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 nutrient loss to Iowa waters and the Gulf of Mexico. The strategy addresses methods and practices to reduce total loads of nitrogen and phosphorus from both municipal and industrial point sources and agricultural nonpoint sources by a combined 45% (INRSSA, 2013). The 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 practices that reduce nitrogen and phosphorus loss from the agricultural landscape. 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 (INRSSA, 2013).

Meeting the nitrate reduction goal

The science team created scenarios to illustrate the combination of practices and rates of adoption to achieve this goal. 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. The scenarios in table 1 illustrate two of the many potential combinations of practices and associated level of adoption needed to fully achieve the 41% reduction goal for nitrate-nitrogen and 29% reduction goal for phosphorus from nonpoint agricultural sources. To reach the goals will require a high rate of adoption of a combination of the in-field, edge of field and land use change practices.

Table 1. Example statewide combination scenarios that achieve the nitrate-nitrogen and phosphorous load reduction goal of the Iowa Nutrient Reduction Strategy (INRS, 2013).

Practice/Scenario	Nitrate-N Reduction	Phosphorus Reduction	Initial Investment	Total Equal Annualized Cost (EAC)	Statewide Average EAC
	% (from baseline)	*% (from baseline)*	*(million $)*	*(million $/yr)*	*($/acre)*
MRTN Rate on all corn acres, 60% of row crop acreage with cover crop, 27% of ag land treated with wetland and 60% of drained land has bioreactor	42	30	3,218	756	36
MRTN Rate on all corn acres, 95% of row crop acreage with cover crops, 34% of ag land in heavily tile drained areas treated with wetland, and 5% land retirement	42	50	1,222	1,214	58

The 2017 Iowa Nutrient Reduction Strategy Annual Report summarized implementation progress through the end of 2016 for the practices identified in the science assessment. Approximately 623,000 acres of cover crops were established in 2016 with 305,000 acres implemented with state and federal cost-share programs and the remaining 318,000 estimated to be established by landowner, farmer and other private investment (INRS, 2017). Implementation of edge-of-field practices that reduce nitrate including nitrate removal wetlands and bioreactors, has also increased. According to available cost-share practice data, there are currently 85 nitrate removal wetlands installed in the state that are removing nitrate from 100,000 acres of tile drained crop land and 20 bioreactors treating approximately 1000 acres (INRS, 2017). Terraces and sediment control basins constructed since 2011, when data became readily available, are reducing sediment and phosphorus loss from approximately 250,000 acres (INRS, 2017). Land retirement through the Conservation Reserve Program has remained steady since 2001 with 1.4 million acres currently enrolled in the program in Iowa.

While the increases in practices that reduce nitrate and phosphorus loss are encouraging, acres and numbers of practices currently on the landscape fall far short of what's needed to reach the Iowa Nutrient Reduction Strategy nonpoint source goal illustrated in table 1. Approximately 12 million acres of cover crops, 7,600 wetlands, and 120,000 bioreactors will be needed to fully reach the goals. Agronomists and consultants that advise farmers on cropping system management decisions have an opportunity to assist farmers in the implementation of nitrogen and phosphorus practices, particularly in-field fertilizer and cover crop management. As highly trusted sources of information, agronomists and crop consultants can serve as advocates for water quality improvement efforts in many capacities including participating in local watershed projects and connecting farmers with conservation and natural resource professionals when nitrogen and phosphorus loss challenges are identified.

Rapid Needs Assessment and Response facilitated discussion

To quickly gather participants' current knowledge of water quality issues and the Iowa Nutrient Reduction Strategy, the group will engage in a facilitated discussion format called Rapid Needs Assessment and Response (RNR) (Comito, et al, in preparation). First, the group will divide into small groups of eight and collaboratively analyze five key questions about water quality in Iowa.

1. What are the leading causes of water quality issues in Iowa?
2. What practices are most effective in improving water quality in your area?
3. What practices are most effective in improving soil health and preventing soil erosion in your area?
4. What are the major barriers to adoption of:
    a. Edge of field practices- bioreactors, wetlands, saturated buffers?
    b. In-field practices- cover crops, no-till, strip-till?
5. Who is responsible to pay for in-field and edge-of-field conservation practices?

Each group will spend five minutes at each question and then rotate through the rest of the questions adding only new responses as they follow other groups. When they return to their original question, small groups will rank the top three responses. The group facilitators will then discuss the top responses with the larger group. Through the process of small group and facilitated discussion, participants will: identify the primary sources of nitrate-N and phosphorus (P) in Iowa surface water bodies, compare effective nitrate-N and P loss practices, evaluate the costs, benefits and barriers to adoption of the practices, and determine strategies for scaling up practice adoption to meet the Iowa Nutrient Reduction Strategy goals.

References

Comito, J., Case Haub, B., Licht, M. (In preparation). Rapid Needs Assessment and Response (RNR) Technique.

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