1.1 CLIMATE DATABASE MODERNIZATION PROGRAM PROVIDES ACCESS TO HISTORICAL DATA AND RECORDS: AN OVERVIEW OF VARIOUS PROJECTS

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1. BACKGROUND and PROGRAM GOALS

The National Oceanic and Atmospheric Administration's (NOAA) Climate Database Modernization Program (CDMP) has a very simple goal: to make major climate databases available via the world wide web. The CDMP is a partnership between NCDC and private industry to image and key paper and microfilm records and to make them available on the web to members of the climatological research community (Figure 1).

As the CDMP matured in its fourth year of existence, the program had grown to include tasks involving five NOAA line offices. The program became international, with data modernization efforts underway involving data from six African countries and one country in Central America. The amount of images available on-line reached over 42 million records, totaling over 5 terabytes of data. These images are stored on the Web Search Store Retrieve Display (WSSRD) system maintained by Information Manufacturing Corporation (IMC). Modernization continued to involve the keying of observations; the imaging of original records whether on paper, microform, or photographs; the vectorizing of shorelines; and the digitizing of analog records.

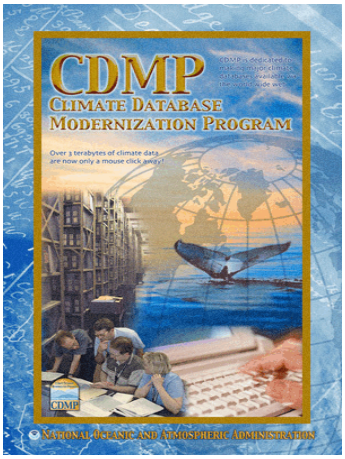

Figure 1. Climate Database Modernization Program Informational Poster

The program is managed by the National Environmental Satellite, Data, and Information Service's National Climatic Data Center (NCDC) located in Asheville, NC.

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The National Oceanic and Atmospheric Administration holds a vast amount of varied and unique climate and environmental data. Much of these data remain on paper or microform and are difficult to access. CDMP has historically funded numerous NOAA projects to rescue and recover environmental data. This year, CDMP has funded additional NOAA projects that will enable these data to become easily accessible. Some of these projects and tasks are highlighted in this report.

2. CDMP TASKS by NOAA ORGANIZATION

A breakdown of projects by government line offices is shown in Figure 2. The CDMP program manages over 40 different tasks with NOAA line offices, and data centers, and also additional projects with various Regional Climate Centers (RCC).

The National Environmental Satellite, Data, and Information Service's three data centers (National Oceanographic Data Center, National Geophysical Data Center, and the National Climatic Data Center) have dozens of tasks underway. These range from imaging historical photographs of Alaskan glaciers, to keying weather observations from the Forts collection (1820-1895), to imaging Defense Meteorological Satellite Program (DMSP) film. The NOAA library brought the *Daily Weather Map* series and the *Monthly Weather Review* to the web through the imaging of these valuable historical publications.

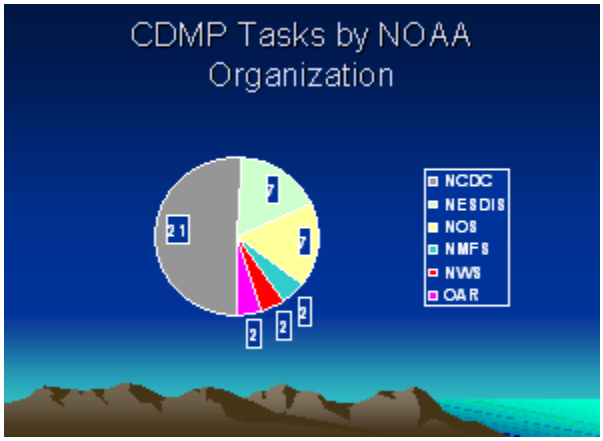

Figure 2. CDMP Tasks by NOAA Organization

The NCDC currently has over 20 different tasks under the CDMP program (Figure 3). One of the largest involves the scanning and keying of various databases, e.g., the cooperative station and surface airways observations prior to 1949. These cooperative and station observations are multi-year keying projects, and will extend the digital databases back to early 1900 or even earlier for selected stations. Another major effort, completed in 2003, was developing access to a historical suite of NCDC

publications. These are now available as real-time generated Portable Document File (PDF) output files via the web site. One of the earliest publications, Climatological Data, is available back into the 1890's for many states.

