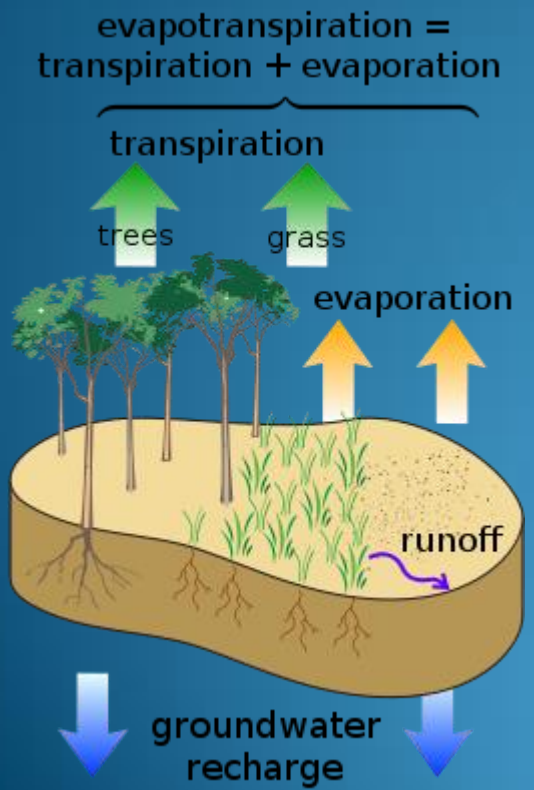
National Weather Service Forecast Reference EvapoTranspiration (FRET)



Outline

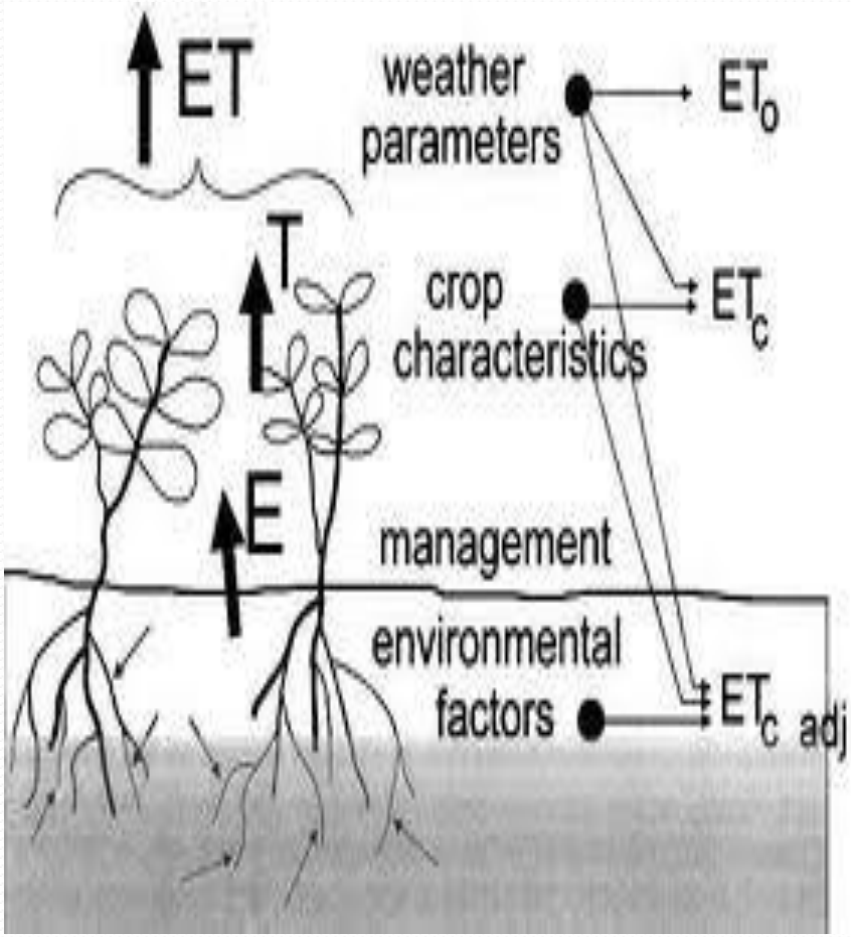
- FRET Background
- Participating Offices
- FRET Verification

The FRET Project

- Contributors:
  - Mike Hobbins (NOAA – ESRL)
  - Holly Osborne (NWS – STO)
  - Bill Rasch (NWS – STO)
  - Wade Earle (NWS – PDT)
  - Jon Mittelstadt (NWS – RNO)
- Verification Contributors:
  - Pamela Krone – Davis (CSU Monterey Bay)
  - Forrest Melton (NASA Ames Research Center)

