

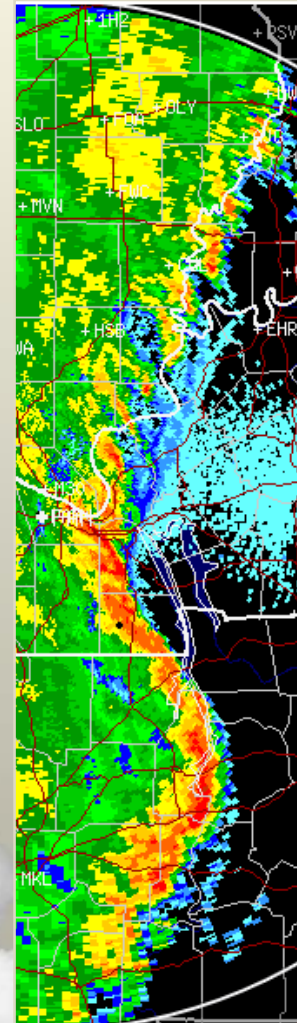
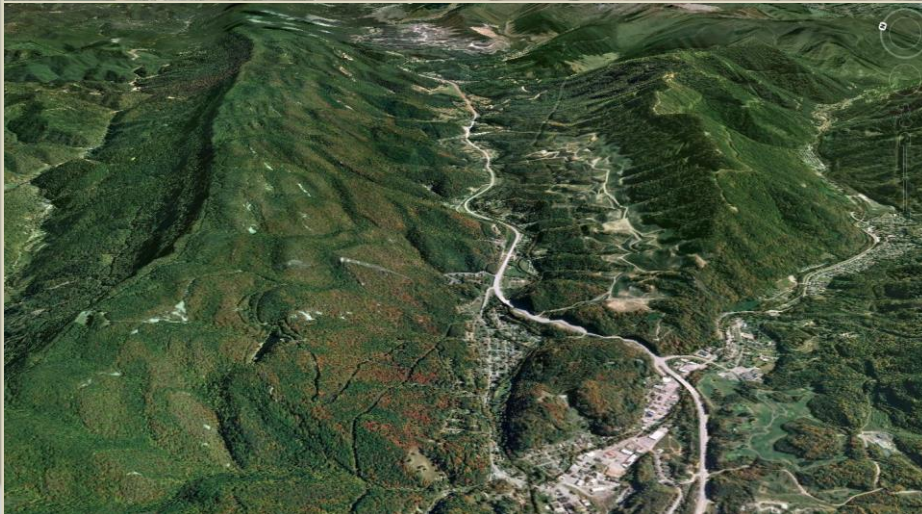
The Kentucky Mesonet: Past, Present, and Future

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Kentucky Climate Center
Western Kentucky University

Interim Joint Committee on Local Government
Legislative Research Commission
Frankfort, Kentucky

June 27, 2018

Kentucky's Weather and Climate Monitoring Infrastructure



Getting Off the Ground



Mitch McConnell
SENATE MAJORITY WHIP - UNITED STATES SENATOR FOR KENTUCKY

ABOUT THE SENATOR	PRESS RELEASES
PRESS OFFICE	Senator McConnell Secures \$1.5 Million In Funding For Western Kentucky University <i>from the Office of Senator Mitch McConnell</i>
WHIP OFFICE	Thursday, July 13, 2006
CONSTITUENT SERVICES	*Full Senate must now approve McConnell's requests*
PHOTO GALLERY	WASHINGTON, D.C. - U.S. Senate Majority Whip Mitch McConnell announced today that the Senate Appropriations Committee has approved his request for \$1.5 million in funding for Western Kentucky University's Environmental Monitoring Network. The funding, which is included in the FY'07 Commerce, Justice, and Science Appropriations bill, must now be approved by the full Senate.
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1. Approval of federal funding via National Weather Service
2. State recognition via SJR 228
3. Kickoff meetings at ADDs across the state

WESTERN KENTUCKY UNIVERSITY News Release

Kentucky Mesonet Recognized As Official Climate Data Source

April 06, 2006

Bowling Green, Ky. - Gov. Ernie Fletcher has signed a resolution recognizing the Kentucky Mesonet as the official source of climatological observations for the state.

