

# Is Harvey Making Houston Resilient?

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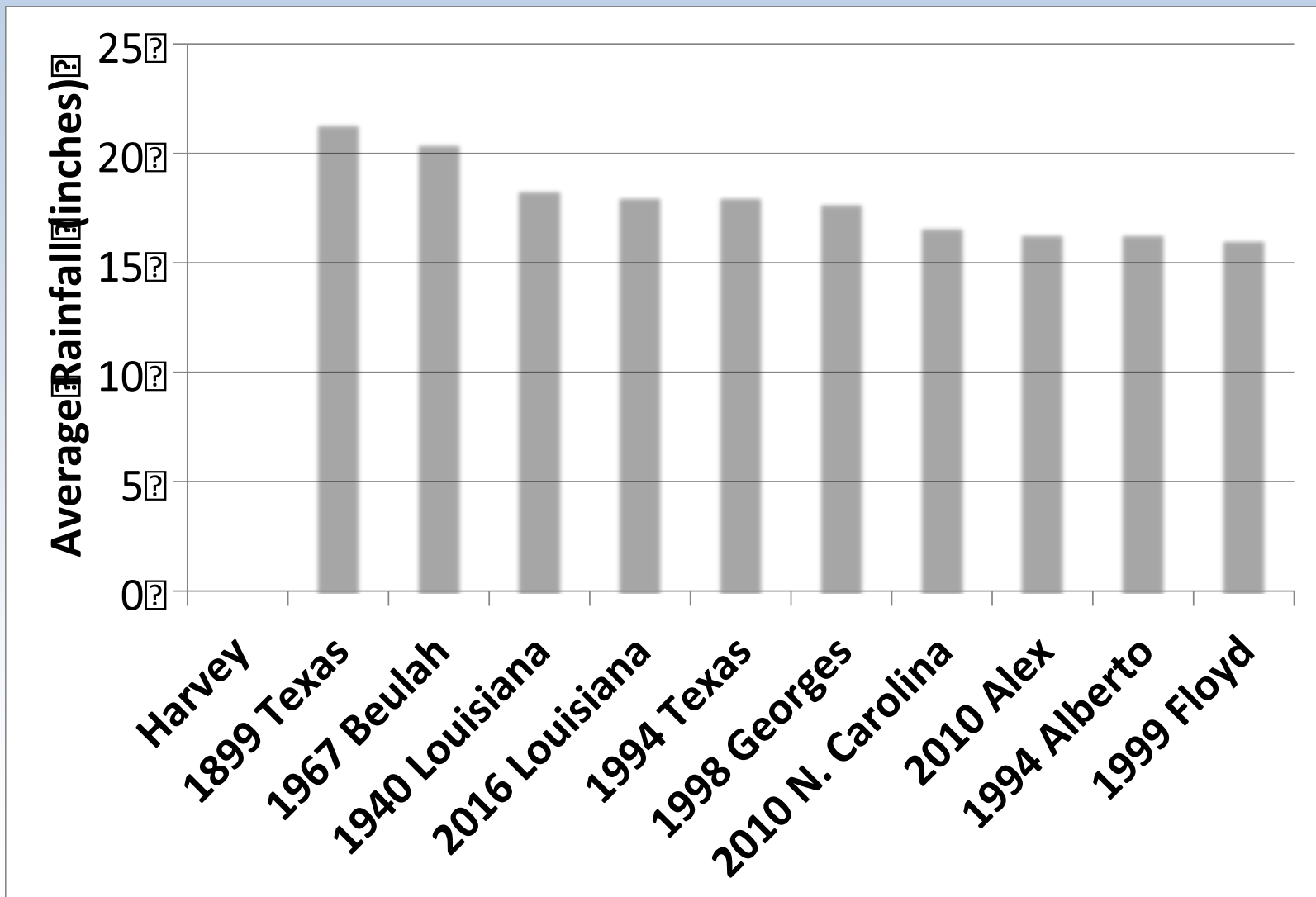
# (Central/Eastern) US Depth-Area-Duration All-Time Records Before Harvey

Area\Duration	2 Days	3 Days	4 Days	5 Days
1,000 sq mi	Louisiana, August 1940	Louisiana, August 1940	Louisiana, August 1940	Louisiana, August 1940
2,000 sq mi	Louisiana, August 1940	Louisiana, August 1940	Louisiana, August 1940	Louisiana, August 1940
5,000 sq mi	Louisiana, August 1940	Texas, June 1899	Texas, June 1899	Texas, June 1899
10,000 sq mi	Georges, Florida 1998	Texas, June 1899	Texas, June 1899	Texas, June 1899
20,000 sq mi	Georges, Florida 1998	Beulah, Texas 1967	Beulah, Texas 1967	Beulah, Texas 1967
50,000 sq mi	Georges, Florida 1998	Beulah, Texas 1967	Beulah, Texas 1967	Beulah, Texas 1967

