PROJECT TITLE: **Updating Precipitation Intensities for Runoff Estimation and Infrastructure Designs.**

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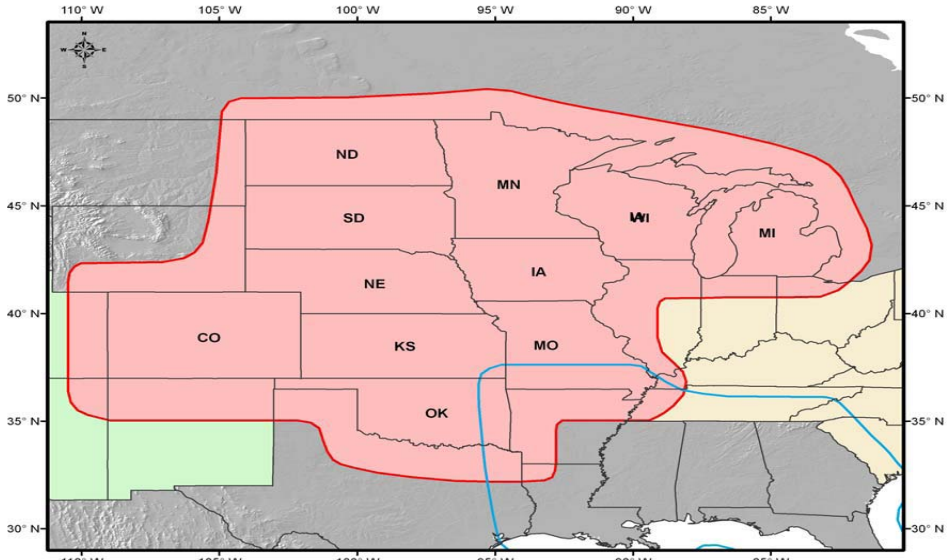
LEGAL CITATION:	M.L. 2008, Chp. 367, Sec 2, Subd. 5(c)
APPROPRIATION AMOUNT:	$100,000

Overall Project Outcome and Results

Checking the daily weather forecast for where and how bad the next storms will be has become a more important part of our daily routines. Recent variable climate (dry periods, intense storms and floods) have brought heightened awareness by farmers, engineers, cities and water managers of rainfall intensity (how fast) and duration (how long). Up to now, available summaries (done in the early 1960's) were based on relatively crude analyses of rainfall data collected through the 1950's. This project has updated precipitation intensities based on the compilation of hundreds of rainfall monitoring locations in and around Minnesota (including our neighboring Canadian and adjacent state partners) with continuous data collected through 2009 via a partnership with the National Oceanic and Atmospheric Administration, National Weather Service (NOAA/NWS). State-of-the-art computer-based statistical procedures have generated summary information and maps with a resolution of 4 km by 4 km (or about 2.5 miles by 2.5 miles). NOAA required one contract with all 11 Midwest states (Minnesota, North Dakota, South Dakota, Wisconsin, Michigan, Iowa, Missouri, Colorado, Nebraska, and Kansas) with pass-through funding via the Pooled Highway Fund. All Environment and Natural Resources Trust Fund dollars were expended by June 30, 2011 with additional funding provided by the Minnesota DOT being used to complete the final work components. This study has generated rainfall frequency estimates for durations from 15 minutes to 60 days and for average recurrence intervals from 1 to 1,000 years along with trend analyses. Final web-based products will be available in early 2012 due to delays associated with reducing huge amounts of data from about ½ of the contiguous United States. The results of this work are required for standard engineering practices associated with runoff routing, flood prevention and safe road & culvert designs - and will become part of our daily forecasts ('today's storm is called a hundred year event').