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WKU Calendars
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Kentucky Mesonet Infrastructure across the Commonwealth



Graves County, KY



Morgan County, KY



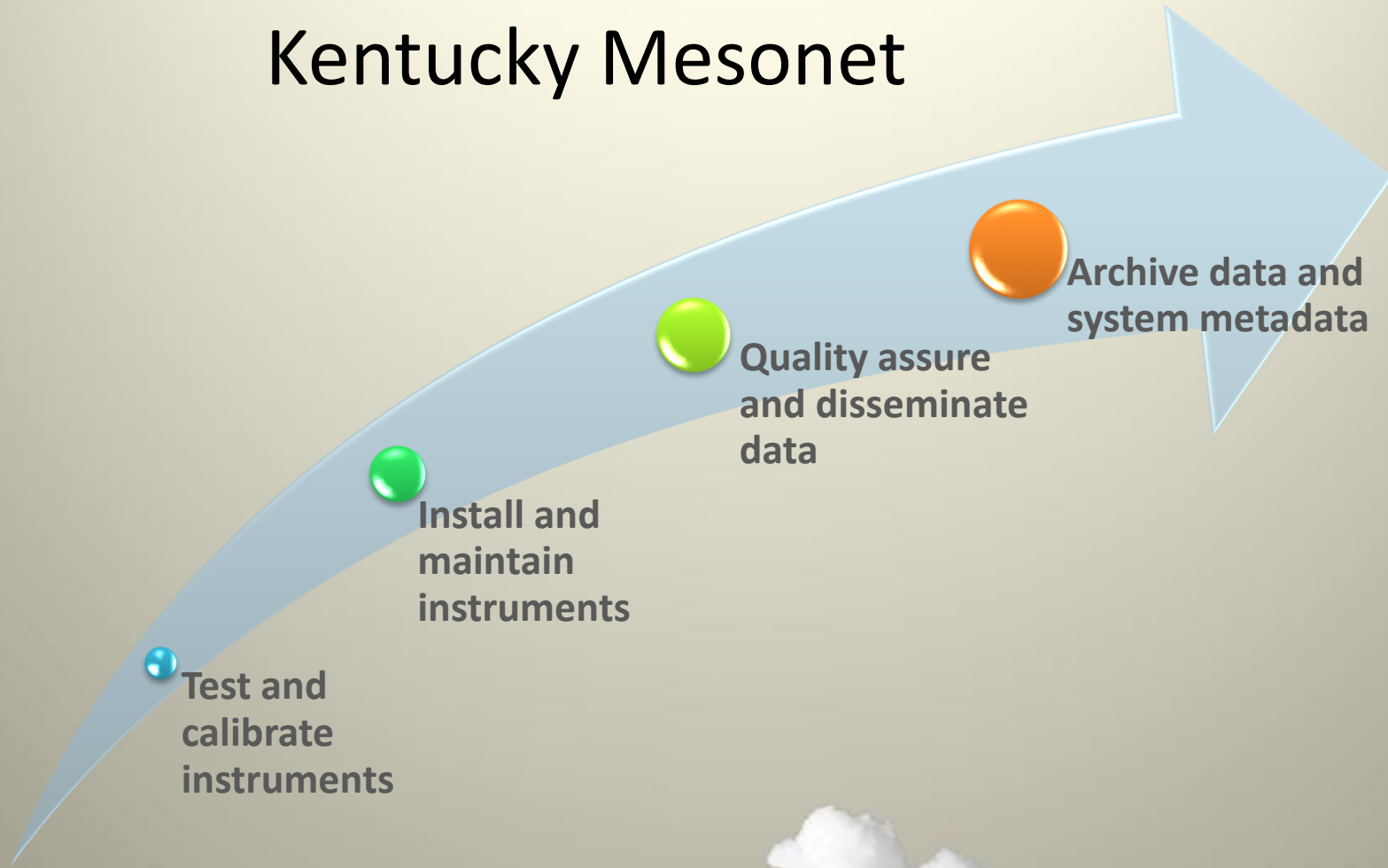
Carroll County, KY



Pike County, KY



Vertical Integration of the Kentucky Mesonet



Station Instrumentation

Standard Instrumentation

- Air temperature
- Precipitation
- Leaf Wetness
- Solar radiation
- Relative humidity
- Wind speed & direction

Base Infrastructure

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

Supplemental Instrumentation *

- Soil moisture & temperature
- Barometer
- Camera
- Multi-level temperature



* Tier II stations are in the process of being developed. Some sites already have all listed instrumentation.

Station Maintenance



- Spring, summer, and fall site maintenance passes to maintain station network infrastructure
 - Check and clean instrumentation
 - Periodically swap out instruments and replace batteries
 - Cut vegetation
 - Take site photographs
- Respond to “trouble tickets” when QA reports require unscheduled site maintenance visits



Metadata Database

Equipment History

Effective Time	Performed By	Calibration Location	Equipment Used	Variable	Equation
2008-04-04 16:55:(	Dana Grabowski	KYMN LAB	Fluke 7380 High Pre	TA01	0.9968X+-0.0511
2008-04-04 16:55:(	Dana Grabowski	KYMN LAB	Fluke 7380 High Pre	TA02	0.9968X+-0.0511
2008-04-04 16:55:(	Dana Grabowski	KYMN LAB	Fluke 7380 High Pre	TA03	0.9968X+-0.0511

