

HYDROMETEOROLOGICAL DESIGN STUDIES CENTER QUARTERLY PROGRESS REPORT

1 April 2013 to 30 June 2013

Office of Hydrologic Development
National Weather Service
National Oceanic and Atmospheric Administration
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DISCLAIMER

The data and information presented in this report are provided only to demonstrate current progress on the various tasks associated with these projects. Values presented herein are NOT intended for any other use beyond the scope of this progress report. Anyone using any data or information presented in this report for any other purpose does so at their own risk.

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I. INTRODUCTION

The Hydrometeorological Design Studies Center (HDSC) within the Office of Hydrologic Development of National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) is updating precipitation frequency estimates for various parts of the United States and affiliated territories. Updated precipitation frequency estimates for durations from 5 minutes to 60 days and average recurrence intervals between 1- and 1,000-years, accompanied by additional relevant information (e.g., 95% confidence limits, temporal distributions, seasonality) are published in NOAA Atlas 14.

NOAA Atlas 14 is divided into volumes based on geographic sections of the country and affiliated territories. Figure 1 shows the states or territories associated with each of the Volumes 1 to 9 of the Atlas. Estimates for the following northeastern states: Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont are also shown and will be published in 2015 as Volume 10. NOAA Atlas 14 is a web-based document available through the Precipitation Frequency Data Server (PFDS; <http://hdsc.nws.noaa.gov/hdsc/pfds/index.html>).

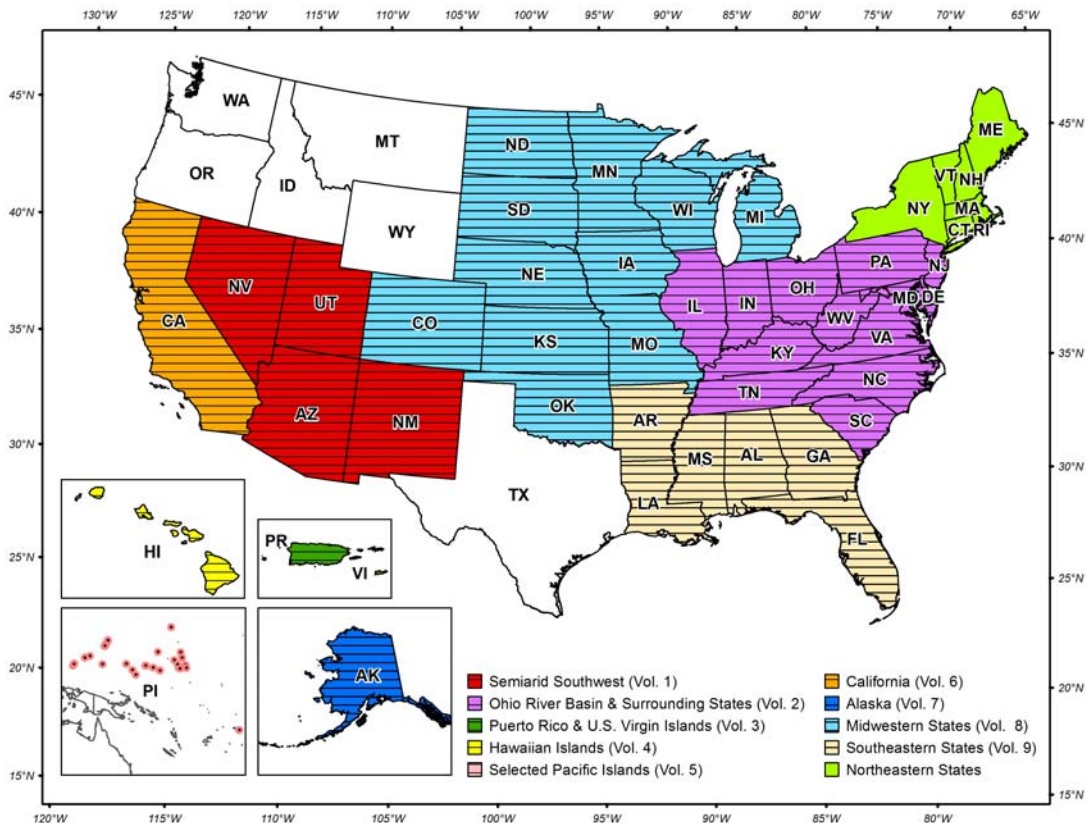


Figure 1. Project area for the northeastern states and project areas published in NOAA Atlas 14, Volumes 1-9.

