
The Next Conservation Revolution Is Upon Us
How Can We Match Potential With Results?

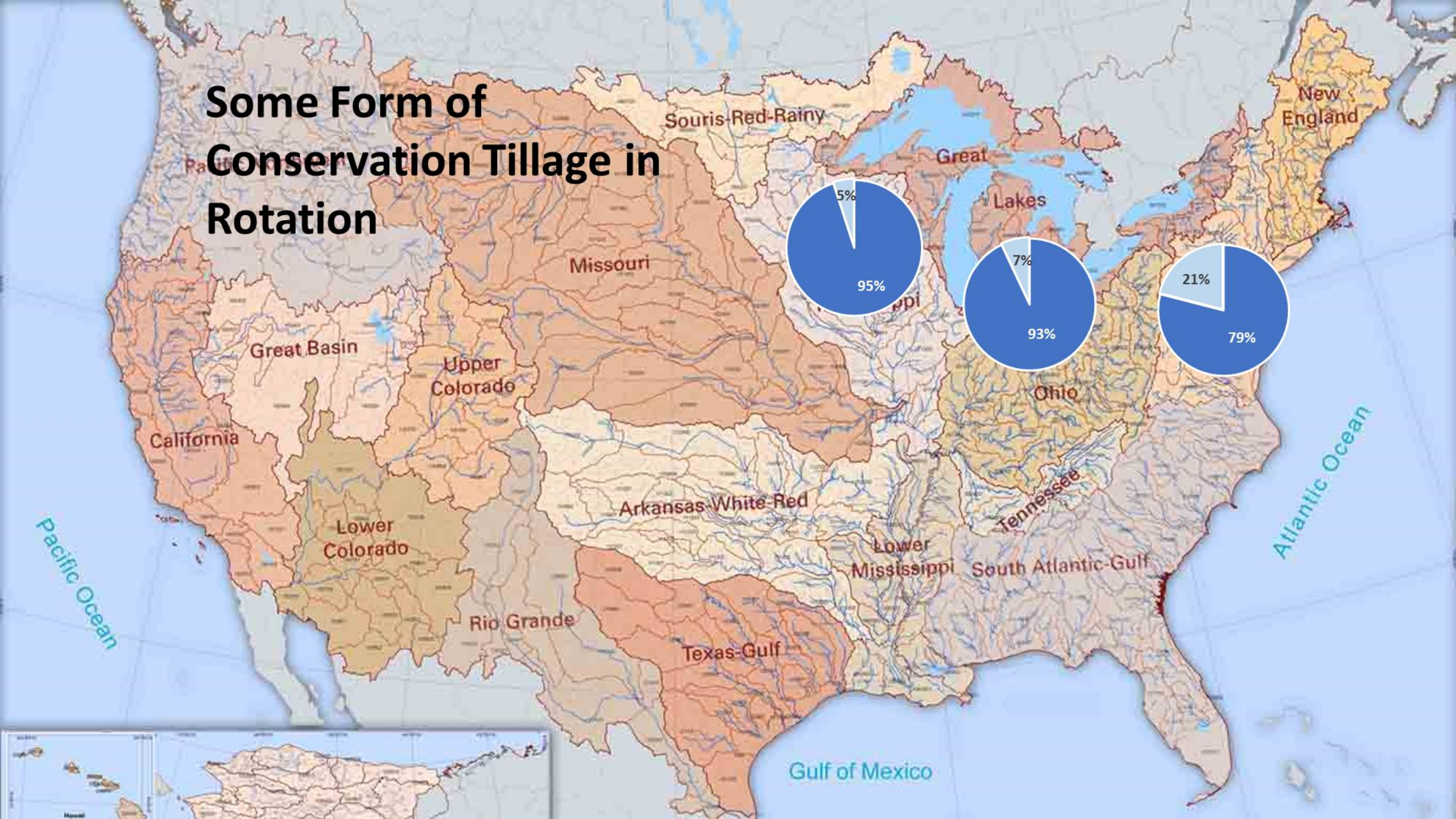

DUST STORM APPROACHING SPEARMAN, TEXAS.
APRIL 14. 1935

National conservation action must spring from people on the land, and to a large extent, be advanced by them as individuals, with the help of government.

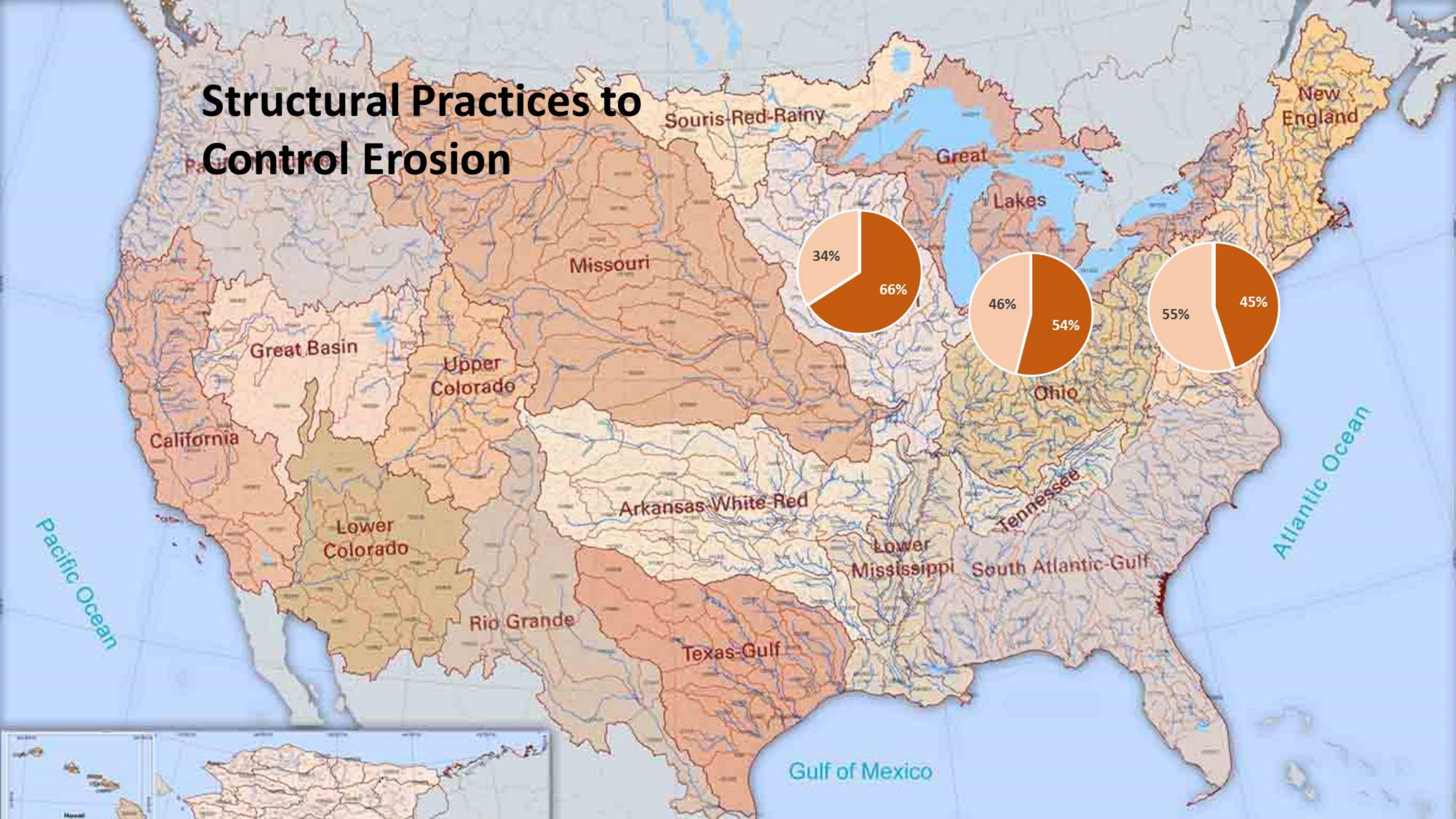
Hugh Hammond Bennett. *Soil Conservation.* New York: McGraw-Hill Book Company, Inc., 1939.

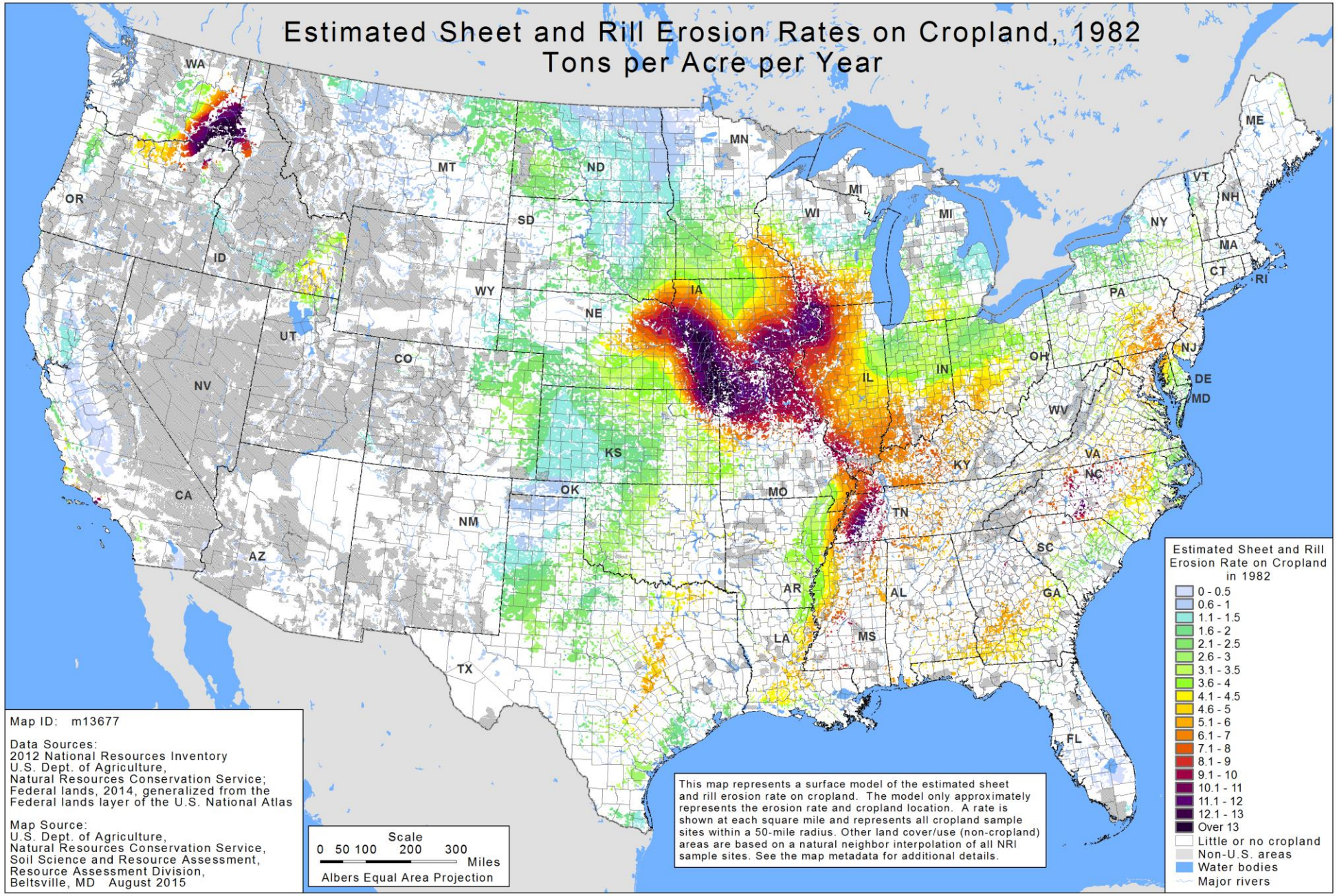
At Least One Conservation Practice Applied

Some Form of Conservation Tillage in Rotation



Structural Practices to Control Erosion

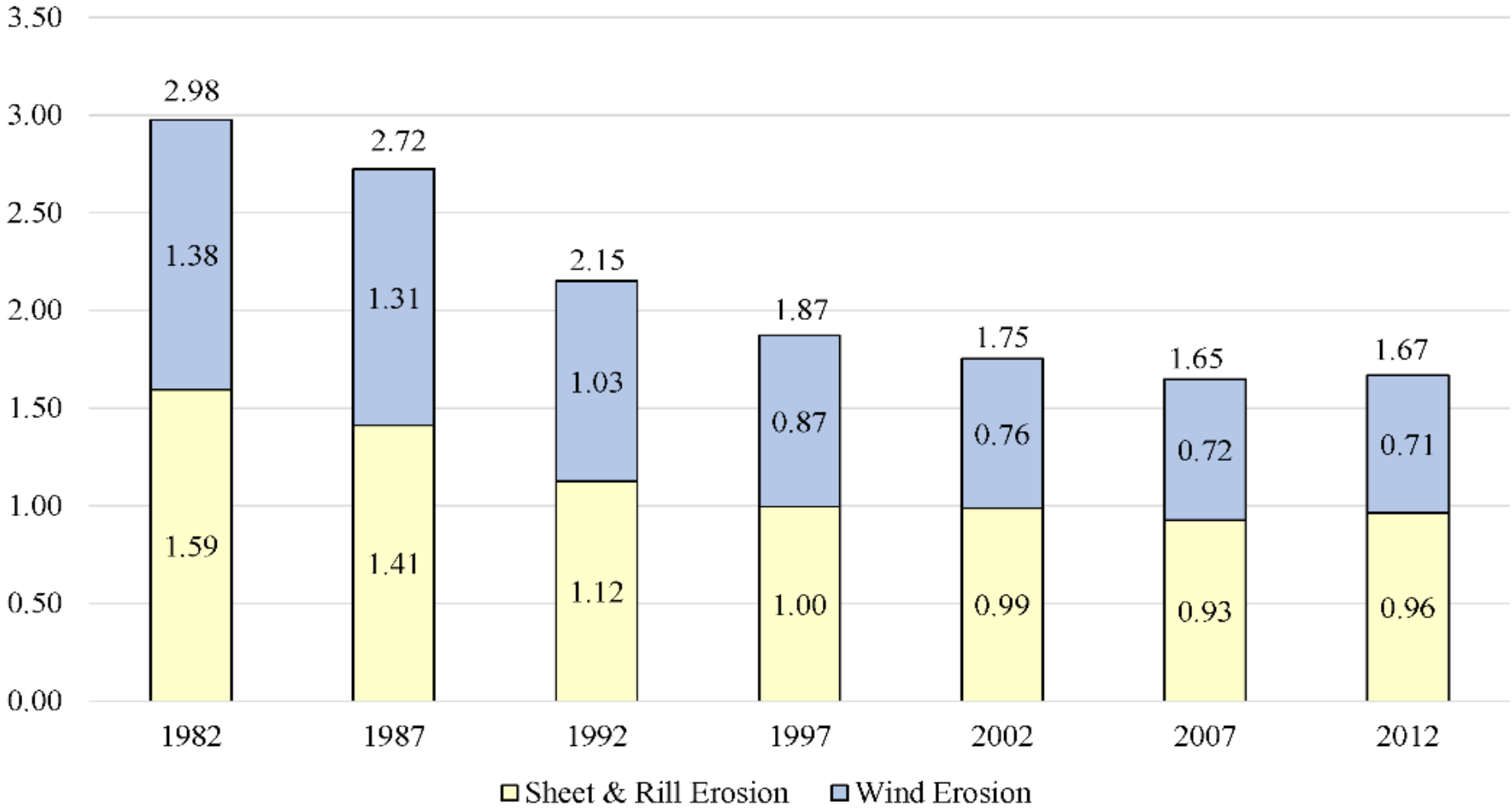



Estimated Sheet and Rill Erosion Rates on Cropland, 1982
Tons per Acre per Year
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
KY
TN
AL
OH
WV
GA
FL
SC
NC
VA
PA
NY
ME
VT
NH
MA
CT
RI
NJ
DE
MD
Estimated Sheet and Rill Erosion Rate on Cropland in 1982
0 - 0.5
0.6 - 1
1.1 - 1.5
1.6 - 2
2.1 - 2.5
2.6 - 3
3.1 - 3.5
3.6 - 4
4.1 - 4.5
4.6 - 5
5.1 - 6
6.1 - 7
7.1 - 8
8.1 - 9
9.1 - 10
10.1 - 11
11.1 - 12
12.1 - 13
Over 13
Little or no cropland
Non-U.S. areas
Water bodies
Major rivers
This map represents a surface model of the estimated sheet and rill erosion rate on cropland. The model only approximately represents the erosion rate and cropland location. A rate is shown at each square mile and represents all cropland sample sites within a 50-mile radius. Other land cover/use (non-cropland) areas are based on a natural neighbor interpolation of all NRI sample sites. See the map metadata for additional details.
Scale
0 50 100 200 300
Miles
Albers Equal Area Projection
Map ID: m13677
Data Sources:
2012 National Resources Inventory
U.S. Dept. of Agriculture,
Natural Resources Conservation Service;
Federal lands, 2014, generalized from the
Federal lands layer of the U.S. National Atlas
Map Source:
U.S. Dept. of Agriculture,
Natural Resources Conservation Service,
Soil Science and Resource Assessment,
Resource Assessment Division,
Beltsville, MD August 2015

Erosion on Cropland, by Year

Billions of Tons

(Cropland includes cultivated and noncultivated cropland)



Column totals may not exactly match sum over type due to rounding.

