



# National Weather Service – Forecast Reference Evapotranspiration (FRET)

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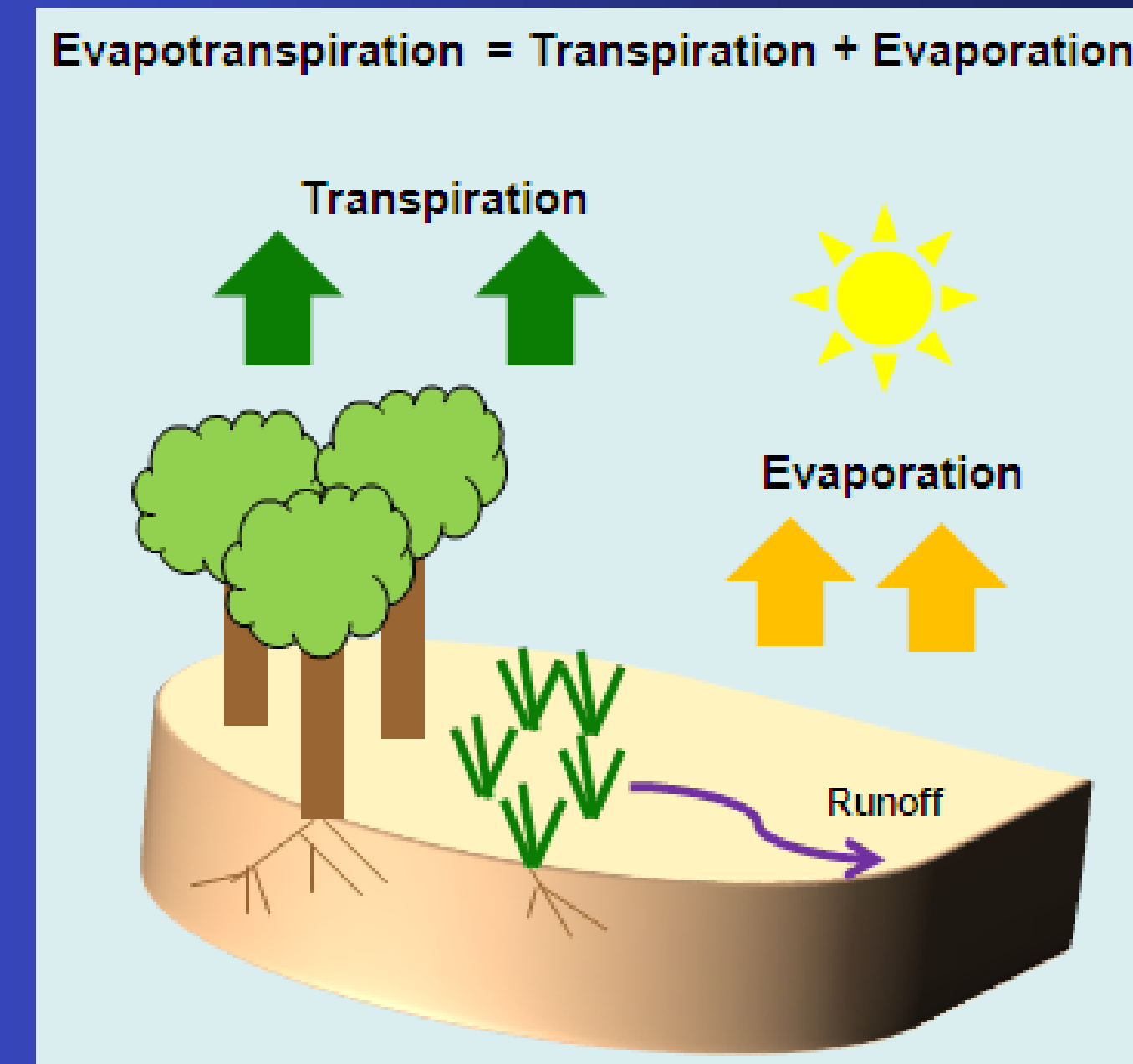


## What is FRET?

The National Weather Service is now producing Forecast Reference Crop Evapotranspiration (FRET), a forecast estimate of the amount of evapotranspiration for a well-watered reference crop (grass or alfalfa) under prescribed conditions for a 24 hour period. Weekly FRET forecast calculations and NLDAS derived reference crop ET Climatology and departure from normal are available as well.

\* Penman Monteith (PM) equations (adopted by the American Society of Civil Engineers Environmental Water Resources Institute) use 12 cm grasses as the reference crop.

\* Kimberly Penman (KP) (adopted by USBR in the Pacific Northwest) uses alfalfa as the reference crop.