II. CURRENT PROJECTS

1. PRECIPITATION FREQUENCY PROJECTS FOR THE MIDWESTERN AND SOUTHEASTERN STATES

1.1. PROGRESS IN THIS REPORTING PERIOD (Apr - Jun 2013)

The release of the documentation for NOAA Atlas 14 Volumes 8 & 9 discussed below marks the completion of the Midwestern and Southeastern states projects.

1.1.1. Publication announcement

Documentation describing the station metadata, data, and project methodology used to update precipitation frequency estimates for the Midwestern States and Southeastern States as NOAA Atlas 14 Volumes 8 and 9, respectively, was released on June 28th, 2013.

The documentation and precipitation frequency estimates, along with the time series data used to compute the estimates, are available through our Precipitation Frequency Data Server at <http://hdsc.nws.noaa.gov/hdsc/pfds/>. Volume 8 covers the states of Colorado, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Wisconsin. Volume 9 covers the states of Alabama, Arkansas, Florida, Georgia, Louisiana and Mississippi.

As with other NOAA Atlas 14 Volumes, the documentation not only includes a description of the methodology, but also a comparison with previous NWS precipitation frequency publications and an appendix of all comments from the peer review of preliminary estimates along with HDSC responses.

2. PRECIPITATION FREQUENCY PROJECT FOR THE NORTHEASTERN STATES

2.1. PROGRESS IN THIS REPORTING PERIOD (Apr - Jun 2013)

The project area includes the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont and an approximately 1-degree buffer around these states (Figure 2).

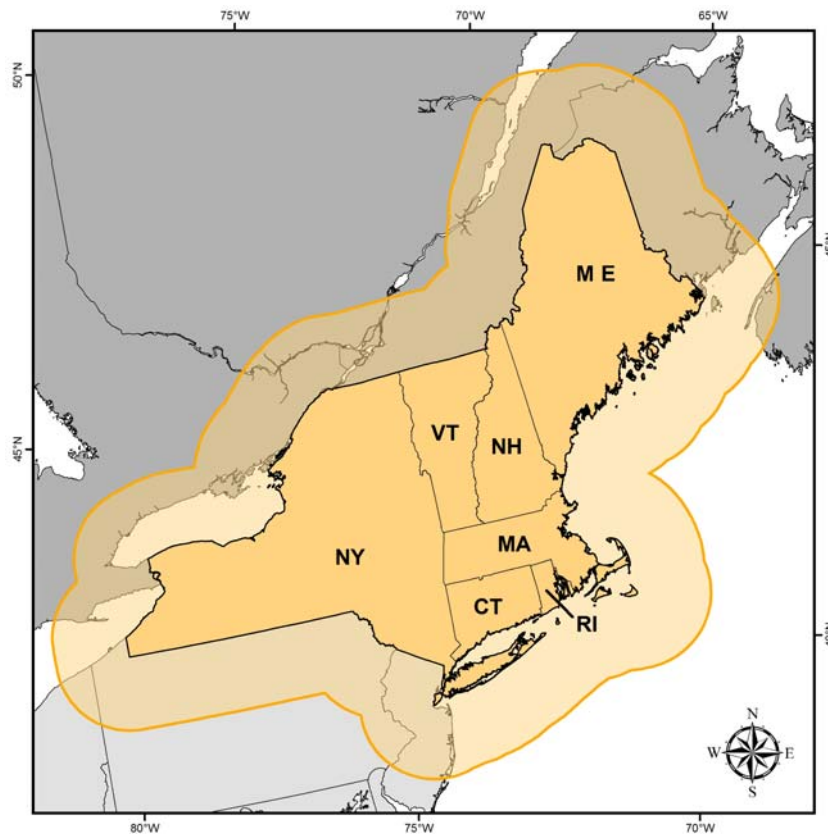


Figure 2. Northeastern precipitation frequency project area (shown in orange).

