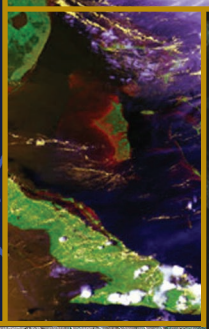
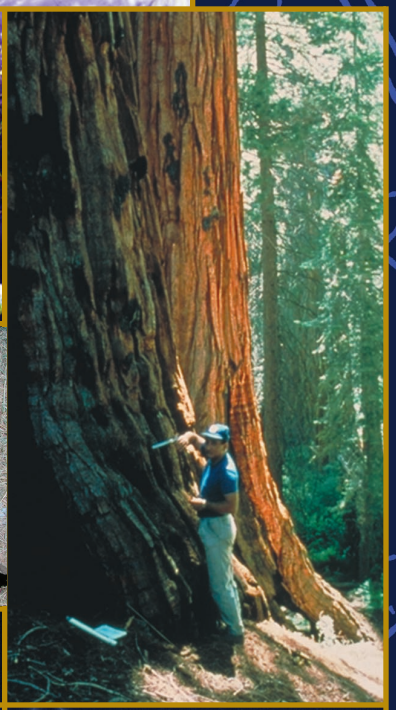
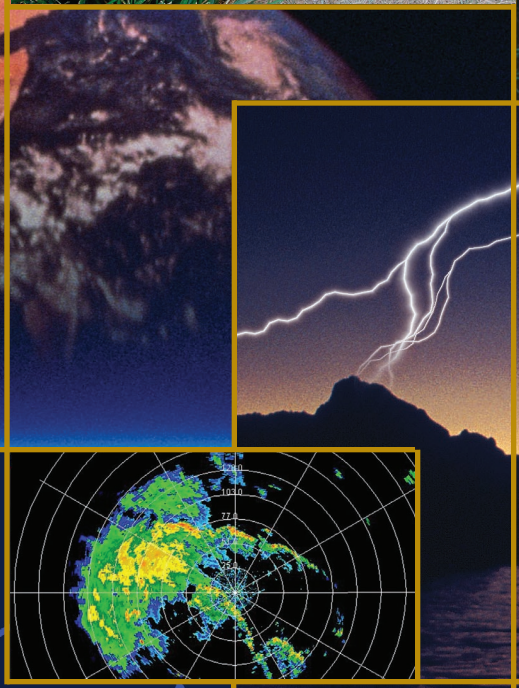
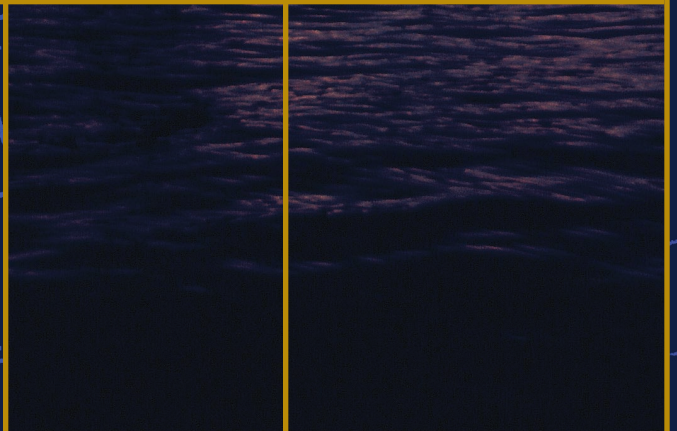
NOAA's National Climatic Data Center









2002 ANNUAL REPORT

The NCDC Mission:

to manage the Nation's resource of global climatological in-situ and remotely sensed data and information to promote global environmental stewardship;

to describe, monitor, and assess the climate; and,

to support efforts to predict changes in the Earth's environment.

These efforts require the acquisition, quality control, processing, summarization, dissemination, and preservation of a vast array of climatological data generated by National and International meteorological services.

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Foreword

During 2002, with the support of the National Environmental Satellite, Data, and Information Service (NESDIS), the National Oceanic and Atmospheric Administration, and the Department of Commerce, the National Climatic Data Center (NCDC) met or exceeded the milestones we set for ourselves. Our milestones were based on providing better products and services to our many and broad-based customers and to ensure that in future years we continue to play our prominent role in national security, public safety, protection of property, sustainable development, and environmental awareness.

As one of NESDIS' three data centers, we have continued to set records for the number of users we serve and the amount of data we archive. Many new products were introduced this year and efforts have begun to host a Users Conference in 2003. The Center made national headlines numerous times with our analyses of drought, temperature increases and evidence of increases of other environmental extremes. Our data and the expertise of our scientists were used many times during the year to brief Congressional committees as they endeavored to determine the best procedure to follow in setting important national policy in areas related to climate and the Nation's future. Among the many accomplishments during 2002, the Center developed a web interface to provide direct access to Weather Surveillance Radar-1988 Doppler (WSR-88D) Level II digital data products via the radar resources web page. Users are able to directly access Next Generation Radar (NEXRAD) data, at no cost, via FTP without contacting a NCDC customer service representative.

The Center also continues to develop partnerships with outside organizations. One area of partnership is with the U.S. Climate Reference Network (USCRN). We have partnered with the Office of Systems Development (OSD) by having OSD take responsibility for procurement and maintenance of the network. The Office of Oceanic and Atmospheric Research partnership has taken two forms: the Atmospheric Turbulence Diffusion Division is responsible for deployment of stations and is also participating in the USCRN field studies comparing different instruments. Our partnership with the National Weather Service (NWS) on USCRN includes interactions between USCRN and the NWS Cooperative Observer Network (COOP), both with the current COOP and with their modernization effort. In addition, NWS is participating in field studies for instrument inter-comparisons. Another area of partnership is our climate monitoring effort. NWS/Climate Prediction Center participates in the development of the U.S. and the new North American Drought Monitor product.

During 2002, the Center accomplished a major reorganization with the establishment of our Remote Sensing and Applications Division (RSAD). RSAD's mission for the future is to provide leadership in the use of the Center's satellite and radar data sets; to design and develop methods for the long-term calibration, inter-calibration, and validation of these data and to plan and implement scientific data stewardship strategies for long-term archival and application of satellite data sets in collaboration with NOAA, NASA, and other international space agencies.

At the same time, NESDIS realigned its Paleoclimatology Program from our sister center, the National Geophysical Data Center, to the NCDC. This realignment allows the incorporation of pre-instrumental data (paleo) into long-term climate data archived at the Center. The group will be able to collaborate with other parts of the NCDC to integrate data from instrumental, historical, documentary and proxy sources to document past climate variability, and to develop and provide data summaries, integrative products and syntheses for regular assessments of national and global climatic conditions.

In this report, you will see a brief description of NCDC today, our efforts in partnership building, a description of newly developed products, and a brief enumeration of the Center's future plans. Without the efforts of our hard working, dedicated employees, none of the accomplishments set forth in this report would have been possible. I hope you find the report to be informative and useful in understanding the special role the NCDC plays as we continue to serve the people of our Nation.

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Director

NCDC Management and Staff

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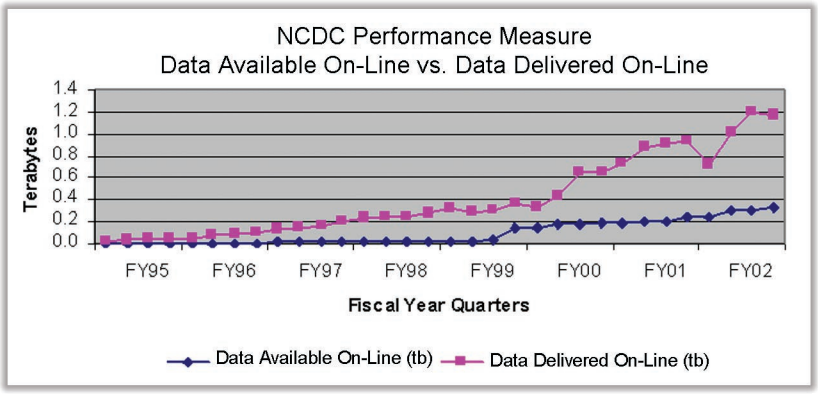
Technical Library

