

The Kentucky Mesonet: Active and Strategic Initiatives

Stuart A. Foster
Kentucky Climate Center
Department of Geography and Geology
Western Kentucky University

Kentucky Agriculture Science and Monitoring Committee

Louisville, Kentucky
December 12, 2019

The Night and Day of Weather Observations



Classic NWS Cooperative Network station collects temperature and precipitation observations once a day.

365 observations per year

Kentucky Mesonet station collects a suite of meteorological observations every 5 minutes.

105,120 observations per year



Instrumentation Suite for New Stations

Instrumentation Measures

Standard

- Air temperature
- Precipitation
- Solar radiation
- Relative humidity
- Wind speed & direction
- Barometric pressure

Enhanced

- Soil moisture & temperature
- Multi-level temperature (inversion monitoring)
- Landscape/weather camera imagery

Base Infrastructure

- Datalogger controls station operations
- Cellular modem enables 2-way communication via AT&T
- Batteries are trickle-charged via solar or AC power



Kentucky Mesonet Stations

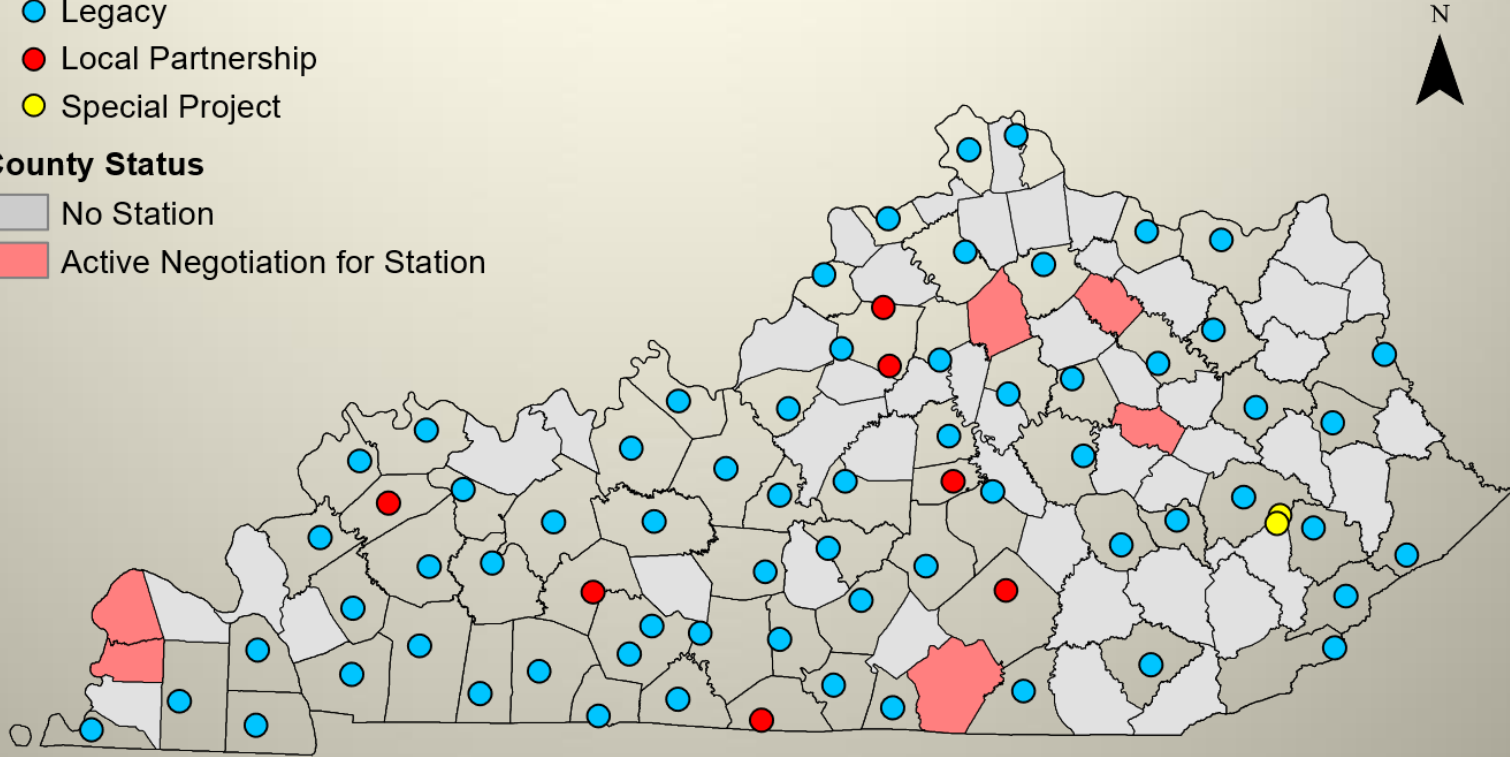
September 9, 2019

Station Funding Type

- Legacy
- Local Partnership
- Special Project

County Status

- No Station
- Active Negotiation for Station



Source: Kentucky Climate Center

0 60 120 240 Kilometers



Selected Kentucky Mesonet Outreach Applications

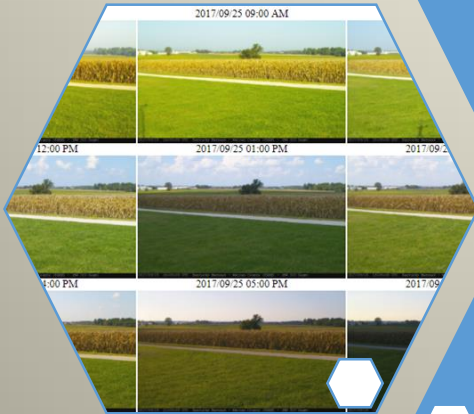
**Temperature
Inversion
Monitoring**



**Kentucky
DEWS**

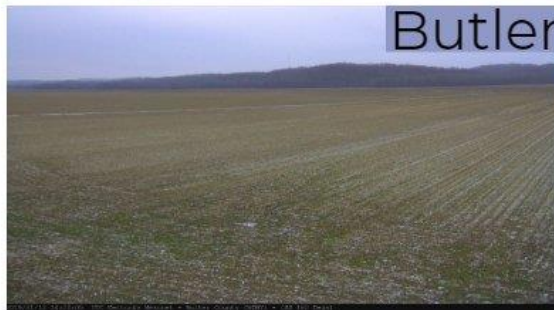


**Time Lapse
Imagery**



Webcams

KENTUCKY
MESONET
AT WKU



Very important to see whether snow is accumulating or not – Ground Truth!



Sample Application of Camera Imagery: Time Lapse of Fog Dissipation



01/19/17 13:00:00 - IFC Weather Webcam - Butter County, Ohio - 65° 2'N 82° 1'W



Sample Application of Camera Imagery: Hourly Archive of Landscape and Weather Conditions



