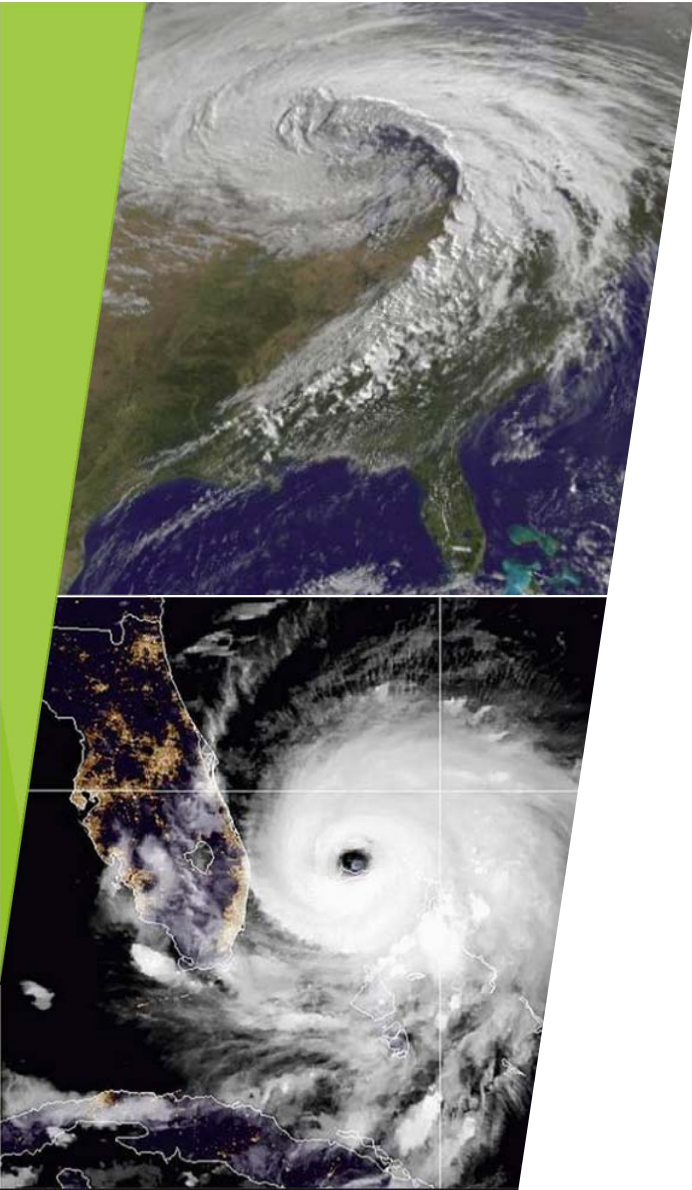




**CMAP - Environment & Natural Resources Committee**

**Lake County Stormwater Management Commission**

**Increasing Rainfall - Its Effects on the Des Plaines River and the Watershed Development Ordinance.**



# Today: Global - Regional - Local

## Global

- ▶ What evidence is there for climate change - data driven, forget the term climate change, the globe is getting warmer!
- ▶ Warm air holds more water
- ▶ Warm air has more energy
- ▶ Why are we getting record cold? - and what is a bomb cyclone?

## Atmospheric Moisture Increase

The atmosphere holds 7 percent more moisture per 1.8°F / 1°C of warming (since 1750)

Storms are Stronger?

'Strength' Needed to Lift 2" of Rain?

