



Conservation Practices to Improve Sustainability

Better Bean Series

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Saving the land that sustains us

- Protecting farm and ranch land
- Promoting sound farming practices
- Keeping farmers on the land



Today's presentation

- Tillage Trends
- Weather
- Nutrient Loss Reduction Strategy
- Conservation practices to improve sustainability
- Conservation Cropping Systems



Tillage Transect Survey

- Ephemeral gully erosion has been cut in half since 2001
- Steady decrease in no-till soybean acres since 2006
- Corn no-till numbers consistent but low



Tolerable Soil Loss?

- T by 2000 campaign started in 1983
- In 2000 86% of cropland was <T
- 2018 -- 79% was <T



Climate Changes

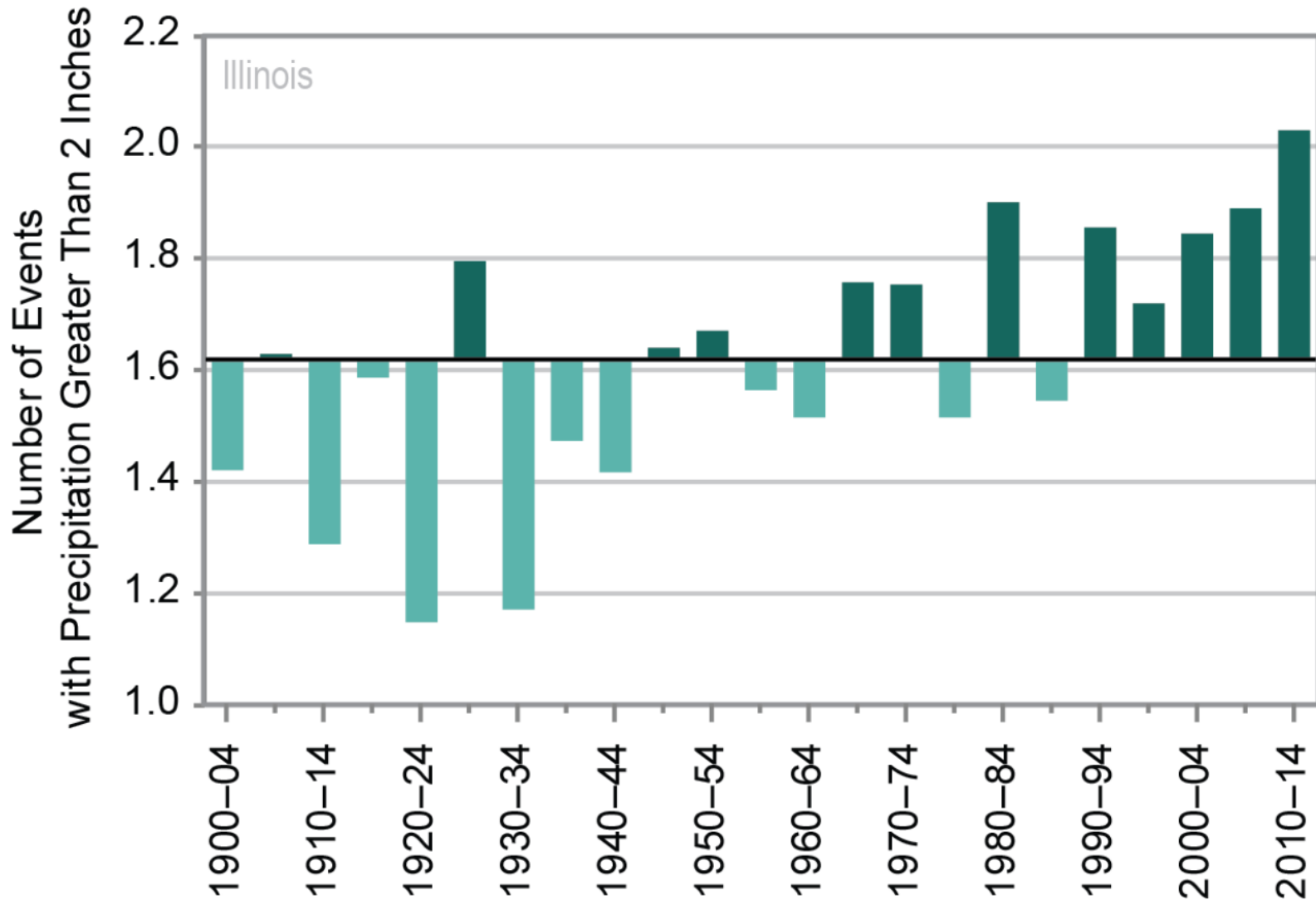
- “We’re getting more of our rain in one-off events, followed by longer dry spells. If you’ve got a tilled field, you’ve got the ability to handle that water — you’re OK, but if you don’t, you’re in trouble,” Eric Snodgrass-Atmospheric Scientist.
- Midwest growing season is getting longer
- Growing conditions become more favorable in the Midwest

