

SEMIARID PRECIPITATION FREQUENCY PROJECT

Update of *Technical Paper No. 49* and *NOAA Atlas 2*

Thirty-first and Final Progress Report
1 October 2004 through 31 December 2004

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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 technical tasks associated with this project. 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 purpose other than for what it was intended does so at their own risk.

TABLE OF CONTENTS

1. Introduction	1
2. Highlights	2
3. Progress in this Reporting Period	3
4. Issues	7
5. Projected Schedule and Remaining Tasks	7
References	8

SEMIARID PRECIPITATION FREQUENCY PROJECT

Update of *Technical Paper No. 49* and *NOAA Atlas 2*

1. Introduction

This will be the final Progress Report for the Semiarid Southwestern United States Precipitation Frequency Project as the project is now finished. The final product, including documentation, is available as NOAA Atlas 14 Volume 1 "Precipitation Frequency Atlas of the United States" and is available on the Internet through the Precipitation Frequency Data Server at <http://www.nws.noaa.gov/ohd/hdsc>. NOAA Atlas 14 Volume 1 includes estimates for four states completely; Arizona, Nevada, New Mexico, and Utah, and southeastern California.

The Hydrometeorological Design Studies Center (HDSC), Hydrology Laboratory, Office of Hydrologic Development, U.S. National Weather Service has updated its precipitation frequency estimates for the Semiarid Southwestern United States. Updated precipitation frequency estimates contained in NOAA Atlas 14 Volume 1 "Precipitation Frequency Atlas of the United States" replace those found in Technical Paper No. 49 "Two- to ten-day precipitation for return periods of 2 to 100 years in the contiguous United States" (Miller et al 1964), NOAA Atlas 2 "Precipitation-Frequency Atlas of the Western United States" (Miller et al 1973), "Short Duration Rainfall Frequency Relations for California" (Frederick and Miller, 1979) and "Short Duration Rainfall Relations for the Western United States" (Arkell and Richards, 1986) for the Semiarid region. The project included data collection and quality control, dataset formatting, regional frequency analyses, frequency distribution selection and fitting techniques, spatial interpolation and documentation.

The project determined annual all-season precipitation frequencies for durations from 5 minutes to 60 days, for average recurrence intervals from 2 to 1,000 years. For the project, HDSC reviewed and processed all available rainfall data for the Semiarid project area and used accepted statistical methods. In particular, the Semiarid Project was the pilot project in which decisions regarding the methods and format were made that affect subsequent projects. Documentation and project results are published as Volumes of NOAA Atlas 14 on the internet (<http://www.nws.noaa.gov/ohd/hdsc>) with the additional ability to download digital files.

2. Highlights

Final documentation for NOAA Atlas 14 Volume 1, "Precipitation Frequency Atlas of the United States" (Bonnin et al., 2004) was made available through the Precipitation Frequency Data Server (PFDS) at <http://hdsc.nws.noaa.gov/hdsc> on December 3rd, 2004. Only minor edits were required following an internal and public review of draft documentation made available via the PFDS.

This will be the final Progress Report for the Semiarid Southwestern United States Precipitation Frequency Project. Any further progress related to the Precipitation Frequency Data Server or the Areal Reduction Factor Project may be followed in the subsequent Progress Reports for the Puerto Rico and U.S. Virgin Islands Precipitation Frequency Project or the Ohio River Basin and Surrounding States Precipitation Frequency Project. Additional information is provided in Section 3.1, Final Documentation.

The Precipitation Frequency Data Server (PFDS) - the on-line portal for all NOAA Atlas 14 deliverables and information - underwent several subtle, but important changes. The computer server for the PFDS was replaced with a much faster computer which reduces waiting time when downloading results. Additional information is provided in Section 3.2, Precipitation Frequency Data Server.

Progress continues in the development of geographically-fixed Areal Reduction Factor (ARF) curves for basin area sizes of 10 to 400 square miles. Development and testing of software is 95% complete. There are currently 14 study areas located throughout the conterminous U.S., Hawaii, and Puerto Rico that have been quality controlled, processed and ready for ARF analysis. Additional information is provided in Section 3.3, Areal Reduction Factors.

3. Progress in this Reporting Period

3.1 Final Documentation

A peer review period of the draft documentation for NOAA Atlas 14 Volume 1 precipitation frequency estimates for the Semiarid Southwestern United States began September 27th, 2004 and concluded October 31st, 2004. Five very comprehensive sets of comments were received and addressed on an individual basis. Following a short revision period, NOAA Atlas 14 Volume 1 documentation was published in its final form on December 3rd, 2004. The comprehensive 240-page document can be downloaded as a whole or in parts via the PFDS and NOAA Atlas 14 Documentation page at http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_docs.html.