- ▶ 2" of rain over 1 acre = 453,000 lbs of water
- ▶ 226 tons



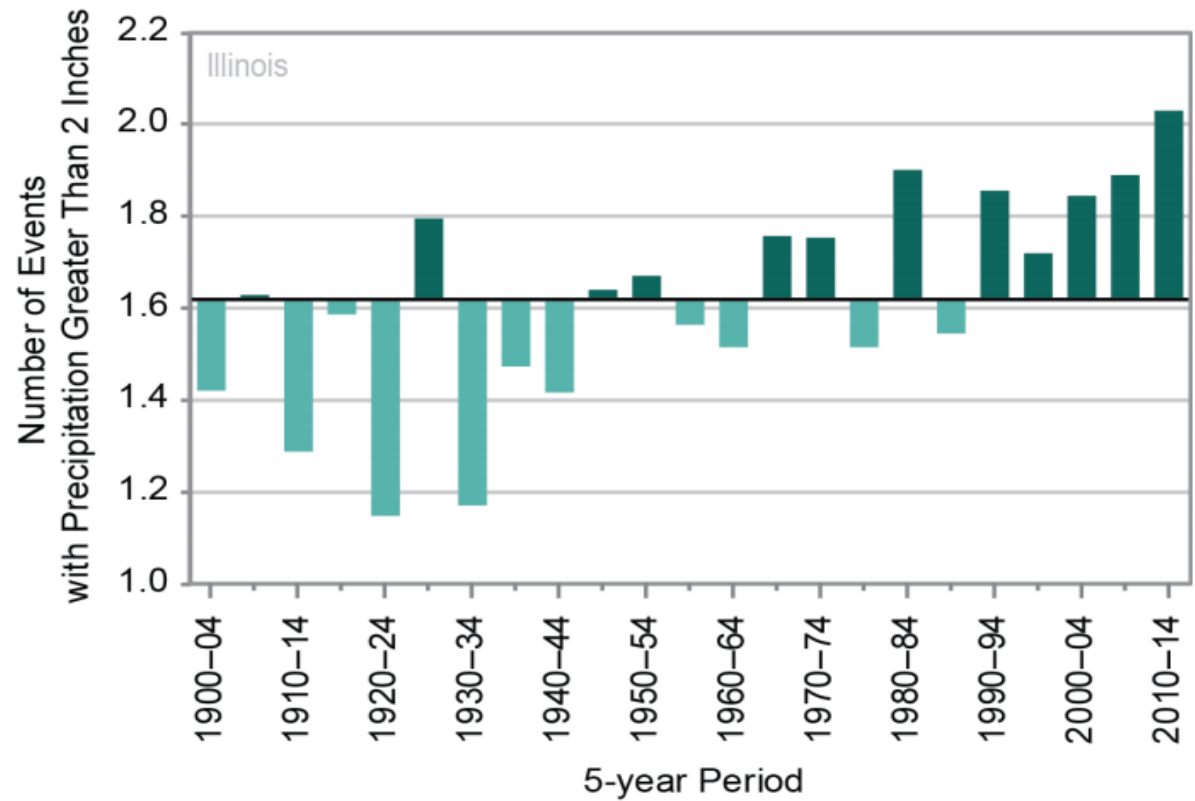
# Regional - Stronger Storms

► Storms holding more water - there is a trend



## Illinois

Observed Number of Extreme Precipitation Events



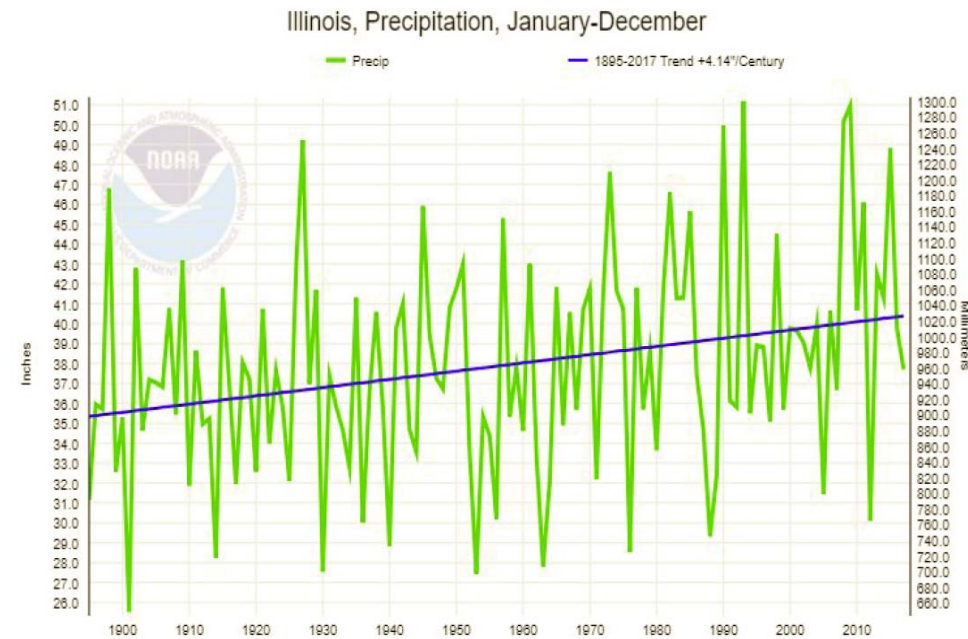
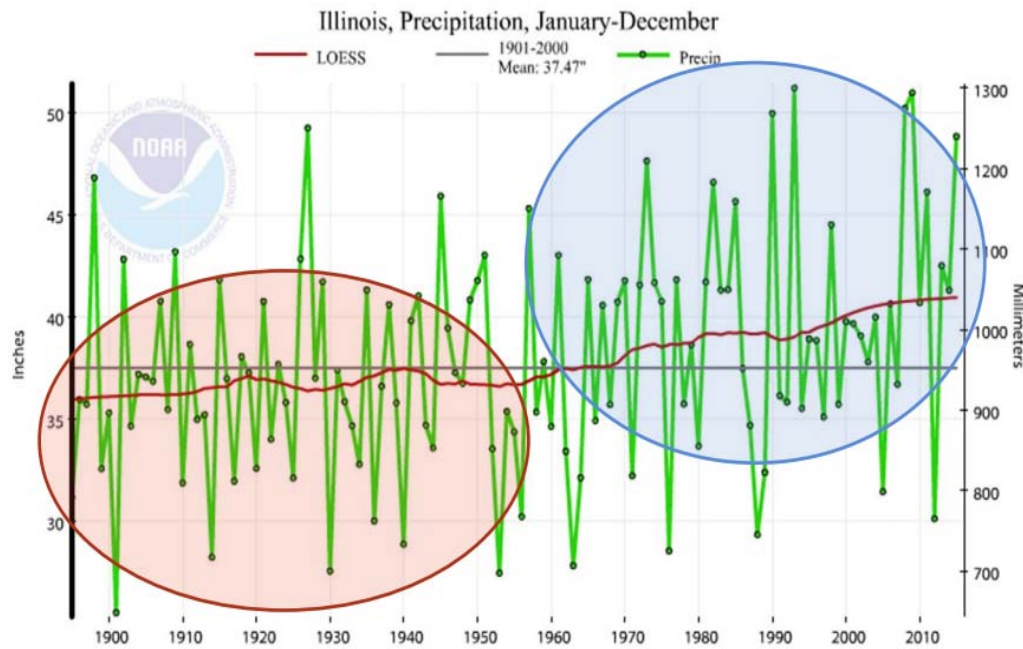


