Minnesota's Nutrient Reduction Strategy

Focus on Precision

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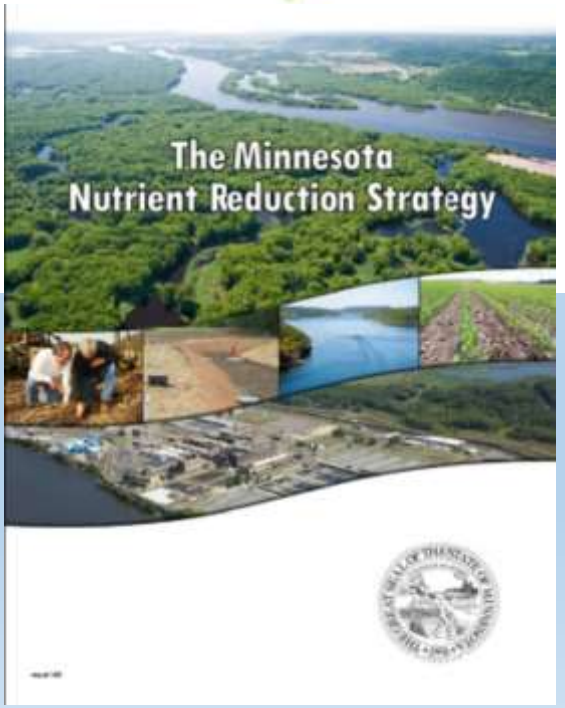
MINNESOTA AGRICULTURAL WATER RESOURCE CENTER

Mississippi River Basin Milestones

Figure 5. Example adaptive management schedule for the Mississippi River basin.

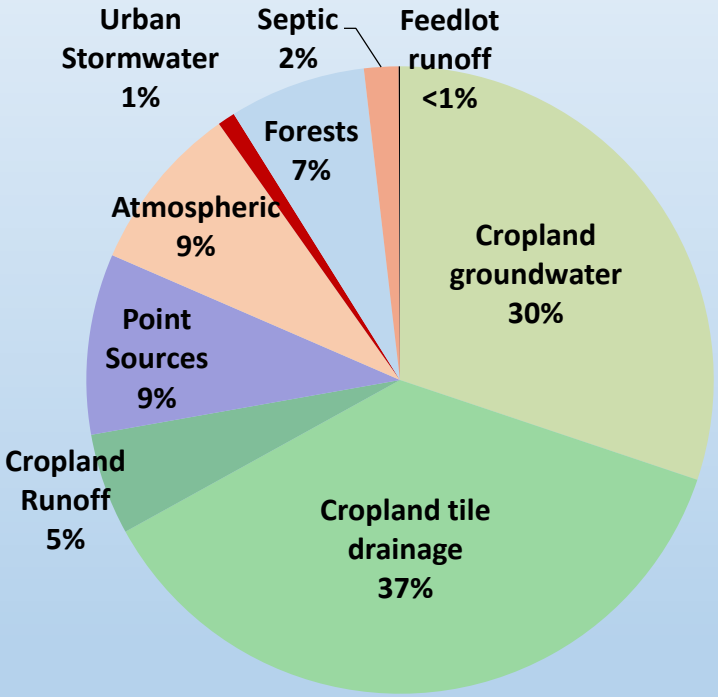


From MPCA


Yellowstone River
Missouri River
Mississippi River
Platte River
Illinois R.
Ohio River
Arkansas River
St Louis
Tennessee River
Red River
Mississippi River
New Orleans
0 200 KILOMETERS
0 200 MILES

