

Soil Health, Cover Crops & Nutrient Management

Dr. Michael Castellano

Department of Agronomy

castelmj@iastate.edu

515-294-3636

 @castellmj

How much nitrogen is in a healthy Iowa soil from 0-45”?

- a. 0-100 lbs per acre**
- b. 2000-4000 lbs per acre**
- c. 5000-7000 lbs per acre**
- d. 9000-11000 lbs per acre**

How much nitrogen is in a healthy Iowa soil from 0-45”?

a. 0-100 lbs per acre

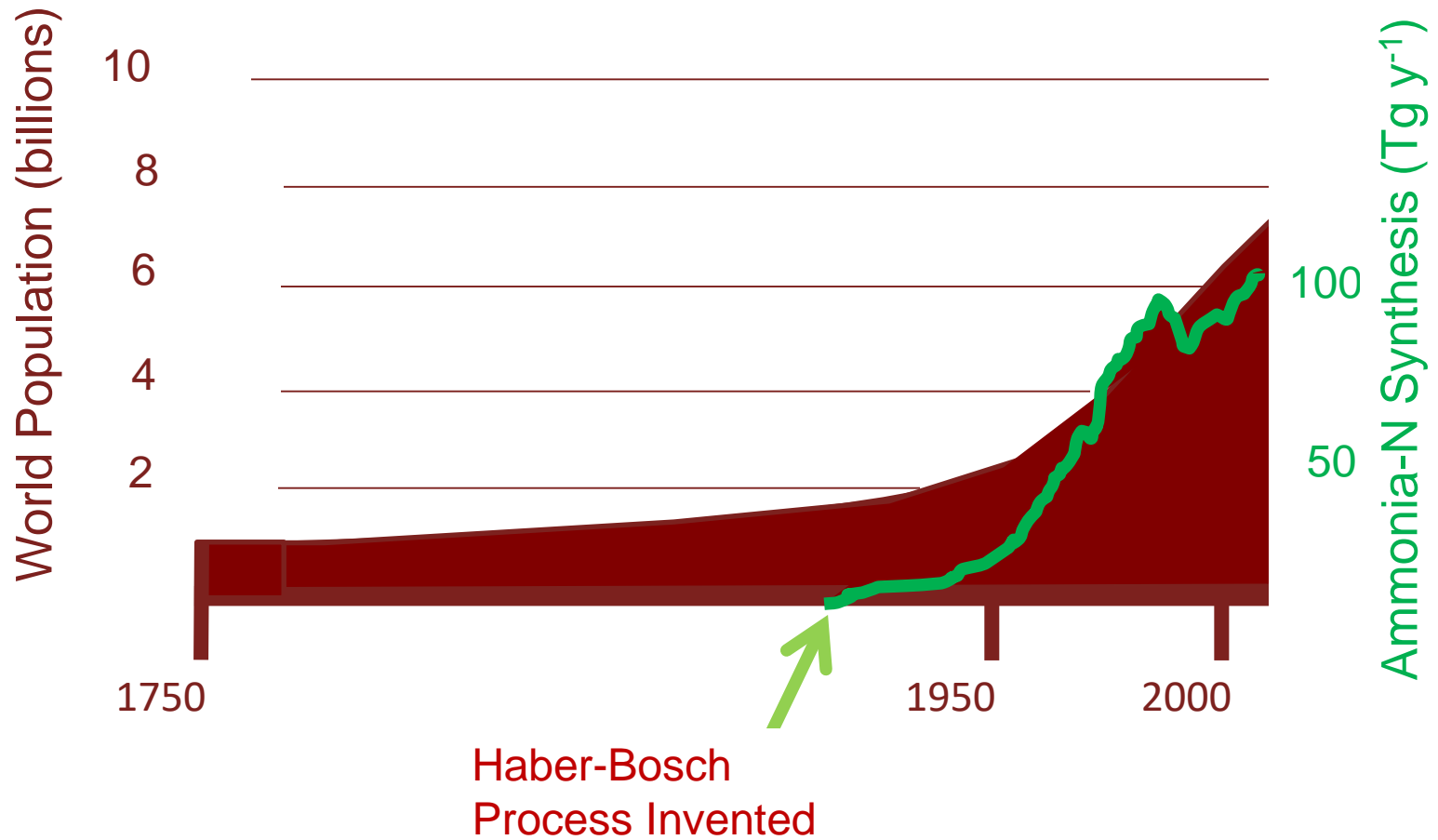
c. 5000-7000 lbs per acre

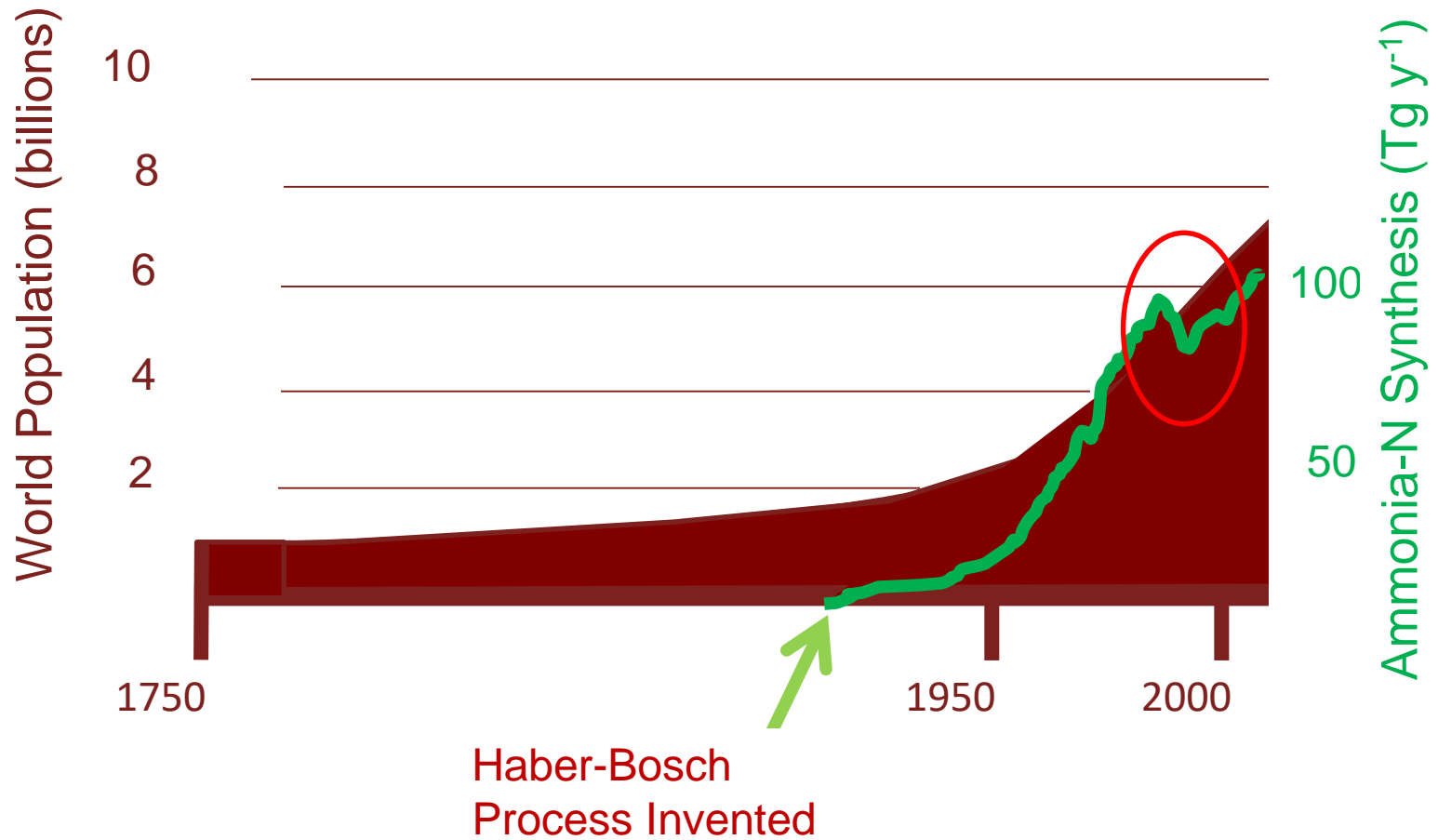
b. 2000-4000 lbs per acre

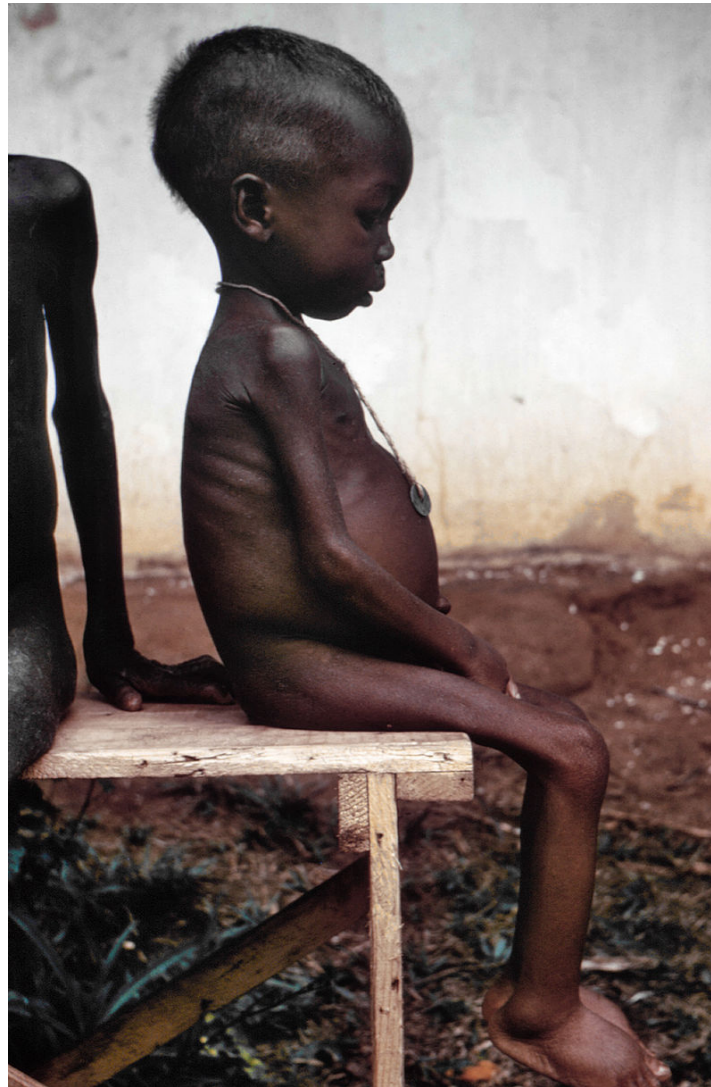
d. 9000-11000 lbs per acre



Courtesy Stuart Holmes







By Dr. Lyle Conrad - Centers for Disease Control and Prevention, Atlanta, Georgia, USA Public Health Image Library (PHIL); ID: 6901 <http://phil.cdc.gov/>, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=425975>

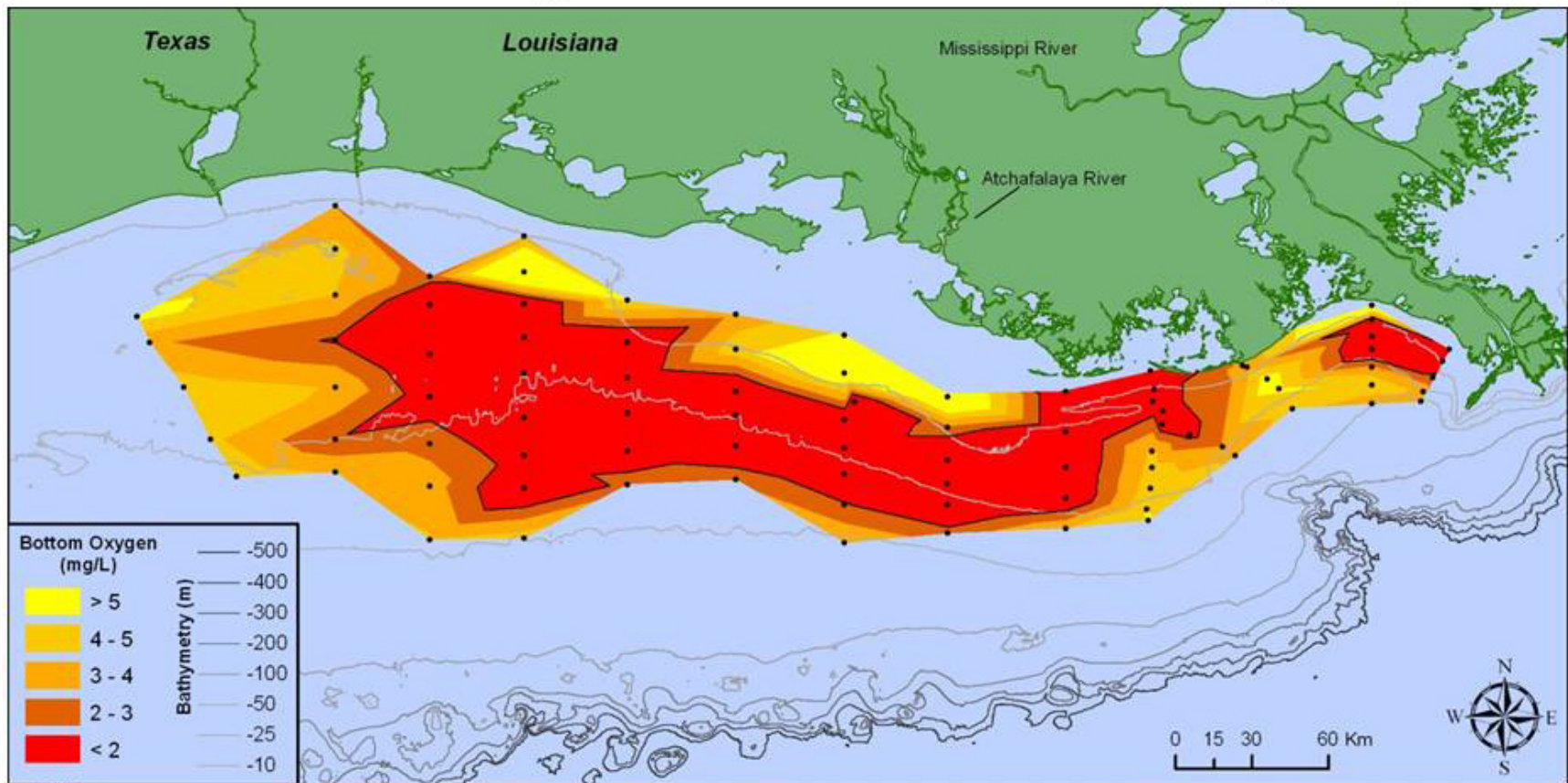


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Bottom-water dissolved oxygen across the Louisiana shelf from July 22-28, 2013



Data source: N.N. Rabalais, Louisiana Universities Marine Consortium, R.E. Turner, Louisiana State University
Funded by: NOAA, Center for Sponsored Coastal Ocean Research



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Is N fertilizer bad for soil health?

Is N fertilizer bad for water quality?

THE N2 DILEMMA: IS AMERICA FERTILIZING DISASTER?

New research: synthetic nitrogen destroys soil carbon, undermines soil health

By Tom Philpott on Feb 24, 2010



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“Fertilizer is good for the father and bad for the sons.”

—Dutch saying

For all of its ecological baggage, synthetic nitrogen does one good deed for the environment: it helps build carbon in soil. At least, that’s what scientists have assumed for decades.

If that were true, it would count as a major environmental benefit of synthetic N use. At a time of climate chaos and ever-growing global greenhouse gas emissions, anything that helps vast swaths



Just precisely what does all of that nitrogen fertilizer *do* to the soil?

SUSTAINABILITY

Fertilizer Runoff Overwhelms Streams and Rivers--Creating Vast "Dead Zones"

The nation's waterways are brimming with excess nitrogen from fertilizer--and plans to boost biofuel production threaten to aggravate an already serious situation