E-Government Results in Climate Data Access Growth

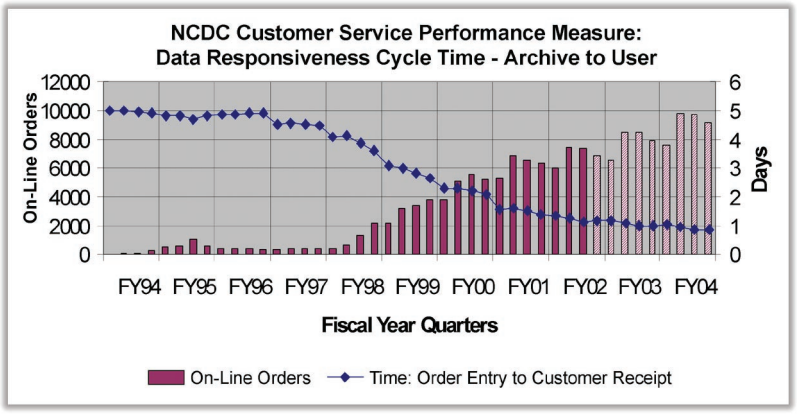
Timely access to environmental data is of critical importance, allowing decision makers, scientists, and business people from many professions to make informed decisions using the most up-to-date information. Here, NCDC has led the way in the area of E-Government, transitioning customer access to the large majority of its data and products to the Internet. In 2002, approximately 2/3 of orders traditionally serviced by telephone calls or letters were received and serviced on-line, with no human intervention. To make our E-Government services even more efficient and effective, NCDC is leading the effort to implement a new E-Government system for NESDIS. Implementation began in 2002 and will be completed in 2003. The system will replace the current order management system used at the NESDIS data centers to enter and track orders via the web and will also be used by customer service representatives.



More than 2.1 million web contacts (defined as unique user hosts) were received at NCDC in 2002, up more than 10% from the previous year. This resulted in approximately 100 million files and more than four terabytes of data being downloaded from the NCDC web site. The latter was an increase of more than 18% from the previous year. The amount of on-line available data was 1/3 of a terabyte and will grow to almost one terabyte in 2003. By contrast, NCDC received approximately 66,000 requests for information via telephone, letter, fax, and e-mail, down more than 18%.

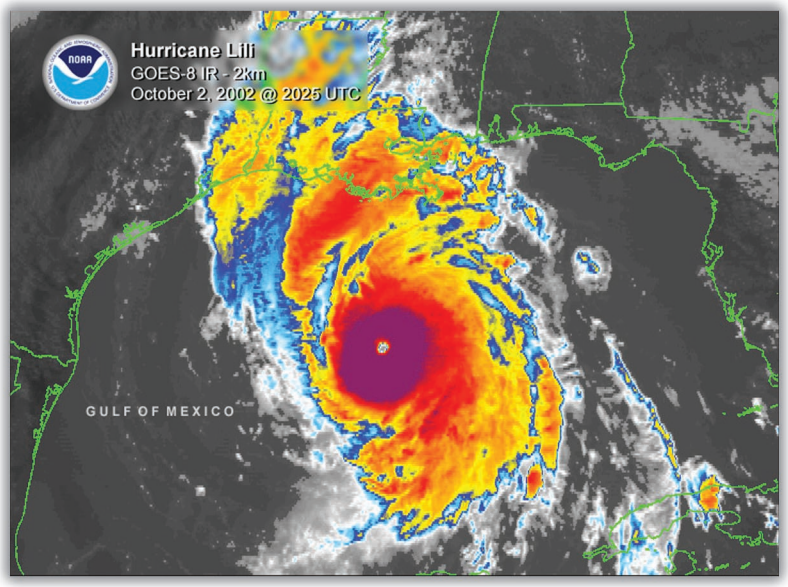
Customer Satisfaction

Improving communication and rapport with customers are of the utmost importance, and NCDC has made major strides in 2002 in achieving these goals. NCDC is the lead agency for the planning of a NESDIS Data Users' Workshop to be held June 11-12, 2003, in Boulder, Colorado. In addition, NCDC serves as the lead agency for implementation and planning of a NESDIS Customer Satisfaction Survey. These efforts will allow users to provide opinions on current NESDIS data and information products and services, and also highlight improvements.



Of major importance when transitioning to E-Government is to ensure that customer satisfaction remains at a high level and also to show consistent improvement. In this area, web-based ordering has had positive major impacts on the success of the NOAA and NCDC mission. Program costs for customer service have dropped dramatically, resulting in major cost avoidance in staffing required to service customer requests. This has resulted in improved service to customers who now receive data in minutes as opposed to an average five day turnaround just a few years ago.

Geostationary Operational Environmental Satellite (GOES) Active Archive

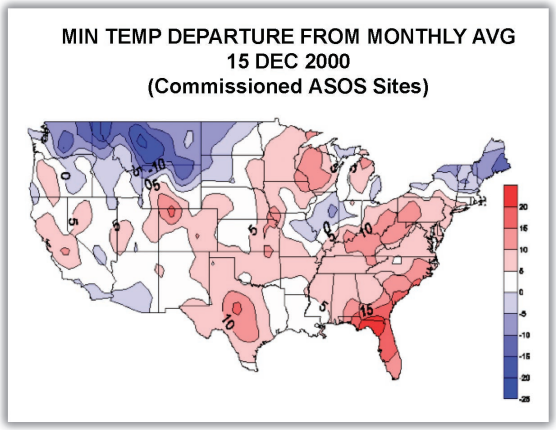


NCDC is working with various NESDIS offices to implement the Comprehensive Large Array-data Stewardship System (CLASS). CLASS will expand NCDC's capacity to handle the large increase in data volume expected in the next 15 years. CLASS will also improve access and dissemination of these large data sets to the public utilizing the Internet. The first data expected to become available through CLASS will be the GOES Active Archive.

The archive and access functions for GOES data and products will be integrated into the CLASS. CLASS came into existence in FY 2002 as a redeployment of the Satellite Active Archive, an automated system originally designed only for ingesting and distributing NOAA polar-orbiting satellite data. Currently, CLASS is planned as a single software system operating at two distinct locations, one in Washington, District of Columbia, (currently Suitland, Maryland), and the other in Asheville, North Carolina. Data sets will be ingested and stored in robotic storage at one location and immediately mirrored in the robotic storage at the other location via telecommunication links.

During FY 2003, a key focus of the CLASS development effort will be to make the necessary modifications to enable CLASS to ingest, archive and distribute GOES data in GOES Variable (GVAR) format. The GOES campaign plan is to start with the existing baseline CLASS system and develop software modules as necessary to implement full GOES functionality within CLASS. The first phase of the GOES Active Archive is expected to be completed in July 2003.

Improved Data Quality Control

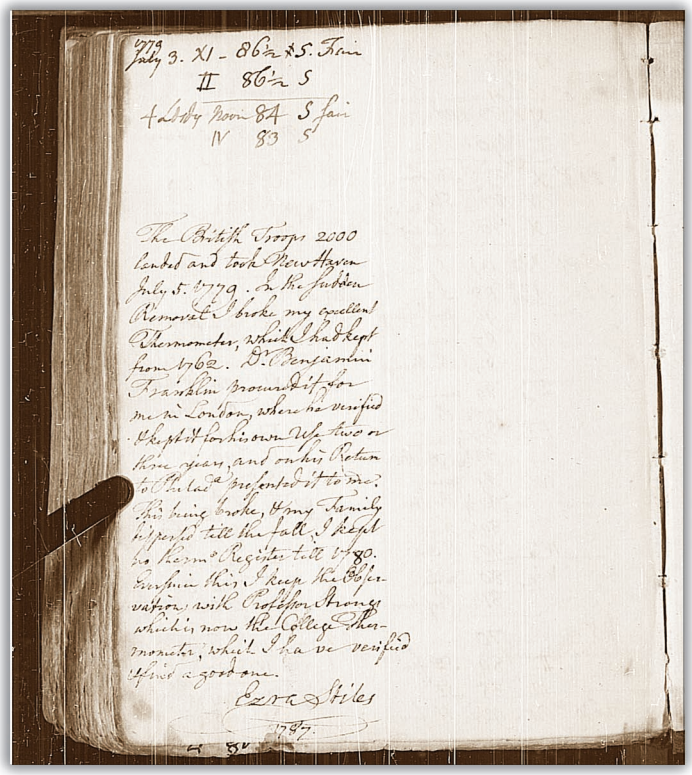


NCDC developed and implemented a new automated operational temperature validation (TempVal) quality assurance system for the *Cooperative Summary of the Day* data. The system uses rules-based Geographical Information System technology to fully automate spatial quality assurance of observed daily temperature values. Gridded fields are derived from quality controlled Automated Surface Observation Systems (ASOS) and Automated Weather Observation Systems (AWOS) hourly and daily temperature values. These reports serve as "ground truth" to quality assure the COOP daily temperature data. This automated TempVal system replaces a manually intensive interactive TempVal system. The system enabled the number of edits to increase from 120K in FY 2001 to 196K in FY 2002. Additionally, TempVal enables a limited reprocessing when new quality assurance algorithms are developed. Plans for the future include expanding the spatial quality control to include precipitation data (PrecipVal).