From EPA

4. Nitrogen reductions through concerted agricultural effort



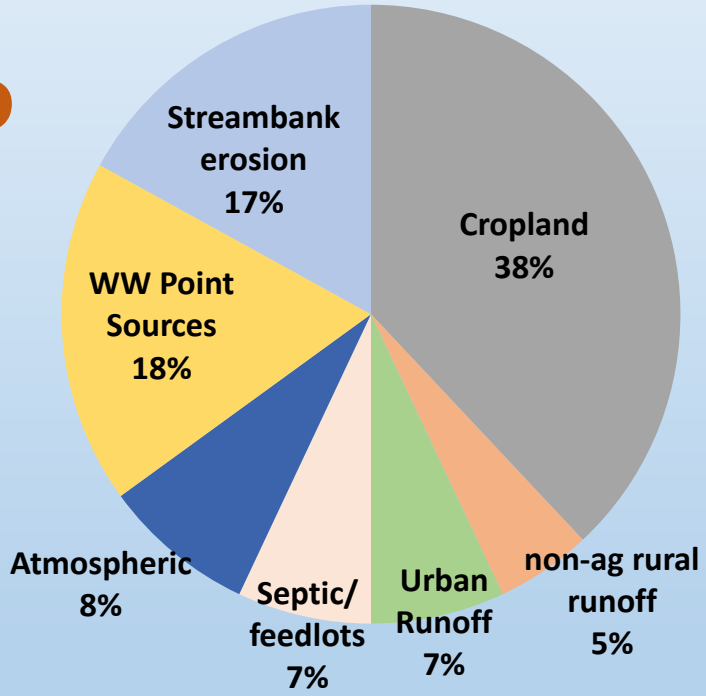
Cropland Nitrogen BMPs	Acres
1. Rate & timing optimized	11 million
2. Drainage water retention & management	1 million
3. Living vegetative cover	1 million

Chart from MPCA & U of MN, 2013 - statewide

From MPCA

5. Phosphorus reductions through holding soil P in place

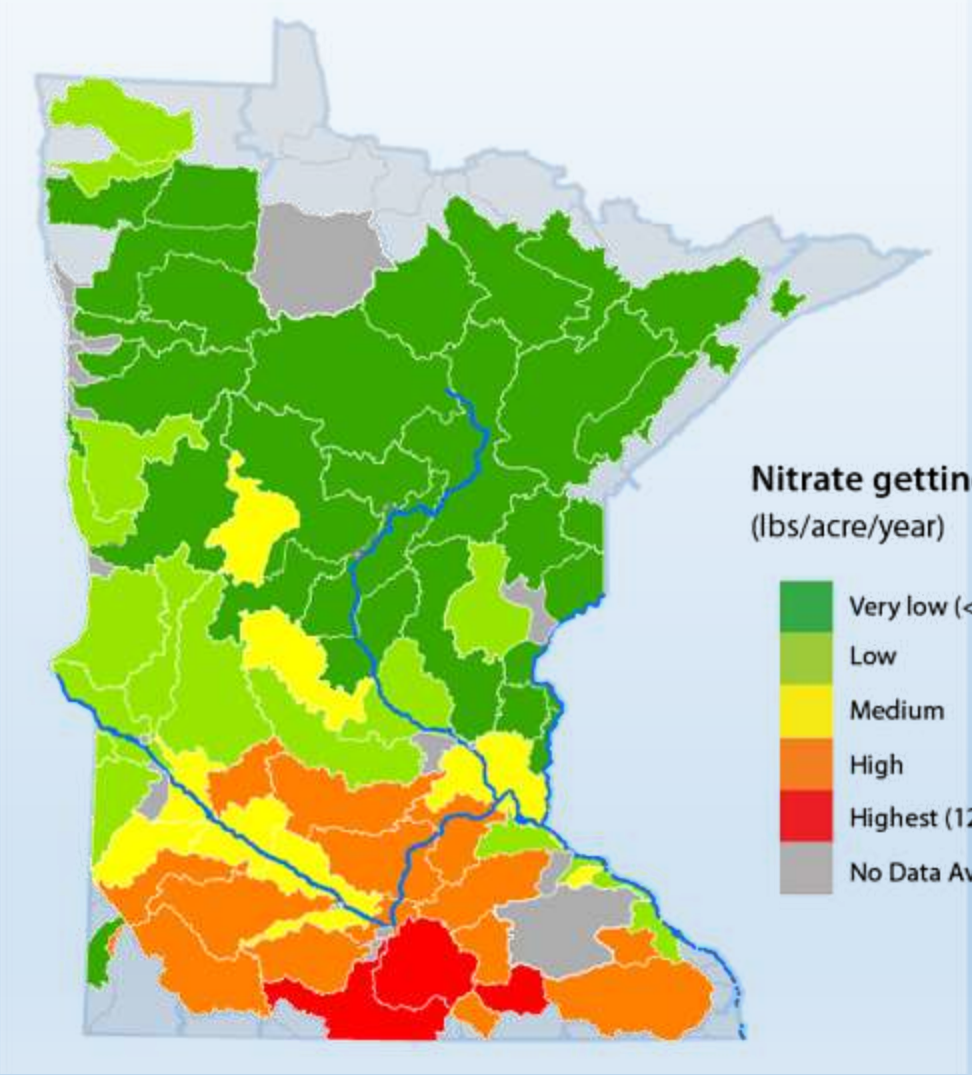
P



Phosphorus BMPs	Acres
1. Crop residue increases	7 million
2. Banding & soil P mgmt	2 million
3. Living vegetative cover	1 million