By David Biello on March 14, 2008 9



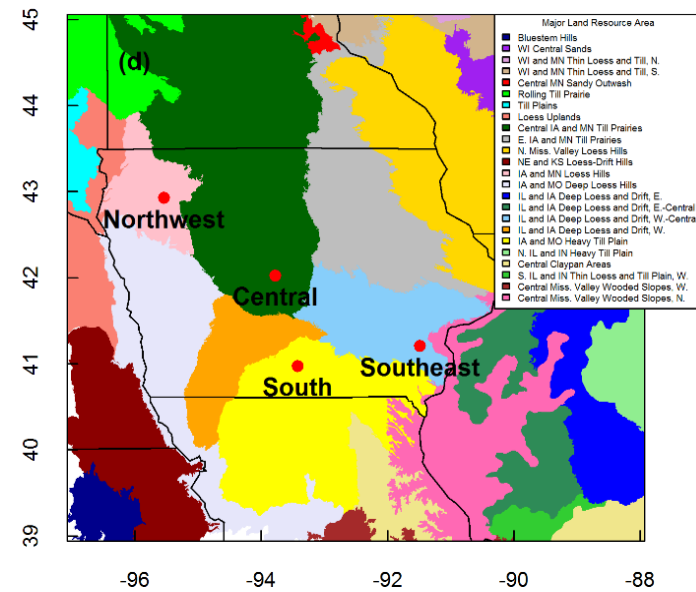
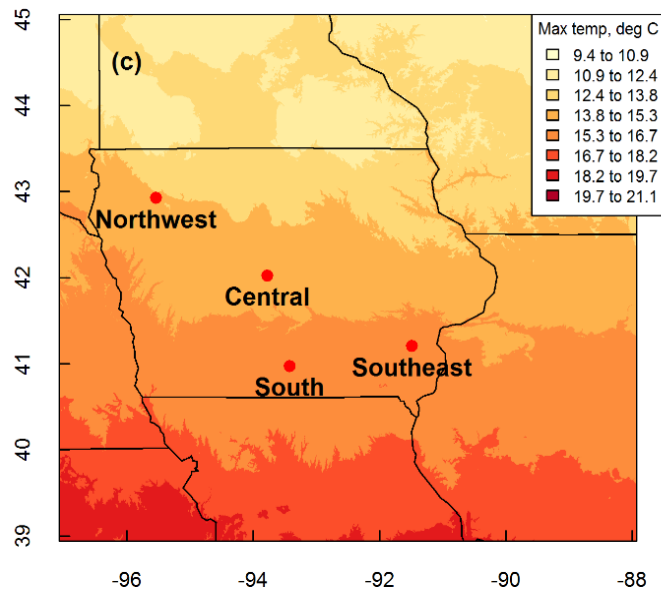
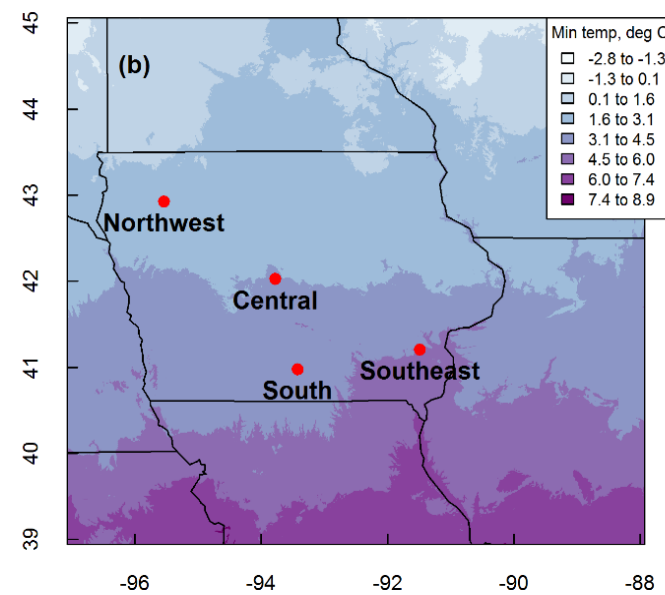
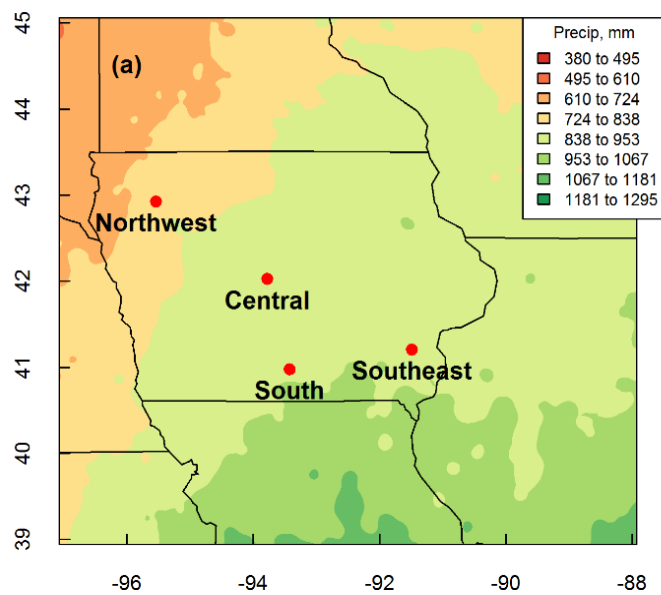
Is N fertilizer bad for soil health?

Is N fertilizer bad for water quality?

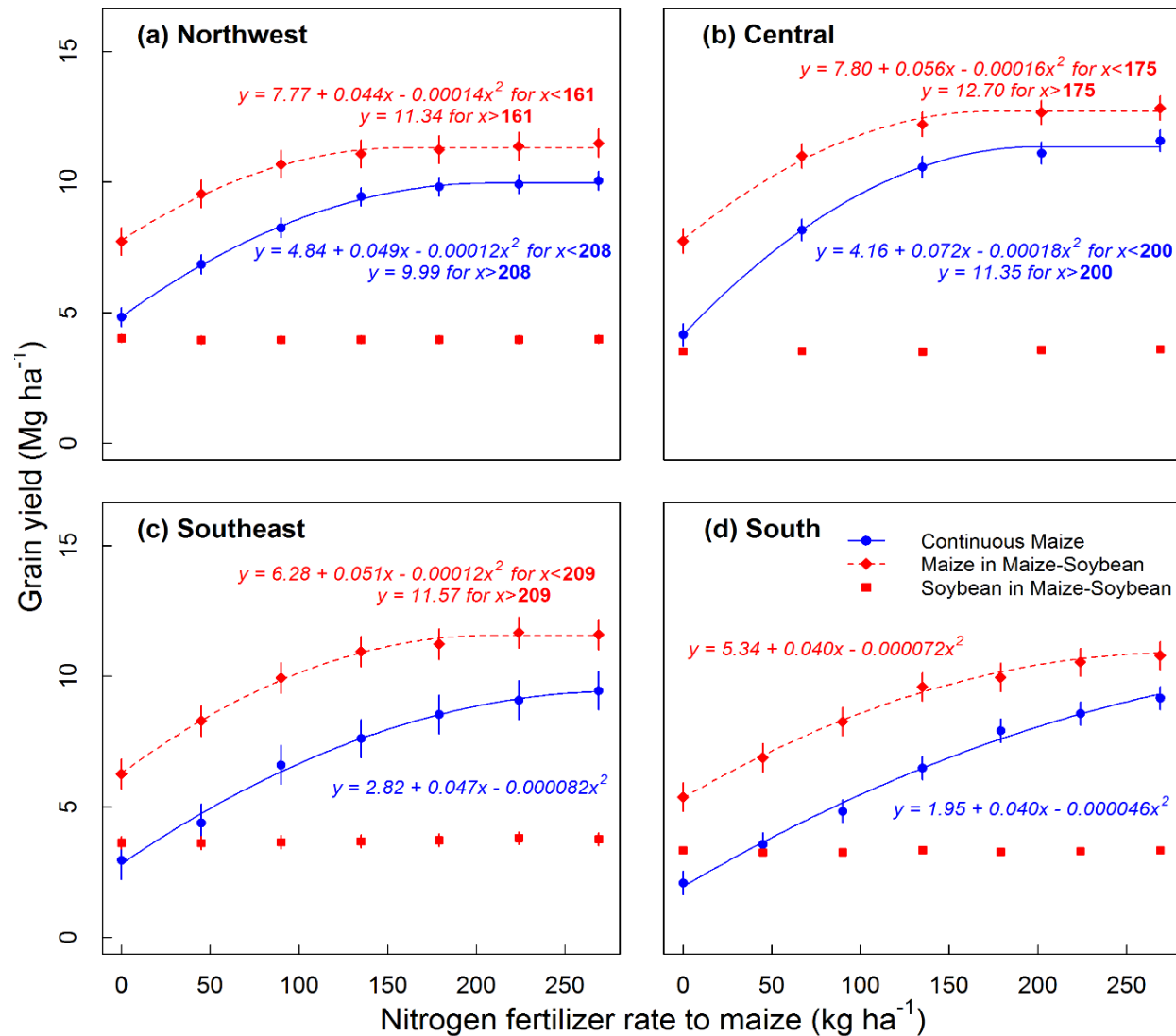
Can we have it all?

Yield, healthy soil and water quality?