Climate Database Modernization Program

Paleoclimate Data and the CDMP

The Climate Database Modernization Program (CDMP) continued to image and digitize a wide variety of historical climatological data in 2002. Major tasks were underway to digitize and make available hourly surface weather observations from the late 1890s through 1948, upper air observations from the 1920s until the late 1940s, and daily observations from the 1820s to the 1890s. Of particular interest are the weather observations taken prior to the 1820s, those observations taken by the founding fathers of the United States. A collection of 1800 Century diaries and journals were imaged and placed on-line. These 1800 and 1900 Century historical climate data form a critical link between high-resolution paleoclimatic data, such as tree rings, and the modern instrumental data. CDMP also continued to support other NOAA line offices, helping them modernize climate holdings such as ionospheric data, shoreline information, Great Lakes ice thickness, water temperature and density, and other oceanographic data.

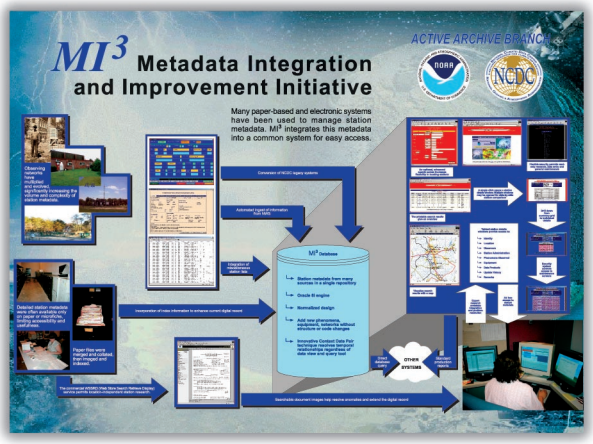


Entry in Ezra Stiles' diary from 1787, bemoaning the breaking of his thermometer given to him by Ben Franklin.

Bronze Medal Award Winner

The CDMP implementation team was presented the Department of Commerce's Bronze Medal Award for leadership and expertise in making historical climate databases accessible via the Internet. The team consisted of Stephen Doty, Linda Statler, Joe Elms, John Davis, Jeffrey Arnfield, and Stephen Del Greco.

Metadata Integration & Improvement Initiative (MI3)

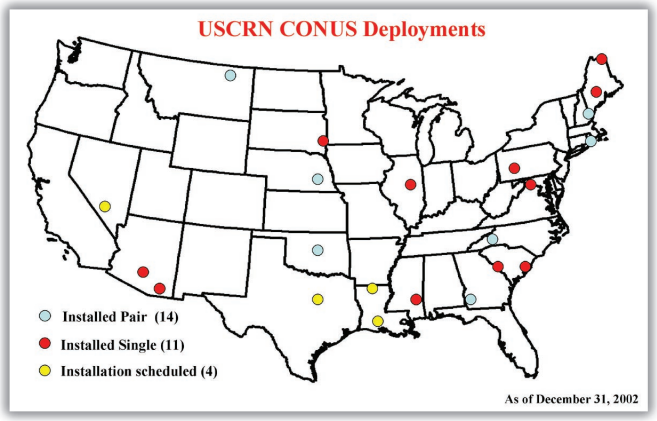


Under the CDMP, the NCDC began the development and implementation of a robust system for maintaining and accessing observing station history information known as the Metadata Integration and Improvement Initiative (MI3). Many paper-based inventory systems and several electronic systems have been used to manage station history metadata. MI3 integrates these metadata into a common system for easier access and management. During the first phase of implementation (FY 2002), the system was implemented with electronic ingest of station history information from the COOP. The second phase will be implemented by June 2003 with operational access not only to COOP station history information, but will include USCRN stations, AWOS, and ASOS. MI3 is designed to manage other observing systems' metadata (upper-air, profiler, etc.), and these will be added as the system matures.

A CD-ROM, which details the CDMP's activities and also includes a climate time line of significant climatological events, is available upon request.

U.S. Climate Reference Network

The U.S. Climate Reference Network (USCRN) is being installed over a period of several years. The goal of the network is to detect national trends in temperature and precipitation. Homogeneity, accuracy, and completeness of the data are of the utmost importance. NCDC has worked with NOAA's Air Resources Laboratory, Atmospheric Turbulence and Diffusion Division in installing the sites. In 2002 the partnership was expanded to NESDIS' Office of Systems Development, as it is playing a key role in the deployment, acquisition, and maintenance of the future network. A CD-ROM depicting the USCRN Program is available upon request.



By the end of 2002, the number of installed USCRN sites had more than doubled, from 10 in 2001 to 27 in 2002. The illustration at left depicts the installed singles, installed pairs, and those scheduled for installation in 2003. The installed sites will be evaluated as a demonstration test during the summer of 2003. In addition, two sites have been established in Alaska to evaluate the performance of the equipment in the harsh climate.

The USCRN has a performance measure based on the percent of unexplained variance in the national temperature and precipitation trends. At the end of 2002 there was only 13 percent unexplained variation in the temperature trend, but 45 percent still remained unexplained in the precipitation variation. These percentages will be reduced to 5 percent and 17 percent, respectively by the end of 2003.

Pictured at right is the Stillwater, Oklahoma, USCRN site, which is a typical two-part configuration. The instruments in the green fenced area (60' x 60') contain the sensors for the measurement of solar radiation, infrared radiation, wind velocity, and temperature, as well as the electronics and control box (data logger) and antenna for up-linking data to the GOES satellite. The wooden fenced area partially hides the weighing gauge for the precision measurement of precipitation, whether rain or snow. The wooden fence slowly winds across the collecting throat of the weighing gauge in order to obtain a more accurate precipitation measurement.

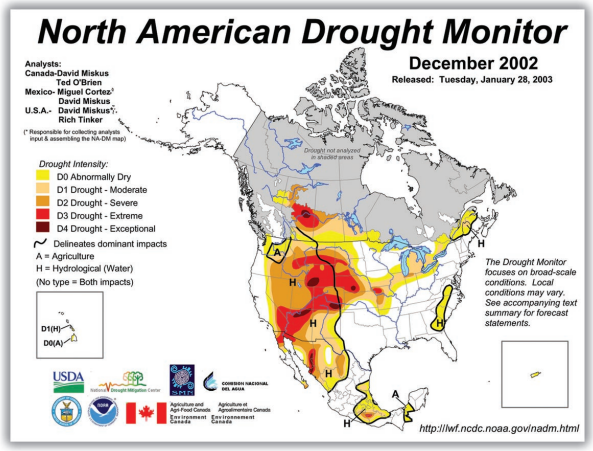
USCRN Site - Stillwater, Oklahoma

This rural site, located on a university's large research farm, demonstrates the stringent USCRN requirements of instrument exposure: no large trees or buildings within 150 meters of the station, relatively flat landscape, long duration (50-100 years) land ownership, the high likelihood that this land will remain undeveloped in the future, and representative of the climate of the region.

Drought Monitoring Workshop

NCDC hosted a drought monitoring workshop in April 2002 involving several dozen participants from government agencies and the commercial sector. The purpose of the workshop was two-fold: (1) conduct the second annual U.S. Drought Monitor Forum, an annual review of the weekly interagency U.S. Drought Monitor product, and (2) initiate plans for the development of a North America Drought Monitor product. The U.S. Forum included a day of presentations to review perspectives from authors and users of the product and included discussions of perceived U.S. Drought Monitor strengths and weaknesses. Administrative, technical, and operational issues were discussed during the second day of the forum. These discussions are part of a continuing effort to improve the science of the U.S. Drought Monitor, established in 1999, while also creating a product that best meets the needs of the user community.

The success of the U.S. Drought Monitor in providing accurate weekly assessments of drought in the U.S., along with an evolving effort to improve the monitoring and assessment of climate extremes across the North American continent, led NCDC and several other U.S., Canadian and Mexican government organizations to develop a similar program for monitoring drought across the entire continent. An agreement to develop a continental-scale Drought Monitor was first established at a workshop of the "Troika," held at the NCDC in November 2001, and involved officials from the U.S., Mexico and Canada. Technical discussions involving representatives of the three countries were held as part of a three day meeting in April 2002, and a strategy for creating a North America Drought Monitor program was developed.