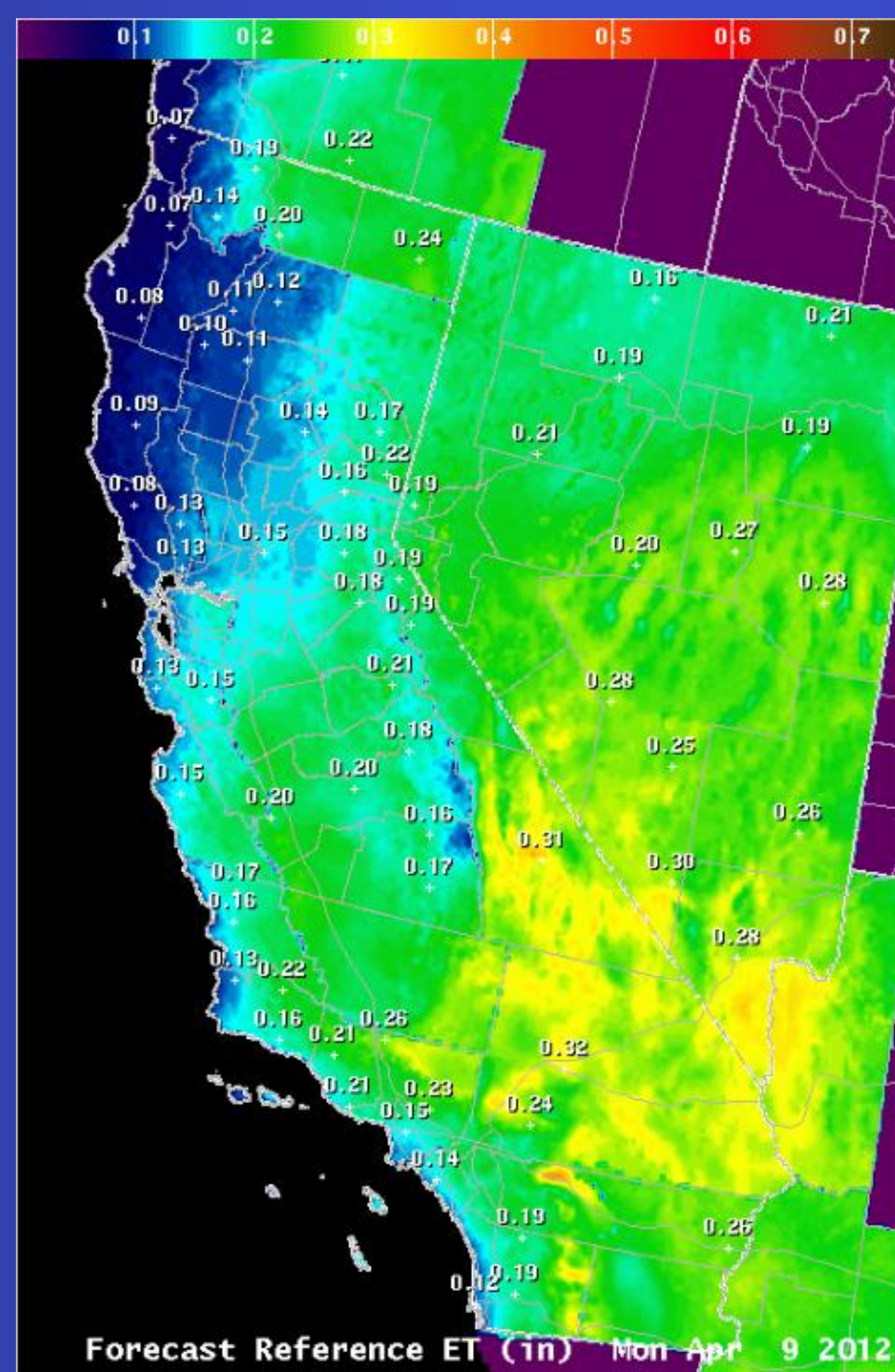


$$ET_o = \frac{0.408\Delta(R_n - G)}{\Delta + \gamma(1+0.34U_2)} + \frac{\left(\frac{900\gamma}{T_M+273}\right)U_2(e_s - e_a)}{\Delta + \gamma(1+0.34U_2)}$$

## What goes into FRET?

NWS Forecast Temperature, Sky Cover, Wind Speed, and Relative Humidity

Penman-Monteith or Kimberly Penman Reference Evapotranspiration Equations



### Applications:

- Water Management (CA DWR)
- Soil Model Input
- Drought Mitigation
- University Research (UC Davis)
- Irrigation Management (agriculture, golf courses, public works departments)