Maintenance History

Action	Description	By	Time
CLEANED	Cleaned PRT Shelter		

Manage Sites

Move Equipment At Sites

Manufacturer	Model	Serial No	Vendor	Type
AirLink	Raven Edge E3214	0638149585	Campbell Scientific	Cellular Modem
Vaisala	VRG101	B45102	Vaisala	Weighing Bucket
Campbell Scientific	CR3000-XT-SW-NB-NC	1353	Campbell Scientific	Micrologger
Thermometrics	316-125-1000CR-385-4-TL3	7	Thermometrics	PRT
Kyocera	KC125TM	058101920	Solar Craft	Solar Panel
Kyocera	KC125TM	058101359	Solar Craft	Solar Panel
R M Young Company	05103-5	WM00075165	R.M. Young	Wind Monitor
Vaisala	HMP45C	B3220026	Campbell Scientific	Temp/RH probe

Non-Collection Site

Manufacturer	Model	Serial No	Vendor	Type
Thermometrics	316-125-1000CR-385-4-TL3	134	Thermometrics	PRT
R M Young Company	05103-5	WM00075175	R.M. Young	Wind Monitor
Thermometrics	316-125-1000CR-385-4-TL3	138	Thermometrics	PRT
Vaisala	HMP45C	B3230034	Campbell Scientific	Temp/RH probe
Met-One Instruments	076-B	F7077	Met-One Instruments	Aspirated Shield
Thermometrics	316-125-1000CR-385-4-TL3	9	Thermometrics	PRT
Thermometrics	316-125-1000CR-385-4-TL3	8	Thermometrics	PRT
R M Young Company	05103-5	WM00075174	R.M. Young	Wind Monitor
Apogee Instruments Inc.	PYR-P	4048	Apogee	Silicon Pyranometer
Vaisala	HMP45C	B3240065	Campbell Scientific	Temp/RH probe

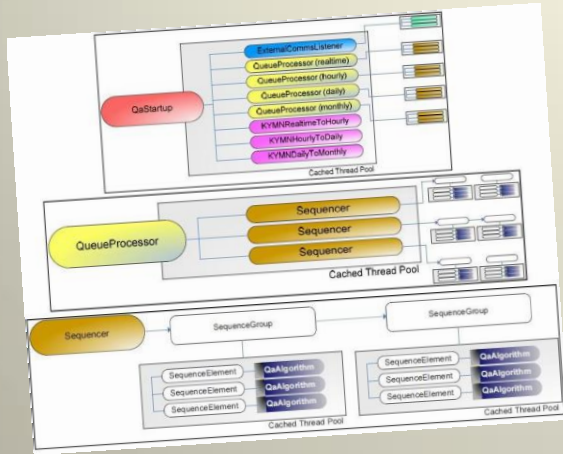
- Inventory of all scientific instrumentation, including serial numbers, deployment sites and dates, and calibration history
- Record of visits to all sites for both regular maintenance and trouble tickets.



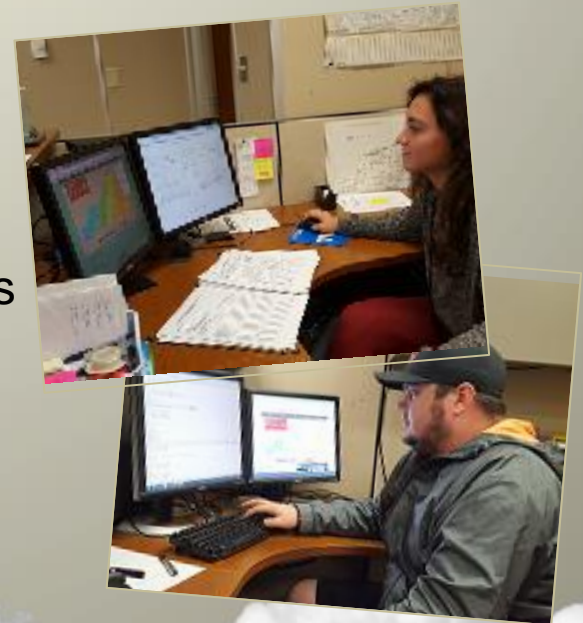
Quality Assurance

Over 200,000,000 data values are collected, processed, and archived each year across the network.

