

2020 Illinois Nutrient Loss Reduction Strategy Scenarios

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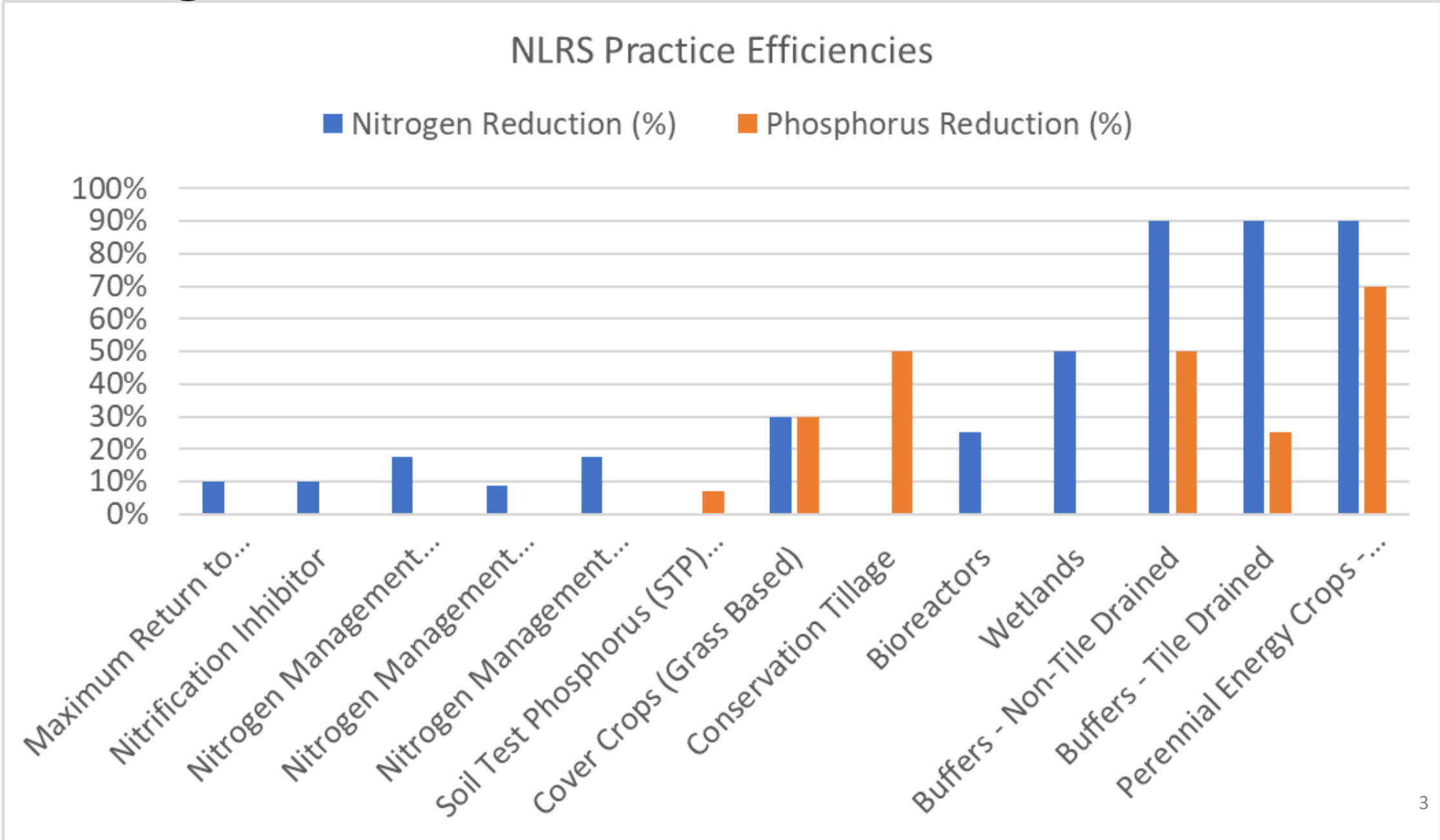
October 20, 2020

AWQPF

Background

- Need scenarios to reflect interim goals
 - 15% nitrate loss reduction (Scenario N7)
 - 25% total phosphorus loss reduction (Scenario P7)
 - Combined (Scenario NP7)
- Align scenarios with available data sources
 - Allows tracking of progress
- Point source reductions have been included
- Practice efficiencies from David et al. (2014) science assessment

Background



Background

- Using the 2011 benchmark period as starting point
 - So additional acres needed are from 2011
- Incorporated “practical maximum” values to limit over-use
 - Information sources vary
 - Bioreactor and wetland maximum was suggested by David et al. (2014)
 - Nitrogen management (i.e., MRTN) as all corn acres
 - Cover crops after Kladivko (2014)
- Nitrogen management practices are specific

Input from You

- Scenarios are drafts
 - Need input on practice feasibility (reality)
 - Number of acres suggested appropriate?
 - Are additional scenarios needed?