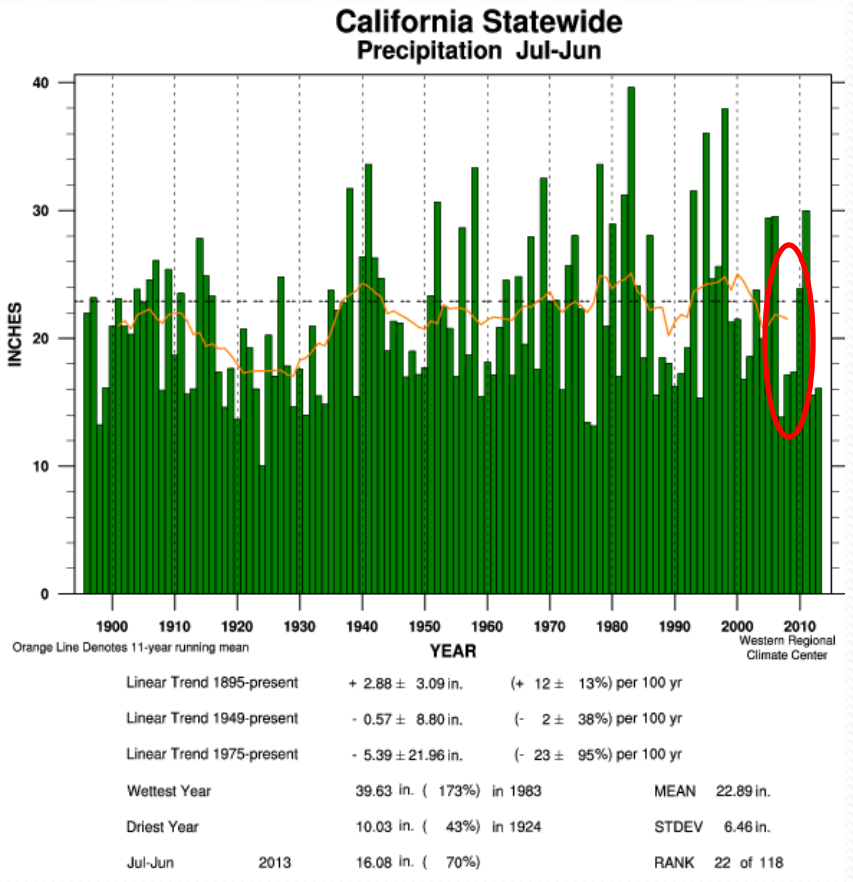
What is FRET?

- Forecasted estimate of the amount of evapotranspiration for a 24 hour period
  - Penman Monteith (PM) equations (adopted by the Environmental Water Resources Institute of Civil Engineers) uses 12 cm grasses as reference crop.
  - Kimberly Penman (KP) (adopted by USBR in the Pacific Northwest) uses alfalfa as reference crop.
- These equations assume a well watered surface.