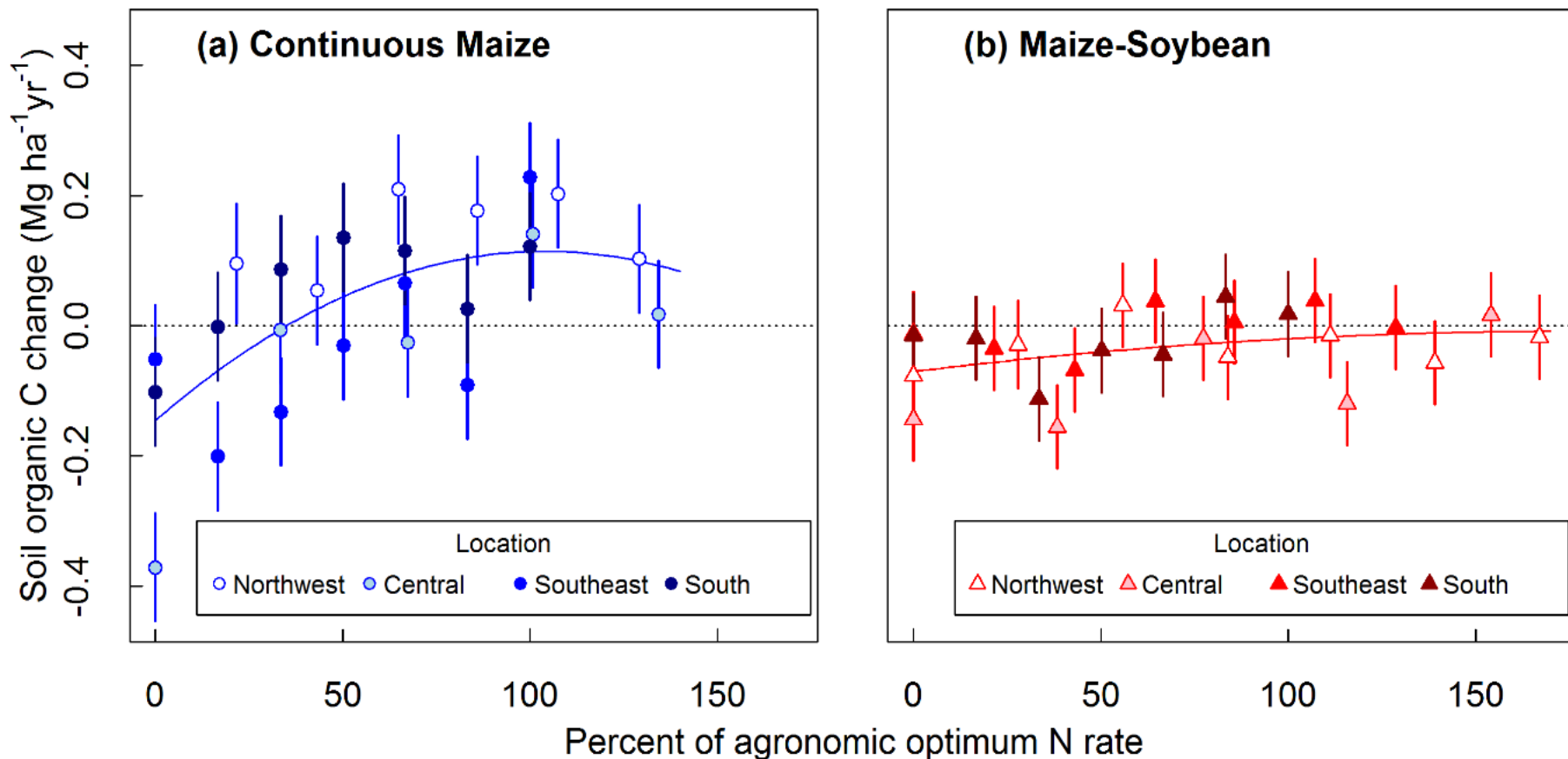




Average optimum N rate 1999-2014



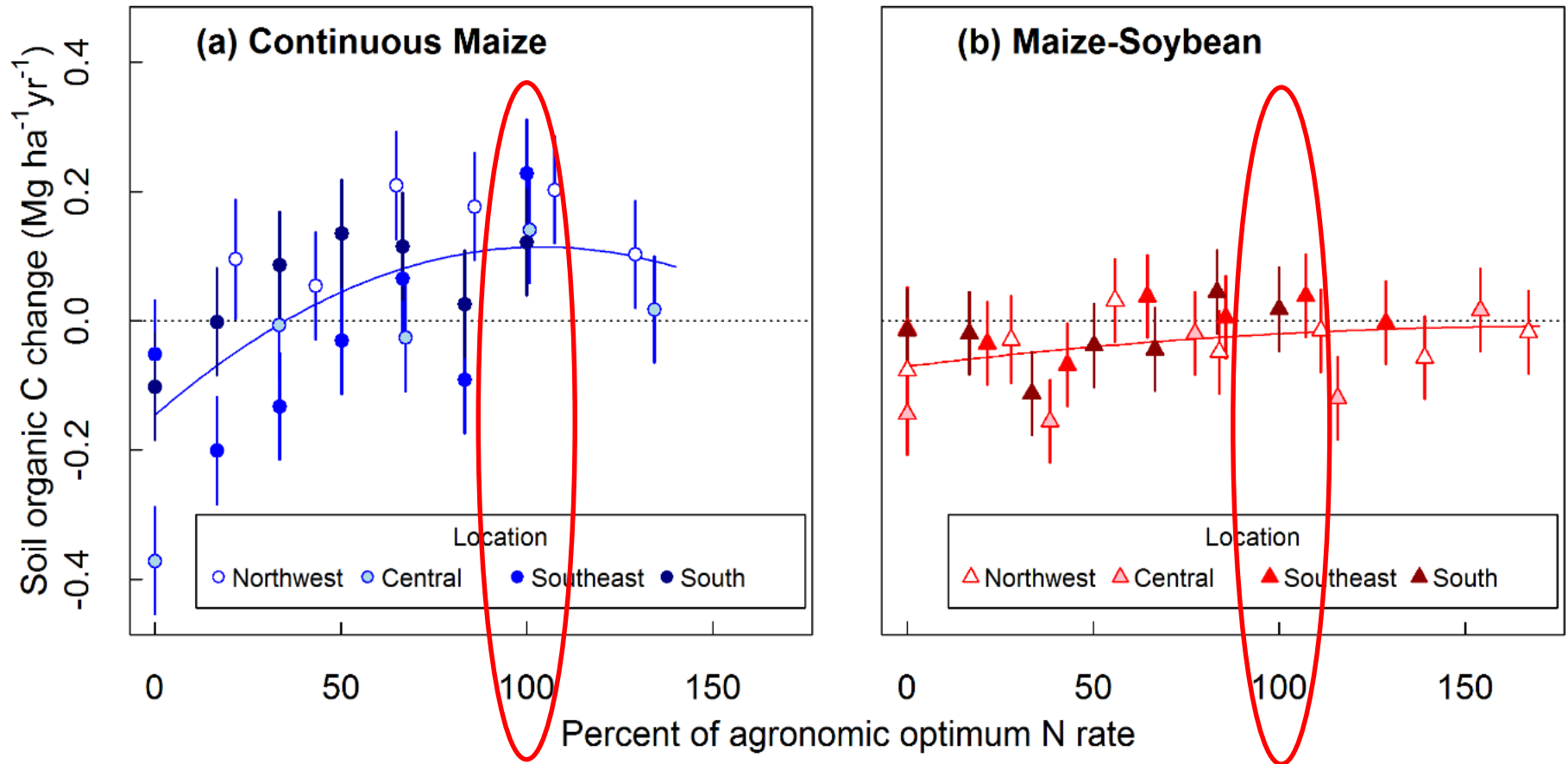
Nitrogen fertilizer is critical for soil health



All responses from previous slide scaled as a percent of the optimum rate at each site