# (Central/Eastern) US Depth-Area-Duration All-Time Records After Harvey

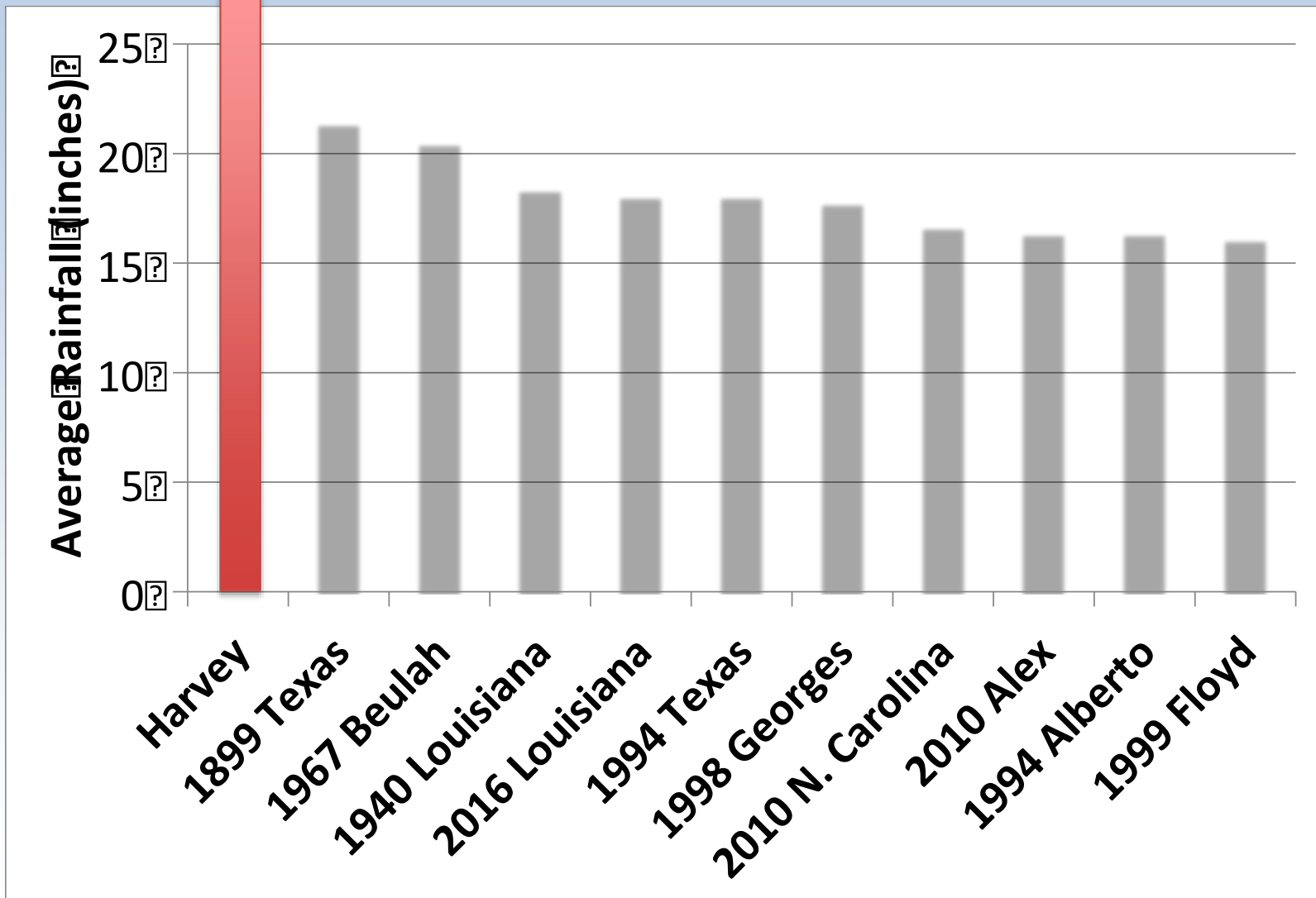
Area\Duration	2 Days	3 Days	4 Days	5 Days
1,000 sq mi	Louisiana, August 1940	Harvey	Harvey	Harvey
2,000 sq mi	Harvey	Harvey	Harvey	Harvey
5,000 sq mi	Harvey	Harvey	Harvey	Harvey
10,000 sq mi	Harvey	Harvey	Harvey	Harvey
20,000 sq mi	Harvey	Harvey	Harvey	Harvey
50,000 sq mi	Harvey	Harvey	Harvey	Harvey

# Greatest US Storms: 5 days, 10,000 sq mi



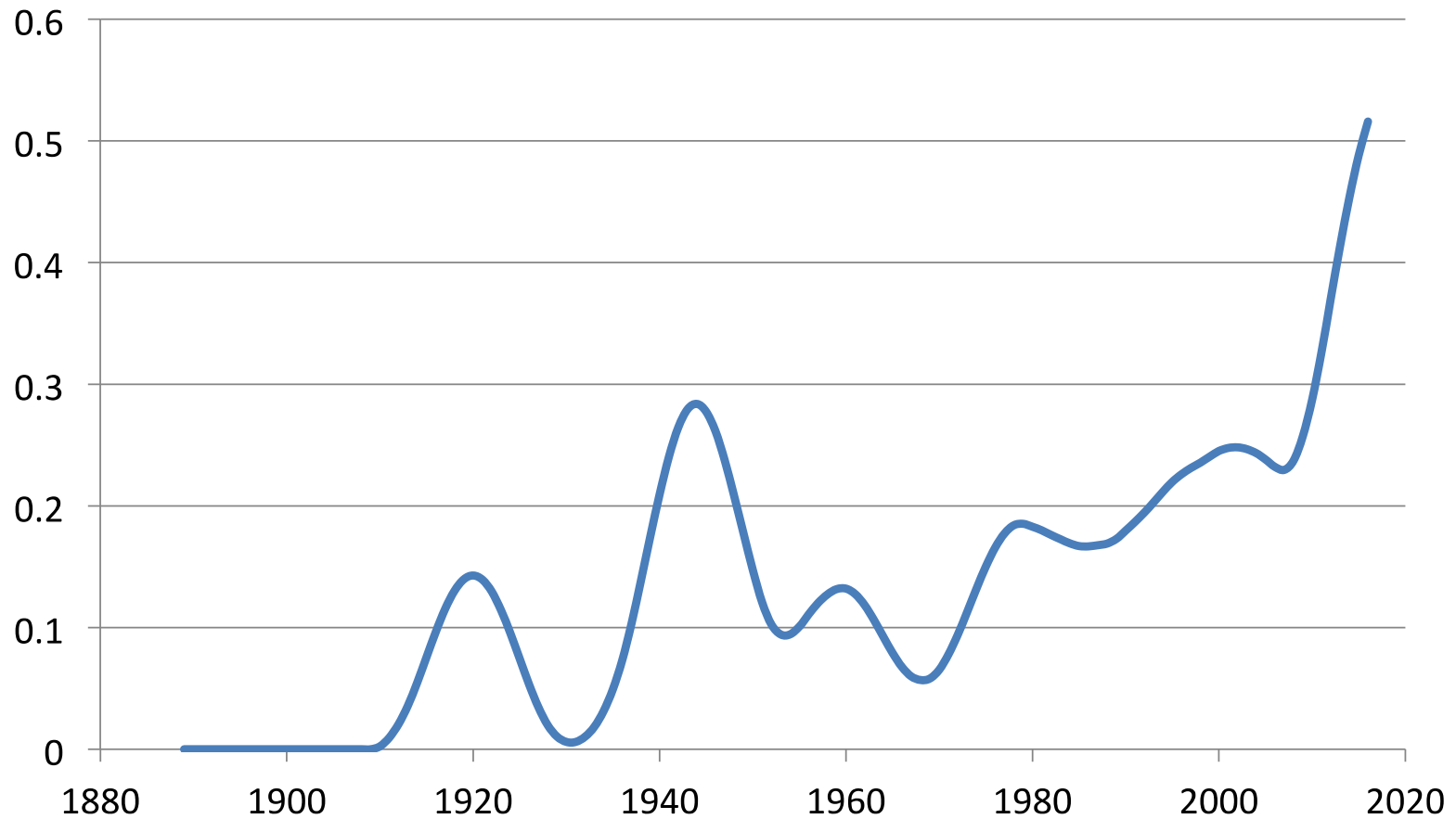
Historic analyses: Applied Weather Associates; US Army Corps of Engineers  
John Nielsen-Gammon, Texas A&M University