Monitoring Vegetation Health



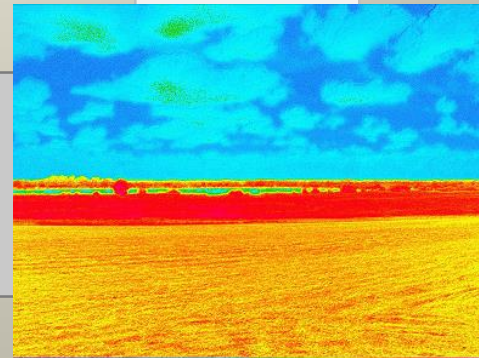
Visible

Infrared

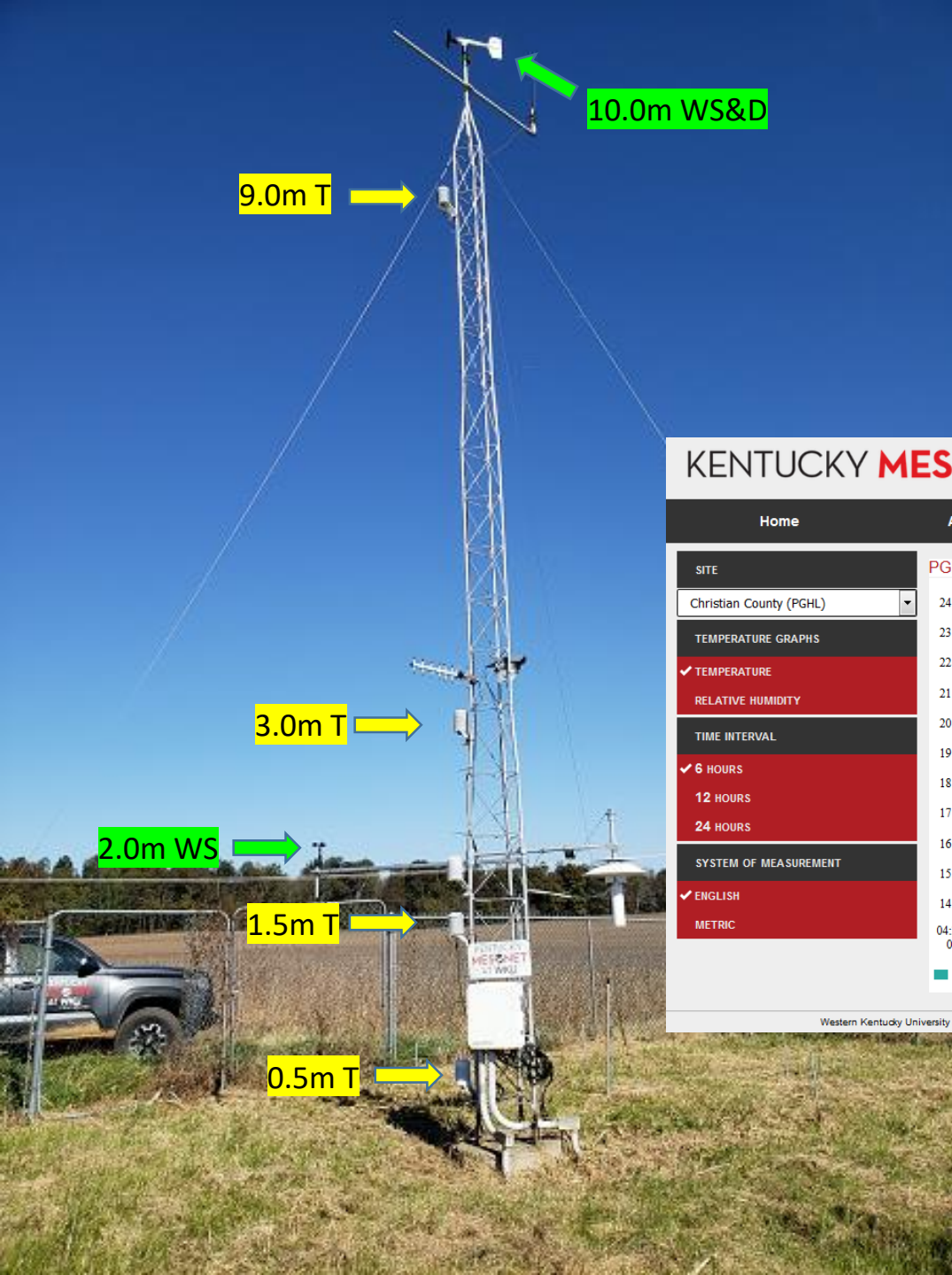
Feb 8, 2018



Jul 18, 2018



Temperature Inversion Monitoring



KENTUCKY MESONET | WKU

The Commonwealth's Official Source for Weather and Climate Data

Home

About

Data

Climate

Applications

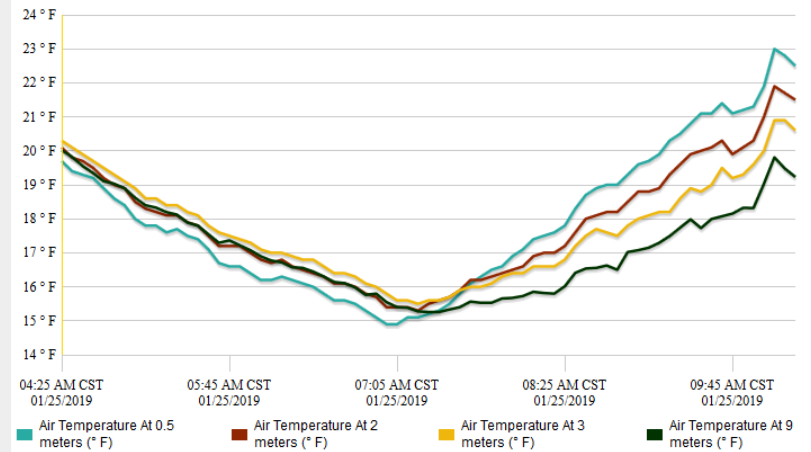
SITE
Christian County (PGHL)

TEMPERATURE GRAPHS
 TEMPERATURE
 RELATIVE HUMIDITY

TIME INTERVAL
 6 HOURS
 12 HOURS
 24 HOURS

SYSTEM OF MEASUREMENT
 ENGLISH
 METRIC

PGHL Temperature Inversion



Western Kentucky University - Kentucky Mesonet - 1906 College Heights Blvd #31066 - Bowling Green, KY 42101 - 270.745.4567 - kymesonet@wku.edu



Monitoring the Near-surface Temperature Profile

Diagram not drawn to uniform scale

+10 m

+9.0 m

Atmosphere

+1.5 m

+0.5 m

0 m

-5 cm

-10 cm

Soil

-20 cm

-50 cm

-1 m

-100 cm





Agricultural Drift & Inversion Monitoring (ADIM) Workshop