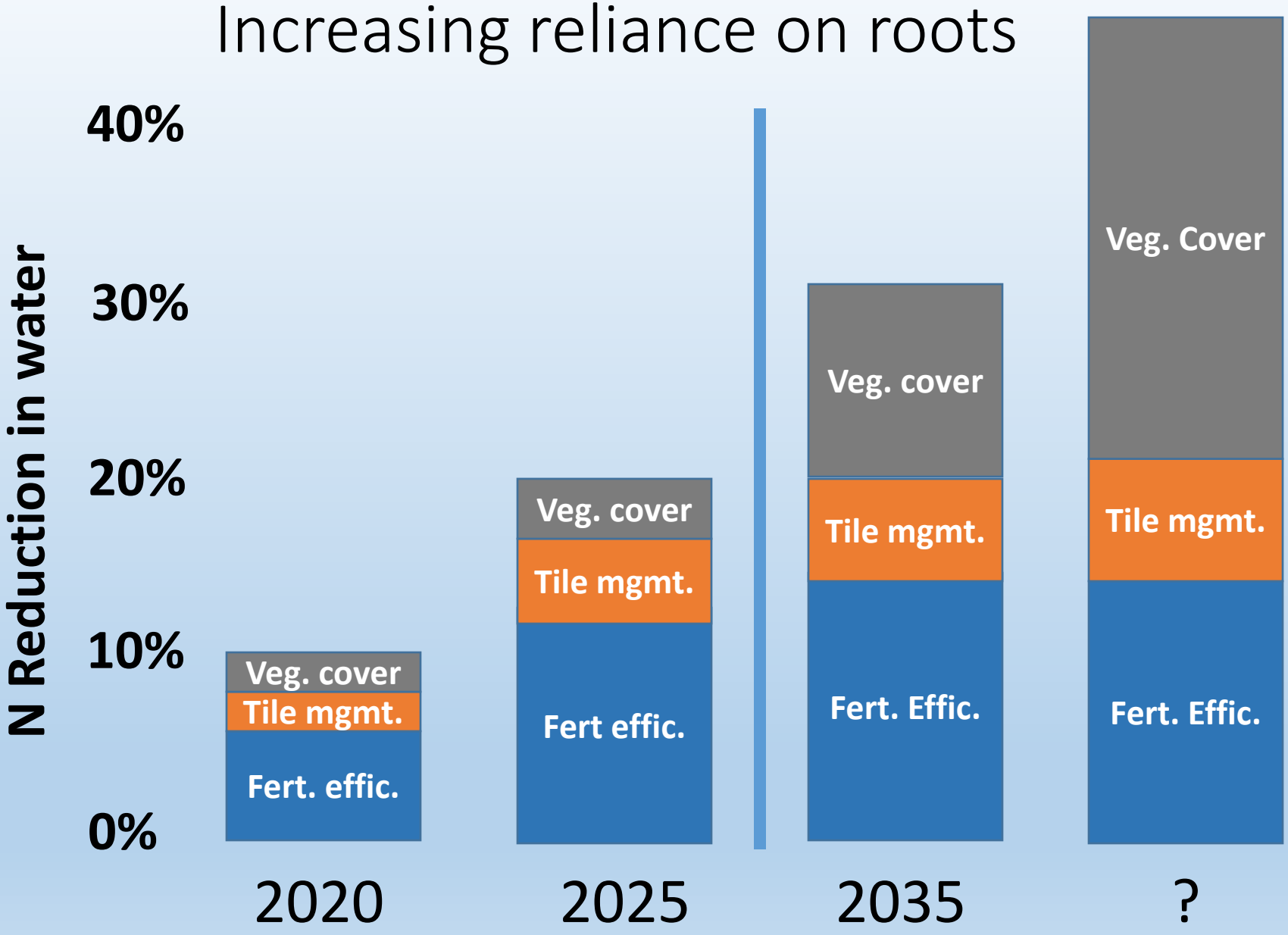
Chart from Barr Engineering 2004, with 2012 updates – Basins into Miss. R.