# Gr... US Storms: 5 days, 10,000 sq mi

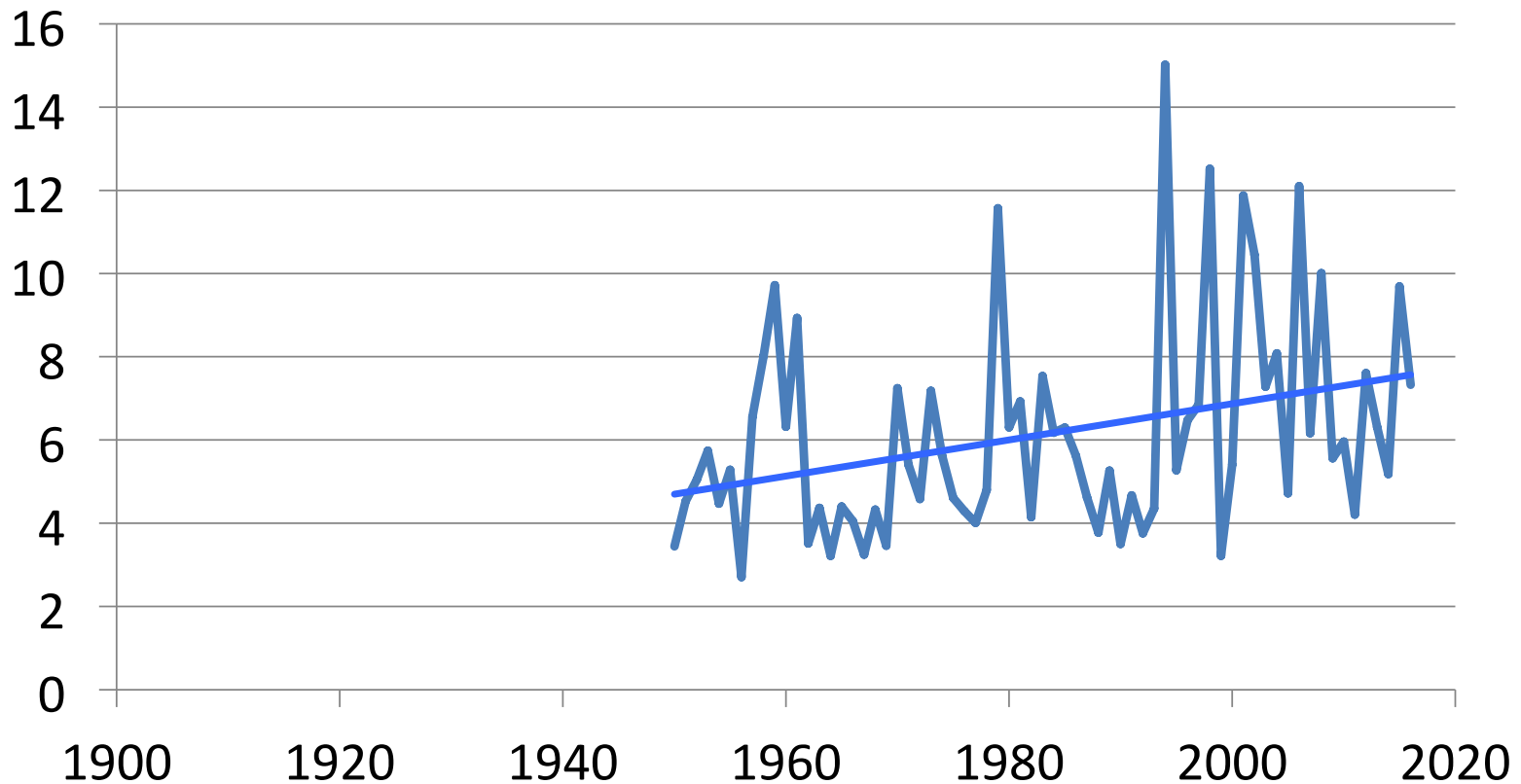


Historic analyses: Applied Weather Associates; US Army Corps of Engineers  
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## Yearly Odds of a Two-Day 8" Event at Any Long-Term Harris County Station