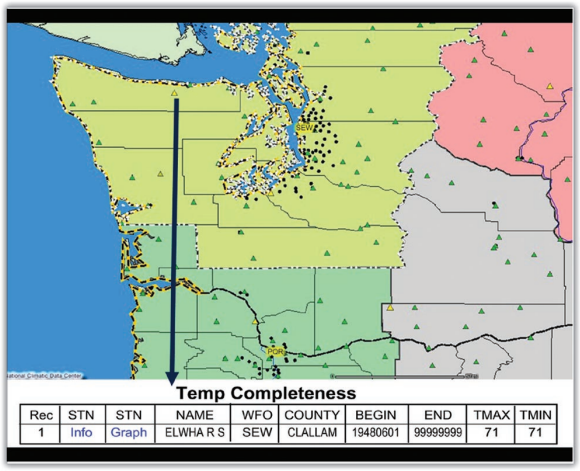
Although all three countries have active climate and drought monitoring programs, until recently, there has been only limited cooperation and coordination between the countries' drought experts. Past drought assessments typically have stopped at each country's borders as differences in resources and policy objectives, as well as differing methods for monitoring drought in each country effectively prevented an integrated view of drought conditions across the continent. Because the North America Drought Monitor effort is based on the highly successful U.S. Drought Monitor program, it relies on similar methods of data analysis and multi-agency cooperation to create the best possible assessment of current drought conditions.

As of December 2002, experimental North America Drought Monitor maps are being produced on a monthly basis and development of essential data sets and procedures continue. As resources become available to all international participants, the monthly assessments will be released to the general public each month. Other future plans include release of the monthly assessments as "official" NOAA products and a possible transition to monitoring on a weekly or bi-weekly basis after fully developing the operational procedures. Weekly updates would allow rapidly changing conditions to be continually monitored and more current summaries of drought conditions provided to government and private sector decision makers, as well as the public, in a manner similar to the current implementation of the U.S. Drought Monitor.

U.S. participants involved in the development and implementation of the North America Drought Monitor include drought experts from NOAA's NCDC and Climate Prediction Center, the U.S. Department of Agriculture, and the National Drought Mitigation Center at the University of Nebraska-Lincoln. Others from the U.S. include representatives from NOAA's Regional Climate Centers and several State Climatology offices and universities. International participants include representatives from Agriculture and Agrifood Canada, the Meteorological Service of Canada, and the National Meteorological Service of Mexico.

Health of the Network

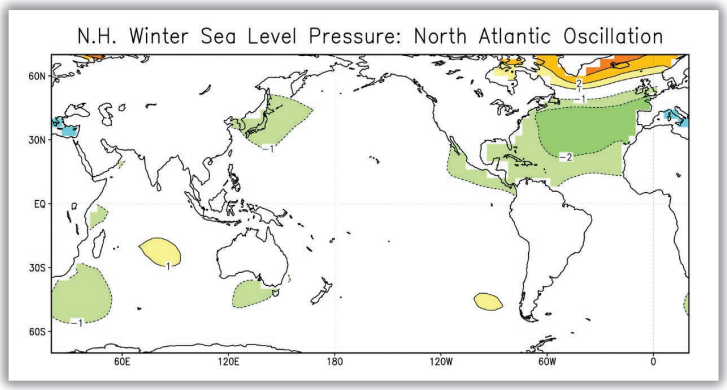
The Network Performance Indicators/Health of the Network project is well on its way to placing an interactive mapping system on-line. Currently, the source information on the COOP is being reprocessed. After the reprocessing is completed and the system is given a final check, it will be able to go on-line to the public. By spring 2003, the system will produce interactive maps of COOP stations reporting and data completeness. Additional maps depicting information on data validity, data quality and receipt timeliness will also be provided to users through web access.



Seattle-Tacoma Weather Forecast Office region of data completeness. The indicated station in the top of the Olympic Peninsula is identified in the box below the map.

Historic Sea Level Pressure Analysis

An historic marine sea level pressure (SLP) analysis was developed for the period 1854 to present and is available to users on the NCDC web page. This analysis complements last year's sea surface temperature (SST) analysis. The analysis supplements the marine SLP data from ships and buoys with SLP data from coastal and island stations. In some regions, the magnitude of the analysis is weak and has large error estimates prior to 1910 due to sparse data. However, after 1910, the analysis is much better and should prove very useful. An example of the SLP signal in the analysis is the North Atlantic Oscillation (NAO), which is useful for forecasting. The spatial NAO is a pattern of positive and negative SLP anomalies with centers over Iceland and the Azores. The figure shows the NAO spatial pattern from the analysis from 1910-1997 for the Northern Hemisphere winter. Additional work is being performed to further evaluate climatic variations in the SLP analysis and to relate them to long-term variations in SSTs and land temperatures.



Deployment of New Buoys for Sea Surface Temperature (SST) Requirements

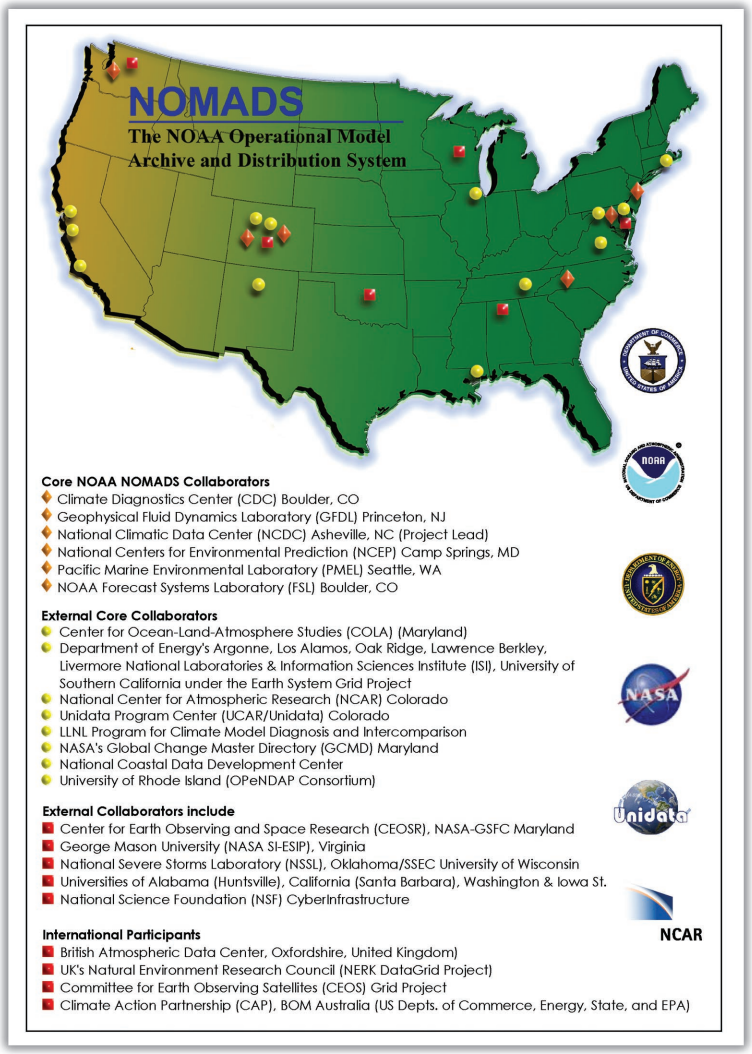
To ensure the accuracy of SST analyses for climate studies, a procedure is being developed at NCDC to determine where additional buoys are needed to supplement the existing SST network of ship, buoy and satellite observations. The buoys are needed for two purposes, to correct any biases in satellite data and to supplement SST data in regions where other data are inadequate. Once this procedure is operational, the results will be sent to NOAA's Atlantic Oceanographic and Meteorological Laboratory, where personnel responsible for drifting buoy deployment will modify their deployment plans to satisfy these buoy need requirements.

The NOAA Operational Model Archive and Distribution System (NOMADS)

NOMADS completed its second year, with NCDC leading in the establishment of many new national and international partnerships (see illustration this page). The NCDC NOMADS team designed its system architecture for distributed access to limited NCDC holdings with NOMADS. Services will be available by early 2003. Under NOMADS, and other similar distributed data access efforts, climate and computer scientists across the geosciences are providing the tools and the common framework that support collaboration and data sharing.