From MPCA



From the MPCA

Increasing reliance on roots



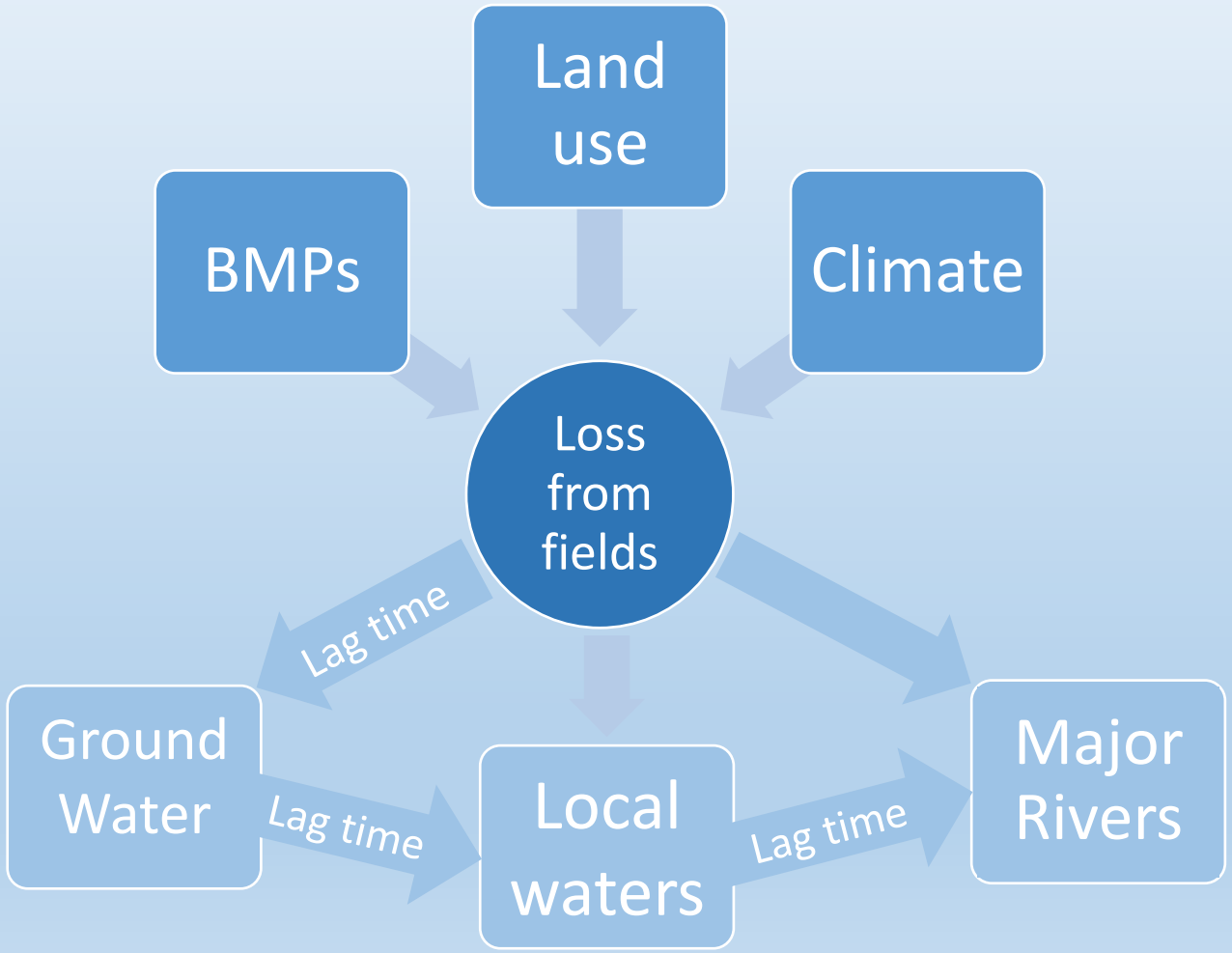
From MPCA

6. Increased roots will improve soil and water

- Cover crops
  - short season crops
  - fallow
  - corn/soybean
- Perennials
  - Riparian land
  - Marginal land
  - Vulnerable land
  - Other lands?