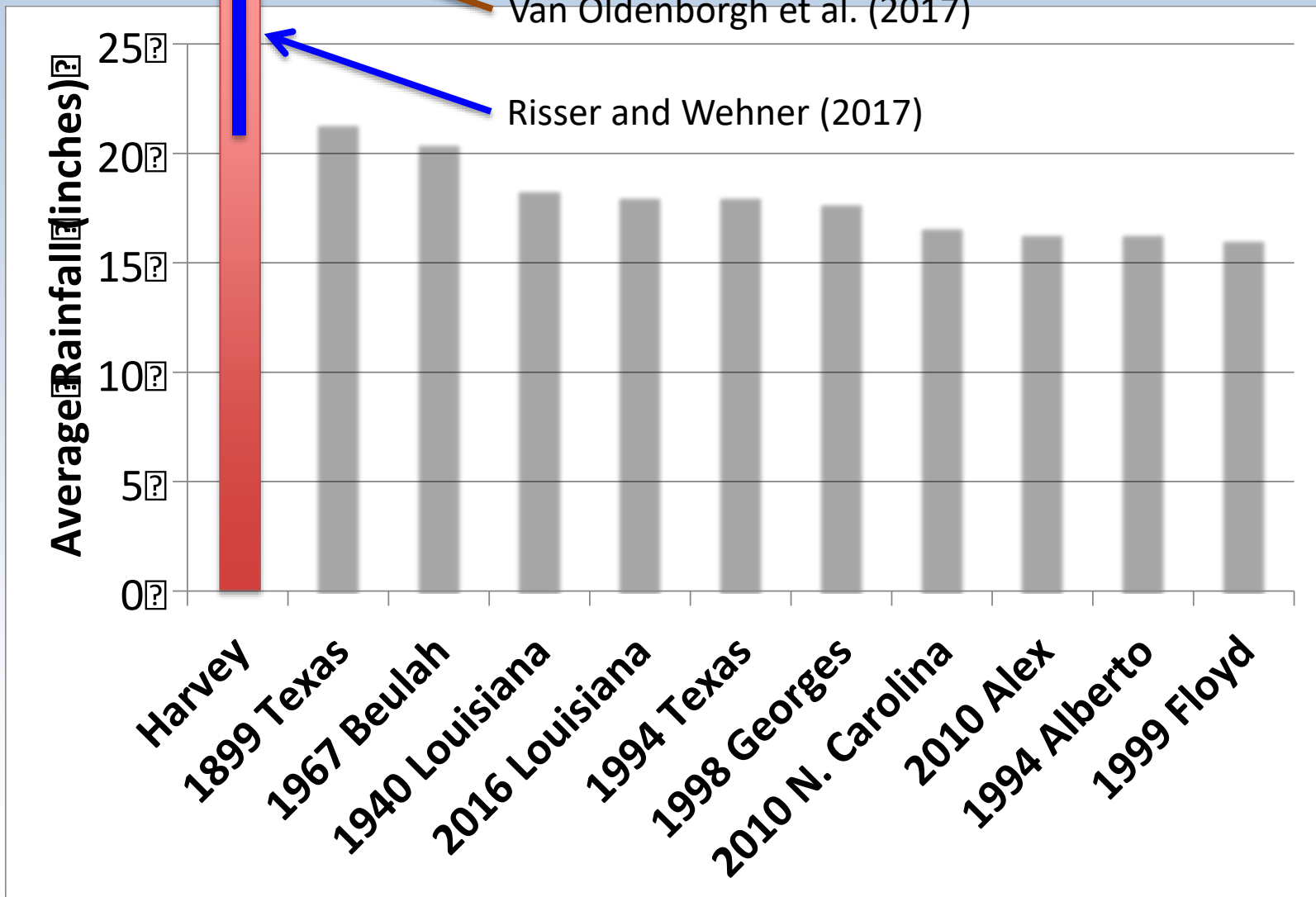


# Average Annual Maximum 7-Day Precipitation (inches), SE Texas



# Gr... US Storms: 5 days, 10,000 sq mi

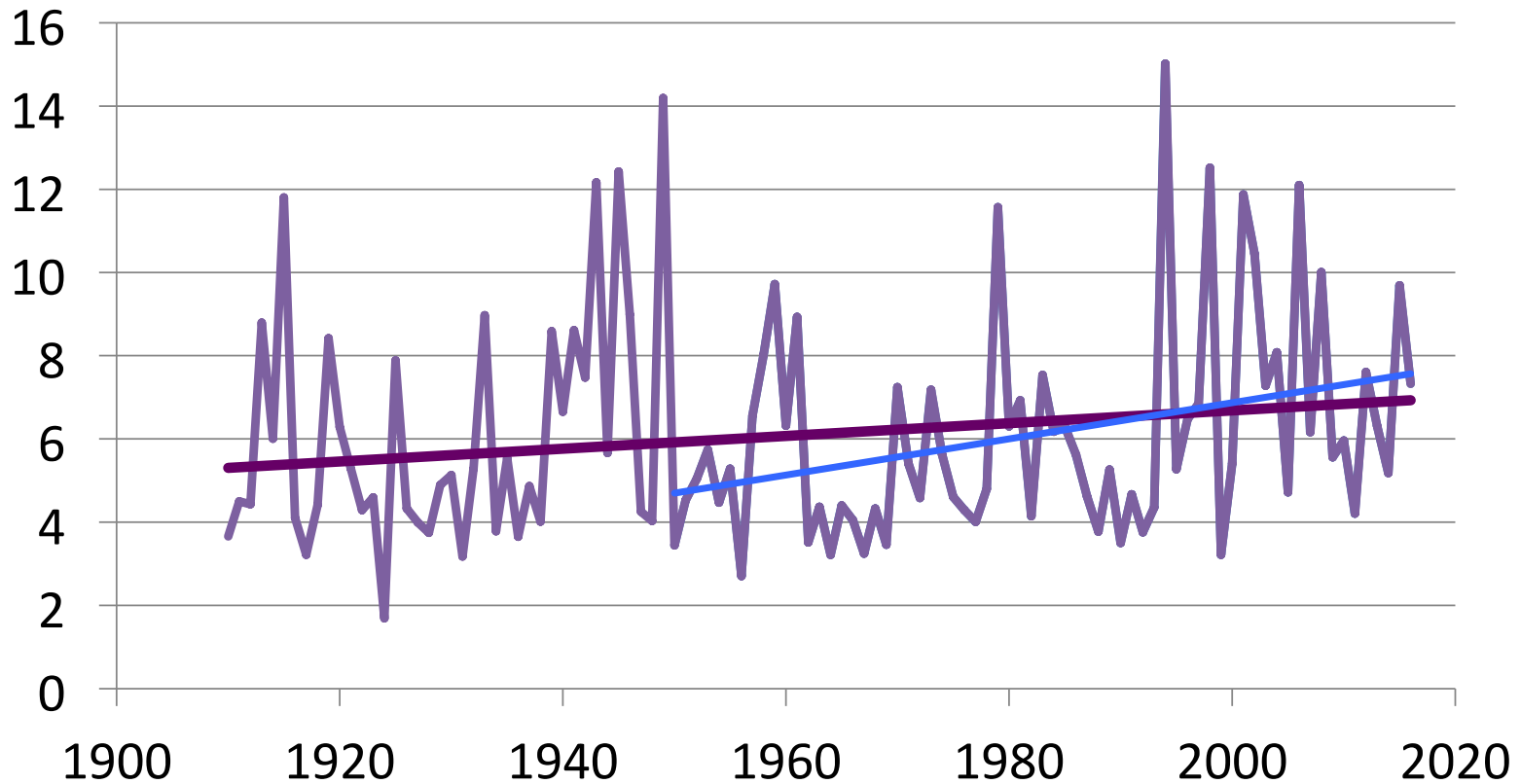
33.28"