Figure 3 Statewide average annual precipitation for Illinois from 1895 to 2017. The green line shows the year-to-year variability. The blue line is a linear trend showing an increase of 4.14 inches over the past century. Source: NOAA NCEI, 2018.

## Regional - More Rain

- ▶ The two graphs both show total precipitation data, however the subtle difference is most of the increase has occurred since 1970

## ISWS Concludes

- ▶ High confidence that heavy precipitation events will increase in frequency and amounts

## Effect on Lake County

- 100 year, 24-hour storm in Lake County
- Current = 6.5"
- New 8.57"
- Increase = 32%, (but wait)

# Hydrology of a rainfall event

Initial abstraction includes:

infiltration - into pervious surfaces

interception - caught by vegetation

depressional storage - held by ground surface features

evaporation - rain converting to gaseous state

## Runoff After Abstractions (Lake County Example)

24-hour 100-year storm - Rainfall difference 6.5" to 8.57" = 32%

½" (0.5) of Initial Abstraction, Runoff difference 6" to 8.07" = 35%

1" of Initial Abstraction, Runoff difference 5.5" to 7.57" = 38%



# Floodplain Flow Analysis

Des Plaines River - Flood Insurance Study 02/17/16 (Current Effective)		Peak Discharges (cubic feet per second)		
<u>Flooding Source and Location</u>	Drainage Area (Sq Mi)	1-Percent (100-yr)	0.2-Percent (500-yr)	% Diff 500yr/100yr
Approximately 0.98 mile downstream of Half Day Road (IL Route 22)	326.53	6,018	7,511	25%
Approximately 1.98 mile downstream of Belvidere Road (IL Route 120)	275.74	5,865	7,705	31%
<b>Approximately 220 feet upstream of Belvidere Road (IL Route 120)</b>	<b>244.09</b>	<b>5,805</b>	<b>7,841</b>	<b>35%</b>
Approximately 500 feet downstream of Skokie Highway (Route 41)	234.61	5,644	7,723	37%
Approximately 2,600 feet downstream of Wadsworth Road	223.20	5,491	7,595	38%
Approximately 0.76 mile upstream of State Route 173	150.63	4,026	5,739	43%
Approximately 400 feet downstream of the Illinois-Wisconsin state boundary (Russell Road)	127.09	3,773	5,580	48%