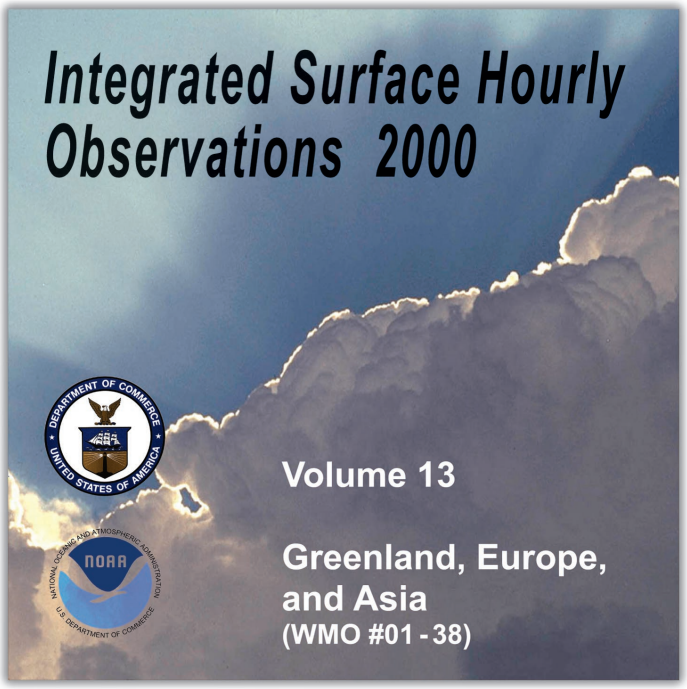
During 2002 the NOMADS Team:

- Began operational ingest and archive of the National Centers for Environmental Prediction Global Data Assimilation System Spectral Statistical Interpolation model input. The period of record will include the year 2000 to the present.
- Implemented CEOS-Grid server at NCDC to run NOMADS applications (invited by Committee on Earth Observation Satellites (CEOS)-Grid committee).
- Served on United Kingdom's Natural Environment Research Council (NERC) DataGrid Advisory Committee (invited by the European NERC E-science Steering Committee).
- Selected for a "Climate Action Partnership" with Australia (1 of 5 activities under the Departments of Commerce, State, Energy, and the Environmental Protection Agency).
- Released the Open-source Project for a Network Data Access Protocol Data Connector (ODC) data search engine (in cooperation with UNIDATA).



For further information on using or providing data under the NOMADS framework see www.ncdc.noaa.gov/oa/climate/nomads/nomads.html or to obtain model data visit: http://nomads.ncdc.noaa.gov:9090/index.html.

NCDC produced and added more than 30 new products to the NOAA National Data Center's On-Line Store in 2002. These products included posters, CD-ROMs, technical reports, publications, and digital data files. Some of the more popular new products include:

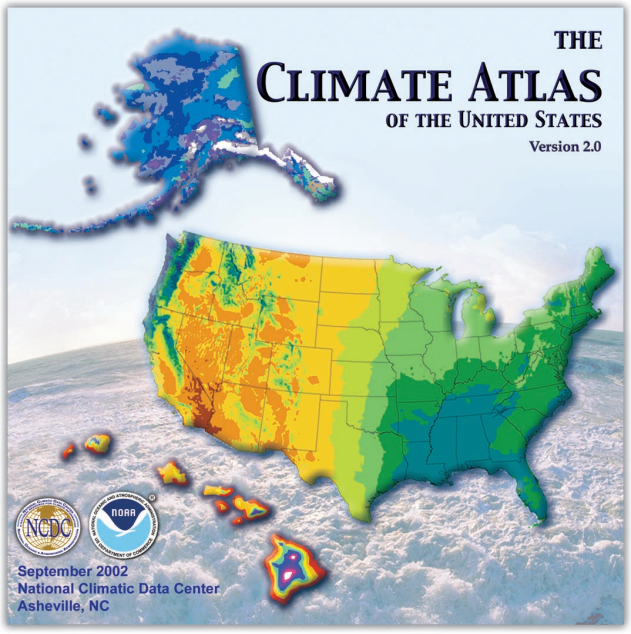


Integrated Surface Hourly Database

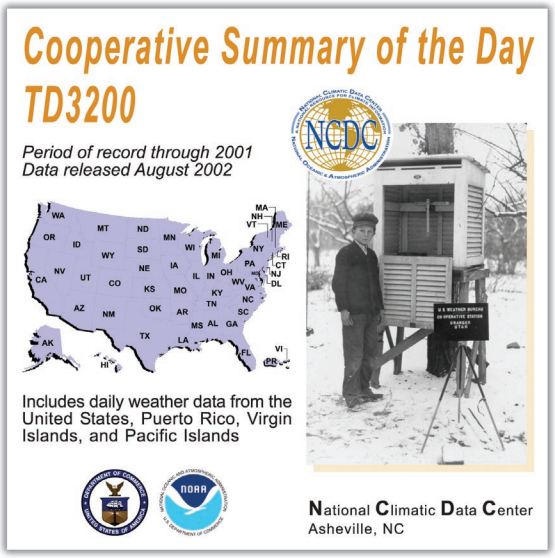
In 2002, NCDC made great strides in improving data quality and access to the Integrated Surface Hourly (ISH) database, the most popular digital data set requested by customers. Version 2 of the database was completed, which involved quality control processing for the full period of record through 2002. The quality checks were for temporal continuity, consistency among parameters, extreme values, and other selected algorithms. In addition, a 16-volume CD-ROM set comprising the complete global database for 1995-2000 was created, containing interactive (map-based) data selection software. These files contain surface weather observations recorded primarily at airports throughout the world. The database comprises more than 20,000 global stations historically, with data from as early as 1900.

New U.S. Climate Atlas

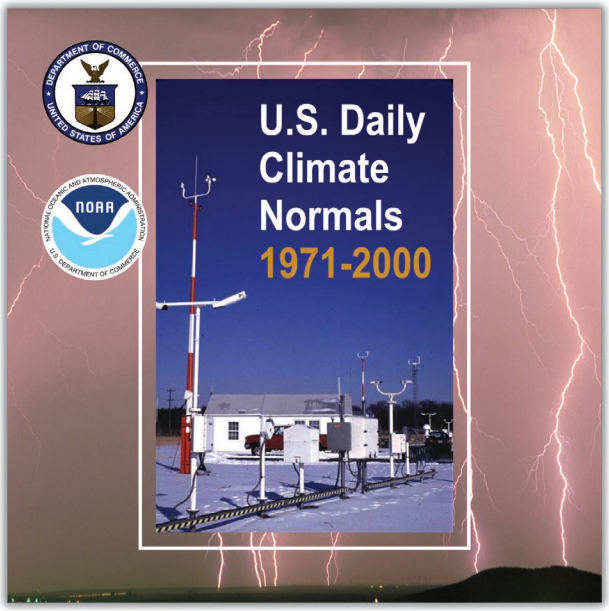
Version 2 of the Climate Atlas of the United States CD-ROM was developed in 2002. This new version contains more than 2,000 climate maps for all 50 states. It replaces the very popular paper copy of the Climate Atlas of the United States, published in 1968, and supersedes the Climate Atlas of the Contiguous United States CD-ROM (version 1.0), which was published in 2000. The station data for 7,700 locations used to produce the Atlas maps along with detailed documentation are also contained on the CD-ROM. The Atlas can be ordered on-line at http://www.ncdc.noaa.gov/oa/climate/climateproducts.html.



Cooperative Daily Data CD-ROM



The three volume CD-ROM contains data files and associated station history files for the *Cooperative Summary of the Day* (TD3200) data set. The data set is a compilation of daily observations from more than 20,000 cooperative weather stations in the United States, U.S. Caribbean Islands, U.S. Pacific Islands, and Puerto Rico. It includes air and soil temperatures, rainfall, snowfall, and evaporation elements. The old product had 21 CD-ROMs and cost $1,300; the new product has 3 volumes and costs $225. A map interface has also been added for ease of use. The period of record varies among stations, but falls within the period from the 1850s through 2001.

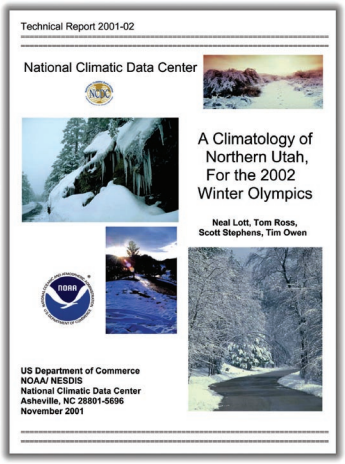


New 1971-2000 Normals Products

Several new climate normals products were created in 2002 fulfilling the mandate of Congress "... to establish and record the climatic conditions of the U.S." These products included newly computed daily climate normals for approximately 8,000 stations across the U.S., snow normals for more than 500 NWS stations, Monthly Precipitation Probabilities, Annual Degree Days to Selected Bases, and Monthly Divisional Normals/Standard Deviations. These products are used for planning purposes affecting most aspects of our economy, including agriculture, commerce, industry, and transportation. The products are available for downloading via the web and some are available on CD-ROM. Further information can be found at: http://www5.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl.

