

## THE NATIONAL CLIMATIC DATA CENTER'S HISTORY, OUTREACH PROGRAM AND ACTIVITIES FOR EDUCATORS

Thomas F. Ross  
National Climatic Data Center  
Asheville, North Carolina

### 1. NCDC Background

The National Climatic Data Center (NCDC) is part of the National Oceanic and Atmospheric Administration (NOAA). NCDC's mission is to manage and disseminate national and global environmental data. The Center archives over four hundred thousand magnetic tapes/cartridges, 1.2 million microfiche, and 200 million paper records. The data center has more than 150 years of data on hand and adds 233 gigabytes of information daily. The Center recently celebrated its 50<sup>th</sup> year anniversary as the world's largest data archive complex. The Center's web page is at the following address: [wlf.ncdc.noaa.gov/oa/ncdc.html](http://wlf.ncdc.noaa.gov/oa/ncdc.html). The WWW site handles approximately 3.0 million users per year.

The Center also operates a Climate and Weather Museum highlighting the history of the climate and weather forecasting.

### 2. History of Climate and Weather Observation

Weather and climate have long fascinated man. Numerous biblical references exist defining seasons and times of heat and cold. The Chou dynasty in China in 1066 B.C. had official records which included climatic descriptions.

Public notices displayed in Greek cities around 400 BC gave information on the wind direction. This was followed by Aristotle's *Meteorologica*, which was the first work on the science of the atmosphere. In A.D., 61 Seneca complained of air pollution in Rome. Then in 825, Discuil, an Irish monk, commented on the lack of ice around Iceland as being different from the report of Pytheas in 300 B.C. An Arab scientist, Idrisi, used seven climatic zones each with 10 divisions. Galilei or Santorio invented the air thermometer in 1593. Progress in climatology was rapid in the 17<sup>th</sup> and 18<sup>th</sup> century.

Part of NCDC's outreach effort is to inform our users of the rich and varied history of climatology and meteorology. Weather and climate records have their roots in one of the earliest observers, Rev. John Companius Holm who made the first known regular weather observation in North America near Wilmington, Delaware in 1644. Almost 100 years later, Benjamin Franklin tracked a hurricane while serving as Postmaster General. Franklin and Thomas Jefferson loom almost as large in the history of American weather and climatology as they do in the history of our country. George Washington, an avid weather watcher, made daily weather observations in his diary up to the day before his death.

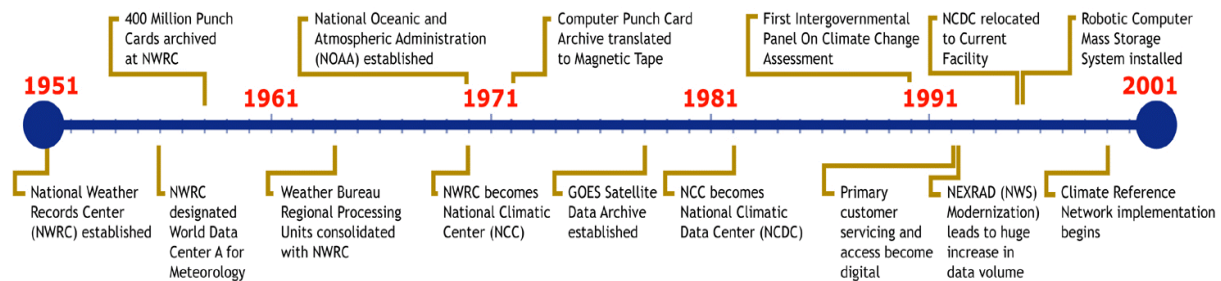


Fig 1. Computer Room and Climate Museum Images

Corresponding author address: Thomas F. Ross,  
NOAA/National Climatic Data Center, 151 Patton  
Avenue, Asheville, NC 28801; e-mail:  
[tom.ross@noaa.gov](mailto:tom.ross@noaa.gov)

