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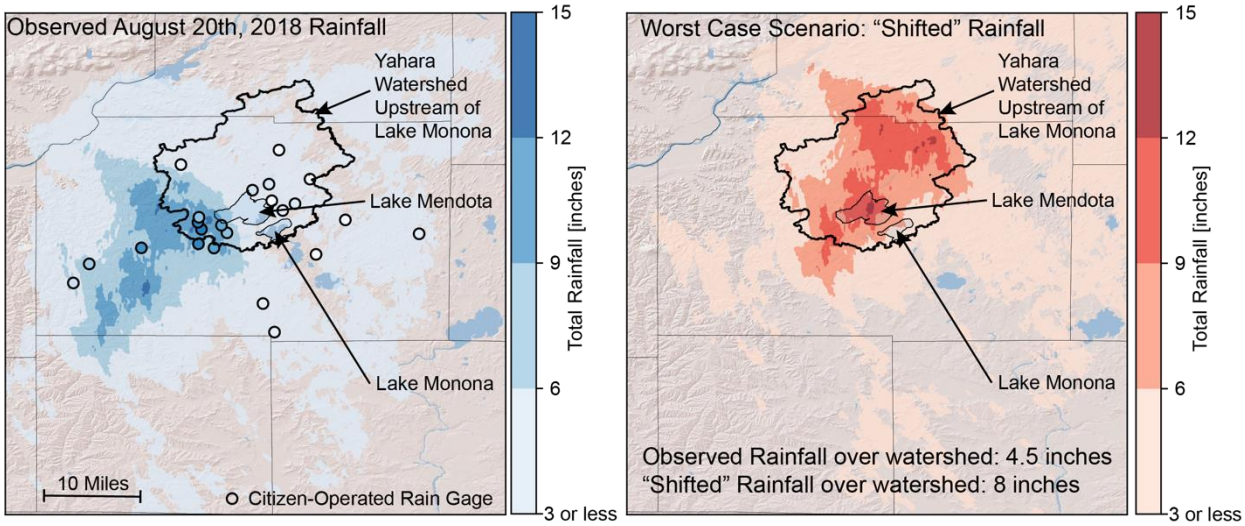
WISCONSIN INITIATIVE ON CLIMATE CHANGE IMPACTS

FACT SHEET—Creating Updated Extreme Rainfall Information using RainyDay

Rainfall values such as the 100-year 24-hour storm published by the National Weather Service are used as inputs to infrastructure design and planning. In Wisconsin, these values are calculated from rainfall records that typically span multiple decades but *do not include data more recent than 2012*. There are growing concerns about those values' neglect of recent storms and a warming climate that is resulting in more heavy rainstorms. As part of the Wisconsin Rainfall Project, the UW-Madison/WICCI research team has created rainfall statistics for present-day conditions using the RainyDay software developed at UW-Madison.

RainyDay uses a technique known as stochastic storm transposition combined with recent weather radar data and rain gage measurements to generate rainfall statistics intended to better reflect recent and current rainfall likelihood and severity. Weather radar provides detailed spatial pictures of extreme storms that were previously unavailable using only sporadic rain gages. Meanwhile, the basic premise of stochastic storm transposition is that a storm that occurred in one location in real life could have hit somewhere else with equal or different probability. Therefore, that storm can be transposed (that is, moved) to help understand how often and how severe storms can be—thus providing estimates of values such as the 100-year storm.



Left—National Weather Service radar and citizen rain gage observations for the August 20, 2018 storm in Dane County and surrounding areas. Right—Transposition of the same storm 15 miles to the northeast, directly over the upper Yahara watershed (upstream of Lake Monona), which is outlined in black. Stochastic storm transposition of hundreds of recent storms is repeated thousands of times by the RainyDay software to evaluate many possible "alternative realities" of extreme rainfall and its likelihood.

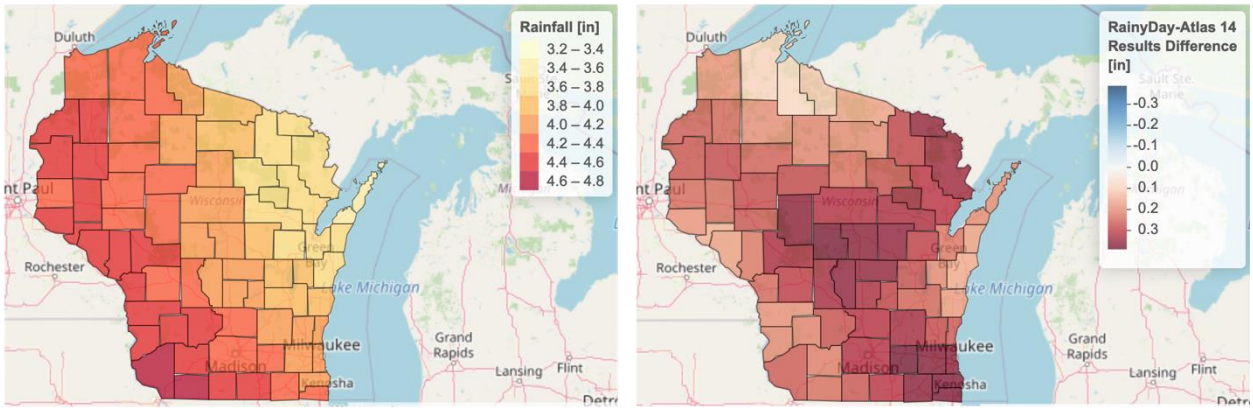
The RainyDay approach has undergone significant scientific peer review. It has also been previously used in work funded by the federal Natural Resources Conservation Service to create updated extreme rainfall statistics for dam safety analyses in Vernon County, Wisconsin, and has been used to study rainfall and flooding throughout the midwestern US and elsewhere.

Summary of Data

- County-level rainfall Intensity–Duration–Frequency (IDF) statistics and uncertainties for 3, 6, 12, 24, and 48-hour as well as 4-day and 10-day durations based on gage-corrected National Weather Service radar rainfall observations from 2002-2019 (19 years)
- Recurrence Intervals: 2, 5, 10, 25, 50, 100, 200 500, and 1,000 years
- Direct comparisons with NOAA Atlas 14 results (available here)
- Uncertainty estimates—in the form of 90% confidence intervals—for all estimates

Example Results and Key Findings

Below Left: 10-year 24-hour rainfall from the UW-Madison RainyDay-based analysis. Below Right: Difference between the 10-year 24-hour rainfall from RainyDay and the National Weather Service Atlas 14 Volume 8. These maps show more heavier rainfalls from the RainyDay approach than from Atlas 14, though this result varies with location, rainfall duration and return period.



Further Information

- Daniel Wright, David Lorenz, and Zhe Li, *Final Project Report—The Wisconsin Rainfall Project: Current and Future Rainfall Information for Infrastructure and Planning*, technical report to Wisconsin Dept. of Natural Resources, March 31, 2021 (download here)
- Daniel Wright, Ricardo Mantilla, and Christa D. Peters-Lidard. *A Remote Sensing-Based Tool for Assessing Rainfall-Driven Hazards*. Peer-reviewed scientific paper published in the journal Environmental Modeling and Software in 2017 (download here)
- Web-based data visualization and download portal (access here)
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