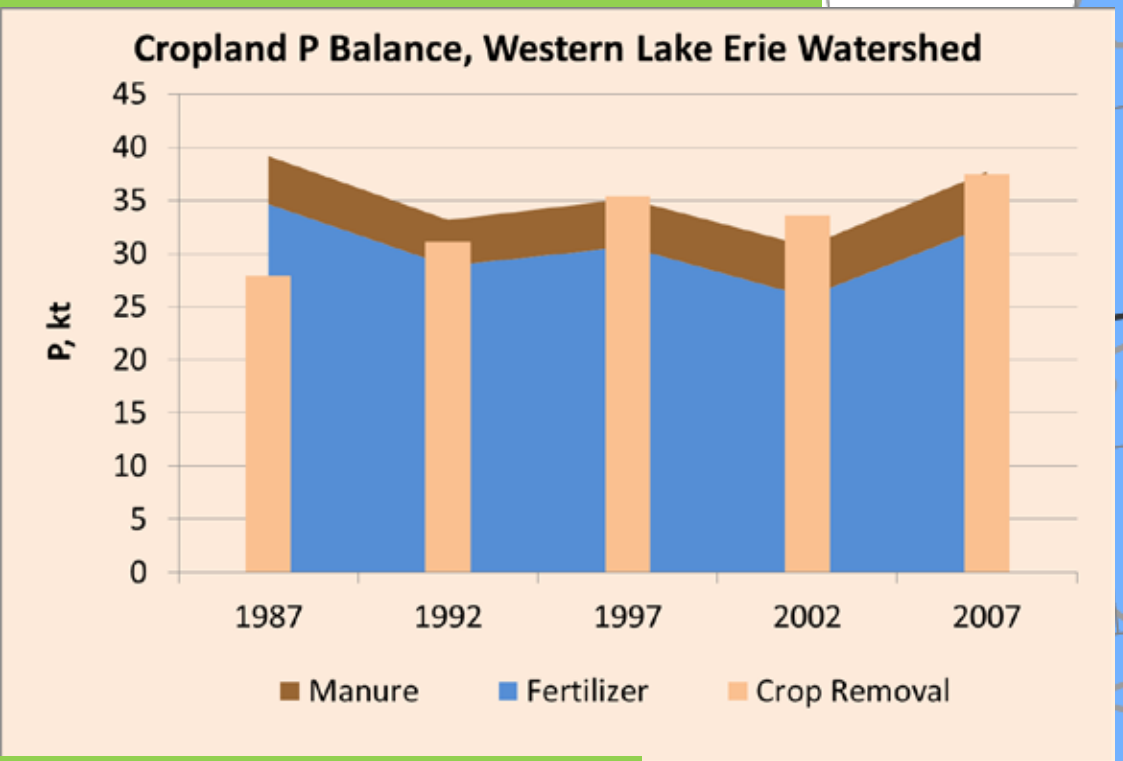


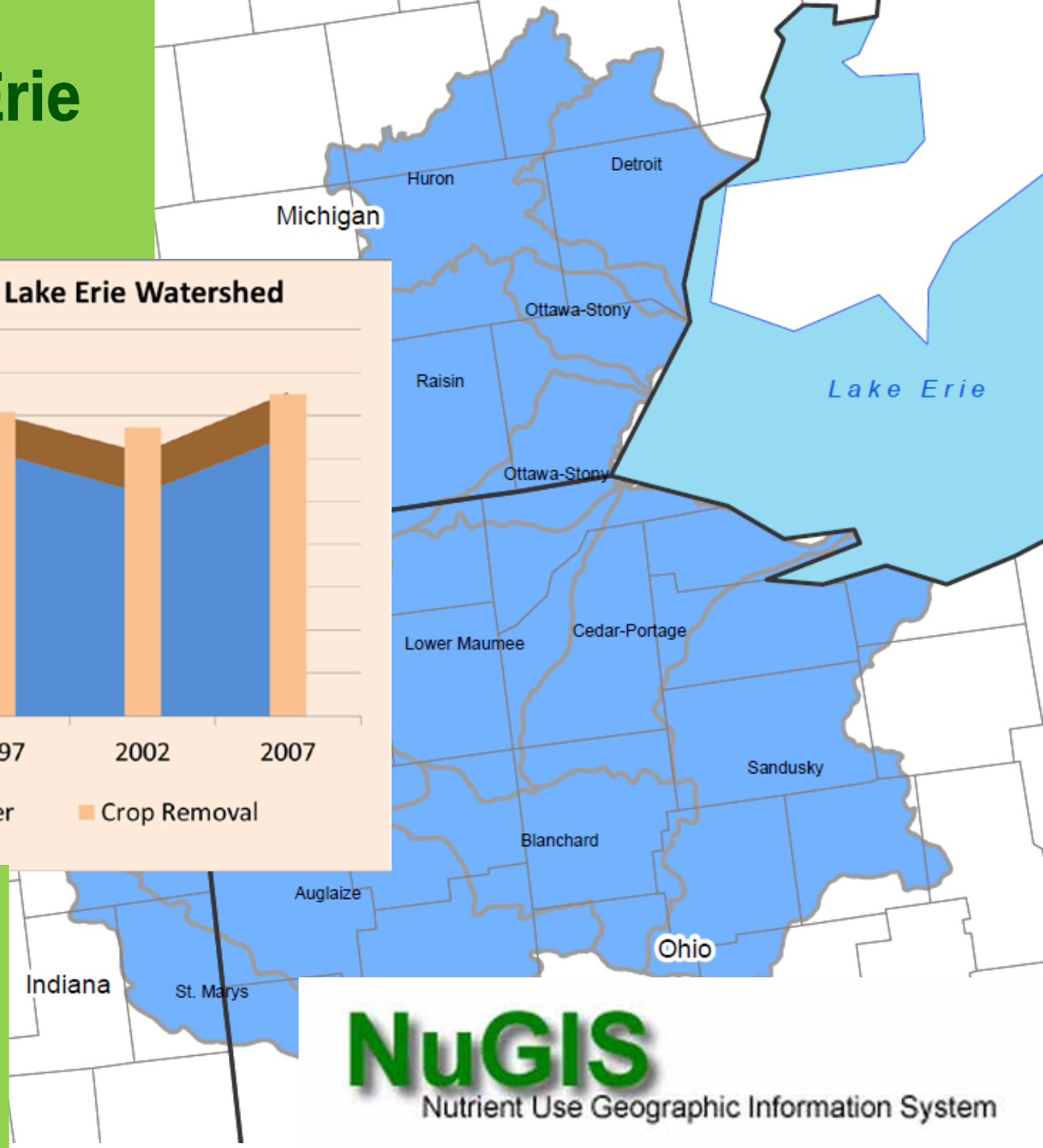
NuGIS 1/12/2012



MODIS satellite image 3 Sept 2011. Source: Michalak et al., 2013, PNAS.

