An Overview of the U.S. Regional Climate Reference Network

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A new network of stations called the **U.S. Regional Climate Reference Network (USRCRN)** is now being deployed by NOAA. These stations maintain the same level of climate science quality measurements as the national-scale U.S. Climate Reference Network (USCRN), but are spaced more closely, and focus solely on temperature and precipitation. Beginning with a pilot project in the Southwest, USRCRN stations will be deployed at a 130 km spatial resolution to provide for the detection of regional climate change signals. Following completion of the pilot project, the long-term vision is deployment in each of the nine NOAA climate regions of the United States at a 130 km spatial resolution that will allow the detection of regional climate change signals. As with the USCRN, USRCRN stations have triple redundancy and are placed in pristine environments. About 538 locations in the United States will have either a USRCRN or USCRN station at the end of deployment for this project.

Since FY 2008, the USCRN program at has partnered closely with the National Weather Service (NWS) and NOAA's Atmospheric Turbulence and Diffusion Division (ATDD) to establish a climate monitoring network built on the same design principles as USCRN. What was initially known as the U.S. Historical Climatology Network Modernization (USHCN-M) and Regional U.S. Historical Climatology Network is now designated as the U.S. Regional Climate Reference Network (USRCRN). The NWS has programmatic responsibility for USRCRN and has delegated lead responsibilities for development, deployment, and day-to-day operations of the network to the National Climatic Data Center (NCDC) and ATDD. The continued growth of the USRCRN program will involve considerable collaboration with the USCRN program as it benefits from lessons learned and successes realized over the past seven years of experience with implementing and maintaining USCRN.

While the primary mission of the USCRN is to determine national climate trends, the complementary USRCRN mission is to deploy a regional scale observing network to better characterize regional trends for temperature and precipitation. The prototype for USRCRN was designed by the USCRN program as part of a pilot study in Alabama in 2006 and involved the deployment of 17 stations using the same technology as USCRN but equipped with only modified temperature and precipitation instruments.

The USRCRN applies accepted Climate Monitoring Principles and meets Global Climate Observing System requirements. A USRCRN station maintains the USCRN capability of capturing three independent, high-quality measurements of surface air temperature and precipitation for just over half the cost of a normal USCRN station. It is solar powered with sufficient battery backup for 10 days, and the data loggers, satellite transmitters, and wetness sensors are like those of a USCRN. The temperature measurement is configured with three platinum resistance thermometers within one radiation shield serviced by two fans, a primary and a back-up, to

maintain aspiration even if a fan fails. The precipitation gauge is exactly like the primary Geonor gauge of the USCRN, except that a Double Alter (DA) wind shield is used. A diagram illustrating station components is shown in Figure 1.

