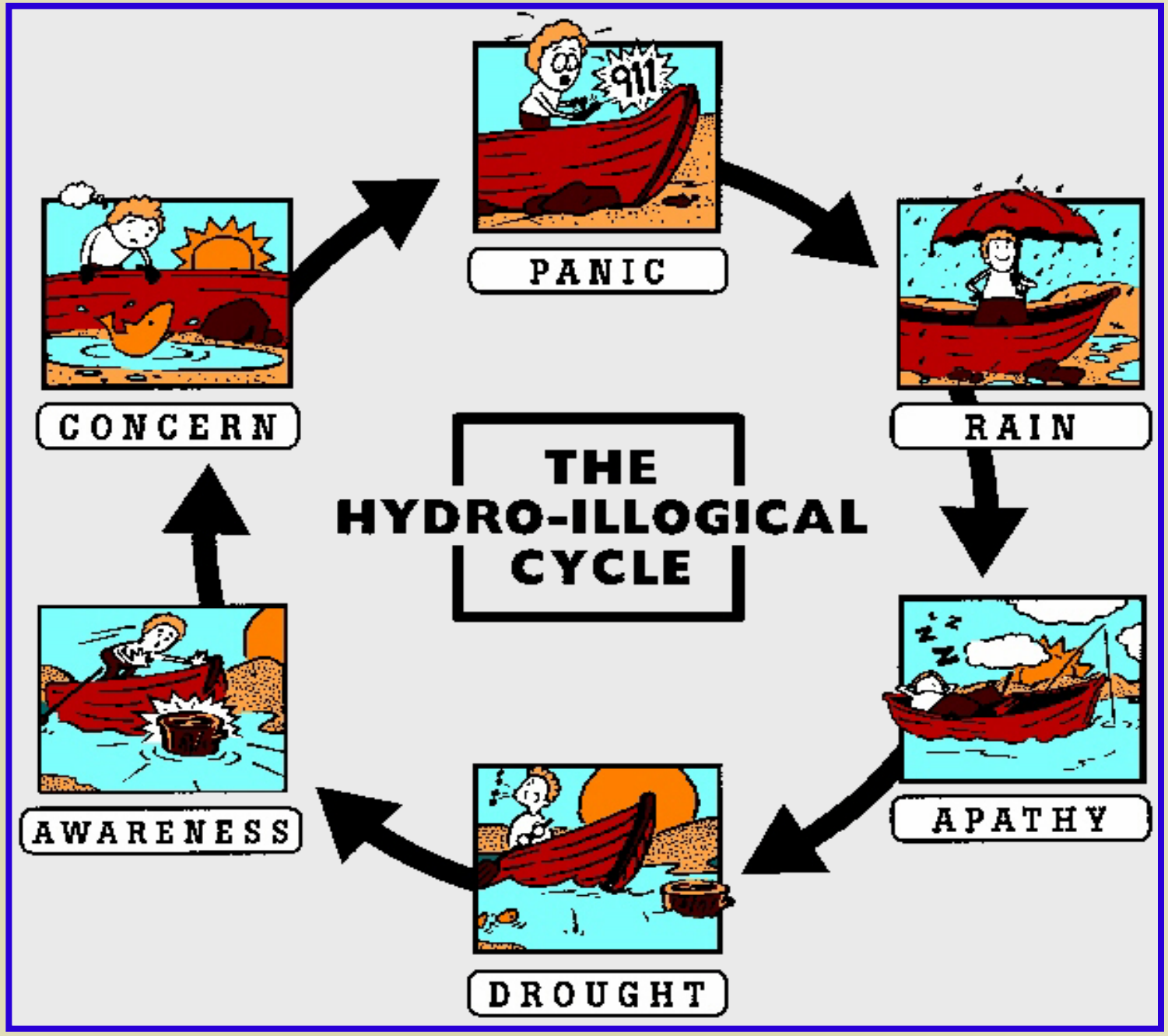
Leveraging Kentucky Mesonet for Drought Early Warning System

Rezaul Mahmood
Kentucky Mesonet and Kentucky Climate Center
Western Kentucky University

KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER



KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER

Photo: Ruffin McDaniel, 2016, Chapman, KS

http://www.weather.gov/top/LongTrackTornadoHitsNorthCentralKS

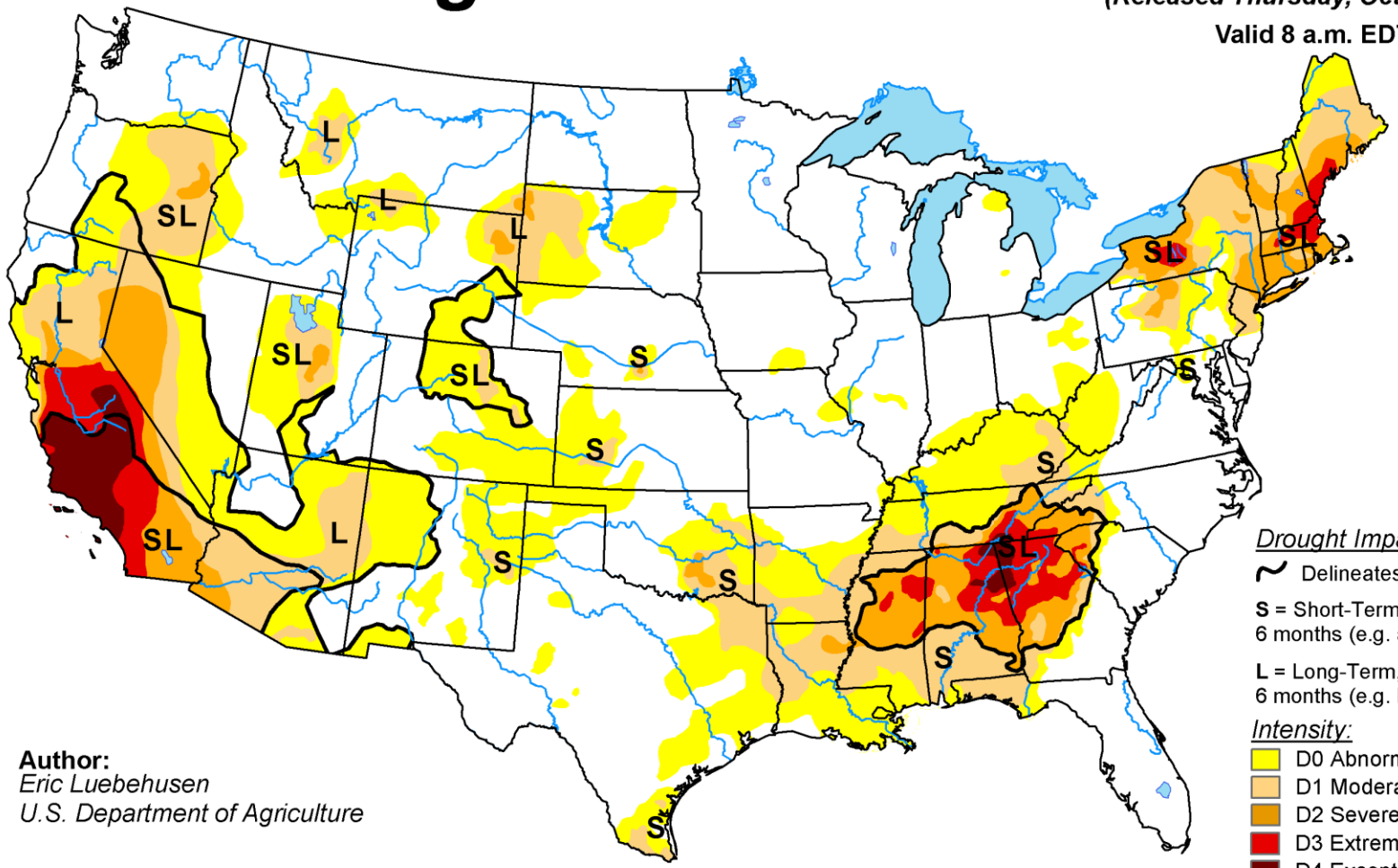
KENTUCKY CLIMATE CENTER

U.S. Drought Monitor

October 18, 2016

(Released Thursday, Oct. 20, 2016)

Valid 8 a.m. EDT



Author:
Eric Luebehusen
U.S. Department of Agriculture

Drought Impact Types:

Delineates dominant impacts

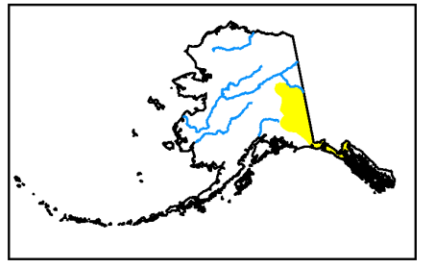
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