For Hotel Workers, Weinstein Allegations Put a Spotlight on Harassment

Power Outage at Atlanta Airport Snarls Operations

Thomas Fire Spreads Rapidly to Santa Barbara County

UTUADO JOURNAL

Rebuilding Puerto Rico, One Small Gesture at a Time

U.S.

Tap Water Ban for Toledo Residents

By EMMA G. FITZ... AUG. 3, 2014

The discovery of high toxin levels in water from Lake Erie had residents in Toledo, Ohio, relying on bottled water while local supplies were being tested. Joshua Lott/Reuters

RELATED COVERAGE

Fertilizer Limits Sought Near Lake Erie to Fight Spread of Algae FEB. 26, 2014

With Surf Like Turf, Huge Algae Bloom Befouls China Coast JULY 5, 2013

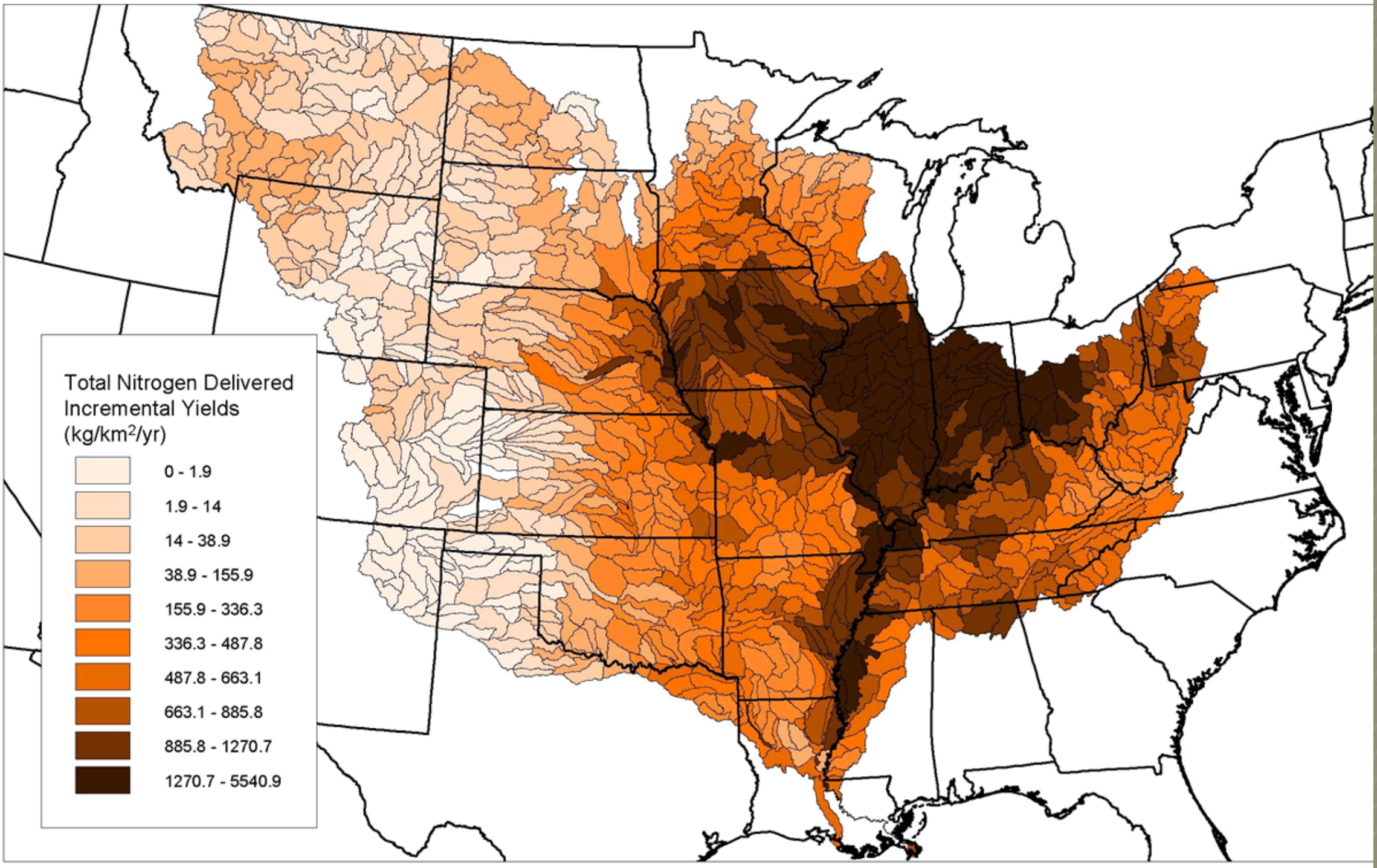
Algae Blooms Threaten Lake Erie

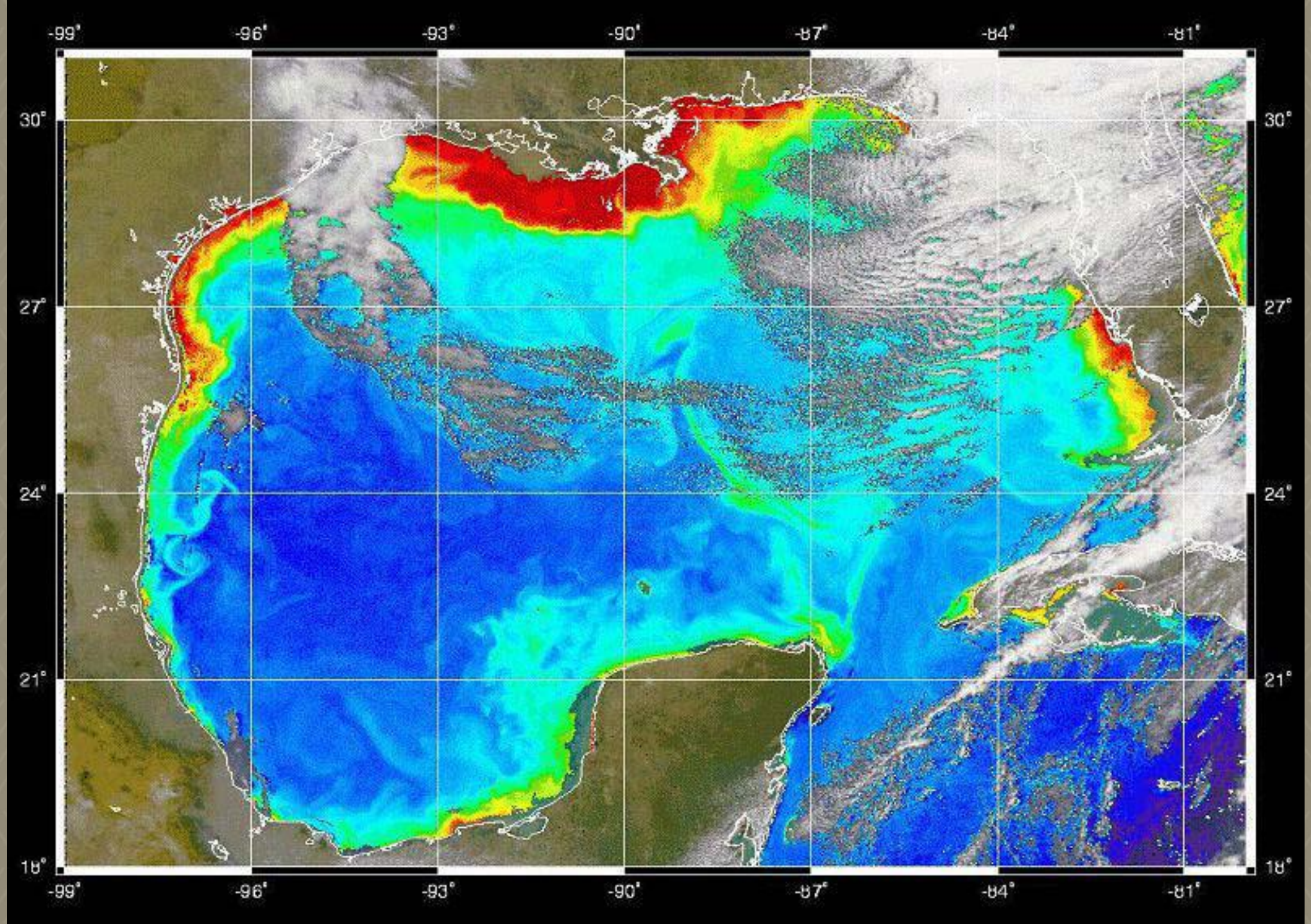
MARCH 14, 2013

RECENT COMMENTS

Memi August 4, 2014

Sorry to be so cynical, but this environmental catastrophe is nothing but a free market opportunity for the bottled water industry. Bottled...


Total Nitrogen Delivered
Incremental Yields
(kg/km2/yr)
0 - 1.9
1.9 - 14
14 - 38.9
38.9 - 155.9
155.9 - 336.3
336.3 - 487.8
487.8 - 663.1
663.1 - 885.8
885.8 - 1270.7
1270.7 - 5540.9


-99°
-96°
-93°
-90°
-87°
-84°
-81°
30°
27°
24°
21°
18°


15:08:03

Minnesota farmers worried buffer la… threaten property rights

By April Baumgarten on Apr 27, 2017 at 8:18 p.m.

City of Columbus issues nitrate

By Lori Kurtzman, The C
Posted Jun 30, 2016 at 12
Updated Jul 1, 2016 at 10:

GREEN

This Lawsuit Has Put Big Ag On The Defensive In A Major Way

A pending Iowa case could set a new national precedent for water pollution stemming from farms.

Jul 30, 2016 | **Updated** Aug 02, 2016

Joseph Erbentraut Senior Reporter, The Huffington Post

…munities face contaminated … manure, nitrates, records

…sted Aug 15, 2017

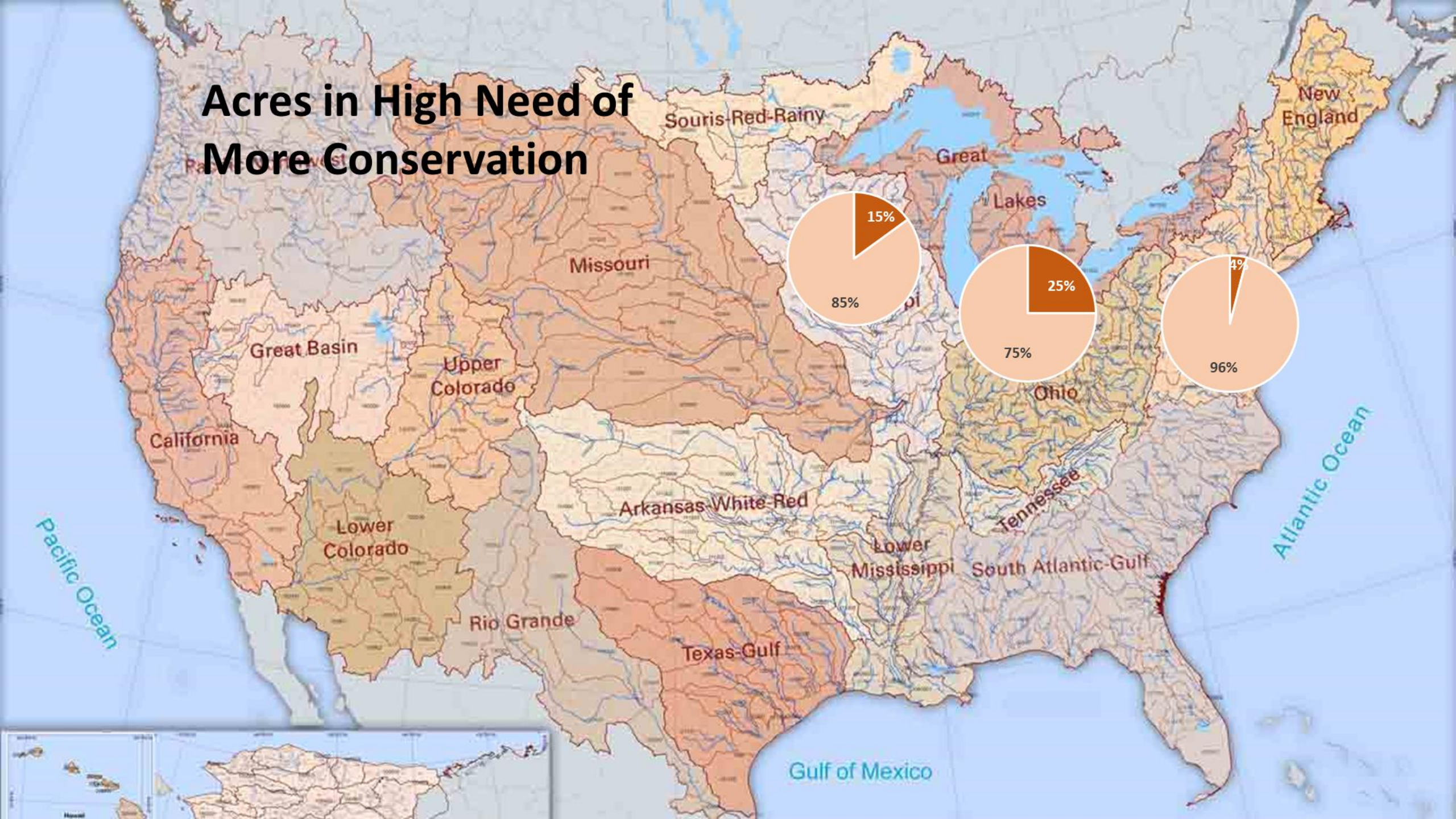
…yride Farms, LLC in Waunakee. *Chuck Quirmbach/WPR*