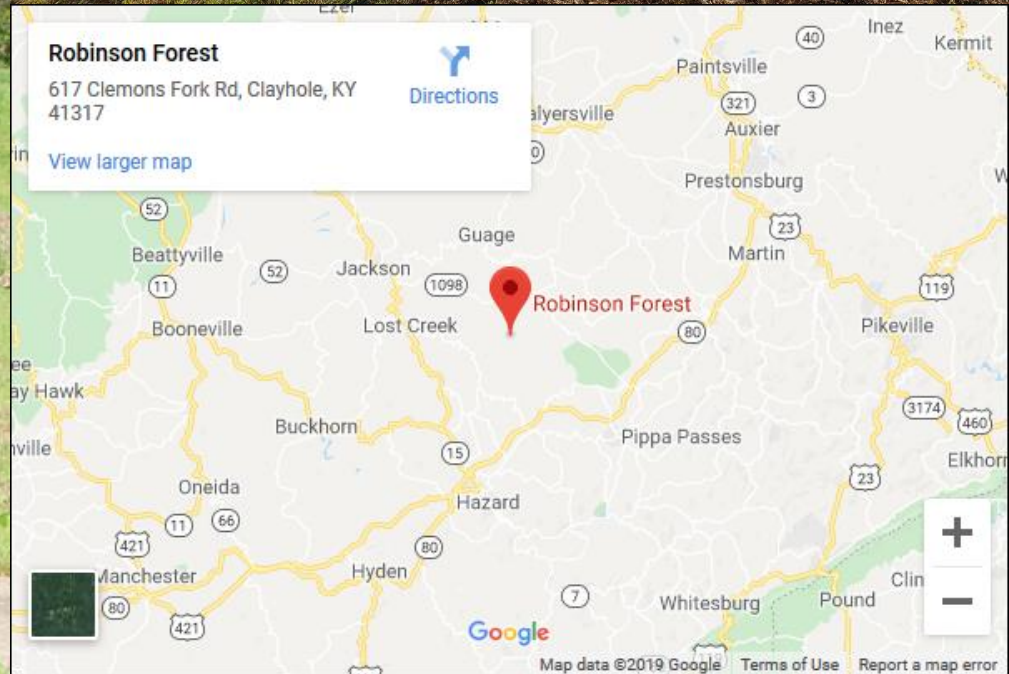
The USDA Midwest Climate Hub and the Indiana State Climate Office at Purdue University will provide a 1.5 day workshop on regional research, management and monitoring needs with an emphasis on herbicide/pesticide drift issues.

This workshop will provide “science-to-services” specific to air quality concerns in the Midwest and Central Plains regions connecting data with decisions for the following targeted audience:

- USDA agencies and partners (e.g., NRCS)
- University Faculty and Extension Staff (weed science, crops, etc.)
- Climate scientists
- Mesonet operators
- Federal scientists
- State Dept. of Agriculture/Natural Resources (e.g., policy regulators)



Robinson Forest Environmental Monitoring



Kentucky Mesonet Station

Installations at Robinson Forest



Site: Ridge (combined)
Elevation: 1,533 ft.



Site: Reclaimed Strip Mine
Elevation: 1,373 ft.



Site: Valley (combined)
Elevation: 833 ft.