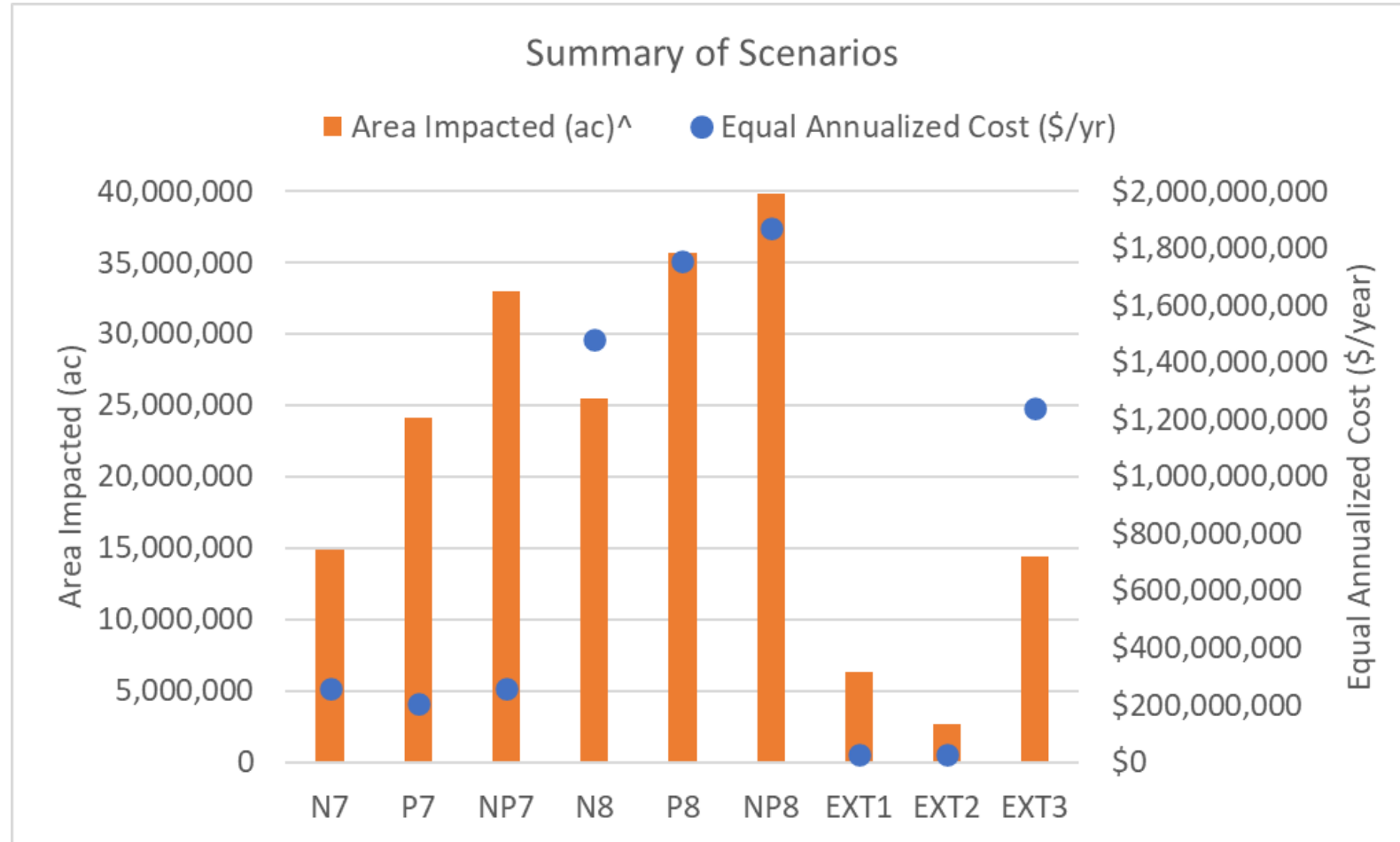


Quick Overview

- N7 = Interim Nitrogen Loss Reduction (15%)
- P7 = Interim Phosphorus Loss Reduction (25%)
- NP7 = Combined Interim Reduction

- N8 = Full Nitrogen Loss Reduction (45%)
- P8 = Full Phosphorus Loss Reduction (45%)
- NP8 = Combined Full Reduction

- EXT1 = Detailed tillage categories
- EXT2 = Saturated buffers
- EXT3 = Conversion to perennial



^Practices may be implemented on the same acreage, though no data sources are available for estimating this. There are no estimates developed showing combined impact of practices on the same area.

Scenario N7 = 15% Nitrate Loss Reduction

Summary	N Reduction (lbs)^	Statewide N Reduction (%)	Area Impacted (ac)	Net Equal Annualized Cost (EAC) (per acre)	Total Net Equal Annualized Cost (nearest \$1 million)	Equal Annualized Cost (EAC) (nearest \$1 million)	Equal Annualized Cost Savings (EACs) (nearest \$1 million)	Number of Practices
Total	61,500,000	15.0%	14,935,493	\$16	\$319,000,000	\$338,000,000	-\$19,000,000	
Point Source	8,730,000	2.1%	0		\$84,000,000	\$84,000,000	\$0	
Urban Stormwater	0	0.0%	0	\$0	\$0	\$0	\$0	
Agriculture	52,770,000	12.9%	14,935,493	\$16	\$235,000,000	\$254,000,000	-\$19,000,000	6
--General Agriculture	3,798,294	0.9%	2,380,000	-\$8	-\$19,000,000	\$0	-\$19,000,000	1
--Tile-Drained Agriculture	28,961,874	7.1%	6,908,955	\$20	\$139,000,000	\$139,000,000	\$0	3
--Non-Tiled Agriculture	20,009,833	4.9%	5,646,538	\$20	\$115,000,000	\$115,000,000	\$0	2

^ Total values leaving the state were estimated from data tables contained in the original Nutrient Loss Reduction Strategy or the supporting Science Assessment

Scenario N7 = 15% Nitrate Loss Reduction

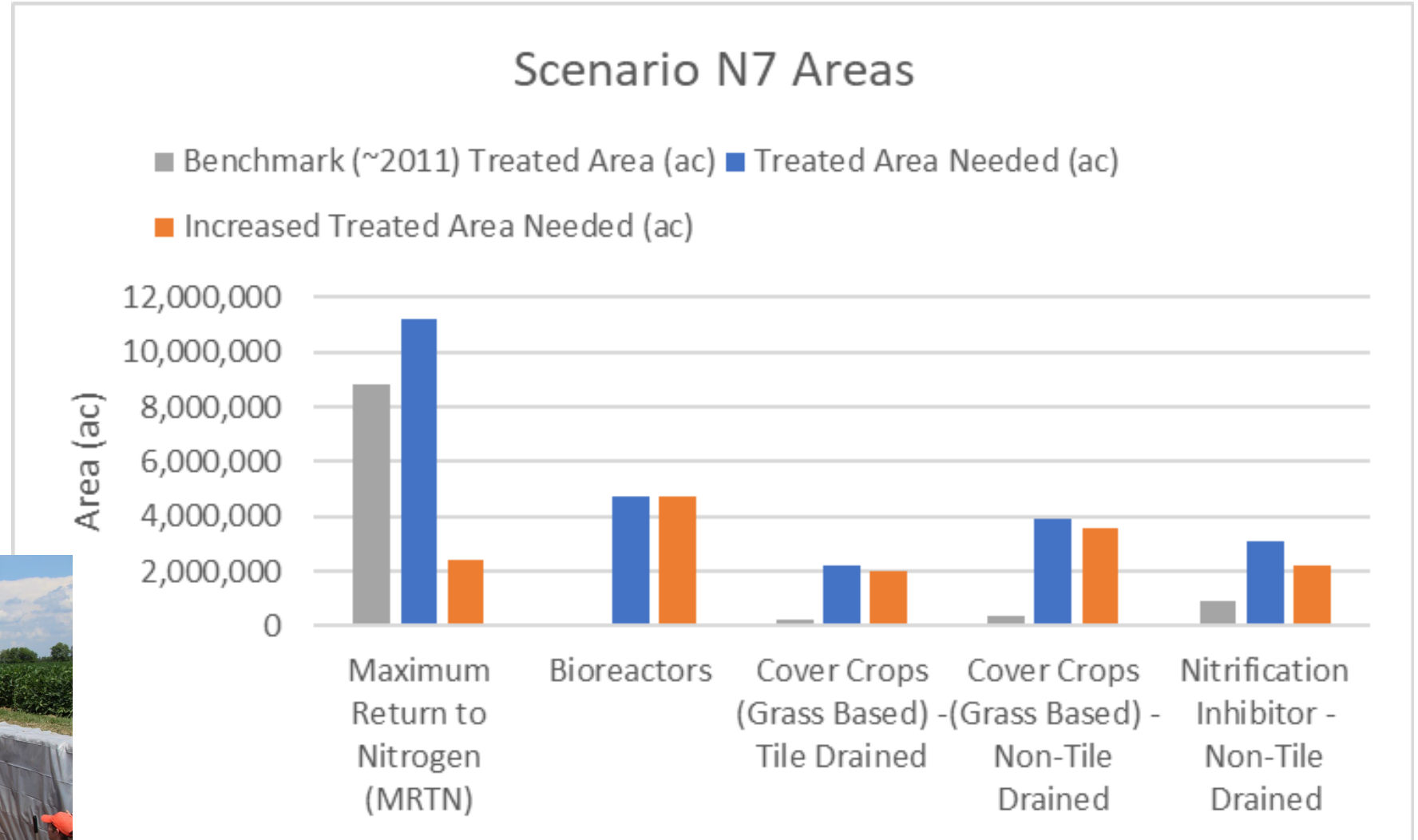
Practice	Practice N Efficiency (% Reduction)	Treated Area Needed (ac)	Benchmark (~2011) Treated Area (ac)	Increased Treated Area Needed (ac)	Adoption Needed (%)	Maximum Implementation (ac)**	State-wide N Reduction (%)	State-wide Agricultural N Reduction (%)	Tracking Source(s)
Maximum Return to Nitrogen (MRTN)	10%	11,200,000	8,820,000	2,380,000	100%	11,200,000	0.9%	1.2%	State NASS Survey
Bioreactors	25%	4,736,773	160	4,736,613	100%	4,736,773	4.6%	5.7%	USDA NRCS
Cover Crops (Grass Based) - Tile Drained	30%	2,223,438	220,000	2,003,438	39%	5,632,387	2.3%	2.9%	State NASS Survey
Nitrogen Management (40% in fall; 10% spring pre-plant; 50% sidedress) - Tile Drained	18%	1,898,904	1,730,000	168,904	72%	2,648,905	0.1%	0.1%	State NASS Survey
Cover Crops (Grass Based) - Non-Tile Drained	30%	3,825,783	380,000	3,445,783	55%	7,017,557	4.0%	5.0%	State NASS Survey
Nitrification Inhibitor - Non-Tile Drained	10%	3,107,955	907,200	2,200,755	100%	3,107,955	0.9%	1.1%	State NASS Survey
Total				14,935,493			12.9%	16.0%	