# 100 yr Regulatory Model Floodplain Flow Analysis -Due to Upper Des Plaines Development

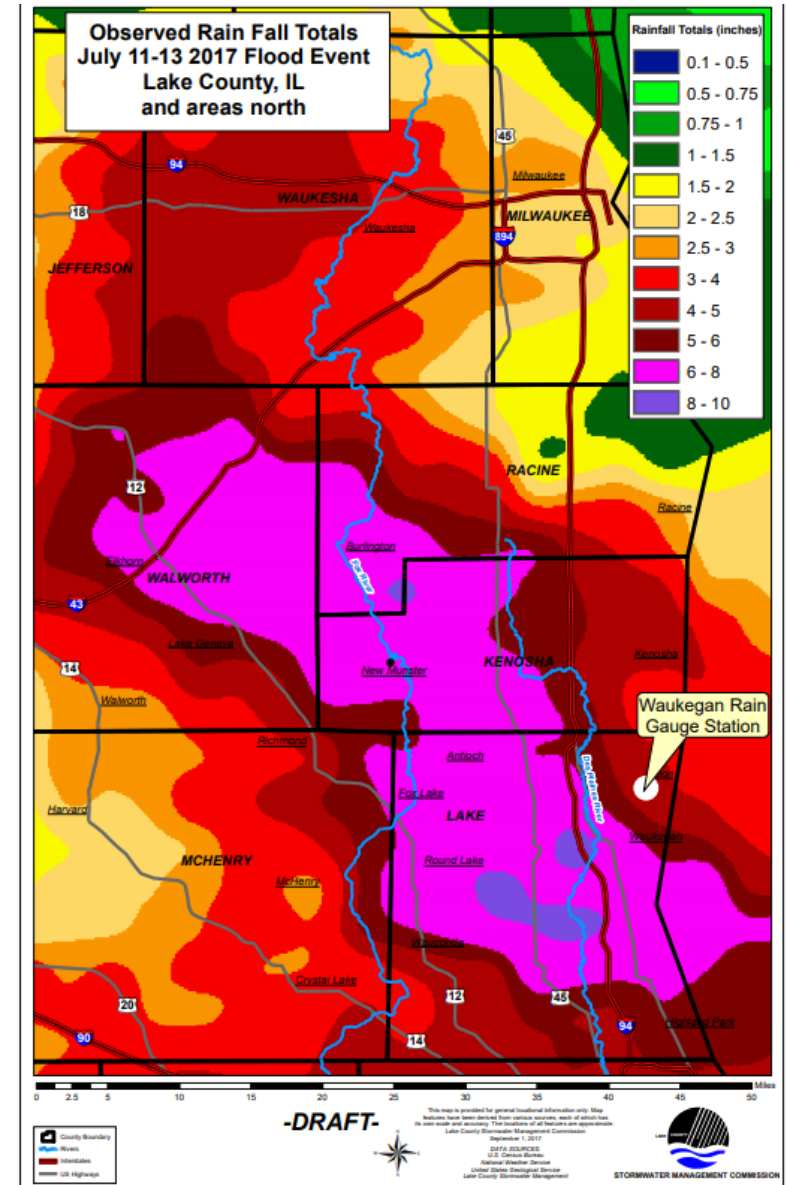
**Table 4: Full Build-Out HEC-1 Results**

Location Description	Regulatory HEC-1			Full Build-Out Existing Conditions		Full Build-Out Proposed Conditions			% Incr.
	Label	Peak Flow (cfs)	Basin Area	Peak Flow (cfs)	Change from Regulatory	Peak Flow (cfs)	Change from Regulatory	Change from Existing	
~500 ft upstream of Hoffman Dam	DESDIV	7708	629.32	7717	9	7776	68	59	0.8
~1,000 ft downstream of 31st Street	C239	6693	484.50	6702	9	6757	64	55	0.9
~1,800 ft downstream of Chicago Ave	C329	6510	459.79	6526	16	6600	90	74	1.3
~3,000 ft downstream of Kennedy Expressway	C128	6222	419.37	6494	272	6792	570	298	9
At Algonquin Road	C123	6193	382.08	6769	576	7085	892	316	14
~1,600 ft upstream of Golf Road	R22	6161	362.65	6910	749	7233	1072	323	15
~1,300 ft downstream of Palatine Road	C218	6308	357.57	6974	666	7302	994	328	16
~0.98 mi downstream of Half Day Road	C21A	6018	326.53	6812	794	7166	1148	354	19
~1.98 mi downstream of Belvidere Road	C120	5865	275.74	6677	812	7068	1203	391	21
~220 ft upstream of Belvidere Road	18A	5805	244.09	6655	850	7079	1274	424	22
~500 ft downstream of Skokie Highway	R17	5644	234.61	6515	871	6948	1304	433	23
~2,600 ft downstream of Wadsworth Road	C16	5491	223.20	6366	875	6816	1325	450	24
~0.76 mi upstream of State Route 173	C115	4026	150.63	4982	956	5458	1432	476	36
~400 ft downstream of IL-WI State Boundary	R14	3773	127.09	4747	974	5253	1480	506	39

## Evidence

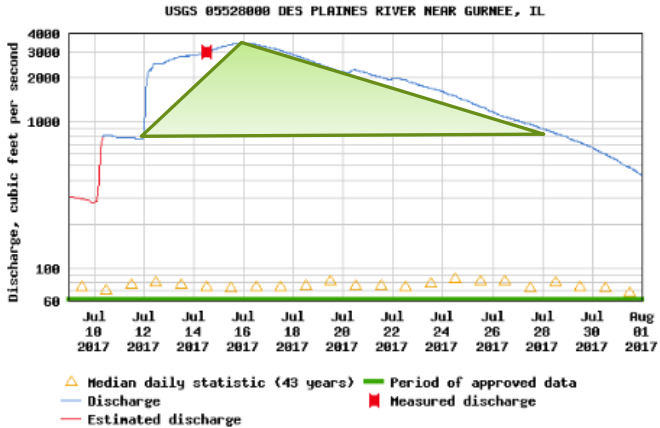
### Recent History (July 2017)

