NOAA Regional Climate Centers

Providing Climate Services for Better Decisions

For the past twenty-five years, the Regional Climate Centers (RCC) have delivered climate services at national, regional and state levels working with partners in the National Climatic Data Center (NCDC), National Weather Service (NWS), the American Association of State Climatologists (AASC), NOAA Research Institutes, numerous State and Federal agencies, private industries, and individual citizens. This successful effort provides jointly developed products, services, and capabilities that enhance the delivery of climate information to the American public. As NOAA and Congress work to help society adapt to climate change and variability, these collaborative efforts form a framework for data stewardship, climate services, climate assessment, and applied research that assists individuals, communities, government agencies, and industries make informed climate decisions.

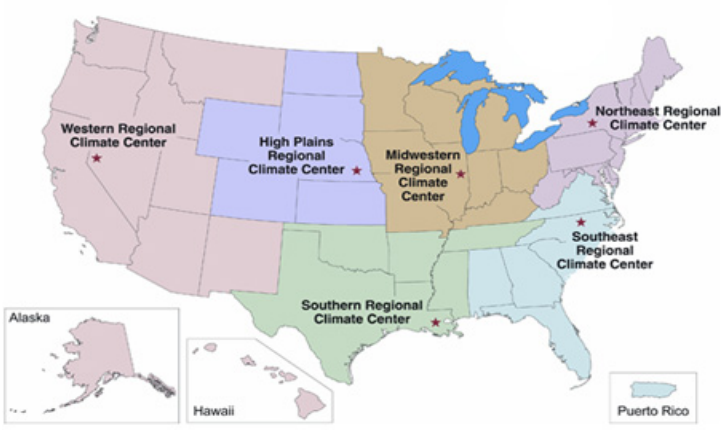
Climate Services:

The provision of a broad spectrum of climate information to end-users that includes unbiased climate observations and products, assessments of current climate conditions and trends, and climate outlooks that characterize the past, present and future condition of the earth climate system to enhance the decision processes of private individuals; commercial enterprises; and local, state, and federal government agencies.

NOAA Regional Climate Centers - Climate Services

Since its inception more than two decades ago, the RCC program has provided climate services to federal, state, and local government agencies; commercial and non-commercial industries; students and researchers; and private individuals. This approach emphasizes:

- Providing services based on direct interaction with climate stakeholders
- Distributing accurate and unbiased climate data, data-products, and summary information
- Enhancing climate services and developing decision support tools through applied research
- Educating stakeholders on emerging regional climate issues



In partnership with NOAA and the AASC, the RCCs envision a three-tiered climate service structure that supports improved decisions to enhance industries, protect the environment, and promote public safety at the national, state, and regional levels.

Climate Service Strategy

Through years of experience we have learned that effective and meaningful climate services must be defined very broadly to satisfy stakeholder needs. Climate services should satisfy the domain-specific needs of stakeholders in ways that can be directly assimilated into their business practices and decision strategies.

Services should include:

- Two-way dialogs between climate scientists and users of climate information
- State-of-the-art systems to collect, archive, assess, and deliver climate information
- Timely access to climate data, products, and analyses derived from integrated data sources that incorporate state, regional, and national data networks
- Climate outlooks and interpretive tools
- General and specific assessments of climate conditions at pertinent spatial and temporal scales
- Access to research results pertaining to basic and applied climate issues
- Decision support tools developed for domain-specific applications
- Educational products and services

Currently, the RCCs deliver the following information services that we hope to expand and enhance through development of national, regional, and state capabilities.

- Direct contact with users provided by full-time User Service Climatologists
- Public access climate information web sites
- Climate services delivered via web interfaces and direct customer interaction
- Contractual agreements with public and private customers that includes consulting meteorologists, climatologists, and private corporations and industries
- Regional expertise on climate patterns, trends, and variability

Service To NOAA And Other Federal Agencies

The RCCs have established themselves as a valuable resource within a variety of NOAA operational and planning activities. At the invitation of NOAA line offices we have supported or participated in the following activities.

