Meeting the nitrate reduction goal: What will it take?

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Introduction

The Iowa Nutrient Reduction Strategy is a science and technology-based framework developed to assess and reduce nutrients loss to Iowa waters and the Gulf of Mexico. The strategy includes efforts to reduce the total loads of nitrogen and phosphorus from both point and nonpoint sources by a combined 45%. The practice-based approach was developed in response to the 2008 Gulf Hypoxia Action Plan that calls for Iowa and other states in the Mississippi River watershed to develop strategies to reduce nutrient loadings to the Gulf of Mexico and ultimately reduce the size of the gulf hypoxic zone.

The Iowa strategy development was led by the Iowa Department of Agriculture and Land Stewardship and the College of Agriculture and Life Sciences at Iowa State University and included an assessment of recent research to identify agricultural practices that reduce nitrogen and phosphorus loss. An assessment of nitrogen and phosphorus discharge from the state's largest wastewater treatment plants was conducted by the Iowa Department of Natural Resources. Through these assessments, the point source reduction goals were set at 4% for nitrate-nitrogen and 16% for phosphorus and non-point source goals are 41% for nitrate-nitrogen and 29% for phosphorus.

Meeting the nitrate reduction goal

A high rate of adoption of a combination of the in-field, edge of field and land use change practices is needed to meet the nitrate reduction goal. The included publication Reducing Nutrient Loss: Science Shows What Works, further describes the practices and nitrate-nitrogen reduction effectiveness for each practice. The science team created eight scenarios to illustrate the combination of practices and rates of adoption to achieve this goal. Table 28 from the Iowa Nutrient Reduction Strategy science assessment includes the description of each scenario, the load reduction from the calculated baseline, and the cost estimate for each scenario per pound of nitrate reduced and per acre averaged statewide.

Table 28. Example Statewide Combination Scenarios that Achieve the Targeted Nitrate-N Reductions, Associated Phosphorous Reductions and Estimated Equal Annualized Costs based on 21.009 Million Acres of Corn-Corn and Corn-Soybean Rotation. Notes: Research indicates large variation in reductions from practices that is not reflected in this table. Additional costs could be incurred for some of these scenarios due to industry costs or market impacts.

		Nitrate-N	Phosphorus	Cost of N Reduction from baseline ($/lb)	Initial Investment (million $)	Total EAC* Cost (million $/year)	Statewide Average EAC Costs ($/acre)
Name	Practice/Scenario**	% Reduction from baseline					
NCS1	Combined Scenario (MRTN Rate, 60% Acreage with Cover Crop, 27% of ag land treated with wetland and 60% of drained land has bioreactor)	42	30	2.95	3,218	756	36
NCS2	Combined Scenario (MRTN Rate, 100% Acreage with Cover Crop in all MLRAs but 103 and 104, 45% of ag land in MLRA 103 and 104 treated with wetland, and 100% of tile drained land in MLRA 103 and 104 treated with bioreactor)	39	40	2.61	2,357	631	30
NCS3	Combined Scenario (MRTN Rate, 95% of acreage in all MLRAs with Cover Crops, 34% of ag land in MLRA 103 and 104 treated with wetland, and 5% land retirement in all MLRAs)	42	50	4.67	1,222	1,214	58
NCS4	Combined Scenario (MRTN Rate, Inhibitor with all Fall Commercial N, Sidedress All Spring N, 85% of all tile drained acres treated with bioreactor, 85% of all applicable land has controlled drainage, 38.25% of ag land treated with a wetland)	42	0	0.88	4,810	225	11
NCS5	Combined Scenario (MRTN Rate, Inhibitor with all Fall Commercial N, Sidedress All Spring N, 65% of all tile drained acres treated with bioreactor, 65% of all applicable land has controlled drainage, 29.25% of ag land treated with a wetland, and 15% of corn-soybean and continuous corn acres converted to perennial-based energy crop production)	41	11	5.58	3,678	1,418	67
NCS6	Combined Scenario (MRTN Rate, 25% Acreage with Cover Crop, 25% of acreage with Extended Rotations, 27% of ag land treated with wetland, and 60% of drained land has bioreactor)	41	19	2.13	3,218	542	26
NCS7	Combined Scenario (MRTN Rate, Inhibitor with all Fall Commercial N, Sidedress All Spring N, 70% of all tile drained acres treated with bioreactor, 70% of all applicable land has controlled drainage, 31.5% of ag land treated with wetland, and 70% of all agricultural streams have a buffer)	42	20	0.95	4,041	240	11

Scenario building and facilitated discussion

Participants attending this presentation will review the nitrate reduction practice options identified in the Nutrient Reduction Strategy. Using practice effectiveness information, landscape qualities, and cropping system characteristics, participants will discuss and select practices to build a scenario to meet the nitrate reduction goal for a central Iowa HUC 12 watershed. Watershed characteristics to aid in decision making and scenario building including land use, crop acreage and inputs, drainage, livestock numbers, and acres that receive manure will be provided. The participants will work in small groups to discuss and select practices and levels of adoption to complete their watershed scenario. Each group will appoint a leader to present their scenario to the larger group and the nitrate load reduction will be calculated using the Nitrate Load Estimate Calculator. The groups will have the opportunity to adjust their scenario and recalculate the load reduction estimate. Through this facilitated discussion, participants will demonstrate their understanding of nitrate reduction practices and the level of adoption needed to meet nitrate reduction goals for a HUC 12 watershed.

References

Iowa Department of Agriculture and Land Stewardship, Iowa Department of Natural Resources, and Iowa State University. 2013. Iowa Nutrient Reduction Strategy: A Science and Technology-Based Framework to Assess and Reduce Nutrients to Iowa Waters and the Gulf of Mexico. http://www.nutrientstrategy.iastate.edu/documents.