



DUPAGECOUNTY

STORMWATER MANAGEMENT



Local Impact of Climate Change

on Rainfall, Flooding, Permitting & Water Quality in DuPage County



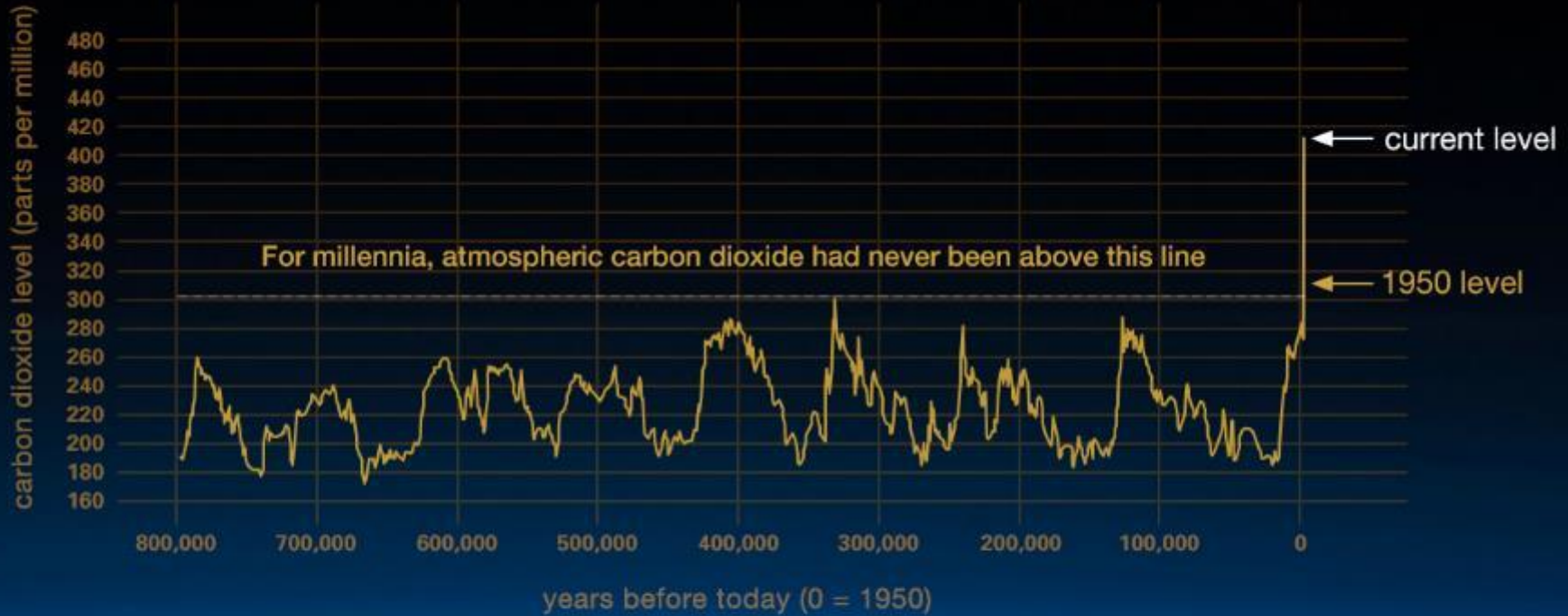
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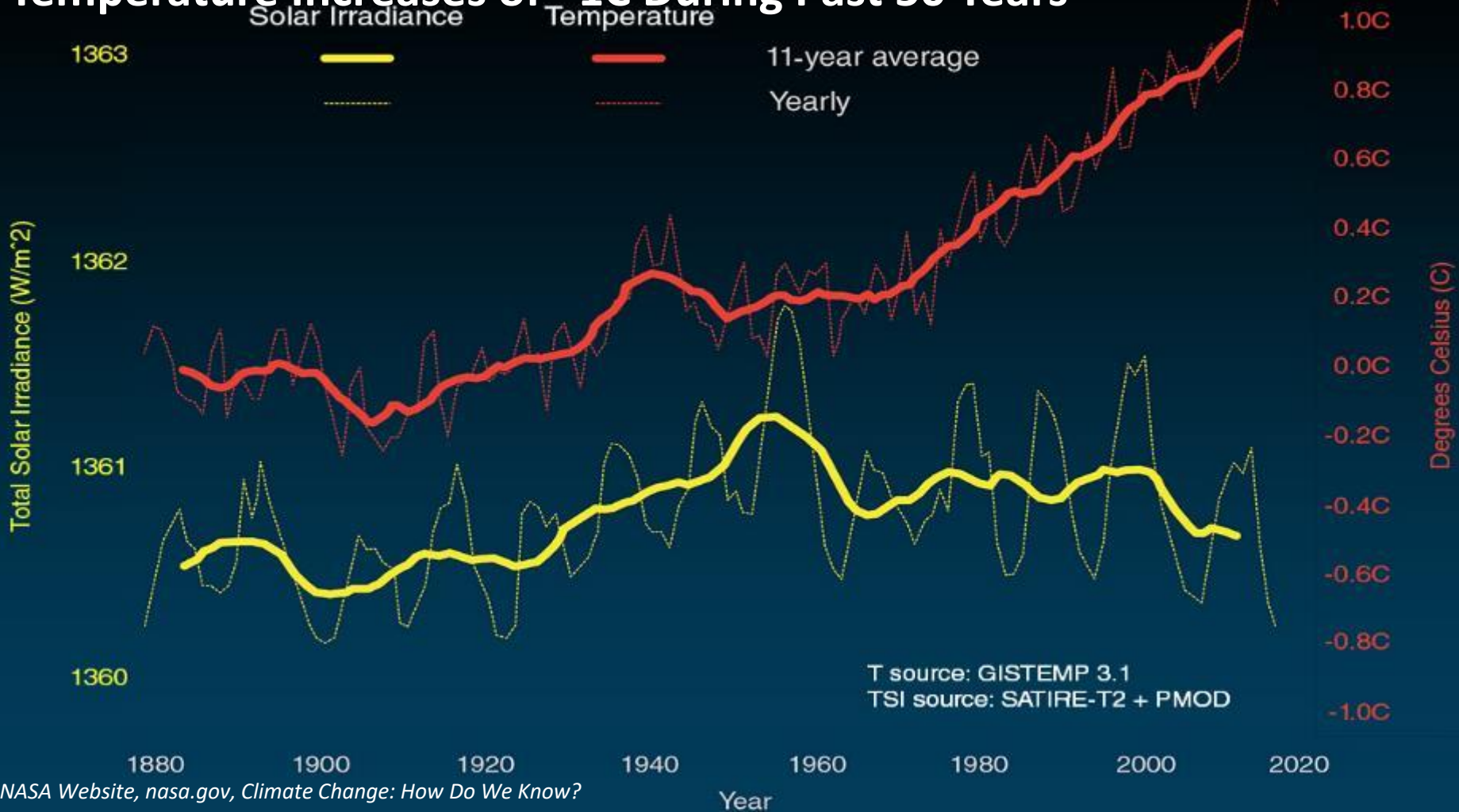
Climate Change & Rainfall