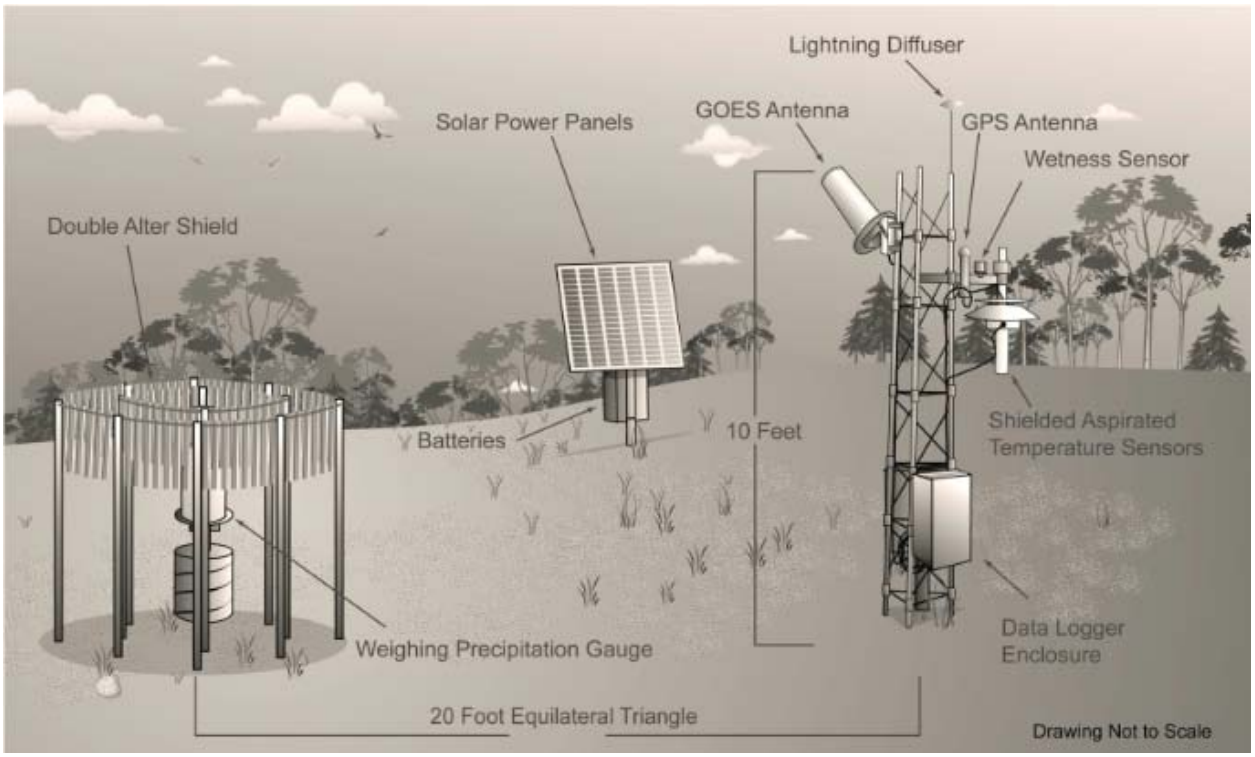

Figure 1: Schematic diagram of a typical RCRN station.

This design was formally adopted by the USRCRN program, and deployments were initiated in the four-corner states of the Southwest region in 2009 (Figure 4). By the end of FY 2011 the program completed the installation of stations in the last of 72 gridpoints in the region3. Observations and technical information for each USRCRN station are available on the USRCRN website at http://www.ncdc.noaa.gov/crn/usrcrn/. Following the completion of tests and evaluation the Southwest region will be commissioned in FY 2012. A station installed near Lake Mead, AZ, provides a real-world example (Figure 2).

The U.S. has thousands of weather observing stations, but many are not in the best locations for producing the quality of data needed to describe climate change. Observations made in pristine locations with highly accurate, well maintained instruments, mean fewer stations are needed to accurately detect climate trends. Analysis based on a newly developed dataset of monthly temperature and precipitation values at approximately 470,000 gridded data points determined that a network of 538 uniformly distributed stations (Figure 3) is sufficient for identifying trends in all U.S. regions. It was also determined that non-regular grid solutions did not increase efficiency over a uniform grid.

Figure 2: USRCRN station at Lake Mead National Recreation Area.

