Nutrient Reduction Strategy and Best Management Practices

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Situation

- Increasing concern for local and regional waters
- Substantial demand for agricultural products
- Hypoxia Action Plan in 2008 called for development and implementation of comprehensive N and P reduction strategies for states in the Mississippi/Atchafalaya River Basin
- Increasing concern about phosphorus loading to Lake Erie and the role of drainage in this loading

Gulf of Mexico Hypoxia Goals

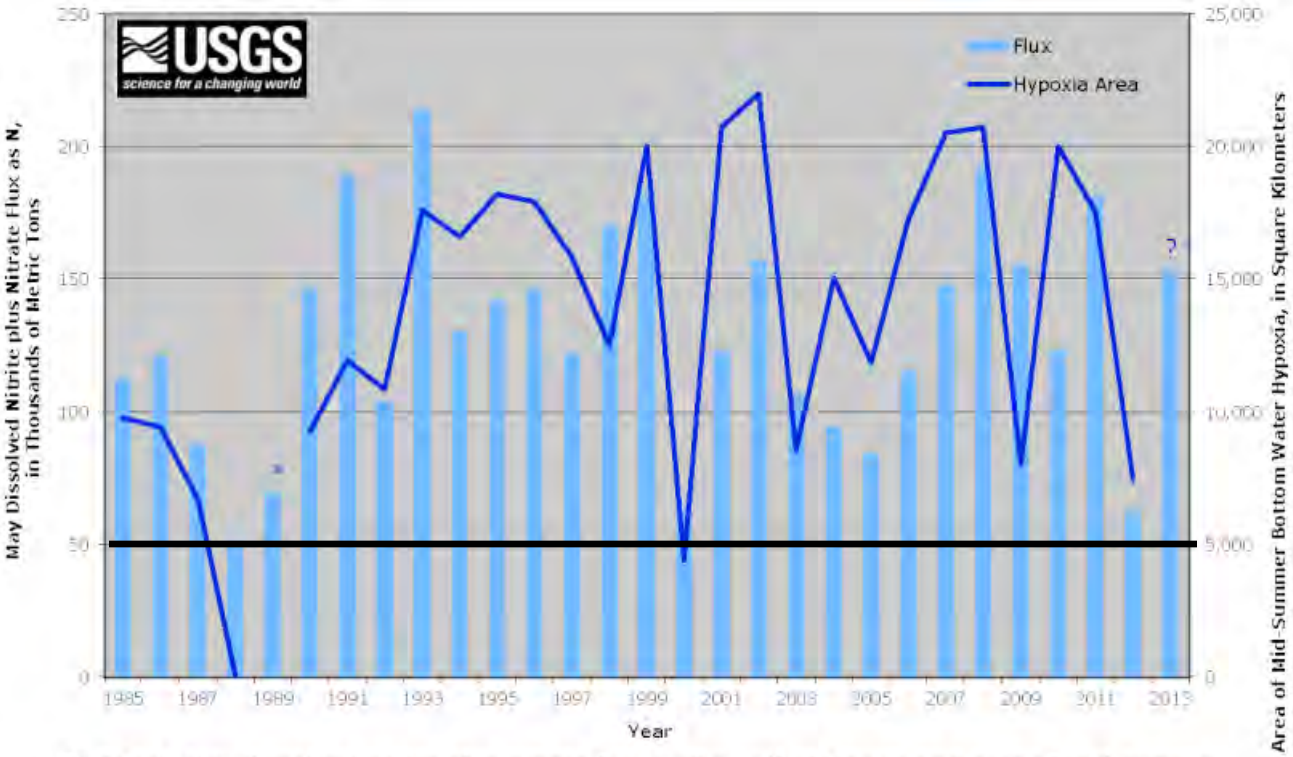


Figure 1. May dissolved nitrite plus nitrate flux to the Gulf of Mexico and area of mid-summer bottom water hypoxia (dissolved oxygen concentrations of less than 2 miligrams per liter) in the northern Gulf of Mexico. Hypoxia area data from Nancy N. Rabalais, Louisiana Universities Marine Consortium. *No hypoxia area data for 1989.