- ▶ 2" predicted, received between 6"-10" in Lake County
- ▶ All 9 river gages in the county set new record
- ▶ Fox/Des Plaines/North Branch Chicago River



**Discharge, cubic feet per second**

Most recent instantaneous value: 98.5 09-04-2019 08:30 CST

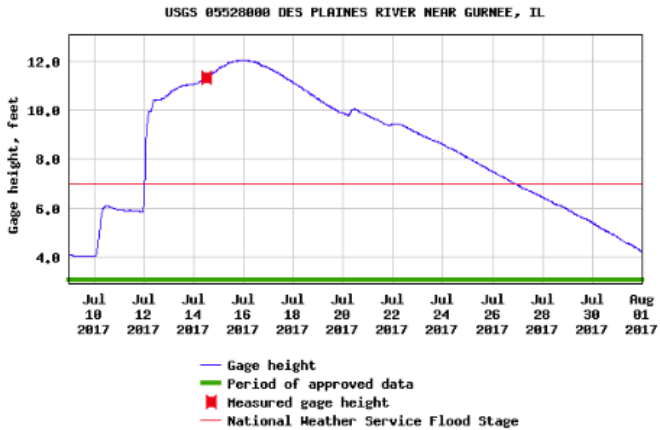


Create [presentation-quality / stand-alone](#) graph. Subscribe to [WaterAlert](#)

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**Gage height, feet**

Most recent instantaneous value: 2.36 09-04-2019 08:30 CST



What volume of water is in a storm? (July 2017)

Volume Above Flood Stage (Route 120 Gage)

$A = \frac{1}{2} \text{ Base (time) } \times \text{ Height (flow) } = \text{ Volume}$

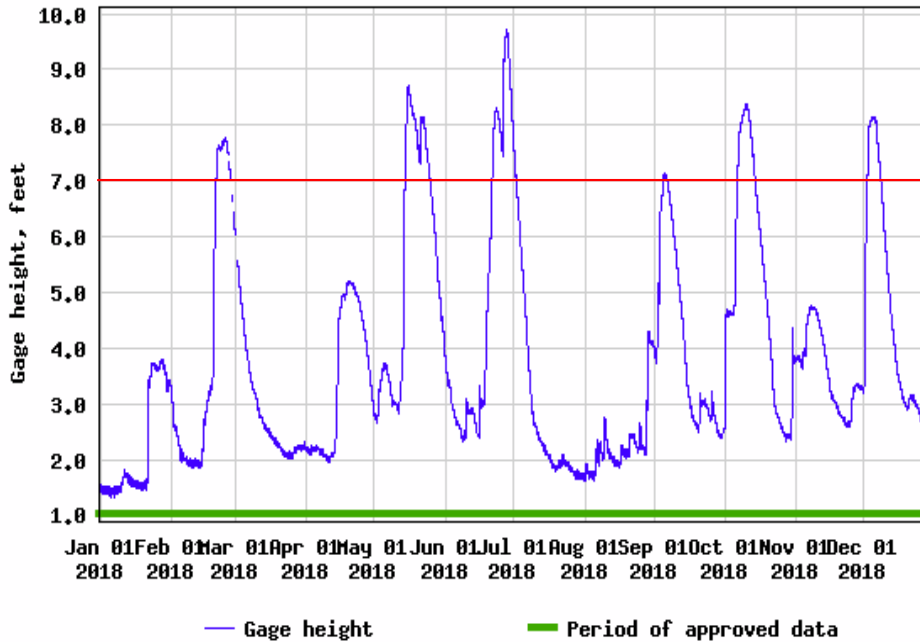
$\text{Volume} = \frac{1}{2} (14 \text{ days}) \times (2600 \text{ cfs}) = 36,000 \text{ Acre-feet}$