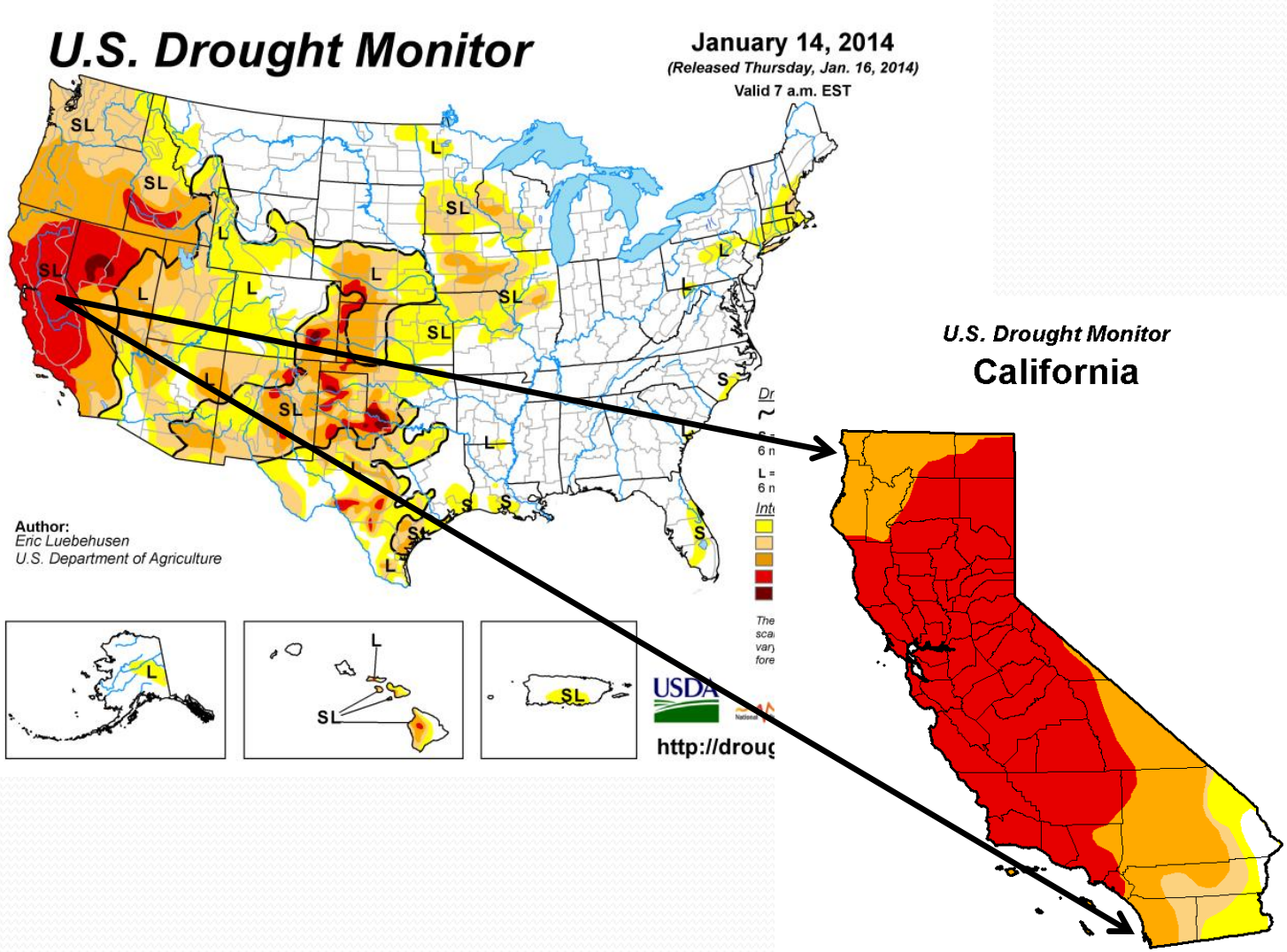


FRET's History

- Project started in 2008, following two years of drought and entering our third year of dry conditions.
- Project was in conjunction with California Department of Water Resources and the University of CA, Davis.



What's our Current Drought Status?