2002 Winter Olympics Climatological Report

NCDC completed a technical report describing the climatology for the venues of the 2002 Winter Olympics in Salt Lake City, Utah, along with other areas of northern Utah. The 26-page report includes a climatological narrative; nine data tables/summaries showing the February means and extremes for temperature, precipitation, snowfall, and snow depth; and six contoured analyses of temperature, snowfall, and snow depth. The report is available on-line at no charge: http://www.ncdc.noaa.gov/oa/climate/climateproducts.html.



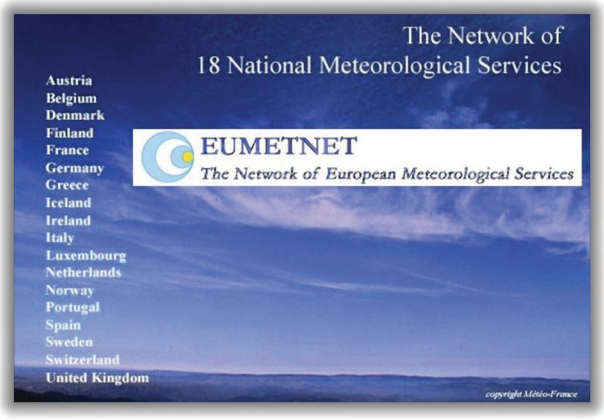
Document storage warehouse in Maputo, Mozambique

Climate Data Modernization Program (CDMP) Goes International

The CDMP hosted a workshop, Digitizing of Analog Charts, in Asheville, North Carolina, July 9-10, 2002. The goal of the workshop was to explore and identify viable low cost methods of digitizing the large numbers of hourly precipitation and other analog data under the stewardship meteorological communities in many countries. Digital versions of these valuable records will reduce the risk of loss due to deteriorating media and provide convenient and timely access by researchers within the respective country and worldwide. During the months of May and December 2002, Larry Nicodemus and Mark Seiderman, NCDC Meteorologists, visited Vietnam and countries in Africa (Kenya, Malawi, Mozambique, Niger, Senegal, and Zambia) to teach local meteorological services how to image historical weather records using digital cameras.

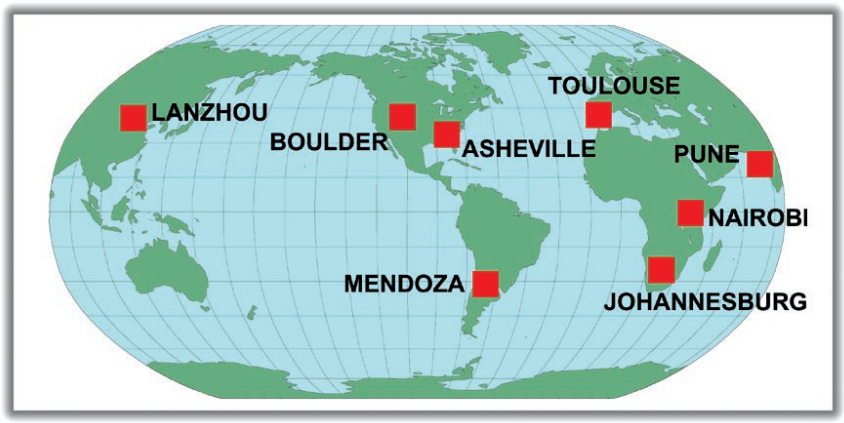
European Meteorological Network Going Worldwide Via the Web

NCDC's Neal Lott was an invited guest speaker at the European Meteorological Network (EUMETNET) Workshop on World Wide Web (WWW) Technologies in Langen, Germany. The EUMETNET plans to develop a web system for access to their vast data holdings. The NCDC has been in the forefront of implementing WWW techniques for data access and distribution. Neal Lott delivered a one-hour Keynote Presentation entitled, "The National Climatic Data Center's implementation and plans for WWW technology." Items of importance to EUMETNET, included metadata, data integration, data modeling, and data access via relational database systems. More information can be found via the web at the following url: http://www.dwd.de/UNIDART/.

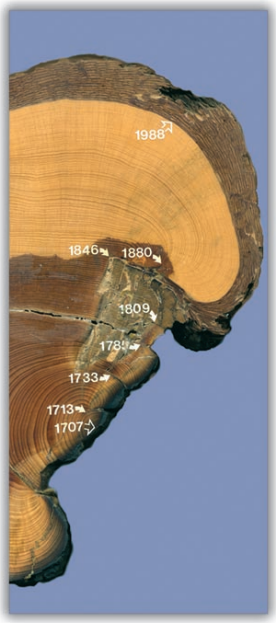


Worldwide Paleoclimatology Data: More Data, Greater Access

The World Data Center for Paleoclimatology (WDC-Paleoclimatology) is one of a global network of disciplinary data centers that facilitate international exchange of scientific data sponsored by the International Council for Scientific Unions. The NOAA Paleoclimatology Program became a component of the NCDC in 2002 and has expanded the network of international mirror sites from four to six during 2002 (see illustration). Two new partner institutions, the Indian Institute for Tropical Meteorology in Pune, India, and the Cold and Arid Regions Environmental and Engineering Research Institute in Lanzhou, China, began servicing data from WDC-Paleoclimatology in September 2002. These mirror sites in Asia expand the network that previously included servers in Toulouse, France; Nairobi, Kenya; Johannesburg, South Africa; and Mendoza, Argentina. These paleoclimatology mirror sites contain complete sets of over 4,000 web pages, 4,000 images, 100 script files, and 110,000 FTP files. Making these data more accessible to scientists in other regions of the world enhances international data sharing and has led to numerous contributions of data from around the world to the WDC-Paleoclimatology holdings at the NCDC, Asheville, North Carolina, and Boulder, Colorado, locations.



International Mirror Sites for WDC-Paleoclimatology



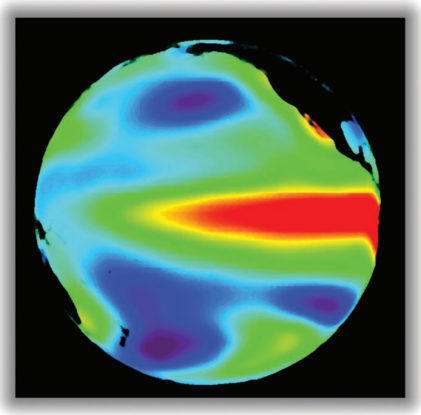
Fire-scarred ponderosa pine from the Colorado Front Range, near the St. Vrain River.

Paleoclimate Program - A Natural Collaboration with Academia

Academic and research institutions are critical partners in the expansion of the paleoclimate records, now a part of the NCDC's responsibilities. The NOAA Paleoclimatology Program is applying the wide array of very long period paleoclimatic data to develop a better understanding of climate change prior to the use of instruments. Ongoing cooperative work between academic researchers and NCDC scientists in Boulder, Colorado, and Asheville, North Carolina, will develop new data sets blending paleoclimatic and instrumental records. In the last year, several centuries-long records of drought, precipitation and stream flow from tree rings have been used to compare the widespread drought of 2002 on both the regional and national scales with droughts recorded by natural means such as tree rings. In addition to already published data, newly developed data have been contributed to aid analysis of drought in areas of special interest.

Science on a Sphere Project

NCDC created animations of historical global climate data sets for NOAA's spectacular new earth science demonstration system called "Science on a Sphere" (SOS). Developed by NOAA's Forecast Systems Laboratory (FSL) in Boulder, Colorado, SOS uses high-speed computers, projectors, and advanced imaging techniques to create the illusion of a planet suspended in space. The "Official NOAA Science on a Sphere Illumination" took place at the NOAA Science Center, in Silver Spring, Maryland, in December 2002, where over 600 visitors were captivated as they imagined that they were gazing upon the Earth 22,000 miles above its surface. The NCDC animations of temperature anomalies over land and the sea surface for the past 50 years impressed upon viewers the importance of the Center's role in data stewardship and its contributions to NOAA's mission of studying climate change. Viewers watched El Niño/La Niña events intensify and subside and witnessed the variability of world climate and warming trends in many regions. The entire SOS effort was a collaborative effort between many agencies across NOAA and also featured animations of satellite imagery, weather forecast modeling, the consequences of increasing atmospheric CO_2 levels, the evolution of the Earth's surface due to plate tectonics over the past 600 million years, and more.