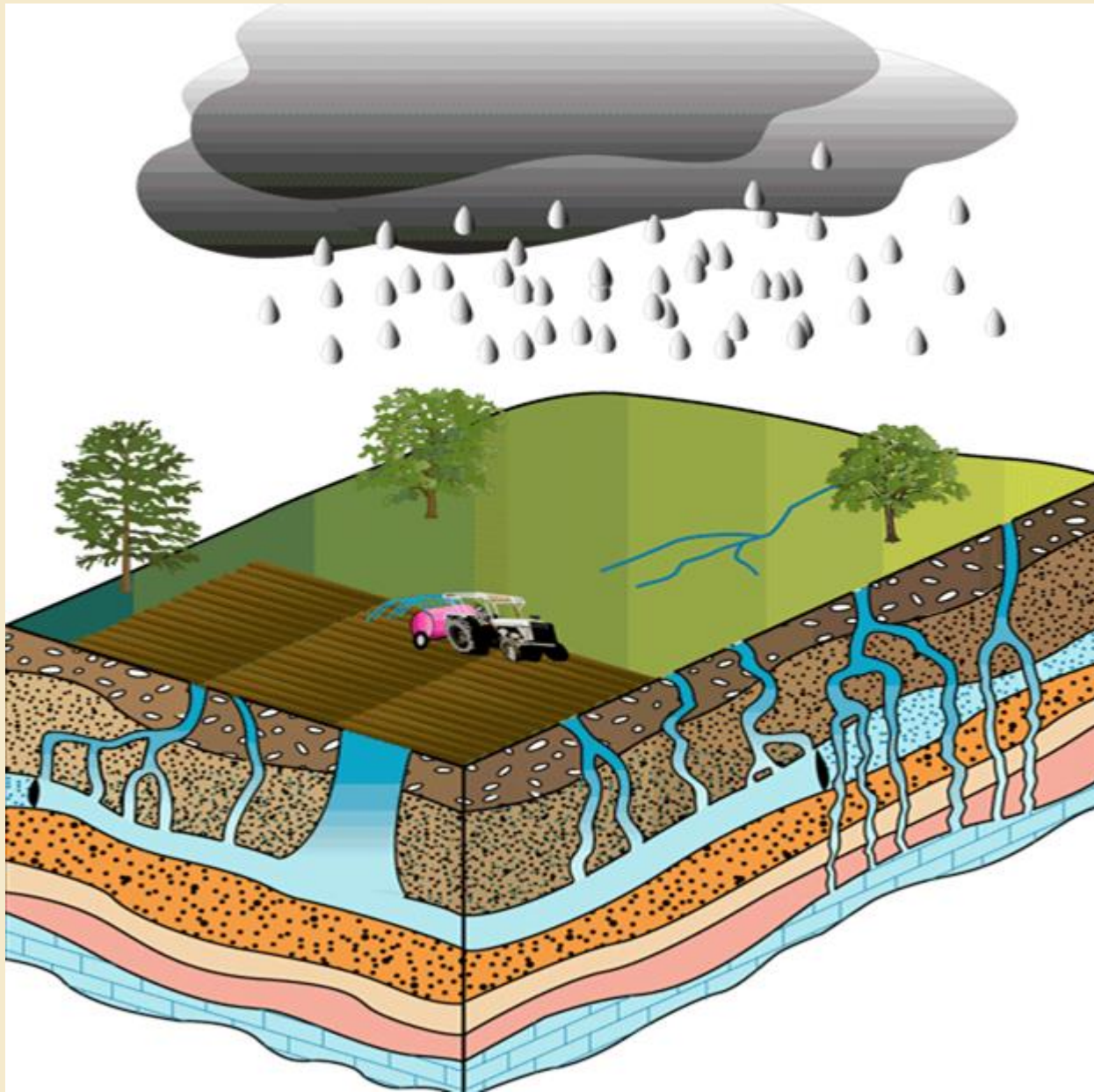
Rainfall Intensity and Frequency

- 2009-17 average flows average ~20% greater than 1980-96



Observed Number of Extreme Precipitation Events





Annual grain production systems are leaky, especially in high precipitation environments. The 4Rs can help but conservation practices (in-field and edge-of-field) are also needed.