Carbon Dioxide & Other Greenhouse Gases Increasing



Temperature Increases of ~1C During Past 50 Years

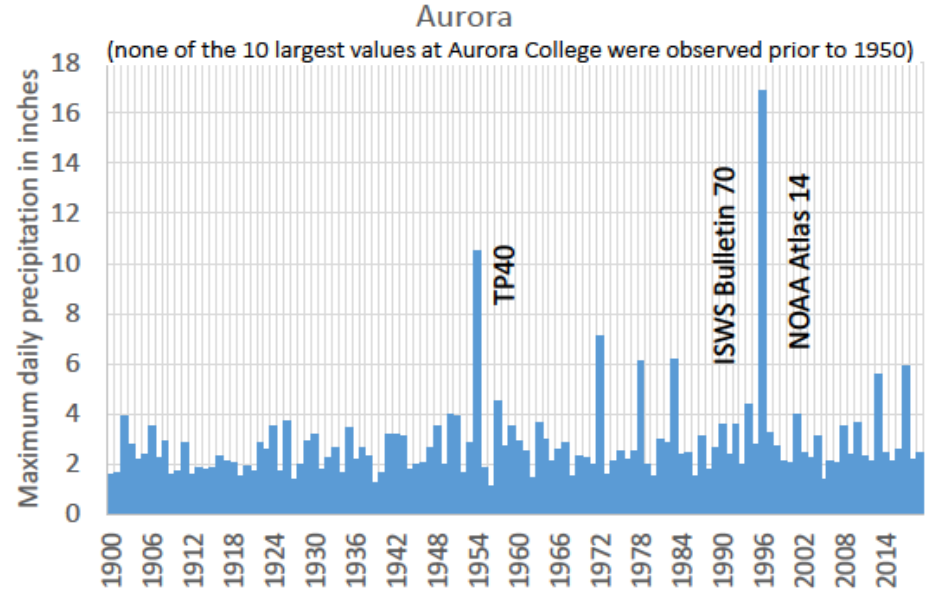


Climate Change & Rainfall



Increased Frequency of Heavy Rainfall

Annual Maximum Daily Rainfall

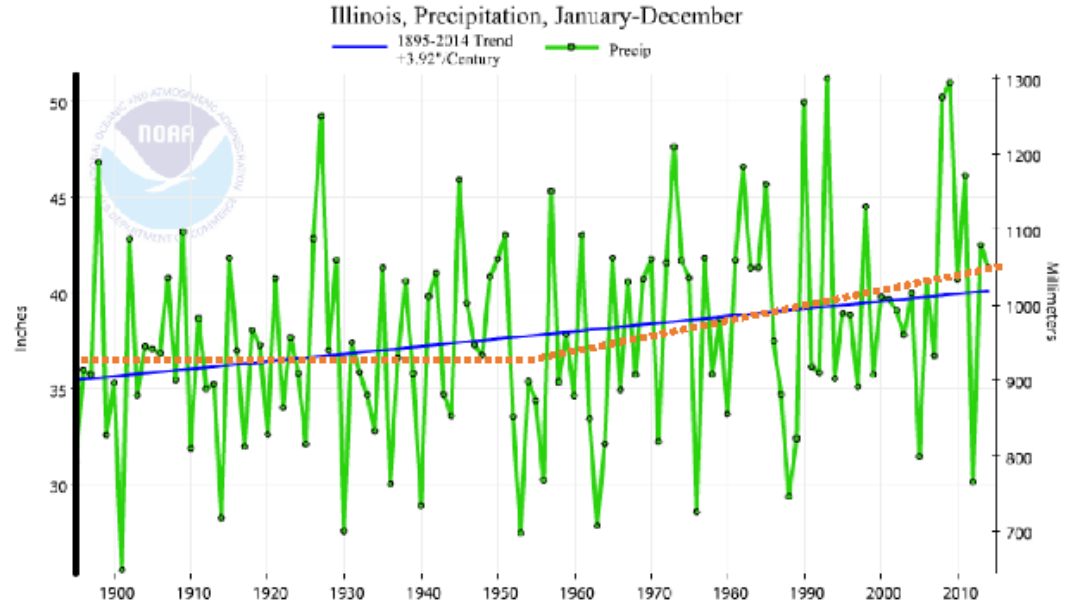


Jim Angel and Momcilo Markus, Illinois State Water Survey, "Frequency Distributions of Heavy Precipitation in Illinois: Updated Bulletin 70"

Climate Change & Rainfall



Increased Average Annual Rainfall



Jim Angel and Momcilo Markus, Illinois State Water Survey, "Frequency Distributions of Heavy Precipitation in Illinois: Updated Bulletin 70"

Climate Change & Rainfall



More Frequent & Intense Rain Events

- Average annual precipitation in most of the Midwest has increased by 5% to 10%.
- Rainfall during the four wettest days of the year has increased by about 35%.
- Flow rates in most streams during the worst flood of the year have increased by more than 20%.

Looking Ahead

During the next century, spring rainfall and average precipitation are likely to increase, and severe rainstorms are likely to intensify.

