Rural Iowans are doing everything possible to reduce nitrates in water running off farm fields

-Iowa Sen. Randy Feenstra as reported by the Des Moines Register

Nitrate in Iowa Rivers

- The Problem
- The Root Cause of the Problem
- The Solution

Effect of CROPPING SYSTEM on drainage volume NO_3-N concentration, and N loss in subsurface tile drainage during a 4-yr period (1990-93) in MN.

Cropping System	Total Disharge	Nitrate-N	
		Conc.	Loss
	Inches	ppm	lb/A
Cont. Corn	30.4	28	194
Corn – Soybean	35.5	23	182
Soybean – C	35.4	22	180
Alfalfa	16.4	1.6	6
CRP	25.2	0.7	4

Gyles Randall, University of Minnesota

11/25/02

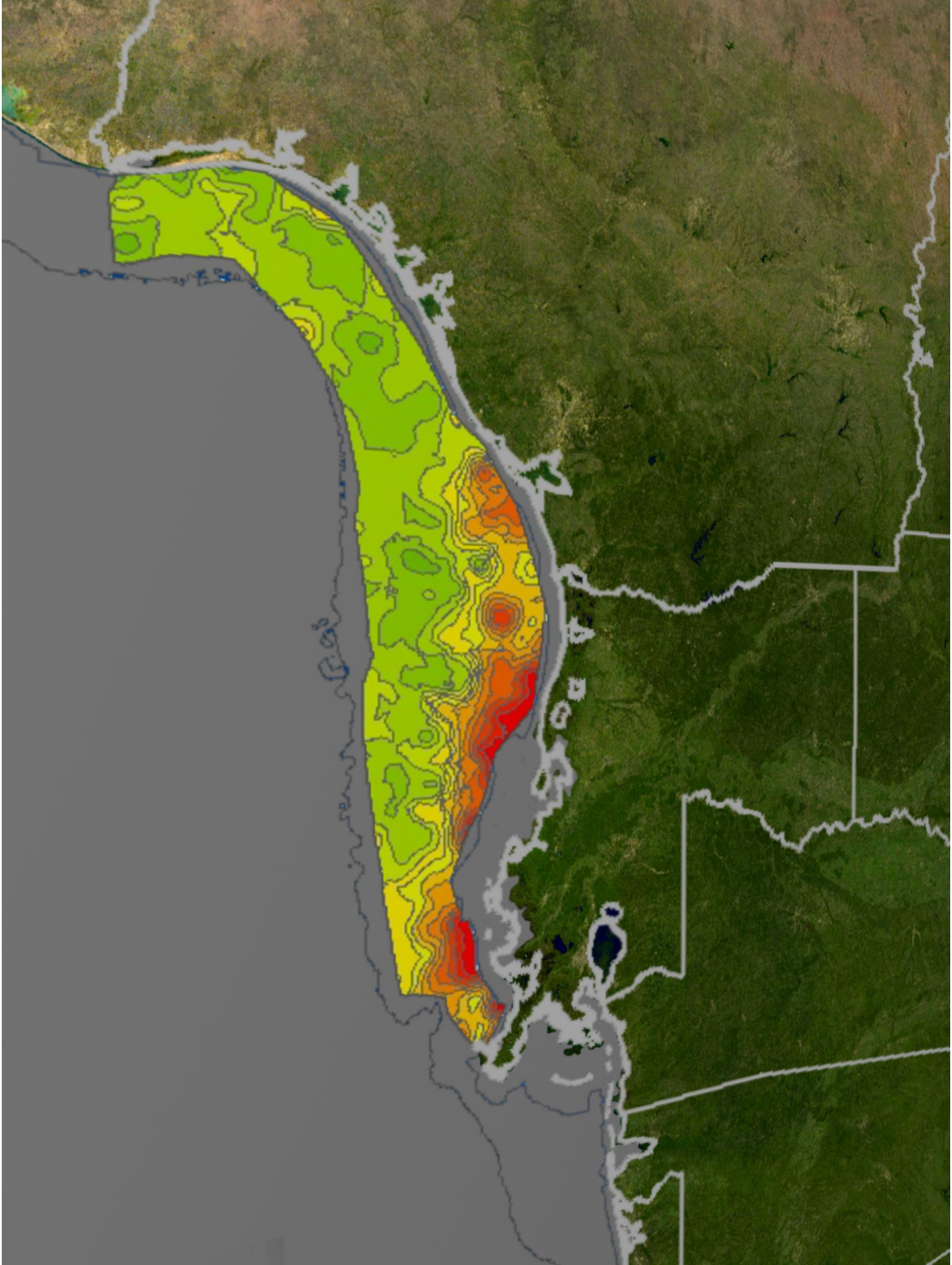
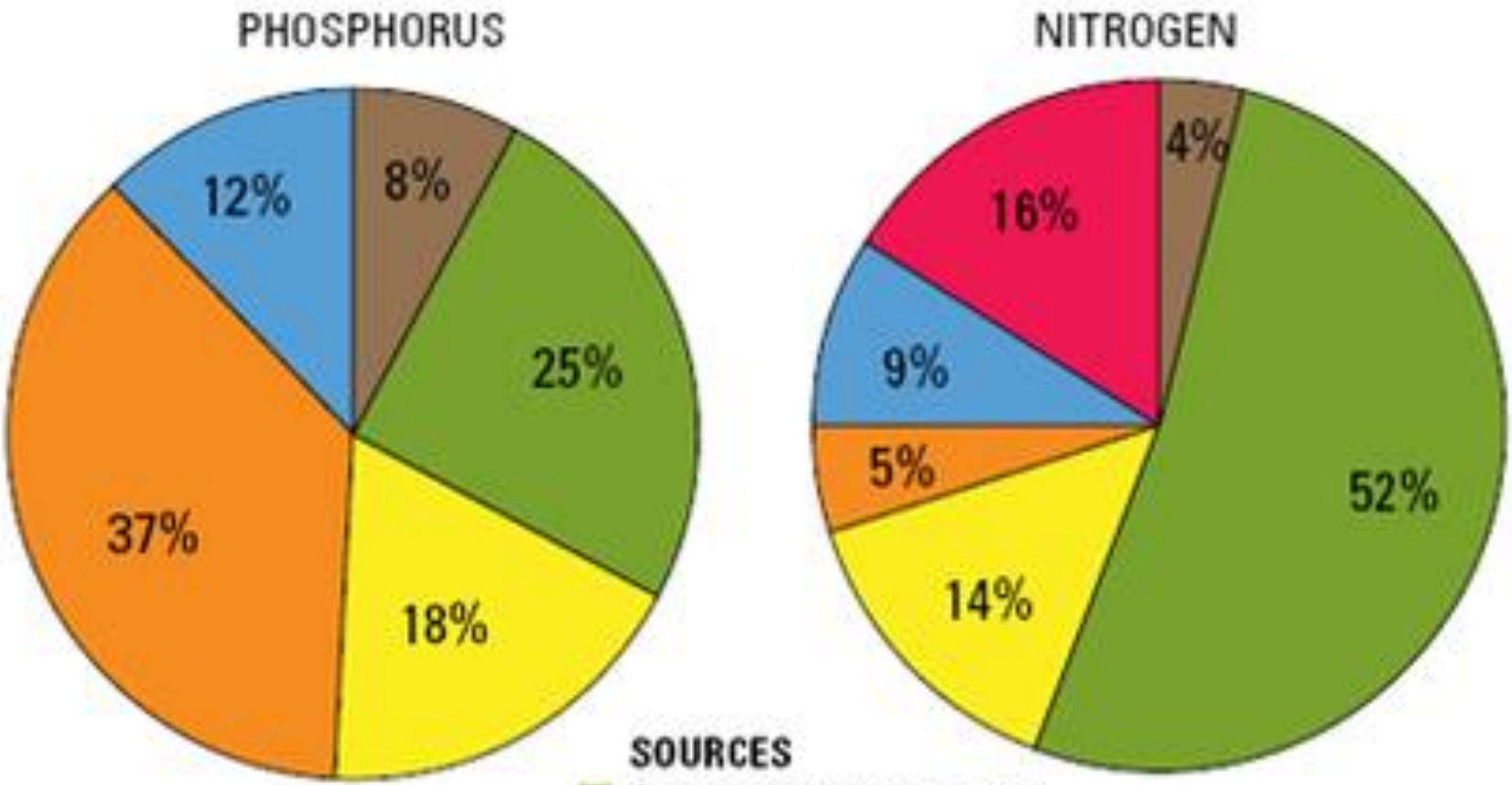