- Automated QA processes run on data every five minutes as they are collected from remote sites



- Manual QA is performed on a daily basis to provide expert assessment of system performance and issue “trouble tickets”



Warren County, KY

Bowling Green 5 S

Dewpoint: 66.5°F

Humidity: 99%

Precipitation: 5.06 in. (SINCE 12AM)

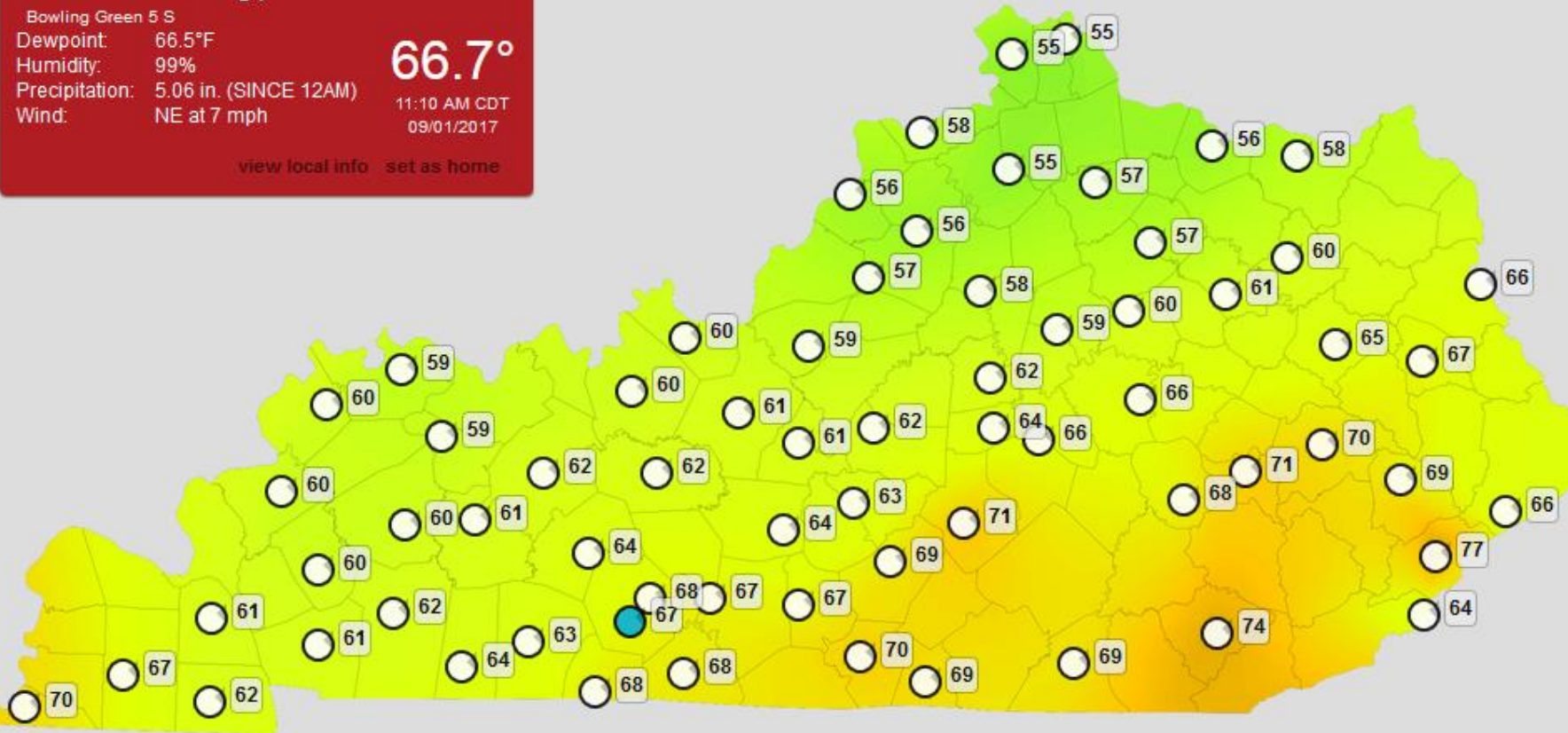
Wind: NE at 7 mph

66.7°

11:10 AM CDT

09/01/2017

[view local info](#) [set as home](#)



Air Temperature Data Points on Air Temperature Contour Map



Leaflet



Warren County, KY

Bowling Green 5 S

Dewpoint: 66.0°F

Humidity: 100%

Precipitation: 5.05 in. (SINCE 12AM)