Climate Change & Rainfall



Significant & Intense Rainfall Events in DuPage County

Storm Event	Rain Gage	Rainfall Amount
August, 1972	Wheaton Gage	5.26" in 2 hrs
August, 1987	O'Hare Gage	9.35" in 18 hrs
	Wheaton Gage	7.26" in 18 hrs
	Local Gage	>13" in 4 days
July, 1996	Wheaton Gage	9.52" in 24 hrs
	Aurora Gage	Approx. 17 " in 24 hrs

Storm Event	Rain Gage	Rainfall Amount
August, 2001	O'Hare Gage	4.27" in 3 hrs
September, 2008	O'Hare Gage	8.28" in 43 hrs
July, 2010	Local Gages	6.5" to 7.5" across County
April, 2013	Local Gages	5.5" to 7.5" across County
October, 2017	Local Gages	3.5" to 7.5" across County



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Climate Change & Flooding



Flood Control Facilities



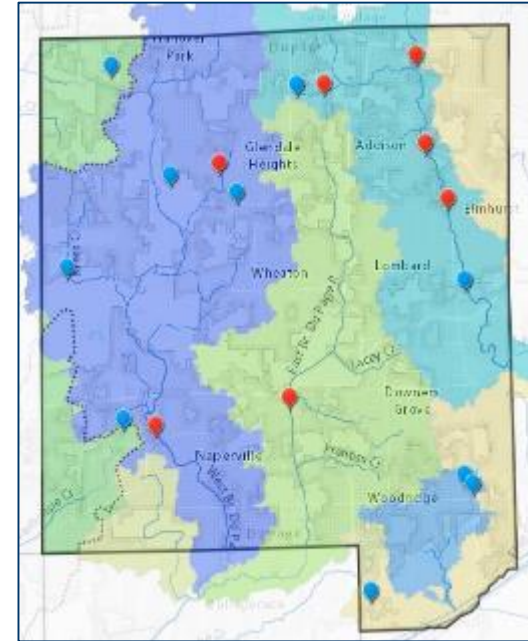
DuPage County has 17 Flood Control Facilities

Major Facilities

- Armstrong Park Reservoir
- Elmhurst Quarry
- Fawell Dam
- Wood Dale – Itasca Reservoir

Additional Facilities

- Brewster Creek
- Country Lakes Basin
- Crest Road Basin
- Dale Road Basin
- Eldridge Park Reservoir
- Gary Kehoe Reservoir
- Kress Creek Reservoir
- Meacham Grove
- Pleasantdale Reservoir
- River Dumoulin Pump Stations
- Spring Creek Reservoir
- Wayne Oaks Dam
- Westwood Creek Dam, Pump Station, Reservoir



Wood Dale-Itasca Reservoir



Elmhurst Quarry Facility



Elmhurst Quarry Facility



Pumps, Gates & Actuators



Gravity-Operated Facilities



Urban Flooding & Drainage Issues



"The Growing Threat of Urban Flooding: A National Challenge 2018" Heavy rains produce neighborhood flooding, Kenilworth, Illinois, 2013. Source: Village of Kenilworth

Urban Flooding



Urban Flooding Definition

FEMA defines urban flooding as “the inundation of property in a built environment, particularly in more densely populated areas, caused by rain falling on increased amounts of impervious surfaces and overwhelming the capacity of drainage systems.”



“The Growing Threat of Urban Flooding: A National Challenge 2018” Heavy rains produce neighborhood flooding, Kenilworth, Illinois, 2013. Source: Village of Kenilworth

Urban Flooding



Flooding Pattern

Urban Flooding includes situations in which stormwater enters buildings through:

- Windows, doors, or other openings;
- Water backup through pipes and drains;
- Seepage through walls and floors;
- Sanitary sewer backup into homes;
- Water seeping through foundation walls;
- Ponding of water caused by clogged street drains; and
- Overflow from roads or other barriers that restrict stormwater runoff.



