

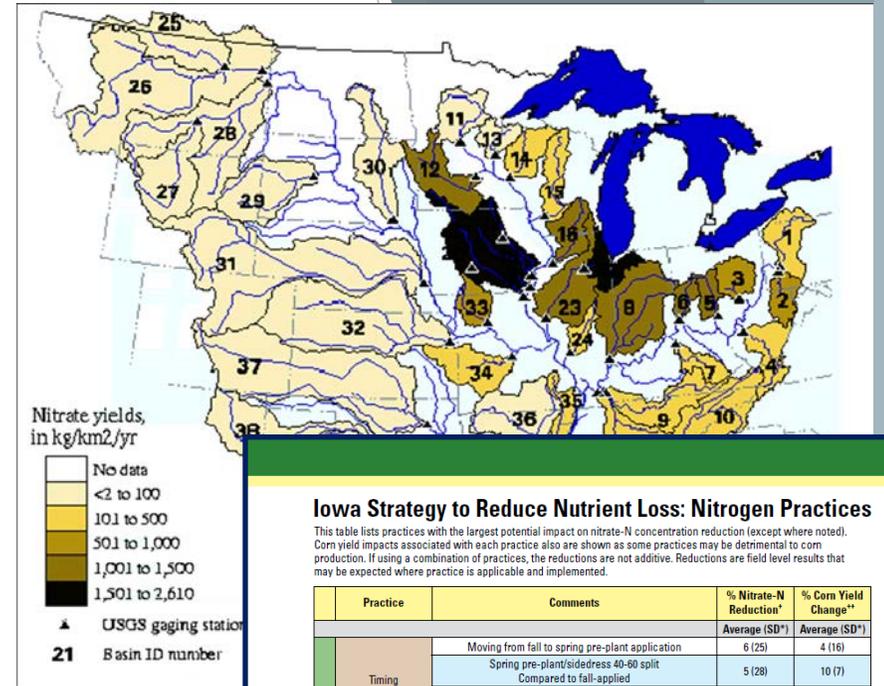
Reconnaissance Study of Nitrate and Phosphorus Concentrations at Iowa Golf Courses

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Background

- ▶ Nonpoint source pollution from nitrate-nitrogen (N) and phosphorus (P) contributes to nutrient enrichment in local streams and development of hypoxic (dead) zones in regional water bodies, including the Gulf of Mexico
- ▶ Iowa Nutrient Reduction Strategy developed to reduce N and P from point and nonpoint sources
- ▶ Objective of strategy to reduce N and P from nonpoint sources by 45% through in-field, edge-of-field and land management practices
- ▶ Focus on agricultural impacts in INRS - no explicit accounting for golf course contributions



Iowa Strategy to Reduce Nutrient Loss: Nitrogen Practices

This table lists practices with the largest potential impact on nitrate-N concentration reduction (except where noted). Corn yield impacts associated with each practice also are shown as some practices may be detrimental to corn production. If using a combination of practices, the reductions are not additive. Reductions are field level results that may be expected where practice is applicable and implemented.

Practice	Comments	% Nitrate-N Reduction*	% Corn Yield Change**	
		Average (SD)*	Average (SD)*	
Nitrogen Management	Timing			
	Moving from fall to spring pre-plant application	6 (25)	4 (16)	
	Spring pre-plant/sidedress 40-60 split Compared to fall-applied	5 (28)	10 (7)	
	Sidedress - Compared to pre-plant application	7 (37)	0 (3)	
	Sidedress - Soil test based compared to pre-plant	4 (20)	13 (22)**	
	Liquid swine manure compared to spring-applied fertilizer	4 (11)	0 (13)	
	Poultry manure compared to spring-applied fertilizer	-3 (20)	-2 (14)	
Nitrogen Application Rate	Nitrogen rate at the MRTN (0.10 N:corn price ratio) compared to current estimated application rate. (ISU Corn Nitrogen Rate Calculator - http://extension.agron.iastate.edu/soilfertility/nrate.aspx can be used to estimate MRTN but this would change Nitrate-N concentration reduction)	10	-1	
Nitrification Inhibitor	Nitrapyrin in fall - Compared to fall-applied without Nitrapyrin	9 (19)	6 (22)	
Cover Crops	Rye	31 (29)	-6 (7)	
	Oat	28 (2)	-5 (1)	
	e.g. Kura clover - Nitrate-N reduction from one site	41 (16)	-9 (32)	
Land Use	Perennial			
	Energy Crops - Compared to spring-applied fertilizer	72 (23)		
	Land Retirement (CRP) - Compared to spring-applied fertilizer	85 (9)		
Extended Rotations	At least 2 years of alfalfa in a 4 or 5 year rotation	42 (12)	7 (7)	
Grazed Pastures	No pertinent information from Iowa - assume similar to CRP	85		
Edge-of-Field	Drainage Water Mgmt.	No impact on concentration	33 (32)	
	Shallow Drainage	No impact on concentration	32 (15)	
	Wetlands	Targeted water quality	52	
	Bioreactors		43 (21)	
	Buffers	Only for water that interacts with the active zone below the buffer. This would only be a fraction of all water that makes it to a stream.	91 (20)	
	Saturated Buffers	Divert fraction of tile drainage into riparian buffer to remove Nitrate-N by denitrification.	50 (13)	

* A positive number is nitrate concentration or load reduction and a negative number is an increase.
 ** A positive corn yield change is increased yield and a negative number is decreased yield. Practices are not expected to affect soybean yield.
 SD = standard deviation. Large SD relative to the average indicates highly variable results.
 *** This increase in crop yield should be viewed with caution as the sidedress treatment from one of the main studies had 95 lb-N/acre for the pre-plant treatment but 110 lb-N/acre for the sidedress with soil test treatment so the corn yield impact may be due to nitrogen application rate differences.