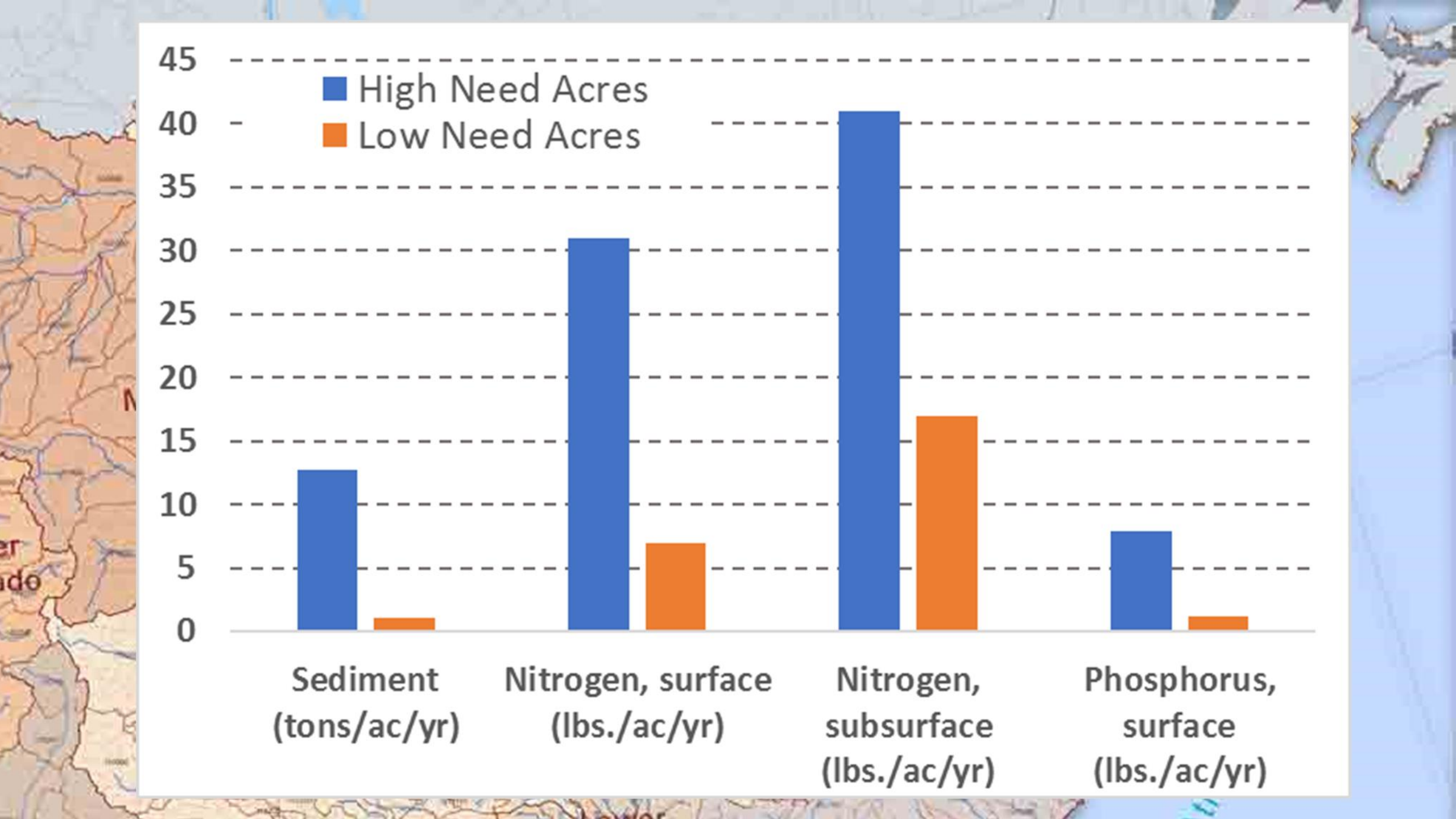
… Operations Grow In Size And …rapples With Environmental Impact

…ge Farms Raise Concern Over Water Quality

…Dam

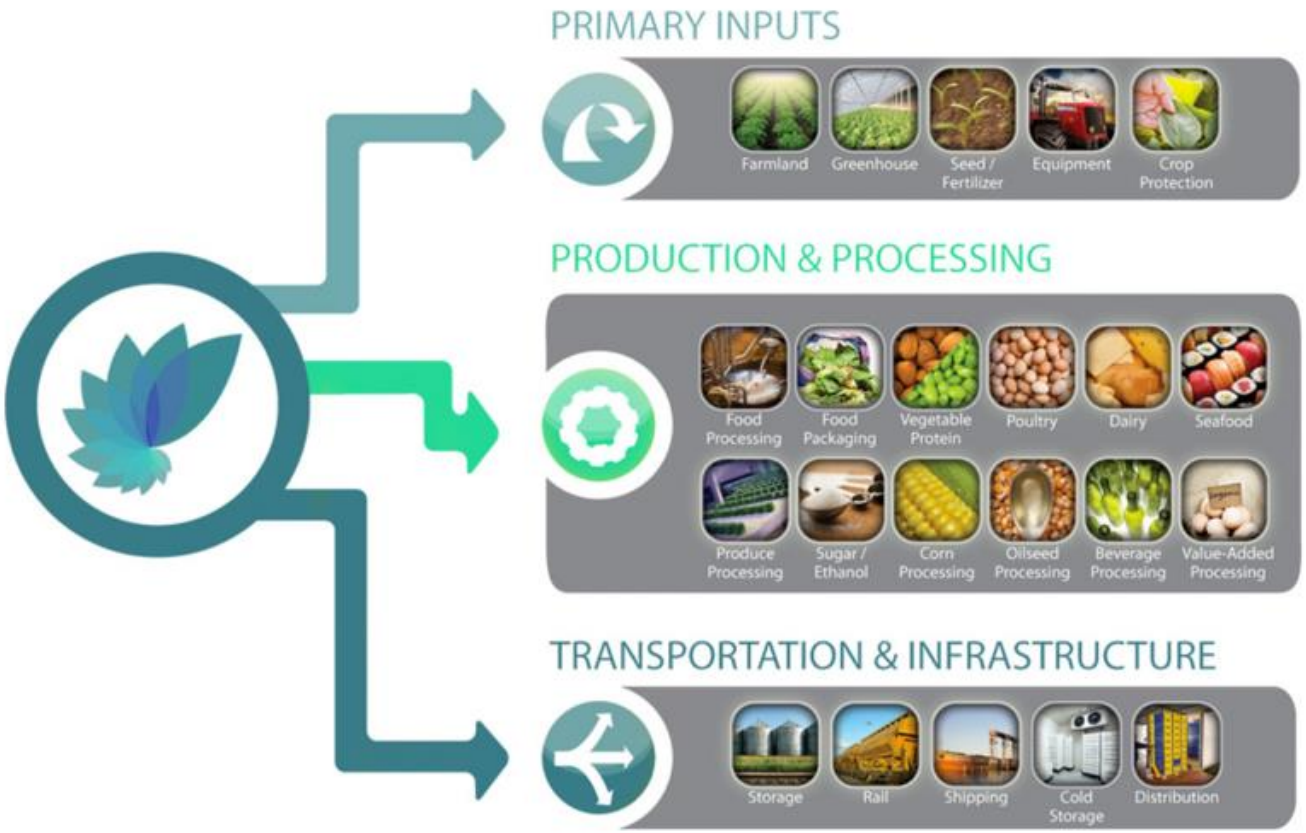
Acres in High Need of More Conservation




45
40
35
30
25
20
15
10
5
0
High Need Acres
Low Need Acres
Sediment (tons/ac/yr)
Nitrogen, surface (lbs./ac/yr)
Nitrogen, subsurface (lbs./ac/yr)
Phosphorus, surface (lbs./ac/yr)

New Revolution:
Convergence of Public Interest with Consumer Interest with Capital Interest


CONSUMER
DEMANDS
ARE CHANGING


PRIMARY INPUTS
Farmland
Greenhouse
Seed / Fertilizer
Equipment
Crop Protection
PRODUCTION & PROCESSING
Food Processing
Food Packaging
Vegetable Protein
Poultry
Dairy
Seafood
Produce Processing
Sugar / Ethanol
Corn Processing
Oilseed Processing
Beverage Processing
Value-Added Processing
TRANSPORTATION & INFRASTRUCTURE
Storage
Rail
Shipping
Cold Storage
Distribution

Sustainability Drivers: Consumers

Consumers increasingly want to know where and how their food is produced

83% Consider sustainability when buying food

66% Say it's important their food and beverages are produced in a sustainable way

58% Change food choices to reduce environmental impact

Survey data from: Cone Communications Trend Tracker 2014, National Geographic Greendex 2014, and IFIC Consumer Perceptions of Food Technology Survey 2014

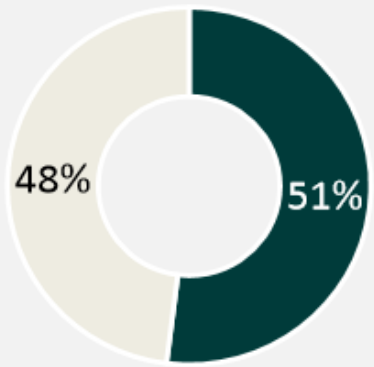
These evolving value drivers are impacting consumer purchases across geography, age, and income segments

Legend: **Traditional Drivers** (taste, price, convenience) | **Evolving Drivers** (healthy & wellness, safety, social impact, experience, transparency)

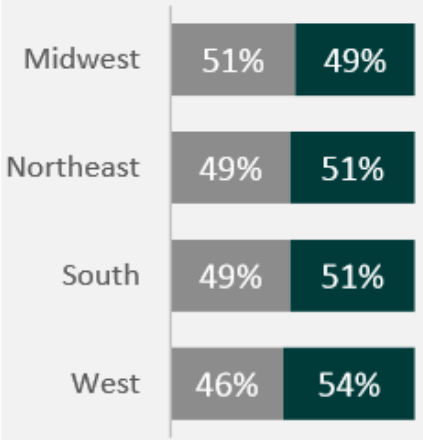
Perception:

- It's still the **minority**
- It's only the **coasts**
- It's only **Millennials**
- It's only the **rich**

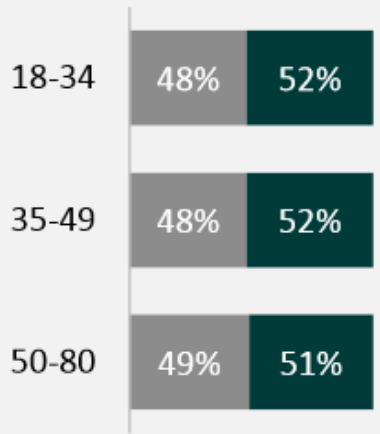
Reality: 51% of consumers weigh evolving drivers more heavily



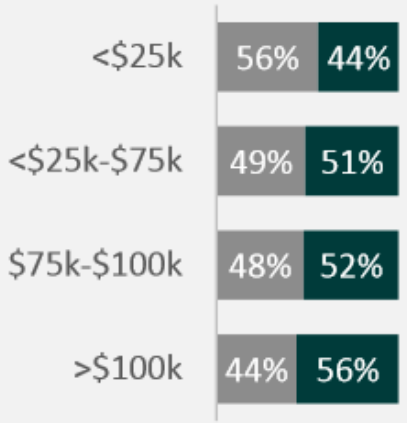
Reality: Evolving drivers are equally important across regions



Reality: Evolving drivers are equally important across age groups



Reality: Evolving drivers are highly relevant across income groups



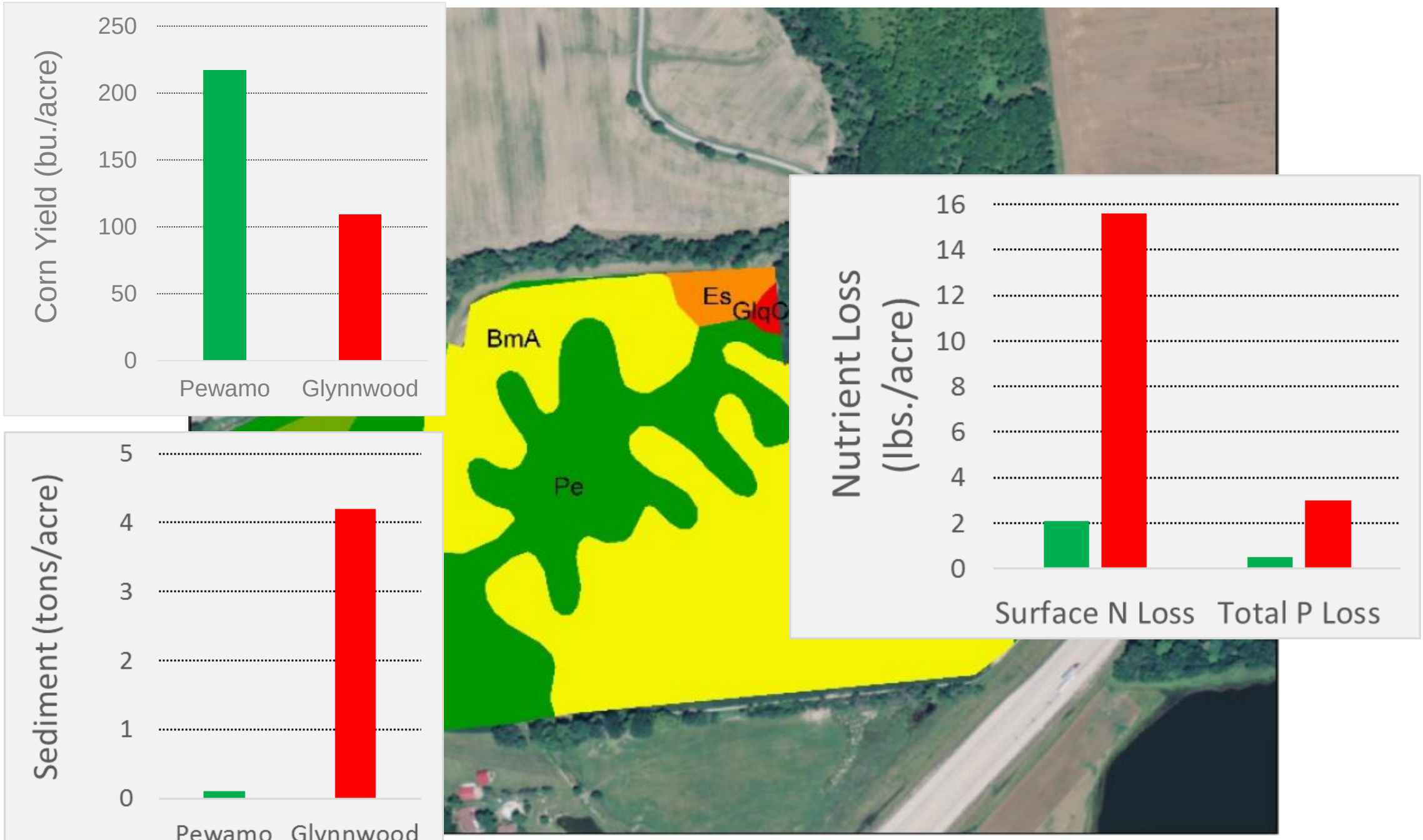
Source: Deloitte Consumer Food Value Equation Survey, 2015; Deloitte analysis

Sustainability Drivers: Customers

Customer interest & level of engagement are growing

Not All Acres Were Created Equal . . . And They Shouldn't Be Managed That Way

LAND O'LAKES SUSTAIN™


Corn Yield (bu./acre)
250
200
150
100
50
0
Pewamo
Glynnwood
Es
GlqC
BmA
Pe
Nutrient Loss (lbs./acre)
16
14
12
10
8
6
4
2
0
Surface N Loss
Total P Loss
Sediment (tons/acre)
5
4
3
2
1
0
Pewamo
Glynnwood

As the dynamic frontier between the living world of biology and Earth's rocky bones, soil is the realm in which microbial life recycles the remains of higher life into the raw materials for new life.