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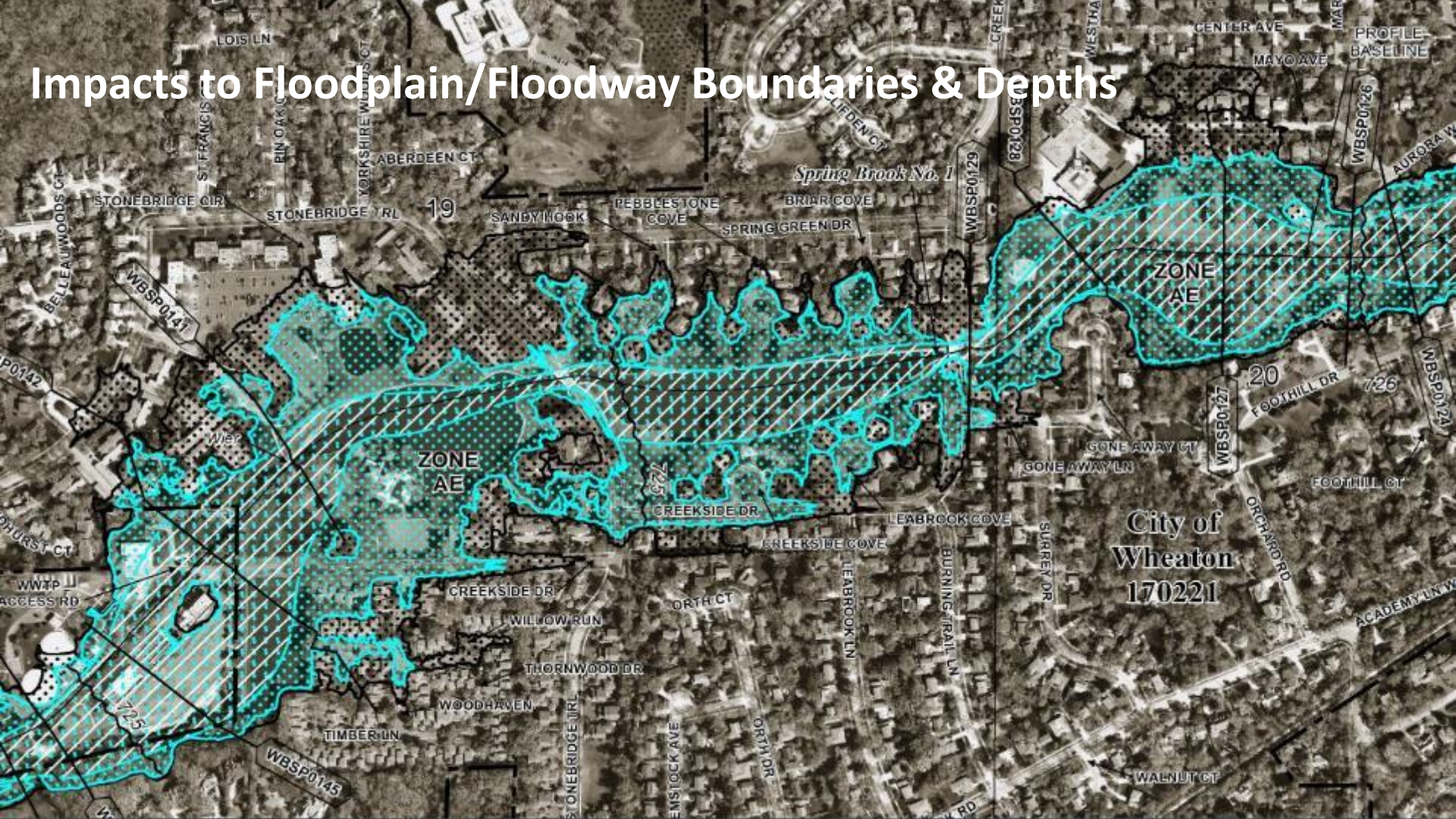
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Climate Change & Regulatory Impacts