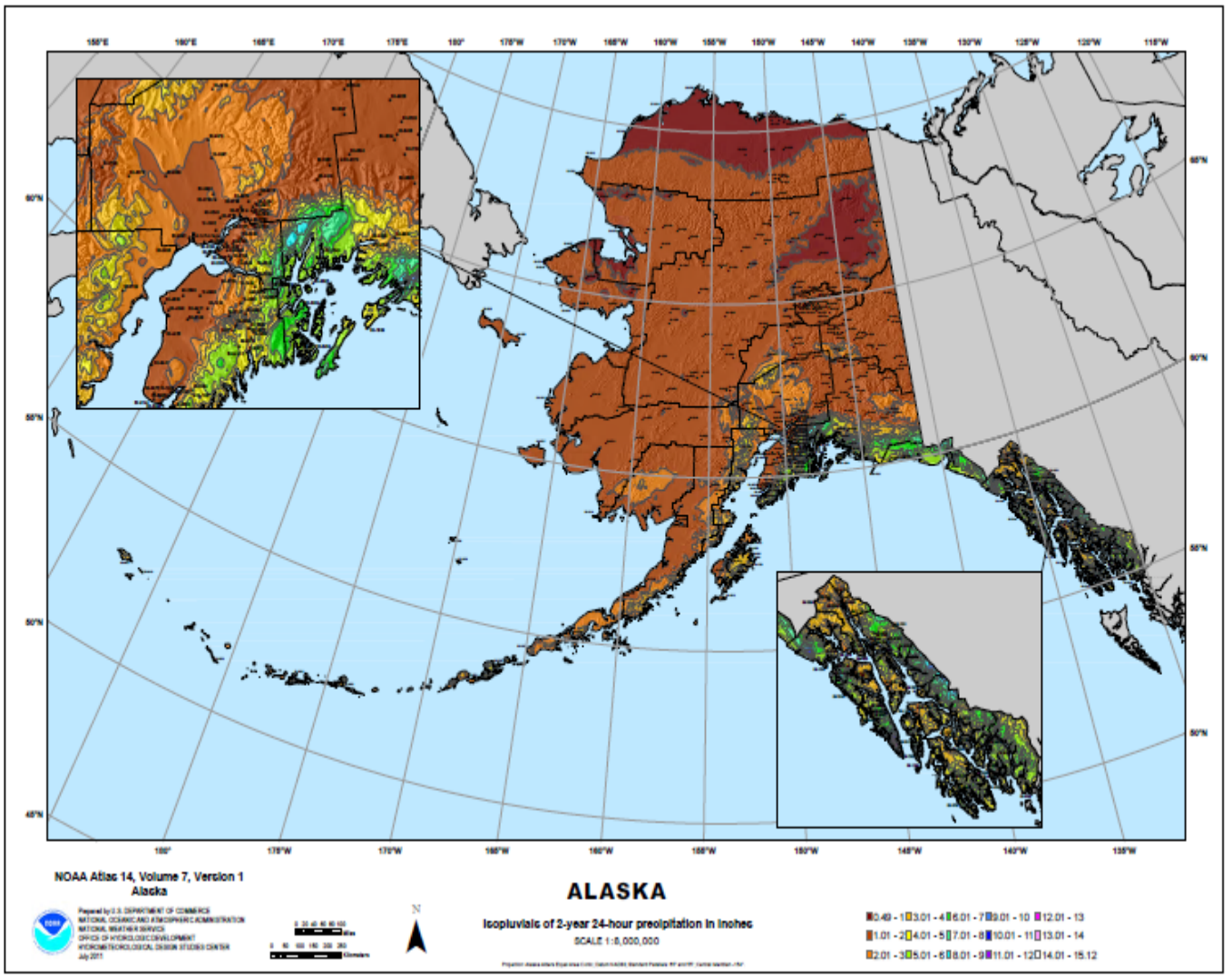


NOAA 14 Midwest Project Area

Project Results Use and Dissemination

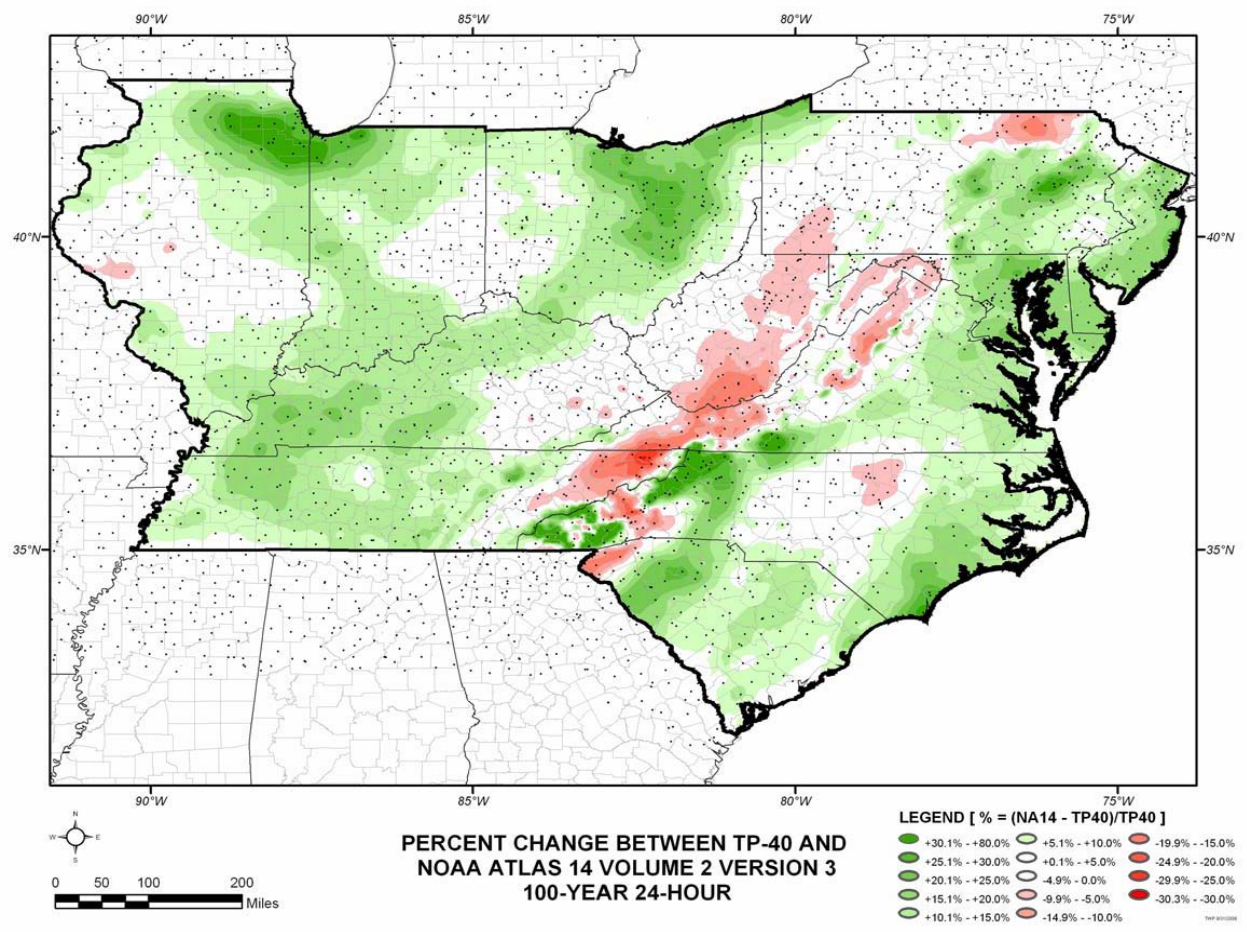
1. Precipitation frequency information is required for standard engineering practices for building new roads, highways, bridges, and developments so as to minimize flooding and for water quality treatment, agricultural and other watershed management purposes.
2. This study has resulted in rainfall frequency estimates from 15 minutes to 60 day durations and for average recurrence intervals from 1 to 1,000 years. Data has been summarized in NOAA's nationally recognized standard engineering tables. New products have been developed for inclusion in GIS formats for a wide variety of computer-based applications and website distribution for watershed management purposes. Regional patterns and comparisons to old TP-40 rainfall frequency data will also be available.
3. Project products will be freely available from the NOAA website http://hdsc.nws.noaa.gov/hdsc/pfds including reports, maps and spatial data with precipitation frequency estimates and downloads of digital files including:
    - point estimates (via a point-and-click interface)
    - ArcInfo© ASCII grids
    - ESRI shapefiles
    - color cartographic maps for each state
    - associated Federal Geographic Data Committee-compliant metadata
    - data series used in the analyses: annual maximum series and partial duration series
    - temporal distributions of heavy precipitation (6-hour, 12-hour, 24-hour and 96-hour)
    - seasonal exceedance graphs: counts of events that exceed the 1 in 2, 5, 10, 25, 50 and 100 annual exceedance probabilities for the 60-minute, 24-hour, 48-hour, and 10-day durations.

State and regional examples from completed NOAA/NWS work for other US areas are included below. State precipitation frequency products. The below graphic depicts considerable variation in intensity in the typical storm that occurs once every 2 years over a 24 hour period across Alaska. In this example, lesser amounts associated with brown colors (e.g. less than 3 inches) with greater amounts shown in green (~ 5 to 9 inches) and yet greater amounts in blue/pink (e.g. 9 to 15 inches).