From MPCA

9. Accountability and tracking are key to a credible strategy



From MPCA

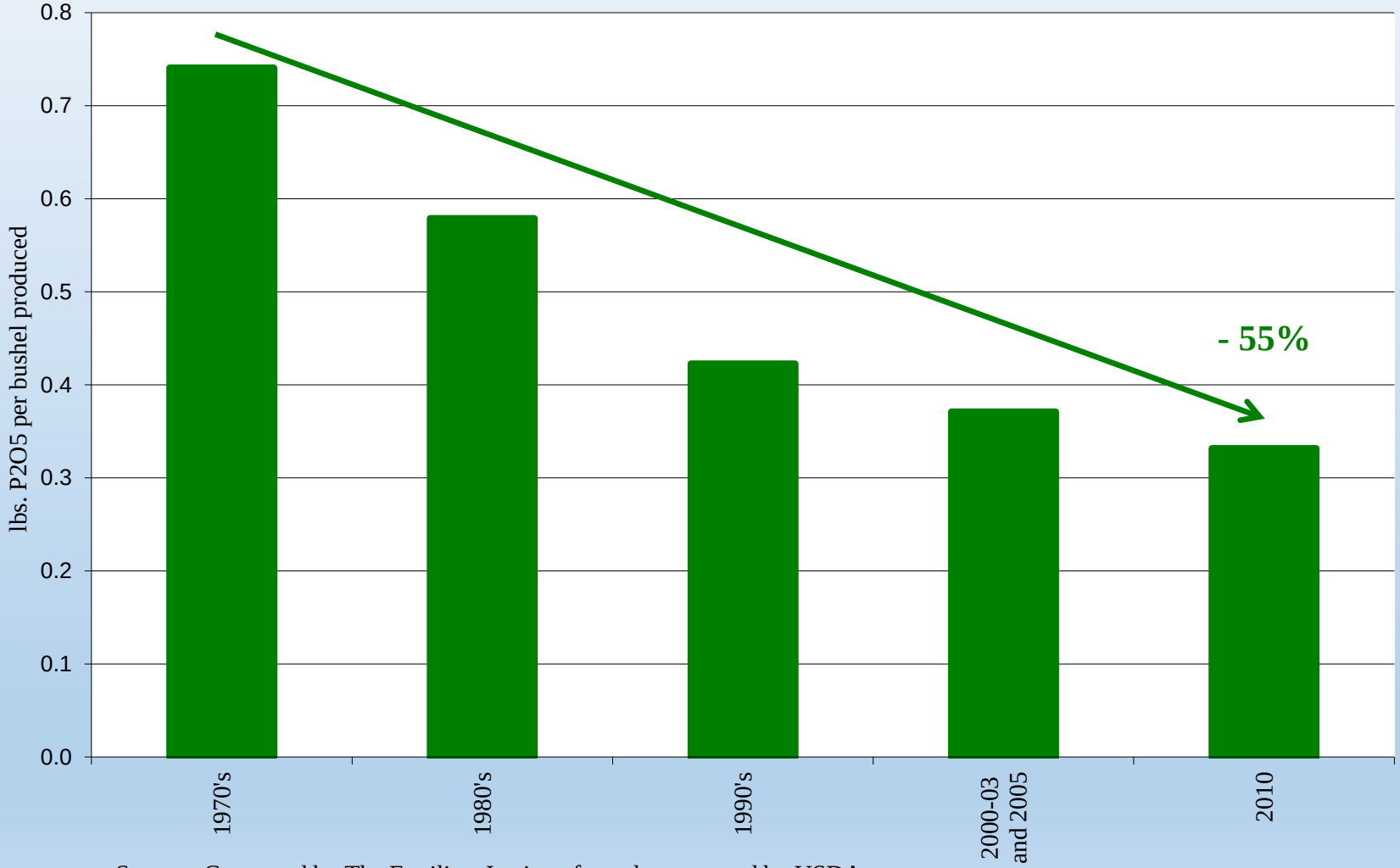
What does the MPCA's Nutrient Reduction Strategy mean for agriculture? Worst Case Scenario