Impacts to Floodplain/Floodway Boundaries & Depths



Precipitation Updates



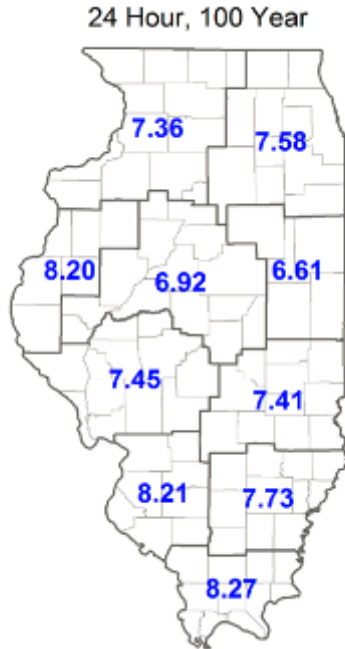
Rainfall Studies

- **Technical Paper No.40** (TP40); US Department of Commerce, Weather Bureau; David M. Hershfield; 1961; **100yr-24hr rainfall = 5.8"**
- **Bulletin 70**; Rainfall Distributions and Hydroclimatic Characteristics of Heavy Rainstorms in Illinois; Illinois State Water Survey; Huff, F.A. and J.R. Angel; 1989; **100yr-24hr rainfall = 7.58"**
- **Updated Bulletin 70**; Frequency Distributions of Heavy Precipitation in Illinois; Illinois State Water Survey; Jim Angel & Momcilo Markus; 2019; **100yr-24hr rainfall = 8.57"**

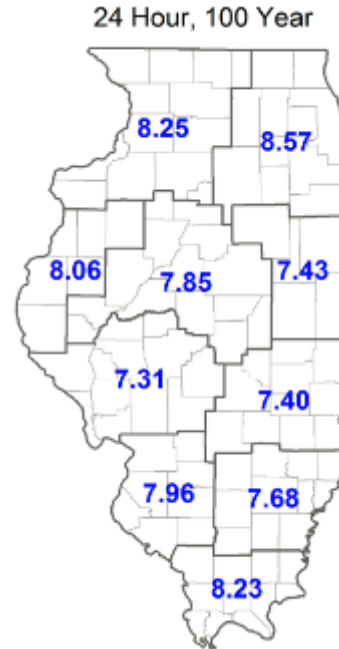
Old & New 100-yr, 24-hr Storm



Old



New

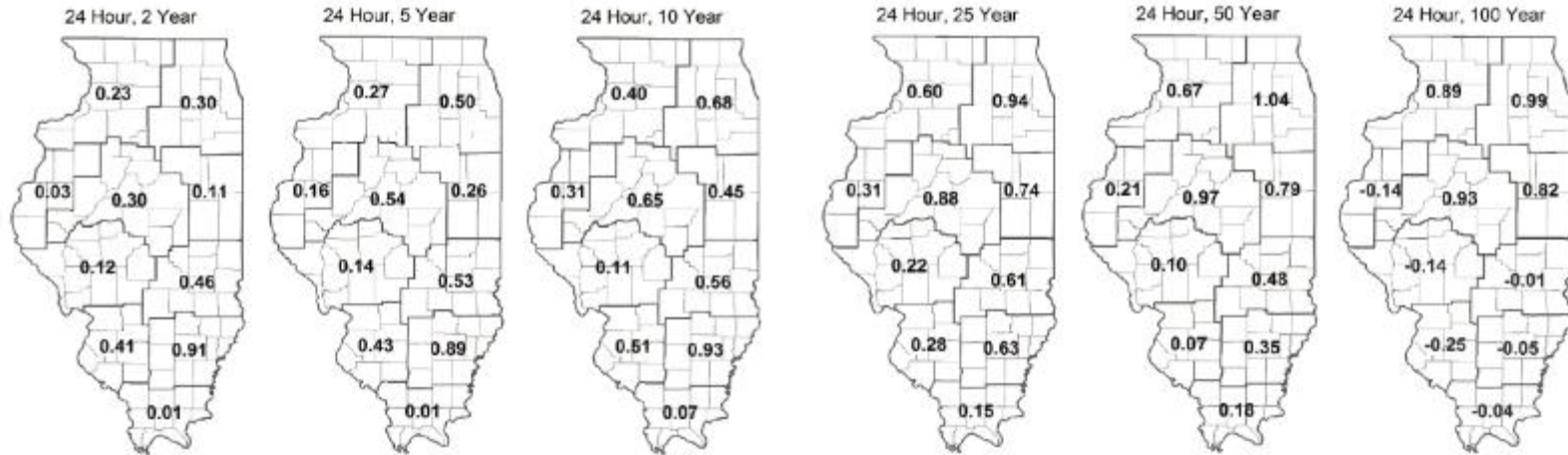


Jim Angel and Momcilo Markus, Illinois State Water Survey, "Frequency Distributions of Heavy Precipitation in Illinois: Updated Bulletin 70"

Updated Bulletin 70



Updated Bulletin 70 vs. Bulletin 70 (Difference in Inches)