Building the Kentucky Drought Early Warning System

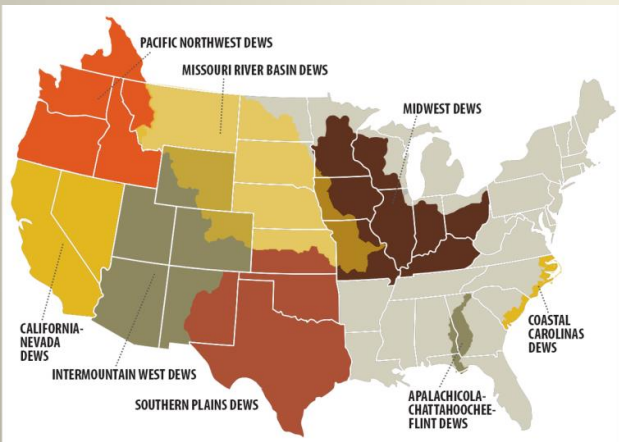
Proposed scope of work integrates four key themes:

Data Collection

Information Extraction

Messaging

Communication



Projected timeline:

Two-year project beginning in Summer of 2018.

Drought Analysis and Reporting Tool

Landscape Photo



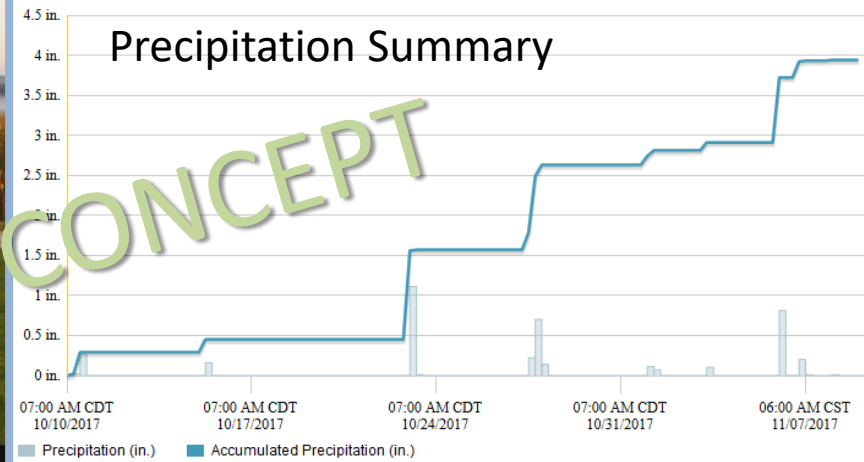
2017/09/24 12:00:00 UTC Kentucky Mesonet - Warren County (FARM) - (NW 320 Degs)

Report1

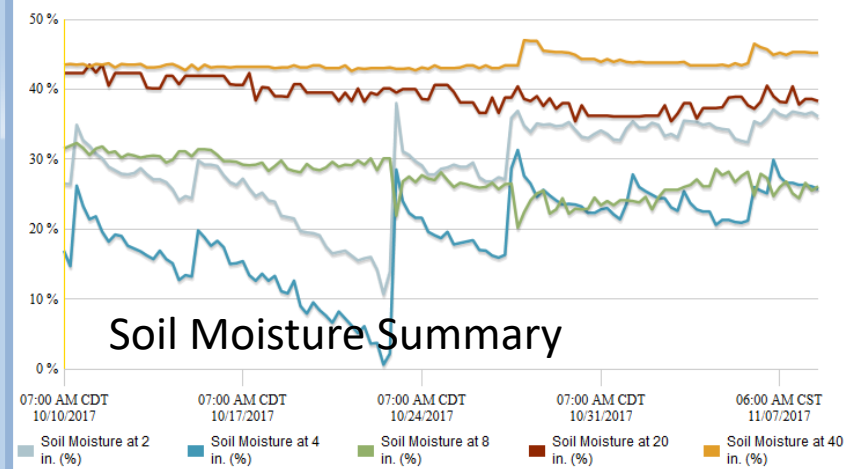
Farmers report ponds becoming dry. Pastures are in poor condition particularly in the northern portion of the county.

Text Description

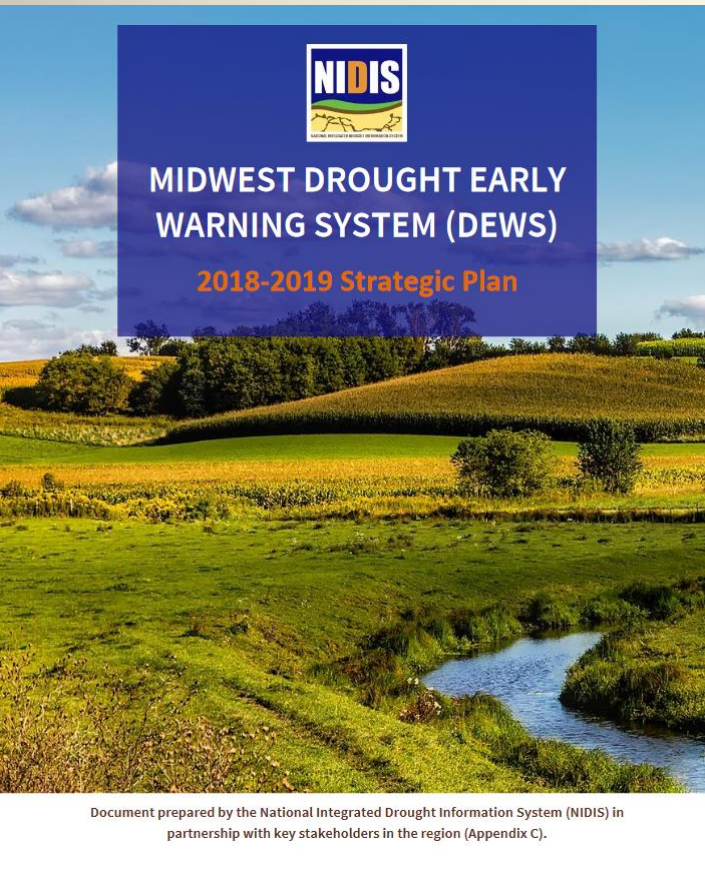
FARM Precipitation and Accumulated Precipitation (30 Day)



FARM Soil Moisture (Water Fraction by Volume) (30 Day)



Dashboard Functional Requirements



- Interactive platform to create time-series graphs that can be integrated with images, maps, and tables
- Provide users with flexibility to customize graphs and other dashboard content
- Enable users to access multiple, complementary data sources, including Kentucky Mesonet and USGS stream and reservoir data





Graphs



Images



Maps



Tables
Coming soon...

