Extreme Weather: What Illinois Farmers Need to Know

Heavy Rainfall Events

What Is a Heavy Rainfall Event?

A heavy rainfall event occurs when intense amounts of rain falls in a short amount of time (at more than 0.3 inches per hour), and substantially exceeds what is normal for that location or season. These events can cause significant economic, agronomic, or infrastructure damage from runoff, erosion, inundation, and flooding.

Fig. 1. Damaging mud and debris in a field after heavy rains caused a field flood. Photo by Hans Schmitz.

Fig. 2. Floodwaters sit on a field after heavy rains. Photo by Hans Schmitz.

Impacts of Rainfall Events

- Intense precipitation can increase runoff, erosion, and gully formation, and lead to fertilizer and nutrient loss, which all contribute to significant farm economic losses and downstream pollution.
- Extended or multiple heavy rainfall events can result in crop losses from delayed planting operations, saturated soils, or ponding.
- Extreme flooding can cause damages to property and land, or threaten human health and safety.
- Crops can be exposed to toxins, pollutants, pathogenic microorganisms, and mold when fully or partially submerged in flood waters, a factor that can create food safety risks.

Areas at Most Risk for Heavy Rainfall Events

Across the Midwest, average annual precipitation has increased over the past century, and heavy rainfall events are becoming more common and are projected to continue increasing in frequency. Heavy rainfall events can occur anywhere in Illinois, with no significant historical differences across regions. Events are most common in spring and summer. In spring, soils are often saturated, and heavy rainfalls combined with snowmelt can contribute to flooding. In summer, soils can become dry and crusted, decreasing infiltration rates and leading to higher runoff risk. On the other hand, in cases of summer inundation, significant crop and infrastructure damage can occur. Topography can play a big role in how quickly flood waters move and where flood waters pool and stagnate. For example, slopes are highly erodible and low-lying gullies are subject to stagnant water.

Fig. 3. Heavy rains carved a deep gully erosion. Photo by Hans Schmitz.

Farm Management Recommendations

Keep Soils Covered to Reduce Erosion and Nutrient Loss

- Maintain crop residues and plant cover crops to protect bare soil. The soil is most vulnerable to erosion during extreme rainfall, increased infiltration, and slow overland water flow.

Use Diverse Crop Rotations and Cover Crops

- Increase aboveground biomass to intercept raindrops, which reduces splash erosion and slows runoff.
- Incorporate small grains and cover crops to improve soil structure, increase infiltration, and reduce compaction through deep and varied root systems.
- Incorporate diverse perennial and annual cropping systems to increase soil organic matter and reduce plant water stress. A 1% increase in soil organic matter translates to ~1.2% increase in water holding capacity.

Minimize Tillage and Soil Disturbance

- Reduce tillage to lower soil bulk density, increase pore space, and improve water-holding capacity.
- Reduce tillage to support earthworm populations, which enhances bioturbation, infiltration, and drainage, helping offset waterlogging damages to crops.
- Use no-till systems where possible, which can significantly increase infiltration in wetter climates.

Target High Flood and Erosion Risk Areas for Permanent Plantings

- Establish contour buffer strips — permanent bands of herbaceous vegetation on slopes — to capture sediment, reduce erosion, and protect water quality.
- Establish and carefully maintain grassed waterways to safely convey runoff at non-erosive velocities, and to prevent gully formation in vulnerable areas.
- Convert erosion- or flood-prone areas to various types of conservation buffers, pasture, agroforestry, or other perennial vegetation to reduce negative impacts to crop yield and soil and nutrient loss.
- Minimize or avoid fertilizer, manure, and pesticide applications before forecasted storm events or during high-risk seasons to reduce nutrient and chemical losses through runoff and erosion.

How to Be Part of the Solution

- Check with a local Illinois Extension office to learn about field days and how to integrate recommended practices in an operation.
- Check out the Illinois Nutrient Loss Reduction Strategy (NLRS) newsletter, blogs, and podcasts to learn more and hear about opportunities across the state. Listen to the NLRS Episode 59, "When It Rains, It Pours: Extreme Precipitation & Nutrient Loss."

- Participate in the Community Collaborative Rain, Hail & Snow Network (CoCoRaHS) to track and access hyper-local precipitation data by specific region.
- Reach out to local Natural Resources Conservation Service (NRCS) or Soil and Water Conservation District (SWCD) offices to learn more about available funding and technical assistance programs to establish practices.
- Investigate private and non-profit organizations that provide technical, financial, and peer-to-peer learning resources for soil conservation practices, such as the Savanna Institute, the Illinois Sustainable Ag Partnership (ISAP) Soil Health Leadership Program, and American Farmland Trust's Farmer-Led Advances in Soil Health (FLASH) Program.

About Extreme Weather: What Illinois Farmers Need to Know

Extreme weather events, like dust storms, heavy precipitation, and high winds, have become more common in recent years. These extreme weather events delay timely field operations, including crop planting, alter growing seasons, and can cause dramatic soil and nutrient loss, negatively affecting farm economics. As these impacts continue to grow, the Illinois agricultural community needs resources to support adapting to these conditions and farming through extremes. This series of fact sheets was developed by Illinois Extension to review available research and provide evidence-based recommendations for best practices to build farm resilience to extreme conditions. Access series glossary and additional fact sheets at go.illinois.edu/CropsFactSheets.

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Authors

Jessica Rudnick, Climate Resilience Specialist, University of Illinois Extension
Talon Becker, Meagan Diss, Dane Hunter, and Steve Brand, Commercial Agriculture Specialists, University of Illinois Extension
Rachel Curry, Nutrient Loss Reduction Educator, University of Illinois Extension
Trent Ford, State Climatologist, Prairie Research Institute
Megan Weber, Program Coordinator, University of Illinois Extension

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