2.1.1. Data collection and formatting

During this reporting period, five datasets were investigated as potentially providing additional data for use in the project and one new dataset, from Boston Water and Sewer Commission was obtained. However, three of the datasets did not have data suitable for precipitation frequency analysis due to short records or data quality concerns. We also completed downloading the RAWs data. Lastly, we are digitizing data from PDFs of forms sent to us from the Massachusetts Department of Conservation and Recreation for stations with long records and/or in areas where data coverage is needed.

Three datasets were formatted during this quarter. Table 1 has been updated and shows the current status of the data collected thus far. If you know about other data we could use, please contact us at HDSC.Questions@noaa.gov.

Table 1. Sources of data for the precipitation frequency analysis for the Northeast states. Datasets in grey were investigated but will not be used for various reasons.

| Source | Reporting interval | Preliminary number of stations | Status |
|------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------|-----------------------------------------------------------------|
| Automated Surface Observing Systems (ASOS) | 1-minute | 42 | Formatted. |
| Colorado Climate Center: Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) | 1-day | 2,637 | Formatted (however, many only have a few years). |
| Boston Water and Sewer Commission | 5-minute 15-minute 1-hour | 6 | Received via email. |
| Environment Canada | 1-day 1-hour | 2,980 536 | Formatted. |
| Illinois State Water Survey: National Atmospheric Deposition Program (NADP) dataset | 1-day | 62 | Formatted. |
| Massachusetts Department of Conservation and Recreation (DCR) | 1-day | 176 | Received on CD. |
| Mid-Atlantic River Forecast Center: Integrated Flood Observing and Warning System (IFLOWS) data | varies | TBD | Formatted to 1-hour and 1-day. |
| Midwestern Region Climate Center (MRCC): 19th Century Forts and Voluntary Observers Database | 1-day | 63 | Formatted. |
| Mount Washington Observatory | 1-hour 1-day | 1 | Sent inquiry. |
| National Climatic Data Center (NCDC) | 1-day 1-hour 15-minute n-minute | 3,001 593 517 43 | Formatted. |
| National Environmental Satellite, Data, and Information Service (NESDIS): U.S. Climate Reference Network (USCRN) | 1-day 1-hour | 11 11 | Formatted. |
| National Resources Conservation Service (NRCS): Soil Climate Analysis Network (SCAN) | 1-hour 1-day | 6 6 | Downloaded from website. |
| U.S. Department of Agriculture: Agricultural Research Service (ARS) | variable | 23 | Downloaded from website; working to ascertain station metadata. |
| U.S. Forest Service: Remote Automated Weather Stations (RAWS) dataset | 1-hour | 40 | Downloaded and formatted. |
| USGS Maine Water Science Center | 1-day 15-minute | 16 n/a | Formatted. |
| USGS Massachusetts-Rhode Island Water Science Center | 1-day hourly 15-minute | 5 1 16 | Formatted. |
| USGS New Hampshire-Vermont Water Science Center | 1-day 15-minute | 6 n/a | Formatted. |
| USGS New York Water Science Center | 1-day | 1 | Formatted. |
| Connecticut ALERT Network/ Automated Flood Warning Systems (AFWS) | variable | n/a | Network discontinued; no suitable archived dataset available. |
| Cornell University: Network for Environment and Weather Applications (NEWA) | 1-hour | n/a | Data have short records and limited quality assurance. |
| Global Summary of the Day (NCDC) | 1-day | n/a | Data are duplicate of NCDC and Environment Canada data. |
| Northeast States for Coordinated Air Use Management (NESCAUM): CAMNET | 15-minute | n/a | Only one unique site with short record. |
| Northeast Regional Climate Center (NRCC): CLimate Information for Management and Operational Decisions (CLIMOD) | 1-day | n/a | Data are duplicate of NCDC. |

| Source | Reporting interval | Preliminary number of stations | Status |
|--------------------------------------------------------------------------------|--------------------|--------------------------------|--------------------------------------------|
| Rhode Island Department of Environmental Management, Office of Water Resources | 1-hour | 1 | Record is too short for use in analysis. |
| U.S. Army Corps of Engineers | 1-hour | n/a | No suitable dataset available. |
| U.S. Geological Survey (USGS) Connecticut Water Science Center | 15-minute | n/a | Downloaded but only three years available. |