The documentation includes descriptions of the quality control and analytical procedures, descriptions of the results and how to interpret them, and tables of statistical measures and regional growth factors. It also includes temporal distributions for heavy rainfall, seasonality and trend information.

462 upper-limit cartographic maps for Arizona were developed and uploaded to the PFDS in November 2004.

The publication of the final documentation marks the end of this project. This will be the final Progress Report for the Semiarid Southwestern United States Precipitation Frequency Project. Any further progress related to the Precipitation Frequency Data Server or the Areal Reduction Factor Project may be followed in the subsequent Progress Reports for the Puerto Rico and U.S. Virgin Islands Precipitation Frequency Project or the Ohio River Basin and Surrounding States Precipitation Frequency Project.

3.2 Precipitation Frequency Data Server

The Precipitation Frequency Data Server (PFDS) - the on-line portal for all NOAA Atlas 14 deliverables and information - underwent several subtle, but important changes. They include:

1. Added several frequently asked questions (FAQ) to the FAQ page.
2. Added this important cartographic map usage caveat to the "GIS Data and Maps" page:

The color maps should not be used for interpolating point or areal precipitation frequency estimates. Point and areal values should be obtained from the PFDS interface which gets data directly from the high resolution grids. The color maps were created to serve as visual aids only.

3. Continued to update the PFDS Performance and Stats page on a monthly basis (see below).

4. Made several subtle changes to the NOAA Atlas 14 Download page, however plans are underway to make this page even more user-friendly in the future.
5. Reorganized state-specific pages
 - a. Moved buttons to ancillary information to top of page
 - b. Added NWS background to top of page
 - c. Added FAQ button

On December 12, 2004, the PFDS server was replaced with a much faster computer which reduces waiting time when downloading results.

HDSC continuously monitors the hits, integrity and performance of the PFDS. The graph (Figure 1) below summarizes the number of individual data inquires made since January 2004, while the map (Figure 2) indicates the locations of inquires during the past quarter.

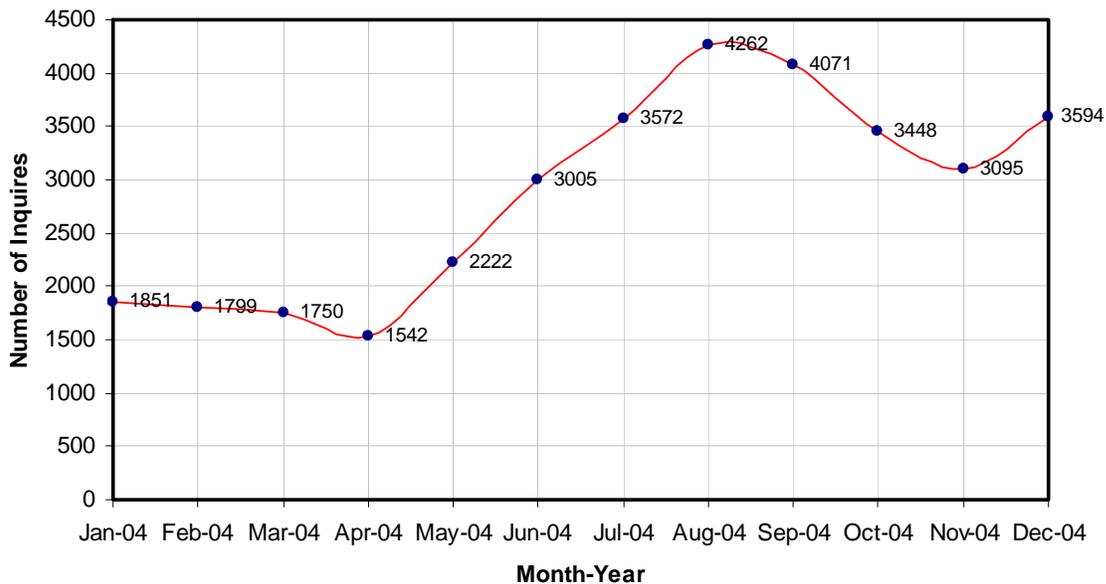


Figure 1. Number of individual PFDS data inquires per month.

