Impacts of 2008 Flooding on Agricultural Lands in Illinois, Missouri and Indiana

K.R. Olson, NRES, ACES, University of Illinois at Urbana-Champaign
Rain

- The corn and soybean planting season was late due to cold temperatures and heavy rain.
- From May 30 to June 12, 2008 over 10 inches of rain in Iowa, SW Wisconsin, South Central Illinois, South Central Indiana and N Missouri.
- After the ground was saturated strong thunder storms, heavy rains and flowing resulted in the death of 26 people by July 1, 2008.
14-Day Precipitation
(ending 8 a.m., EDT, June 12, 2008)
Rain and Flooding

- In 2008 the heavy rain area (Upper Midwest) was only half the size of the rain affected area of 1993 flood.
Mississippi River Drainage Basin and SOC Storage

From: NRCS/STATSGO
Initially the nearly level headwaters in Midwest held the rainwater in:

- soils
- depressions
- pot holes and
- wetlands
Leaving behind drowned corn and soybean plants

- Most pothole areas did not dry up until after June 20, 2008. Only 1/3 of the lost corn planted areas (assume to be as high as 30% of the planted corn acreage) was re-planted to corn by July 1, 2008 with lower crop yields anticipated.
- Part of the remaining acreage was switched to soybeans since they can be planted later.
- It appears some previously planted corn acreage, up to 1 million acres in IL, did not produce an agricultural crop and might have qualify for disaster payments.
Runoff Effects on Soil Erosion and Deposition

- Soil erosion on upland can result in loss of topsoil and crop yield reductions.
Runoff Effects on Soil Erosion Phase

- Sheet, rill and gully erosion on upland soils can result in topsoil loss and may change the erosion phase from slightly to moderately or severely eroded.
Annual Corn Grain Yields

All Soils With Root Restricting Subsoils

Eroded Phases

- Slight
- Moderate
- Severe
Runoff Effects on Crop Yields

- For soils with unfavorable subsoils, the annual corn yield of the moderately eroded soil phase can be 5 to 10 bu/ac lower and the severely eroded phase an additional 10 to 15 bu/ac lower than the slightly eroded phases of the same soils.
How did various soil conservation structures and practices fare?

- Strip cropping
- Contour farming
- Waterways and tile inlets
- Retention ponds and check dams
- Terraces
- Conservation structures
- No-till and conservation tillage
However, many Lower Midwest levees (including Winfield, MO; Keithsburg, IL; Meyers, IL; Sainte Marie, IL and Mayville, IN) broke and flooded the agricultural fields.
Flooding Effects on Soil Erosion and Deposition

- Alluvial soil profiles at the levee break can be removed (eroded) creating a blow-out hole or crater.
- These craters adjacent to broken levees resulted in the creation of hundreds or thousand of acres of permanent ponds which replaced the agricultural floodplain soils.
Flooding Effects on Soil Erosion and Deposition

- As the water slows, a thick sand deposit can bury the adjacent alluvial soils just beyond the blow-out craters. Tens of thousands of acreage were affected in the entire Mississippi River Basin.

- The silts and clays are carried further by flood waters and deposited in thin layers on agricultural fields in the previously levee-protected floodplain. Hundreds of thousands of acres were affected.
Effects on Soils

- Soil erosion including loss of topsoil from sheet, rills and gullies on upland
- Thin sediment deposits on unprotected floodplains with flooding but little soil erosion
- If levee breaks there is usually a blow-out hole or water filled crater created and an adjacent sand delta formed with some gully formation
- Thick sand deposits (>6 inches) could lower future crop yields if not removed
- Thin sediment deposits on floodplain (alluvial) soils should have limited impact on soil productivity in future years if tilled into the topsoil before planting the next crop
Reclamation of Damaged Agricultural Lands Previously Protected by Levees
Why was the Illinois, Missouri, and Indiana vulnerable to 2008 flooding?

- Received 5 to 12 inches of rain in the 12 Midwest states in 2 weeks at the end of corn and soybean planting season when soils were already saturated.
- Many of the watersheds have a high slope gradients with great runoff potential.
- Also, the hydrologic soil grouping in some watersheds can affect the runoff rate.
Why was the Illinois, Missouri, and Indiana vulnerable to 2008 flooding? (con’t)

- The crop rotation included up to 90% corn and soybean crops with little or no small grains and forages.
- Urban and highway development has occurred in floodplain and in watersheds.
- Drainage systems designed to remove excess water in 24 hours to open outlets.
- Fewer soil conservation structures and retention ponds are being built and maintained.
- Levee breaks occurred.
2008 Flooding Impact

- Resulted in significant upland soil erosion of the topsoil and ponding and reduced the agricultural production capacity of the upland soils and reduced food stability.

- Resulted in loss of thousands of acres of the 2008 crop production in unprotected flood plains and where levees broke and reduced food stability.
Agricultural land was permanently lost where adjacent to levee breaks, where water filled craters were created and could result in loss of agricultural productivity in future years where buried by thick sand deposits unless levees are rebuilt, the crater filled in and any thick sand deposit is removed.

Agricultural land with thin sand, silt and clay deposits can often be reclaim for agricultural production in future years by mixing with tillage equipment.
Contact Information

- Dr. Kenneth R. Olson
- Professor of Soil Science
- S-224 Turner Hall, Department of Natural Resources and Environmental Sciences, University of Illinois - Urbana-Champaign, 1102 S. Goodwin Avenue, Urbana, IL 61801, USA
- Phone: (o) 217-333-9639, (f) 217-244-3219
- E-mail: krolson@illinois.edu