2.1.2. Data quality control

We began screening NCDC station metadata, which make up the majority of the data for the project, for errors. First, stations with potential errors were identified by reviewing published coordinates and elevations for large changes over the course of the station's lifetime. Final latitudes, longitudes and elevations were adjusted for any identified misplaced station. Second, stations plotting in incorrect states or in water features are currently being resolved. Lastly, stations where their assigned elevations are more than 100 feet different than elevations extracted from a digital elevation model (DEM) are being investigated. Such stations may be re-located based on inspection of satellite images and maps.

2.2. PROJECTED ACTIVITIES FOR THE NEXT REPORTING PERIOD (Jul - Sep 2013)

Data collection and formatting will be completed for all datasets. Quality control of station metadata will be completed. Work to screen co-located station data (to extend records and remove duplicate data) will begin.

2.3. PROJECT SCHEDULE

Data collection, formatting, and initial quality control [June 2013; revised to July 2013]

Extraction of annual maximum series (AMS); additional quality control and data reliability tests (e.g., outliers, trend analysis, independence, consistency across durations, duplicate stations, candidates for merging) [December 2013]

Regionalization and frequency analysis [July 2014]

Initial spatial interpolation of precipitation frequency (PF) estimates and consistency checks across durations [December 2014]

Peer review [December 2014]

Revision of PF estimates [June 2015]

Remaining tasks (e.g., development of precipitation frequency estimates for partial duration series, seasonality, temporal distributions, documentation) [July 2015]

Web publication [September 2015]

3. AREAL REDUCTION FACTORS

3.1. PROGRESS IN THIS REPORTING PERIOD (Apr - Jun 2013)

Areal reduction factors (ARFs) are needed to convert average point precipitation frequency estimates to areal estimates with the same recurrence interval for an area of interest. After an extensive literature review, HDSC has selected three diverse fixed-area ARF methods for further evaluation. Selection was done primarily from the perspective of their potential application to NOAA Atlas 14 precipitation frequency estimates. These methods are described in earlier Quarterly Progress Reports (e.g., see http://www.nws.noaa.gov/oh/hdsc/current-projects/progress/201301_HDSC_PR.pdf).

Due to limited resources and higher priority precipitation frequency projects, during this reporting period, little progress was made on this task. However, work has fully recommenced to evaluate the selected methods.

3.2. PROJECTED ACTIVITIES FOR THE NEXT REPORTING PERIOD (Jul - Sep 2013)

With the recent completion of the precipitation frequency projects for the midwestern and southeastern states, we expect to make significant progress on this task in the next reporting period.

3.3. PROJECT SCHEDULE

It is expected that this project will be completed by the end of 2013.

III. OTHER

1. RECENT MEETINGS AND CONFERENCES

On June 26th, Sanja Perica gave a webinar on NOAA Atlas 14 Volumes 8 & 9 for the Extreme Storms Workgroup of the Advisory Committee on Water Information's Subcommittee on Hydrology at the Nuclear Regulatory Commission in Rockville, Maryland.

2. PERSONNEL

On June 6th, HDSC began hosting a summer student from NOAA's Educational Partnership Program. Pedro Matos-Llavona is a rising Junior at the University of Mayaguez, Puerto Rico. He will be assisting with current HDSC tasks and working on extreme rainfall climatology for Puerto Rico until August 4th.

3. STORM ANALYSIS

HDSC developed maps representing the annual exceedance probabilities of two recent events:

- the worst case 6-hour rainfall from the May 25th, 2013 event in the San Antonio region (Figure 3),
- the worst case 4-hour and 6-hour rainfall from the May 31st to June 1st, 2013 event in the Oklahoma City region (Figure 4),

For the analyses, we considered rainfall for durations 1-hour through 24-hours and determined the duration of the worst case scenario. The time period for the selected duration is not necessarily the same for all locations; as a result, maps do not represent any particular point in time. For the Oklahoma City event, the 6-hour duration showed the lowest exceedance probabilities for the largest area, but it occurred east of the city in less-densely populated areas; so, we also included the 4-hour duration which was the worst case for downtown Oklahoma City.