- **Farmers required to "Document" that best management practices are being implemented**
- **Best practices neither well defined or understood**
- **Beginning of the building of the "practice" police**

What does the MPCA's Nutrient Reduction Strategy mean for agriculture? Best Case Scenario

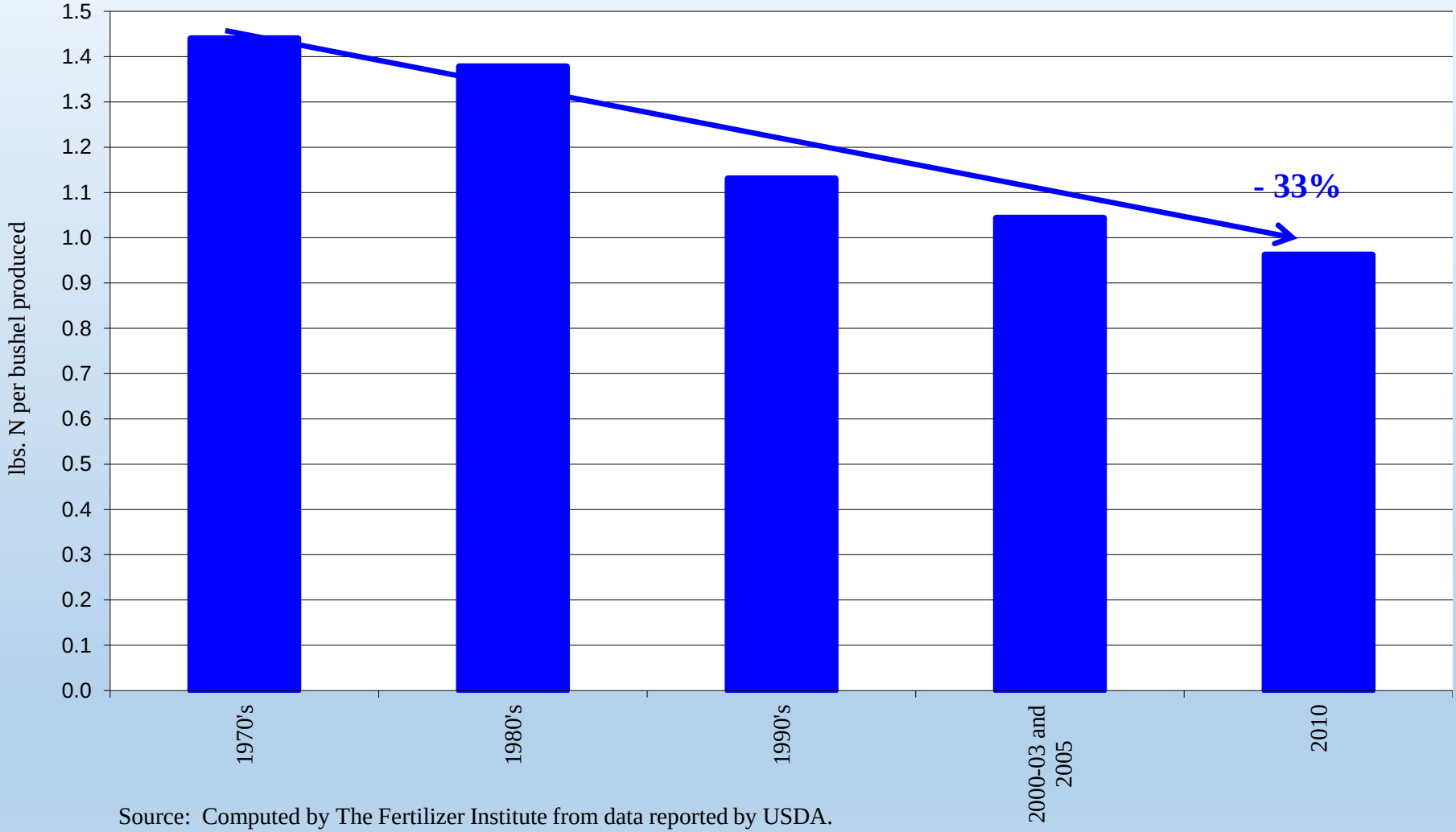
- **Recognizes the importance of nutrient efficiency**
- **Recognizes the importance of industry-led research and development**
- **Recognizes the importance of on-going research on "BMP" effectiveness**

Phosphate Use per Bushel of Corn Produced



Source: Computed by The Fertilizer Institute from data reported by USDA.