Observations on the weather Philadelphia 1776		
July	Time	Weather
1	9-10 A.M.	64 1/2
2	7 P.M.	62
3	6 A.M.	78
4	9-10 A.M.	78
5	9 P.M.	74
6	5-10 A.M.	71 1/2
7	1-10 P.M.	70
8	10 A.M.	74
9	6 A.M.	68
10	7 P.M.	73 1/2
11	7 P.M.	74
12	7 P.M.	73 1/2
13	6 A.M.	71 1/2
14	9 P.M.	71
15	9 P.M.	74
16	5 A.M.	74
17	9 P.M.	72
18	10 P.M.	74
19	7-10 A.M.	74
20	1 P.M.	72
21	1 P.M.	74
22	1 P.M.	74
23	1 P.M.	74
24	1 P.M.	74
25	1 P.M.	74
26	1 P.M.	74
27	1 P.M.	74
28	1 P.M.	74
29	1 P.M.	74
30	1 P.M.	74
31	1 P.M.	74

Fig 2. A Page from Thomas Jefferson's Journal of Weather Observations Recorded During a Meeting of the Continental Congress in Philadelphia, Pennsylvania in July 1776.



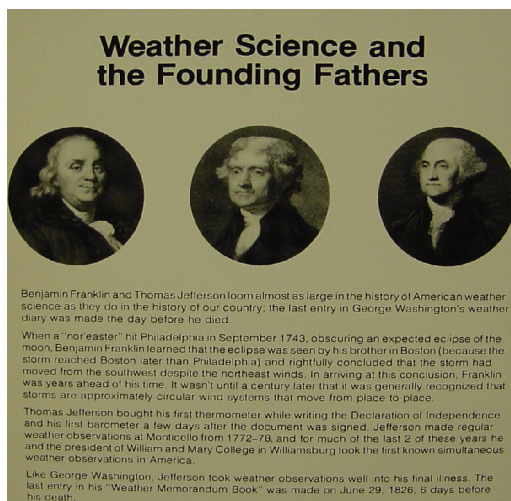
**Fig 3. NCDC 50<sup>th</sup> Anniversary Timeline 1951- 2001**

When a “Nor’easter” hit Philadelphia in September 1743, obscuring an expected eclipse of the moon, Ben Franklin learned that the eclipse was seen by his brother in Boston (because the storm reached Boston later than Philadelphia) and rightfully concluded that the storm had moved from the southwest despite the northeast winds at the surface. In arriving at this conclusion, Franklin was years ahead of his time. It wasn’t until a century later that it was generally recognized that storms are approximately circular winds systems that move from place to place. Thomas Jefferson bought his first thermometer while writing the Declaration of Independence and his first barometer a few days after the document was signed. Jefferson made regular weather observations at Monticello from 1772-78, and for much of the last two of these years he and the president of William and Mary College in Williamsburg took the first known simultaneous weather observations in North America.

Like George Washington, Jefferson took weather observations well into his final illness. The last entry in his “Weather Memorandum Book” was made on June 29<sup>th</sup>, 1826, six days before his death. These men were all forerunners of the modern science of climatology, see Figure 4. In the years after American Independence, Thomas Jefferson envisioned a network of observers. That network was established in 1847 under the auspices of the Smithsonian Institution. A volunteer observer network was organized by the Army Signal Corps Weather Service in the 1870's. The cooperative observer network was established in 1890 and managed by the U.S. Weather Bureau in the Department of Agriculture. Today, the network is managed by the National Weather Service and data are archived at the National Climatic Data Center.

### 3. NCDC History

No organized system existed in the United States to take weather observations until the 19th Century. Congress acted in 1891 with a charge to archive and distribute "...such meteorological observations as may be necessary to establish and record the climatic condition of the United States..." The Civilian Weather Service inherited an operating climatological service made up of the U.S. Signal Service, Department of Agriculture, and Cooperative volunteers. The Federal Records Act passed by Congress in 1950 established the National Weather Records Center (now the NCDC) as the official Federal Records Center for U.S. weather records. The NCDC began managing global data bases for meteorology, and providing information and services to customers beginning with its establishment in Asheville, North Carolina in 1951. Figure 3 highlights some of the milestones in NCDC's history. Currently, the Center processes millions of requests for data on the climate from the general public, insurance companies, engineers, construction companies, government agencies, and policy makers. Climatic data are used extensively in areas that affect our daily lives. These data are used in the design and construction of buildings, bridges, and airports; heating and air conditioning systems; transportation systems; remote sensing systems, and others.



