

## Metstat's Extreme Precipitation Index Product Description

METSTAT produces the Extreme Precipitation Index (EPI) is a new product that objectively conveys the rarity of precipitation. The EPI is a color-shaded map of the average number of years between the recurrence of a similar precipitation event, otherwise known as the Average Recurrence Interval (ARI) or "return period." The EPI allows users to quickly ascertain areas of potential flooding rather than using simple rainfall amounts, since what is deemed heavy rain in one part of the U.S. may be typical in another. EPI-maps provide an objective, timely and accurate depiction of the magnitude and extent of high-impact precipitation and allow users can make appropriate decisions. The conversion of precipitation to an EPI removes the distraction of heavy, but not abnormal precipitation thereby only highlighting the precipitation that has the potential of causing flooding. EPI better describes the utility of this product, but it will be interchangeably referred to as ARI maps.

EPI-maps are based on the industry's highest resolution and most accurate precipitation data from WDT and official precipitation frequency estimates published by the National Oceanic and Atmospheric Administration (NOAA).

### Background Information

Describing floods in terms of an Average Recurrence Interval (ARI) or "return period" (e.g. 100-year) has been used for decades to convey the rareness of flooding at stream gauges. However, describing the intensity of precipitation in a similar manner has not been as routinely, but provides an equally objective perspective of extreme precipitation events. Official, gridded NOAA/NWS precipitation frequency estimates provide the statistical basis for translating observed or forecast precipitation into an equivalent ARI at any location in the U.S..

ARI is defined as the average, or expected, period of time between exceedances of a given rainfall amount over a given duration. For example, suppose five inches of precipitation at a location is equivalent to an ARI of 100 years. This means five inches of precipitation is only expected to occur, on average, every 100 years at this location. Since the ARI is an average, a similar or even larger precipitation amount could occur again this year, next year or any other year. It does NOT mean an event of 5 inches will not occur again for 100 years. The ARI can also be described as a probability or percent chance of occurring in any given year. The table below converts the different terminologies.

PFI/ARI	Probability of occurrence in any given year	Percent chance of occurrence in any given year
500 yr	1 in 500	0.2%
100 yr	1 in 100	1%
50 yr	1 in 50	2%
20 yr	1 in 20	5%
10 yr	1 in 10	10%
5 yr	1 in 5	20%
2 yr	1 in 2	50%
1 yr	1 in 1	100%

It is important to understand that the ARI of precipitation does not necessarily equate to a flood of the same ARI. Floods can be caused by heavy rain, spring snowmelt, dam/levee failure and/or limited soil absorption. The degree of flooding from heavy precipitation depends on the precipitation intensity, storm duration, topography, antecedent soil conditions, ground cover, basin size and infrastructure design. Precipitation associated with a ARIs as low as 1 to 5 years can cause significant urban flooding since most urban storm water systems are designed for 1 to 10 year ARI precipitation events, yet this may not equate to any flooding in well-drained rural areas. ARIs for highway and other transportation infrastructure typically vary from 10 to 25 years. However, it is a near certainty that rainfall associated with ARIs greater than 100-year will cause major flooding, regardless of anything else. Dams and levees are generally designed for rainfall ARIs much larger than 500 years, but can be compromised during ARIs of 100-500+ year events.

**Two (2) EPI Packages are available through Yosemite Cloud**

## 1. EPI Analysis Package

The EPI Analysis Package includes near real-time EPI maps, updated each hour, based on observed/analyzed precipitation. In addition, maximum EPI maps are provided which provide a quick summary of areas impacted by rare precipitation during the past several hours and days via a single map. The EPI-maps are based on the industry's highest resolution (1-km<sup>2</sup>) and most accurate gauge-adjusted radar-based precipitation data from WDT.

Real-time EPI Analysis Package includes all of the following, which equates to 192 maps a day:

- 1-hr ARI (Full U.S.)
- 3-hr ARI (Full U.S.)
- 6-hr ARI (Full U.S.)
- 24-hr ARI (Full U.S.)
- Maximum\* 1-hr ARI (Full U.S.)
- Maximum\* 3-hr ARI (Full U.S.)
- Maximum\* 6-hr ARI (Full U.S.)
- Maximum\* 24-hr ARI (Full U.S.)

\* Maximum ARI - Maximum 1-, 3-, 6-, and 24-hour ARI over the past 3, 12-, 24 and 72-hours respectively.

## 2. EPI Forecast Package

The EPI Forecast Package includes EPI maps, updated four (0300, 0900, 1500 and 2100 UTC) times a day, based on the Quantitative Precipitation Forecasts (QPFs) from the Weather Research Forecast (WRF) mesoscale numerical weather prediction model. The WRF model is run four times a day 0300, 0900, 1500 and 2100 UTC. Advances in the science of numerical weather prediction have significantly increased skill and resolution of QPF over the last decade and mesoscale models such as WRF provide excellent forecast guidance, particularly for strongly forced events typical of those that lead to widespread heavy rainfall and flooding. The maximum products make it easy to identify areas of potential flood risk for the next five days by looking at one single map.

PFI Forecast Package includes all of the following, which equates to 200 maps a day:

- 6-hour forecast PFI every 3-hours out to 120-hrs (Full U.S.)
- 24-hour forecast PFI every 12-hours out to 120-hrs (Full U.S.)
- Maximum\* 6-hr (Full U.S.)
- Maximum\* 24-hr (Full U.S.)

\* Maximum ARI - Maximum 6- and 24-hour PFI for entire 120-hour (5-day) model run.

### *Disclaimer*

*METSTAT, WDT, and Marta Systems do not and cannot guarantee the accuracy of the EPI products since the underlying precipitation frequency data inherently carries a degree of uncertainty. While we shall use our best professional efforts and most accurate data available to achieve the most reliable results, METSTAT, WDT and Marta Systems make no warranty or guarantee, expressed or implied, as to the accuracy of the EPI values.*