← Go Back



Mesonet Camera



Upload



US Drought Monitor

Mesonet Camera

Site FARM (NW 320 Degs)



2019-08-20

Timezone: UTC Time

Sort: Ascend

[Previous](#) [Forward](#)



2019/08/20 11:00 UTC



2019/08/20 11:30 UTC



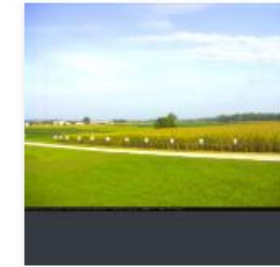
2019/08/20 12:00 UTC



2019/08/20 12:30 UTC



2019/08/20 13:00 UTC



2019/08/20 13:30 UTC



2019/08/20 14:00 UTC



2019/08/20 14:30 UTC



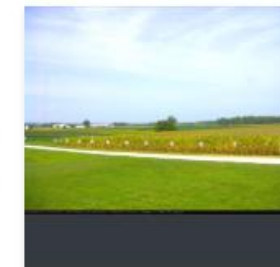
2019/08/20 15:00 UTC



2019/08/20 15:30 UTC



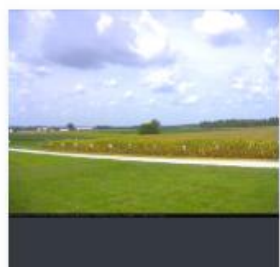
2019/08/20 16:00 UTC



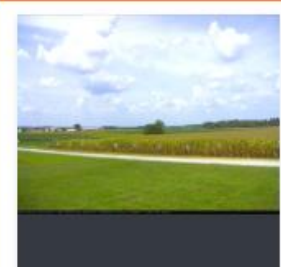
2019/08/20 16:30 UTC



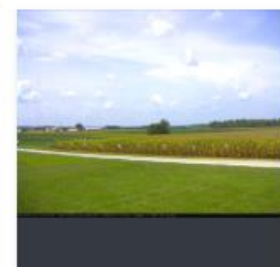
2019/08/20 17:00



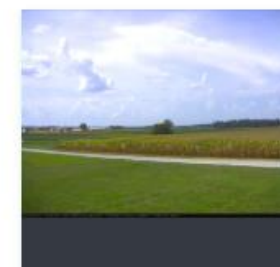
2019/08/20 17:30 UTC



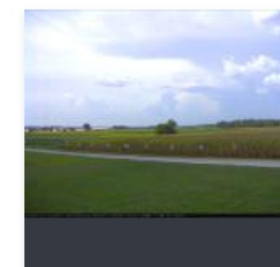
2019/08/20 18:00



2019/08/20 18:30



2019/08/20 19:00



2019/08/20 19:30 UTC



Graphs



Images



Maps



Tables
Coming soon...

[← Go Back](#)

Advanced Mode

Source

Kentucky Mesonet

Group

Location Group Selection ▾

📍 Location

User allows to select one or more than one locations.

× Caldwell County (PRNC)

🕒 Data Interval

Data interval affects the sample size of the graph.

1 Day ▾

⚙️ Variables

User allows to select one or more than one variables.

× Accumulated Precipitation - Daily Sum

📅 Time Range

Time range affects the range of the graph.

06/01/2019 12:00 AM - 08/19/2019 4:22 PM

🕒 Yearly Comparison (Optional)

This is an optional option, once a year is selected. The system will generate a yearly comparison graph.

× 2017 × 2018

United States Geological Survey

Variable Group Selection ▾

📍 Location

User allows to select one or more than one locations.

🕒 Data Interval

Data interval affects the sample size of the graph.

1 Day ▾

⚙️ Variables

User allows to select one or more than one variables.