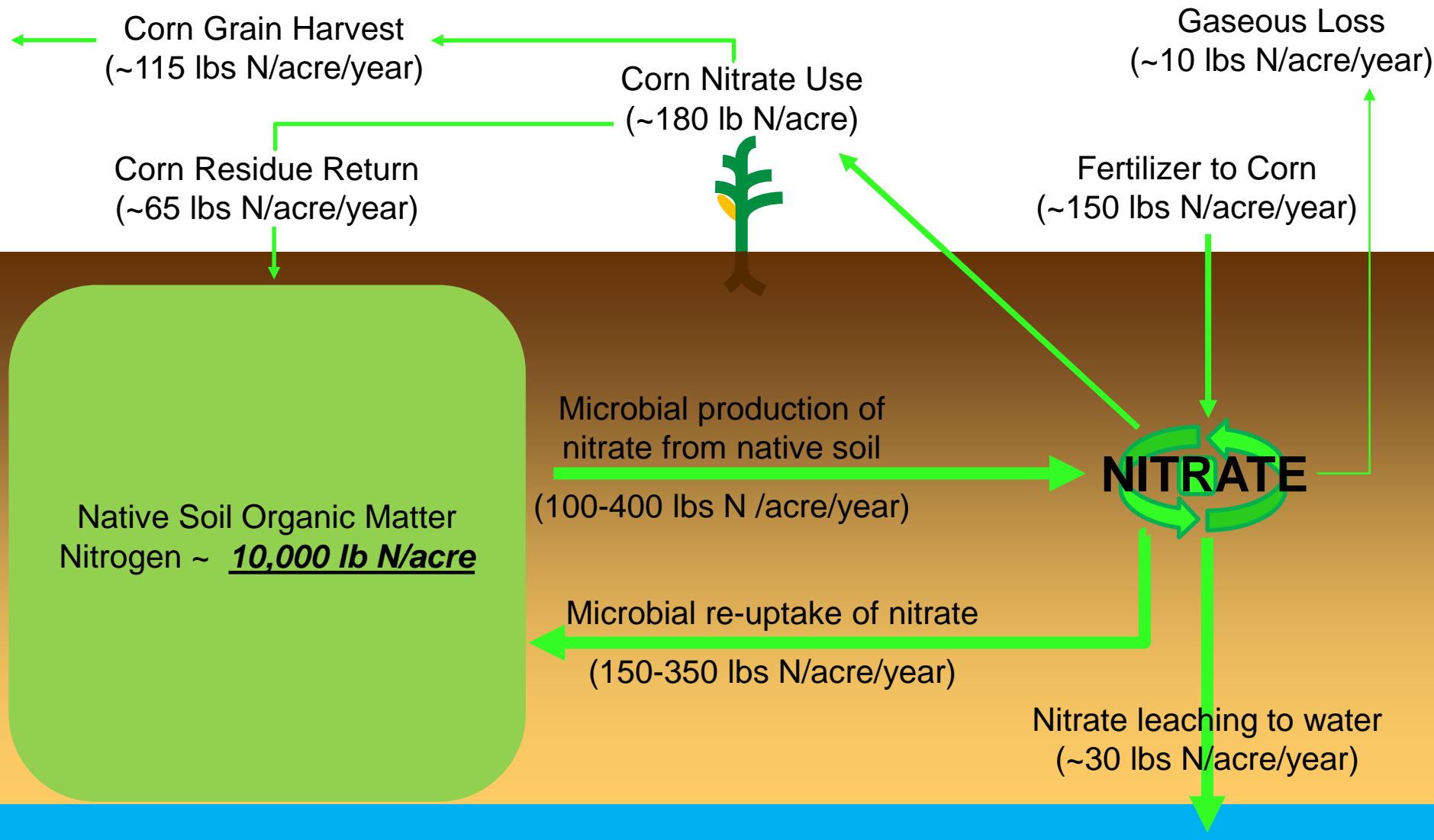
Nitrogen fertilizer is critical for soil health

Is it bad for water quality?

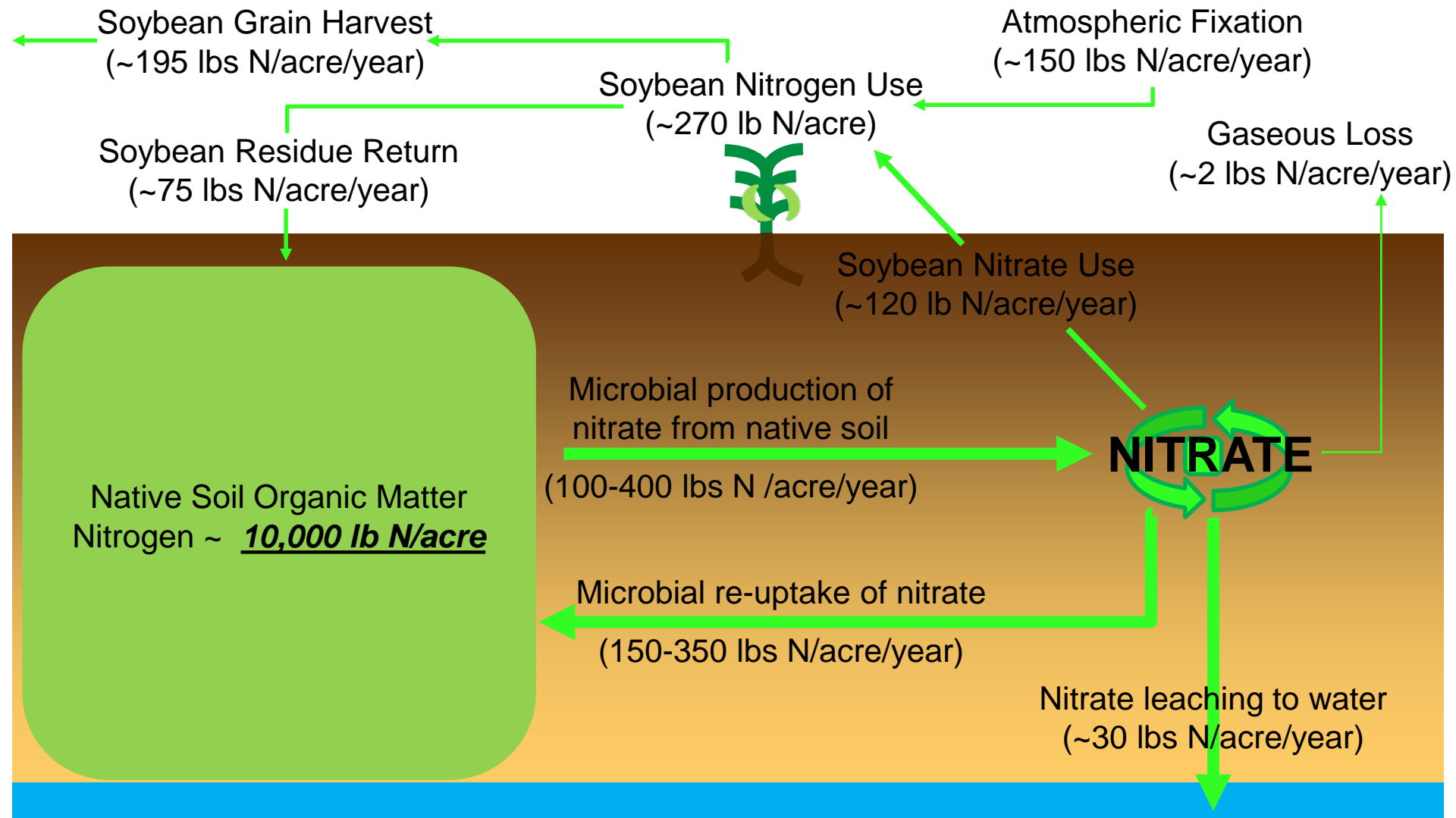


To understand the role of N
fertilizer in water quality
challenges, we need to know
where the nitrate comes from...

Corn Nitrogen Cycling & Budget @ 200 bushels



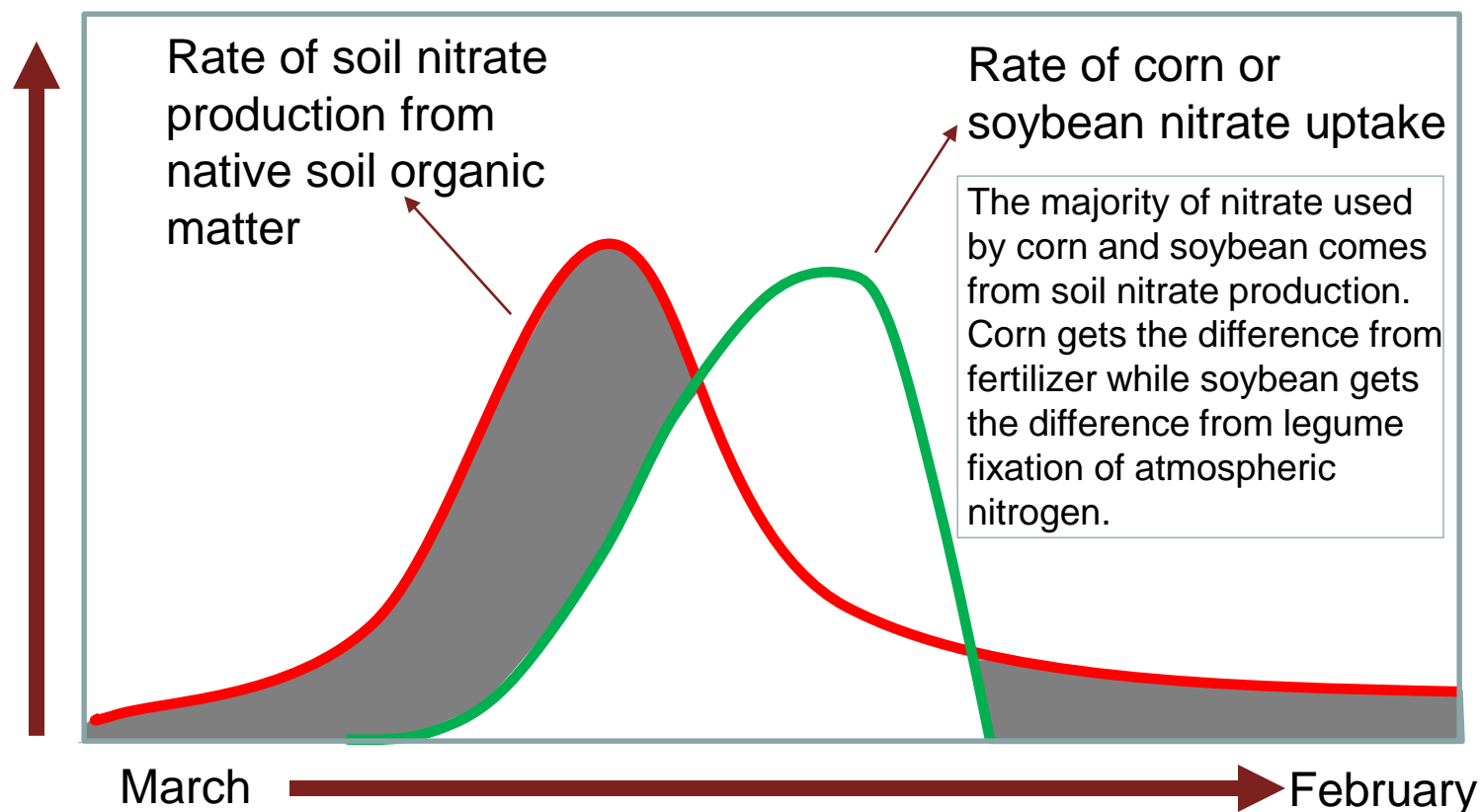
Soybean Nitrogen Cycling & Budget @ 60 bushels