Scenario N7 = 15% Nitrate Loss Reduction

Agriculture

EAC = \$257 million

EAC Savings = \$19 million

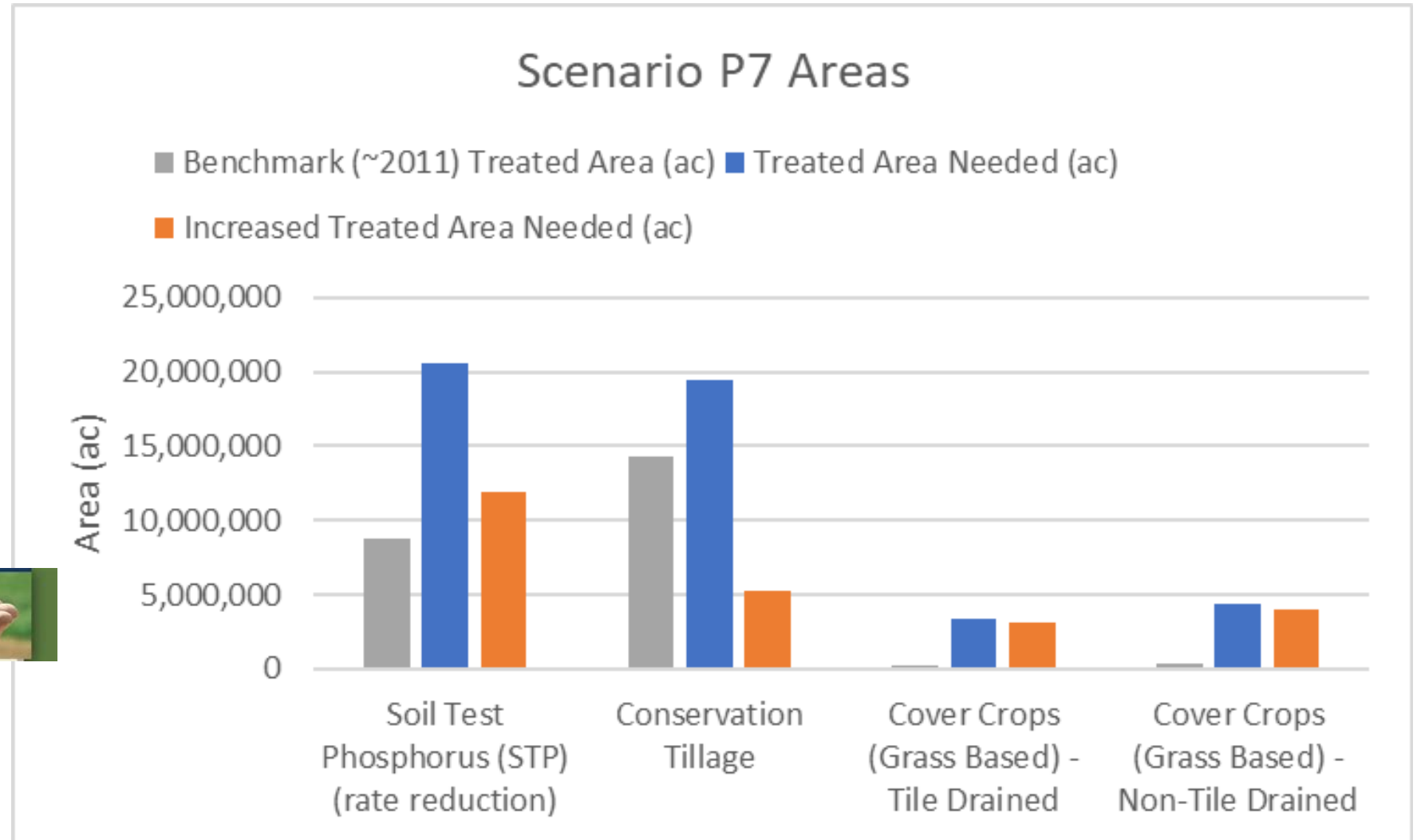


Scenario P7 = 25% P Loss Reduction

Agriculture

EAC = \$206 million

EAC Savings = \$94 million



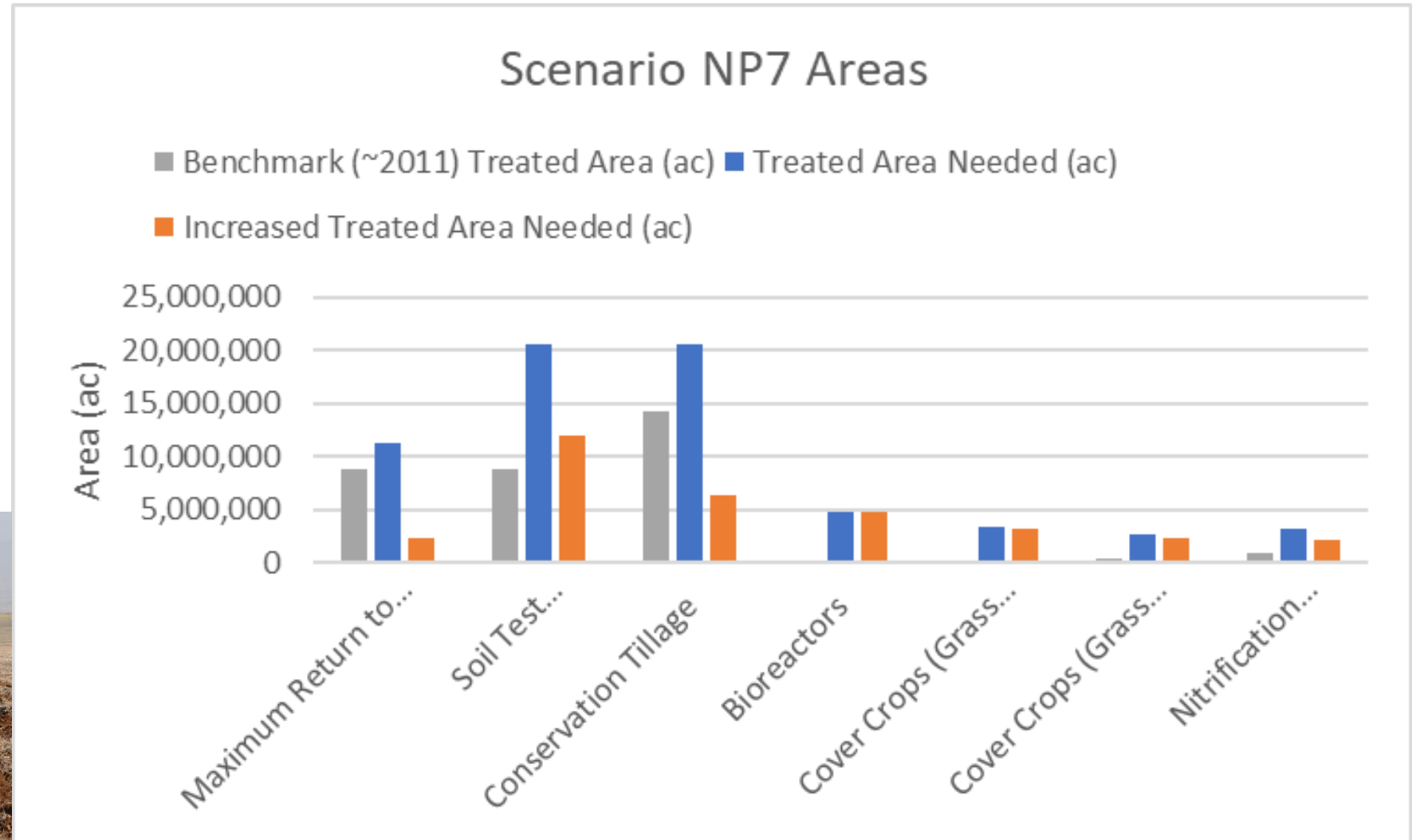
From: <https://web.extension.illinois.edu/soiltest/>