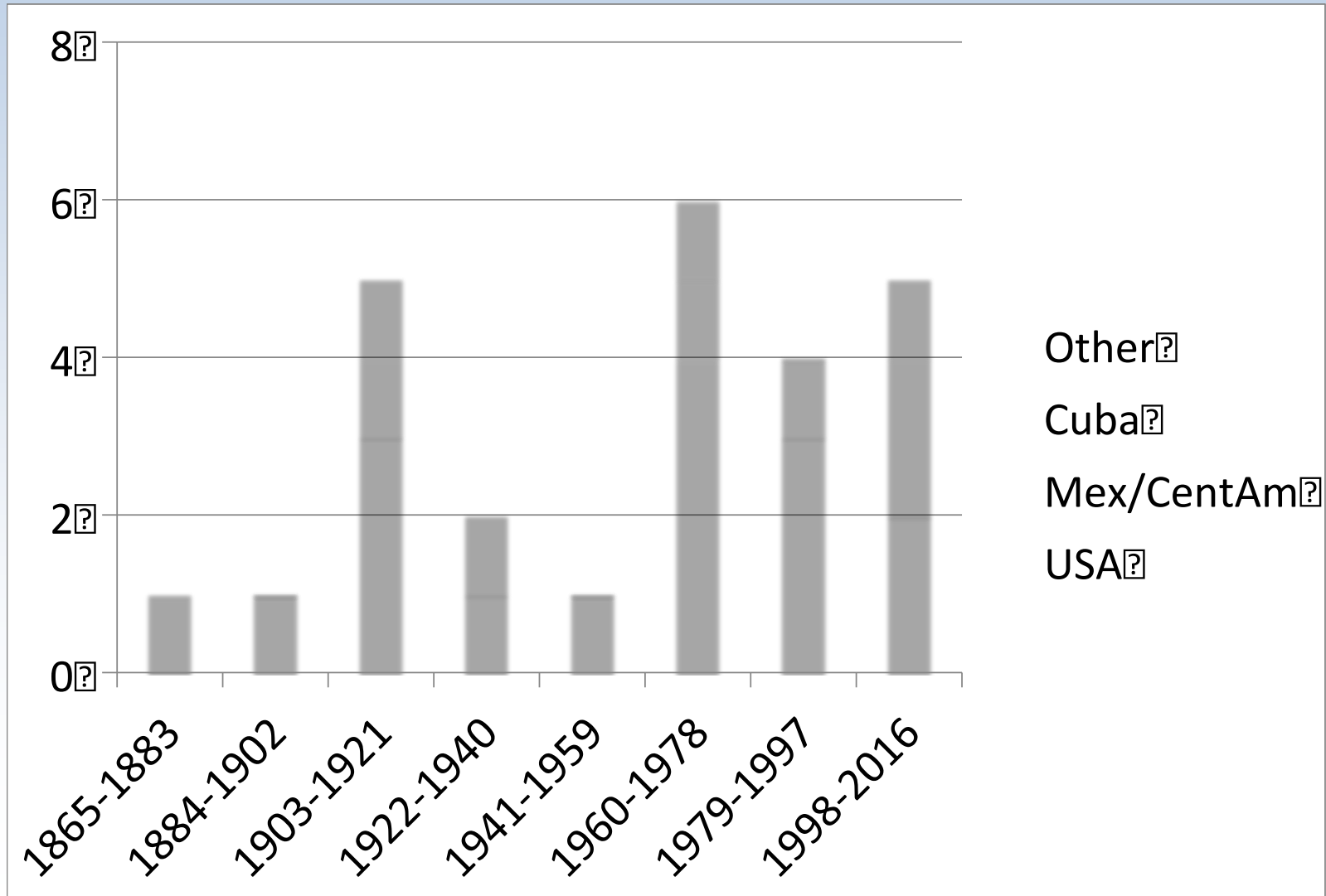
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# Average Annual Maximum 7-Day Precipitation (inches), SE Texas



