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The NOAA Atlas 14 Update and What it Means for Houston, Texas

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NOAA Atlas 14: What is it?

The United States (U.S.) National Oceanic Atmospheric Administration (NOAA) Atlas 14 is a Precipitation-Frequency Atlas covering the United States. NOAA's Atlas 14 Update (Perica et al. 2018) provides a suite of location-based estimates for precipitation-depth duration frequency (PDDF) values for storms of various sizes (e.g. rainfall depth), duration, and frequency (e.g. 2-year, 100-year, and 500-year storm events, etc.). The NOAA Atlas 14 Update is publicly available at https://hdsc.nws.noaa.gov/hdsc/pfds/index.html. From there, data users can identify a location of interest to derive NOAA's updated PDDF values. Estimates and their confidence intervals can be displayed directly as tables or graphs via separate tabs.

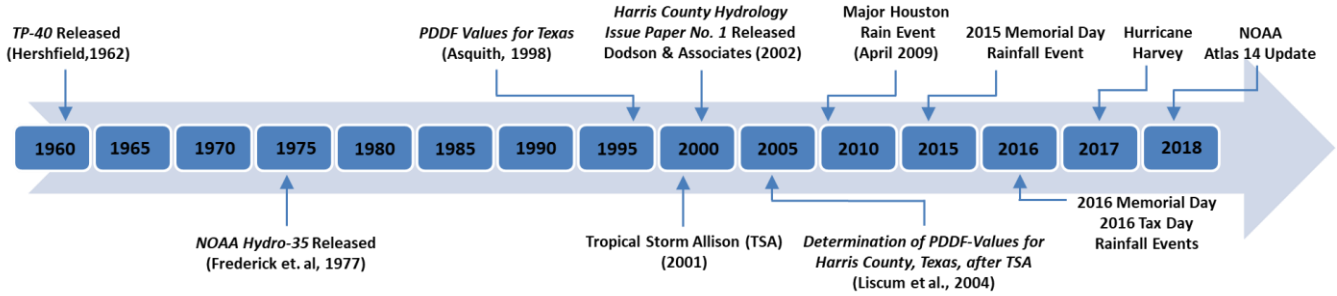

Figure 1. Timeline of past analyses applicable to Harris County and notable rainfall events. (adapted from Torres 2014).

NOAA Atlas 14: What changed?

The NOAA Atlas 14 (Volume 11 [Texas region]) includes comprehensive updates to previously published PDDF values. These estimates supersede NOAA's Hydro-35 (Frederick 1977), TP-49 (Miller 1964), and TP-40 (Hershfield 1961) reports. Rainfall exceedance values are not typically updated with great frequency and the values themselves are only as good as the datasets from which they are based. **Figure 1** shows a general timeline of rainfall frequency updates and notable storms that have occurred in the process. No major updates to rainfall frequency values have been adopted since 1998 from the U.S. Geological Survey (USGS) (Asquith 1998). NOAA's last major update of rainfall frequency estimates date back to 1977 with the Hydro-35 (Frederick et al. 1977). Through a combination of manual and automated data analysis, LAN extracted PDDF datasets for the full State of Texas and conducted spatial interpolations from point estimates. These spatial interpolations of PDDF values are illustrated in **Figure 2** for the 100-year storm event and 24-hour duration. Currently adopted 100-year/24-hour estimates for Harris County range from 12.4 to 13.5 inches. The updated NOAA 100-year/24-hour rainfall estimates within the Harris County region range from 16 to 18 inches. **Figure 2(c)** plots spatial differences comparing previously accepted statewide PDDF estimates and the NOAA Atlas 14 update. Noticeable increases are noted for the Houston-Galveston region between previously published PDDF values and the NOAA Atlas 14 Update, ranging between four and five inches.