Scenario NP7 = 15% N and 25% P

Agriculture

EAC = \$257 million

EAC Savings = \$114 million



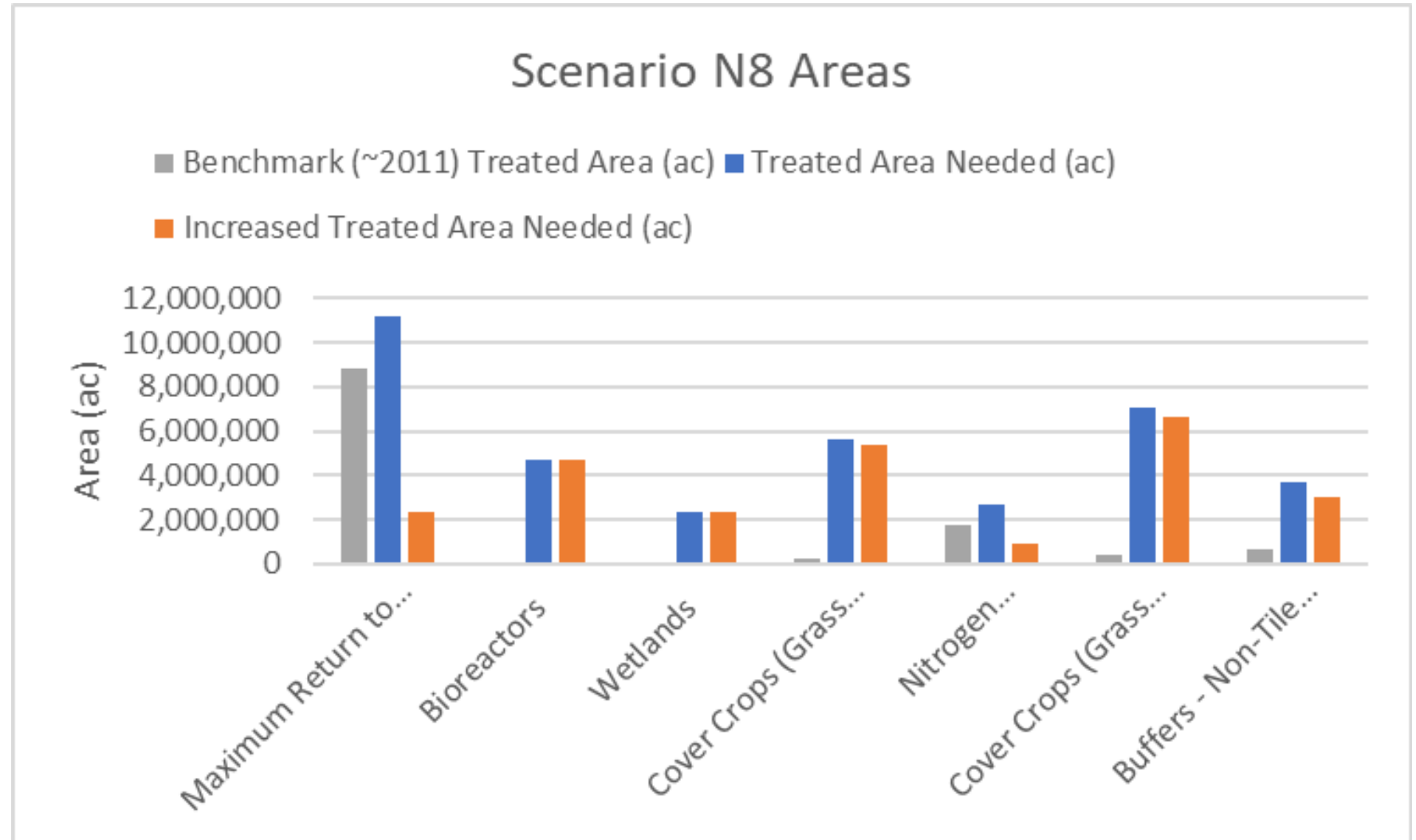
From: https://commons.wikimedia.org/wiki/File:Strip-till_2011_09_07_1709.jpg