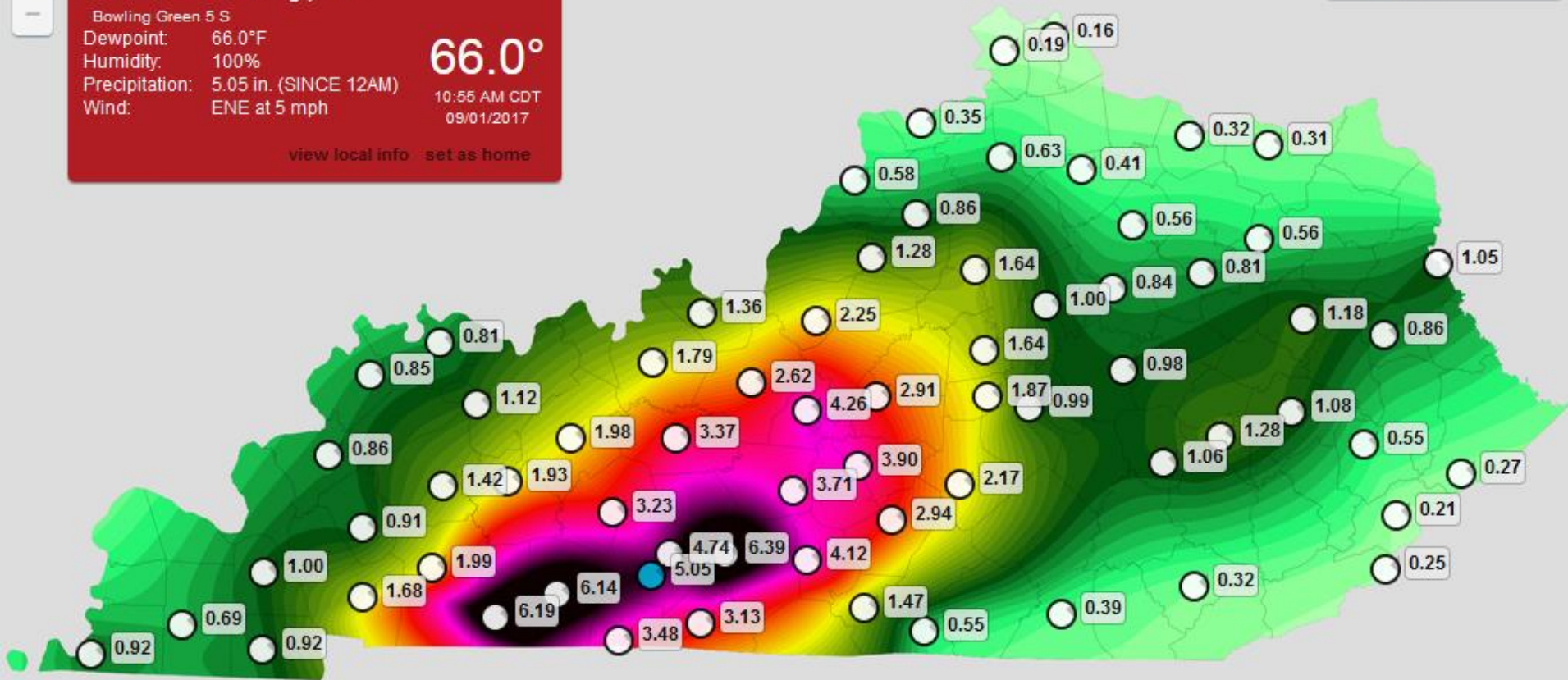
Wind: ENE at 5 mph

66.0°

10:55 AM CDT
09/01/2017

[view local info](#) [set as home](#)

