Online HydroGRAM

Network of Automated Weather Stations Delivers Timely Information

Timely and accurate weather information is critical to many aspects of life in Kansas. Each and every day, farmers, engineers and utility operators make decisions that depend on the weather. When hazardous weather is imminent, public safety depends on knowing the location, severity and movement of storms.

In Kansas, a network of automated weather stations is being developed to provide meteorologists, emergency managers and the public with basic weather information, from rainfall to wind speed, almost as soon as it happens. Called the Kansas Mesonet, 13 stations are being installed this fall in strategic locations around the state that lack nearby automated stations providing near real time information.

Celebrating the installation of one of the first of the new network of automated weather stations is Mary Knapp, State Climatologist based at Kansas State University, and Paul Liechti, Assistant Director of the Kansas Biological Survey. The station was installed on the University of Kansas Nelson Environmental Study Area (KU-NESA) northeast of Lawrence. Data collected at the site is posted on the Natural Resources Conservation Service's Soil Climate Analysis Network web site, www.wcc.nrcs.usda.gov

Local, state and national cooperation is essential in the development of the Kansas Mesonet. Tom Lowe, chair of the Kansas Mesonet Steering Committee, left, is joined by Dean Kettle, assistant director for the University of Kansas' Nelson Environmental Study Area; Garry Schaefer, NRCS National Water and Climate Center of Portland, Oregon; and Mary Knapp, State Climatologist based at Kansas State University at the Nelson Environmental Study Area. The instrumentation on the left end of the tower's lower cross bar is a rain gauge; the device on the right measures temperature and humidity. The upper cross bar features an anemometer to measure wind speed and a device to measure solar radiation.

"Applications for the data we'll collect will be broad," says Mary Knapp, State Climatologist based at Kansas State University. "In Kansas, most people think of farming uses first, but we receive calls from many data users such as fiber optic companies and utilities that want to know how deep the ground is frozen so they can install their cable or piping." Not all users will need updates on a five-minute or hourly interval, but the information will be there for both immediate and long-term historical reference.

"The more information we have, the better," says George Phillips, Science and Operations Officer for the National Weather Service in Topeka. "The denser the network of reliable surface observations, the more precise we can be with our forecasts."

Phillips says that while radar is a great tool, knowing what is happening on the ground enhances meteorologists' ability to forecast and issue warnings for flooding and severe weather. Multiple observations of wind direction, wind speed, temperature and dewpoint of the air flowing into a storm helps them distinguish between the need for a tornado warning vs. a thunderstorm warning.

"The network of automated weather stations also helps support emergency response to hazardous material incidents," Phillips says. "If there's a chemical spill, it's critical that first responders know wind speed and direction as quickly as possible. We're better able to support them if we have multiple observation sites and frequent recording of data."

Each of the new automated weather stations has a 10-meter tall instrument tower outfitted with sensors to measure precipitation, wind speed and direction, solar radiation, air temperature and relative humidity. All stations are powered by solar panels with a power line back up if it's available. Communications and data retrieval will be made via a digital modem. Data from the Mesonet stations will be available on the Kansas State University Weather Data Library website.

Securing tower guy wires was among the final stops in the installation of the Kansas Mesonet automated weather station at the University of Kansas' Nelson Environmental Study Area.

Soil moisture, temperature and salinity measurements also will be made. The battery of soil measurements allows Kansas Mesonet stations to be compatible with the Soil Climate Analysis Network (SCAN) maintained by the Natural Resources Conservation Service. Measurements will be taken at 5, 10, 50 and 100 centimeter depths. The SCAN sites are located on benchmark soils representative of their region.

"There's a real advantage to having precise soil measurements along with weather data," says Chad Remley, Soil Data Quality Specialist with the Natural Resources Conservation Service of Salina. "One of the soil parameters we measure is seasonal soil saturation. Knowing when and how much it rained allows us to measure water movement over time through different soils." Soils underlain with a clay layer can remain saturated for weeks while water will quickly move through others.

One of the first of the new network of automated weather stations was installed in August at the Kansas Biological Survey's Nelson Environmental Study Area northeast of Lawrence. It reflects the cooperative nature of the project, being funded by the University of Kansas, Kansas State University and the National Water and Climate Center, the Natural Resources Conservation Service SCAN headquarters in Portland, Oregon. It will be part of the Kansas Mesonet network.

Participants in the installation of the automated weather station include, l. to r., Tom Lowe, Kansas Water Office, Topeka; Dean Kettle, Nelson Environmental Study Area, Lawrence; Chad Remley, Natural Resources Conservation Service, Salina; Debbie Harms, NRCS National Water and Climate Center, Portland, Oregon; Bill Wehmueller, Natural Resources Conservation Service, Salina; Mary Knapp, Kansas State University, Manhattan; Garry L. Schaefer, NRCS National Water and Climate Center, Portland, Oregon; Galen Pittman, Nelson Environmental Study Area; Paul Liechti, Kansas Biological Survey; and Tony Tolsdorf, NRCS Water and Climate Center.

"Having this quality of information on site will be invaluable to the research conducted here," says Dean Kettle, assistant director for the Nelson Environmental Study Area. "It's also good to be part of a broader network providing worthwhile information."

Installation of several Kansas Mesonet stations will continue through this fall. Additional stations are planned for later years. For additional information on currently available information on the Kansas State University Weather Data Library, refer to http://www.oznet.ksu.edu/wdl/ . For information on the Soil Climate Analysis Network, refer to www.wcc.nrcs.usda.gov

Genesis of the Kansas Mesonet

The 2006 Kansas Legislature directed the Kansas Water Authority to review the state's existing automated weather station networks with an eye toward determining any duplication of effort or lack of coordination among them. Reporting its findings in 2007, the Authority called for establishment of an interagency body to promote better coordination among existing networks and to expand automated weather station coverage to underserved areas of the state.

In 2007, the Kansas Legislature approved expenditures from the State Water Plan Fund for purchase and installation of several new automated weather stations, the start of the Kansas Mesonet. Funding for additional stations came from the U.S.Bureau of Reclamation. Additional funding was provided by the 2008 Legislature.

To help meet these recommendations, the Kansas Water Office organized the Kansas Mesonet Steering Committee, a team of professionals that includes meteorologists, weather station network administrators, and weather data users.

"The Water Office has a long-standing interest in automated weather stations," says Tom Lowe, Chair of the Mesonet Steering Committee. In the mid-1990s, funding from the State Water Plan Fund was used by several groundwater management districts to purchase automated weather stations that provide data for use in irrigation scheduling. Operation and maintenance for several of these stations continues to be provided by Kansas State University with financial support from the State Water Plan Fund.

"With the Mesonet, more weather and soil information will be available in near real-time, making this data valuable for a wider variety of users," Lowe noted. He looks forward to the day when Kansas, like Oklahoma, will have a Mesonet station in all counties in the state.

Counties initially designated to be the site of a Kansas Mesonet automated weather station included Clay, Washington, Jewell, Mitchell, Osborne, Hodgeman, Harper, Wabaunsee, Butler, Elk, Osage, Woodson, Jefferson, Miami and Cherokee. Funding only was available for 13 sites.

Chad Remley, Soil Data Quality Specialist with the Natural Resources Conservation Service of Salina, takes advantage of the pit dug to install soil sensors in connection with the automated weather station, to give University of Kansas students a lesson in soils. The sensors are installed at depths of 5, 10, 20, 50 and 100 centimeters at all Soil Climate Analysis Network (SCAN) sites. At Mesonet sites, sensors are placed at 5, 10, 50 and 100 centimeter depths.