Scenario N8 = 45% Nitrate Loss Reduction

Agriculture

EAC = \$1.48 billion

EAC Savings = \$19 million

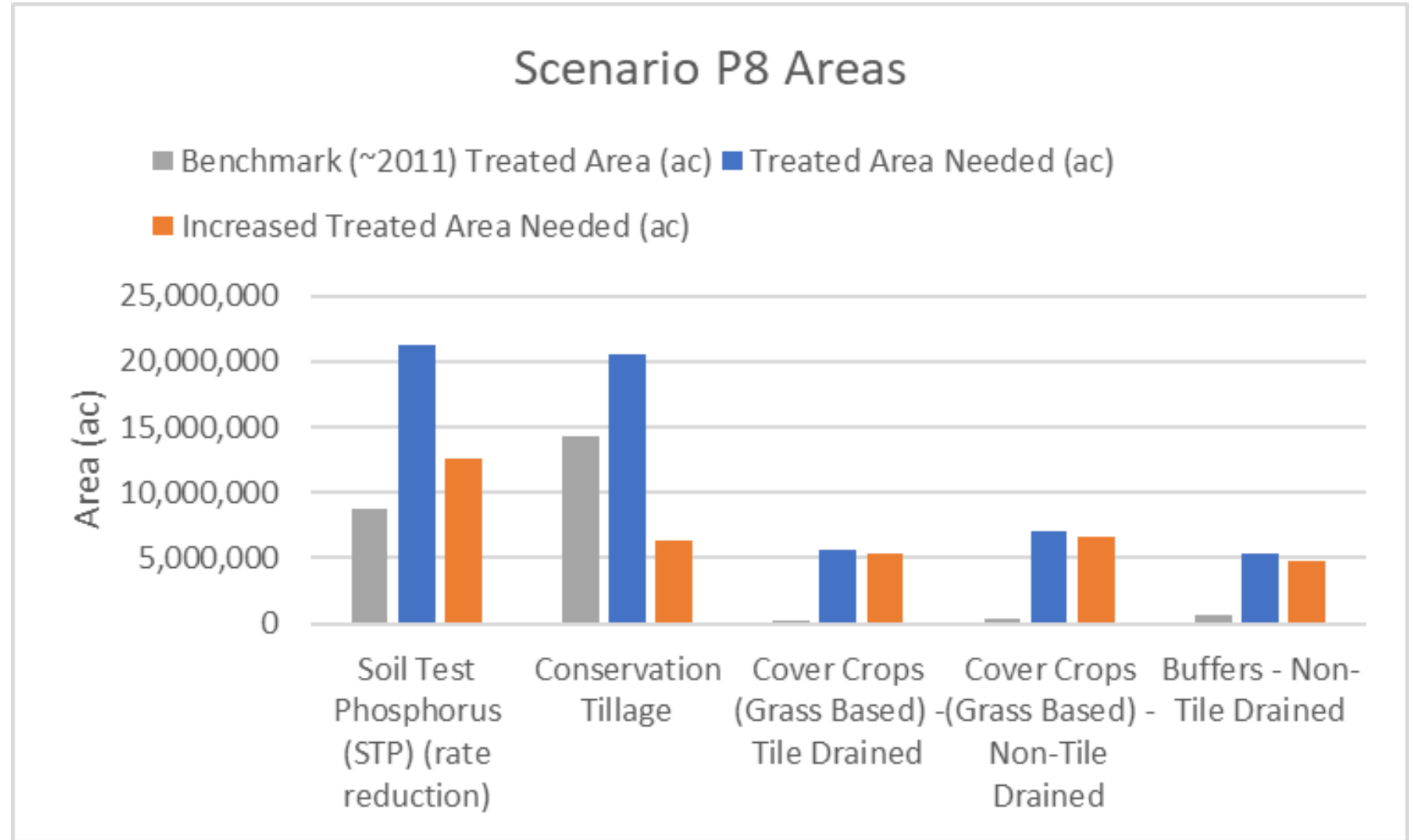


Scenario P8 = 45% P Loss Reduction

Agriculture

EAC = \$1.76 billion

EAC Savings = \$100 million

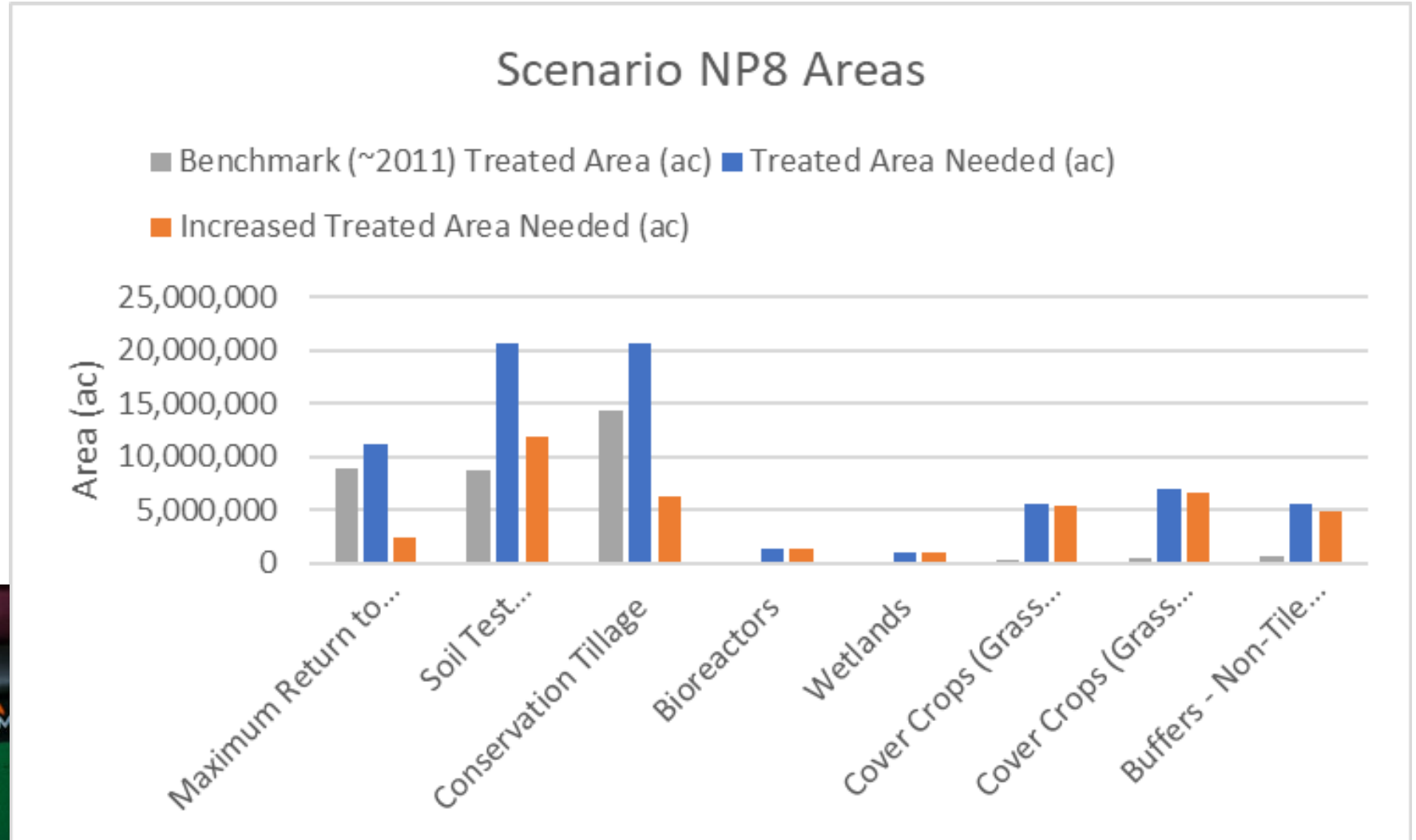


Scenario NP8 = 45% N and 45% P

Agriculture

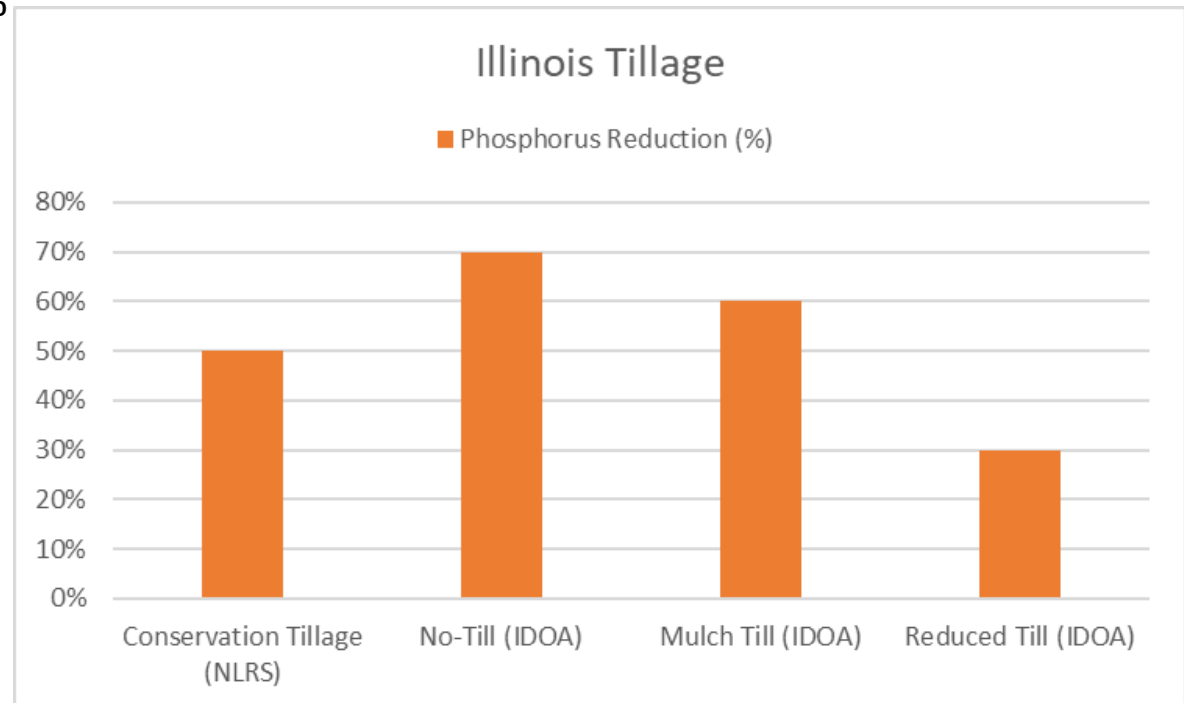
EAC = \$1.87 billion

EAC Savings = \$114 million



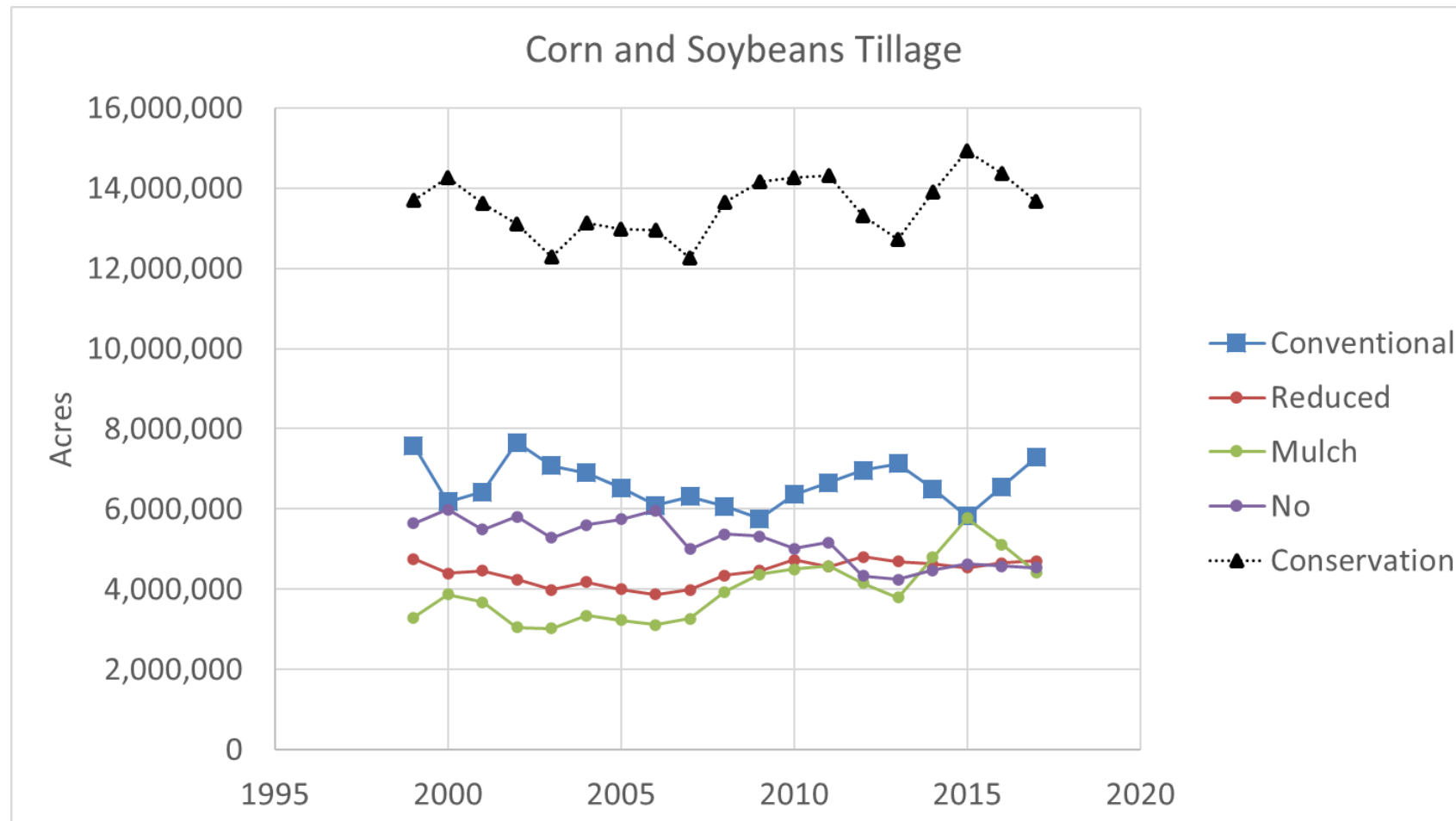
Extended Scenarios

- EXT1 – detailed tillage categories
 - Potential to increase phosphorus loss reduction estimates
 - Distribute 6.3 million acres of conservation tillage from P8
 - Evenly over reduced till, mulch till, and no-till → increase of 0.6%
 - All to no-till → increase of 2.9%
 - Illinois Department of Ag
 - Tillage Transect Survey
 - Estimates of erosion to gauge effectiveness



Extended Scenarios

- EXT1 – detailed tillage categories



Annualized tillage transect survey data as part of work with Walton Family Foundation

Extended Scenarios

- EXT2 – saturated buffers
 - Implementing at maximum level (2.7 million acres) →
4.6% statewide N reduction
- EXT3 – conversion to perennial
 - Implementing to meet a 45% statewide P loss reduction requires 14.4 million acres



All Scenario Tables follow for Comparison

(Just in case you like to power through)



Scenario N7 = 15% Nitrate Loss Reduction

Summary	N Reduction (lbs)^	Statewide N Reduction (%)	Area Impacted (ac)	Net Equal Annualized Cost (EAC) (per acre)	Total Net Equal Annualized Cost (nearest \$1 million)	Equal Annualized Cost (EAC) (nearest \$1 million)	Equal Annualized Cost Savings (EACs) (nearest \$1 million)	Number of Practices