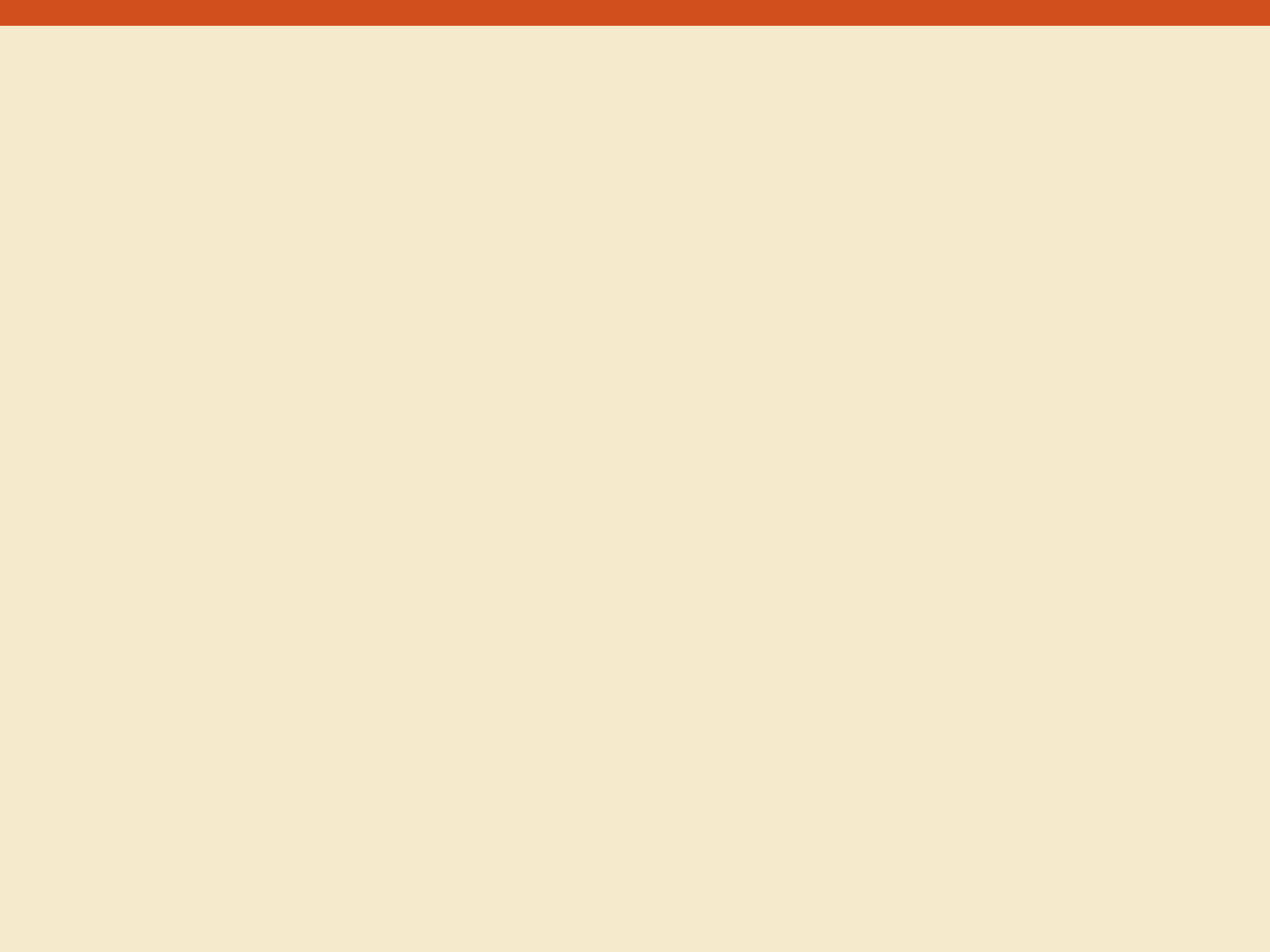
ILLINOIS
NUTRIENT LOSS
REDUCTION STRATEGY