Example Regional Products. The above product for east-central US depicts the percent change in rainfall between the old TP-40 rainfall intensity data to the new NOAA Atlas 14 for a 100 year, 24 hour storm event with green colors showing increased amounts (up to 30% to 80 % (pocket by Chicago) increase from TP-40 values) and red shades depicting declining amounts (up to ~ 30% declines in the mountain areas from old TP-40 values). Hence, using TP-40 data could result in the use of significantly different

rainfall amounts than current data would suggest, for the design of developments and associated infrastructure.



Summary of Final Deliverables to be Freely Disseminated by Spring 2012:

- Web-based Precipitation Frequency Data Server.
- Precipitation frequency estimates with 90% confidence intervals at rain gage locations for durations of 15, and 30 minutes,1, 2, 3, 6, 12 hours, and 1, 2, 4, 7, 10, 20, 30, 45, and 60 days and average recurrence intervals (return period)) of 1, 2, 5, 10, 25, 50, 100, 200, 500, and 1000 years.
- High resolution grids of average precipitation frequency estimates and 90% confidence intervals for each combination of duration and average recurrence intervals, as specified above. .
- Shapefiles of contours of the gridded estimates of average precipitation frequency estimates and 90% confidence intervals for each combination of durations and average recurrence intervals specified above.
- Meta information in Federal Geographic Data Transfer Standard format.
- Cartographic maps of the estimates with one map for each combination of frequency and duration for the expected value and upper and lower 90%

confidence intervals or equivalent information delivered through an Internet map server.

- Probabilistic temporal distributions for 6, 12, 24 and 48 hour durations in both chart and digital form.
- Peer reviews of initial gridded frequency estimates for 1 and 24 hour durations and for 2-year and 100-year average recurrence intervals.
- Charts of the seasonal distribution of annual maxima.
- Documentation.
- Status reports.
- Final products will be provided on the NOAA/NWS website **www.nws.noaa.gov/ohd/hdsc**