Soil Nitrate Production Rate Is High



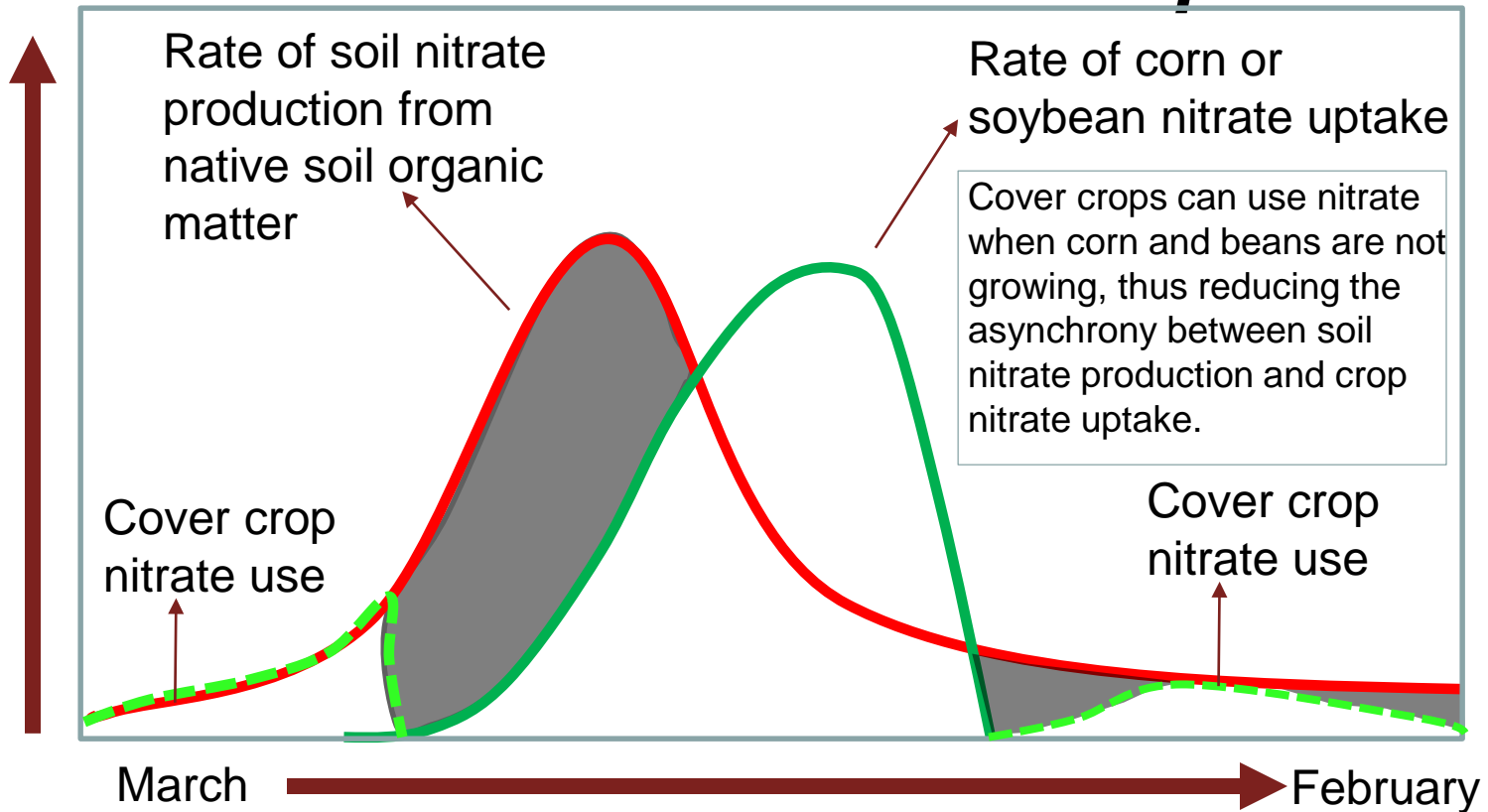
Soil Nitrate Production vs. Crop Nitrate Uptake



In the shaded areas, the soil produces nitrate, but there is no crop to use it. As a result, some nitrate is lost to waterways.