David R. Montgomery. *Growing A Revolution: Bringing Our Soil Back to Life.* New York: W.W. Norton & Company, 2017.

One teaspoon of *healthy* soil contains

100 million-
1 billion individual bacteria

Source: Soil Biology Primer page c-1 (Elaine Ingham, Andrew R. Moldenke, Clive Edwards)

USDA United States Department of Agriculture

Want more soil secrets?
Check out **www.nrcs.usda.gov**

USDA is an equal opportunity provider and employer.

Benefits of Soil Health and Precision Management

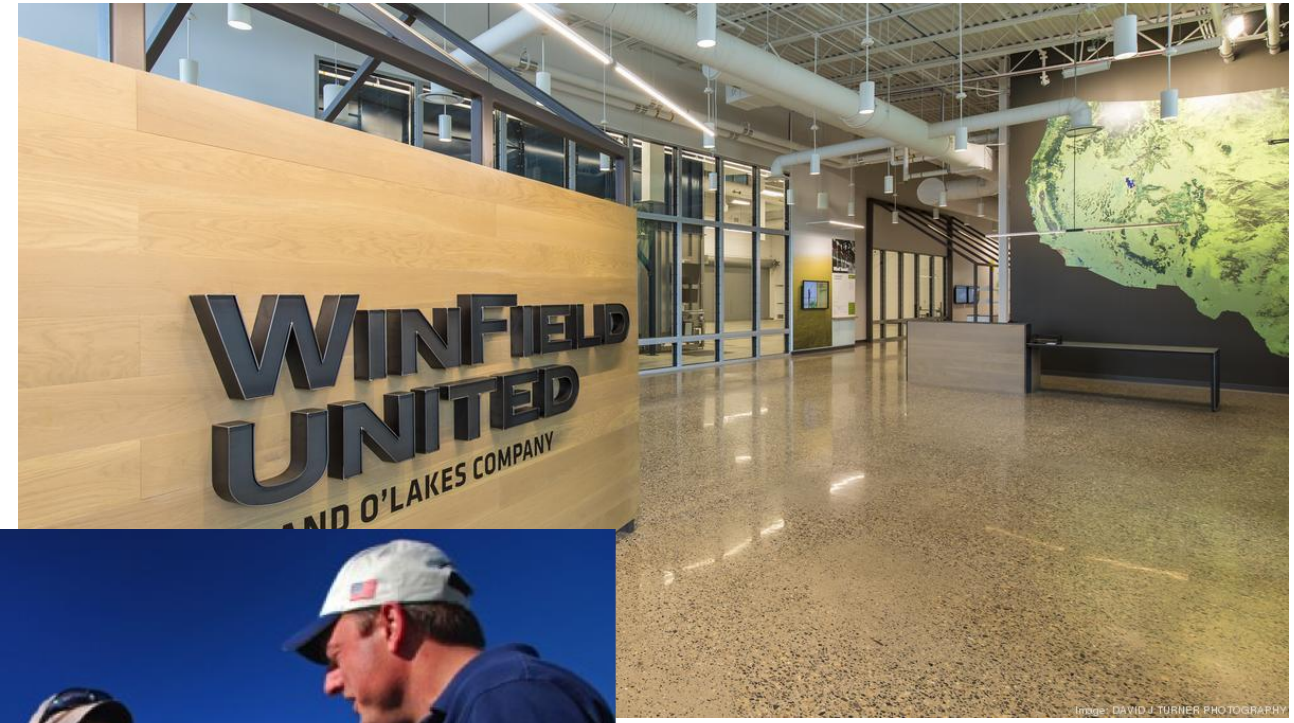
Soil Carbon Trend	Conservation Plan Level	Corn Yield	P added	P lost	N added	N lost
		(bu/acre)		(lbs/acre)		
Gaining Carbon: Healthy	**Complete**	**175**	**15**	**0.7**	**180**	**22**
	Incomplete (Over Fertilized)	176	30	3.1	230	30
Losing Carbon: Unhealthy	Incomplete (Under Fertlized)	152	8	2.3	120	36
	Incomplete	157	26	6.2	190	55
Basin Average		168	18	1.9	160	27

HOW WILL CONSERVATION DRIVE EFFICIENCY AND FARM PROFITABILITY?

Future belongs to the most efficient

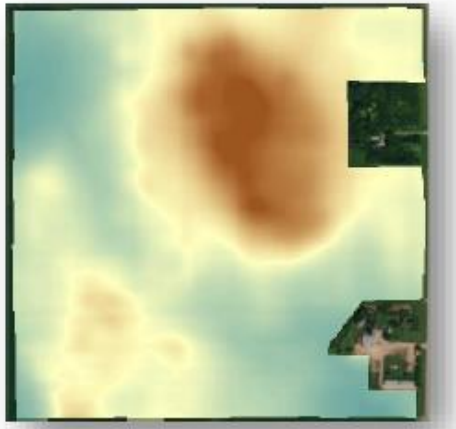
Identify and monetize inefficiencies

Provide reasonable tools to economically eliminate inefficiencies


WINFIELD
UNITED
O'LAKES COMPANY

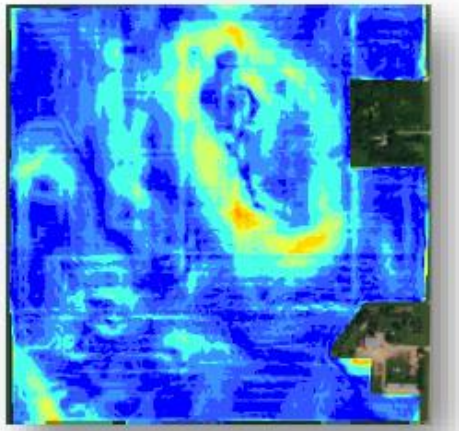
How do we help farmers identify opportunities?

Soil Management Insights



Elevation

Elevation maps are a basic surface showing what the elevation of the field is at each pixel. The Soil Vantage layers are sourced by Lidar data, which provides a very high resolution dataset. R7® processes this data and simplifies it for display purposes. Any areas of the country that do not have Lidar data available will use a secondary elevation model source



Slope

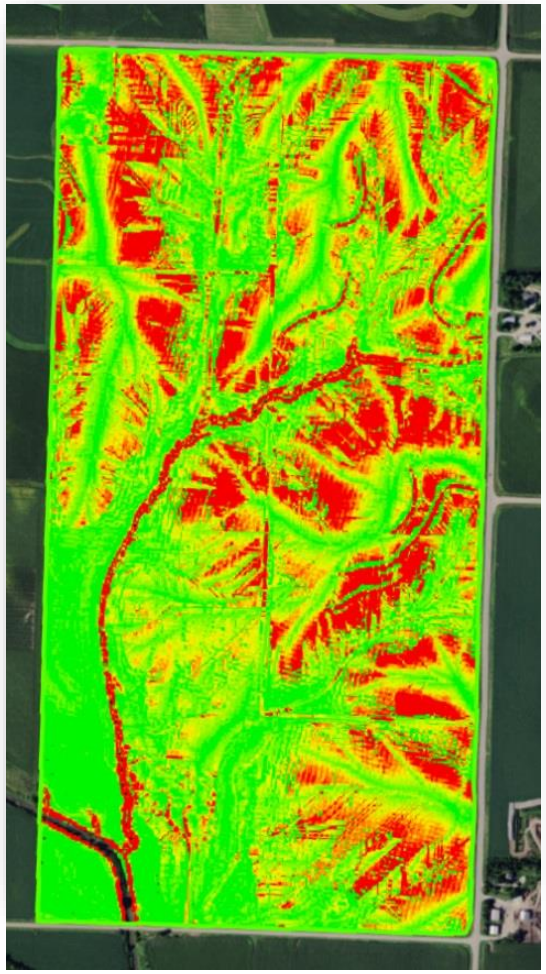
Slope is a map product that illustrates the percentage of change in elevation between pixels on the map. The greater the rate of change, the higher the percent of slope. Areas that are flat across the map, blue on the attached example, show little slope percentage. Steep areas, orange/red on the map, show a high percentage of slope

Erosion Risk

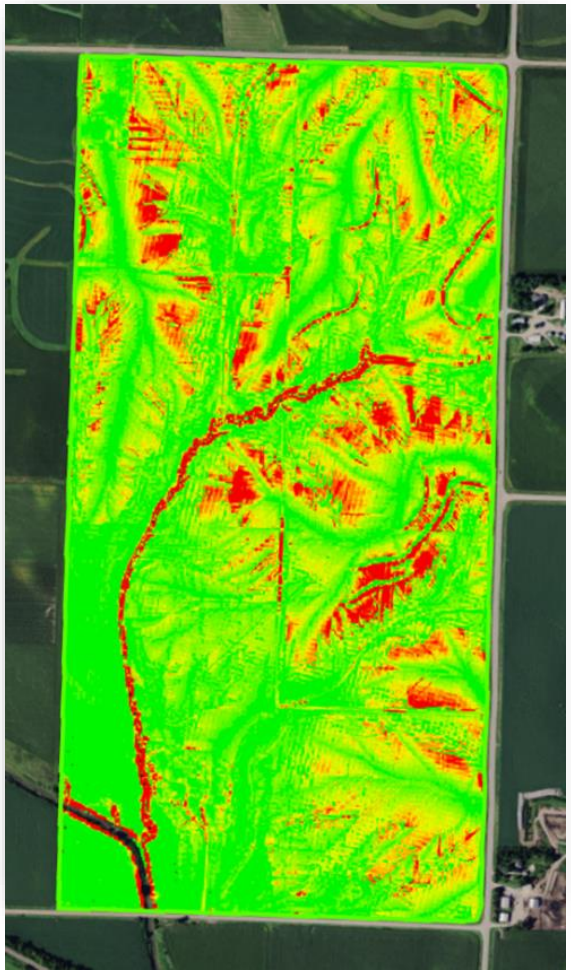
Erosion Risk is another map product that shows which part of the field has the highest risk for erosion. By utilizing slope maps and other hydrologic data, this map will show which parts of the field will likely have the worst erosion, and which parts of the field are generally safer from potential erosion

Precision Conservation Planning

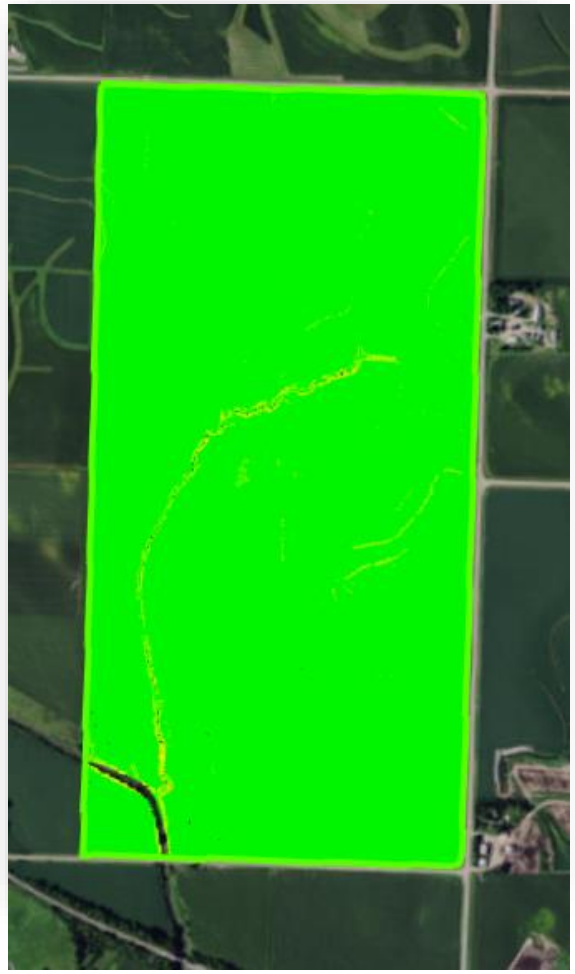
Agren®
SoilCalculator



Conventional tillage

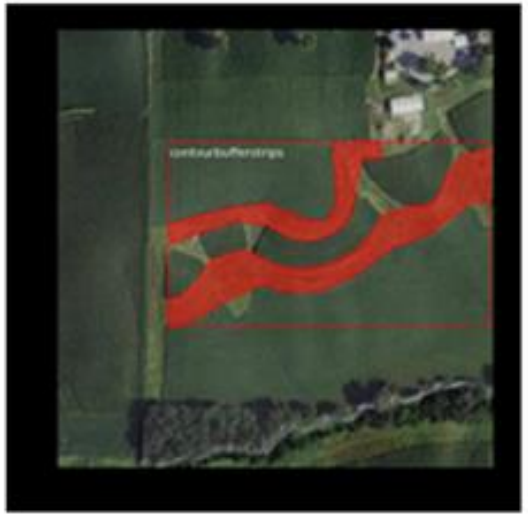


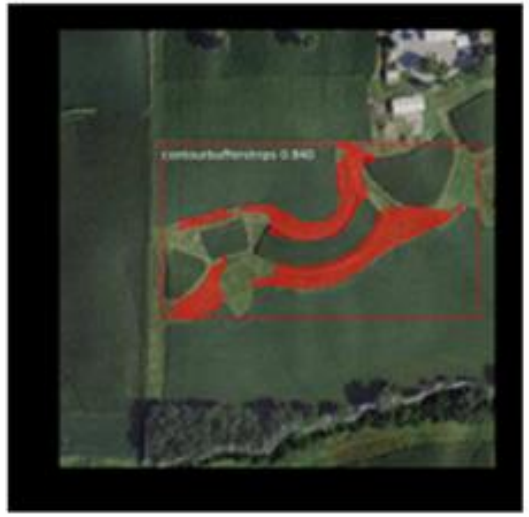
No-till one year



Continuous no-till

Stewardship-Driven Machine Learning



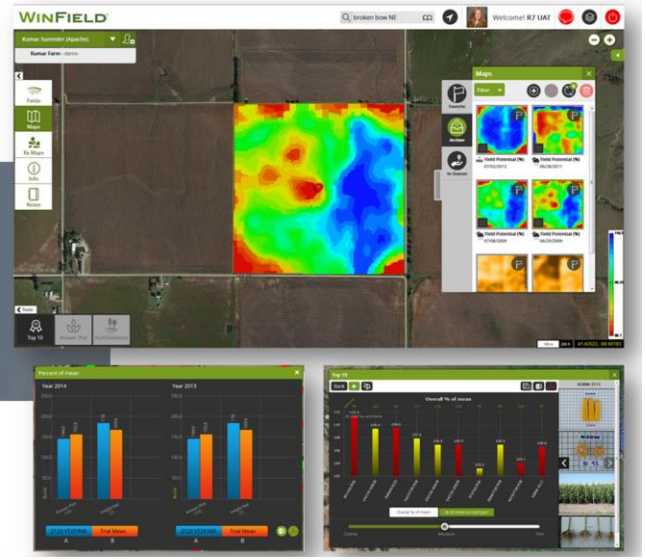


R7® Tool

By WINFIELD® UNITED

- Best in class seed placement tool
- Easy-to-use Web & Mobile Solution
- Satellite Imagery to Detect Vegetation
- Field-Specific Variability Assessment
- Product-Specific Response Insights
- Enabling In-Season Management
- ROI Understanding for each Field