Total	61,500,000	15.0%	14,935,493	\$16	\$319,000,000	\$338,000,000	-\$19,000,000	
Point Source	8,730,000	2.1%	0		\$84,000,000	\$84,000,000	\$0	
Urban Stormwater	0	0.0%	0	\$0	\$0	\$0	\$0	
Agriculture	52,770,000	12.9%	14,935,493	\$16	\$235,000,000	\$254,000,000	-\$19,000,000	6
--General Agriculture	3,798,294	0.9%	2,380,000	-\$8	-\$19,000,000	\$0	-\$19,000,000	1
--Tile-Drained Agriculture	28,961,874	7.1%	6,908,955	\$20	\$139,000,000	\$139,000,000	\$0	3
--Non-Tiled Agriculture	20,009,833	4.9%	5,646,538	\$20	\$115,000,000	\$115,000,000	\$0	2

^ Total values leaving the state were estimated from data tables contained in the original Nutrient Loss Reduction Strategy or the supporting Science Assessment

Scenario N7 = 15% Nitrate Loss Reduction

Practice	Practice N Efficiency (% Reduction)	Treated Area Needed (ac)	Benchmark (~2011) Treated Area (ac)	Increased Treated Area Needed (ac)	Adoption Needed (%)	Maximum Implementation (ac)**	State-wide N Reduction (%)	State-wide Agricultural N Reduction (%)	Tracking Source(s)
Maximum Return to Nitrogen (MRTN)	10%	11,200,000	8,820,000	2,380,000	100%	11,200,000	0.9%	1.2%	State NASS Survey
Bioreactors	25%	4,736,773	160	4,736,613	100%	4,736,773	4.6%	5.7%	USDA NRCS
Cover Crops (Grass Based) - Tile Drained	30%	2,223,438	220,000	2,003,438	39%	5,632,387	2.3%	2.9%	State NASS Survey
Nitrogen Management (40% in fall; 10% spring pre-plant; 50% sidedress) - Tile Drained	18%	1,898,904	1,730,000	168,904	72%	2,648,905	0.1%	0.1%	State NASS Survey
Cover Crops (Grass Based) - Non-Tile Drained	30%	3,825,783	380,000	3,445,783	55%	7,017,557	4.0%	5.0%	State NASS Survey
Nitrification Inhibitor - Non-Tile Drained	10%	3,107,955	907,200	2,200,755	100%	3,107,955	0.9%	1.1%	State NASS Survey
Total				14,935,493			12.9%	16.0%	