Soil Nitrate Production vs. Crop Nitrate Uptake

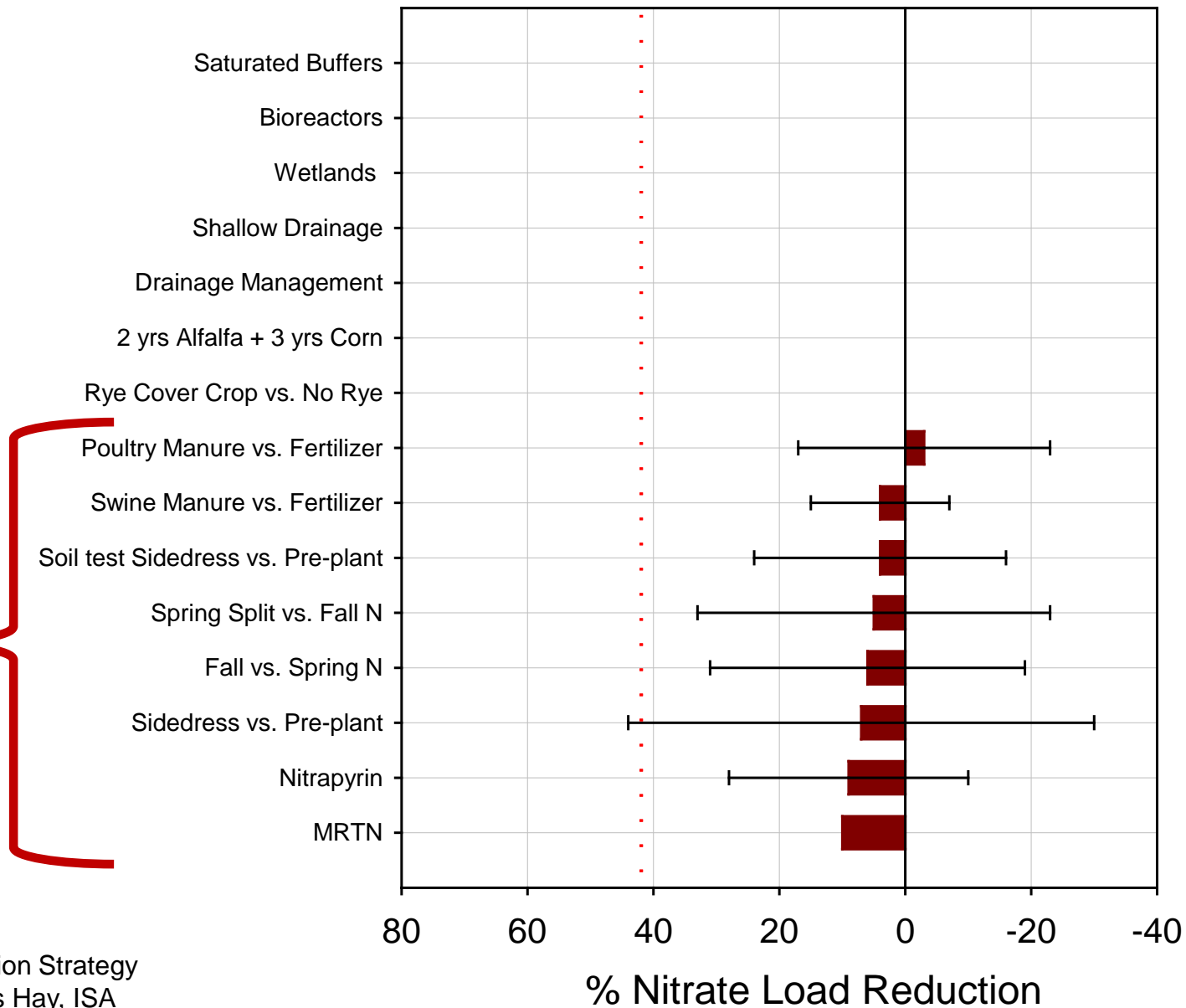
Addition of a Cover Crop



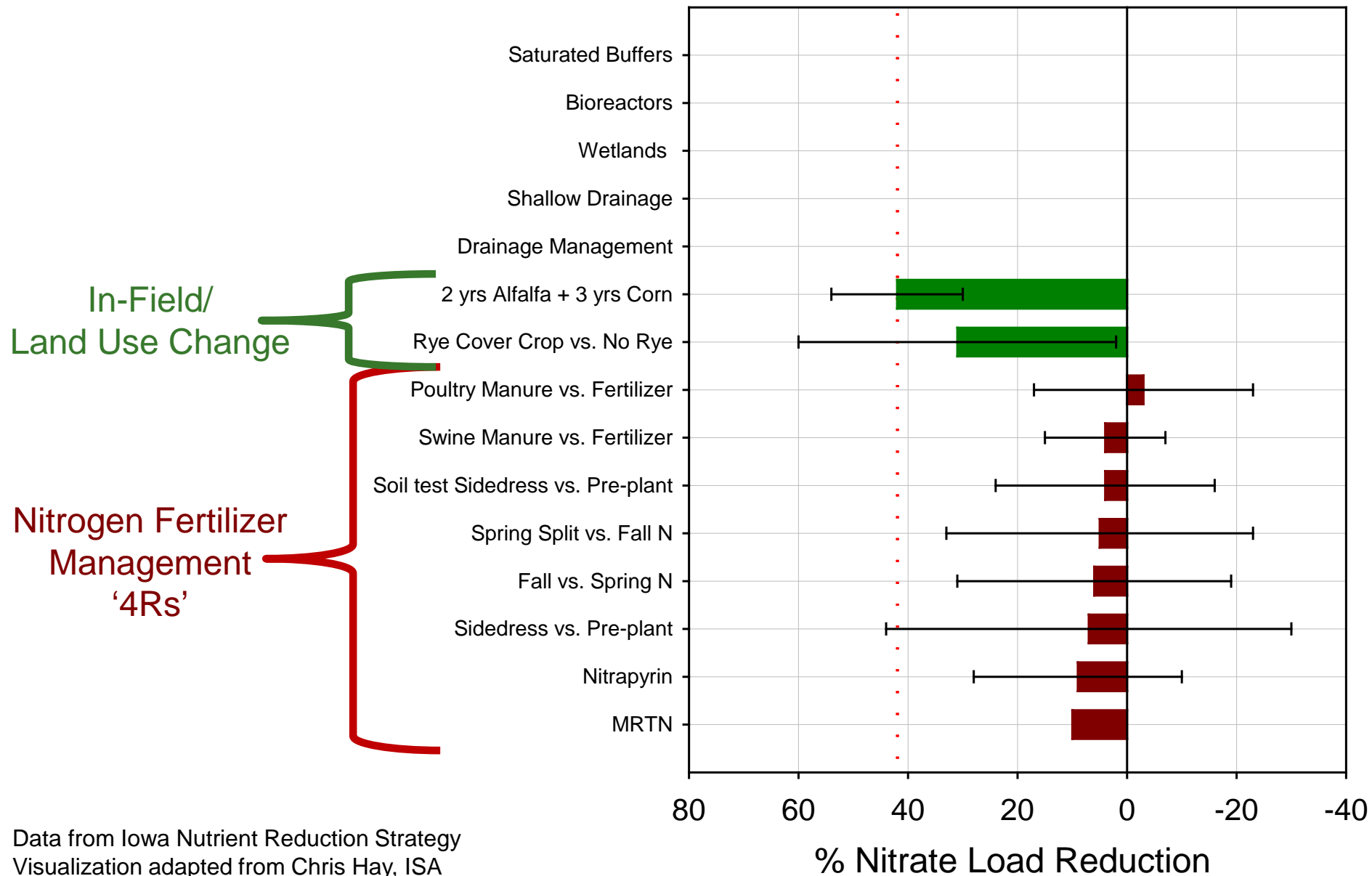
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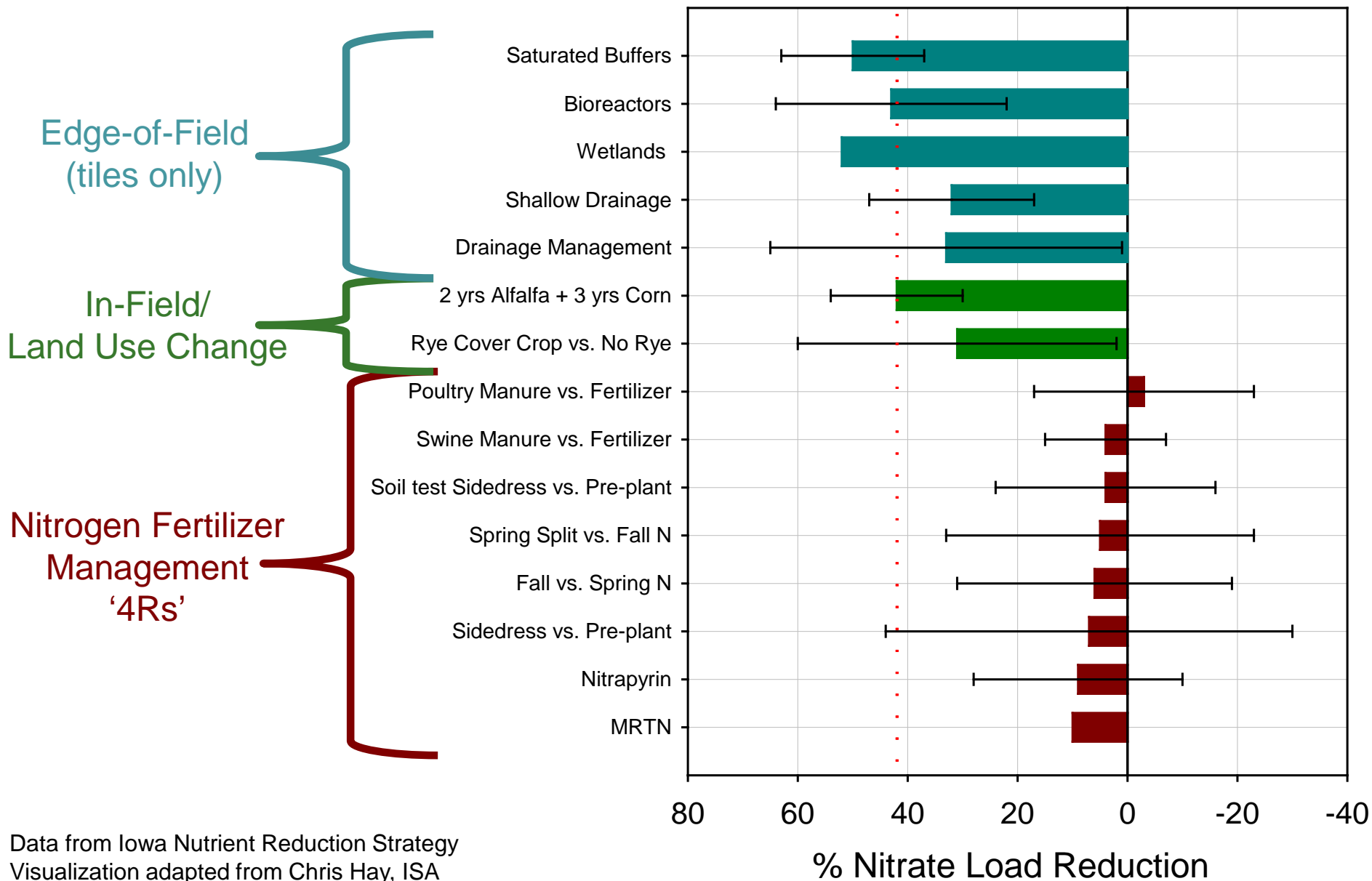
Nitrogen Fertilizer Management '4Rs'