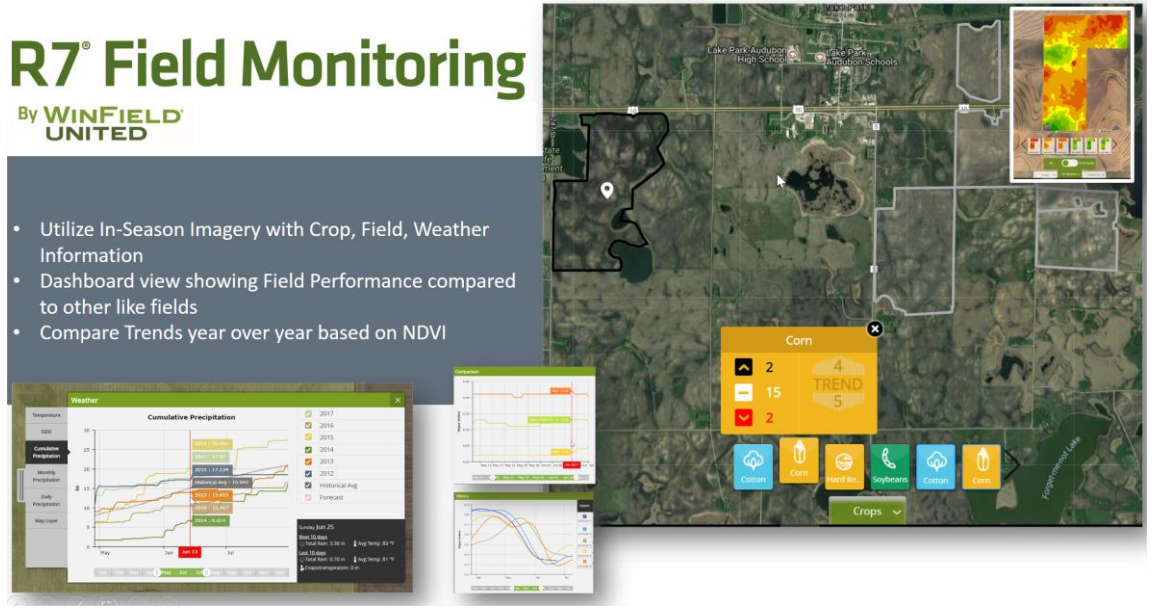
"Enable the growers that we serve to capture the optimal yield potential on every acre."



R7® Field Monitoring

By WINFIELD® UNITED

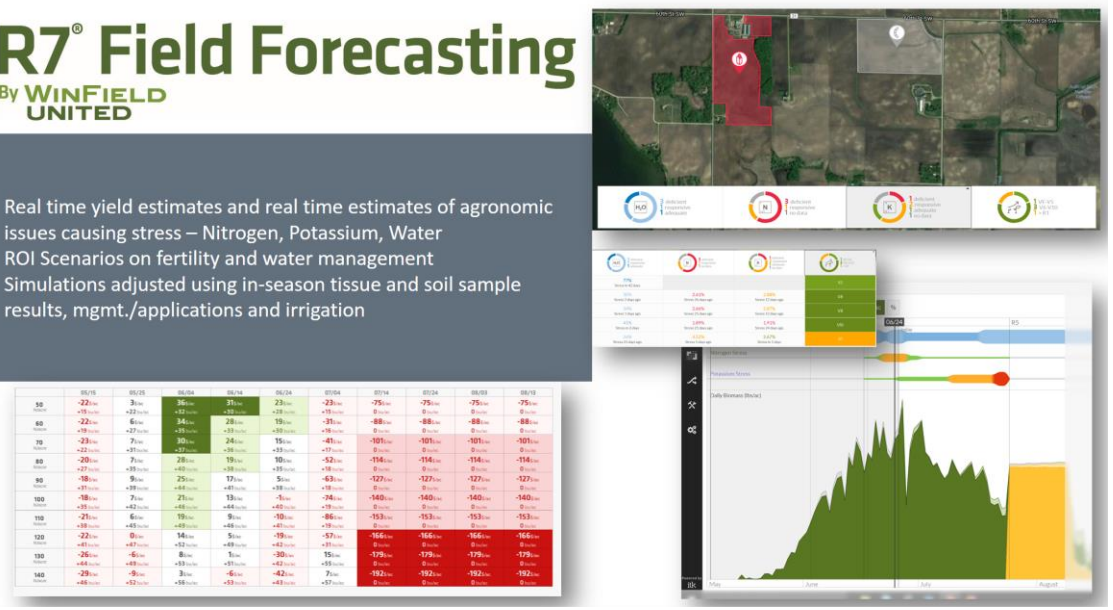
- Utilize In-Season Imagery with Crop, Field, Weather Information
- Dashboard view showing Field Performance compared to other like fields
- Compare Trends year over year based on NDVI



R7® Field Forecasting

By WINFIELD® UNITED

- Real time yield estimates and real time estimates of agronomic issues causing stress – Nitrogen, Potassium, Water
- ROI Scenarios on fertility and water management
- Simulations adjusted using in-season tissue and soil sample results, mgmt./applications and irrigation

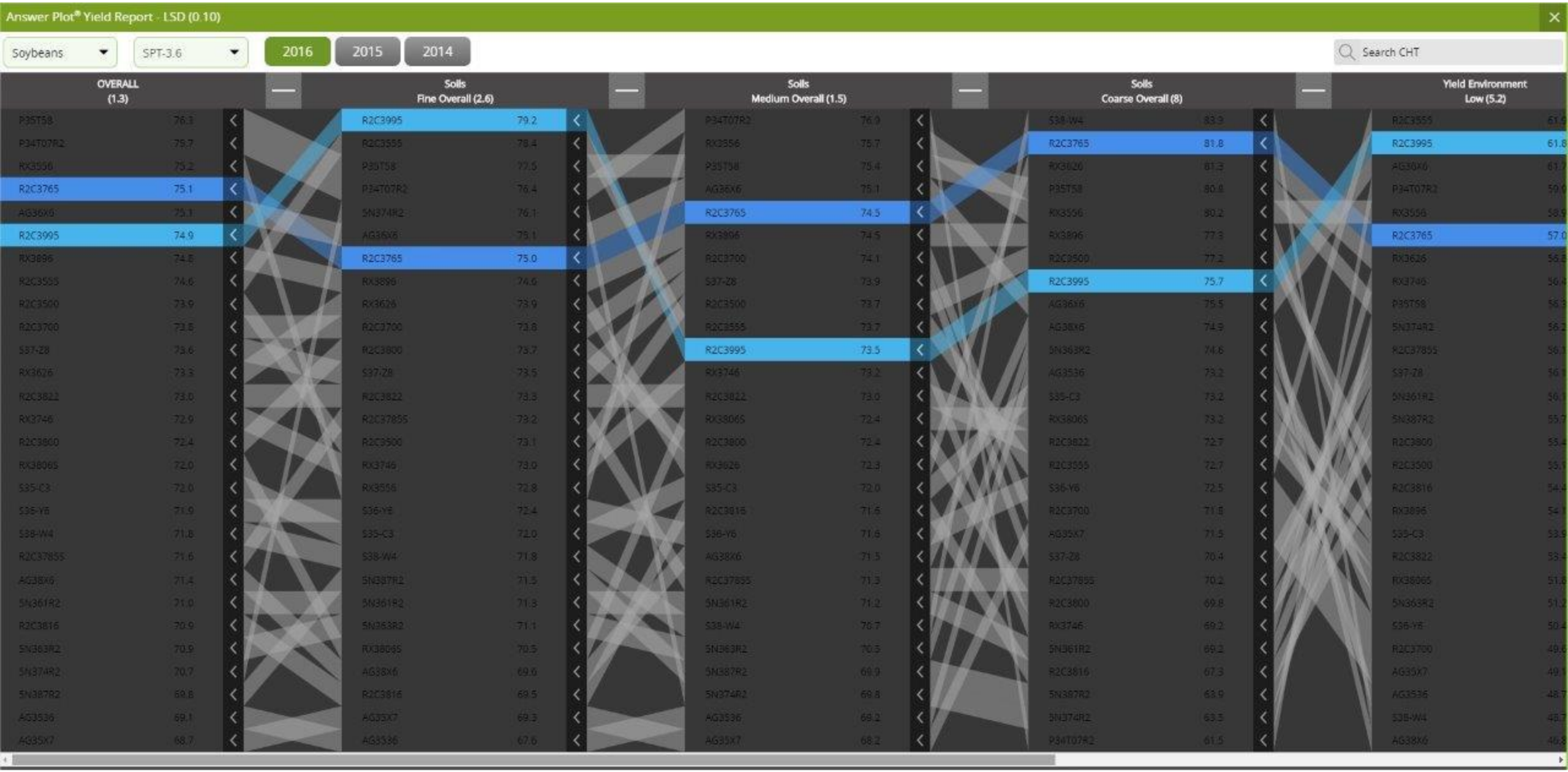


NutriSolutions®

By WINFIELD® UNITED

NS 360

- Improved workflow allowing work order setup via Web-based tools and Ad-hoc sampling for unplanned scouting
- Increased user experience via a Multi-field/sample management process
- Radar Chart reporting to better visualize deficiencies
- Import sample locations or manually pin zones and assign work order to field crews


Answer Plot® Yield Report - LSD (0.10)
Soybeans
SPT-3.6
2016
2015
2014
Search CHT
OVERALL (1.3)
P35T58 76.3
P34T07R2 75.7
RX3556 75.2
R2C3765 75.1
AG36X6 75.1
R2C3995 74.9
RX3896 74.8
R2C3555 74.6
R2C3500 73.9
R2C3700 73.8
S37-Z8 73.6
RX3626 73.3
R2C3822 73.0
RX3746 72.9
R2C3800 72.4
RX3806S 72.0
S35-C3 72.0
S36-Y6 71.9
S38-W4 71.8
R2C3785S 71.6
AG38X6 71.4
5N361R2 71.0
R2C3816 70.9
5N363R2 70.9
5N374R2 70.7
5N387R2 69.8
AG3536 69.1
AG35X7 68.7
Soils Fine Overall (2.6)
R2C3995 79.2
R2C3555 78.4
P35T58 77.5
P34T07R2 76.4
5N374R2 76.1
AG36X6 75.1
R2C3765 75.0
RX3896 74.6
RX3626 73.9
R2C3700 73.8
R2C3800 73.7
S37-Z8 73.5
R2C3822 73.3
R2C3785S 73.2
R2C3500 73.1
RX3746 73.0
RX3556 72.8
S36-Y6 72.4
S35-C3 72.0
S38-W4 71.8
5N387R2 71.5
5N361R2 71.3
5N363R2 71.1
RX3806S 70.5
AG38X6 69.6
R2C3816 69.5
AG35X7 69.3
AG3536 67.6
Soils Medium Overall (1.5)
P34T07R2 76.9
RX3556 75.7
P35T58 75.4
AG36X6 75.1
R2C3765 74.5
RX3896 74.5
R2C3700 74.1
S37-Z8 73.9
R2C3500 73.7
R2C3555 73.7
R2C3995 73.5
RX3746 73.2
R2C3822 73.0
RX3806S 72.4
R2C3800 72.4
RX3626 72.3
S35-C3 72.0
R2C3816 71.6
S36-Y6 71.6
AG38X6 71.5
R2C3785S 71.3
5N361R2 71.2
S38-W4 70.7
5N363R2 70.5
5N387R2 69.9
5N374R2 69.8
AG3536 69.2
AG35X7 68.2
Soils Coarse Overall (8)
S38-W4 83.9
R2C3765 81.8
RX3626 81.3
P35T58 80.8
RX3556 80.2
RX3896 77.3
R2C3500 77.2
R2C3995 75.7
AG36X6 75.5
AG38X6 74.9
5N363R2 74.6
AG3536 73.2
S35-C3 73.2
RX3806S 73.2
R2C3822 72.7
R2C3555 72.7
S36-Y6 72.5
R2C3700 71.8
AG35X7 71.5
S37-Z8 70.4
R2C3785S 70.2
R2C3800 69.8
RX3746 69.2
5N361R2 69.2
R2C3816 67.3
5N387R2 63.9
5N374R2 63.5
P34T07R2 61.5
Yield Environment Low (5.2)
R2C3555 61.9
R2C3995 61.8
AG36X6 61.7
P34T07R2 59.6
RX3556 58.9
R2C3765 57.0
RX3626 56.8
RX3746 56.4
P35T58 56.3
5N374R2 56.2
R2C3785S 56.0
S37-Z8 56.0
5N361R2 56.
5N387R2 55.7
R2C3800 55.4
R2C3500 55.
R2C3816 54.4
RX3896 54.
S35-C3 53.9
R2C3822 53.4
RX3806S 51.8
5N363R2 51.
S36-Y6 50.4
R2C3700 49.8
AG35X7 49.
AG3536 48.7
S38-W4 48.7
AG38X6 46.8

WINFIELD UNITED

Search Location

Jim

Hedges Jim (Moweaqua)