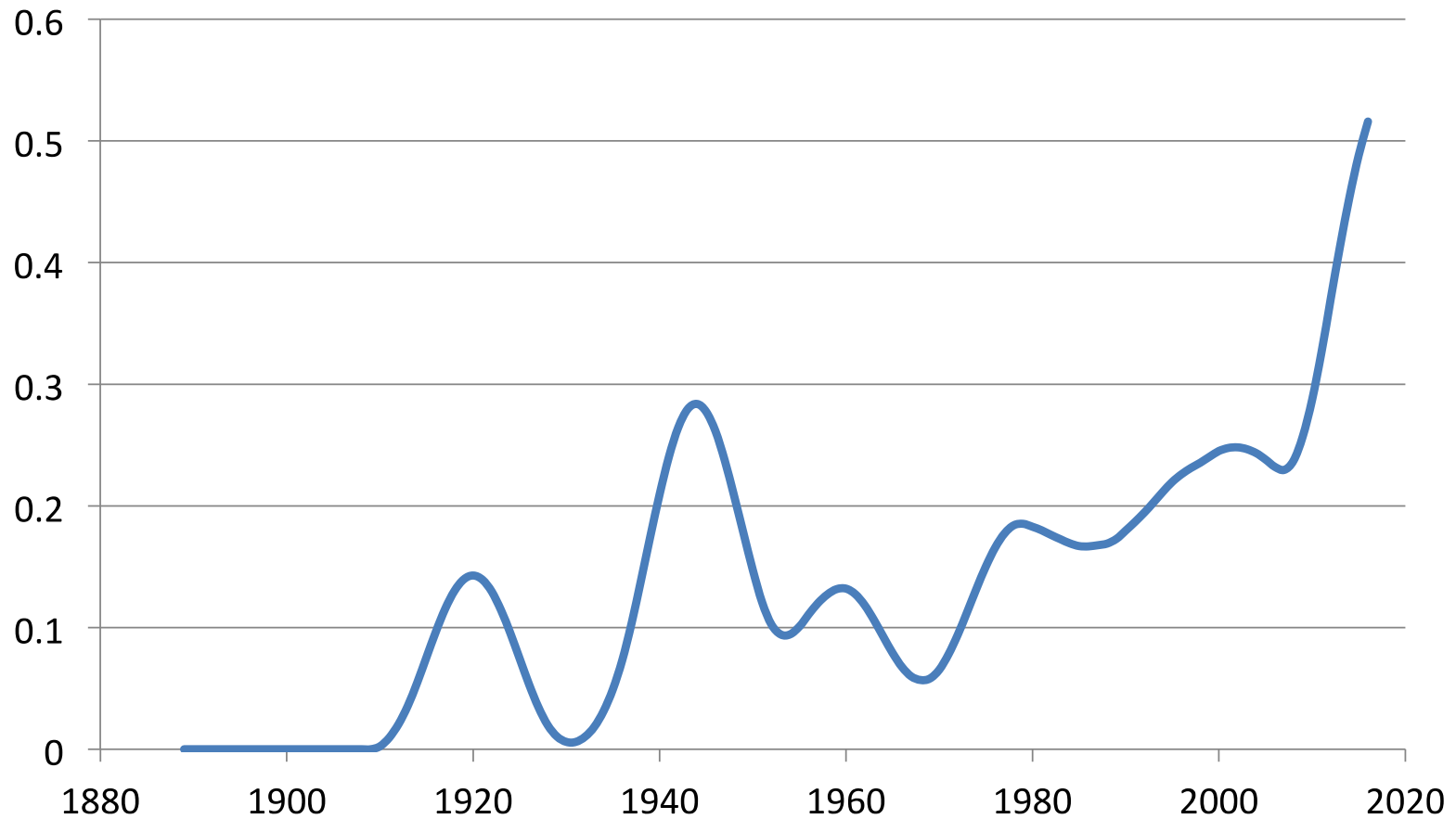
# Number of Coastal Stalls: 100 km inland to 50 km offshore



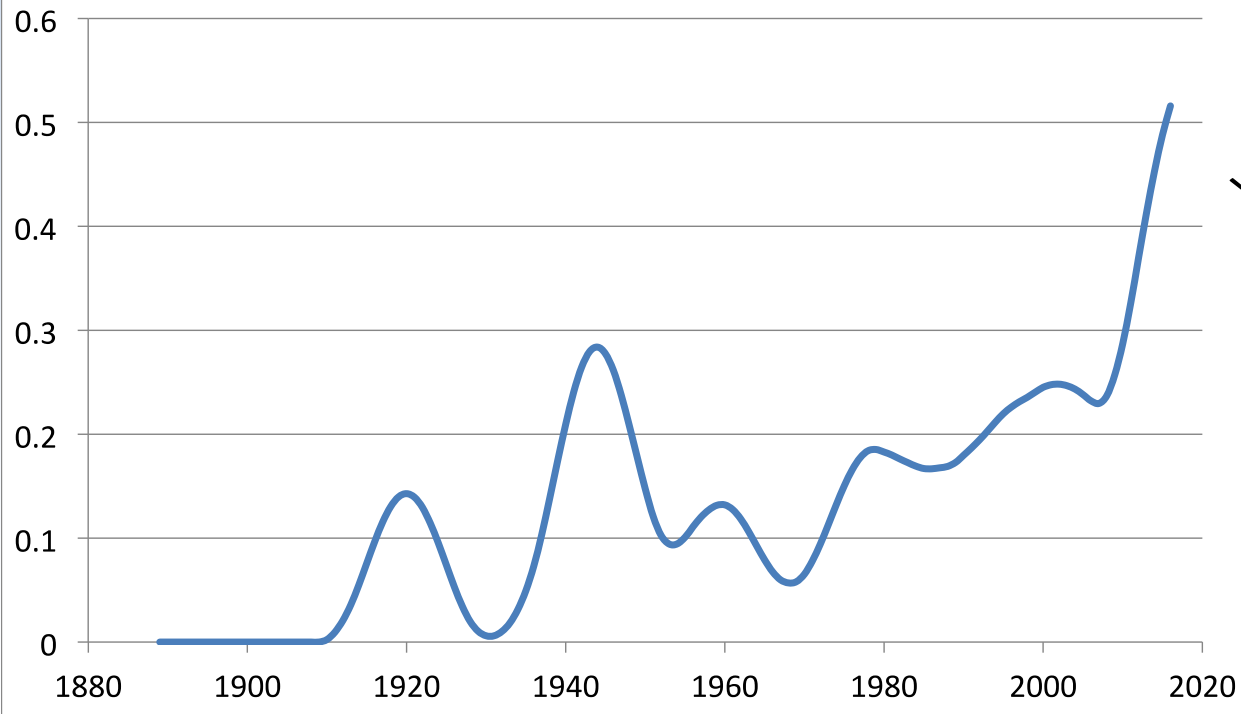
# Messages

- Odds of Harvey-like rainfall have increased
  - And will continue to increase
  - Factor of  $\sim 3$  per  $^{\circ}\text{C}$  global warming
  - 15% more heavy rain per  $^{\circ}\text{C}$  global warming
- Odds of a stalled hurricane may have increased
- Houston has experienced outsized trends