Data from Iowa Nutrient Reduction Strategy
Visualization adapted from Chris Hay, ISA

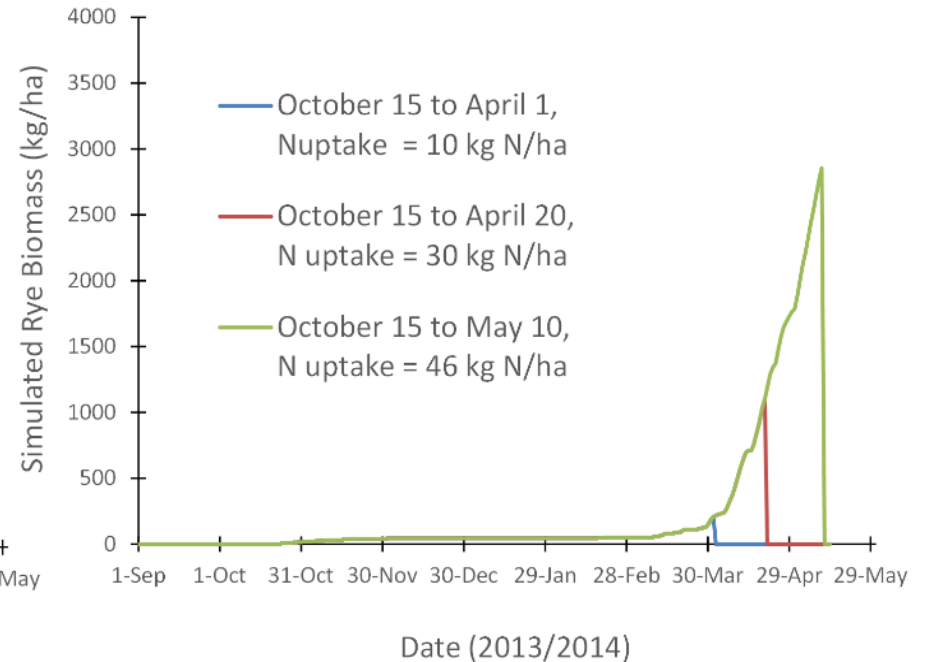
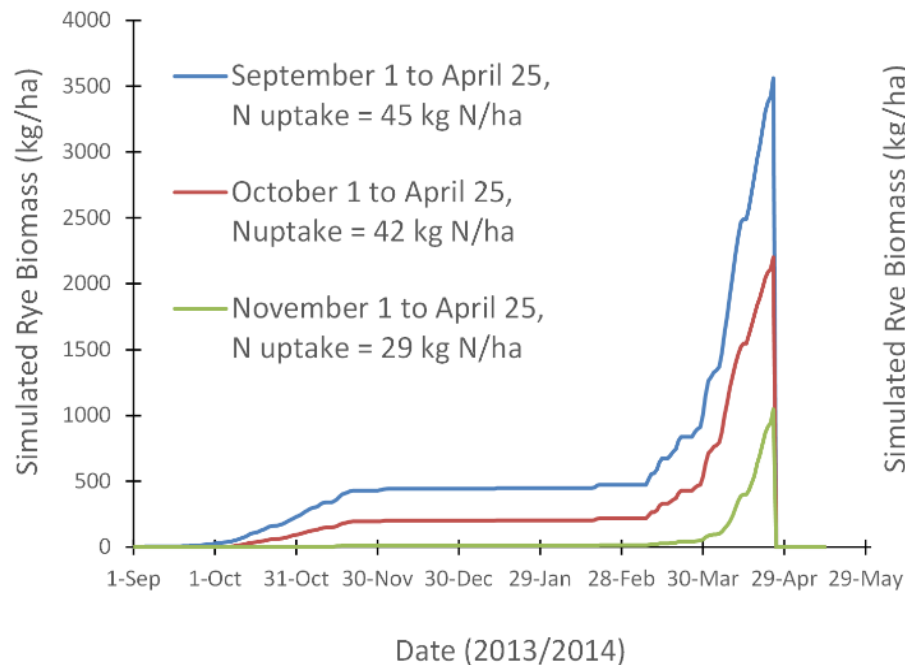


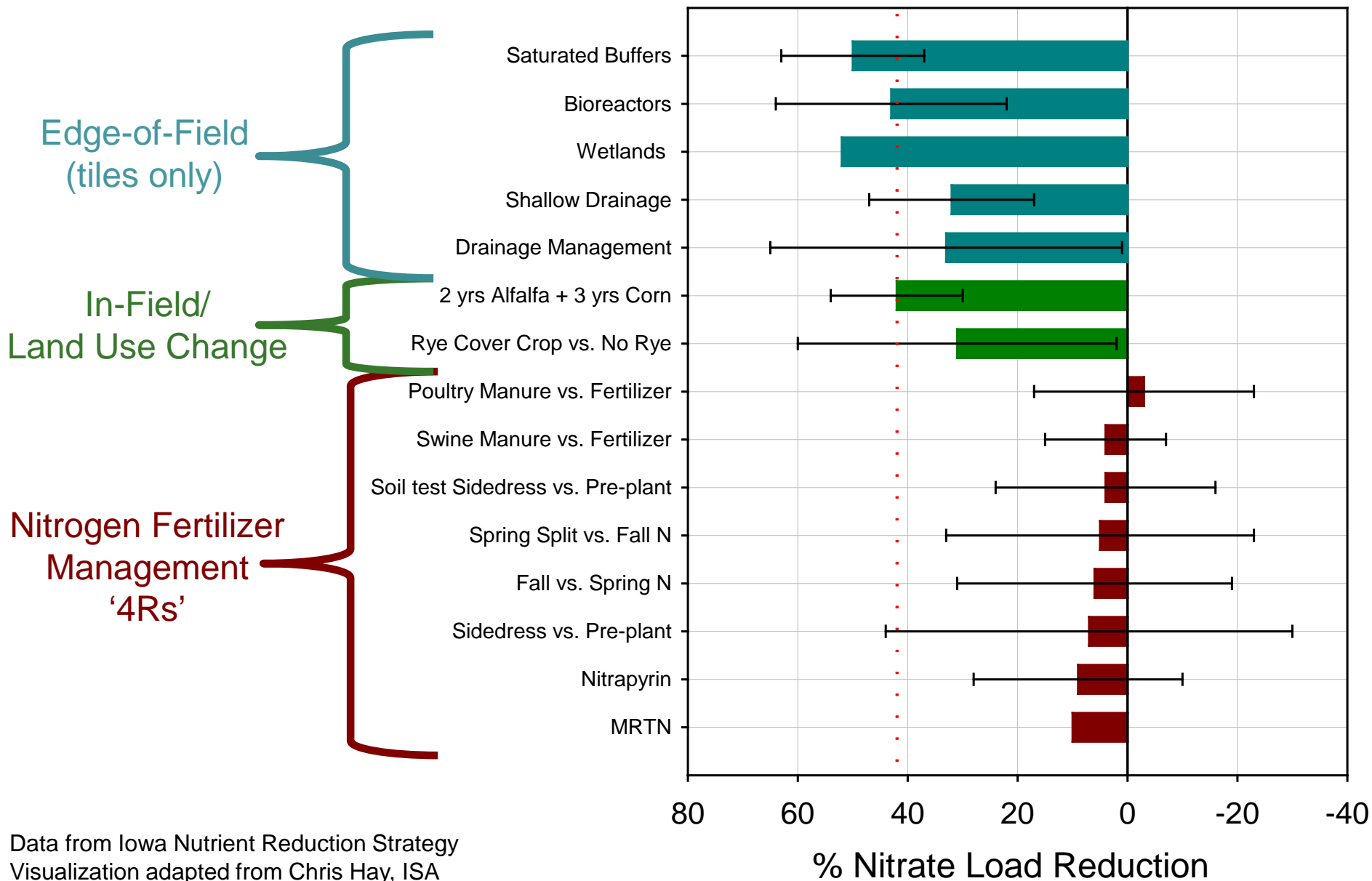
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Data from Iowa Nutrient Reduction Strategy
Visualization adapted from Chris Hay, ISA

Cover Crop Biomass





Data from Iowa Nutrient Reduction Strategy
Visualization adapted from Chris Hay, ISA



Michael Castellano
castelmj@iastate.edu
515-294-3963

@castelmj on twitter

<http://www.nutrientstrategy.iastate.edu/center>