Hedges Farm2 - Mash FFTD2017

S F I

Top 10

Back

RTP/RTN/RTCC/RTF

Maturity

113

110

High 9.0

Mod 6.0

Low 3.0

DKC63-60RIB

N66V-3000GT

RTP RTN RTCC RTF ALL

N66V-3000GT

24 30 36 42

24 42

Tools

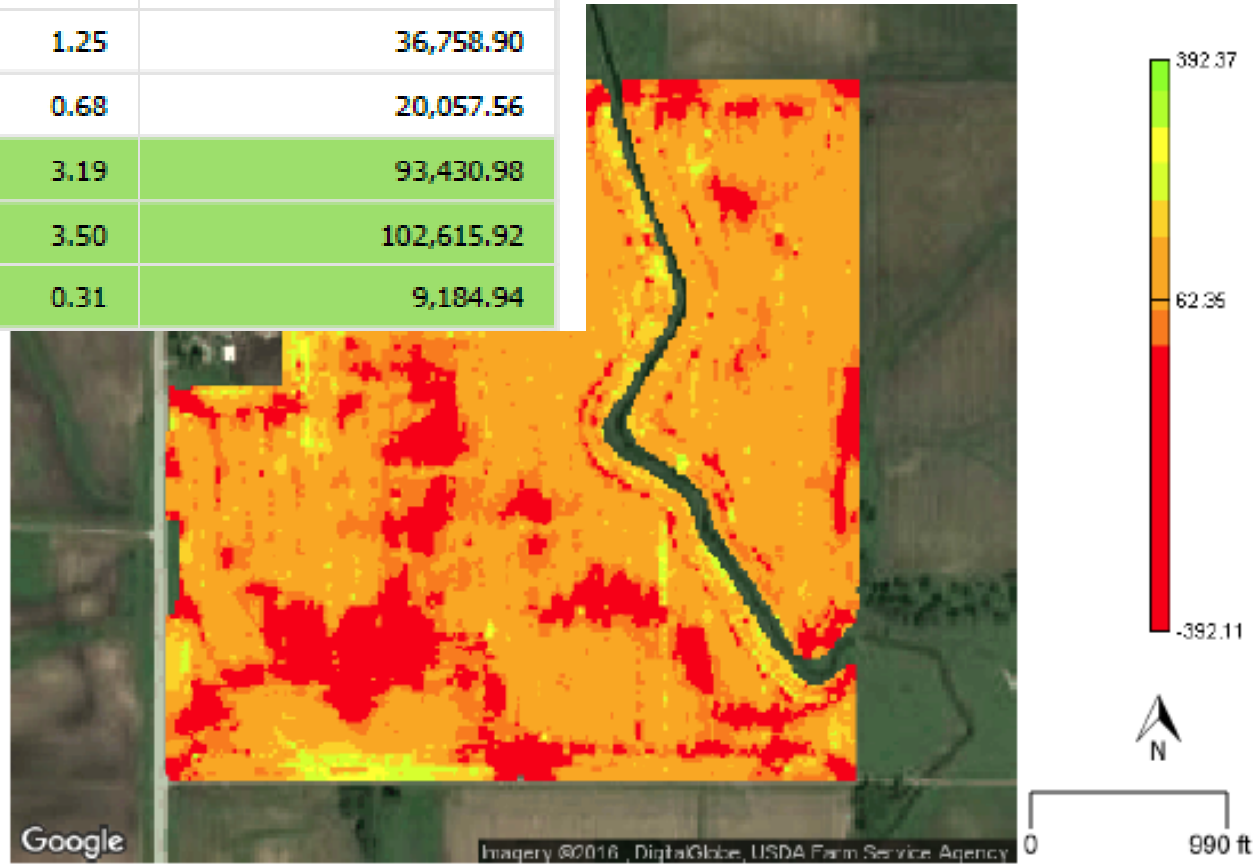
Crops

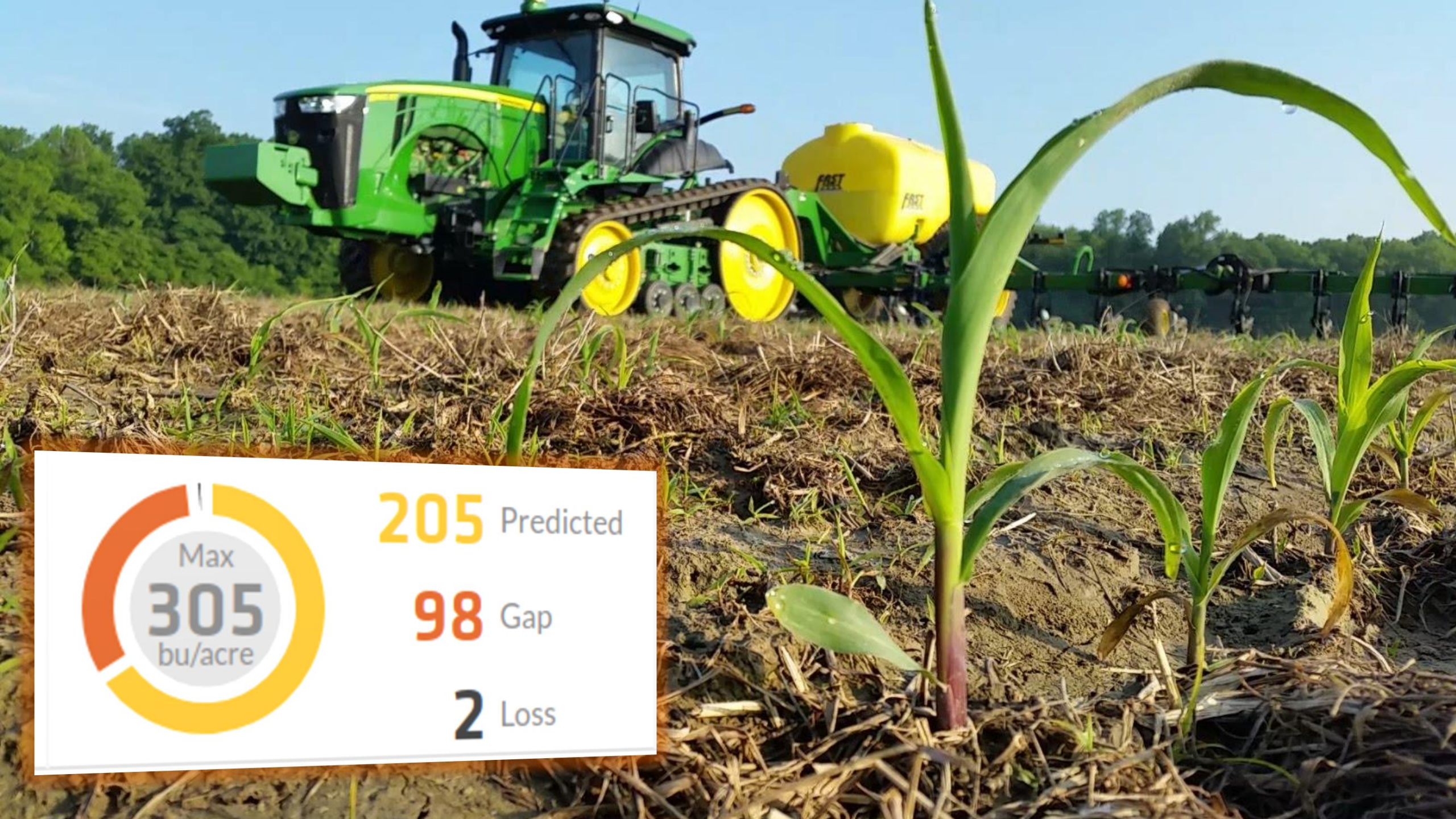
In-Season

Favorite

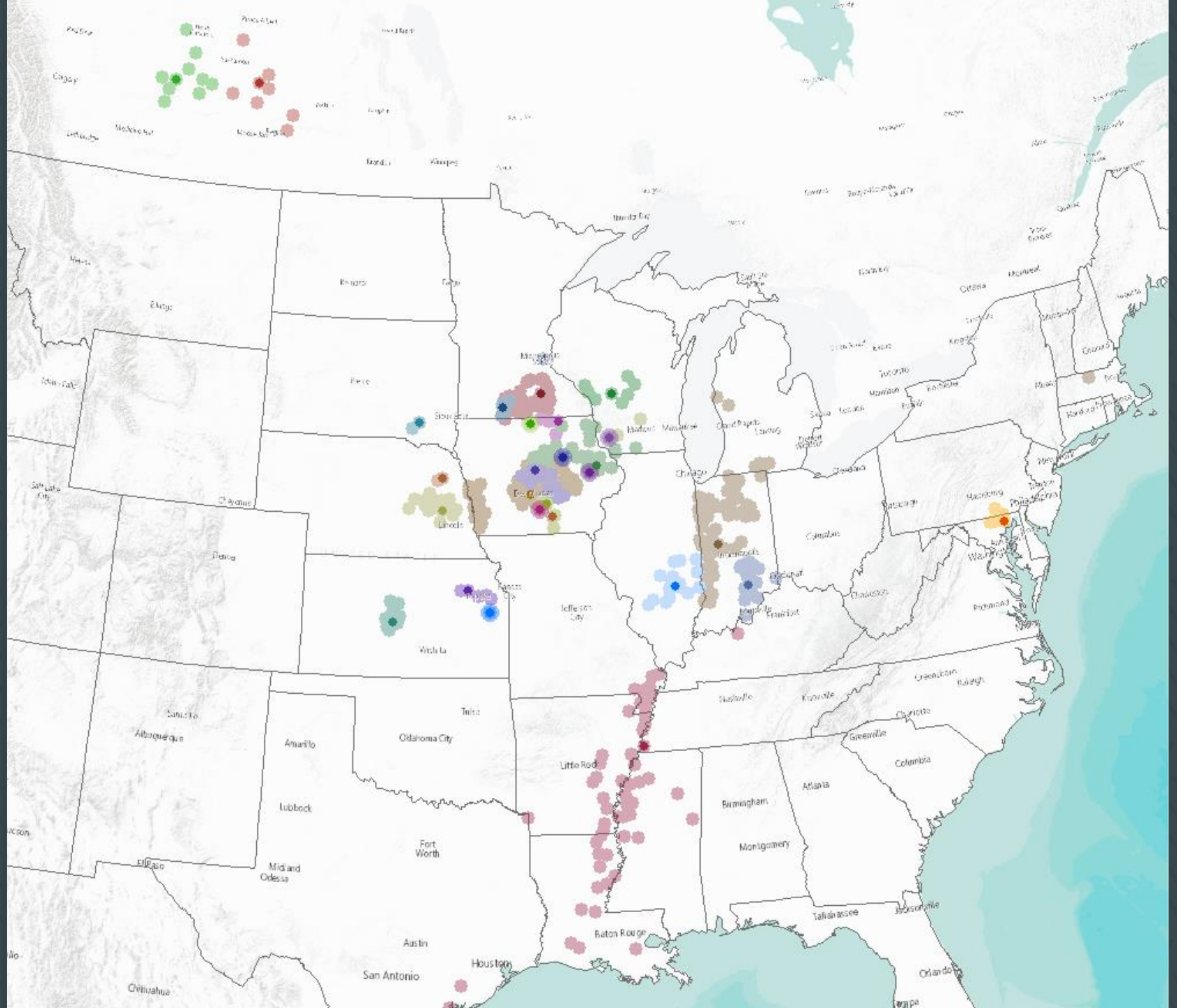
R7 Profit Mapper

Application	Cost ($/Acres)	Cost ($/Bushel)	Cost ($ Total)
Fertilizer	156.11	0.78	22,953.09
Crop Protection	40.85	0.20	6,005.96
Other	2.00	0.01	294.07
Harvesting	50.00	0.25	7,351.78
Land	250.00	1.25	36,758.90
Seed	136.41	0.68	20,057.56
Total Costs	635.43	3.19	93,430.98
Total Income	697.90	3.50	102,615.92
Gross Margin	62.47	0.31	9,184.94




Max
305
bu/acre
205 Predicted
98 Gap
2 Loss

How do we upgrade the conservation delivery engine?


Albuquerque
Amarillo
Oklahoma City
Tulsa
Little Rock
Nashville
Knoxville
Charlotte
Greenville
Columbia
Atlanta
Birmingham
Montgomery
Tallahassee
Jacksonville
Orlando
Baton Rouge
Houston
Austin
San Antonio
Fort Worth
Lubbock
Midland
Odessa
Wichita
Jefferson City
Lincoln
Chicago
Toronto
Ottawa
Raleigh
Richmond
Chihuahua

CUSTOMERS, COMMITMENTS AND CONSULTING

CPG COMPANY CUSTOMERS

Walmart Campbell's Smithfield Kellogg's

PARTNERSHIPS

MAWQCP partnership • EDF • Field to Market

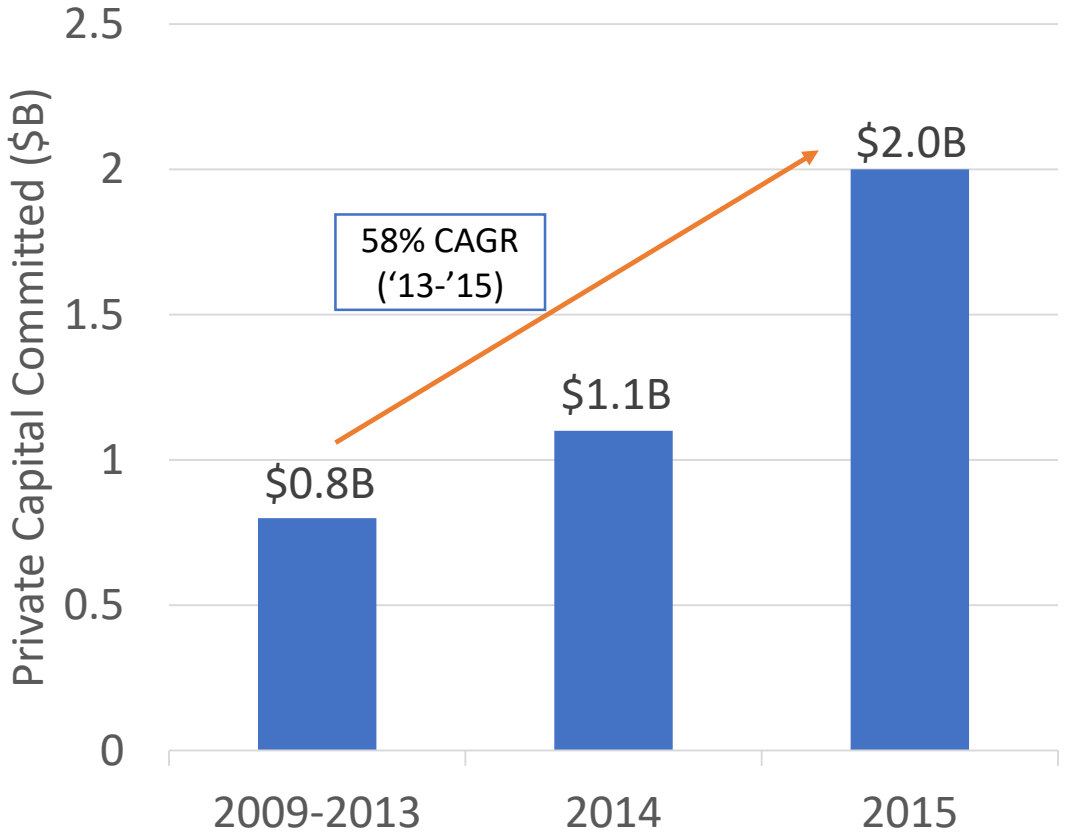
The Nature Conservancy • USDA

Iowa Agricultural Water Alliance

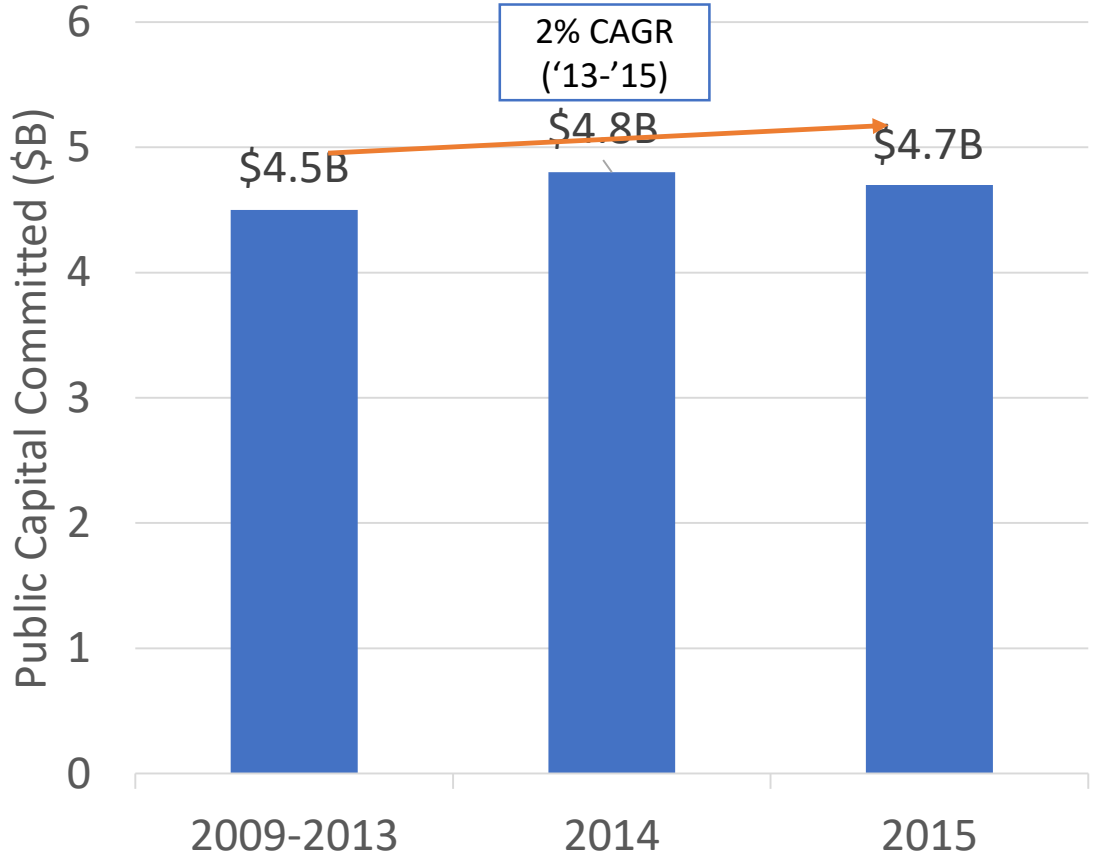
Chesapeake Bay Foundation, university research