Since Midnight >



Precipitation Data Points on Precipitation Contour Map

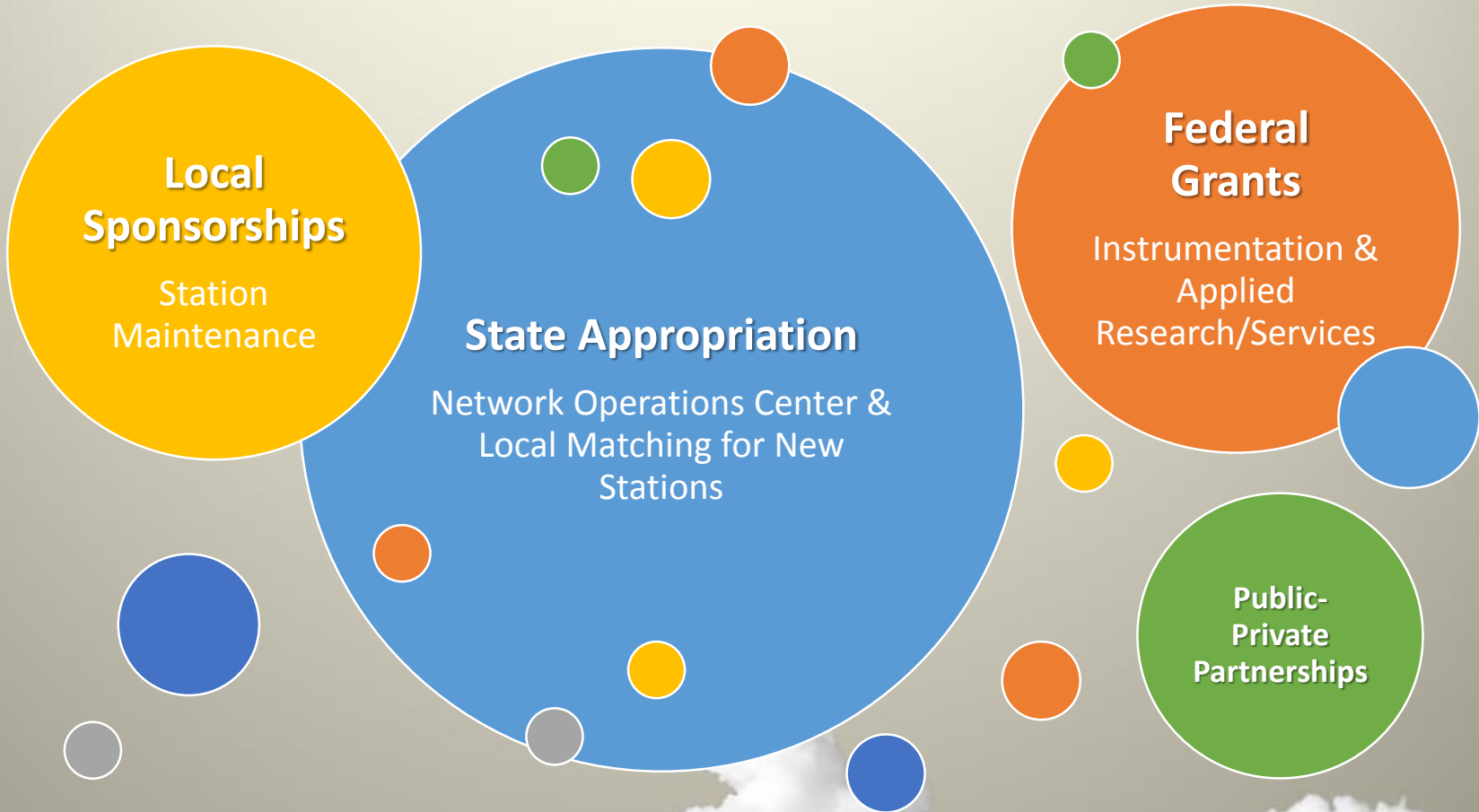


Leaflet



Tiered Funding Model

Leveraging State Investment



Local Partnerships

- **Standard Station Installation Agreement**
 - Estimated station cost: \$25,000
 - Local sponsor's portion: First \$15,000
 - Mesonet match: Remaining \$10,000
- **Sponsorship Agreement**
 - Annual contribution up to \$5,000, but currently \$3,000
 - Supports cost of maintaining station
 - Priority site for instrumentation enhancements
- **Site License Agreement**

