The Colorado Climate Center

By Nolan Doesken, Colorado State Climatologist

Doesken was recently appointed as the Colorado State Climatologist in July 2006 and has been at the Colorado Climate Center since 1977. He succeeds Dr. Roger Pielke (2000-2006), and Dr. Thomas McKee (1974-2000).

The Colorado Climate Center (CCC) is an academic center dedicated to monitoring and tracking climatic conditions throughout Colorado. Part of Colorado State University's Department of Atmospheric Science in the College of Engineering, the CCC also serves as an information resource to business, government, industry, education, researchers and the general public. The CCC is home to the Colorado State Climatologist position. This article highlights primary activities and responsibilities, featuring climate monitoring, data archival, applied research, climate services, and education and outreach. A version of this article was originally featured in the February/March 2007 Colorado Water Newsletter, a Colorado State University Water Center newsletter and publication of the Colorado Water Resources Research Institute (CWRRI) (see On the Web box).

Fort Collins Total Water Year Precipitation (1890 through 2006)

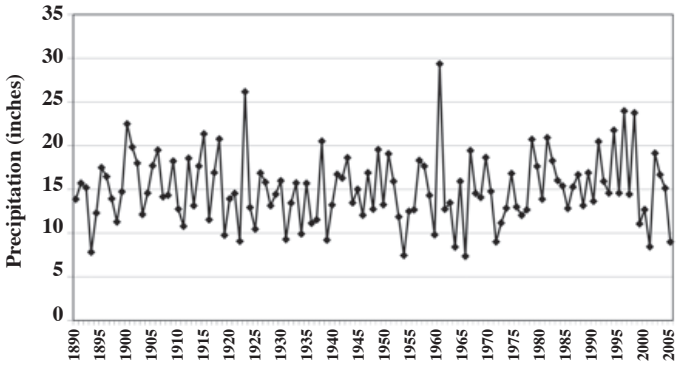

Figure 16a. Water year time series of Fort Collins precipitation amounts in inches; 1890 through 2006.

Climate Monitoring

The CCC is responsible for tracking daily weather conditions and interpreting the seasonal, annual, and interannual observed patterns and variations that climate provides. Climate monitoring for Colorado involves multiple approaches due to the vast local differences in climate that is characteristic of mountainous regions. The first approach involves the National Weather Service's Cooperative (COOP) Network, which has over 200 stations in Colorado reporting temperatures and precipitation on a daily basis. Data from some of these stations date back more than a century and provide the longest continuous data records for tracking climate variations and change. CSU's main campus weather station, part of the COOP network, is operated by the Center and is Colorado's premier historic weather station with complete records dating back to the 1880's (Figure 16a).

The second monitoring approach incorporates observations from other organizations, like the Natural Resource Conservation Service's snow surveys and SNOTEL stations. Information on snow depth, snow water equivalent and, in some places, soil moisture provides essential data for climate and water supply monitoring.

Finally, since the early 1990s, the CCC has assisted several other CSU and federal groups in maintaining a specialized automated weather-observing network to serve Colorado agriculture users. The Colorado Agricultural Meteorological Network (CoAgMet) now provides detailed hourly weather data from 60 stations across the state representing most agricultural areas. Observations include temperature, humidity, wind speed and direction, precipitation, solar energy and soil temperatures. Computations of evapotranspiration from CoAgMet have become the primary data source for much of the state for tracking water use by crops. All current and historic data from this network are available online free of charge (http://ccc.atmos.colostate.edu/%7Ecoagmet/).

Data Archival

The CCC also serves as an archive of historical climate data collected in Colorado including original climate data and published summaries dating back to the 1800s. Digital databases are also maintained. For efficiency, much of the data management is coordinated nationally by the National Climatic Data Center in Asheville, North Carolina, and by regional climate centers in Nebraska and Nevada. This data is available from the Center upon request.

Climate Research

Since its beginning, the CCC has been actively involved in research. Former State Climatologist McKee spearheaded drought research and developed the "Standardized Precipitation Index," a drought-monitoring index that is now used worldwide. The CCC also works closely with the National Weather Service in research to improve accuracy of weather station observations. The CCC is currently leading a nationwide test and evaluation of automated snow measurement systems. Years of research on mountain and valley weather patterns have led to greater understanding of mountain climatology. The CCC is also involved in research on energy, crop production, and engineering applications of climate information.