Global SST departures from normal. Positive departures are in red and negative are in blue. The 1997/98 El Niño is evident in red.

NOAA's SOS provides a unique and engaging way of looking at specific Earth features in its "native (spherical) format" — rather than as a distorted flat representation (shown at right). As a result, it is ideally suited for use in education, outreach, communication and scientific analysis. Thousands of people are expected to see this presentation in early 2003 as SOS makes appearances at the 83rd Annual Meeting of the American Meteorological Society in Long Beach, California, and then at the Smithsonian Museum of Natural History.

NEXRAD Delivers Real-time

The NCDC, working extensively with the NWS, National Severe Storms Laboratory, the University of Alabama - Huntsville, Oklahoma University, University Corporation of Atmospheric Research (University Data - UNIDATA), and the North Carolina Sea Grant, has successfully demonstrated the suitability and feasibility of transmitting digital NEXRAD information in real-time across the U.S. for immediate use by researchers, emergency response users, and operational forecasters. The success of this demonstration project will result in the entire NEXRAD network of approximately 156 sites going to real-time digital transmissions within the next two years, greatly reducing the archive and access costs to NOAA and its customers. Real-time dynamic "data mining" tools are being developed to permit highly autonomous software to identify, select and extract critical parameters for immediate analysis and use, which will lead to the identification of specific weather events as they are occurring.

NCDC supports Big Brothers & Big Sisters of Western North Carolina (WNC)

NCDC has provided mentors for the Mentors and Matches Program of Big Brothers and Big Sisters of WNC since 2001. It was the first area organization to make the commitment to allow a significant percentage of its employees to spend one hour each week during non-academic class periods to tutor and mentor students in the Asheville City and Buncombe County School systems.

During 2002, NCDC was invited to attend a grant review meeting for this non-profit organization to demonstrate support and to speak on behalf of volunteers in the program. NCDC was also invited to speak at the Asheville Chamber of Commerce "Business After Hours" sponsored by Big Brothers and Big Sisters of WNC. This was a recruitment effort to encourage more agencies and companies to provide mentors through Big Brothers and Big Sisters. NCDC participants also attended a brainstorming session to assist in the exchange of ideas and discussion of positive activities for youth.

The Center has received numerous awards and citations for its involvement. NCDC was recognized with the 2002 Outstanding Service to Children Award by the Big Brothers and Big Sisters of WNC. The employees participating in the program were featured in the Hometown Heroes Section of the August 6, 2002, edition of the *Asheville Citizen-Times*. A photo of an employee with her "little brother" was published in the August 14 edition of the *Mountain Xpress*. In addition, Carmella Watkins was honored in January 2002 by the Asheville-Buncombe Martin Luther King Association for her coordination of the Mentors and Matches program at the NCDC.

This has been a truly rewarding experience for NCDC employees and they are often spotlighted in the Mentors and Matches newsletter. They are building a relationship with a child by sharing lunch or attending a game after school, working on a special project or playing a board game. The activities vary but the result is the same, a happier child knowing that some caring adult is involved in their life.

The employees' occupations vary from meteorologists to technicians to secretary. The response from the employees was excellent and they are enjoying the mental challenge of remembering elementary and middle school and working closely with the students. The employees who volunteered for the program from NCDC are Tamara Creech, Kyle Dion, Imke Durre, Sharon LeDuc, Theressa Metcalf, Cheryl Nave, Karol Pittman, Virginia Pressley, Ann Warnick, Benjamin Watkins, and Carmella Watkins. NCDC is a proud sponsor, supporter and contributor to the Big Brothers and Big Sisters of WNC.

Excellence in Public Service Awards

NCDC participated in the 12th Annual Asheville-Buncombe Excellence in Public Service Awards Breakfast on May 15, 2002. All local, city, state, and Federal government employees in the Asheville City and Buncombe County area are eligible to be nominated for this award. This is scheduled during the month for which Public Service Recognition is observed. Employees were nominated in one of ten categories by their peers, co-workers or agency. From those nominated, each level of government selected their finalists through an internal screening process. Of the finalists, a Blue Ribbon Panel selected an overall winner in each category. The Blue Ribbon panel was comprised of local civic and business leaders. The Blue Ribbon Panel also selected one overall recipient, who represents the epitome of public service and made outstanding contributions to the community and his/her agency.

The following persons represented NCDC:

Outstanding Professional Employee - William Angel
Outstanding Trades, Crafts, Service Maintenance Employee - Ray Payne
Outstanding Manager - August Shumbera
Outstanding Supervisor - Vernell Woldu
Outstanding Team - Climate Database Modernization Program (CDMP)
Outstanding Clerical Employee - Karen Owen
Outstanding Technician, Assistant, or Aide - Sara Veasey
Hoyt Abney Community Service Award - Sam Hocking
Outstanding Contributions to the Improvement of Diversity - Carmella Watkins

The following persons or team were chosen to represent the Federal sector in their respective category: CDMP, Karen Owen, Sara Veasey, Sam Hocking, Vernell Woldu, and Carmella Watkins.

The following persons were chosen as winners in their respective category: Carmella Watkins and Vernell Woldu.

We are also very pleased that Vernell Woldu (far right, front row), who was nominated in the Outstanding Supervisor category, was chosen as the 2002 overall Outstanding Public Servant of the Year! NCDC is very proud of all of its outstanding employees.

NOAA "Satellites in Our Everyday World" Conference

The "Satellites in Our Everyday World Conference," held March 14-16, 2002, was a huge success. Held in Asheville, North Carolina, it was co-hosted by the NCDC and the University of North Carolina-Asheville. The conference featured over 12 speakers with approximately 60 registered participants who were mainly middle and high school teachers from the southeastern region of the United States. The conference kickoff began with special tours of NCDC in which over 30 teachers participated. The goal of the conference was to inform teachers on how they could incorporate satellite data and technology in their classroom to make science "come alive" to their students. The conference included several hands-on applications and featured an exercise in operational sea ice mapping which challenged teachers to use operational satellite and conventional data to map "best routes" through ice fields. Additional topics included NASA's Earth Observing System and how to use the data to enhance science curricula and how satellite imagery are used in naval fleet operations. Another popular presentation featured how teachers could incorporate aerial photography satellite imagery, topographic and special-purpose maps and other remotely sensed data in a series of investigative hands-on activities.

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Acronyms

Automated Surface Observation System ..... ASOS
Automated Weather Observation System ..... AWOS
Climate Database Modernization Program ..... CDMP
Committee on Earth Observation Satellites ..... CEOS
Comprehensive Large Array-data Stewardship System ..... CLASS
NWS Cooperative Observer Program ..... COOP
European Meteorological Network ..... EUMETNET
Forecast Systems Laboratory ..... FSL
Geostationary Operational Environmental Satellite ..... GOES
GOES Variable ..... GVAR
Metadata Integration and Improvement Initiative MI3
National Aeronautics and Space Administration ..... NASA
National Climatic Data Center ..... NCDC
National Environmental Satellite, Data, and Information Service ..... NESDIS
National Oceanic and Atmospheric Administration ..... NOAA
National Weather Service ..... NWS
Natural Environment Research Council ..... NERC
Next Generation Radar ..... NEXRAD
NOAA Operational Model Archive and Distribution System ..... NOMADS
North Atlantic Oscillation ..... NAO
Office of Systems Development ..... OSD
Remote Sensing and Applications Division ..... RSAD
Science on a Sphere ..... SOS
Sea Level Pressure ..... SLP
Sea Surface Temperature ..... SST
Temperature Validation ..... TempVal
U.S. Climate Reference Network ..... USCRN
University Data ..... UNIDATA
Weather Surveillance Radar-1988 Doppler WSR-88D
Western North Carolina ..... WNC
World Wide Web ..... WWW