Investor interest in conservation is growing as public sector investment stagnates

Private Capital Committed 2009-2015



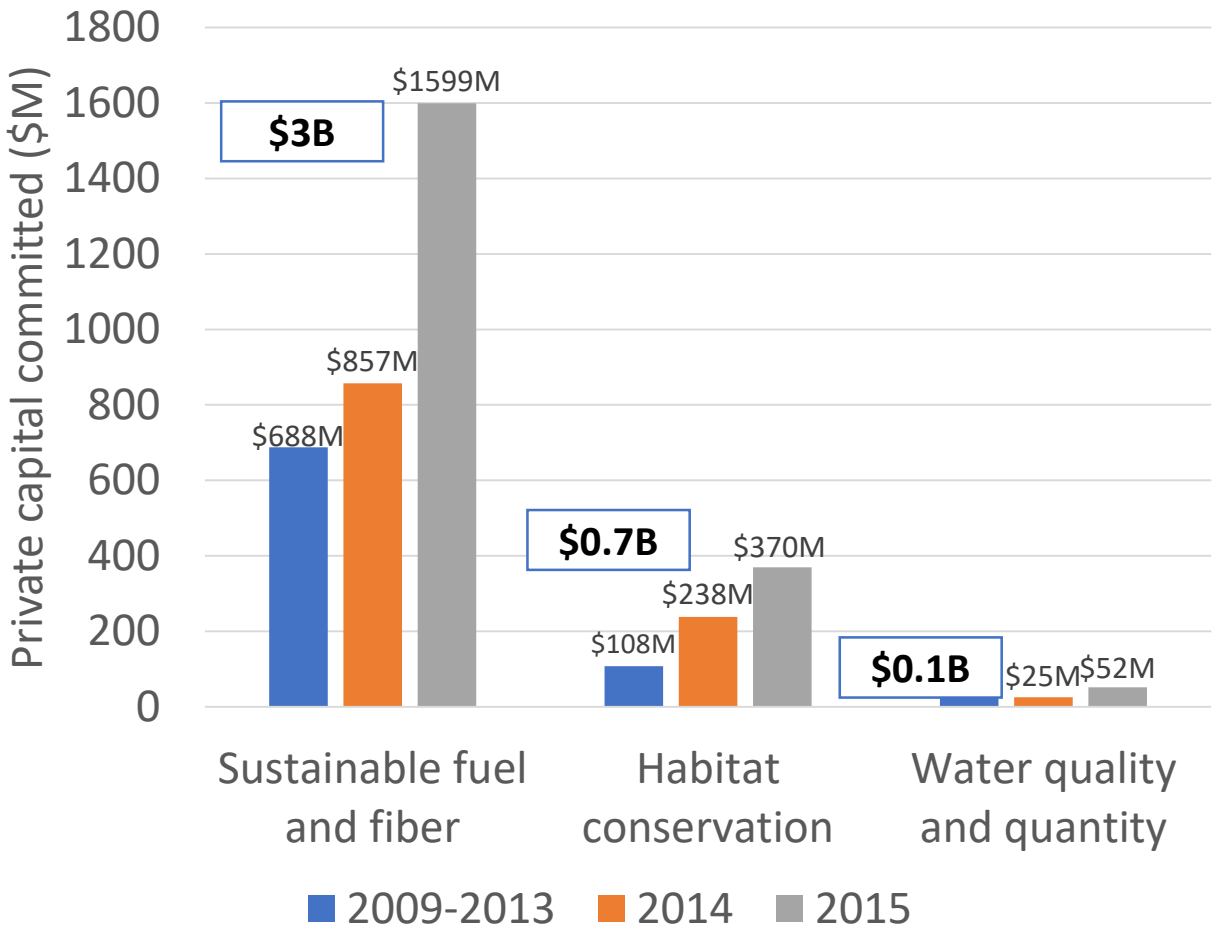
Public Capital Committed 2009-2015



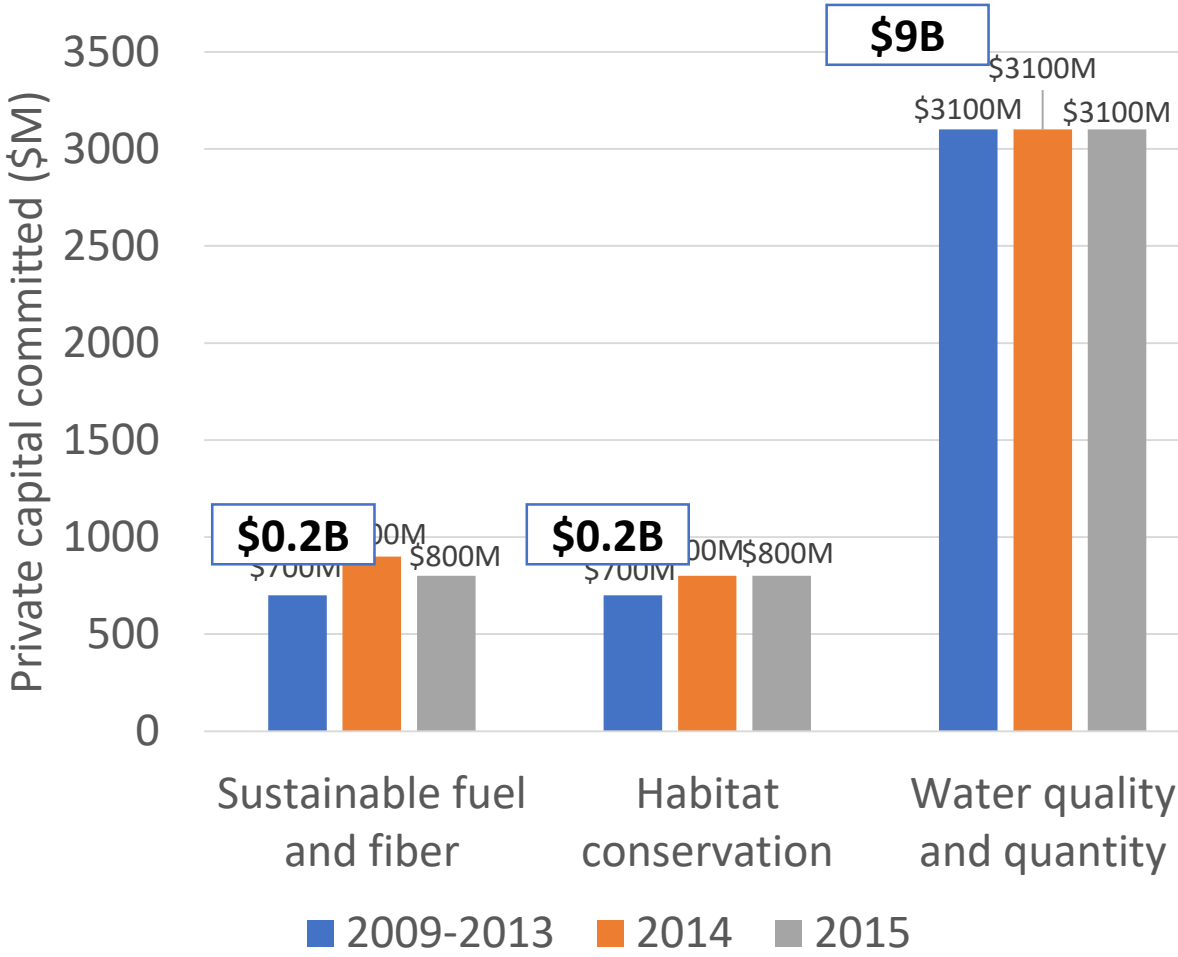
Source: Ecosystem Marketplace, "The State of Private Investment in Conservation 2016"

Private investors favor sustainable food opportunities while public sector focuses on water issues

Private Capital Committed 2009-2015



Public Capital Committed 2009-2015



Source: Ecosystem Marketplace, “The State of Private Investment in Conservation 2016”

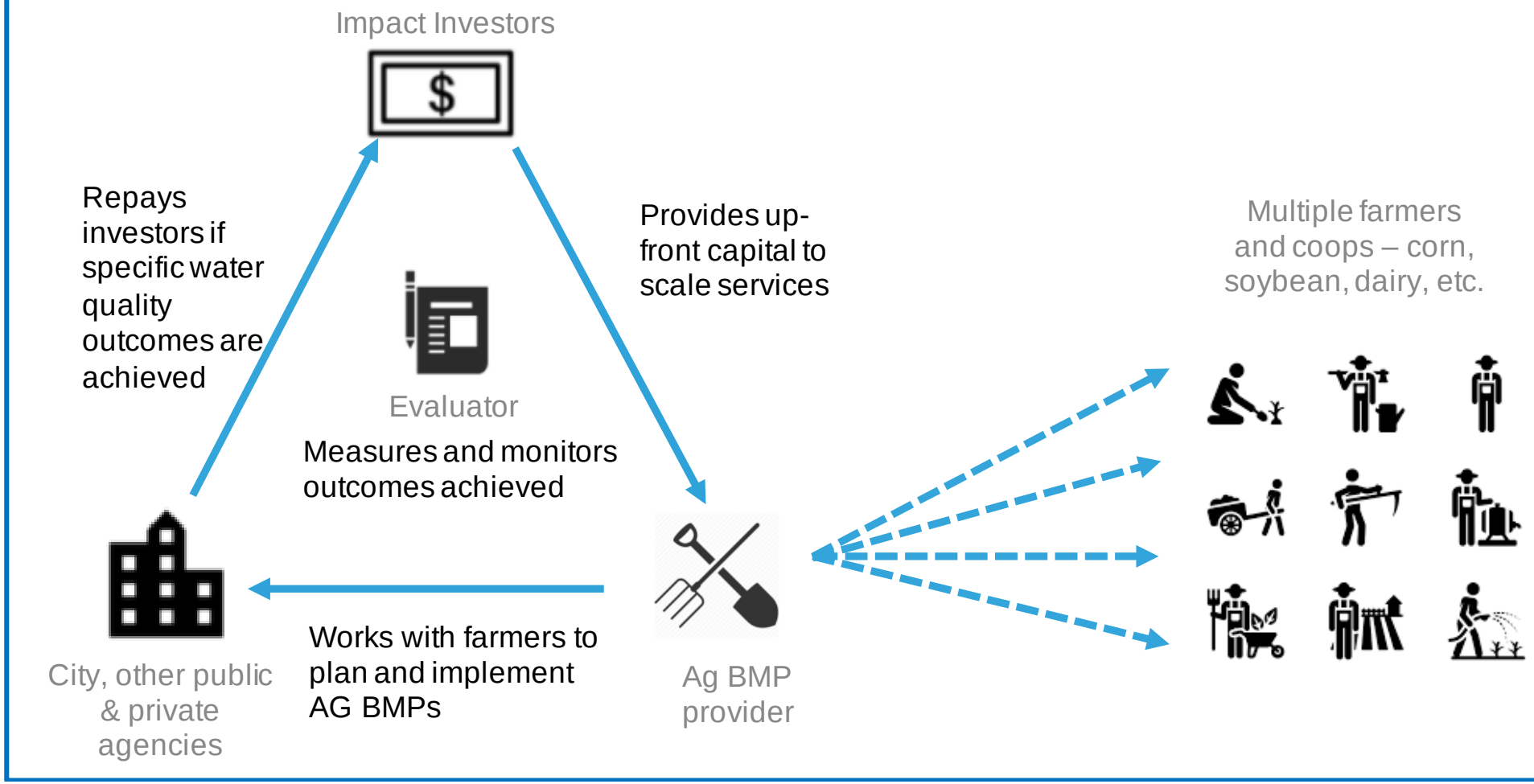
Pay-for-Success Financing Model in Agriculture

LAND O'LAKES SUSTAIN®

Quantified Ventures

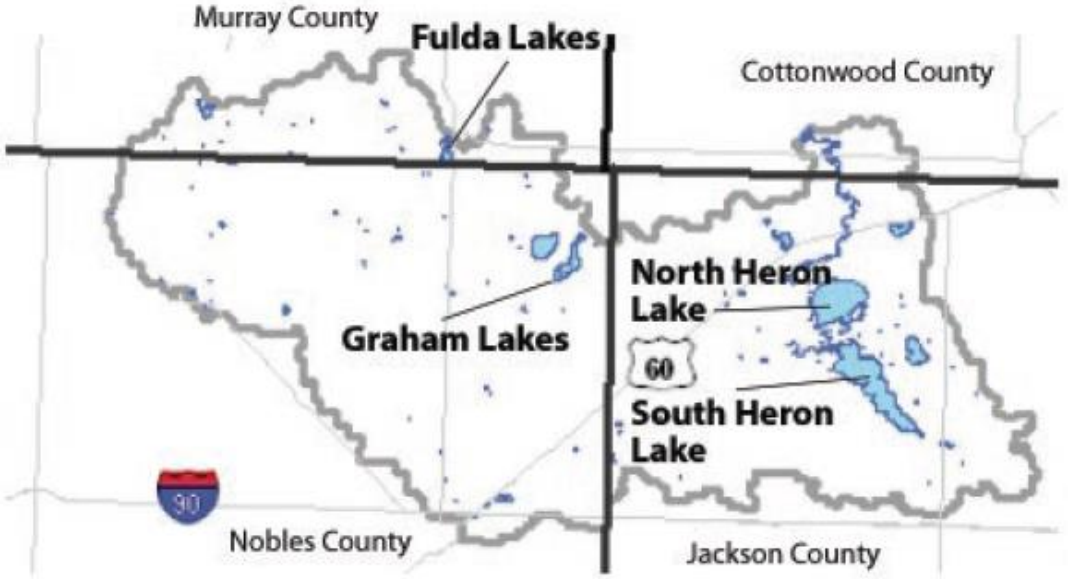
IOWA SOYBEAN Association
Expanding Opportunities. Delivering Results.