## Yearly Odds of a Two-Day 8" Event at Any Long-Term Harris County Station

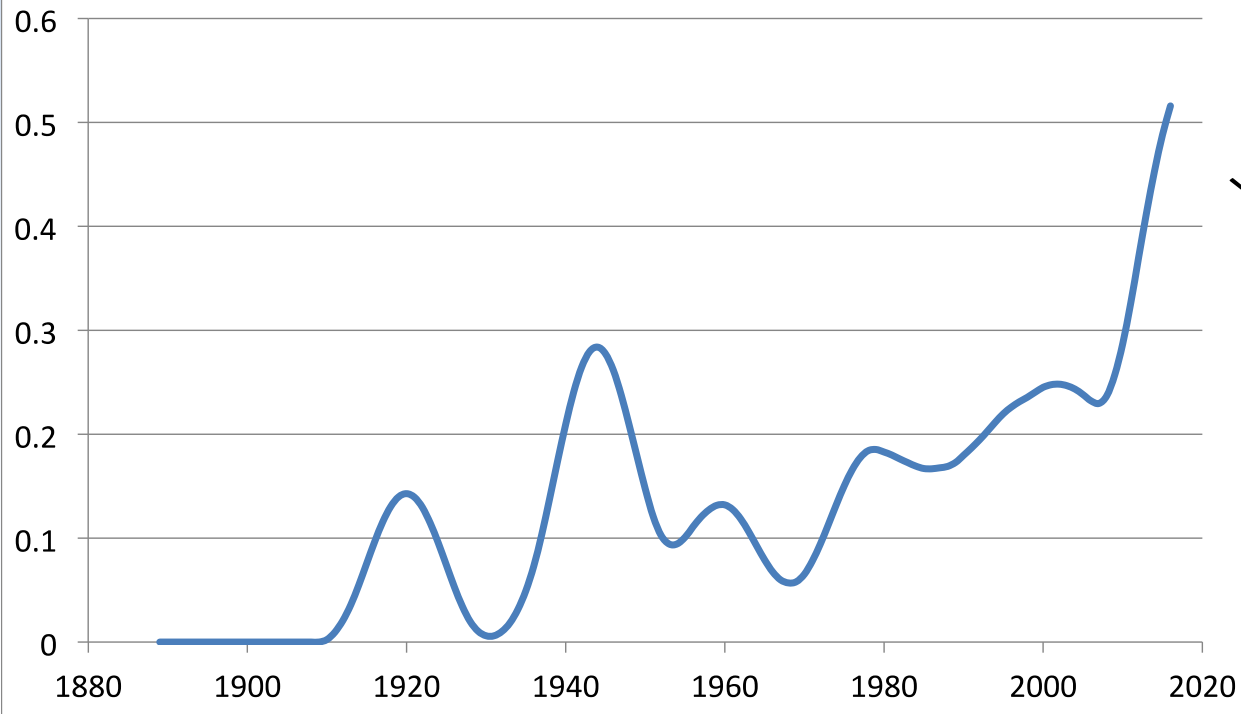


### Yearly Odds of a Two-Day 8" Event at Any Long-Term Harris County Station



*What Houstonians think*

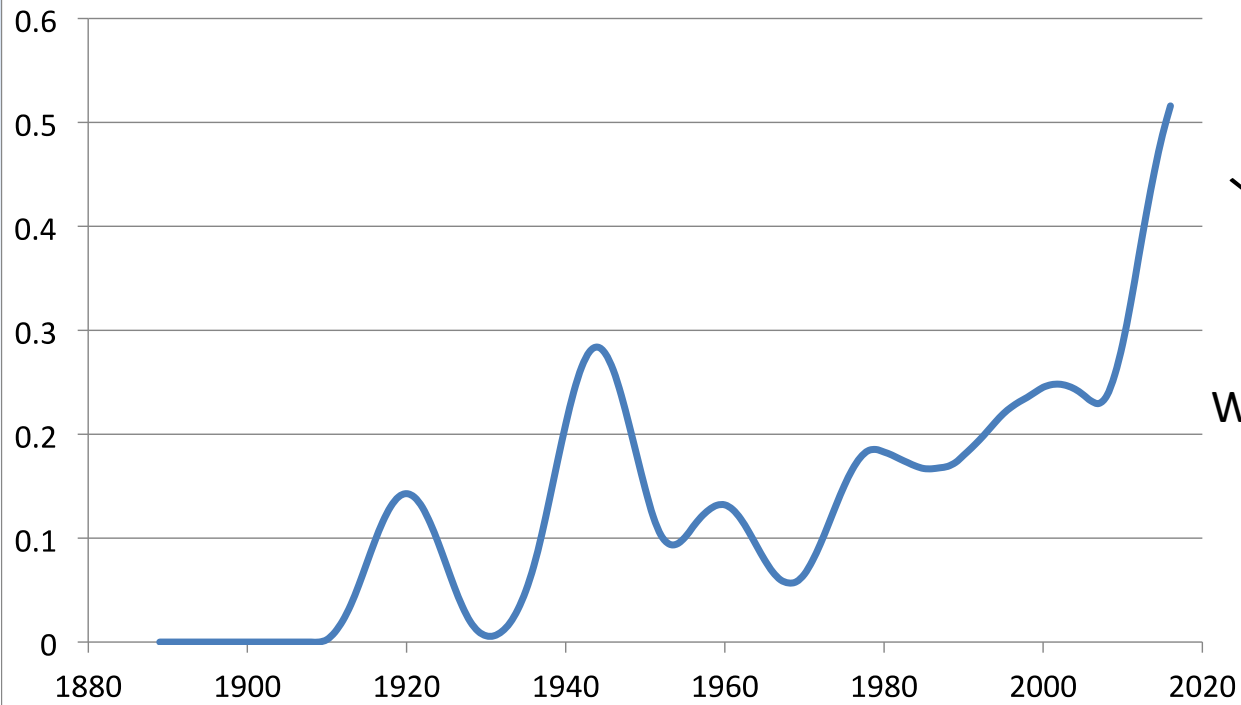
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*What Houstonians think*