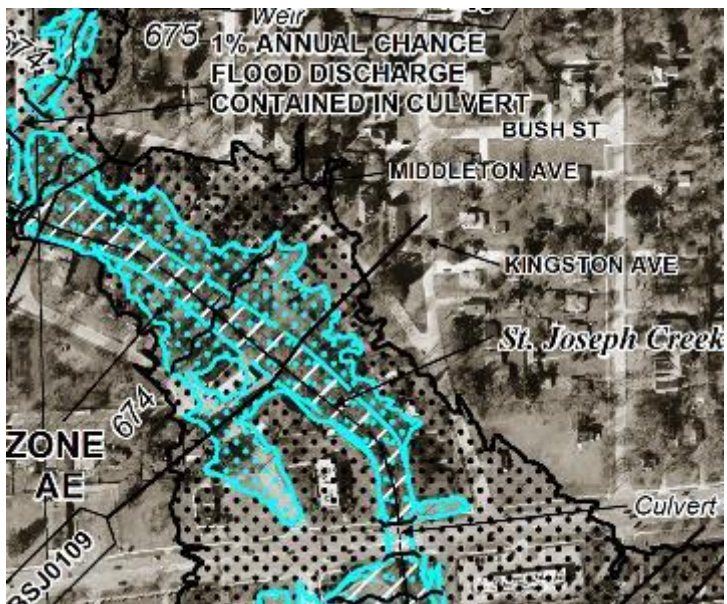


Jim Angel and Momcilo Markus, Illinois State Water Survey, "Frequency Distributions of Heavy Precipitation in Illinois: Updated Bulletin 70"

Updated Floodplain Maps



Effective FIRM



2004 FIRM



Regulatory Impacts



Regulatory Impacts & Permitting

- Wider floodplains and floodways
- Appropriate Use restrictions for development in floodways
- Compensatory storage required for fill within the floodplain
- Structures will be elevated to account for higher floodplain elevations
- Larger detention basins – more of the site required for detention
- Additional best management practice (BMP) requirements



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Climate Change & Water Quality



Climate Change & Water Quality



Impacts of Climate Change on Water Quality

Climate change can contribute to and compound impacts to water quality already caused by:

- Increased impervious area
- Point source discharges
- Urban development
- Agricultural runoff
- Stream modifications

Issues

- Streambank Erosion
- Polluted Stormwater Runoff
- Combined Sewer Overflows
- Nutrients & Algae



Climate Change & Water Quality



Streambank Erosion

More frequent and intense storms leads to:

- Rainwater is carried quickly to streams, especially in urban areas with storm sewer systems
- Streambank erosion & channelization
- Increased sediment load & turbidity



Climate Change & Water Quality



Streambank Erosion

West Branch DuPage River Watershed impairments related to stream erosion include:

- Sediment & Siltation
- Total Phosphorus
- Other flow regime alterations



Climate Change & Water Quality



Combined Sewer & Sanitary System Overflows

Increases in heavy storms and flooding leads to sanitary system overflows, which causes increases in:

- Fecal coliform
- Phosphorus
- Detergents



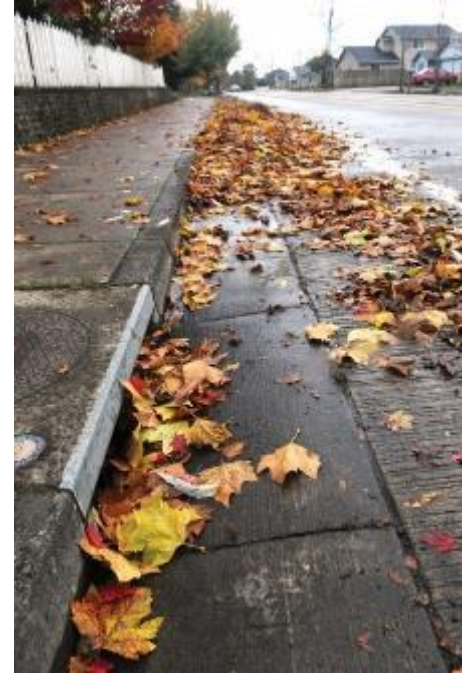
Climate Change & Water Quality



Polluted Stormwater Runoff

Increases in heavy storms and flooding leads to a rise in polluted stormwater runoff from surrounding land.