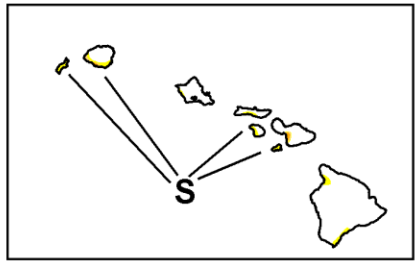
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

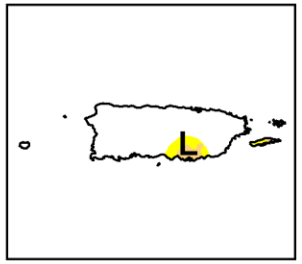
Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.







USDA

National Drought Mitigation Center

NOAA

http://droughtmonitor.unl.edu/

KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER

Todd County, 2010

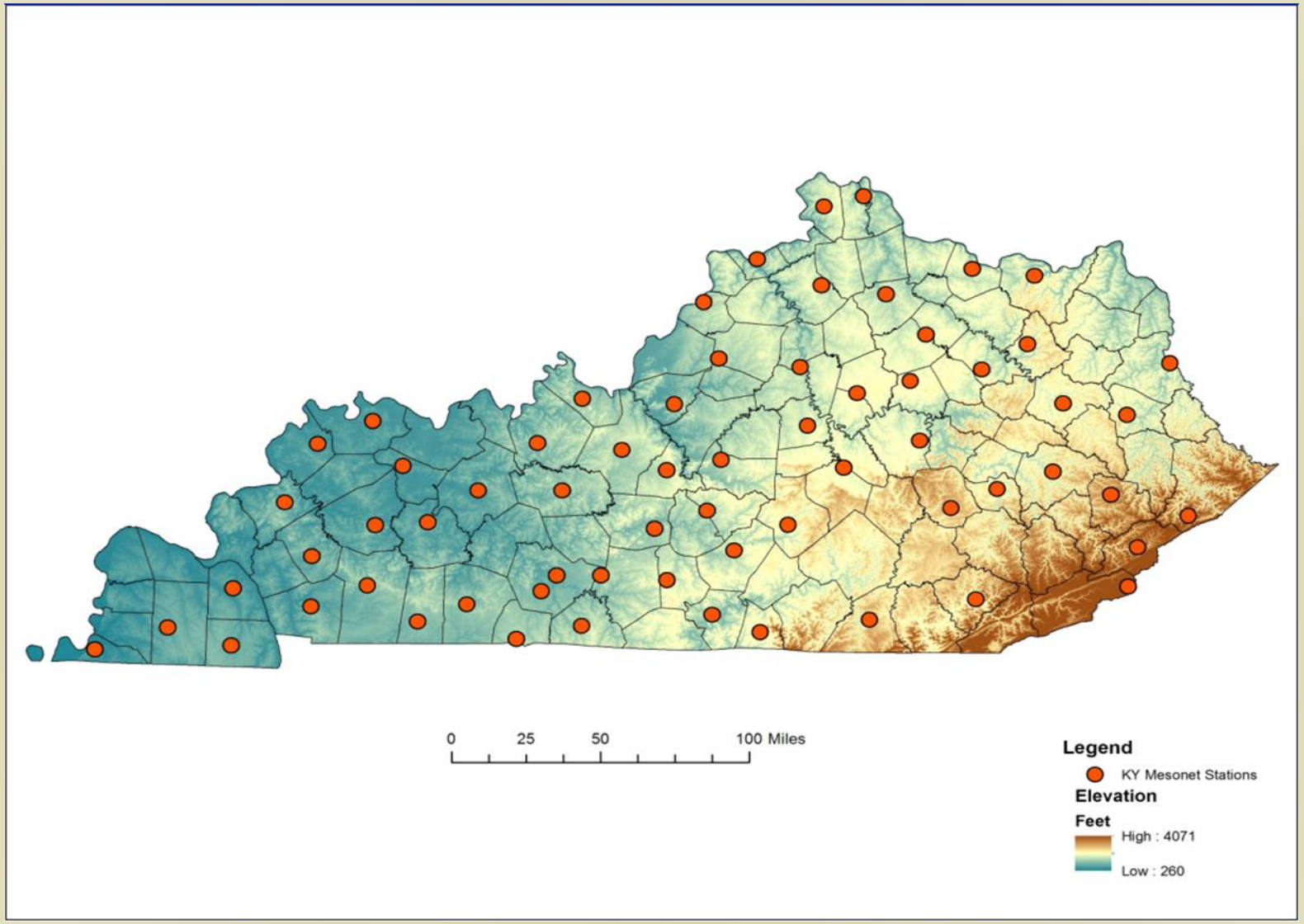
Mayfield, Graves County
July 27, 2012

Graves County

- 3.22” – Precipitation on March 8th
- 4.40” – Precipitation for the entire spring season
- 99.4° - Average high temperature from June 28th through July 8th

KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER



KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER

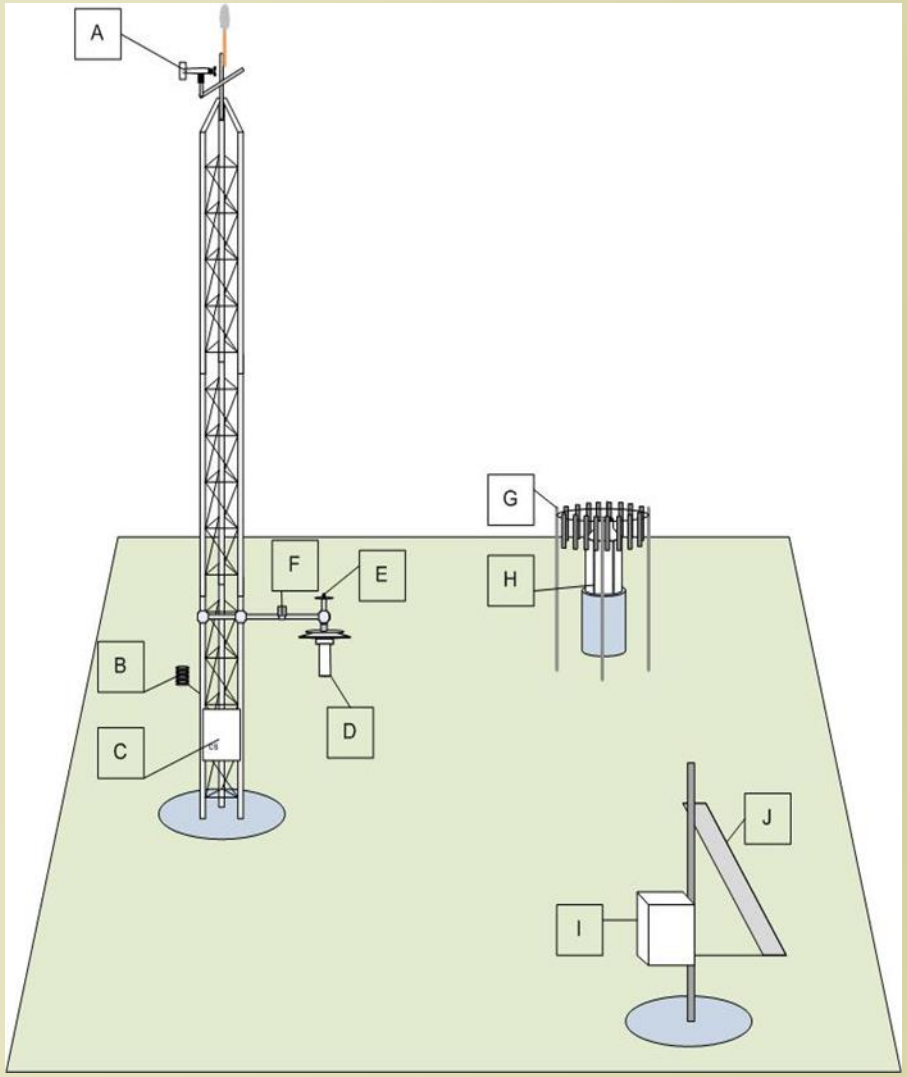
Strategic vision:

- Research quality data
- Operational
- Reliable
- Scalable
- Partnerships

KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER

Layout for Solar-powered Site



A. Wind Monitor
B. Relative Humidity Sensor
C. Datalogger Enclosure
D. Temperature Sensors
E. Pyranometer
F. Wetness Sensor
G. Single Alter Shield
H. Precipitation Gauge
I. Battery Enclosure
J. Solar Panel

