Using North American Regional Reanalysis (NARR) Weather Data in Fire Program Analysis (FPA)

Topic

Using NARR grid-format weather data as a data source for FPA.

Issue

The Fire Program Analysis (FPA) analytical engine requires weather data for calculating fire behavior when analyzing potential Fire Planning Unit (FPU) fire workload. Fire applications include weather data typically collected from Remote Automated Weather Stations (RAWS). RAWS are located across the country and conform to National Fire Danger Rating System Weather Station Standards (PMS 426-3). Figure 1 shows that RAWS are not evenly distributed across the country; the highest station concentrations occur where there is a high prevalence of wildland fire on federal lands.
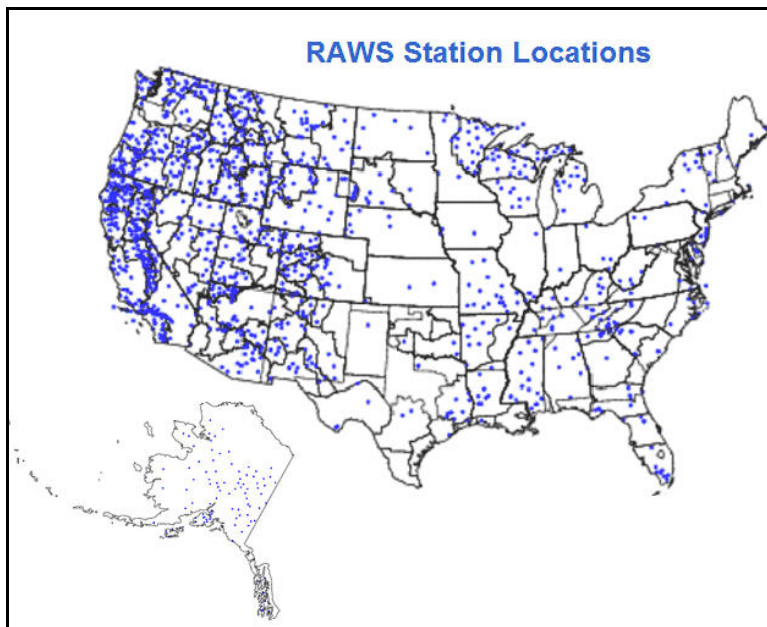

Figure 1: RAWS Data Collection Locations

FPUs without access to NFDRS RAWS data, or where local data insufficiently represents the area being modeled, must be provided other weather data that can be calibrated to approximate NFDRS weather station data. FPA will use standard corporate data sources to obtain accurate modeling and simulation information.

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Term

Energy Release Component (ERC) - The potential available energy per square foot of flaming fire at the head of the fire.[1]

Option

Areas of the country with little or no RAWS data access should consider using the North American Regional Reanalysis (NARR) data for simulations within their Fire Management Units (FMUs) and Fire Workload Areas (FWAs).

NARR is a nationwide data set containing weather data in 32km grid resolution format (approximately 20 mile grid resolution). NARR captures and stores weather data from 1979 up to approximately three months prior to the current date. While the validity of hourly NARR grid-data observations vary by data type, NARR data provides:

- Hourly temperature observations are 88% accurate,

- Relative humidity observations are 71% accurate,

- Wind speed observations are 19% accurate, and

- Precipitation observations are 31% accurate.

Discussion – Comparing NARR and RAWS Data Reliability

Efforts are underway to evaluate and improve the NARR data set for FPA use. The goal is to modify the NARR algorithms so the data produced may be used as reasonable substitutes for NFDRS RAWS data. The result will be a regular spatial grid with an indication of how valid each point is for the calculation of fire behavior. When there is confidence in the recalculated results, the NARR grid data set will be provided in the FPA system.

When deciding what reliable source of weather data to use for simulations, consider these points:

- NFDRS RAWS stations are geared towards critical strategic decision making as they are designed to provide fire managers standardized weather data. Their distribution across the United States reflects known fire workload potential on federal and state lands.

- The NARR weather grid is a long-term, high resolution data set covering North America. While RAWS collects hourly data samples, NARR collects data every three hours. At the current time, when compared with RAWS, NARR data values are most closely correlated for temperature and relative humidity, with relatively low correlations for wind speed (i.e. r-0.33) and precipitation (r=0.29). As larger data samples representing longer time

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[1] http://www.wrh.noaa.gov/sew/fire/olm/nfdr_com.htm

Working Path:

Final Approval: <Approvers initials and date>

periods are compared, correlations increase. When 30 day median correlations are compared, precipitation compares far more favorably (r=0.80), but wind speeds are still weakly correlated (r=0.36). Correlations are not consistent across the continent (Hall and Brown).[2] The recalculations underway for NARR data mentioned above will correct known deficiencies, making this data source suitable for strategic planning purposes.

- Use NARR data when NFDRS RAWS data are unavailable, and then only with caution. For strategic purposes, NARR data provide a set of opportunities for modeling fire workload based on fire behavior calculations over large areas, especially where NFDRS RAWS provide inadequate data for numerous reasons, here are a couple of reasons; station spacing, station location and/or missing data. Even with the relatively low correlation coefficients for wind metrics, the use of long time periods of data increase NARR's representation of weather across landscapes.

Considering the completeness of records, relatively good consistency over space, and low workload for FPU planners are factored in, NARR represents a good value as an enterprise data set.

Recommendation

FPUs should use NARR grid weather data when:

- RAWS data is unavailable, inaccurate, or does not sufficiently cover the FPU's area when selecting a data source for initial response simulation.

- RAWS data contains significant annual gaps or too few years of record to represent climatological trends.

Review History:

Date	Initials	Change Summary
December 17,2007	KSH	To Donna for final review.
December 14,2007	HKR	Provided edits and returned to KSH.
December 13, 2007	KSH	Completed additional edits and send to HR for review.
December 12, 2007	KSH	Added edits from ED and BE. Converted document to

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[2]   Beth L. Hall and Timothy. J. Brown. Comparison of weather data from the Remote Automated Weather Station network and the North American Regional Reanalysis, American Meteorological Society (AMS), http://ams.confex.com/ams/pdfpapers/120445.pdf

		new white paper template. Edited for clarity and readability.
December 3, 2007	HR/BE	Initial version.