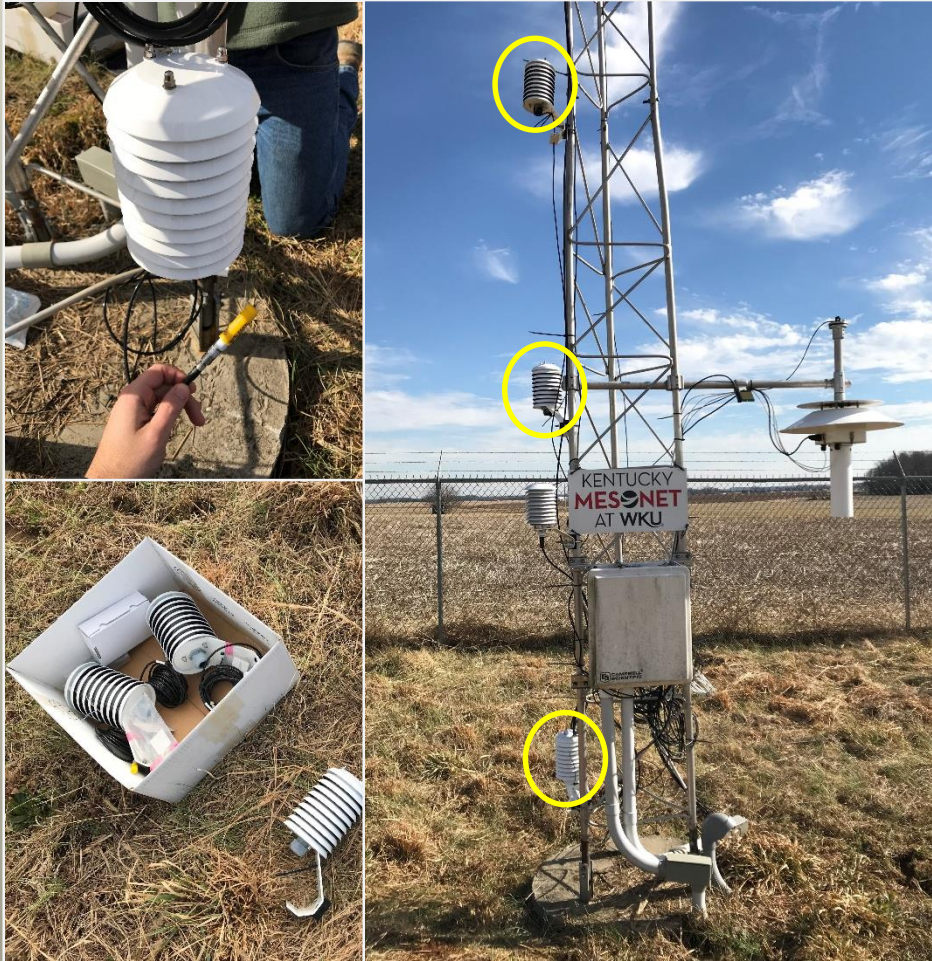


Kentucky Mesonet Outreach Applications



Temperature Inversion Monitoring System

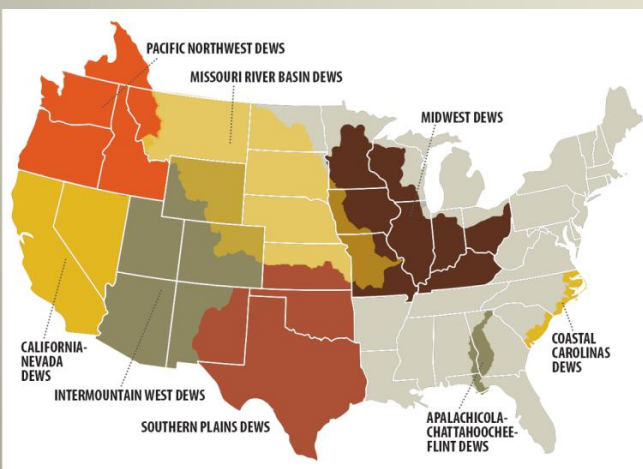
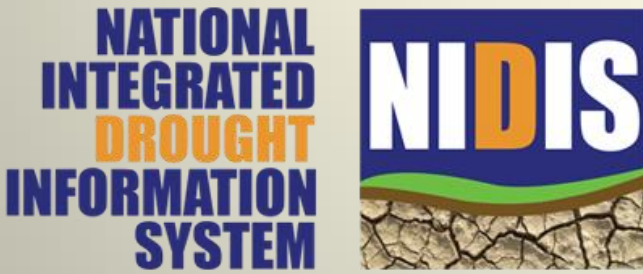
Experimental Project Supported by USDA Midwest Climate Hub



- Multi-level temperature measurements (1.5', 6', and 10') help to determine when the potential for a temperature inversion is high.
- Farmers can determine when conditions are right for applying chemical treatments to crops.
- The monitoring system is being installed at 6 sites.
- Results will be evaluated to determine whether to invest in monitoring at additional sites.



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.