- Fertilizers
- Pesticides
- Oil
- Sediment
- Leaves & Grass Clippings



Climate Change & Water Quality



More Rain, More Snow

Increased precipitation also means increased frequency and intensity of snowstorms, which equates to more road salt usage.



Climate Change & Water Quality

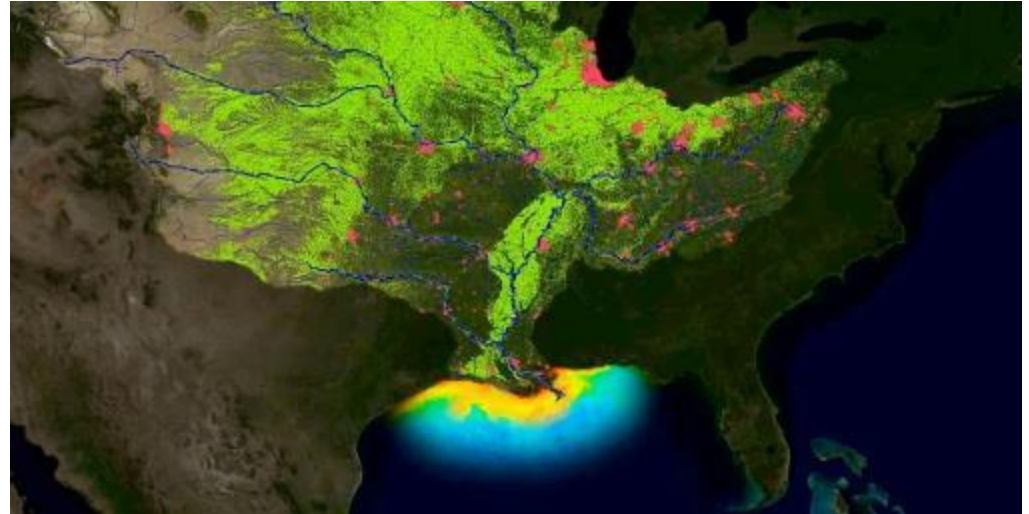


Nutrients & Algae

More spring rains can increase nutrient runoff from fertilizers placed on farm fields and lawns, despite reductions in application.

Local Problem, National Impacts

Eutrophication in local waterbodies contributes to Gulf of Mexico dead zone.



NOAA, "What is a dead zone," oceanservice.noaa.gov/facts/deadzone

Nutrients & Algae

Increasing Temperatures

- Higher average temperatures
- Higher peak temperatures
- Longer growing seasons

Excess Nutrients + Warm Temperatures = Algae Growth



Nutrients & Algae



Water Quality Impacts

- Dissolved oxygen drops
- Impacts to aquatic life
- Aeration in ponds and reservoirs
- Harmful algae blooms - Cyanobacteria



Climate Change & Water Quality



Protecting Water Quality

Certain solutions can help preserve and enhance water quality, including:

- Green Infrastructure
- Low Impact Development



Climate Change & Water Quality



Protecting Water Quality

Certain solutions can help preserve and enhance water quality, including:

- Stream Restoration
- Native Plants
- Wetland Enhancements
- Shoreline Stabilization
- Detention Basin Retrofits



Climate Change & Water Quality



Protecting Water Quality

Certain solutions can help preserve and enhance water quality, including:

- Management of point and non-point sources
- Monitoring



Climate Change & Water Quality



Protecting Water Quality

Certain solutions can help preserve and enhance water quality, including:

- Watershed Planning
- Prioritize Stream Segments
- Priority Projects
- Apply for Grants!



Looking Ahead



Summary

- Large storm events, producing heavy precipitation, happening more frequently and with more intensity.
- Flood Control Facility operation happening more frequently, leads to increased cost, energy usage, maintenance, etc.
- Urban flooding will become more prevalent, with the burden primarily falling on the property owner.
- Updated rainfall studies may lead to wider floodplain/floodways, which has regulatory and permitting implications.
- Increased stormwater runoff leads to further pollution, erosion and eutrophication of waterways.

Thank You!



Questions?

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