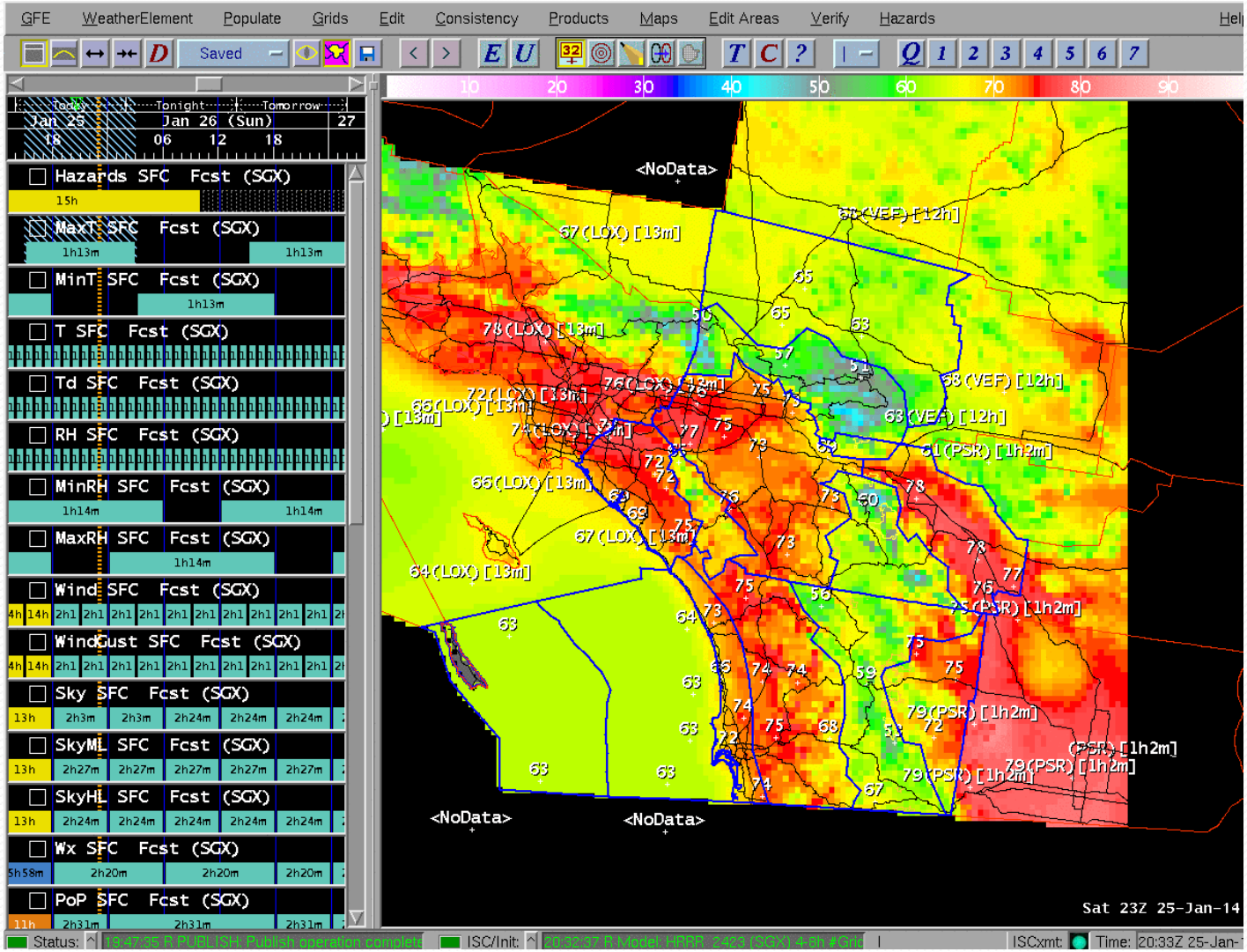
Why FRET? Every Drop Counts

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

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

Water Releases from Friant Dam in better times.

