1.5 THE U.S. CLIMATE REFERENCE NETWORK

C. Bruce Baker *, M. Helfert, D.R. Easterling,T.R.Karl,
NOAA/NESDIS/National Climatic Data Center

R.P. Hosker
NOAA/OAR/ATDD

1. INTRODUCTION

The USCRN program objectives are to develop, acquire, field and operate the premier environmental climate-monitoring network of the United States. The USCRN will provide reliable, high quality surface temperature and precipitation observations that are accurate and representative of a larger area. Site location is particularly important as environmental conditions measured must not be affected by encroachment of urban expansion or other conditions that create a changing local/micro environment.

As the premier reference network, USCRN site locations are envisioned to remain unaffected for a period of 50 to 100 years and, where possible, be co-located with or near existing meteorological observation sites such as the Historical Climate Network (HCN) and the National Weather Service's Cooperative Observer (COOP) network. USCRN co-locations with other networks are also encouraged. Since the network is intended to serve as a model environmental monitoring network for the United States and the international community, the program will develop data transfer functions relating observations from other networks to the USCRN. This will thereby leverage primary and specialized climate observations over broader coverage areas.

USCRN field system technology is designed to be highly reliable, robust and maintainable so that it will collect, format, process and communicate environmental parameters to the National Climatic Data Center's (NCDC) central data management and processing facility in Asheville, NC. The equipment is designed to operate, without human intervention, under a wide variety of environmental conditions. The NCDC will provide data ingest, quality control monitoring, data processing, archiving, and user access for both the climate research community and the general public. After three years of development, the USCRN is accepted to be of sufficient initial density, reliability and to have scientific value justifying moving forward to the status of a commissioned network.

2. HISTORY

The first two experimental USCRN stations were installed in Asheville, NC, in August 2001. At that time, the stations were installed on what was to be a 5-degree geographic grid and installed in pairs for redundancy. Single stations would then be offset from the backbone grid at a denser grid of 2.5 geographic degrees. Paired stations deployments were first priority, and the Asheville pair was utilized to test reliability, functionality, maintenance procedures.

For verification of the two concept and engineering test stations in Asheville, interagency commitees were formed during FY 2001 to provide critical review of USCRN in all of its aspects. The USCRN Program initiated meetings that involved U.S. Department of Agriculture, the National Weather Service (NWS), Regional and State Climatologists and Office of the Federal Coordinator for Meteorological Services to define the USCRN system. These meetings included 10 separate committees which reviewed the program objectives and recommended that USCRN:

(1) Determine the specifications and requirements for the meteorological sensors, data logger, and communications system;
(2) Develop equipment calibration and validation methodology;
(3) Determine equipment installation and maintenance procedures and schedule;
(4) Determine alternate permanent backup instrumentation at each CRN site;
(5) Identify training needs, schedule, and frequency for observers and maintenance personnel;
(6) Define criteria for selecting stations and standards for siting the instrumentation at each station;
(7) Develop physical transfer models to relate data from the new automated instrumentation to the conventional (historical) instrumentation, and determine data adjustment methodologies for the historical data;
(8) Determine metadata needs (historical as well as new metadata, such as digital photos and GIS information) and create a mechanism for updating the metadata and ensuring their quality;
(9) Develop a data quality control and management system to accommodate the CRN data; and
(10) Coordinate the use of CRN data among the various organizations, including how it will be related to the existing CLIMAT network (international network of monthly reporting stations).

3. SENSOR TESTING AND SCIENCE STUDIES

Field studies to support a number of the required 10 Climate Monitoring Principles that included data

* *Corresponding author address:* C. Bruce Baker, NCDC, 151 Patton Avenue, Asheville, NC 28801-5001; e-mail: bruce.baker@noaa.gov.

continuity, fidelity of the measurements, and interchangability of instrumentation were established in FY 2002. The field programs were a cross-matrix with the High Plains Regional Climate Center (HPRCC), the Southern Regional Climate Center (SRCC), OAR, NESDIS, and the NWS and included the evaluation of temperature and relative humidity sensors along with long term collaborative plan with NWS.

Relative Humidity (RH) Sensor Evaluation and Temperature Sensor Evaluation was carried out by the HPRCC and SRCC at their testing facilities. The objective of this study was to test and compare a variety of RH instrumentation to find one suitable for USCRN field deployment. Budget issues prevented deployment.

CRN-NWS Long Term Collaborative Plan was to test, compare, and document NWS and CRN instrumentation, and to develop transfer functions between the CRN and NWS COOP/HCN and to provide information for potential networks:

- Establish a long-term USCRN presence at NWS test facilities. Use facilities when adding new instruments, both NWS and USCRN;
- Gather and analyze data and information on USCRN instrument performance, reliability, and maintenance;
- Provide potential information for NWS COOP Modernization Planning.

Work continued during FY 2003 on developing relationships between the USCRN and other national and international networks to improve understanding of climate variability. Strong interest in linking or exchanging technology and data has been received from nations in Europe, Latin America, Asia, and Australia. Canada is the only nation who has, thus far, a formal relationship with USCRN.

Continued collaboration during FY 2003 with the NWS with respect to the COOP Modernization Program has led to adoption of some CRN philosophies and technology as a basis for that program. It is possible that all CRN sites will eventually be equipped with the COOP Modernization core sensor suite.

4. FY 2004 ACTIVITIES

During FY 2004 work is continuing on developing relationships between the USCRN and other national and international networks to improve understanding of climate variability.

The USCRN will deploy a station to the Canadian National Testbed Facility north of Downsview, Canada (Ontario). In turn, a Canadian Reference Climate System (RCS) station will be co-located with a USCRN station in the United States. These co-locations will allow transfer functions to be developed within and between the two national networks.

Likewise, collaboration with the NWS with respect to COOP modernization, new sensor development, and implementation of new sensors into National Networks will continue.