*What Houstonians who didn't flood think*

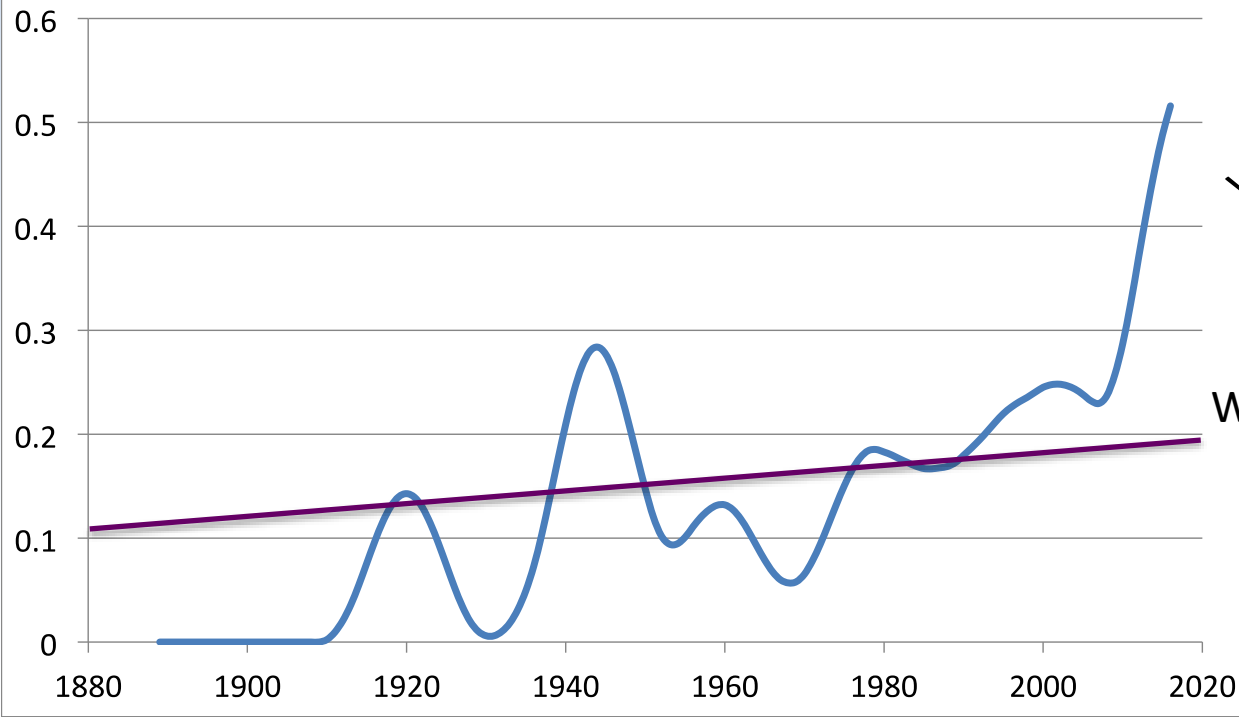
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What Houstonians think

What engineers think  
What Houstonians  
who didn't flood think

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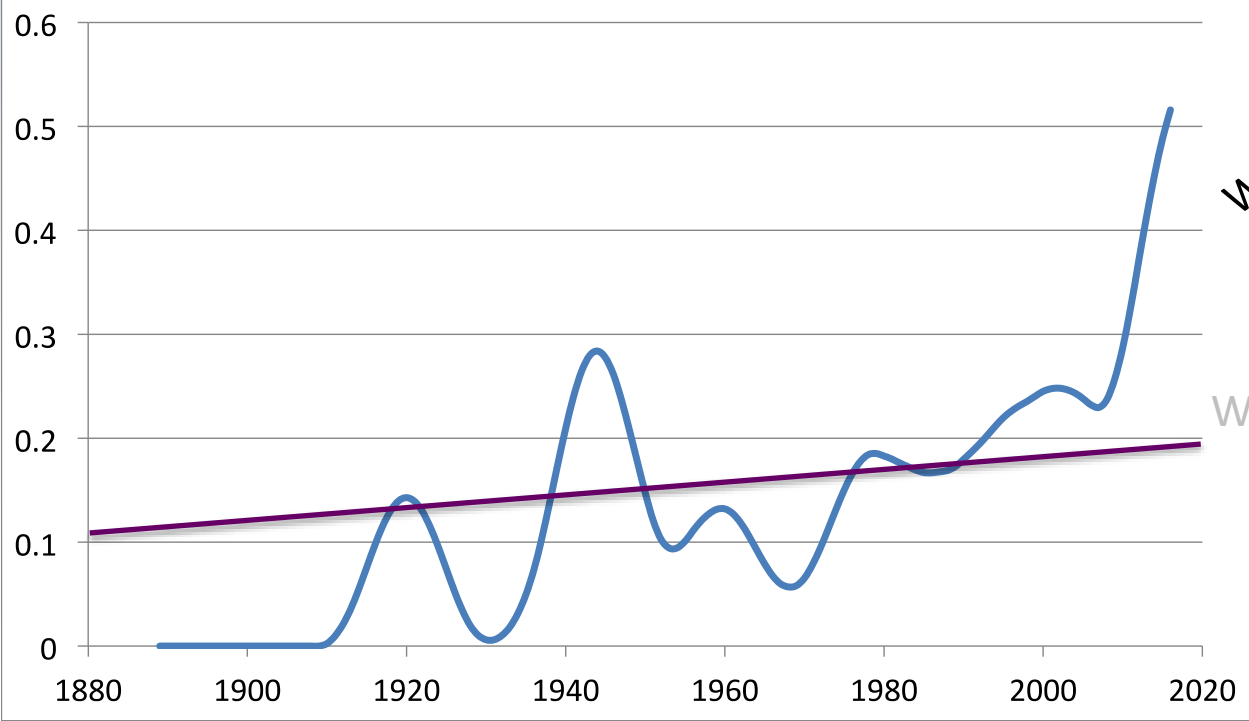


What Houstonians think

What engineers think  
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## Yearly Odds of a Two-Day 8" Event at Any Long-Term Harris County Station



What Houstonians think

What I think  
What engineers think  
What Houstonians who didn't flood think

# More Messages

- Many of you are overestimating present-day flood risk
- With the climate changing, that's a good thing
- But...Harvey was not the worst-case scenario

# Contact Information

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- <http://climatexas.tamu.edu>