Submit

Dashboard

Taskbar

Site Camera Image



2018/08/28 12:00:00 - 100 Resolution - Warren County, TN - 100 Zoom

Site Camera Image

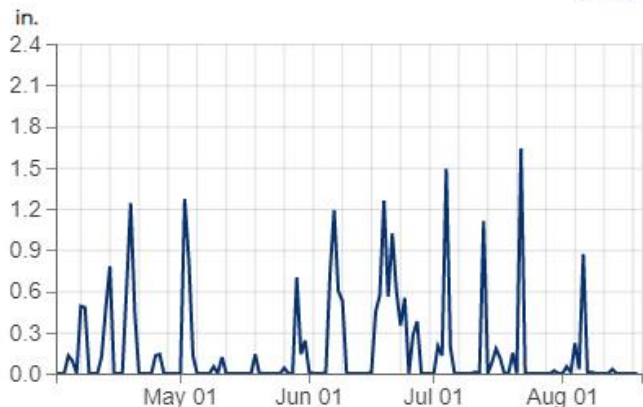


2018/08/28 12:00:00 - 100 Resolution - Warren County, TN - 100 Zoom

Precipitation



Grid: On



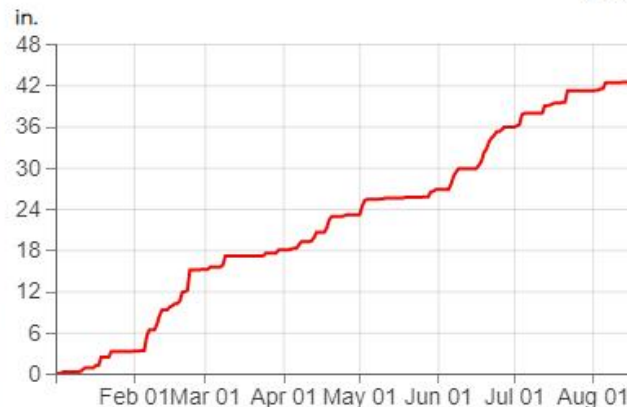
Warren County (FARM) ■ Precipitation

Sort By Site Time

Accumulated Precipitation



Grid: On



Warren County (FARM) ■ Accumulated Precipitation

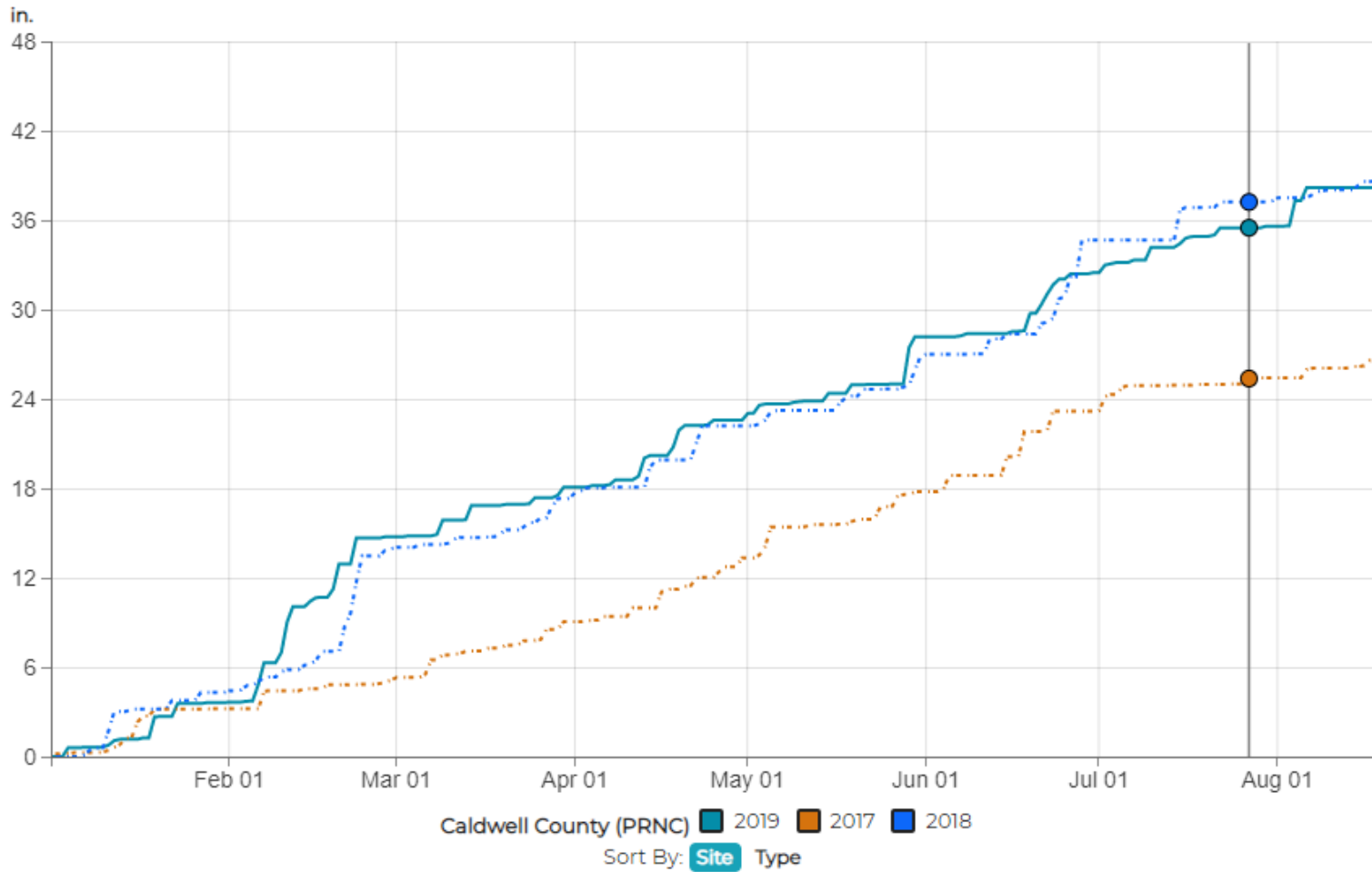
Sort By Site Time

Accumulated Precipitation



Grid: On

Tooltip Summary



07-27 05:00

Caldwell County (PRNC-2019)
Accumulated Precipitation: 35.49 in.

Caldwell County (PRNC-2018)
Accumulated Precipitation: 37.22 in.

Caldwell County (PRNC-2017)
Accumulated Precipitation: 25.37 in.