## Evidence

### ► 2018 (Route 120 Gage)

Above flood stage during 6 separate storm events, for over 60 days of the year

USGS 05528000 DES PLAINES RIVER NEAR GURNEE, IL

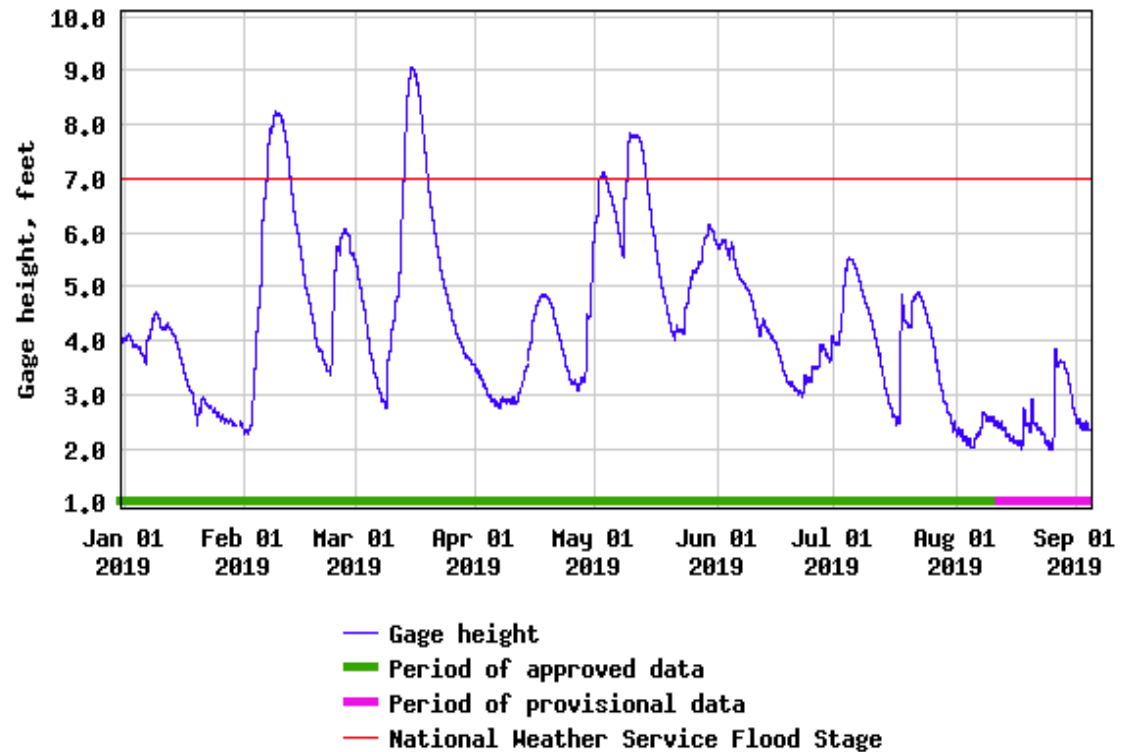


## Evidence

### ► 2019 (Route 120 Gage)

Above flood stage during 4 separate storm events, and counting?

USGS 05528000 DES PLAINES RIVER NEAR GURNEE, IL



# Floods and NFIP in Lake County 1996-2016

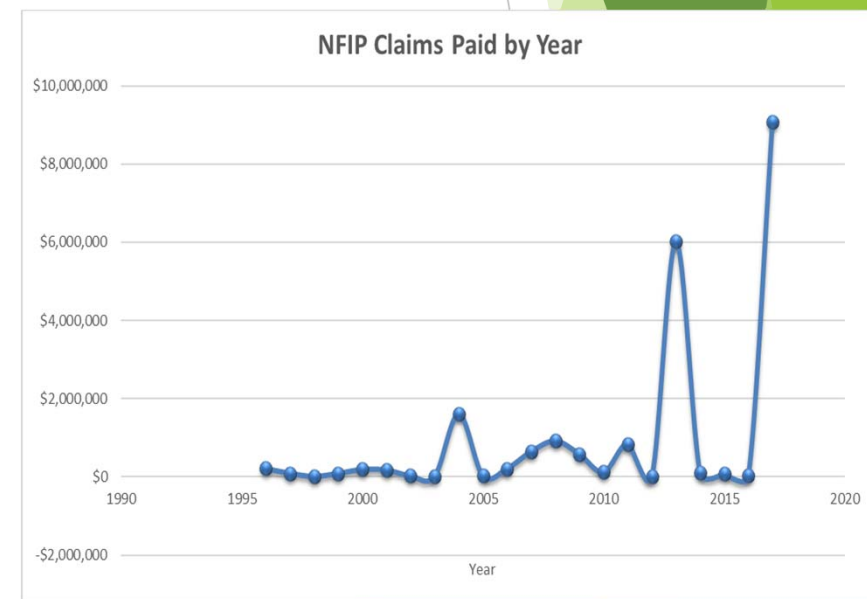
## 1996-2016

- 36 flood events/4 Presidential Disaster Declarations
  - 1.8 (almost 2) flood events per year
- 673 NFIP claims
- \$11,911,650 paid NFIP claims (\$17.7K avg.)

## NFIP in Lake County 2017

### 2017

- 320 NFIP claims
- \$9,069,270 paid NFIP claims (\$28.3K avg.)
- NO Presidential Disaster Declaration!



