Illinois Nutrient Loss Reduction Strategy & Agricultural Conservation Practices

Nutrient loss in Illinois

Multiple sources contribute to the nutrients nitrogen and phosphorus in Illinois waterways. The Illinois Nutrient Loss Reduction Strategy identifies three primary source sectors of nutrients – agriculture, point sources, and storm water – based on measurements taken during the baseline period of 1980 to 1996 (Figure 1). The primary source of agricultural nutrient loss is fertilizer. Much of the nitrogen loss comes from tile-drained agricultural fields in northern and central Illinois. Phosphorus loss is often higher in southern Illinois where soil erosion rates are higher. The original 2015 strategy identified several priority watersheds. Of these, two nitrogen-priority and two phosphorus-priority watersheds had the greatest capacity to reduce annual nutrient losses and these regions have been provided with resources to help.

Impacts of nutrient loss

Excess nutrients can negatively impact water quality and aquatic life in local waterways , throughout the Mississippi River Basin, and downstream in the Gulf of Mexico. High levels of phosphorus and nitrogen lost from the land or wastewater facilities cause algal blooms. Algae grow quickly, consuming oxygen and blocking sunlight from reaching aquatic plants. When the algae die, bacteria in the water consumer the oxygen, creating an uninhabitable hypoxic zone for aquatic life (U.S. EPA). The Gulf of Mexico Hypoxic dead zone costs the U.S. seafood and tourism industries $82 million a year, according to the National Oceanic and Atmospheric Administration. Algal blooms also reduce the quality of drinking water and compromise the safety of recreational activities.

Nutrient loss has other economic implications. Fertilizer is necessary for optimal food production yields, but fertilizer costs have risen drastically in recent years (USDA Foreign Agricultural Service). Even with optimal fertilization techniques, fertilizer can be lost through a variety of pathways. Both over- and under-fertilization have impacts. Over-fertilizing leaves unused fertilizer in the field, which is easily lost. Under-fertilization might prevent the loss of nutrients but can impact crop production. Conservation practices and agricultural management practices that optimize the source, rate, timing, and placement of nutrients help prevent nutrient loss and balance food production needs with stewardship of natural resources. Illinois' strategy highlights activities and management solutions that can reduce nutrient losses from agricultural systems.

The Illinois Nutrient Loss Reduction Strategy

In 2011, the U.S. Environmental Protection Agency tasked the 12 highest nutrient-contributing states to produce nutrient loss strategies. Each state outlined how it would reduce total nutrient loads by 45%. Illinois also has interim reduction goals of 15% nitrate-nitrogen and 25% total phosphorus by 2025. One way to reduce nutrient loss is by implementing conservation practices recommended by the strategy (Tables 1-3).

As research emerges, new and updated practices can be proposed and included in the strategy following a formal evaluation by its science team. These practices and their reduction values lead to measurable local water quality benefits and are also used to track progress toward the reduction goals.

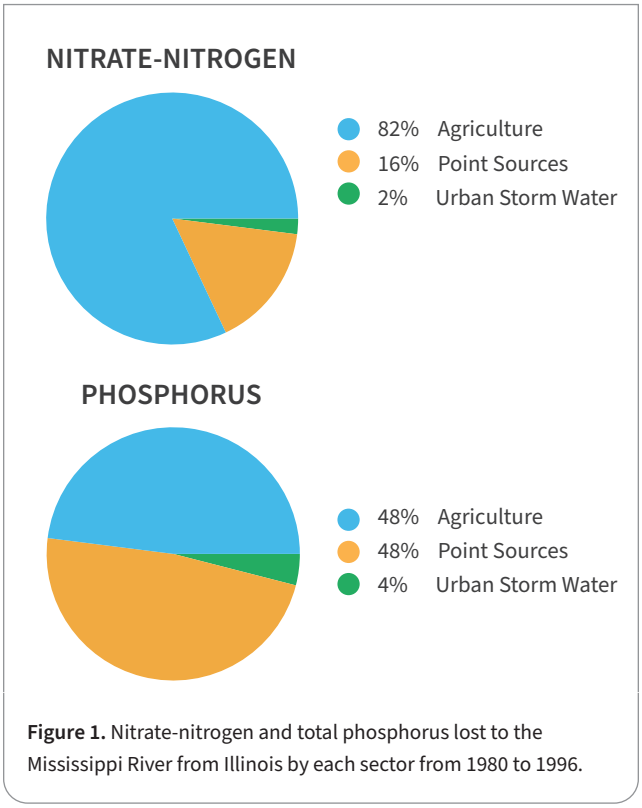

Figure 1. Nitrate-nitrogen and total phosphorus lost to the Mississippi River from Illinois by each sector from 1980 to 1996.

Table 1. In-field Nutrient Loss Reduction Strategy conservation practices.

Practice	N Reduction	P Reduction	Cost / acre / year
Cover Crops (grassed-based)	30%	30% - 50% based on tillage choices	$29
Maximum Return to Nitrogen Calculator	10%	0%	-$8
Soil Test Phosphorus	0%	7%	-$8
Conservation Tillage	0%	30% – 70% based on tillage choices	-$17 to $11 based on tillage choices
Nitrogen Inhibitor	10%	0%	$7
50% Fall Nitrogen / 50% Spring preplant Nitrogen	7.5% - 10%	0%	$17
40% Fall Nitrogen / 10% Preplant / 50% Sidedress	15% - 20%	0%	$17
Spring only Nitrogen	15% - 20%	0%	$18
Terraces	0%	40%	$40
Water and Sediment Control Basins	0%	60%	$64

Table 2. Edge of field Nutrient Loss Reduction Strategy conservation practices

Practice	N Reduction	P Reduction	Cost / acre / year
Bioreactor	25%	0%	$17
Wetland	50%	0%	$61
Saturated Buffers	40%	0%	$10
Buffers (non-tiled)	90%	25% - 50%	$294

Table 3. Nutrient Loss Reduction Strategy land use change practice

Practice	N Reduction	P Reduction	Cost / acre / year
Perennial / Energy Crops	90%	50% - 90% based on tile drainage / tillage type	$86

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References

Illinois Nutrient Loss Reduction Strategy. epa.illinois.gov/content/dam/soi/en/web/epa/documents/water-quality/watershed-management/nlrs/nlrs-final-revised-083115.pdf; The effects: Dead zones and harmful algal blooms. (Jan. 31, 2022). US EPA. www.epa.gov/nutrientpollution/effects-dead-zones-and-harmful-algal-blooms; Congressional interest in harmful algae and dead zone bill prompts hearing. (June 25, 2011). NCCOS Coastal Science Website. coastalscience.noaa.gov/news/cscor-provides-testimony-to-congress-in-support-of-harmful-algae-and-hypoxia-law; U.S. Environmental Protection Agency www.epa.gov/nutrientpollution/effects-dead-zones-and-harmful-algal-blooms; Impacts and repercussions of price increases on the global fertilizer market. (n.d.). USDA Foreign Agricultural Service. www.fas.usda.gov/data/impacts-and-repercussions-price-increases-global-fertilizer-market; 2021 NLRS Biennial Report. epa.illinois.gov/content/dam/soi/en/web/epa/topics/water-quality/watershed-management/excess-nutrients/documents/nlrs-biennial-report-2021_FINAL.pdf

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