**Fig 3. Three Forerunners of Modern Climatology- Franklin, Jefferson and Washington.**



The Center supports the development of the national and global economy by providing valuable U.S. and international climate information to assist users making informed decisions concerning climate applications. Climate data and analysis provided by the Center assist the U.S. economic infrastructure by helping it to remain competitive in areas such as consumer goods, investments, communications, media, manufacturing, construction, and many others.

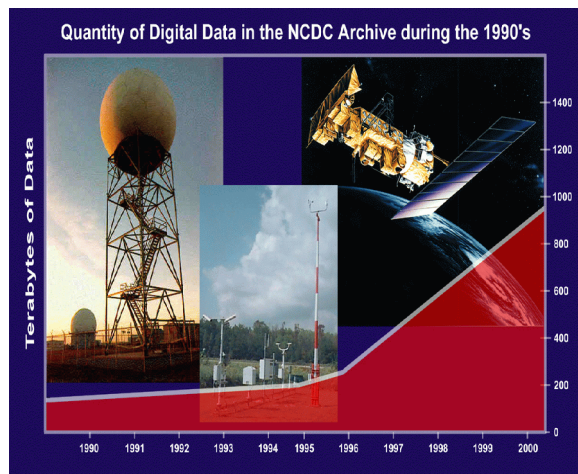


Fig 5. NCDC Digital Archives

In the subsequent half-century, the National Climatic Data Center has met the challenge of serving as the world's largest repository of environmental data (98% of NOAA's data.) The Center and its personnel provide an essential service to the nation in increasing the understanding of the global environmental concerns. Efforts to mitigate damage and the loss of life from weather related catastrophes are developed, in a large part, from NCDC's commitment to archive and quality control historical data bases. Figure 5 gives an idea of the huge data volume increase in the 90's due to new technologies such as the Next Generation Radar (NEXRAD) system, the Polar and Geostationary Satellite Programs (POES & GOES) and the Automated Surface Observing System (ASOS). The growth during the 90's has been phenomenal with a five fold increase from about 200 terabytes to about 1000 terabytes (1 petabyte). NCDC's total digital and non-digital holdings are around 1.5 petabytes.

#### 4. NCDC Products Useful for Educators

NCDC produces various products which are useful in an educational setting to help students and teachers focus on weather and climate. The following examples highlight just a few of the products which are useful in terms of outreach especially to the earth science educator and student, and also to the news media and others. As part of the climate monitoring effort, the Center produces a timely report called, "**Climate**

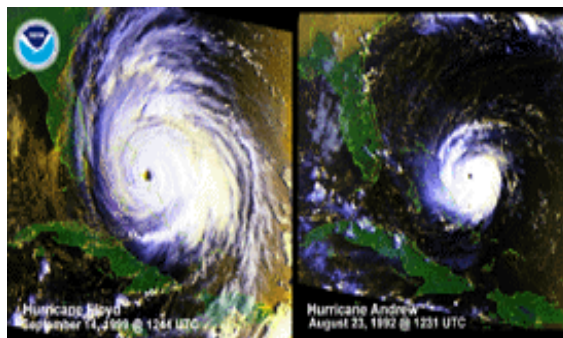


Fig 6. Climate Watch Graphic

**Watch**". The image shown in Figure 6 is a comparison of the sizes of Hurricane Floyd (1999) with Hurricane Andrew (1992). The report is issued usually within the first ten days of the month and updated several times as warranted. The report contains climatological information, data, satellite images, and analyses of current events for the month. The report also highlights new NWS station records of interest and global extreme events. Another useful report is one describing billion-dollar U.S. weather disasters. The U.S. has sustained 49 weather-related disasters over the past 22 years in which overall damages and costs reached or exceeded \$1 billion - see Figure 7. Forty-two of these disasters occurred during the 1988-2001 period with total damages/costs exceeding \$185 billion. Seven occurred during 1998 alone--the most for any year on record, though other years have recorded higher damage totals. The report provides two damage figures for events prior to 1996. The first figure represents actual dollar costs at the time of the event and is not adjusted for inflation.