Climate Services

Uses of climate information including: exploring the potential for introducing new crops, causes for fluctuations in crop and livestock production, recreational opportunities, commercial and residential construction, transportation, verifying insurance claims, human and animal health, where and when to schedule conferences and outdoor events, dam and spillway design and floodplain management, drought and water supply -- the list is nearly endless. The ultimate goal of the CCC is to provide climate data, information, and expertise to a wide range of user groups, so climate services are provided in a variety of ways. CCC's web site is now the primary means for answering questions and sharing data and information, and phone calls and walk-in visitors are welcome as well (see On the Web box).

Education and Outreach

Recent years have seen a huge upswing in education and outreach opportunities for the CCC. Tours of the historic Fort Collins Weather Station bring hundreds of visitors to campus each year and many talks and presentations are provided on the topic of Colorado's amazingly variable climate (Figure 16b). The most visible education and outreach activity of the CCC today is CoCoRaHS -- the Community Collaborative Rain, Hail and Snow Network . Thousands of citizens of all ages help monitor the weather and water resources in Colorado by setting up backyard rain gauges across the state. This program is providing educational opportunities for a large number of individuals while also contributing an incredibly valuable data resource for studying weather patterns and local rainfall variations in Colorado. The project is so popular that it has spread to many other states and may be a nationwide program by 2010 (Figure 16c). The CCC also participates in many statewide meetings and organizations. For example, the CCC was actively involved in the development of Colorado's Drought Response Plan and has attended nearly every meeting of the Colorado Water Availability Task Force since it was established in 1981.

Supplemented by multiple sources of funding including the state of Colorado, CSU, and other grants and contracts, the CCC continues to be a hub for state-wide climate monitoring, research, and educational and outreach resource available to a range of user groups including climate researchers, farmers, and interested citizens. Visit their website or contact Colorado State Climatologist, Nolan Doesken at nolan@atmos.colostate.edu for additional information, resources and services.

Figure 16b. The Center provides education and outreach services to the academic community, water managers and even public school systems. Here, State Climatologist Nolan Doesken explains a weather station to elementary school students.

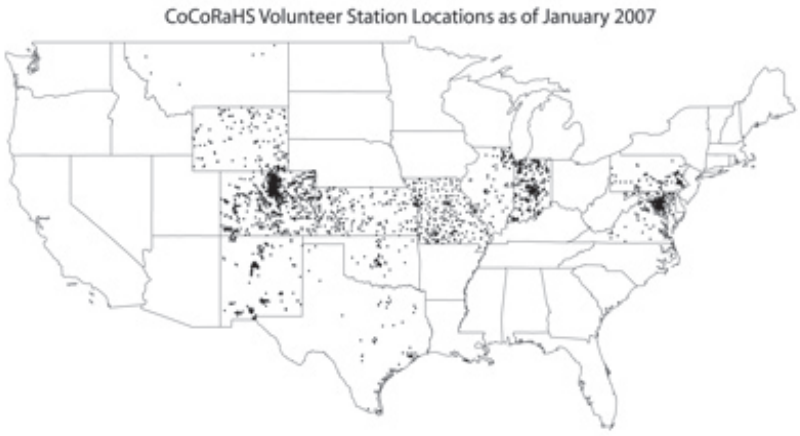

Figure 16c. The state of Colorado hosts one of the largest CoCoRaHS climate monitoring volunteer networks across the nation, Members of the public assist researchers in compiling a database of various climate parameters.

1 See March 2006 Intermountain West Climate Summary for a focus page on CoCoRaHS.

On the Web

- The Colorado Climate Center homepage is available at http://ccc.atmos.colostate.edu/.
- Information about the Colorado Climate Center's Colorado Climate magazine is available at: http://ccc.atmos.colostate.edu/magazine.php. (Past issues are available, but the publication is currently suspended.)
- For information about the CoCoRaHS monitoring assistance programs, visit www.cocorahs.org and click on "Join CoCoRaHS."
- For CoAgMet current & historic climate information beneficial for agriculture users, visit: http://ccc.atmos.colostate.edu/Ecoagmet.
- The Colorado Water Newsletter based out of the Colorado State University Water Center and Colorado Water Reources Research Institue (CWRRI) is available online at: http://cwrri.colostate.edu/pubs/newsletter/newsletter.htm.