NWS Forecasts

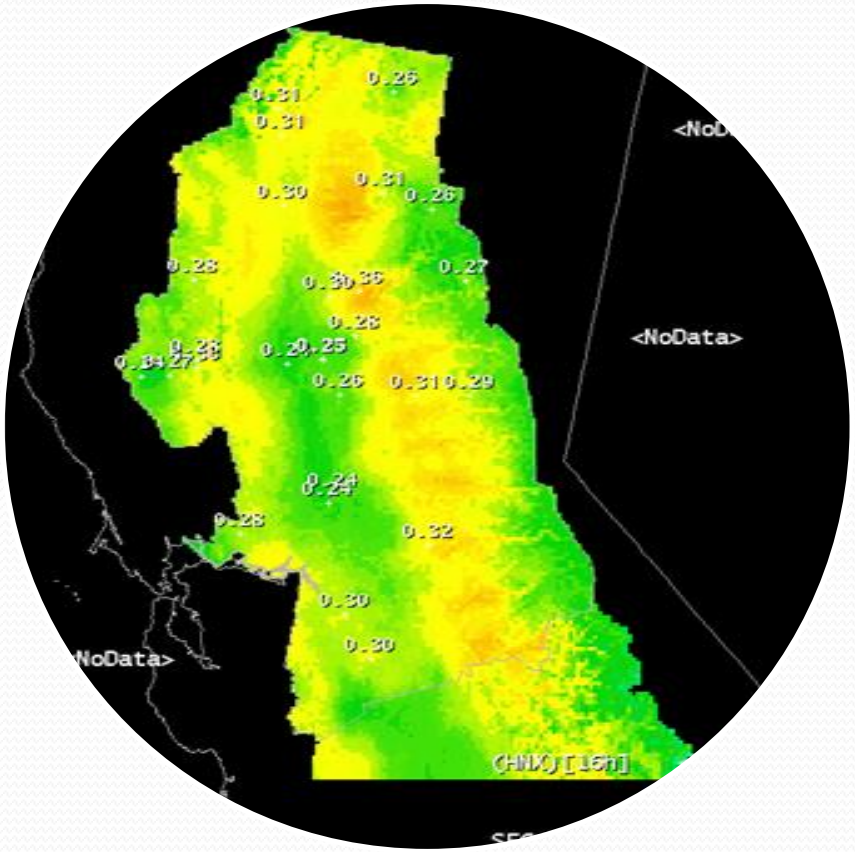


Creation of FRET

Forecast Temperature, Sky Cover, Winds, and Relative Humidity

+

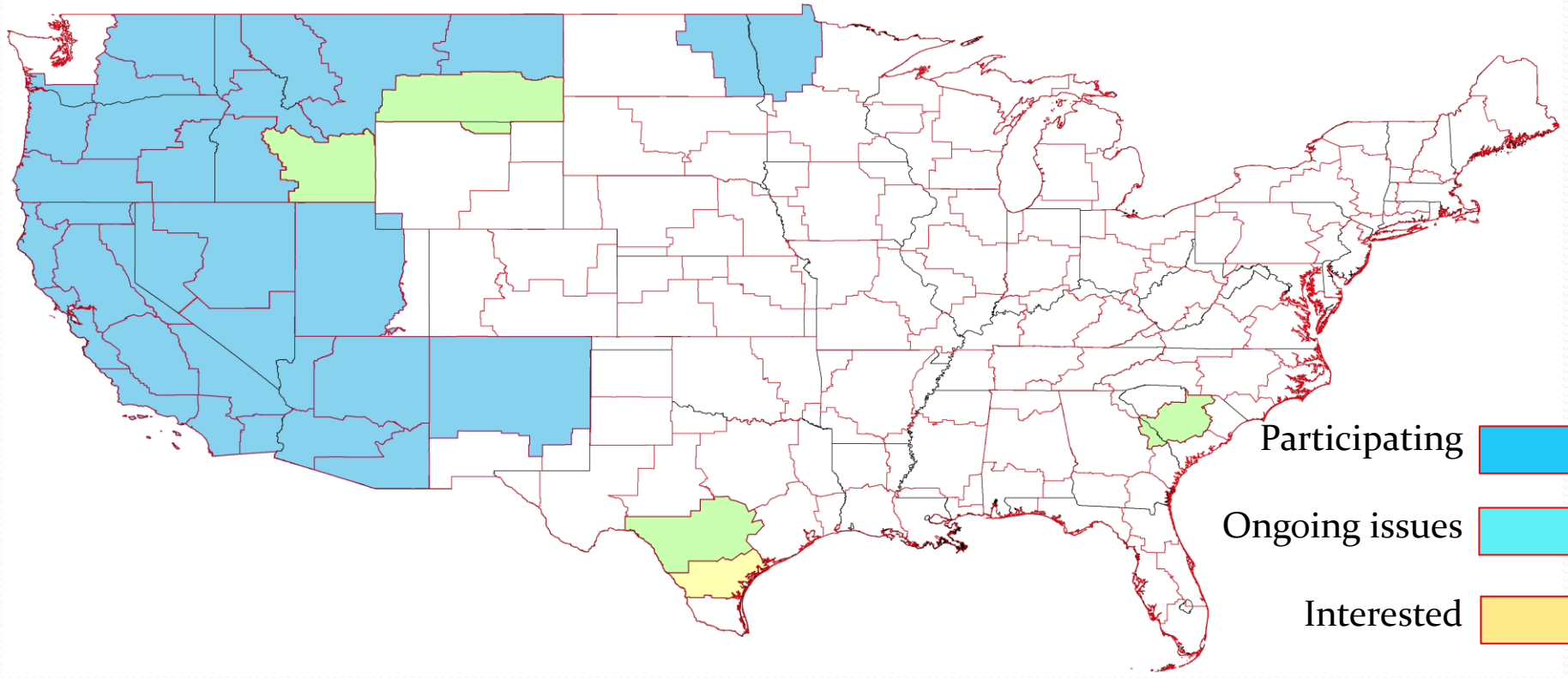
Penman-Monteith or Kimberly Penman Reference Evapotranspiration Equations



FRET Product Suite

- Daily FRET forecast
- Weekly Total FRET Forecast
- Daily Departure from Normal
- Climatology Grids
- Text Product- ETT
- Forecast Weather Tables