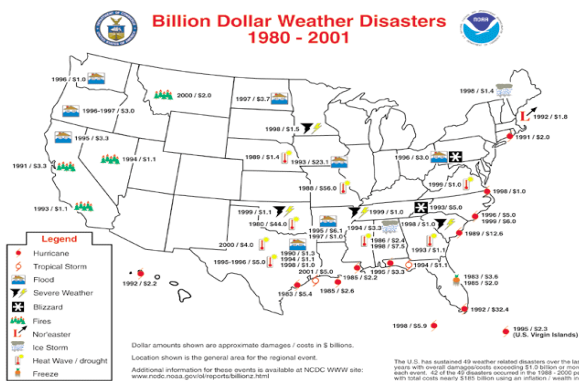


Fig 7. Billion Dollar Weather Disaster's 1980-2001

Therefore, event costs over time should not be compared using this value. The second value in parenthesis (if given) is the dollar cost normalized to 1998 dollars using a GNP inflation/wealth index. This allows for more accurate comparison of damage figures over time. The total normalized losses for the 49 events are over \$280 billion.

The National Climatic Data Center (NCDC) is the "Nation's Scorekeeper" in terms of addressing severe weather events in historical perspective. As part of its responsibility of "monitoring and assessing the climate," NCDC tracks and evaluates climate events (Figure 8.), in the U.S. and globally that have significant economic and societal impacts.

NCDC is frequently called upon to provide summaries of global and US temperature and precipitation trends, extremes, and comparisons in their historical perspectives. Part of the NCDC mission is to "manage America's resource of global climatological in-situ and remotely sensed data and information to promote global



Fig 8. Extreme Weather and Climate Events

environmental stewardship; to describe, monitor and assess the climate; and to support efforts to predict changes in the Earth's environment. NCDC's Climate Monitoring Branch (CMB) is responsible for monitoring and assessing the climate by using high quality research data bases. A sample from a report is shown in Figure 9. The CMB produces a variety of reports on a weekly and monthly basis. See the URL address of <http://lwf.ncdc.noaa.gov/oa/climate/research/monitoring.html> to access these reports.

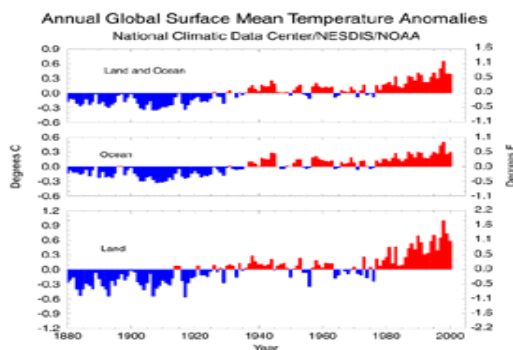


Fig 9. Climate Monitoring

## 5. Outreach Program

NCDC has developed a vigorous outreach program in the local community and across the nation, and the Center expanded its summer intern program in 2001. NCDC had 12 college students working on various projects at the Center as shown in Figure 10. NCDC also works cooperatively with local high schools in job vocational programs which allow students to work part time at the Center during the school year. The Center also has extensive outreach opportunities at the middle and elementary school level by hosting career days and various tours and open house activities. Many NCDC personnel are involved in the community by speaking at various educational and civic groups. Numerous schools and civic groups visit the Center each year. The Center, in conjunction with NESDIS and other NOAA agencies routinely exhibits at various scientific and professional conferences each year.



Fig 10. NCDC Summer Intern Program - 2001

## 6. Conclusion and Contact Information

NCDC believes that its effort in preserving the nation's climatic heritage, along with its education and outreach programs, are a vital service to the taxpayer. If you would like additional information on any topics in this paper or have additional questions, contact Tom Ross at the National Climatic Data Center.

Telephone 828-271-4499  
e-mail: [tom.ross@noaa.gov](mailto:tom.ross@noaa.gov)

NCDC Home Page: <http://lwf.ncdc.noaa.gov/oa/ncdc.html>