## Watershed Development Ordinance Reaction

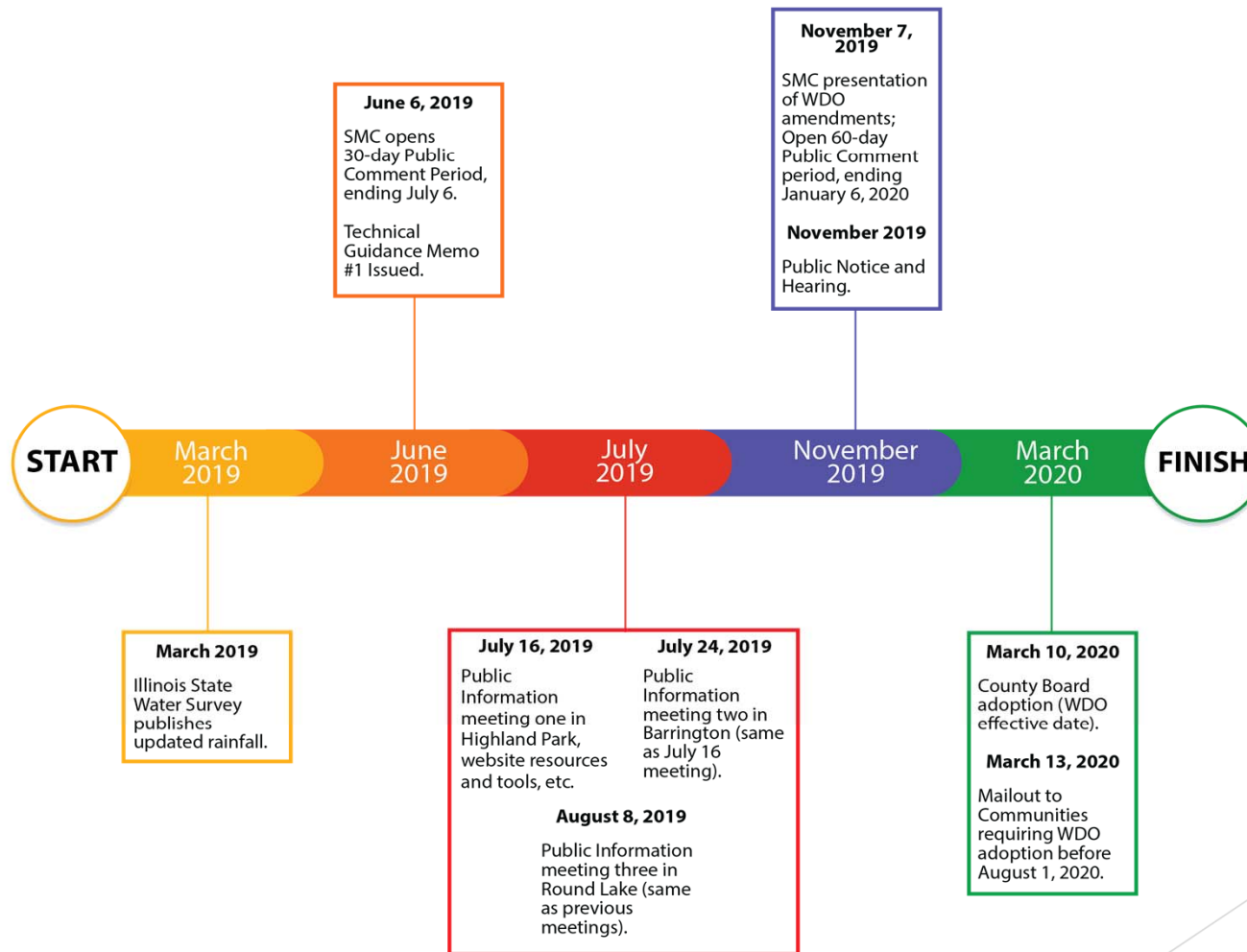
- *Increase Des Plaines River Flood Protection Elevation (WDO)*
- *New Rainfall Table Appendix I*
- *New Rainfall Intensity Distributions (ISWS In Progress)*
- *Modify Detention Holding and Overflow Capacities*
- *Create Fee-in-lieu System*

### *Additional Measures*

*Plan (prevent), Prepare, Respond, Recover, Mitigate*

(SMC Emergency Management Criteria)