We used Stage IV gridded data (<http://www.emc.ncep.noaa.gov/mmb/ylin/pccpanl/stage4/>) to estimate rainfall amounts for the events. Rainfall frequency estimates came from the Weather Bureau's Technical Paper 40 (estimates were extrapolated to 200years) for San Antonio and from the recently published NOAA Atlas 14 Volume 8 for Oklahoma City.

The maps are available for download from the following page:

http://www.nws.noaa.gov/oh/hdsc/aep_storm_analysis/.

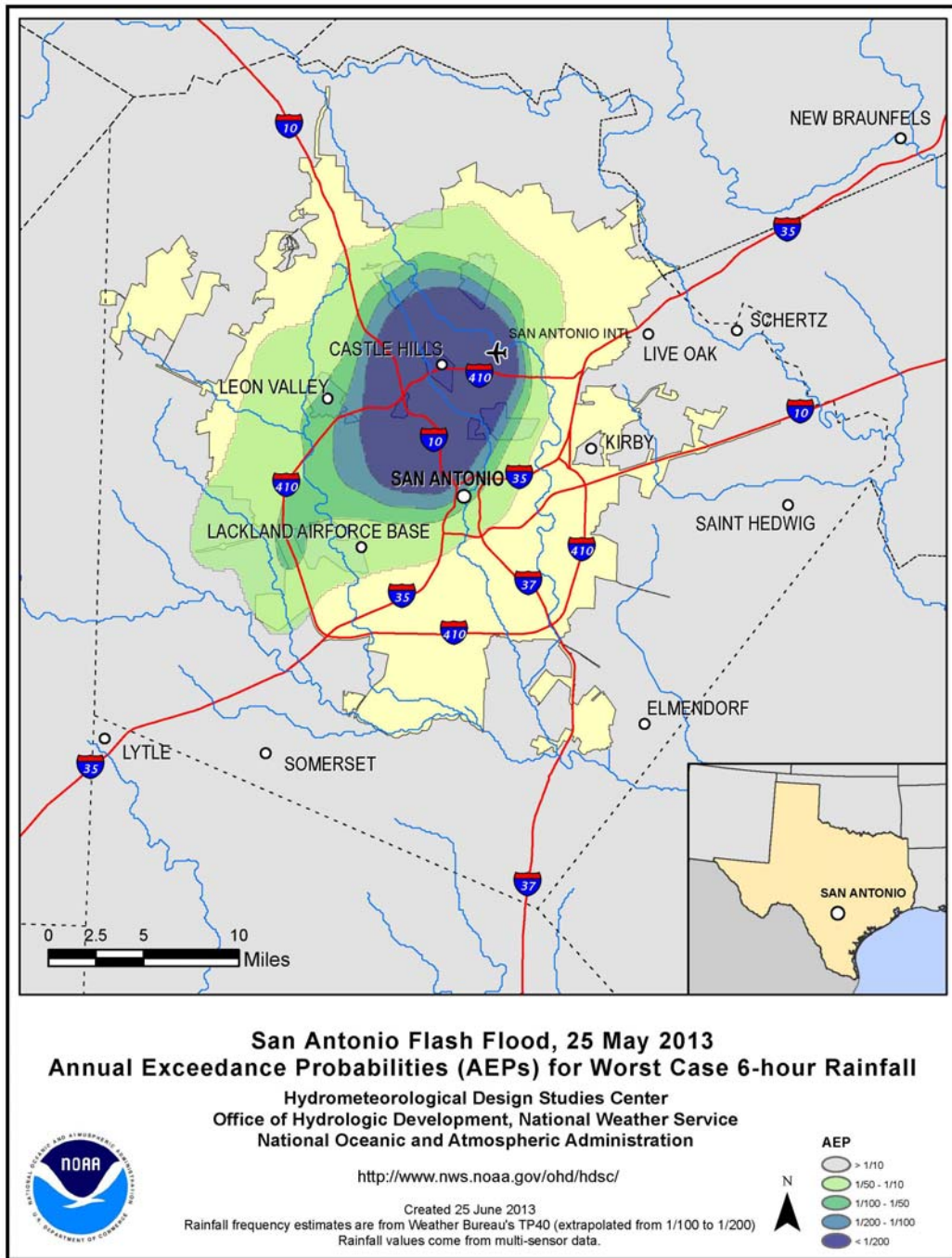


Figure 3. Annual exceedance probabilities for the worst case 6-hour rainfall from the May 25th, 2013 event in the San Antonio region.