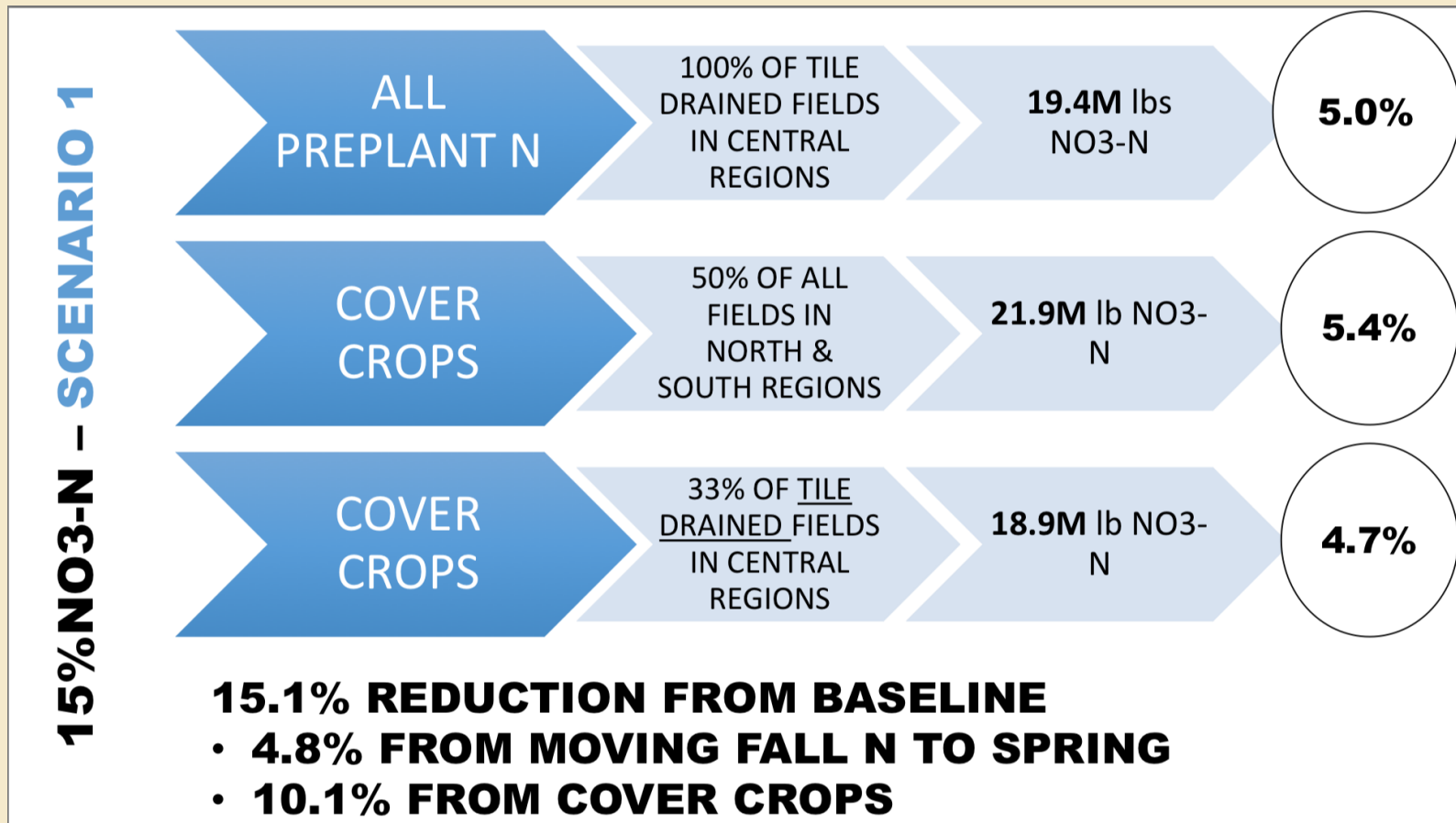
- IL NLRS calls for a 25% reduction in total Phosphorus & a 15% reduction in nitrate-N by 2025; Ultimate goal is 45% reduction for both