# Watershed Development Ordinance Timeline

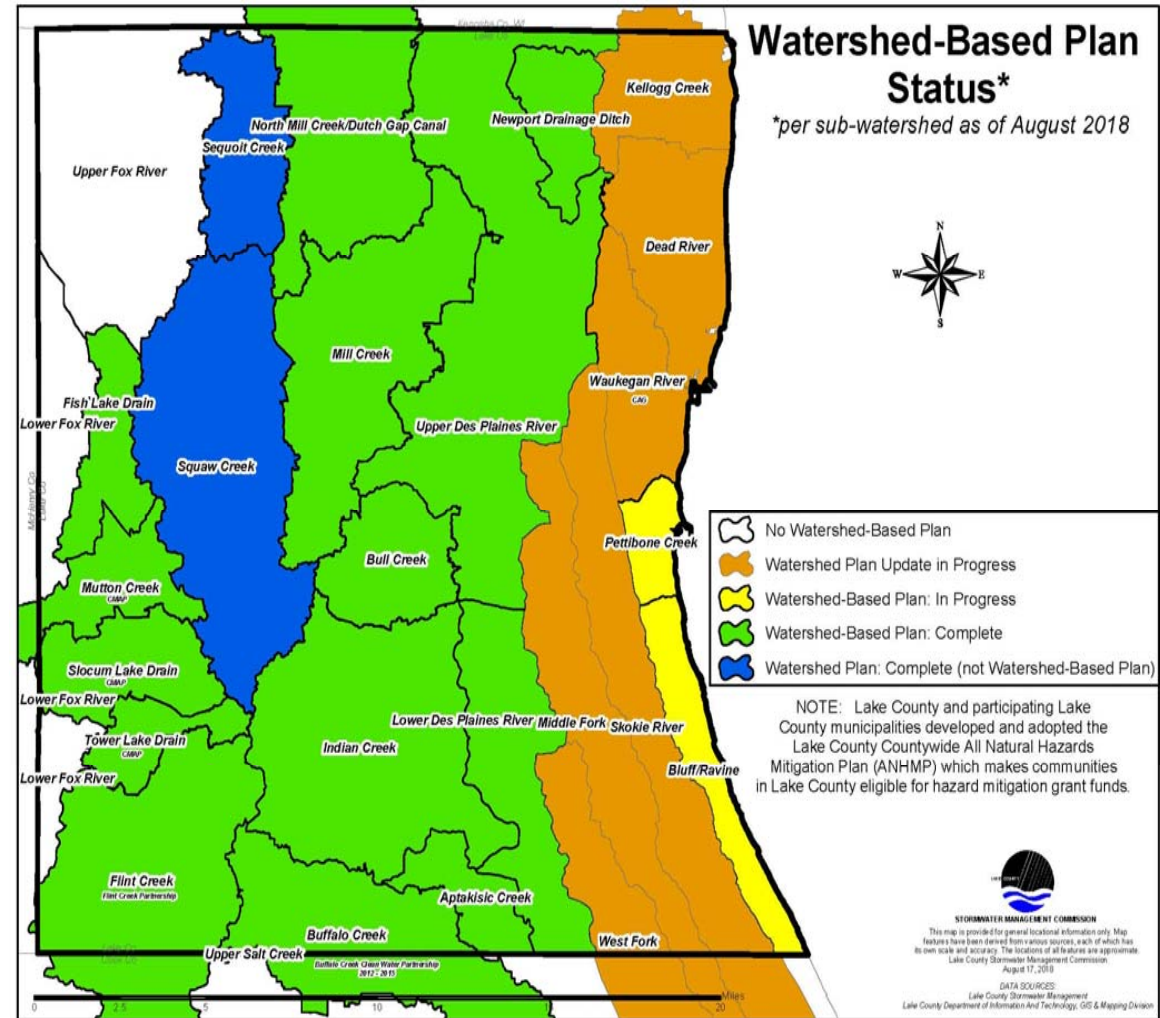




# Plan

## Watershed Planning

- ▶ Basis for water resource management
- ▶ Identifies problems and solutions - both flooding and water quality based)
- ▶ Allows project grant funding eligibility
- ▶ Educates Stakeholders on the problems and solutions





## Prepare

- ▶ Flood Problem Area Inventory
- ▶ Site-specific action plan - concept designs
- ▶ Implement Projects
- ▶ Provide Homeowner Resources
- ▶ *Advocate for FIS Mapping Updates*

# Respond

- ▶ SMC has an adopted Flood Response Manual
- ▶ After Action Briefing following each major flood requires update to manual

*SMC Flood Response Manual*

*Revised August 2017*



**STORMWATER MANAGEMENT COMMISSION**

**DRAFT**

## **FLOOD RESPONSE MANUAL**

**Adopted April 6, 2006  
Revised April 23, 2009  
Revised December 28, 2010  
Revised Summer 2013  
Revised March 2016  
Revised August 2017**

## Mitigate

- ▶ Buyouts! - Over 200 purchased to-date, many more to come
- ▶ IDNR Buyout Project Approved for Lake County (another 12 homes)
- ▶ Infrastructure
  - ▶ Storage (smaller watershed reservoirs, detention ponds)
  - ▶ Conveyance (storm sewers, culverts, stream maintenance and restoration)

QUESTIONS?