Western Lake Erie Watershed

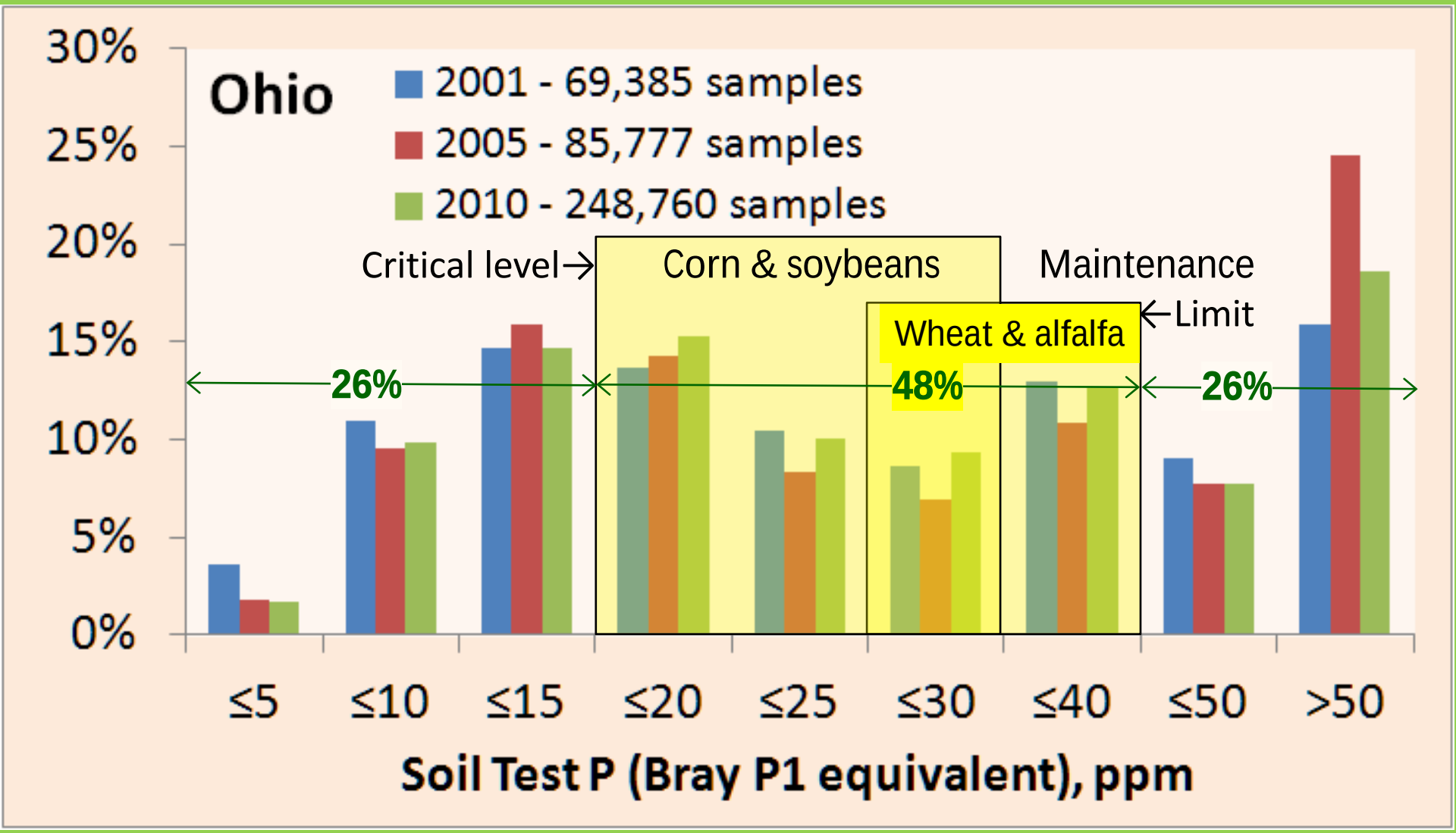




Excess rates are not the issue.

NuGIS
Nutrient Use Geographic Information System

Soil test P distribution, 2001-2010

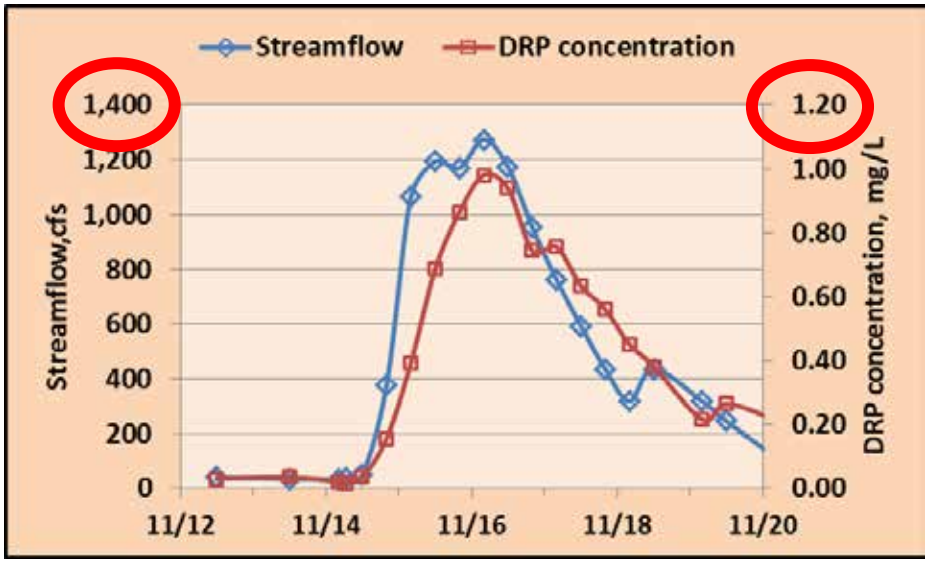


Extreme soil test P is not the issue.