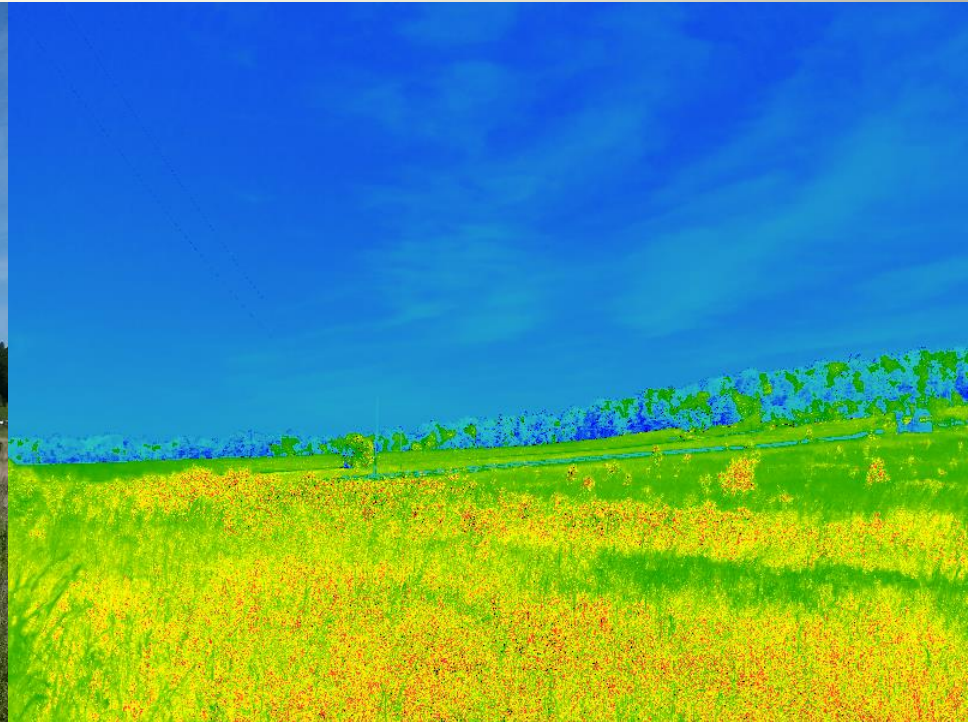


Vegetation Health Indicator

Experimental Project for Drought Impact Monitoring



Visual imagery to document landscape condition



Infrared imagery to document vegetation health through NDVI

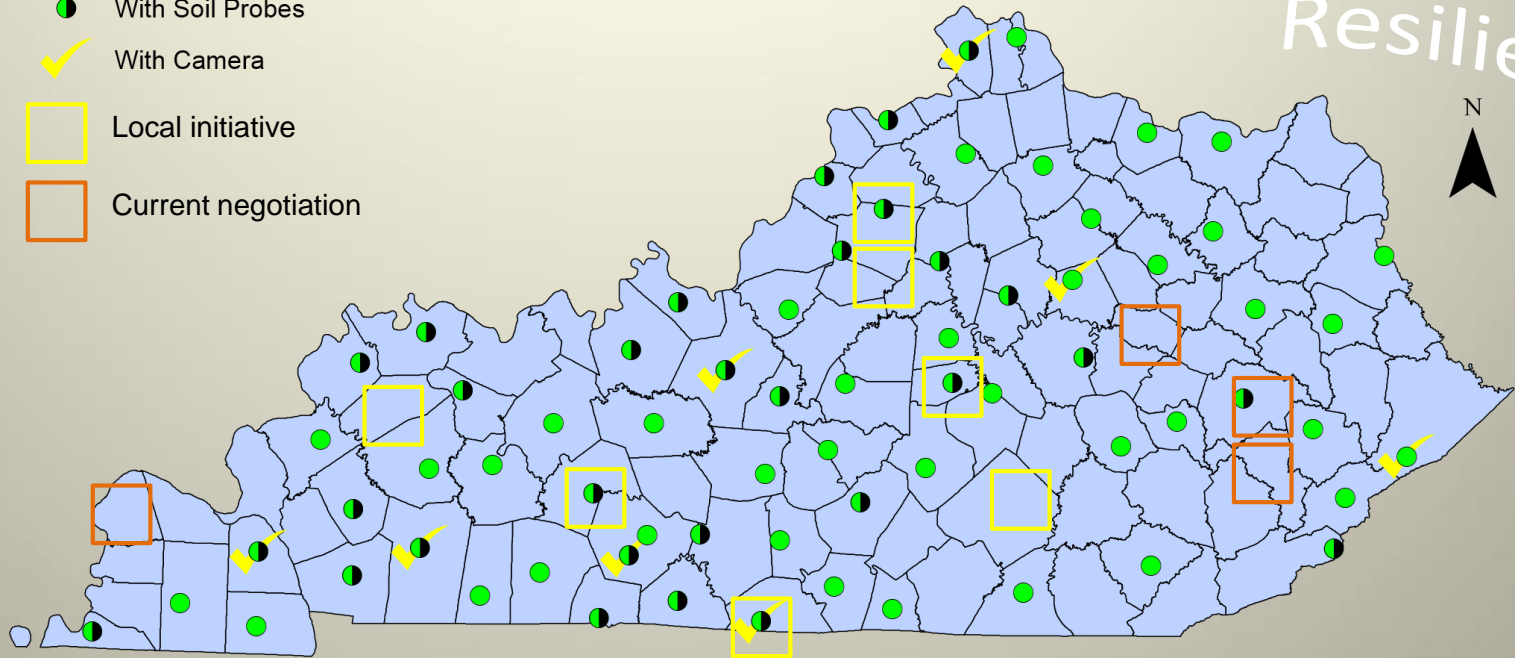


Kentucky Mesonet Stations

Agility
&
Resilience

Legend

- Station
- With Soil Probes
- ✓ With Camera
- Local initiative
- Current negotiation



0 25 50 100 Miles



Takeaways



- A world-class infrastructure benefitting rural and urban communities across Kentucky
- Enhancing public safety in partnership with the National Weather Service
- Strengthening economic competitiveness and development of weather-sensitive industries
- Leveraging state funding through local partnerships and federal grants
- An opportunity to grow Kentucky's knowledge economy through R&D partnerships



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