Scenario P7 = 25% P Loss Reduction

Summary	P Reduction (lbs)^	Statewide P Reduction (%)	Area Impacted (ac)	Net Equal Annualized Cost (EAC) (per acre)	Total Net Equal Annualized Cost (nearest \$1 million)	Equal Annualized Cost (EAC) (nearest \$1 million)	Equal Annualized Cost Savings (EACs) (nearest \$1 million)	Number of Practices
Total	9,357,000	25.0%	24,178,980	\$5	\$203,000,000	\$297,000,000	-\$94,000,000	
Point Source	4,525,000	12.1%	0		\$91,000,000	\$91,000,000	\$0	
Urban Stormwater	0	0.0%	0	\$0	\$0	\$0	\$0	
Agriculture	4,832,000	12.9%	24,178,980	\$5	\$112,000,000	\$206,000,000	-\$94,000,000	4
--General Agriculture	2,981,401	8.0%	17,078,980	-\$6	-\$94,000,000	\$0	-\$94,000,000	2
--Tile-Drained Agriculture	808,008	2.2%	3,100,000	\$29	\$90,000,000	\$90,000,000	\$0	1
--Non-Tiled Agriculture	1,042,591	2.8%	4,000,000	\$29	\$116,000,000	\$116,000,000	\$0	1

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Scenario P7 = 25% P Loss Reduction

Agriculture

EAC = \$206 million

EAC Savings = \$94 million

Practice	Practice P Efficiency (% Reduction)	Treated Area Needed (ac)	Benchmark (~2011) Treated Area (ac)	Increased Treated Area Needed (ac)	Adoption Needed (%)	Maximum Implementation (ac)**	State-wide P Reduction (%)	State-wide Agricultural P Reduction (%)	Tracking Source(s)
Soil Test Phosphorus (STP) (rate reduction)	7%	20,602,515	8,723,535	11,878,980	100%	20,602,515	1.9%	4.0%	State NASS Survey
Conservation Tillage	50%	19,511,992	14,311,992	5,200,000	95%	20,602,515	6.0%	12.6%	Tillage Transect Survey
Cover Crops (Grass Based) - Tile Drained	30%	3,320,000	220,000	3,100,000	59%	5,632,387	2.2%	4.5%	State NASS Survey
Cover Crops (Grass Based) - Non-Tile Drained	30%	4,380,000	380,000	4,000,000	62%	7,017,557	2.8%	5.8%	State NASS Survey
Total				24,178,980			12.9%	27.0%	

Scenario NP7 = 15% N and 25% P

Summary	N Reduction (lbs)^	P Reduction (lbs)^	Statewide N Reduction (%)	Statewide P Reduction (%)	Area Impacted (ac)	Net Equal Annualized Cost (EAC) (per acre)	Total Net Equal Annualized Cost (nearest \$1 million)	Equal Annualized Cost (EAC) (nearest \$1 million)	Equal Annualized Cost Savings (EACs) (nearest \$1 million)	Number of Practices
Total	61,500,000	9,426,147	15.0%	25.1%	33,034,619	\$4	\$234,000,000	\$348,000,000	-\$114,000,000	
Point Source	8,730,000	4,525,000	2.1%	12.1%	0		\$91,000,000	\$91,000,000	\$0	
Urban Stormwater	0	0	0.0%	0.0%	0	\$0	\$0	\$0	\$0	
Agriculture	52,770,000	4,901,147	12.9%	13.1%	33,034,619	\$4	\$143,000,000	\$257,000,000	-\$114,000,000	7
--General Agriculture	3,798,294	3,455,138	0.9%	9.2%	20,549,503	-\$6	-\$114,000,000	\$0	-\$114,000,000	3
--Tile-Drained Agriculture	34,253,818	835,968	8.4%	2.2%	7,943,884	\$22	\$174,000,000	\$174,000,000	\$0	2
--Non-Tiled Agriculture	14,717,889	610,040	3.6%	1.6%	4,541,233	\$18	\$83,000,000	\$83,000,000	\$0	2
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Scenario NP7 = 15% N and 25% P

Agriculture

EAC = \$257 million

EAC Savings = \$114 million

Practice	Practice N Efficiency (%) Reduction)	Practice P Efficiency (% Reduction)	Treated Area Needed (ac)	Benchmark (~2011) Treated Area (ac)	Increased Treated Area Needed (ac)	Adoption Needed (%)	Maximum Implementation (ac)**	State-wide N Reduction (%)	State-wide Agricultural N Reduction (%)	State-wide P Reduction (%)	State-wide Agricultural P Reduction (%)	Tracking Source(s)
Maximum Return to Nitrogen (MRTN)	10%	0%	11,200,000	8,820,000	2,380,000	100%	11,200,000	0.9%	1.2%	0.0%	0.0%	State NASS Survey
Soil Test Phosphorus (STP) (rate reduction)	0%	7%	20,602,515	8,723,535	11,878,980	100%	20,602,515	0.0%	0.0%	1.9%	4.0%	State NASS Survey
Conservation Tillage	0%	50%	20,602,515	14,311,992	6,290,523	100%	20,602,515	0.0%	0.0%	7.3%	15.3%	Tillage Transect Survey
Bioreactors	25%	0%	4,736,773	160	4,736,613	100%	4,736,773	4.6%	5.7%	0.0%	0.0%	USDA NRCS
Cover Crops (Grass Based) - Tile Drained	30%	30%	3,427,271	220,000	3,207,271	61%	5,632,387	3.7%	4.7%	2.2%	4.7%	State NASS Survey
Cover Crops (Grass Based) - Non-Tile Drained	30%	30%	2,720,478	380,000	2,340,478	39%	7,017,557	2.7%	3.4%	1.6%	3.4%	State NASS Survey
Nitrification Inhibitor - Non-Tile Drained	10%	0%	3,107,955	907,200	2,200,755	100%	3,107,955	0.9%	1.1%	0.0%	0.0%	State NASS Survey
Total					33,034,619			12.9%	16.0%	13.1%	27.4%	

Scenario N8 = 45% Nitrate Loss Reduction

Summary	N Reduction (lbs)^	Statewide N Reduction (%)	Area Impacted (ac)	Net Equal Annualized Cost (EAC) (per acre)	Total Net Equal Annualized Cost (nearest \$1 million)	Equal Annualized Cost (EAC) (nearest \$1 million)	Equal Annualized Cost Savings (EACs) (nearest \$1 million)	Number of Practices
Total	184,474,648	45.0%	25,444,737	\$57	\$1,647,000,000	\$1,666,000,000	-\$19,000,000	
Point Source	39,285,000	9.6%	0		\$184,000,000	\$184,000,000	\$0	
Urban Stormwater	0	0.0%	0	\$0	\$0	\$0	\$0	
Agriculture	145,189,648	35.4%	25,444,737	\$57	\$1,463,000,000	\$1,482,000,000	-\$19,000,000	7
--General Agriculture	3,798,294	0.9%	2,380,000	-\$8	-\$19,000,000	\$0	-\$19,000,000	1
--Tile-Drained Agriculture	65,804,242	16.0%	13,377,180	\$29	\$393,000,000	\$393,000,000	\$0	4
--Non-Tiled Agriculture	75,587,112	18.4%	9,687,557	\$112	\$1,089,000,000	\$1,089,000,000	\$0	2

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Scenario N8 = 45% Nitrate Loss Reduction