USGS

2013 Preliminary Mississippi-Atchafalaya River Basin Flux Estimate

Hypoxia Action Plan Goal: Reduce the size of the zone to 5,000 km^2 by 2015

EPA-SAB Recommendations: Reduce Total Riverine Nitrogen and Phosphorus Loads by 45%

Current and Pending Programs

- States in the Mississippi River Basin are implementing state nutrient reduction strategies
- These strategies are a voluntary approach to reducing nutrient loading to downstream waters
- Increasing demand to document water quality improvements and increasing demand for accountability
- Increasing discussion about regulation

Nutrient Reduction Strategy and Source Water Protection

- Reducing water and nitrate movement below the root zone would benefit both source water and the nutrient reduction strategy

Nitrate-N Reduction Practices

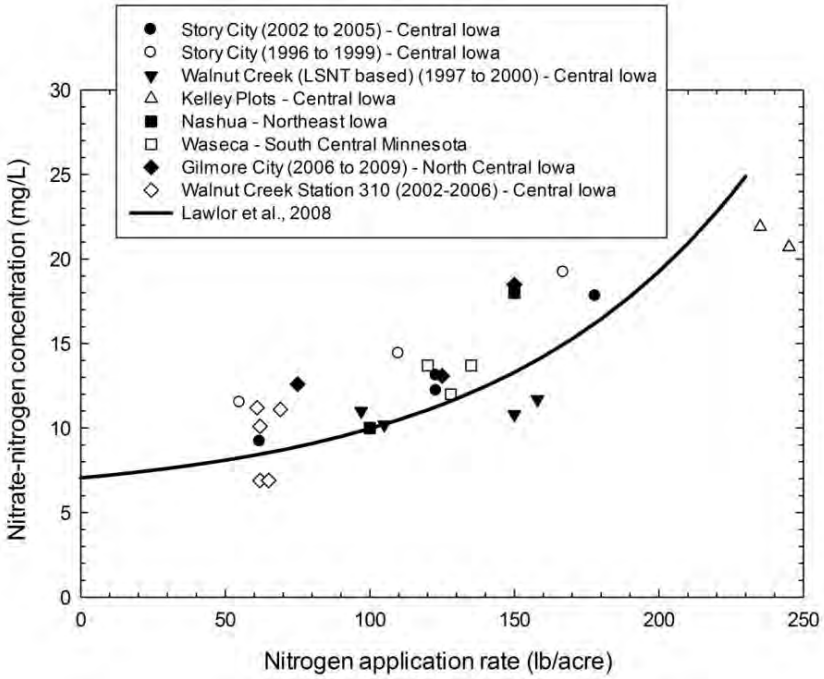
	Practice	% Nitrate-N Reduction [Average (Std. Dev.)]	% Corn Yield Change
Nitrogen Management	Timing (Fall to spring)	6 (25)	4 (16)
	Nitrogen Application Rate (Reduce rate to MRTN)	10	-1
	Nitrification Inhibitor (nitrapyrin)	9 (19)	6 (22)
	Cover Crops (Rye)	31 (29)	-6 (7)
Land Use	Perennial – Pasture/Land retirement	85 (9)	
	Perennial – Energy Crops	72 (23)	
	Extended Rotations	42 (12)	7 (7)
Edge-of-Field	Controlled Drainage	33 (32)*	
	Shallow Drainage	32 (15)*	
	Wetlands	52	
	Bioreactors	43 (21)	
	Buffers	91 (20)**	

*Load reduction not concentration reduction

**Concentration reduction of that water interacts with active zone below the buffer

Nutrient Load Reduction Scenarios

Practice/Scenario	Nitrate-N Reduction	Cost of N Reduction	Phosphorus Reduction	Cost of P Reduction	Total Equal Annualized Cost
	% (from baseline)	($/lb)	% (from baseline)	($/lb)	(million $/yr)
Reducing nitrogen application rate from background to the MRTN 133 lb N/ac on CB and to 190 lb N/ac on CC	9	-0.58			-32



From Iowa Nutrient Reduction Strategy: Goals for Nonpoint Sources is 41% reduction in Nitrogen and 29% reduction in Phosphorus

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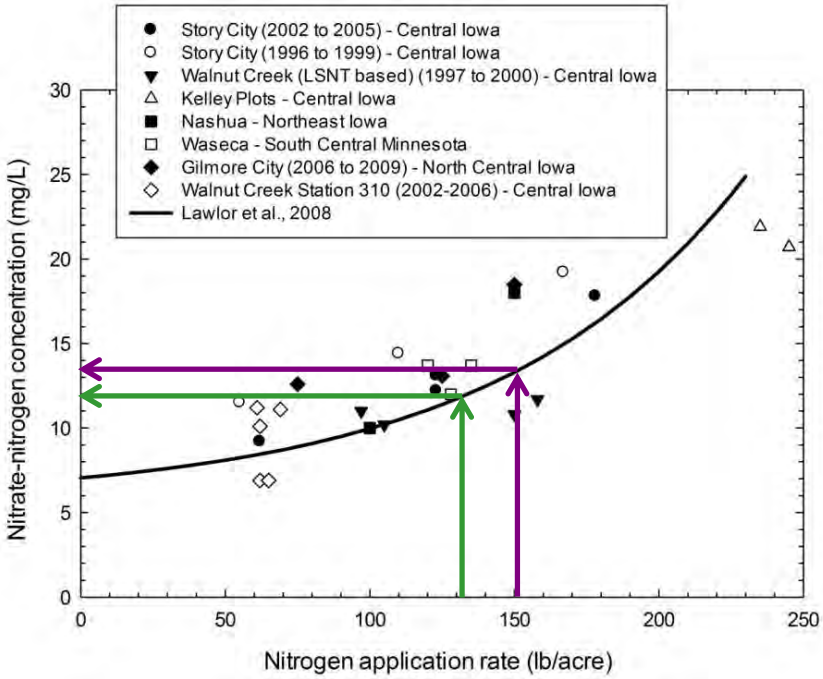