Focus



0:0:0:0

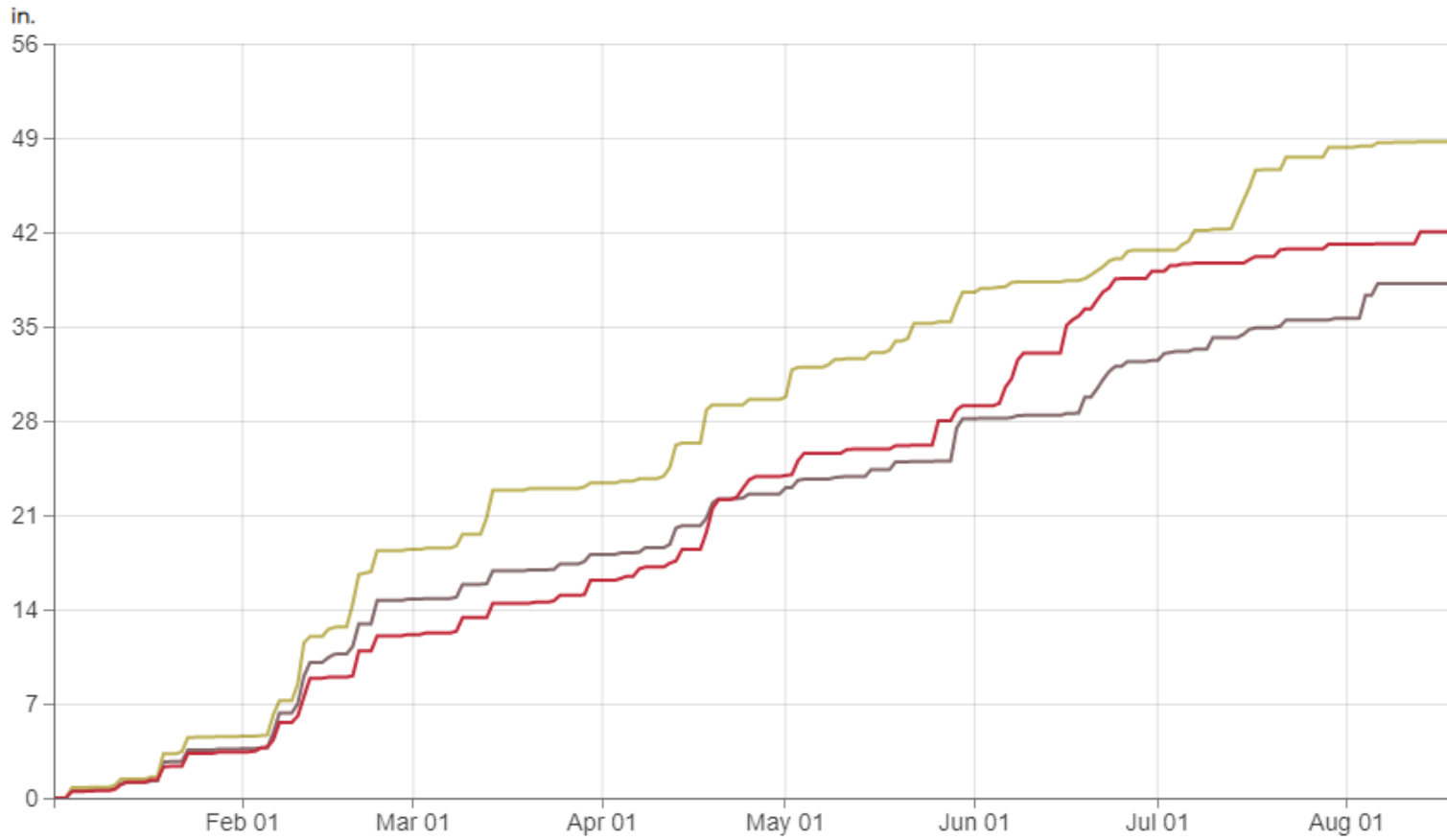
Accumulated Precipitation



Grid: On

Tooltip

Summary



Caldwell County (PRNC) Accumulated Precipitation

Fulton County (HCKM) Accumulated Precipitation

Meade County (BRND) Accumulated Precipitation

Sort By: Site Type

Focus



0:0:0:0

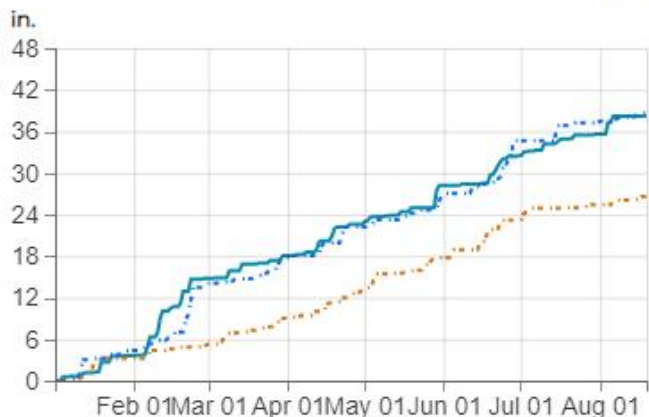
Dashboard

Taskbar

Accumulated Precipitation



Grid: On



Caldwell County (PRNC) 2019 2017 2018

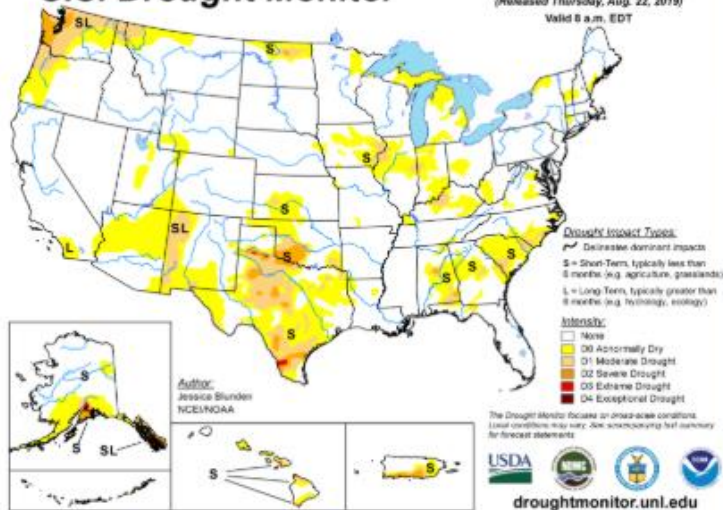
Sort By: Site Type

20190820 - US Drought Monitor National



U.S. Drought Monitor

August 20, 2019
(Released Thursday, Aug. 22, 2019)
Valid 6 a.m. EDT



Accumulated Precipitation



Grid: On



← Go Back

Advanced Mode

Source

Kentucky Mesonet

United States Geological Survey

Group

Location Group Selection ▾

Variable Group Selection ▾

Location

User allows to select one or more than one locations.

Location