Example Statewide Results for P

	Practice/Scenario	Total P reduction per acre (%)	Total P reduced (million lb P)	Total P Reduction % (from baseline)	Cost (\$/lb P removed)
	Baseline		37.5		
In-field	Convert 1.8 million acres of conventional till eroding >T to reduced, mulch or no-till	50	1.8	5.0	-16.60
	P rate reduction on fields with soil test P above the recommended maintenance level	7	1.9	5.0	-48.75
	Cover crops on all corn/soybean acres	30	4.8	12.8	130.40
	Cover crops on 1.6 million acres eroding >T currently in reduced, mulch or no-till	50	1.9	5.0	24.50
Edge-of-field	Wetlands on 25% of tile-drained land	0	0	0.0	
	Buffers on all applicable crop land	25-50	4.8	12.9	11.97
Land use change	Perennial/energy crops equal to pasture/hay acreage from 1987	90	0.9	2.5	102.30
	Perennial/energy crops on 1.6 million acres >T currently in reduced, mulch or no-till	90	3.5	9.0	40.40
	Perennial/energy crops on 10% of tile-drained land	50	0.3	0.8	250.07



NLRS Scenario



Conservation Practices

- Nutrient Management
- No-till/Strip-till
- Cover Crops
- Crop Rotation/Crop Diversity
- Conservation Cropping Systems



4 Principles for Increasing the Health of your Soil

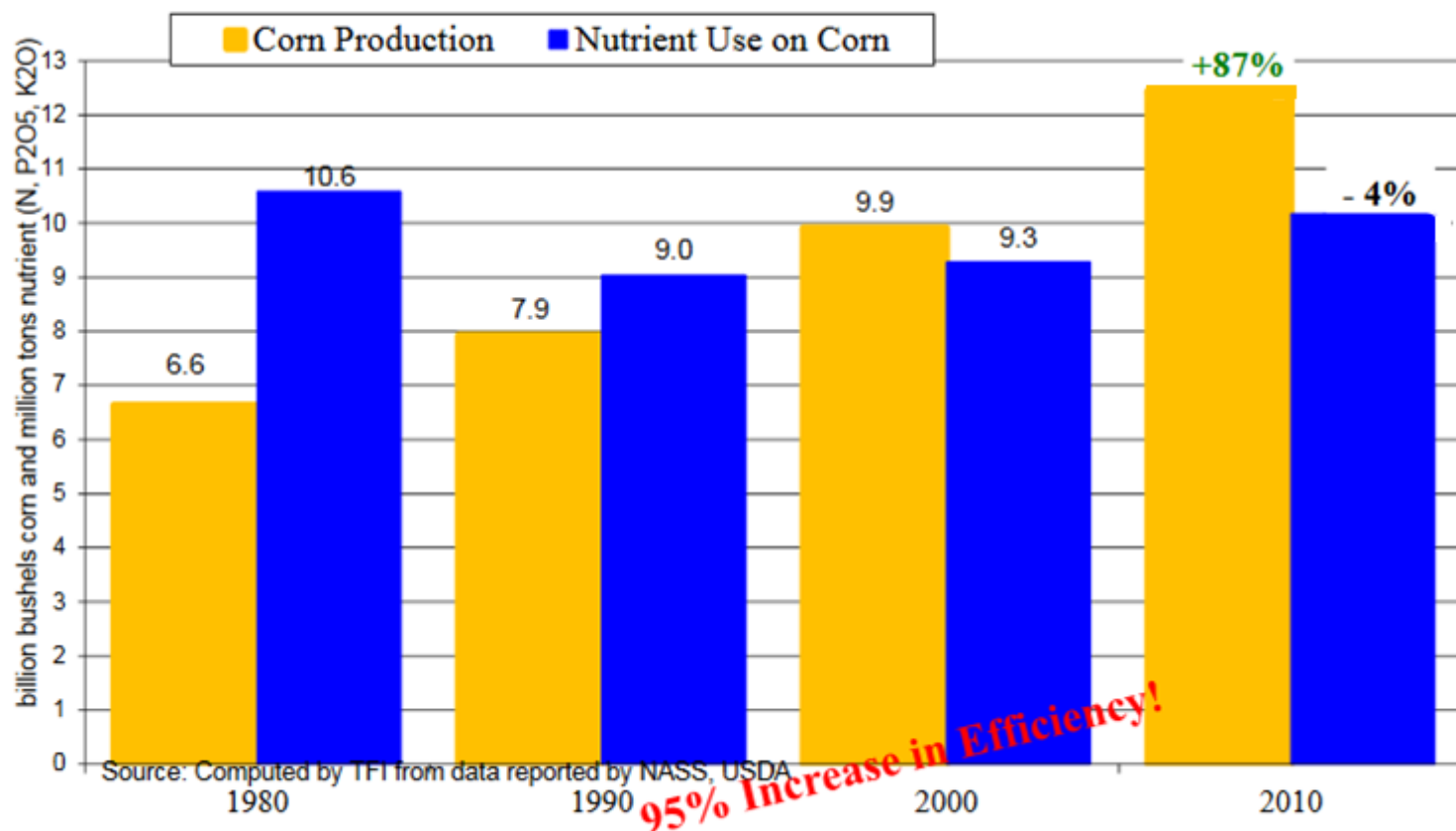
- Maximize Bio-Diversity
- Maximize the amount of continuous living roots in the soil
- Maximize Soil Cover
- Minimize Disturbance
- 5th---Livestock