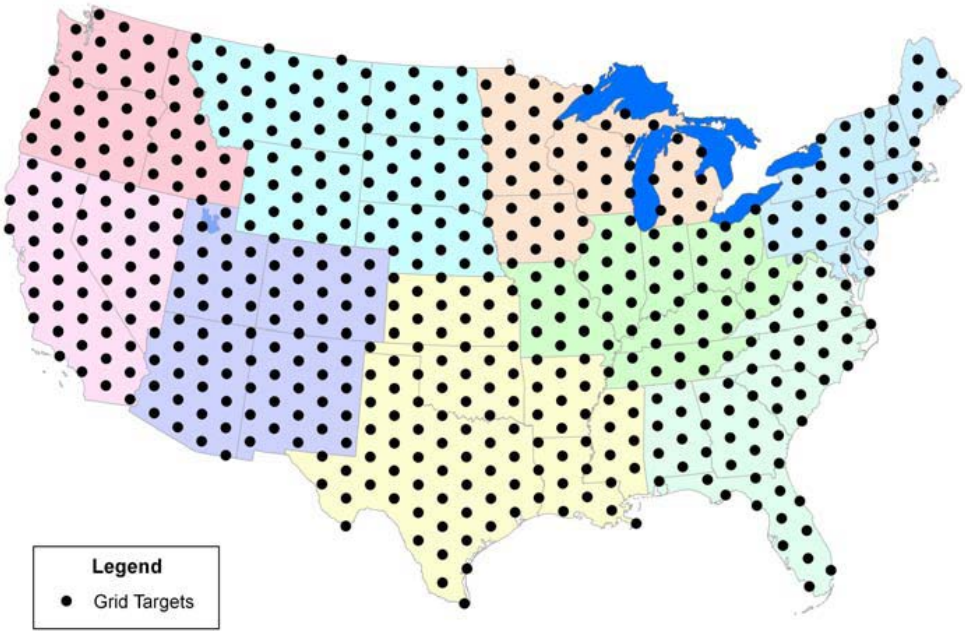

Figure 3: Locations of 538 grid points being used to site USRCRN stations.

With completion of the Southwest region, the USRCRN program initiated the next phase of deployments in the West (California, Nevada) and Northwest (Oregon, Washington, Idaho) regions in March 2011. As it did in the Southwest, USRCRN has partnered with the Western Regional Climate Center (WRCC; http://www.wrcc.dri.edu/) to identify the best sites for installation. Through a lengthy process of background research, contact with potential site hosts, and visits to more than 20 sites each month, scientists at the WRCC provide information that is the basis for sites which are selected by a panel of NCDC, NWS, OAR and ATDD scientists. The panel selects approximately 5 to 6 sites each month. The program then begins a process of establishing Site Land Agreements between NOAA and the host organization which can take from a few months to as much as two years for each site. Examples of USRCRN's federal, state, regional, and municipal partners include National Park Service, Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, Bureau of Reclamation, state parks, and regional and municipal airports. The program expects to install at least 10 stations in these regions in FY 2012 and to have completed site selections for most of 49 sites in the West region and 44 sites in the Northwest region (Figure 4).

The USRCRN is primarily designed to be a benchmark network for providing high quality data for climate purposes, specifically to detect trends in temperature and precipitation at a regional level. However, like many networks, it provides data for a wide variety of uses. For example, the USRCRN program engages local NWS participants in the site selection process. Because the stations are often sited at remote locations, whenever possible, USRCRN sites are located in areas that are currently under-observed, providing highly useful information for local forecasting. Additionally, the USRCRN program endeavors to co-locate stations with existing environmental research programs including the Long-term Ecological Research Network (LTER), and the National Ecological Observatory Network (NEON).

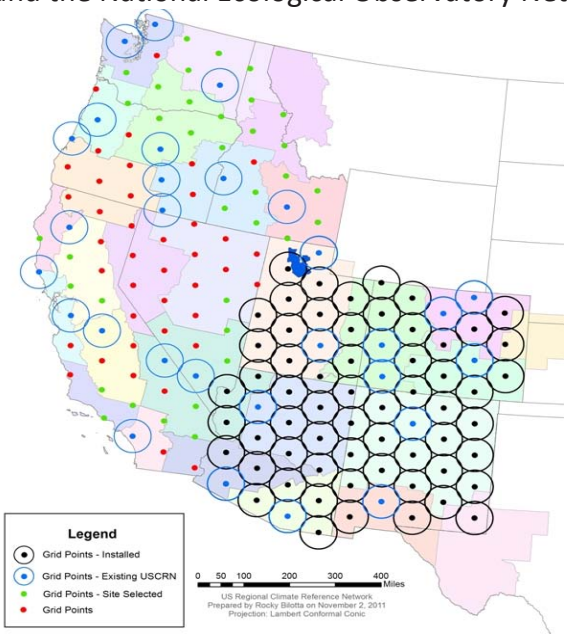

Figure 4: Locations of USCRN and USRCRN stations installed in the Southwest, West, and Northwest regions, grid points with locations selected and grid points needing sites identified.