FIGURE 5: Sources of Nutrients Delivered to the Gulf of Mexico



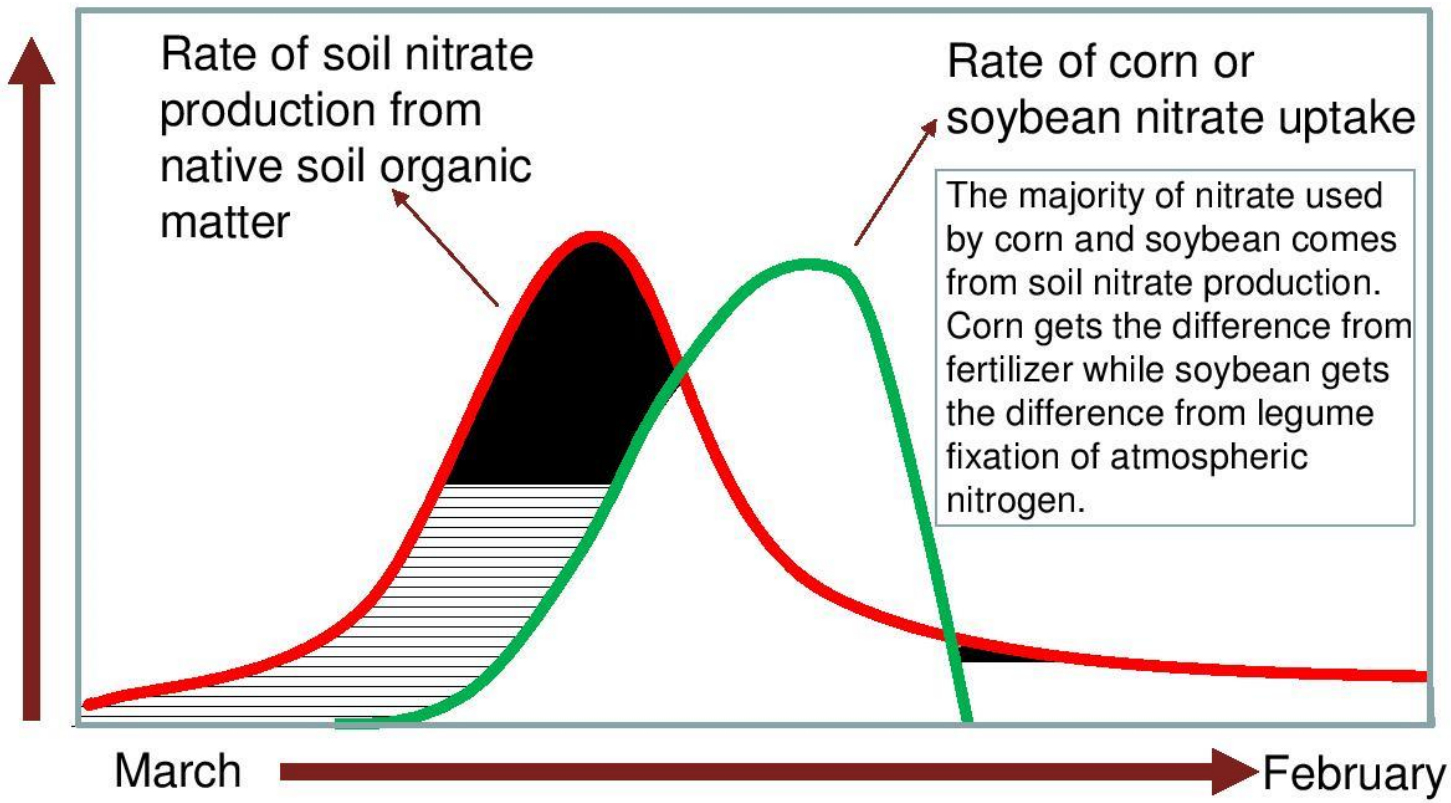
Source: United States Geological Survey

Iowa Nutrient Reduction Strategy

Table 1. Estimated percent load contributions from point and on-point sources.