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Cover crops (rye) on ALL CS and CC acres	28	5.96	50	60	1,025

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Perennial crops (energy crops) on ~6.5 million acres	18	21.46	29	238	2,318

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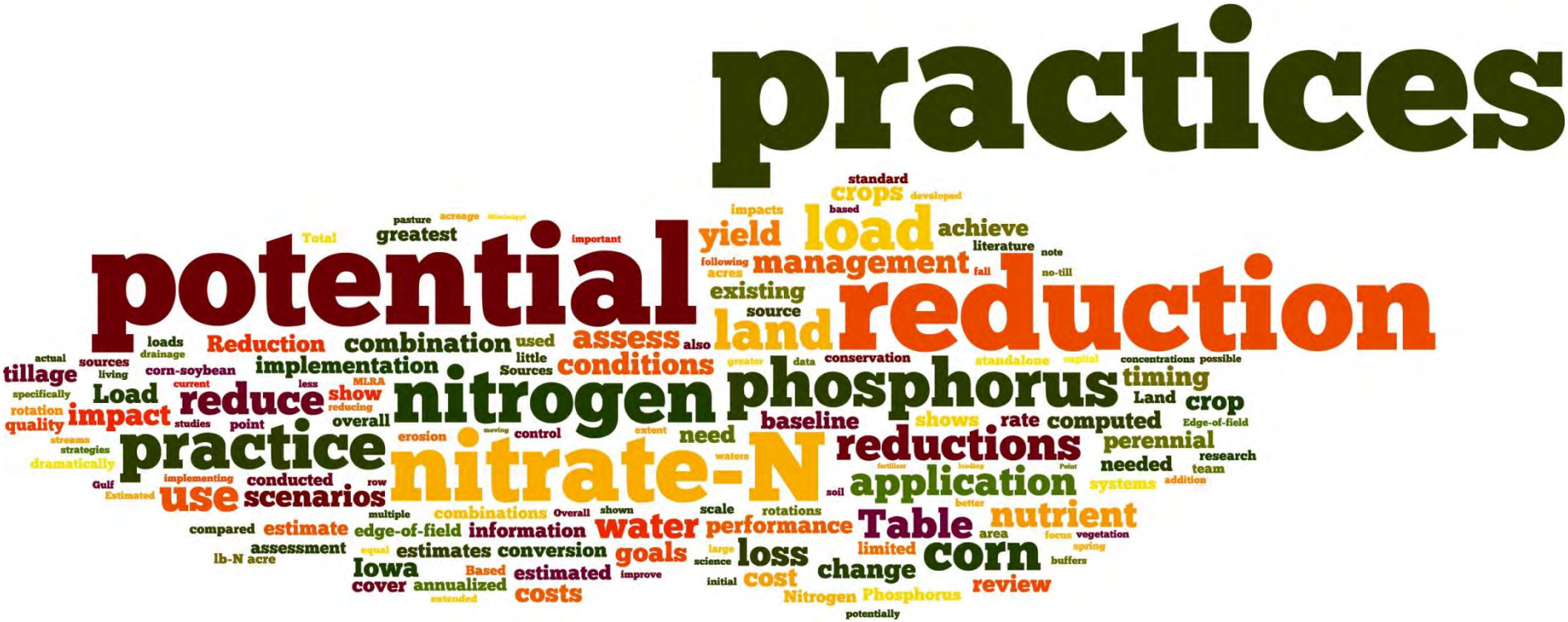
Summary

- The Iowa Nutrient Reduction Strategy is a statewide effort to reduce nutrient loading
- Goals to protect source water complement the goals of the nutrient reduction strategy
- Overarching theme to protect source water is reduce nitrate moving below the root zone



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