



NOAA Atlas 14 Addendum



Precipitation-Frequency Atlas of the United States

Volume 1 Version 4.0: Semiarid Southwest (Arizona,
Southeast California, Nevada, New Mexico,
Utah) Addendum – Update to Version 3.0

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U.S. Department
of Commerce

National Oceanic
and Atmospheric
Administration

National Weather
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Silver Spring,
Maryland, 2004
revised 2006

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Library of Congress Classification Number

GC
1046
.C8
U6
no.14
v.1
(2006)

Introduction

The Version 4 update represents an enhanced product that has added estimates for the 1-year average recurrence interval and has extended the domain to include the entire Lake Tahoe basin. In addition it incorporates some enhanced algorithms based on lessons learned in creating the newest volume, Volume 3 (Puerto Rico and the U.S. Virgin Islands). Each of the additions and enhancements were objectively justified and based on sound science. The enhancements include improved spatial interpolation when using the inverse-distance-weighting function, improved consistency adjustments for co-located daily and hourly stations and for hourly-only stations, and an improvement to the 24-hour confidence limits. Version 4 supersedes information in Version 3.

To facilitate the transition to Version 4, several difference maps between Version 4 and Version 3 are provided below. We recognize the implications of changing the precipitation frequency values, but most of the changes are within the levels of uncertainty previously provided in Version 3.

Table 1 lists the changes. A brief description and justification of each of the changes occurs on the following pages. A complete description of methodology changes will be included in the final NOAA Atlas 14 Volume 1 documentation to be posted here: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_docs.html.

Action	Type	Description	Impact
1	Addition	Added 1-year average recurrence interval (ARI) precipitation frequency estimates	n/a
2	Addition	Expanded the core study area to include the Lake Tahoe Basin in California	n/a
3	Enhancement	Improved the computation of upper and lower confidence limits for the 24-hour duration at co-located daily and hourly stations	At 24-hour co-located daily and hourly stations only
4	Enhancement	Implemented new co-located and hourly-only adjustments that were developed and used in subsequent Volumes	60-min quantiles at co-located stations and hourly quantiles at hourly-only stations
5	Enhancement	Implemented new inverse-distance weighting (IDW) algorithm that uses true (meters) distance instead of decimal degree distances	Spatially interpolated grid cells for data sparse areas/durations (especially at <24hr)
6	Miscellaneous Fixes	Miscellaneous minor station corrections: <ul style="list-style-type: none"> Corrected 1-day precipitation observations at station number 04-9447 (WARNER SPRINGS, CA), which were not properly converted from 1-day to 24-hour with the conversion factor 1.143 Corrected hourly stations in daily region 4 (northeastern Nevada) - The selected best distribution is GEV, but GNO was erroneously used during the co-located daily and hourly adjustment Corrected three SNOTEL IDs (42-0074, 42-0061, and 04-0010) in daily regions 13 and 8 that were duplicates of daily station IDs (although they had different lat/longs and data) 	Primarily 24-hour quantiles at several stations

Table 1. Additions, enhancements and fixes incorporate in NOAA Atlas 14 Volume 1 Version 4.

Explanations of additions, enhancements and fixes

1. Added 1-year average recurrence interval (ARI) precipitation frequency estimates

- 1-year ARIs are now available. 1-year AEPs cannot be theoretically defined, and hence are not available. Details will be available in updated final documentation.

2. Expanded the study area to include the Lake Tahoe Basin in California

- The President Clinton Administration was especially concerned about the degradation of Lake Tahoe, one of America's national treasures. President Clinton asked several Secretaries (notably, the Secretaries of the Army and the Department of Interior) to personally sign an agreement that would initiate the use of their agencies resources to study protection measures for Lake Tahoe. Precipitation frequency information is an important facet to this study. The U.S. Army Corps of Engineers provided funds to HDSC to extend NOAA Atlas 14 Volume 1.

3. Provided improved upper and lower confidence limits for the 24-hour duration at co-located daily and hourly stations

- The 24-hour confidence limits are now obtained from the analysis of the daily regions, which have a larger sample size, instead of hourly regions at co-located stations. This has decreased the band of uncertainty at most co-located stations and more accurately reflects the uncertainty associated with the quantile, which is also derived from the daily region. The enhancements cause the band of uncertainty to be more symmetrical about the mean.

4. Implemented new co-located and hourly-only adjustments

- An enhanced practical adjustment, was applied to the precipitation frequency estimates at co-located daily and hourly and hourly-only stations. The adjustment generates hourly quantiles more consistent with each other and with daily stations given different daily and hourly regions.
- This adjustment algorithm proved to be very effective in mitigating spatial bulls-eyes across the flat terrain of Volume 2 (Ohio River Basin and Surrounding States).

5. Implemented new inverse-distance weighting (IDW) algorithm

- Although the IDW still takes place in a "geographic projection," the distances are computed in true distances (meters) rather than decimal degrees.
- Changes in the updated grids provide a refinement to the estimates but do not exceed previously established confidence limits (although the confidence limits also are subject to change with the update).

6. Miscellaneous minor station corrections

- **Corrected daily station 04-9447, WARNER SPRINGS, CA (-116.6333, 33.2833)**
 - ✓ L-moments were mistakenly run with only 31 instead of 32 daily stations in daily region 32. This prevented the 1-day precipitation at station number 04-9447 from being properly converted from 1-day to 24-hour with the conversion factor 1.143.
 - ✓ This caused a localized impact on the order of +12% at 100-year 24-hour.
- **Corrected hourly stations in daily region 4 (northeastern Nevada) - The selected best distribution is GEV, but GNO was erroneously used during the co-located daily and hourly adjustment**
 - ✓ Seven co-located stations in daily region 4 (northeastern Nevada) had an incorrect 24-hour value because the selected distribution was GEV, but GNO was erroneously used on

the daily data during the hourly co-located adjustment algorithm. The impact was minimal (<1% at 100-year 24-hour). See section 4 of the final documentation for details.

- **Corrected three SNOTEL IDs**
 - ✓ SNOTEL stations 42-0074 (TIMPANOGOS DIVIDE, UT), 42-0061 (PARLEY'S SUMMIT, UT), and 04-0010 (HEAVENLY VALLEY, CA) in daily regions 13 and 8 shared station IDs of different daily stations and hence the daily stations were not included in the spatial interpolation.
 - ✓ Daily stations 42-0074, ALTAMONT, UT; 42-0061, ALPINE, UT; ACAMPO 5 NE, CA are now included in the spatial interpolation.
 - ✓ Impact is minimal (-3.9 to +5.1% at 100-year 24-hour) at the locations of the previously omitted daily stations in earlier versions.

7. Cumulative impact of implementing the above enhancements and fixes

In general, the composite change on the 100-year 24-hour map is small, with most areas only seeing a +/- 5% change. Likewise, most areas on the 100-year 60-minute map experience a change within +/- 5%. Some areas of the 100-year 60-minute map indicate more substantial changes, particularly as a result of the hourly-only adjustment.

The maps posted below graphically indicate the cumulative percent change of all changes/fixes to the 100-year 60-minute and 100-year 24-hour maps.

http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sa_ver3_vs_ver4_100y60m.pdf

http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sa_ver3_vs_ver4_100y24h.pdf