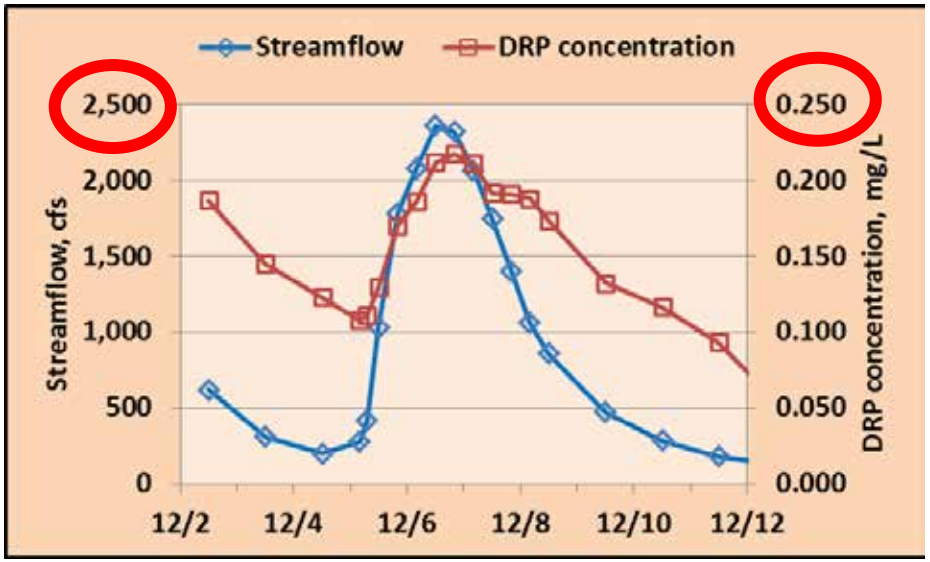
Essex County, Ontario, 30 July 2009
BMPs that limit soil erosion don’t limit dissolved P runoff.

Honey Creek: comparing two runoff events in fall 2011

14 Nov., after 6d field activity



5 Dec., after 2 further rainstorms



0.64 mg/L — **Mean DRP concentration** — **0.18 mg/L**

0.35 kg P_2O_5/ha — **DRP load/ha of watershed** — **0.18 kg P_2O_5/ha**

1. Intense rainstorms following broadcast of P can generate high P concentrations in runoff but the direct agronomic or economic importance can be minimal.
2. As the time intervals increase between surface broadcast P applications and runoff-producing rainfall events, DRP concentrations spike less.

David Baker, Heidelberg University

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Broadcast placement issues

- Fertilizer on the soil surface (acute)
  - If first rainfall generates runoff, can raise [DRP] to 5-20 mg/L in a single event
- Stratification in soil (chronic)
  - Tillage also a factor
  - No-till leads to STP in top 5 cm 3-4 times that in top 20 cm
  - Annual chisel plowing reduces stratification by half
  - Increase runoff [DRP] from ~0.1-0.2 mg/L to perhaps ~0.4 to 0.8 mg/L
- Timing
  - Fall application: lower frequency of intense rainstorms than spring
  - Spring broadcast more likely to be incorporated before first rain
  - Recent research indicates that March-June loadings are most closely related to algal bloom extent from 2001-2011. (Stumpf et al., 2013)
- ***Some practice changes are obvious. Others require research.***

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4R Nutrient Stewardship Certification Standard

Requirements for Nutrient Service Providers in the Lake Erie Watershed

1. Initial Training and Ongoing Education
2. Monitoring of 4R Implementation
3. Nutrient Recommendations and Application

- July/August: review of 4 Pilot Audits
- Fall 2013/Winter 2014: Promotion
- Summer of 2014: Certifications

Version 2.0

September 2013

Stakeholders supporting 4R certification

The Andersons

MABA

AGRibusiness Council of INDIANA

MORRAL COMPANIES

OHIO FARM BUREAU

The Fertilizer Institute
Nourish, Replenish, Grow

The Nature Conservancy
Protecting nature. Preserving life.™

INDIANA CONSERVATION PARTNERSHIP

SOIL AND WATER RESOURCES
Ohio Department of Natural Resources

IPNI INTERNATIONAL PLANT NUTRITION INSTITUTE

Ohio AgriBusiness Association

NRCS

DESHLER FARMERS ELEVATOR Co.