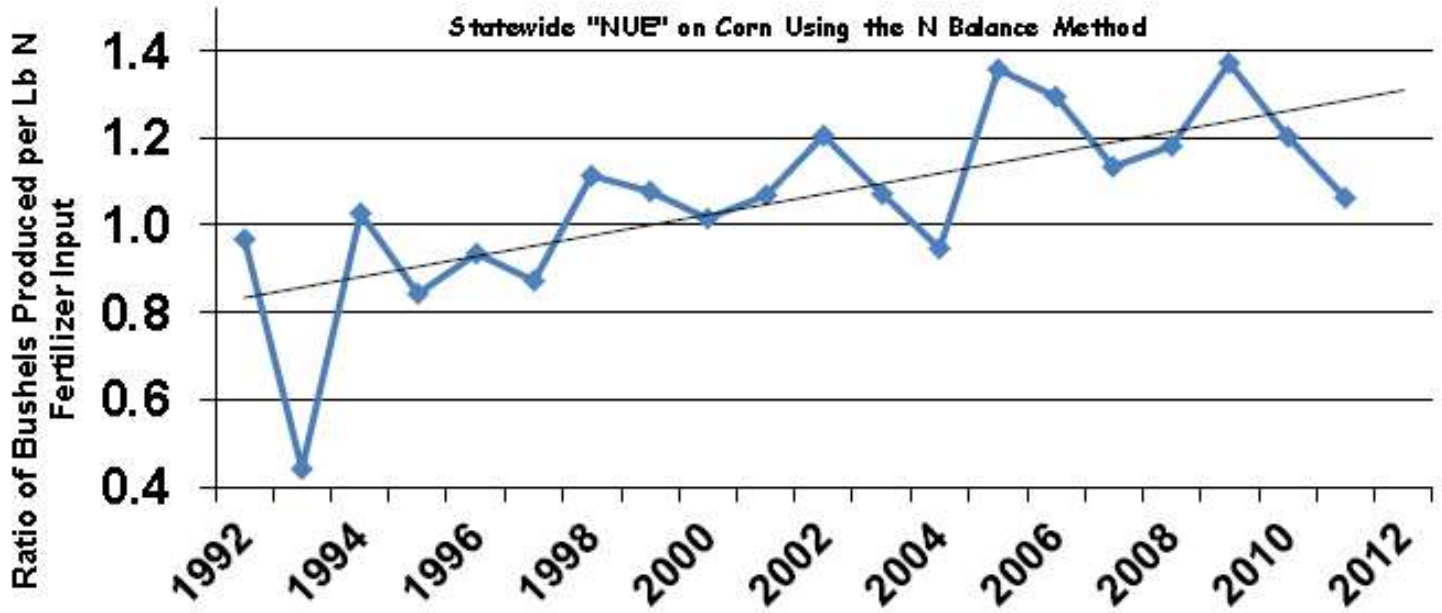
Nitrogen Use per Bushel of Corn Produced



Source: Computed by The Fertilizer Institute from data reported by USDA.