Estimated % of Loads and Load Reduction	Nitrogen	Phosphorus
% of Total Load from Point Sources	7	21
% of Total Load from Non-point Sources (Agriculture)	93	79
% of Overall Load Reduction from Point Sources to meet 45% Total Load Reduction	4	16
% of Overall Load Reduction from Nonpoint Sources to meet 45% Total Load Reduction Goal (Agriculture)	41	29

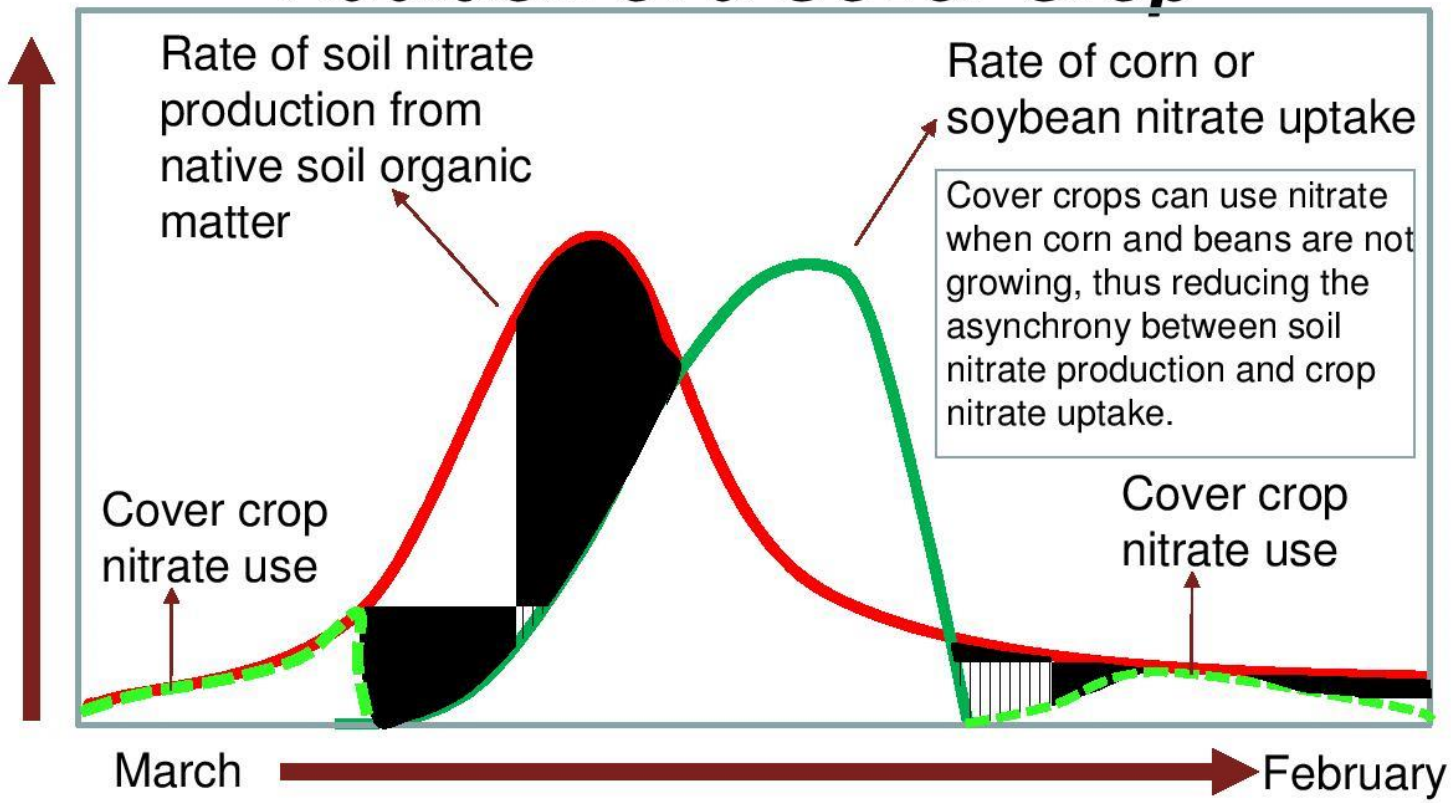
Soil Nitrate Production *vs.* Crop Nitrate Uptake



In the shaded areas, the soil produces nitrate, but there is no crop to use it. As a result, <u>some</u> nitrate is lost to waterways.