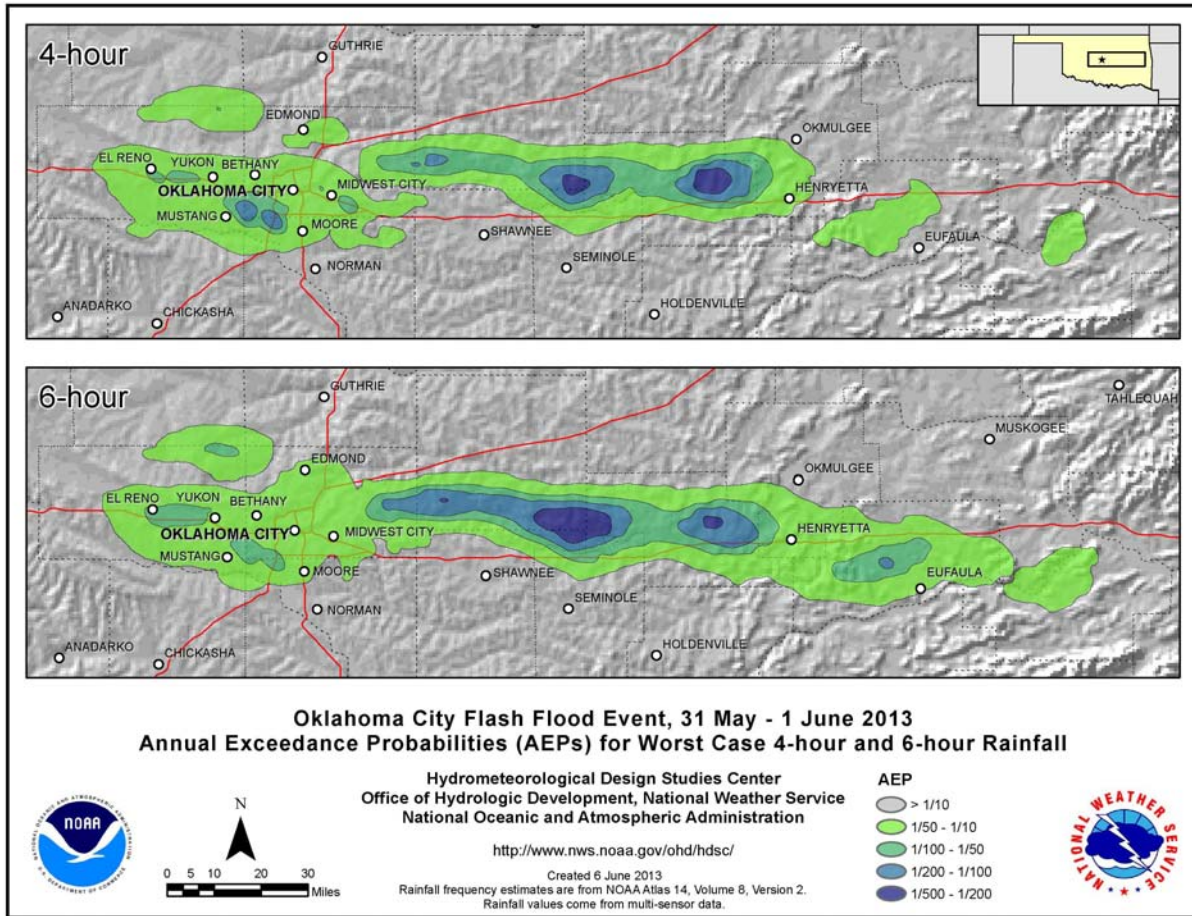


Figure 4. Annual exceedance probabilities for the worst case 4-hour and 6-hour rainfall from the May 31st to June 1st, 2013 event in the Oklahoma City region.