Nutrient Management

- 4R's used as the foundation for Conservation Plan
- MRTN calculator for Nitrogen usage
- No fertilizer or manure applied on frozen or snow covered cropland

Test	Method	Results	SOIL TEST RATINGS					Calculated Cation Exchange Capacity
			Very Low	Low	Medium	Optimum	Very High	
Soil pH	1:1	6.6						12.8 meq/100g
Buffer pH								Calculated Cation Saturation
Phosphorous								%sat meq
P1 Weak Bray	P1	24 ppm						K 2.2 0.3
Bicarb-P	Olsen	13 ppm						Ca 77.7 9.9
Phosphorus (P)	M3	38 ppm						Mg 13.3 1.7
Potassium (K)	M3	112 ppm						H 6.3 0.8
Calcium (Ca)	M3	1989 ppm						Na 0.7 0.1
Magnesium (Mg)	M3	204 ppm						K/Mg Ratio: 0.17
Sulfur (S)	M3	6 ppm						Ca/Mg Ratio: 5.84
Boron (B)	M3	0.3 ppm						
Copper (Cu)	M3	1.2 ppm						
Iron (Fe)	M3	123 ppm						
Manganese (Mn)	M3	66 ppm						
Zinc (Zn)	M3	1.7 ppm						
Sodium (Na)	M3	20 ppm						
Soluble Salts								
Organic Matter	LOI	2.9% ENR						
Nitrate Nitrogen								

U.S. Corn Production and Nutrient Use on Corn



This is impressive - we are doing more with less!!!

No-Till/ Strip-till

- Keeps surface protected
- Allows for nutrient placement
- Creates earthworm habitat
- Improves soil moisture and water infiltration



Let the Earthworms work for you!

- Earth's natural tillers
- Process residue
- Create root channels
- Middens



Cover Crops



Cover Crop Benefits

- Faster infiltration of excess surface water
- Relieving compaction and improving structure of over-tilled soil
- Adding organic matter that encourages beneficial soil microbial life
- Enhancing nutrient cycling

Direct Effects of Covers on Nutrient Cycling

- Capture of Nutrients that could or would otherwise be lost from:
 - Leaching below crop root zone
 - Losses from erosion or runoff
 - Losses from denitrification
- Translocate nutrients from below crop root zone to surface
- Fix Nitrogen (legumes)
- Release Nutrients at a later time when needed by crop

Keep the Soil Covered

- Can be accomplished with no-till
- Cover Crops allow for soil surface coverage more consistently



Roots

- There is more root mass in cover crops species than in corn and soybean plants.
- With covers we can go from having living roots in the soil 6 months out of a year to 10-12 months



General Considerations for cover crops

- Short term goals
- Long Term View
- Herbicide Carryover
- Adjust your planter and practices
- Be timely in seeding and termination
- Plant good quality seed

Cereal Rye planted into Corn Stalks

- No-till cereal rye into corn stalks
- Drilling and vertical seeding
- Optimum seeding dates--first half of October
- Rates depend on seeding method and timing (50-70lbs.)
- Aerial seeding is an option but not usually needed due to wide planting window











Bio-Diversity and Crop Rotation

- Plant species diversity above ground will lead to an increase in diversity below the soil surface



Identifying Soil Health Improvements

- Laboratory Soil Health testing
- Shovel Test
- Boot Test



Conservation Cropping Systems

- A Conservation Cropping System is a suite of practices that work synergistically to replenish soil life and restore organic matter to agricultural soils.
- Over time these improvements increase nutrient efficiency and farm profitability, reduce sediment and nutrient losses, and make farms more resilient to extreme weather conditions.
- <https://www.farmland.org/initiatives/soil>



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