

Meteorologists' Recommendations
Annual Precipitation
For RAWS Station Catalogs (WIMS & FFP)

At the 2024 national delivery of the Intermediate National Fire Danger Rating System (NFDRS) training course (S491), students were instructed on data management issues relating to the Remote Automated Weather Stations (RAWS) that comprise the national NFDRS weather observation network, which include station catalog metadata that is entered in the Weather Management Information System (WIMS) and used for FireFamilyPlus (FFP) analysis application. This Annual Precipitation value is especially important for NFDRSv4 because it is used for the Keetch-Byram Drought Index (KBDI), which – in turn – controls the addition of drought fuel loading under drying conditions.

One particular set of questions arose:

- What does the Annual Precipitation value represent in the RAWS station catalog?
- Is the value based on an average (mean) or median (aka 50th percentile)?
- Where does that data come from?

Unusually, the 2025 S491 session's participants included eight(!) professional meteorologists from the Geographic Coordination Center (GACC) and wildland fire management communities: coaches Steve Marien (Eastern GACC) and Steve Ippolit (Southern GACC); plus students Jon Bonk (Northwest GACC), Kristen Stewart & Eric Drewitz (California – Southern Operations GACC), Nickolai Reimer (Rocky Mountain GACC); Rebekah McCormick (Northern Rockies GACC), and Matt Dehr (Washington Department of Natural Resources). Naturally, we posed the questions above to our meteorology Subject Matter Experts (SME), and their insights and recommendations are presented below.

Statistical Method (e.g. average/mean vs median/50th percentile):

Techniques used by National Weather Service (NWS) can be even more sophisticated (e.g. curve fitting), but mean is probably the most-commonly used technique to calculate “normal” annual precipitation amount.

Regardless, mean or median should be relatively similar for most sites anyhow. Another factor to consider is the length of the climatological period – the annual precipitation total value used for RAWS station catalogs should be based on an observational period of at least 10 recent years; however, a 30-year period may better capture the full range of variability for the site. Analysts can assess whether the annual precipitation amount has shifted notably over the decades, whereupon they may opt to use the most recent 10-year or 20-year period to better reflect recent and ongoing climate trends.

Recommended Data Sources:

If the RAWS is thought to have reliable precipitation data and a sufficiently long period of record (e.g. 10 years or longer), then the RAWS native observations can be used to calculate the “normal” annual precipitation value for the station catalog. However, station managers should validate via comparison with data from other sources. If the RAWS precipitation observation record is suspect, shorter than 10 years, or does not include precipitation measurements year-round, then other data sources can be used as a proxy. These could include nearby RAWS with known reliable data or nearby non-NFDRS network stations. These other networks include: Automated Surface Observing Systems (ASOS) stations (managed by NWS, FAA, or DOD); state mesonet stations; less formal networks like Community Collaborative Rain, Hail and Snow Network (CoCoRaHS); and commercial sources (e.g. Earth Networks).

Two recommended sources that provide gridded climatological precipitation data (so you can interrogate the specific area where the RAWS is located) are AHPS and PRISM, which are described in greater detail below. Of these, AHPS is particularly useful for checking annual precipitation totals for specific recent years, while

PRISM can provide the 30-year "normal" total. PRISM is probably the most common source used as a proxy for the annual precipitation amount for RAWS station catalogs when the RAWS data itself is unsuitable. To determine whether the native RAWS data is suspect usually involves comparison with another source, and that other source is most often PRISM. So, one way or another, RAWS managers typically confer with the PRISM data corresponding to the RAWS site.

A third source was recommended for comparison purposes - the gap-filled/back-filled RAWS weather dataset that is available in FEMS. Users can download the RAWS data from FEMS and then calculate the mean annual precipitation amounts for the full 20-year period, plus the first and last 10-year periods to assess whether there has been a notable climate trend. If the RAWS site has become notably drier, using the most recent 10-year period's mean annual precipitation for the WIMS catalog is probably best. As noted before, the actual data source used could be from the RAWS observations (if good) or from PRISM or another source if the RAWS precipitation data is questionable.

Data Source Details

In addition to the RAWS observations themselves, three data sources will be particularly helpful for RAWS managers who need to validate the Annual Precipitation value used in the station catalog:

1. Fire Environment Mapping System ([FEMS](#))

For each permanent NFDERS RAWS, the Desert Research Institute (DRI) has provided a quality-checked dataset, for which gaps and other common problems in the observations have been resolved using proxy data or other techniques to resolve bias. The dataset for every RAWS extends back to 2000, having been back-filled with proxy data as needed. For RAWS with quality observations dating back to 2000, the FEMS dataset essentially replicates the native RAWS observations and can be used the same as data from WIMS. In creating the FEMS datasets, any gap-fill/back-fill proxy observations added by DRI are assumed to be reasonably accurate and useful, but users should be cautious if their FEMS dataset includes large blocks of proxy values.

2. National Weather Service Advanced Hydrologic Prediction Service ([AHPS](#))

Based on a roughly 4x4 km grid resolution, AHPS has an archive dating back to 2005, with "observed" water-year and annual total precipitation. Here "observed" values are actually radar estimated, but quality-checked against rain gauges at network and cooperator stations. For each grid site, AHPS also offers the "normal" annual precipitation amounts, yet these "normal" values are derived from PRISM (see below).

3. Parameter-elevation Regressions on Independent Slopes Model ([PRISM](#))

PRISM is maintained by the Northwest Alliance for Computational Science & Engineering (NACSE), based at Oregon State University (OSU), and its website is supported by the USDA Risk Management Agency (RMA). The native grid resolution of the PRISM datasets is 800m, but they have been filtered to 4km resolution. PRISM's 30-year climatology was recently updated – it is now based on the 1991-2020 period. The [PRISM Explorer](#) map interface allows you to interrogate specific grid locations.

SMEs' Final Words of Wisdom

Whatever source you use for the annual precipitation in your RAWS catalog, you should validate it using similar data from another source. When using data from another RAWS or non-NFDERS network stations (e.g. ASOS, mesonet), be aware that those other stations may not be particularly representative of the RAWS site due to differences in proximity, elevation, aspect, etc. You will probably use PRISM to either verify that the native RAWS data is good, or to instead use PRISM's annual precipitation value for the RAWS location. If you are unsure or need some support, reach out to your local NWS office, GACC Predictive Services meteorologists (or Agency-sponsored meteorologists like those on staff at OR/ODF & WA/DNR), or even a State Climatologist.