SOY OHIO
Ohio Soybean Council
www.soyohio.org

FARMERS ELEVATOR

WESTERN LAKE ERIE BASIN PARTNERSHIP

EDF ENVIRONMENTAL DEFENSE FUND
Finding the ways that work

Nester Ag LLC

MAEAP

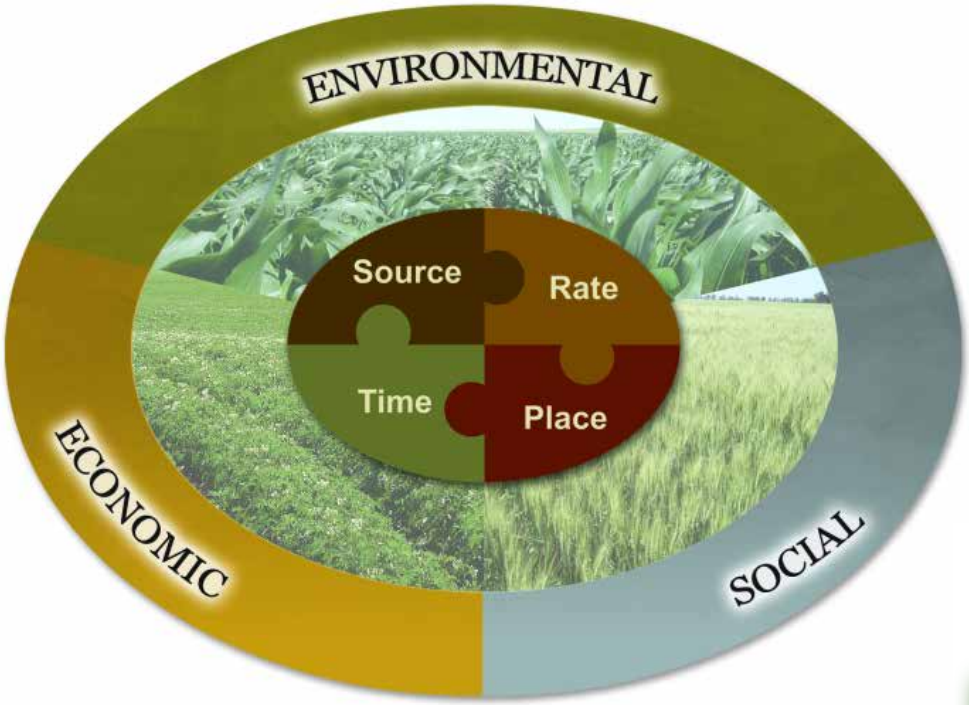
MICHIGAN STATE UNIVERSITY

THE OHIO STATE UNIVERSITY

CAP CONSERVATION action PROJECT

AMERICAN SOCIETY OF AGRONOMY
CERTIFIED CROP ADVISER

4R: “right” means sustainable



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How to Make a Difference - Fertilizer optimization

4R PLANT NUTRITION

4 nutrient stewardship

World Phosphate Rock Reserves and Resources

Country	2011-12 Production	Reserves	Reserve Life
	Mt		Years
Morocco	28	50,000	1790
South Africa	2.5	1,500	600
Jordan	6.5	1,500	230
Russia	11	1,300	115
USA	29	1,400	49
China	85	3,700	43
World Total	204	67,000	328

Source: USGS, 2013

"No matter how much phosphate rock exists, it is a non-renewable resource"
IFDC, 2010

Peak Phosphorus by 2030?

Not likely. Global Partnership in Nutrient Management's "Our Nutrient World" (2013) indicates oil, gas and zinc have shorter reserve lives than P.

4R Research Fund – *environmental, social, economic impacts of 4Rs on P loss*

- **Meta-analyses:** Review and analysis projects. $20K - $70K with duration 6-9 months. Total of $300,000 in 2014. **Due 15 Dec 2013.**
- **New Projects** – Measurement. Projects $50K to $300K/y for up to 5 y; total of $500,000/year. **Due 31 Jan 2014.**
- Both to contribute measures of performance for 4R
- For additional information: www.nutrientstewardship.com/funding

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Summary

1. Amid cloisters of P surplus, large areas of North America feature low and slowly declining soil P levels.
2. Not all P loss impacts relate to extremely high soil P accumulations.
3. Placement, timing, and management of stratification may reduce risks of dissolved P loss… *but require research!*
4. Industry is engaging the 4Rs to address—and support research on—sustainability issues related to P.