Soil Nitrate Production *vs.* Crop Nitrate Uptake

Addition of a Cover Crop



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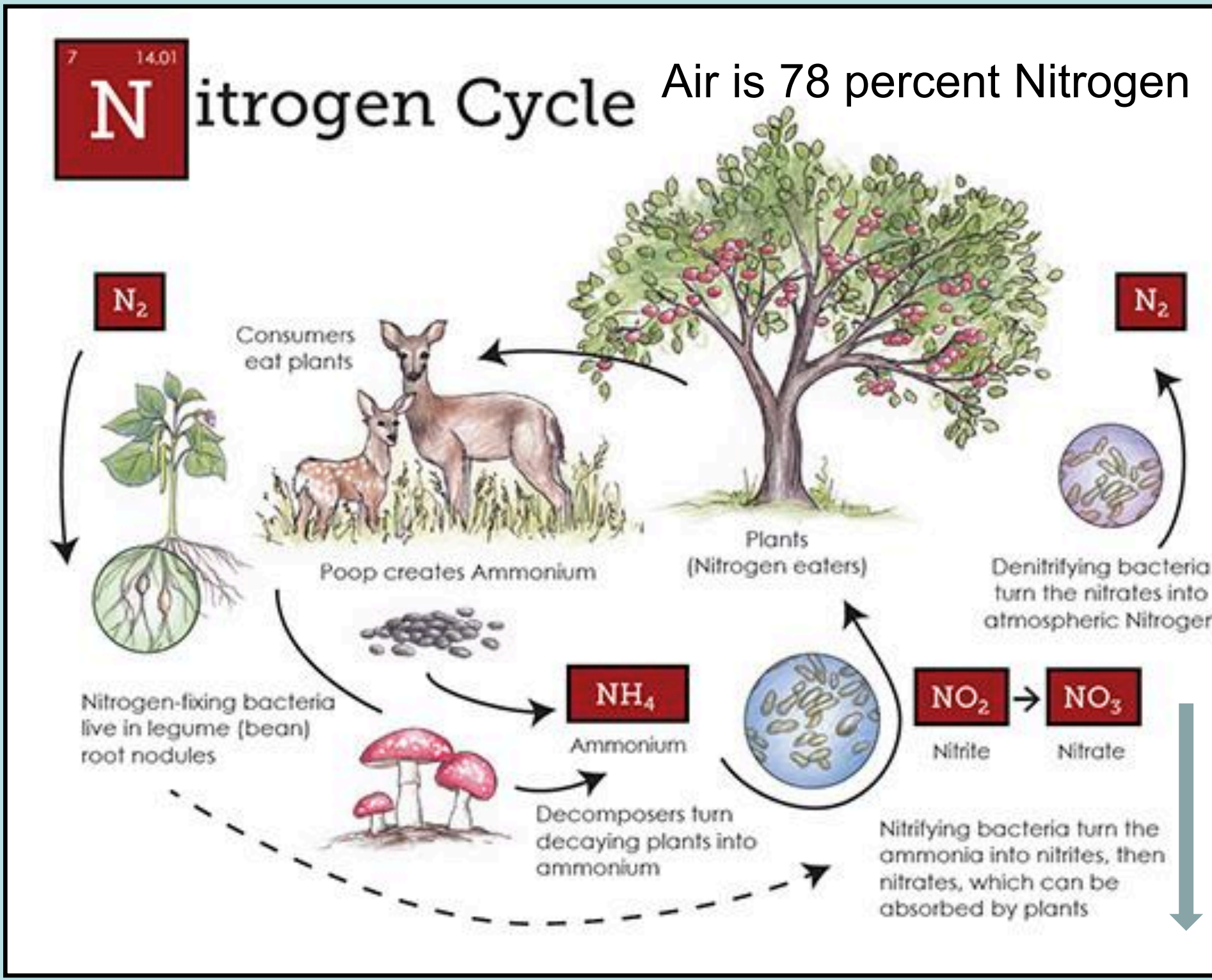
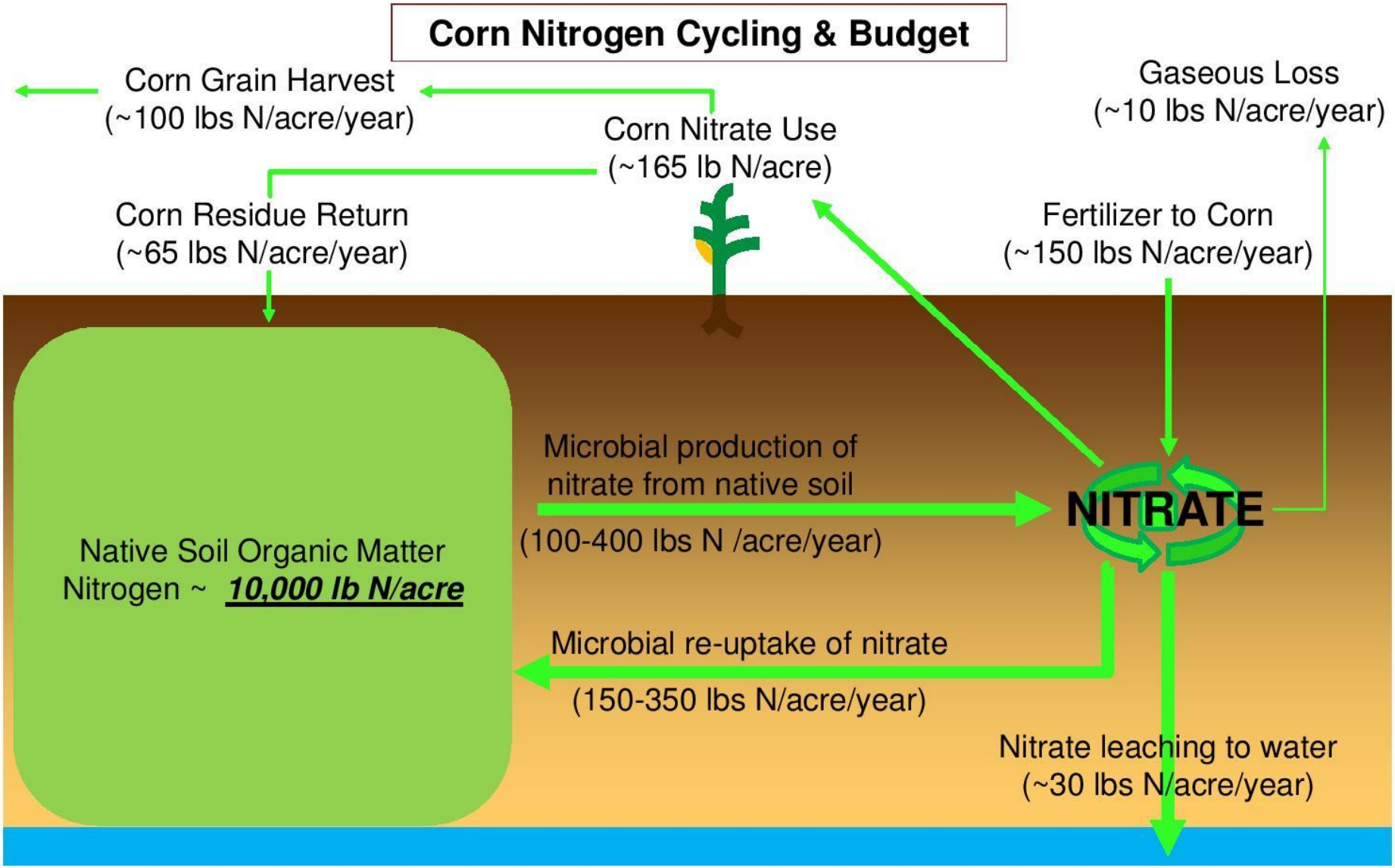