Agriculture

EAC = \$1.48 billion

EAC Savings = \$19 million

Practice	Practice N Efficiency (%) Reduction)	Treated Area Needed (ac)	Benchmark (~2011) Treated Area (ac)	Increased Treated Area Needed (ac)	Adoption Needed (%)	Maximum Implementation (ac)**	State-wide N Reduction (%)	State-wide Agricultural N Reduction (%)	Tracking Source(s)
Maximum Return to Nitrogen (MRTN)	10%	11,200,000	8,820,000	2,380,000	100%	11,200,000	0.9%	1.2%	State NASS Survey
Bioreactors	25%	4,736,933	160	4,736,773	100%	4,736,773	4.6%	5.7%	USDA NRCS
Wetlands	50%	2,368,386	59,271	2,309,115	100%	2,368,386	4.5%	5.6%	Wetland Reserve Easement Program, NRCS EQIP, IL DNR CREP Easements
Cover Crops (Grass Based) - Tile Drained	30%	5,632,387	220,000	5,412,387	100%	5,632,387	6.3%	7.9%	State NASS Survey
Nitrogen Management (40% in fall; 10% spring pre-plant; 50% sidedress) - Tile Drained	18%	2,648,905	1,730,000	918,905	100%	2,648,905	0.6%	0.8%	State NASS Survey
Cover Crops (Grass Based) - Non-Tile Drained	30%	7,017,557	380,000	6,637,557	100%	7,017,557	7.8%	9.7%	State NASS Survey
Buffers - Non-Tile Drained	90%	3,674,910	624,910	3,050,000	30%	12,297,189	10.7%	13.3%	None
Total				25,444,737			35.4%	44.2%	

Scenario P8 = 45% N Loss Reduction

Summary	P Reduction (lbs)^	Statewide P Reduction (%)	Area Impacted (ac)	Net Equal Annualized Cost (EAC) (per acre)	Total Net Equal Annualized Cost (nearest \$1 million)	Equal Annualized Cost (EAC) (nearest \$1 million)	Equal Annualized Cost Savings (EACs) (nearest \$1 million)	Number of Practices
Total	16,858,439	45.0%	35,673,847	\$46	\$1,795,000,000	\$1,895,000,000	-\$100,000,000	
Point Source	8,145,000	21.7%	0		\$140,000,000	\$140,000,000	\$0	
Urban Stormwater	0	0.0%	0	\$0	\$0	\$0	\$0	
Agriculture	8,713,439	23.2%	35,673,847	\$46	\$1,655,000,000	\$1,755,000,000	-\$100,000,000	5
--General Agriculture	3,496,154	9.3%	18,843,903	-\$5	-\$100,000,000	\$0	-\$100,000,000	2
--Tile-Drained Agriculture	1,410,727	3.8%	5,412,387	\$29	\$157,000,000	\$157,000,000	\$0	1
--Non-Tiled Agriculture	3,806,559	10.2%	11,417,557	\$140	\$1,598,000,000	\$1,598,000,000	\$0	2

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Scenario P8 = 45% P Loss Reduction

Agriculture

EAC = \$1.76 billion

EAC Savings = \$100 million

Practice	Practice P Efficiency (%) Reduction)	Treated Area Needed (ac)	Benchmark (~2011) Treated Area (ac)	Increased Treated Area Needed (ac)	Adoption Needed (%)	Maximum Implementation (ac)**	State-wide P Reduction (%)	State-wide Agricultural P Reduction (%)	Tracking Source(s)
Soil Test Phosphorus (STP) (rate reduction)	7%	21,276,915	8,723,535	12,553,380	100%	21,276,915	2.0%	4.3%	State NASS Survey
Conservation Tillage	50%	20,602,515	14,311,992	6,290,523	100%	20,602,515	7.3%	15.3%	Tillage Transect Survey
Cover Crops (Grass Based) - Tile Drained	30%	5,632,387	220,000	5,412,387	100%	5,632,387	3.8%	7.9%	State NASS Survey
Cover Crops (Grass Based) - Non-Tile Drained	30%	7,017,557	380,000	6,637,557	100%	7,017,557	4.6%	9.7%	State NASS Survey
Buffers - Non-Tile Drained	50%	5,404,910	624,910	4,780,000	44%	12,297,189	5.5%	11.6%	None
Total				35,673,847			23.2%	48.7%	

Scenario NP8 = 45% N and 45% P

Summary	N Reduction (lbs)^	P Reduction (lbs)^	Statewide N Reduction (%)	Statewide P Reduction (%)	Area Impacted (ac)	Net Equal Annualized Cost (EAC) (per acre)	Total Net Equal Annualized Cost (nearest \$1 million)	Equal Annualized Cost (EAC) (nearest \$1 million)	Equal Annualized Cost Savings (EACs) (nearest \$1 million)	Number of Practices
Total	184,322,093	16,869,553	45.0%	45.0%	39,799,447	\$44	\$2,000,000,000	\$2,114,000,000	-\$114,000,000	
Point Source	39,285,000	8,145,000	9.6%	21.7%	0		\$241,000,000	\$241,000,000	\$0	
Urban Stormwater	0	0	0.0%	0.0%	0	\$0	\$0	\$0	\$0	
Agriculture	145,037,093	8,724,553	35.4%	23.3%	39,799,447	\$44	\$1,759,000,000	\$1,873,000,000	-\$114,000,000	8
--General Agriculture	3,798,294	3,455,138	0.9%	9.2%	20,549,503	-\$6	-\$114,000,000	\$0	-\$114,000,000	3
--Tile-Drained Agriculture	39,079,590	1,410,727	9.5%	3.8%	7,712,387	\$31	\$240,000,000	\$240,000,000	\$0	3
--Non-Tiled Agriculture	102,159,209	3,858,688	24.9%	10.3%	11,537,557	\$142	\$1,633,000,000	\$1,633,000,000	\$0	2

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Scenario NP8 = 45% N and 45% P

Agriculture

EAC = \$1.87 billion

EAC Savings = \$114 million

Practice	Practice N Efficiency (% Reduction)	Practice P Efficiency (% Reduction)	Treated Area Needed (ac)	Benchmark (~2011) Treated Area (ac)	Increased Treated Area Needed (ac)	Adoption Needed (%)	Maximum Implementation (ac)**	State-wide N Reduction (%)	State-wide Agricultural N Reduction (%)	State-wide P Reduction (%)	State-wide Agricultural P Reduction (%)	Tracking Source(s)
Maximum Return to Nitrogen (MRTN)	10%	0%	11,200,000	8,820,000	2,380,000	100%	11,200,000	0.9%	1.2%	0.0%	0.0%	State NASS Survey
Soil Test Phosphorus (STP) (rate reduction)	0%	7%	20,602,515	8,723,535	11,878,980	100%	20,602,515	0.0%	0.0%	1.9%	4.0%	State NASS Survey
Conservation Tillage	0%	50%	20,602,515	14,311,992	6,290,523	100%	20,602,515	0.0%	0.0%	7.3%	15.3%	Tillage Transect Survey
Bioreactors	25%	0%	1,300,160	160	1,300,000	27%	4,736,773	1.3%	1.6%	0.0%	0.0%	USDA NRCS
Wetlands	50%	0%	1,059,271	59,271	1,000,000	45%	2,368,386	1.9%	2.4%	0.0%	0.0%	Wetland Reserve Easement Program, NRCS EQIP, IL DNR CREP Easements
Cover Crops (Grass Based) - Tile Drained	30%	30%	5,632,387	220,000	5,412,387	100%	5,632,387	6.3%	7.9%	3.8%	7.9%	State NASS Survey
Cover Crops (Grass Based) - Non-Tile Drained	30%	30%	7,017,557	380,000	6,637,557	100%	7,017,557	7.8%	9.7%	4.6%	9.7%	State NASS Survey
Buffers - Non-Tile Drained	90%	50%	5,524,910	624,910	4,900,000	45%	12,297,189	17.2%	21.4%	5.7%	11.9%	None
Total					39,799,447			35.4%	44.1%	23.3%	48.7%	