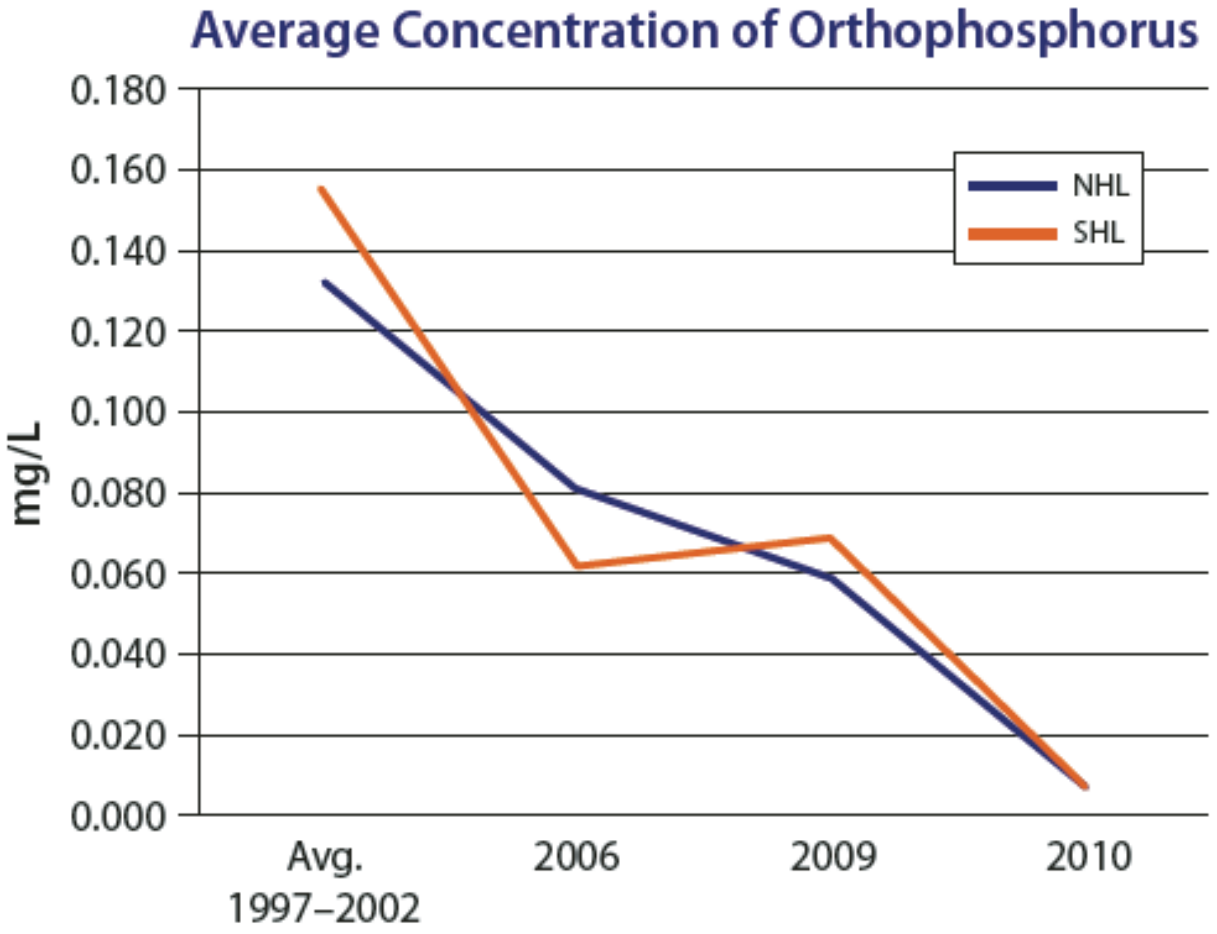
Ag BMP PFS transaction will provide upfront capital from a third party investor to scale evidence-based interventions, with repayment linked to achieving target outcomes



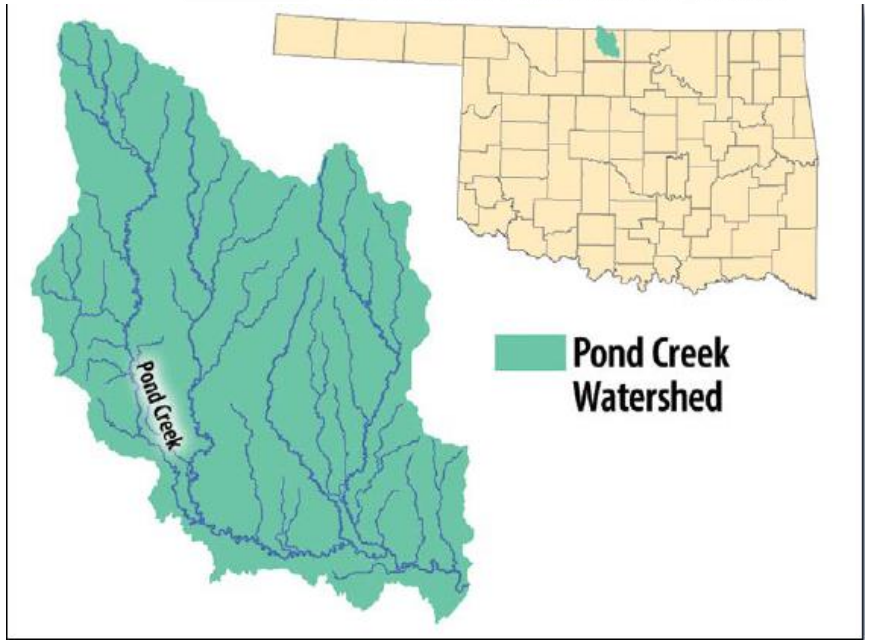

Conservation of
Resources

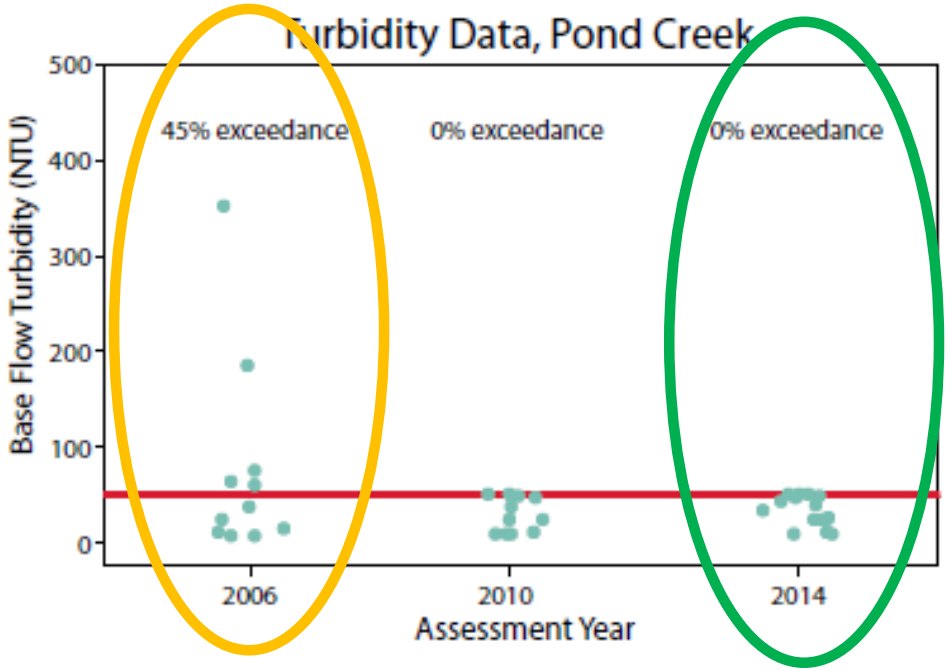
Heron Lake Watershed, MN

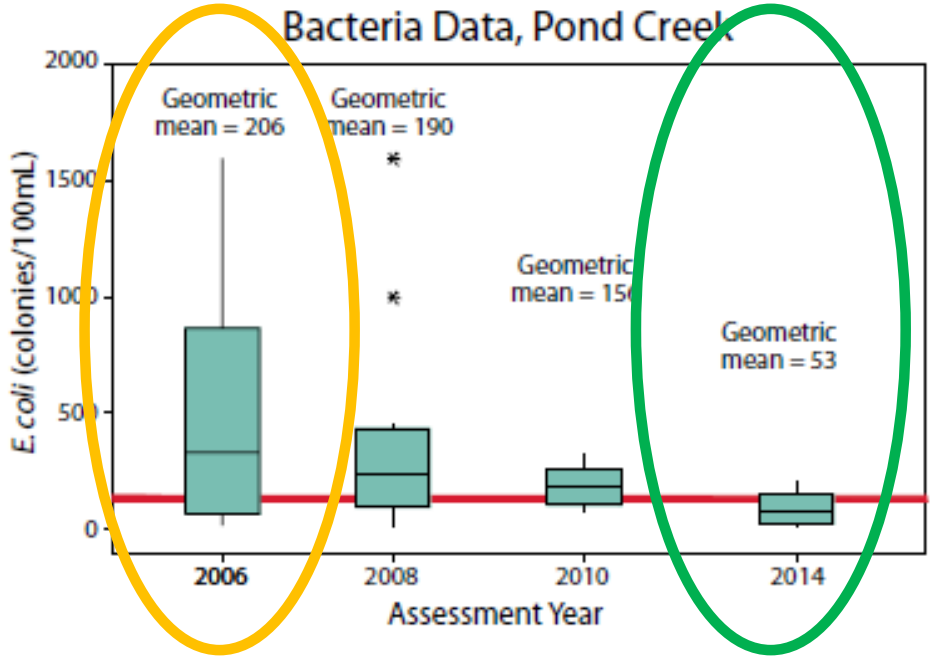




Pond Creek, Oklahoma







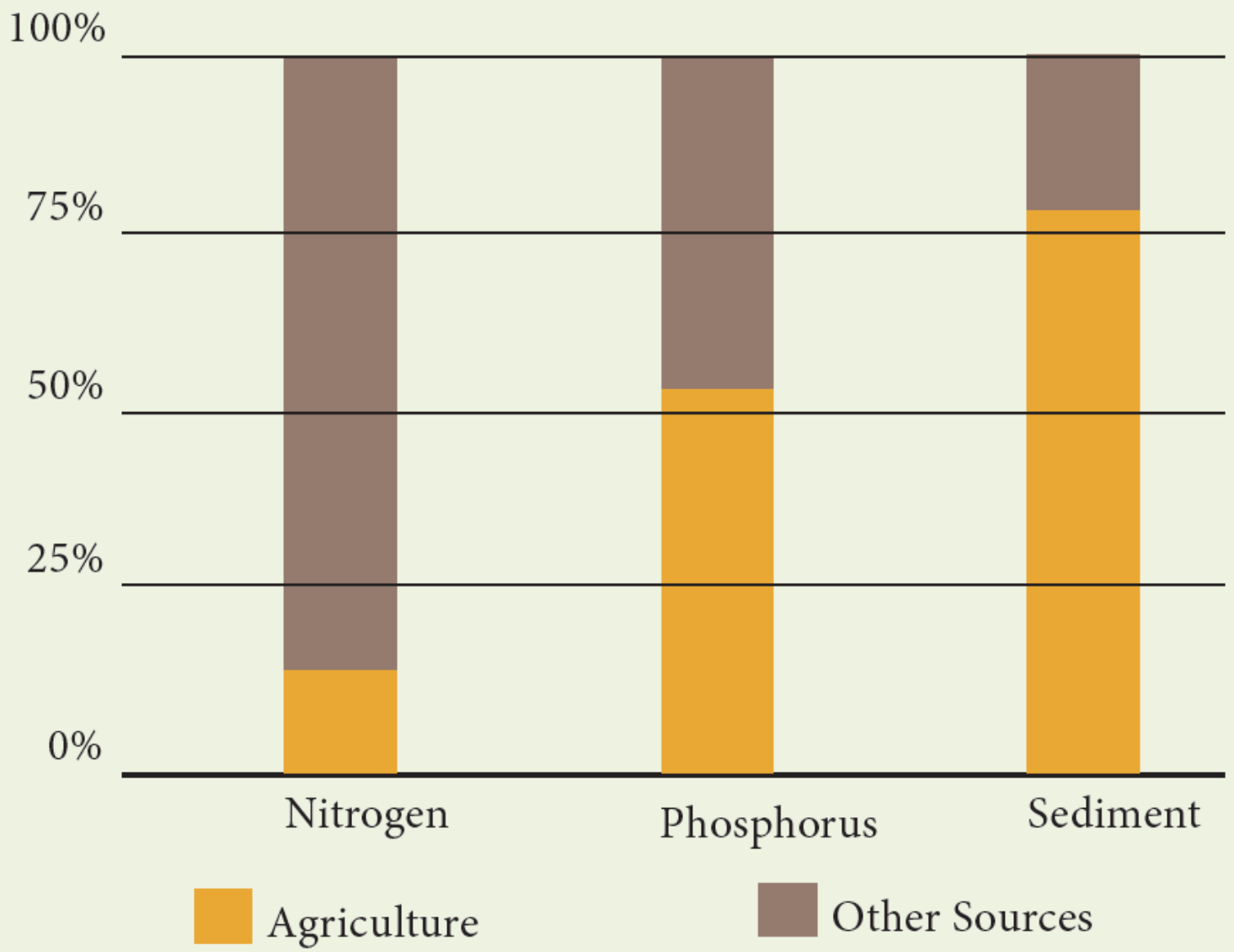
Agricultural Lands – Key to a Healthy Bay

A vibrant and healthy agricultural sector is one key to restoring and improving the Chesapeake Bay – the largest estuary in North America and a national treasure. More than 83,000 farms make up a $10 billion agricultural industry in the Chesapeake Bay watershed.

Since 2009, targeted agricultural conservation investments of nearly $1 billion are putting the agricultural community on its way toward meeting or exceeding key goals for cleaner water and a healthier ecosystem. Independent reports show positive trends for water quality, habitat and key aquatic species including crabs and oysters. Meanwhile, modeled results and monitoring stations show declines in nutrient and sediment loads to the Bay.

While there is no short-term solution for the complex and multi-decadal water quality issues in the watershed, working together can deliver real progress toward a healthier Chesapeake Bay.

REDUCTIONS IN LOADS TO THE BAY, 2009-2015




Old Navy


Urban Transformation Network
MT. VERNON
BAPTIST
CHURCH
Don't Shoot... I'm Gardening!


Metra


ARCUS

Deficiencies in the farmer's temporary stewardship over the land or in the public's permanent interest in the land are very likely to contribute to soil impoverishment.

Hugh Hammond Bennett. *The Hugh Bennett Lectures.* Raleigh, North Carolina: The Agricultural Foundation, Inc., North Carolina State College, June 1959.