User allows to select one or more than one locations.

Data Interval

Data interval affects the

1 Day

Data Interval

Combine data from different sources

Variables

User allows to select one or more than one variables.

Variables

User allows to select one or more than one variables.

Time Range

Time range affects the range of the graph.

08/13/2019 11:25 AM - 08/20/2019 11:25 AM

Yearly Comparison (Optional)

This is an optional option, once a year is selected. The system will generate a yearly comparison graph.

Submit

Precipitation&Streamflow Discharge

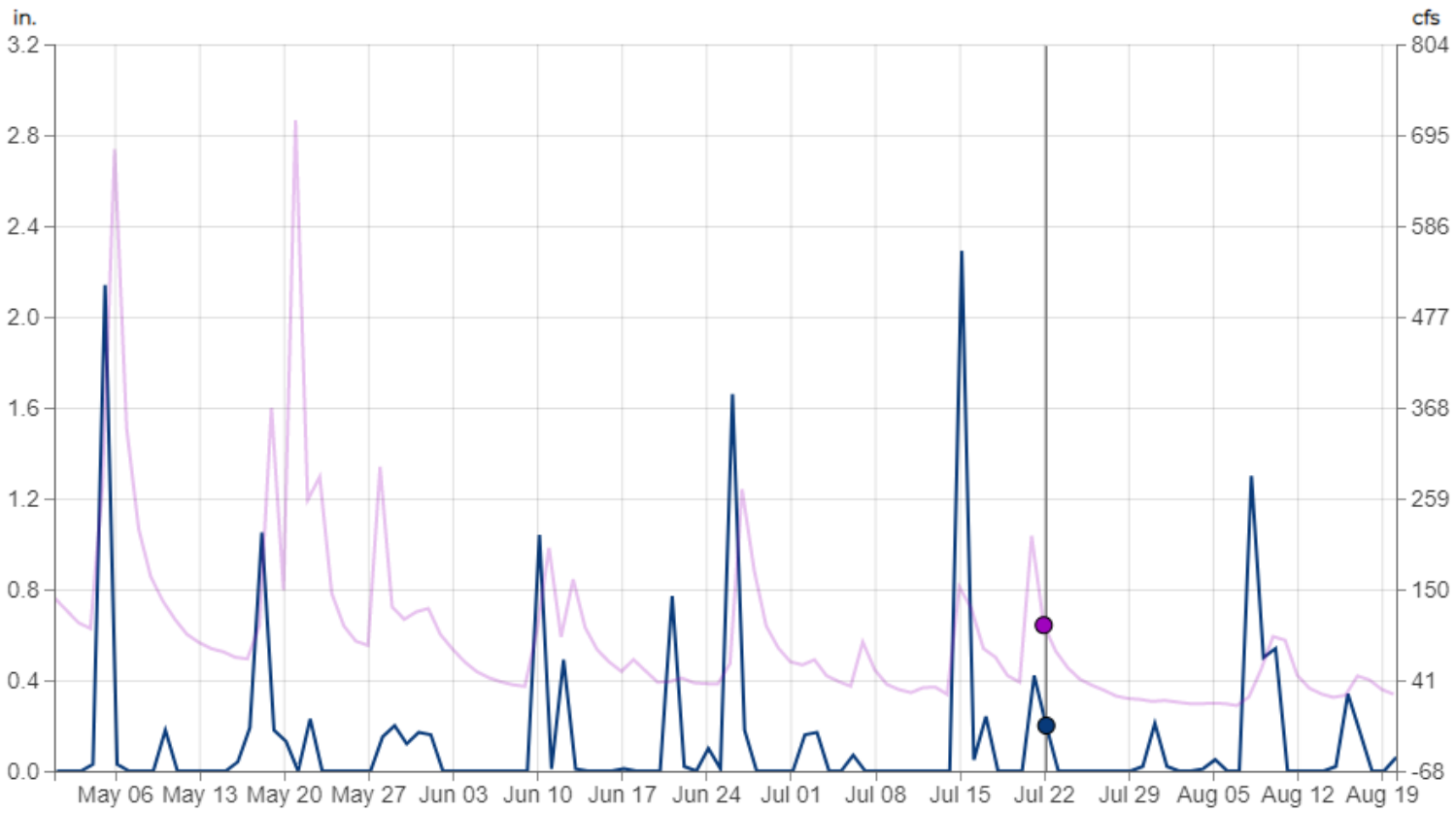


Grid: On

Tooltip Summary

07-22 00:00

Simpson County (SWZR)
Precipitation: 0.2 in.
Simpson County (03313700)
Streamflow Discharge: 107 cfs



Simpson County (SWZR) ■ Precipitation
Simpson County (03313700) ■ Streamflow Discharge
Sort By: Site Type

Focus



O:O:O:O

Research, Applications, and Outreach