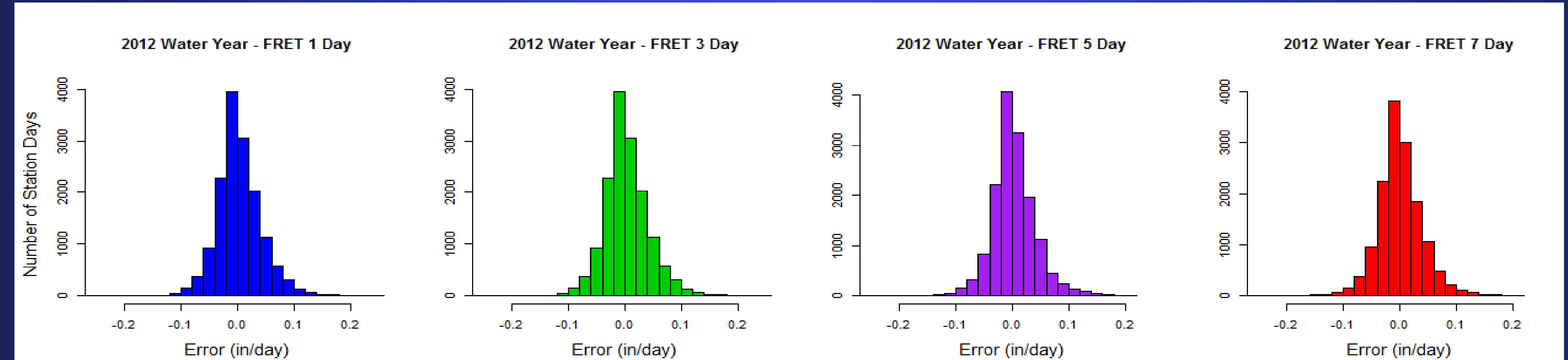
### Applications :

Example 1: Farmers can calculate how much water they need to maintain a depth of 6 inches of water for rice paddies.

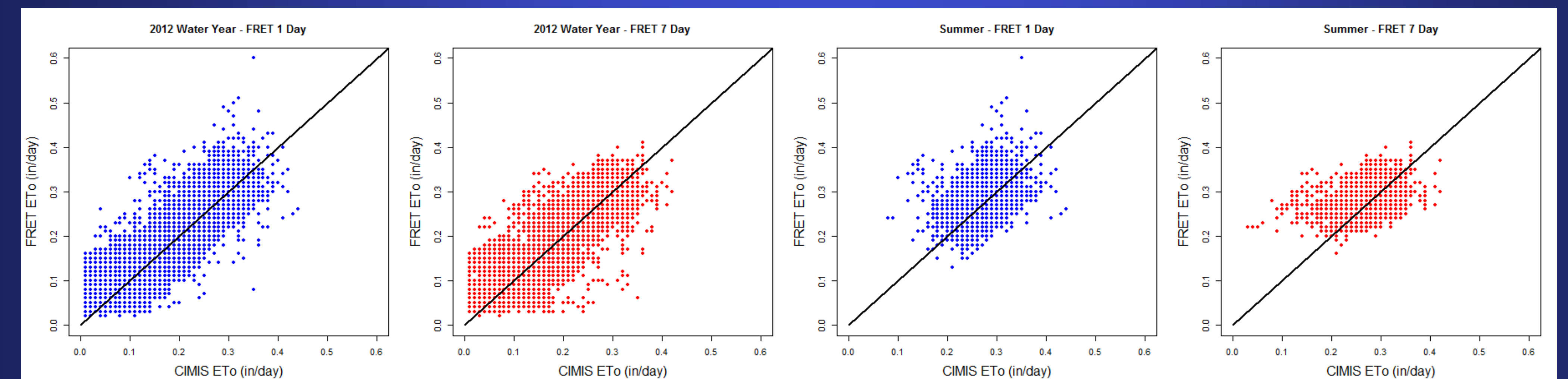
Example 2: Water Management Agencies can calculate how much water to release for downstream use.



## FRET vs Observed CIMIS Reference Evapotranspiration



Histograms of the difference between FRET forecast  $ET_o$  and CIMIS  $ET_o$  for all stations indicate that more than 80% of forecasted  $ET_o$  values are within +/- 0.05 in/day of the CIMIS station measurements for all forecast periods.



Water year and summer period scatter plot comparisons of CIMIS station and FRET  $ET_o$ .

The bias and error in FRET  $ET_o$  forecasts relative to CIMIS  $ET_o$  is consistent across different forecast lead times, and forecast errors are generally less than 0.05 in/day. FRET forecasts have a slight positive bias relative to CIMIS station  $ET_o$  data, with an increased bias in the summer months. This positive bias may lead users of this data to slightly over-estimate  $ET_o$  (in general) and to err on the side of caution in making irrigation or water transport decisions.

## Where can you find FRET?

Daily FRET, Departure from Normal, Weekly FRET and Reference ET Climatology: <http://www.wrh.noaa.gov/forecast/evap/FRET/FRET.php?wfo=xxx>

User selected point FRET values:

<http://www.wrh.noaa.gov/forecast/wxtables/index.php?wfo=xxx>

Where xxx is the three letter identifier of your local weather forecast office ( e.g . xxx=sto)

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