Where do Golf Courses fit in?

- ▶ They are routinely lumped into nonpoint sources and often considered part of the problem - What do we hear?



What does the public hear?

Des Moines Register article

Runoff reduction will fall short of goal, group says

Des Moines Register, September 24, 2013

But an environmental coalition says the report shows the five-year average for total nitrogen and phosphorus has increased since 2007. "This lack of progress cries out for a new approach to pollution reduction, but the task force has instead reinforced its commitment to current programs that are not producing results," said the Mississippi River Collaborative, a group that includes the Iowa Environmental Council. It has pushed the Environmental Protection Agency to set numeric pollution standards along the Mississippi River basin instead of working with states on voluntary efforts to reduce nutrients.

The runoff comes from fertilizers used in farming and on golf courses and suburban lawns, discharge from sewage treatment plants, and erosion of soil full of nutrients, the task force said.

What does the public say?

On-line comments about the Nutrient Reduction Strategy

golf

Iowa Nutrient Reduction Strategy
Online comment submissions

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Iowa Nutrient Reduction Strategy
Online comment submissions

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Secretary of Agriculture Northey,

I would like to take a minute to urge you to support a science based nutrient reduction strategy.

While I support a clean responsible environment, we must also maintain Iowa's productivity and thriving ag industry. Runoff from urban lawns and golf courses should also be included.

Reconnaissance Study of Iowa Golf Courses

- ▶ Goal: measure N and P concentrations in surface and groundwater at a subset of Iowa golf courses to assess the risk posed by these facilities to contribute N and P loads to Iowa rivers
- ▶ Funding provided by U.S. Golf Course Superintendents Association, Iowa Chapter, USGCSA, Iowa Turfgrass Institute

Course Selection

- ▶ Over 400 golf courses in Iowa with at least one course in each of Iowa's 99 counties
- ▶ Stratified random design used to select six courses for this initial reconnaissance study that includes three 18-hole courses and three 9-hole courses in eastern, central and western regions of Iowa



Investigation Activities

- ▶ Monitoring wells were installed within managed turfgrass areas at each course in representative tees, fairway and rough locations



Soil Investigation

- ▶ Soil samples were collected according to the stratigraphy encountered at each site, but in general, soil samples were collected at depth classes of 0-20 cm, 20-50 cm, 50-100 cm, 100-500 cm and 500-1000 cm.
- ▶ Analyzed for particle size analysis, organic matter, major nutrients (N, P, K), Ca, Mg, Na, pH, CEC and nitrate



Water sampling

- ▶ Quarterly sampling for two years
- ▶ Groundwater from wells and surface water from inflow and outflow streams at the golf course or from standing ponds on the course if appropriate sites were available
- ▶ At one well per course, a water level transducer was installed in the well to measure water table fluctuations



Relation to Management Practices

- ▶ Working with the course superintendents to compile land management practices at the six selected courses including the timing, rate and formulation of fertilizer applications
- ▶ Correlate management practices with concentrations in the well following fertilization
- ▶ Goal is to establish best management practices (BMPs) for golf course superintendents to decrease the environmental impact and improve turfgrass fertilization efficiency



Schedule of Activities

- ▶ Ongoing Monitoring - In 2016, we will continue groundwater and surface water sampling at the six courses.
- ▶ Ongoing Evaluations - Throughout the year, golf course superintendents will be surveyed regarding fertility practices.
- ▶ Presentation - Year 1 findings presented at Iowa Turfgrass Conference and Trade Show in Coralville, Iowa during the January 25-27 event
- ▶ Final Report - At the conclusion of the two-year project, a report will be prepared that summarize the findings of the project. The report will be made publically available through the Iowa Golf Course Superintendents Association (<http://www.iowagcsa.org/>).

The screenshot displays the Iowa GCSA website interface. At the top, the URL iowagcsa.org is shown with the tagline "For better turf everywhere." and the GCSAA logo. A navigation bar includes links for Home, Membership, Events, Classifieds, and Jobs. A sidebar on the left lists various site sections such as Advertising, Awards, Allied Associations, Code of Ethics, Classifieds, District Info, Events, Iowa GCSA Board, Quicknotes, Jobs (M), Membership, Merchandise, Past Presidents, Reporter Archive (M), Research Fund, Resources, Scholarship, and Surveys/Studies. The main content area features a "Members Secure Site" section with a link to "Manage Iowa GCSA Membership". Below this are two large advertisements: one for "D&K Products" (Your Turf Products Supplier) and another for "syngenta". A "What's New" section lists recent news items like "Iowa GCSA Chapter Cooperative Research Project" and "Support Iowa GCSA Member Steve Cook - CGCS Make-A-Wish". There is also a "Iowa GCSA Member Blogs" section featuring "The Reporter" magazine cover and a "Iowa GCSA News" section with links to "iaTurf Blog" and "Wee One Foundation Letter".