Current FRET WFOs Status

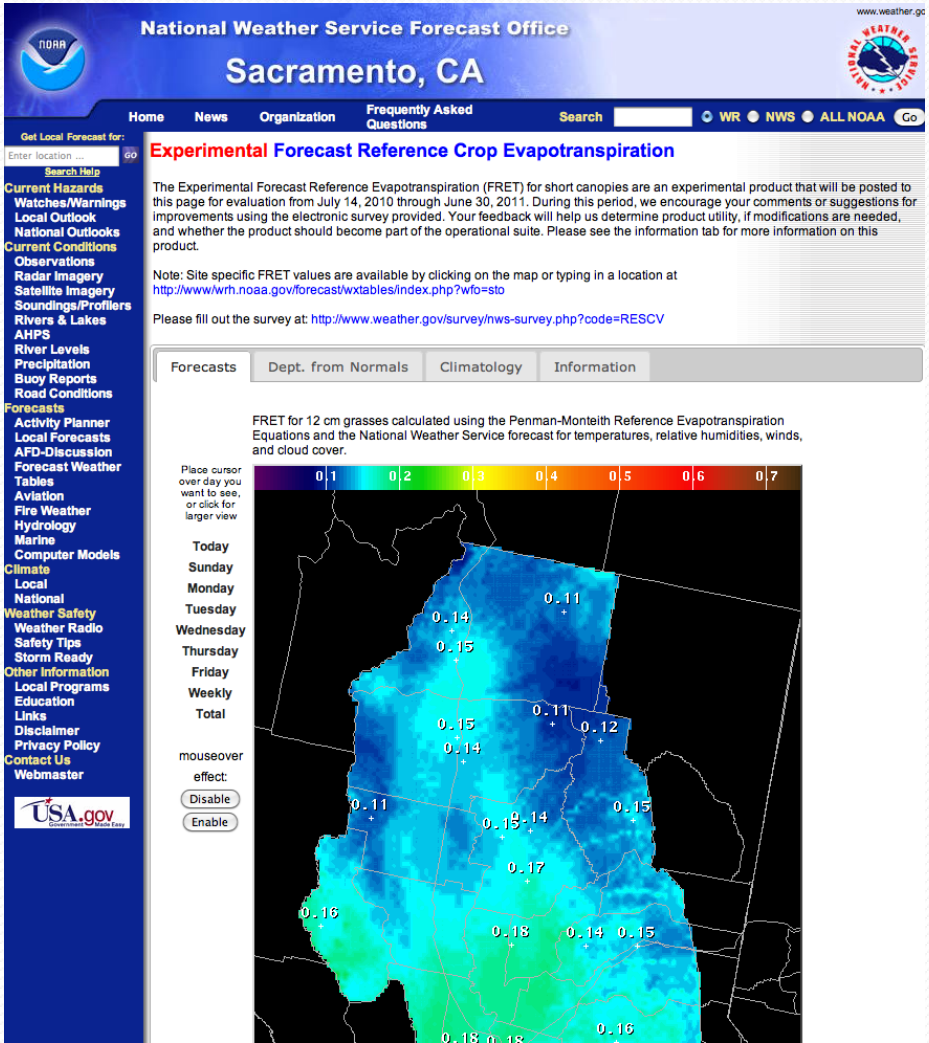


FRET running at 27 WFOs (4 with issues), 1 interested

- Billings, MT: FRET stopped on Awips II instal
- Pocatello, ID: ??
- San Antonio, TX: working with SR to get FRET to www
- Columbia, SC: ET_{rc} climatology issues

FRET Web Page

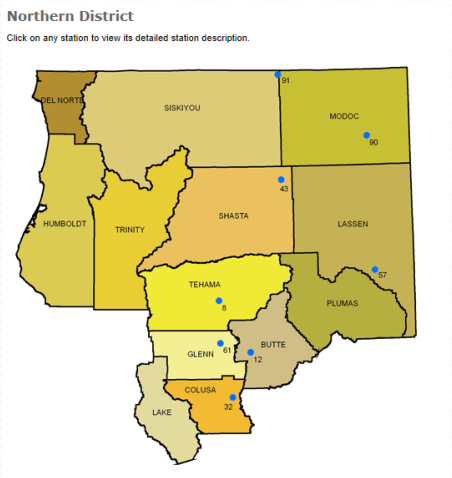
http://www.wrh.noaa.gov/forecast/evap/FRET/FRET.php?wfo=sto

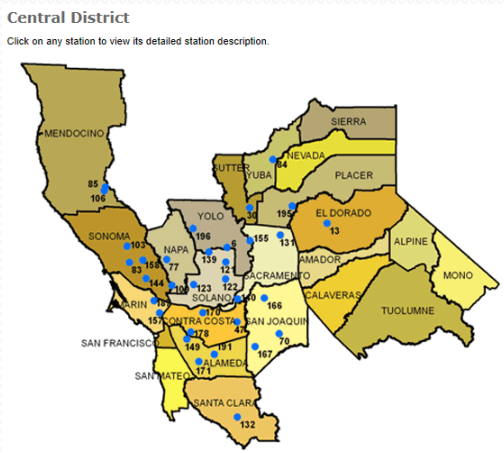


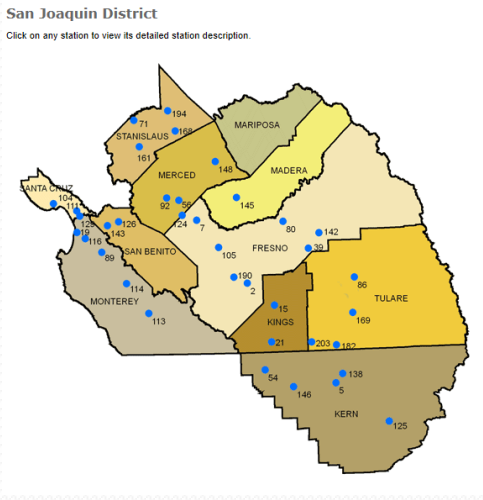
FRET Verification:

California Irrigation Management Information System

- CIMIS Stations – a DWR and UCD project (started in 1982).
- 48 of the 120 automated stations used for this statistical verification.
- Compared day 1, 3, 5, and 7 lead times, using bias, mean bias error (MBE), mean absolute error (MAE)m and root mean square error (RMSE).