- Weekly input to the National Drought Monitor
- National Integrated Drought Information System management and working groups
- Performed site surveys for the NOAA Climate Reference Network
- Performing site surveys for the NOAA modernization of the Historical Climate Network

- NOAA and USDA representatives to World Meteorological Organization Expert Working Groups
- Provide climate guidance for annual USFS National Fire Assessments
- Interact with NOAA Regional Integrated Science and Assessment Program (RISA); actively involved with the newest RISA program at LSU
- NOAA Panels, working groups, reviews, and committees
- National Academy of Science Panels and American Meteorological Society Committees
- Involved with NOAA Test Beds for Climate and Hydrometeorology
- Interact with NWS Weather Forecast Offices, Regions, and River Forecast Centers
- Develop and manage NWS climate information systems
- Members of the NOAA National Data Stewardship Team
- members of the NOAA National Climate Extremes Committee
- Developed and operate WeatherCoder3 for the NWS, an operational system to collect and process thousands of daily weather observations
- Developed and operate Datzilla, a NOAA reporting and tracking system for observational errors
- Provides climate information to national, regional, and local NOAA offices
- Provides monthly climate summaries of regional anomalies to NCDC
- Developed and manage climate information systems for the National Parks Service
- Developed and manage climate information systems for the USDA National Resources Conservation Service

Applied Research

The RCCs placement at major Research I Universities provides a mechanism for vibrant and internationally recognized applied climate research programs, as evidenced by the publication of numerous articles in peer-reviewed journals. RCC researchers have leveraged NOAA funding for climate services with external grants and institutional support to amplify their research programs. A sampling of RCC research topics includes:

◆ *Climate and Hydrology* ◆ *Agriculture* ◆ *Drought* ◆ *Climate observation and instrumentation* ◆ *Climate change and variability* ◆ *Data quality control and*

assurance ◆ Complex terrain effects on climate ◆ Public health and climate ◆ Regional climate issues and problems ◆ Tropical storm climatologies ◆ Atmospheric teleconnections ◆ Environmental water quality ◆ Climate information technology systems ◆ Extreme climate events

The applied nature of much of our research activities aids the development of climate products, decision support tools, best management practices, and information systems that directly benefit the climate services we provide to end-users. Decision support tools have been developed for agriculture, water managers, turf grass managers, and emergency managers that provide cost savings and help protect life and property.

Operational Support Development

The RCCs have been in the forefront of developing operational support systems. The Applied Climate Information System (ACIS) is the foundation for RCC data management and electronic information delivery and was developed to meet the needs of operational efficiency, redundant reliability, and flexibility to accommodate evolving information system configurations and needs. ACIS is becoming an effective operational component of international GEOSS activities through a partnership with the Northrup-Grumman Corporation. The flexible design of ACIS provides data to web servers and services, automated data delivery systems, and on-demand data polling from remote users and user applications. Using a flexible and extensible design approach, ACIS is the core driver for the following RCC systems:

- Distributed and synchronized data archives at all six RCCs
- **xmACIS** (serving the climate information needs of the NWS)
- **NOWData** (similar to xmACIS but developed for the general public)
- **THREADEX** (metropolitan area climate extremes for the NWS and media)
- **agACIS** (agricultural products for the USDA)
- **XML-RPC** services (automated climate information delivery for research and modeling communities)
- **WeatherCoder III** – (data ingest and processing of NOAA daily observations)

These systems deliver millions of products every month and provide a cost-effective method to deliver NOAA and non-NOAA climate data and products to the public. Information systems developed by the RCCs are reliable, responsive, extensible, and were developed at a significant cost savings to the organizations they serve.

Climate Data Stewardship

Observations are the cornerstone of climate information. The RCCs are dedicated to the provision of quality climate information and are actively involved in efforts to improve the data collected and disseminated by NOAA climate observation systems. We are involved in the design and implementation of reference climate observation networks such as the Climate Reference Network (CRN) and the modernized Historical Climate Network (HCN-M). We develop ingest and management systems that improve data quality using advanced quality control and assurance routines and apply these practices to national and regionally operated observation networks. Our data stewardship efforts include preservation of NOAA historical archives through participation in the Climate Database Modernization Program (Forts data, station record books, and daily and hourly data). Participation on the NOAA Data Stewardship Team resulted in RCC development of Datzilla, an error reporting and tracking system that currently involves more than 450 national, regional, and state cooperators to report and correct errors in NOAA climate datasets.

Future Directions

Climate issues continue to rise in visibility as an everyday concern of the American public. The RCCs are working with NOAA to ensure that user services, as embodied in the RCC program, continue to satisfy the NOAA mission to serve the information needs of the nation, enhance economic competitiveness, preserve the natural environment, and protect life and property. A central concept of the NOAA climate service strategy is a strong emphasis on regional, state, and local relevance, precisely the domain in which the RCCs have excelled. A strong and responsive user services program, based on high quality climate information, will ensure that Congress' long-term investment in the RCC program pays a handsome dividend, and that the RCC's trust-based relationships with stakeholders will continue to provide a proven and popular service to the nation.

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