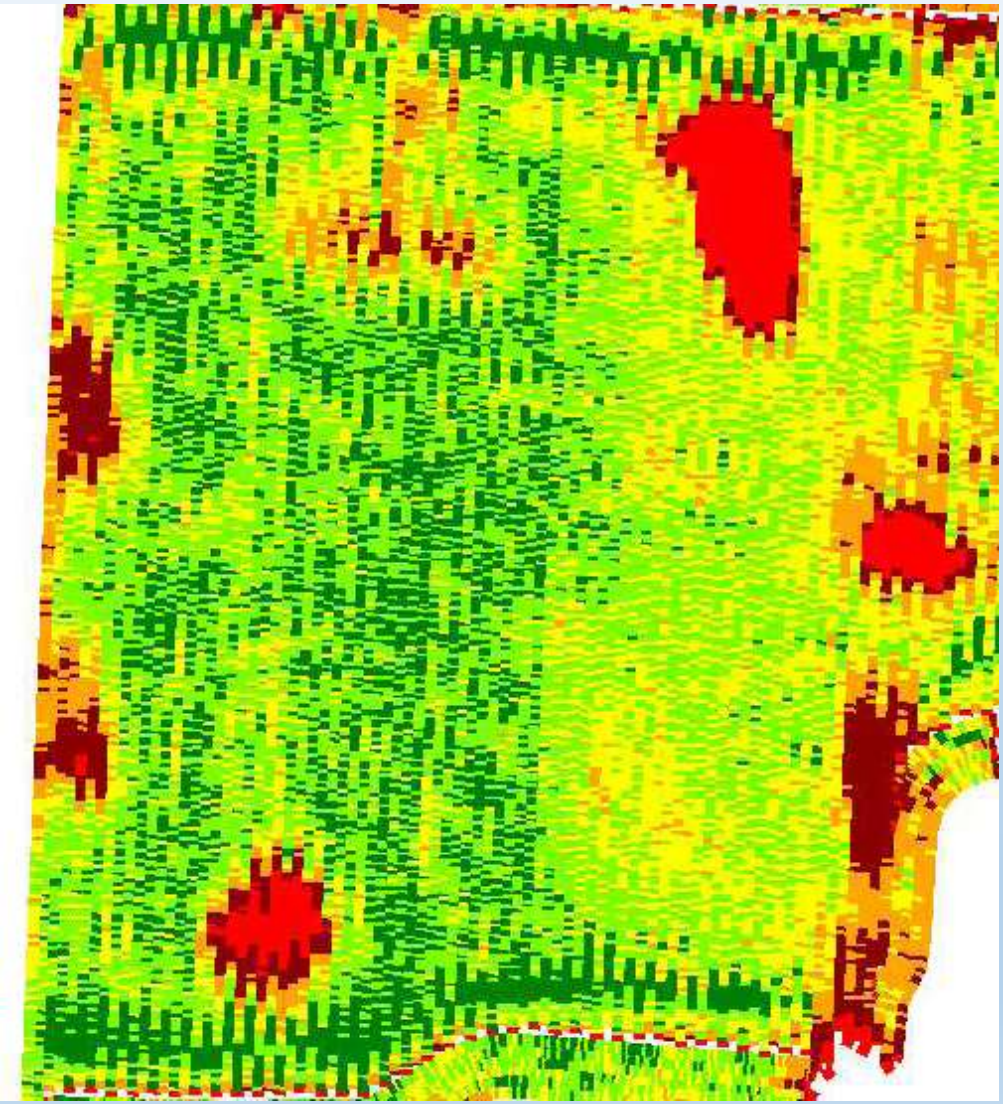
Bushels of Corn Produced per Lb of N Fertilizer

1992 to 2011



MINNESOTA DEPARTMENT OF AGRICULTURE

Is nitrogen use efficiency the same for every acre?



Where will future improvements in efficiency come from?

- **Manure**
  - **More variable product**
  - **More difficult to apply uniformly**
  - **More difficult to manage timing/incorporation**
  - **Uncertainty of volatilization loss**
  - **Uncertainty of mineralization rates**

- **Continued research**
- **Continued innovation in equipment**

  Combining base manure rate with side-dress?

Where will future improvements in efficiency come from?

- **Stabilizers**
  - **Which ones work?**
  - **Under what conditions?**
- **In-season diagnostics**
  - **Tissue testing**
  - **Chlorophyll measurement**
  - **Others**
- **Equipment innovation**

A challenge to our soil fertility research team

- **Make the U of M recommendations more relevant**
- **Incorporate more variables into nitrogen rate recommendations**
  - **Condition adjustments**
- **Keep up with practitioners**

A challenge to farmers, agronomists, fertilizer retailers

- **Zero in on optimal conditions**
- **Get rates right on more acres**
- **Focus on timing**
  - **Fall N applications under tremendous pressure**
- **Consider stabilizers- again**
- **Consider cover crops <u>where they work</u>**

Can we reduce nitrate impacts beyond the field border?

- **Tile treatments**
  - **Wetlands appear to be most effective**
  - **Bioreactors need further evaluation**
  - **Tile depth and spacing as a water management practice**
  - **Controlled drainage- gated structures or lift pumps**
  - **Saturated buffers- very new**

Relative to agriculture, and especially nutrients, clean water act implementation that actually results in environmental improvement AND allows continued productive agriculture will only be achieved when agricultural experts lead the process.