7
14.01
N
itrogen Cycle
Air is 78 percent Nitrogen
N_2
Consumers eat plants
Plants (Nitrogen eaters)
N_2
Poop creates Ammonium
Denitrifying bacteria turn the nitrates into atmospheric Nitrogen
Nitrogen-fixing bacteria live in legume (bean) root nodules
NH_4
Ammonium
NO_2
Nitrite
NO_3
Nitrate
Decomposers turn decaying plants into ammonium
Nitrifying bacteria turn the ammonia into nitrites, then nitrates, which can be absorbed by plants


Corn Nitrogen Cycling & Budget
Corn Grain Harvest
(~100 lbs N/acre/year)
Corn Nitrate Use
(~165 lb N/acre)
Gaseous Loss
(~10 lbs N/acre/year)
Corn Residue Return
(~65 lbs N/acre/year)
Fertilizer to Corn
(~150 lbs N/acre/year)
Native Soil Organic Matter
Nitrogen ~ 10,000 lb N/acre
Microbial production of
nitrate from native soil
(100-400 lbs N /acre/year)
NITRATE
Microbial re-uptake of nitrate
(150-350 lbs N/acre/year)
Nitrate leaching to water
(~30 lbs N/acre/year)

One Size Fits All

- Grass waterways


Source: NRCS

One Size Fits All

- Grass waterways
- Buffer strips along stream banks
- Minnesota drainage laws require a minimum 16.5 foot (1 rod) buffer strip along public drainage ditches


WINDBREAKS
RIPARIAN
FOREST
BUFFERS
FILTER
STRIPS
WETLAND
RESTORATIONS
GRASS
WATERWAYS
USDA NRCS, Ohio

One Size Fits All

- Grass waterways
- Buffer strips along stream banks
- Minnesota drainage laws require a minimum 16.5 foot (1 rod) buffer strip along public drainage ditches
- Proposed MN law: 50-foot buffer of vegetation along every perennial lake, river, stream, and ditch in the state

Cover Crops

Edge-of-Field Treatment of Nitrate

- Bioreactors
- Wetlands
- Denitrify the nitrate (change it to N_2 gas, which goes back to the atmosphere)

KOMATSU

Reducing Nitrate

- More efficient N fertilizer: 10%
- Cover Crops: 31%
- Bioreactors: 43%
- Wetlands: 52%
- Perennials: 85%

What Might It Take to Reach Goals?

Example: Combination Scenarios that Achieves N Goal From Non-Point Sources for Nutrient Reduction Strategy

Practice/Scenario	Nitrate-N Reduction % (from baseline)
N management - Maximum Return to Nitrogen Application Rate and 60% of all Corn-Bean and Continuous Corn Acres with Cover Crop **Edge-of-Field** - 27% of all ag land treated with wetland and 60% of all subsurface drained land with bioreactor	42

What Might It Take to Reach Goals?

Example: Combination Scenarios that Achieves N Goal From Non-Point Sources for Nutrient Reduction Strategy

Practice/Scenario	Nitrate-N Reduction % (from baseline)
N management - Maximum Return to Nitrogen Application Rate and 25% of all Corn-Bean and Continuous Corn Acres with Cover Crop **Land Use** - 25% of acreage with Extended Rotations **Edge-of-Field** - 27% of all ag land treated with wetland and 60% of all subsurface drained land with bioreactor	42

Water Quality Plan

Soil Conservation Plan

Soil Conservation Plans

- Required for participation in federal farm programs
- Almost every Iowa farm has one
- Universal Soil Loss Equation (computerized)
- Estimates soil loss from farming practices
- Must meet T Value (“tolerance”)
- If plan doesn’t meet T, must add more conservation practices (reduced tillage, contour farming, etc. to meet T

Water Quality Plans

- Already have extensive data on the water quality effects of farming practices
- Create WQ computer model, like for soil
- T values for N and P set to meet goals of Iowa Nutrient Reduction Strategy
- 41% reduction in N pollution
- 29% reduction in P pollution
- Farm WQ Plan must include practices that meet T for N and P