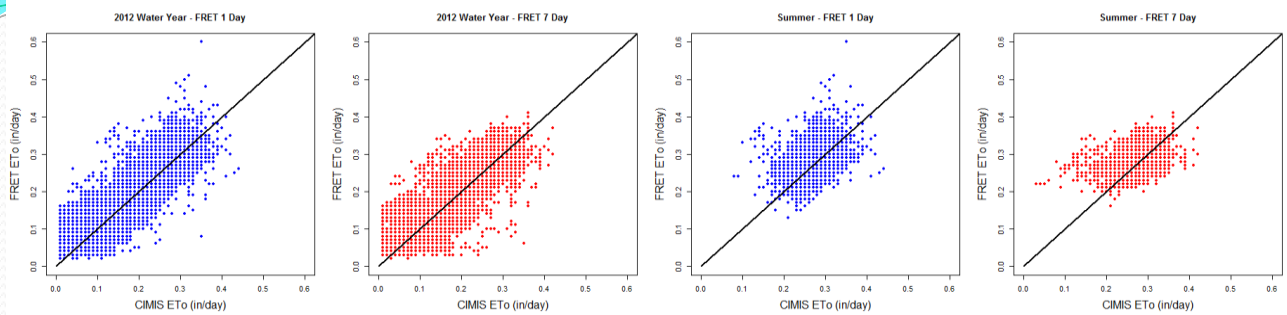




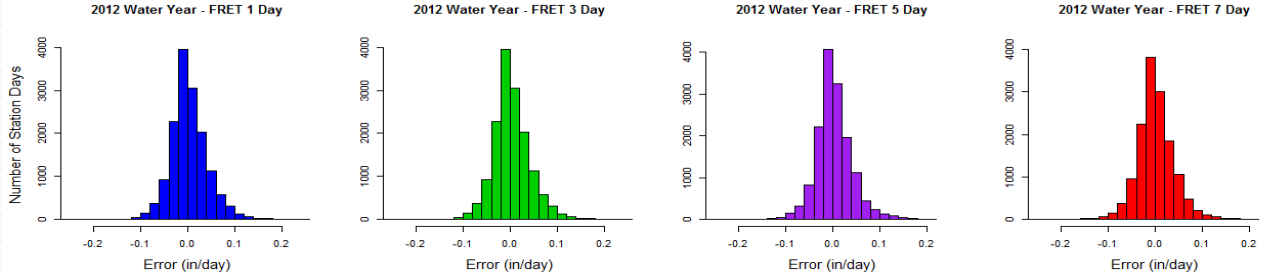


Verification of FRET against CIMIS observations

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



Histograms of difference between FRET forecast ET_o and CIMIS ET_o for all stations



> 80% of FRET values within 0.05 in/day of CIMIS station ET_o for all forecast periods.

FRET has slight +ve bias wrt CIMIS station ET_o, increased bias in summer

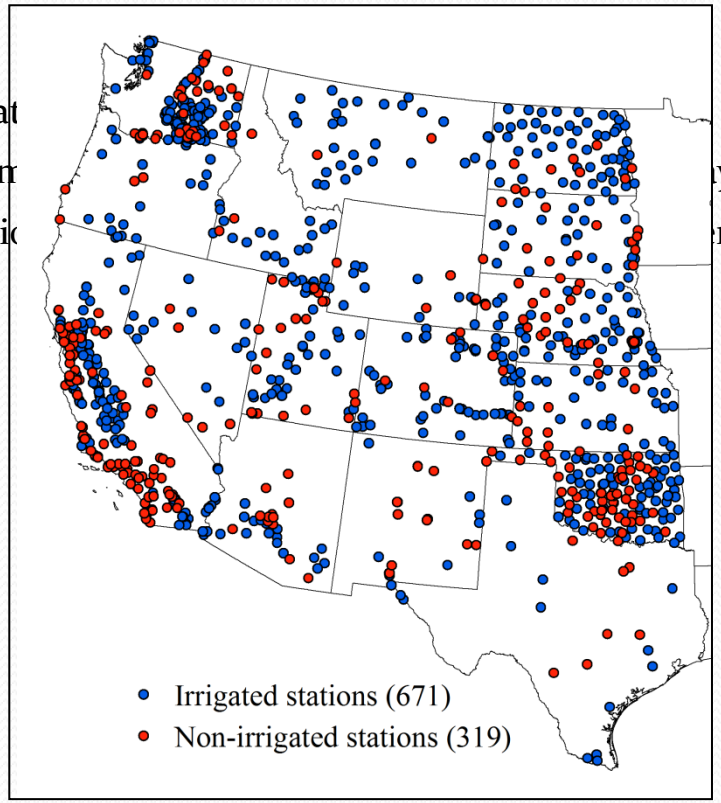
	2012 Water Year			2012 Summer		
Forecast Period	**BIAS (in/day)**	**MBE (unitless)**	**MAE (in/day)**	**BIAS (in/day)**	**MBE (unitless)**	**MAE (in/day)**
FRET 1 Day Forecast	0.006	0.18	0.029	0.015	0.07	0.036
FRET 3 Day Forecast	0.006	0.18	0.028	0.015	0.08	0.034
FRET 5 Day Forecast	0.006	0.18	0.028	0.013	0.08	0.032
FRET 7 Day Forecast	0.004	0.17	0.028	0.012	0.07	0.032