Guy wires not shown. Drawing not to scale

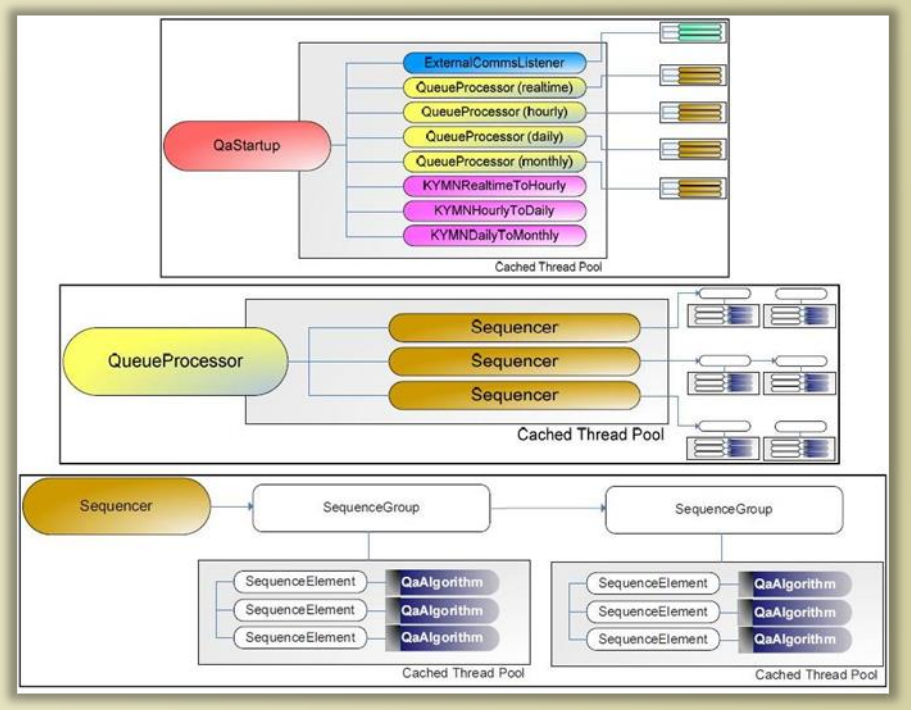
KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER

KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER

Quality Assurance Procedures



Automated QA runs on five-minute data as they are collected

Manual QA is implemented on a daily basis to provide expert assessment of system performance from remote sites

Twice daily QA report

KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER

Meteorological Database

- **Observations are taken every 5 minutes**
- **Each station collects over 105,000 observations each year**
- **Each station returns over 2,730,000 data values each year**

Types of Drought:

Agricultural drought

Meteorological drought

Hydrological Drought

Temporal aspects of drought

Short-term Drought

Long-term Drought

Spatial aspects of drought:

Local scale

Regional scale

Large scale

What is available?

NDMC

NIDIS

NOAA

NASA

USGS

Drought Monitor, PDSI, SPI, VegDRI and many others

KENTUCKY CLIMATE CENTER

What else do we bring to the table?:

Expertise, Meteorology Program, Climate Science

Mesonet, High Performance Computing Cluster, Climate Research Lab and others….

High Resolution data (local scale assessment),

KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER

High quality data, near real-time delivery

Assess developing drought and long sustaining drought

KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER

How do we achieve our objectives?:

1) Robust drought assessment by integrating all mesonet observed variables

2) PET (could be cumulative), variety of calculated parameters (accumulated precipitation, deviation from the normal)

3) GIS-based Mapping of these estimates (hence spatial distribution)

4) Soil moisture products (there should be about 19 stations operating next year, at the least); temporal point data

5) Eventually, as we install more probes, we can have mapped products based on actual data (current, deviation etc.)

5) Crop specific, crop growth stage specific drought index

6) Automated Modeled customized forecasts

…….and there are more…….

How do deliver?:

App

Web

Twitter

….And others

Acknowledgements: I thank Dr. Michael Hayes, NDMC, UNL for drought chasing slides.

Also thank Dr. Stuart Foster for Drought Photos for Todd and Graves Counties.

Questions?

KENTUCKY MESONET | WKU

KENTUCKY CLIMATE CENTER