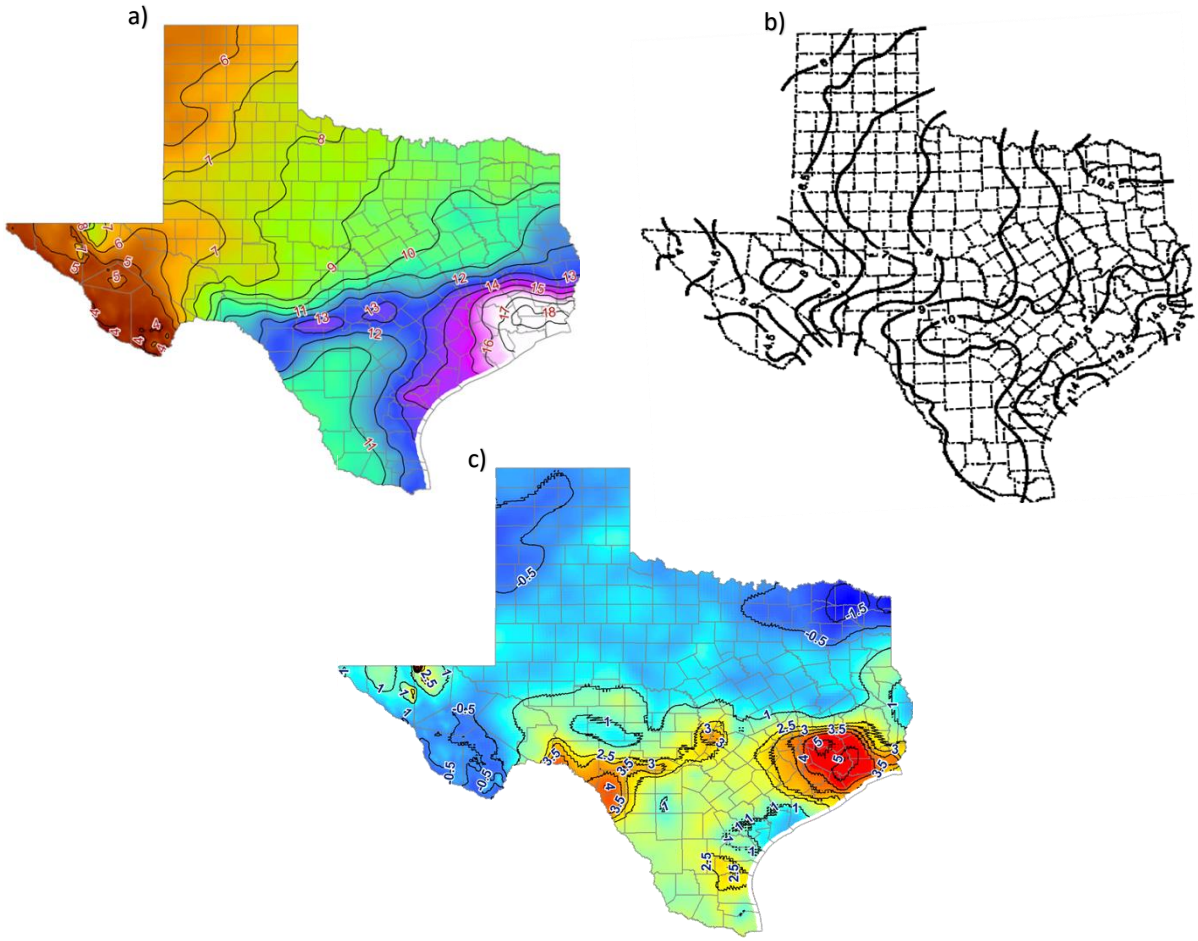

Figure 2. NOAA ATLAS 14 Update for Texas (a) 100-Year/24 Hour Average Annual Maximum Series Date-Duration Rainfall Frequency, (b) USGS 2004, and (c) delta difference between both. (Values are UNOFFICIAL), (Figures Courtesy of LAN).

NOAA Atlas 14: Why is this important?

The frequency of heavy storm events in the last three years have raised public concerns in the Houston area over the validity of adopted 100-year rainfall estimates and other storm return periods (i.e. 500-year, 50-year, 10-year, etc.). NOAA Atlas 14 comes at a critical moment for Houstonians, as the statistical updates to annual exceedance rainfall depths were long overdue. *So what does this mean?* An approximate 5-inch increase to the 100-year rainfall is a pivotal shift towards long-term flood risk mitigation. The increased 100-year rainfall will soon become officially adopted into current land development criteria and design standards. If the 100-year storm event is to remain the level of risk acceptance for policy, land use regulations, and drainage infrastructure design; then an increase in the 100-year storm magnitude will have commensurate effects on increased flood risk. Policy makers and engineers will abide accordingly to these new standards. On the "average," Houstonians can expect new floodplains to widen in a manner commensurate with increased 100-year rainfall depths; new detention basins are expected to get bigger if they are sized to contain the 100-storm; and storm sewer pipes will get larger to convey more runoff. This will inherently affect communities' flood risk perception. Costs for drainage projects will go up, but presumably in a way that more closely aligns with effective flood mitigation against storm events in the recent past. It is worth noting – particularly in

highly urbanized environments with relatively flat topography – that drainage infrastructure sized for the 100-year storm are ill-equipped to handle storms of more extreme exceedance (e.g. 250-year, 500-year, etc.). Hurricane Harvey was "off the charts," and has highlighted the need for policy makers and engineers to more effectively communicate the nature of flood risks to the community.

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