National Water Quality Initiative

- Research (USDA-ARS)
- Extension/Education (Coop. Extension)
- Technical Assistance (USDA-NRCS)
- Financial Assistance (USDA-FSA)
- 1988
- Voluntary
- Voluntary Water Quality Merry-Go-Round

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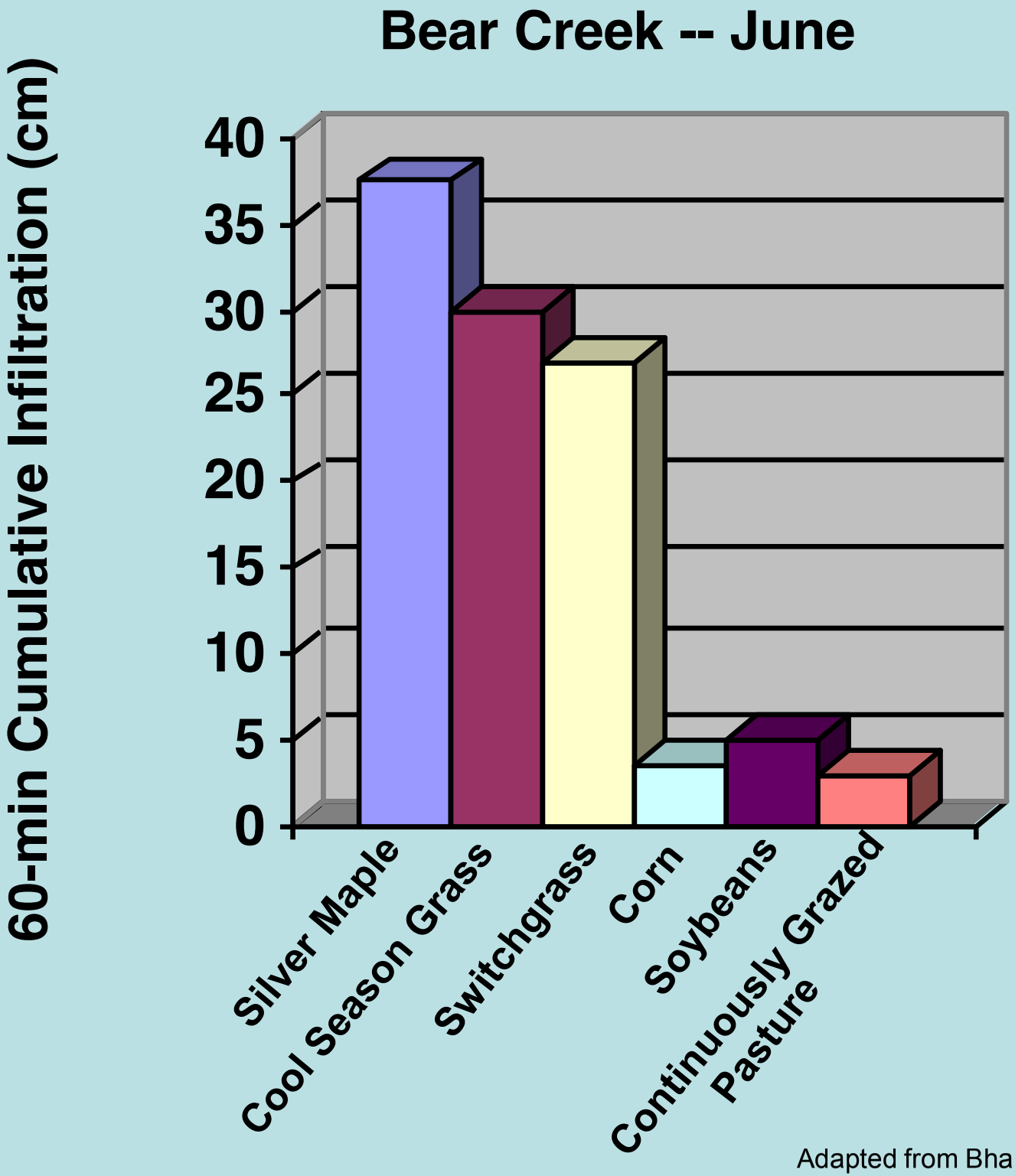

Adapted from Bharati, Lee, and Schultz

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Soybean Nitrogen Cycling & Budget