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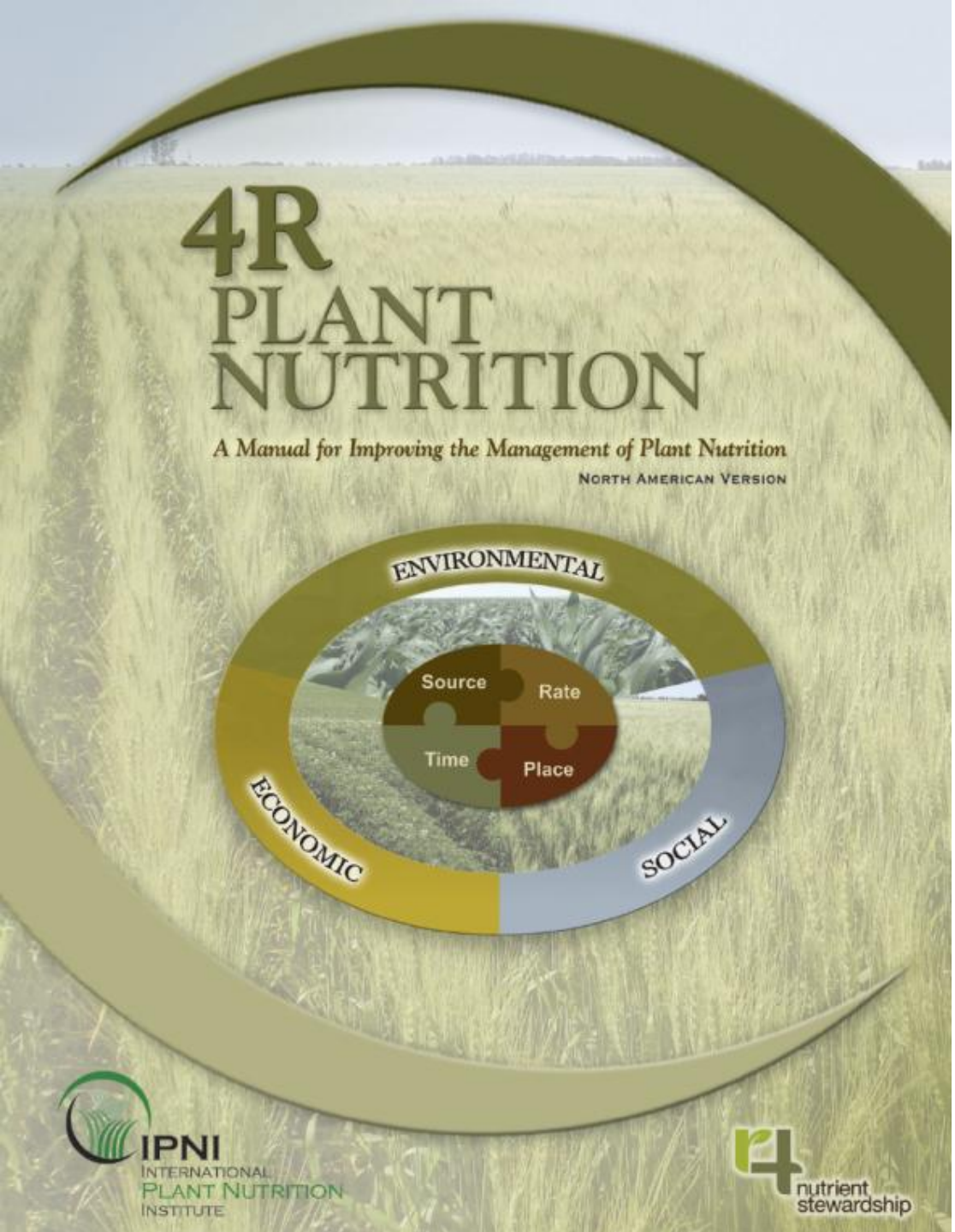

Thank You

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