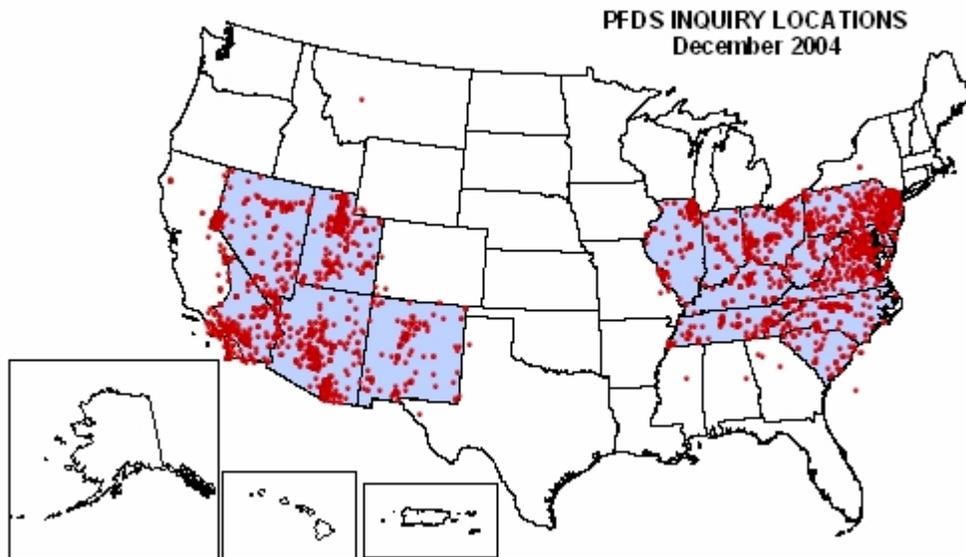


Figure 2: Map of 10,137 PFDS data inquiry locations during the period October-December 2004.

3.3 Areal Reduction Factors

Progress continues in the development of geographically-fixed Areal Reduction Factor (ARF) curves for basin area sizes of 10 to 400 square miles. Development and testing of software from the procedure described in NOAA Technical Report NWS 24 continues and is 95% completed.

Quality control of the recently added study area, Santa Barbara County, CA has been completed. The Chickasha, OK study area has been put on hold pending permission from the Oklahoma Mesonet for use of the data. The Ventura County, CA study area was eliminated due to unsuitable data records. Currently, there are 14 sites located throughout the conterminous US, Hawaii, and Puerto Rico that have been quality controlled, processed and ready for ARF analysis (see Figure 3). The "not used" study areas indicated in Figure 3 were considered but judged inadequate for the study due to lack of station density, poor data, limited or no metadata, or other problems.

4. Issues

4.1 International Cooperation

Members of HDSC were invited to the Nanjing Hydraulic Research Institute (NHRI) in Nanjing, China to demonstrate the techniques used on this project. Geoff Bonnin, Bingzhang Lin and Debbie Todd presented a seminar on December 9-10th, 2004. The seminar focused on the theory and practical application of regional precipitation frequency analysis using L-moments as used in HDSC. Members of various agencies of the Chinese Ministry of Water Resources (MWR) and various other agencies and Universities attended. These agencies included the NHRI Department of Hydrology and Water Resources, UNESCO-IHP Intergovernmental Council Bureau and Institute for Water Education, MWR Bureau of Hydrology and Office for National Flood Controlling and Commanding System, Reconnaissance, Planning, Design and Research Institute of Yellow River Conservancy Commission, Hohai University, and Tongji University. The scientific exchange was well received and generated interest in future collaboration.

The series of presentations included:

- *Recent Updates to U.S. Rainfall Frequency Estimates: Overview* by Geoff Bonnin
- *Seminar on Regional L-moments Analysis Method* by Bingzhang Lin
- *Implementation of Regional Precipitation Frequency Analysis using L-Moments* by Debbie Todd
- *Recent Updates to U.S. Rainfall Frequency Estimates: Spatial Analysis* by Geoff Bonnin
- *Recent Updates to U.S. Rainfall Frequency Estimates: Program Management* by Geoff Bonnin

5. Projected Schedule and Remaining Tasks

This Project is complete. The following lists the remaining Areal Reduction Factor Project with a tentative schedule with completion dates and a brief description of tasks being worked on next quarter. To track the progress of the Areal Reduction Factor Project in the future, please see subsequent Progress Reports for the Puerto Rico and U.S. Virgin Islands or the Ohio River Basin and Surrounding States Precipitation Frequency Projects.

Areal Reduction Factors [May 2005]

5.1 Areal Reduction Factors (ARF)

Computations for the ARF curves will be completed for 14 areas. The resulting curves will be tested for differences to determine if a single set of ARF curves is applicable to the entire U.S. or whether curves vary by region.

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