Verification of ET_{rc} Climatology

- Verification of climatology ET_{rc} against agromet station-based observations across western US irrigated:
  - 990 stations: 671 irrigat
  - ET_{rc} does not reflect an
    - ambient conditi

yer

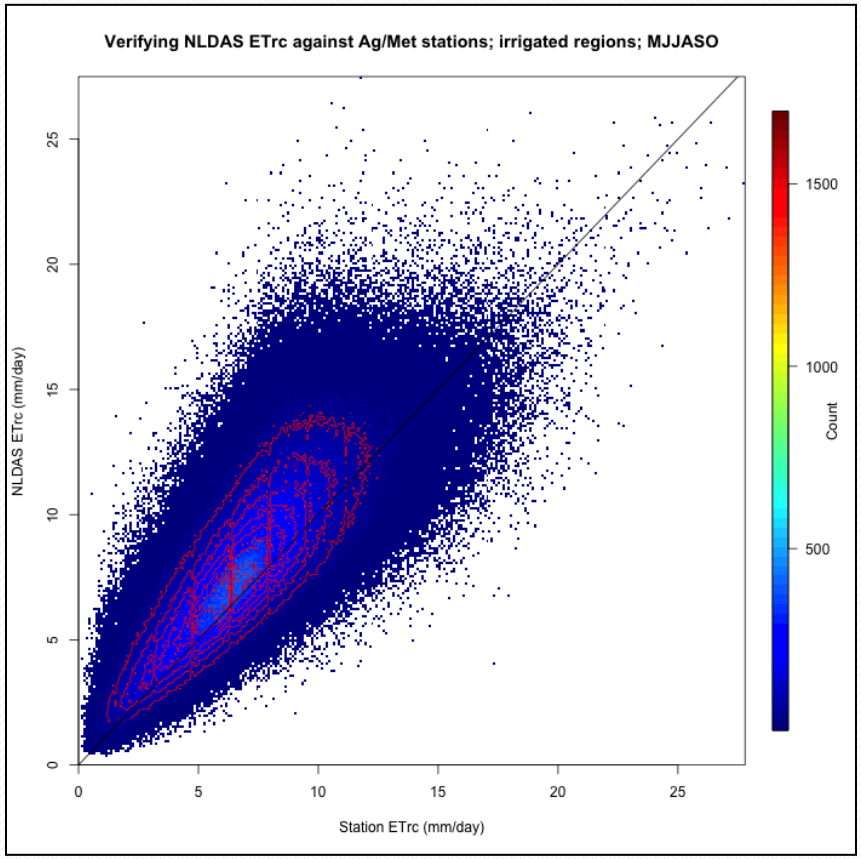
n-2 ET_{rc} product



Verification of ET_{rc} Climatology

Summary

- All-year, all-season bias about -11% (NLDAS $ET_{rc} > agmetET_{rc}$)
- Warm-season +ve bias; cool-season –ve bias
- Lower biases in non-irrigated areas (Counter intuitive)
- Growing season daily r^2 ~ 0.64
- July-Sept daily r^2 ~ 0.6



Possible future for FRET

- **FRET in Integrated Water Resources Science and Services (IWRSS) at National Water Center?**
  - Create regional mosaic of FRET
  - Expansion beyond NWS Western Region
  - FRET in NDFD
  - Ability to select area to download data from grids
- Archive forecast or ongoing NLDAS-driven observations to display past 7-day values on web page
- Observed ET_{rc} values

Any Questions?