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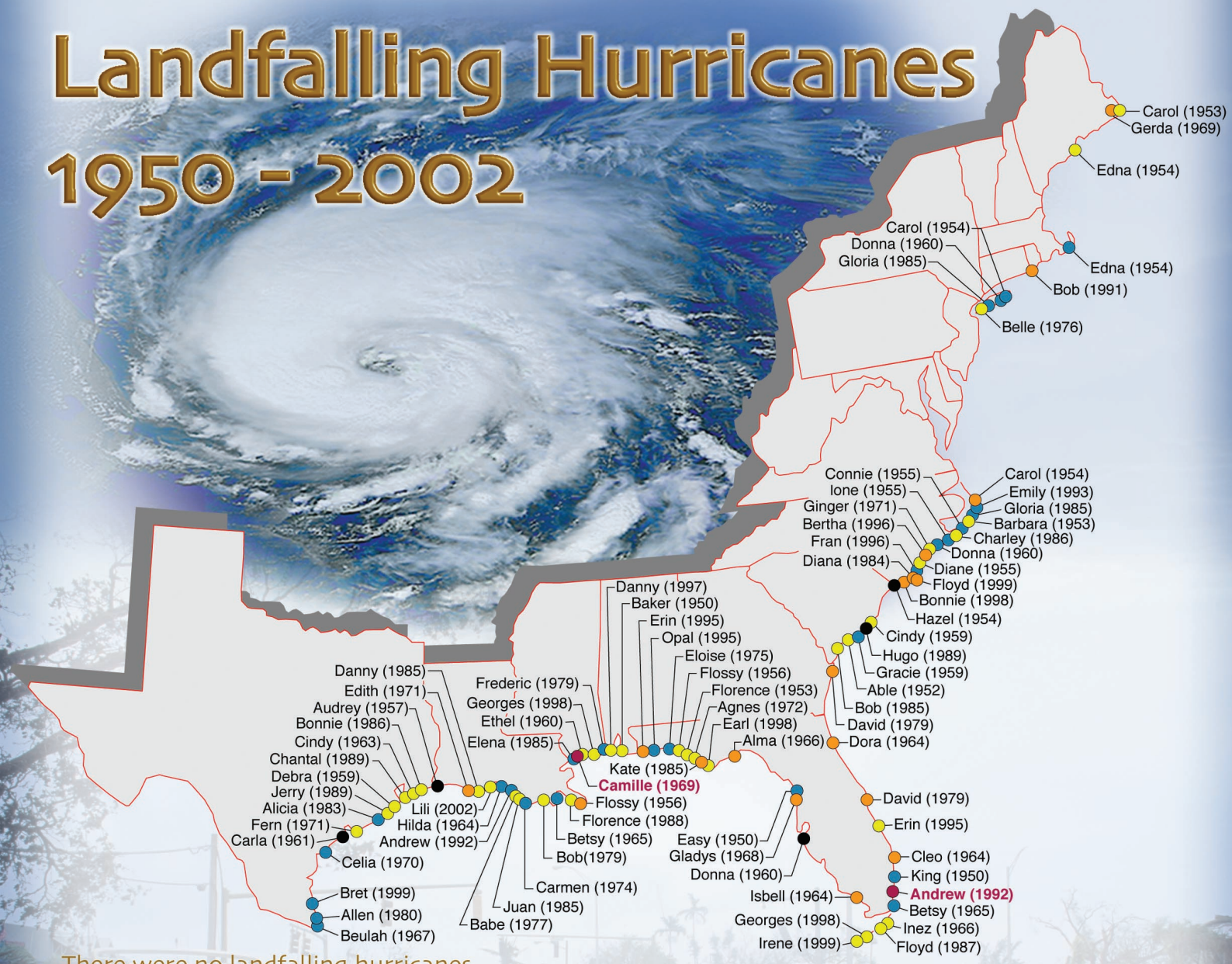
United States Landfalling Hurricanes 1950 - 2002



There were no landfalling hurricanes in the U.S. for the period 2000-2001.

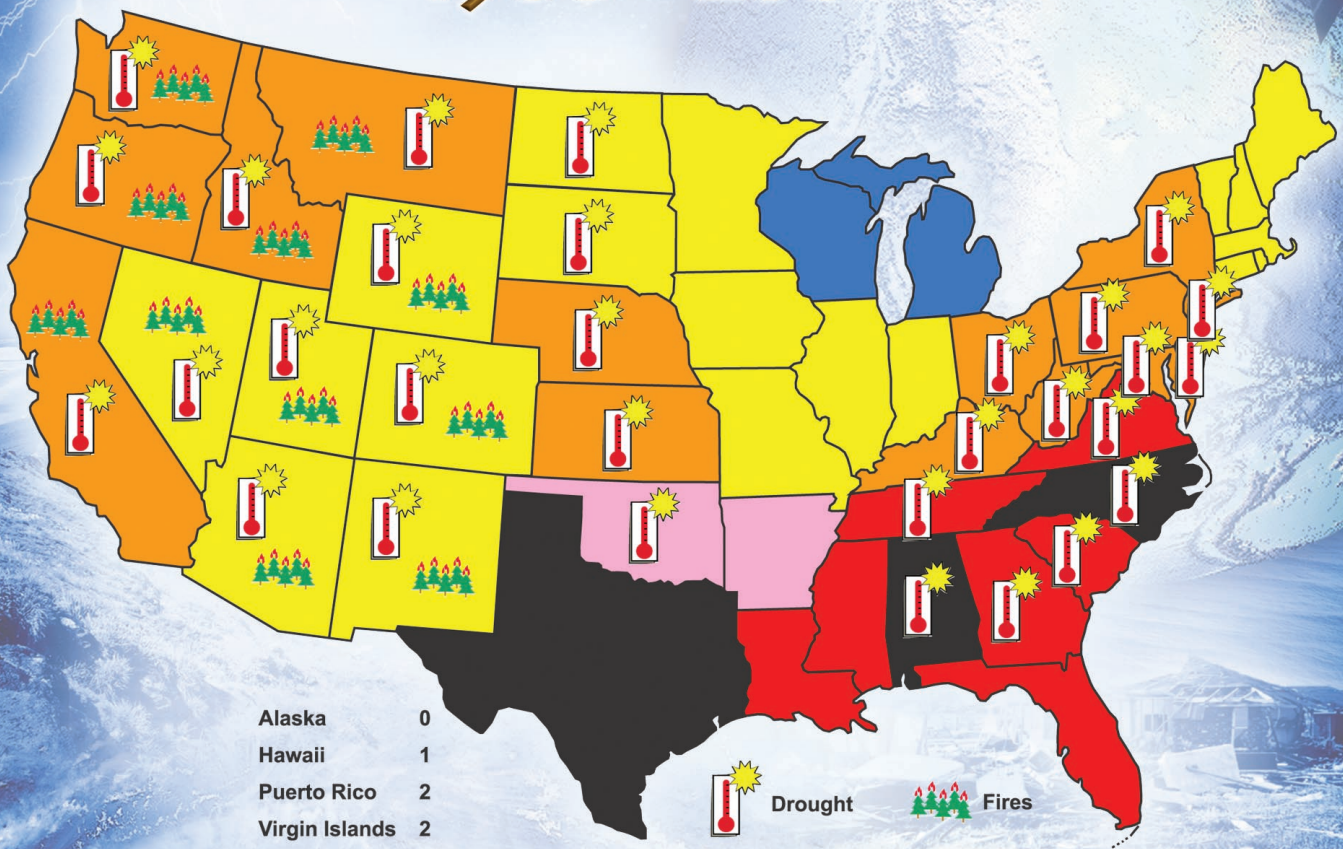
Saffir-Simpson Category of Landfalling Hurricanes

Sustained Winds (MPH)	
74-95	Category 1
96-110	Category 2
111-130	Category 3
131-155	Category 4
>155	**Category 5**

NOAA'S NATIONAL CLIMATIC DATA CENTER
ASHEVILLE, NORTH CAROLINA

Billion Dollar Climate and Weather Disasters

1980 - 2002



NUMBER OF EVENTS
1 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 20

NUMBER OF EVENTS	DISASTER	FREQUENCY
15	Tropical Storms/Hurricanes	28%
12	Non-Tropical Floods	22%
10	Heatwaves/Droughts	18%
5	Severe Weather	9%
5	Fires	9%
2	Freezes	4%
2	Blizzards	4%
2	Ice Storms	4%
1	Noreaster	2%

2002 EVENTS

Widespread drought spring through fall 2002. Moderate to extreme drought over large portions of 30 states; preliminary estimates of over $10 billion in damages/costs.

Western fire season spring through fall 2002. Major fires over 11 states due to drought and periodic high winds with over 7.1 million acres burned; over $2 billion in damages/costs; 21 deaths.

Most of these events affected multiple states; for example, 13-15 events shown for a state means that the state was impacted by 13-15 events -- each producing significant damage. The aggregate damages from affected states are totaled and combined and must equal at least $1 billion to be classified as a "Billion Dollar" event.

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