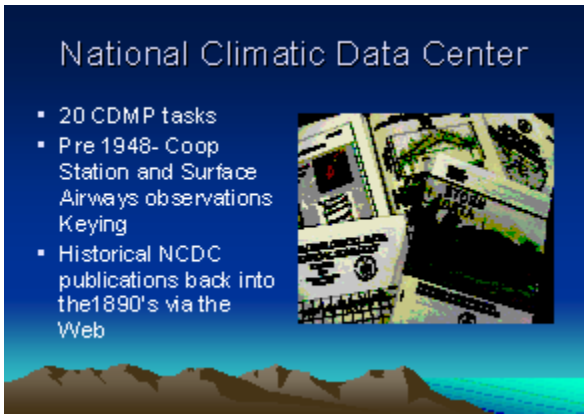

Figure 3 . National Climatic Data Center CDMP tasks

Much of the weather and climate data recorded by the founding fathers of this country (Washington, Jefferson and Franklin - Figure 4) were archived in original manuscripts, then microfilmed and stored at the National Archive and Records Administration (NARA). Those records available from NARA on microfilm have been imaged and placed on-line via the CDMP WSSRD system. To date, there are more than 42 million of those images on-line. These colonial diaries and data are a treasure trove to the climatologist seeking data on climate of the 19th century.

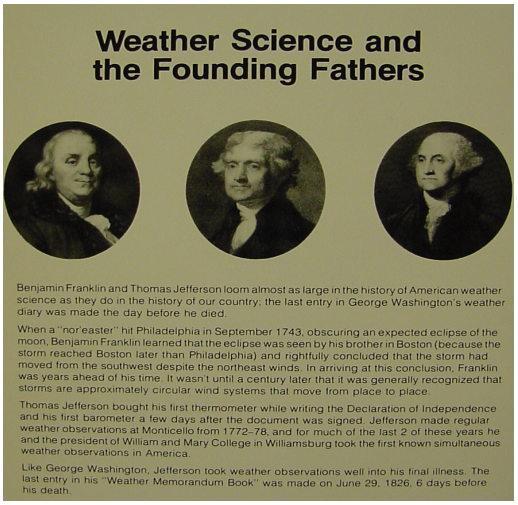

Figure 4. Three Forerunners of Modern Climatology - Franklin, Jefferson and Washington

The National Geophysical Data Center (NGDC) is involved in four on-going tasks under the CDMP program (Figure 5). The largest project is imaging of DMSP film. This project involves creating digital images from analog microfilm which was archived in the 1970's. The other projects include keying ionospheric and volcanic ash data recovery, and scanning and providing web access to historical glacier photographs.

Figure 5. National Geophysical Data Center CDMP Tasks

In support of NOAA's National Ocean Service (NOS), sea surface water temperature and density observations are being keyed (Figure 6). CDMP is also involved in another multi-year effort to digitize and vectorize various NOS shoreline charts. This vectorization process would allow data and information once only accessible in a paper format to be available electronically through a Geographic Information System (GIS).

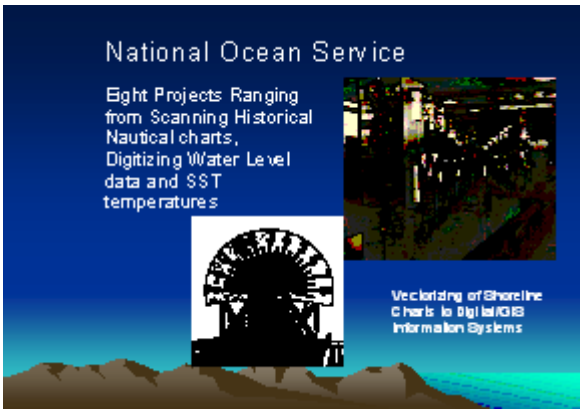

Figure 6. National Ocean Service CDMP Tasks

CDMP contractors worked to modernize a selection of logbooks and photographs documenting whales, dolphins and porpoise populations for the National Marine Fisheries Service (Figure 7). These logbooks and photographs may aid scientists studying Sea Surface Temperature (SST) patterns.

Other NESDIS projects are underway in additional offices to recover climate and environmental data under the

CDMP program (Figure 8). The National Weather Service worked with African and additional international meteorological offices to image their meteorological holdings. Under the African upper air project, digital equipment was provided to the meteorological services of seven African countries. These meteorological services then produced Joint Photographic Experts Group (JPEG) images of upper air data forms for stations in their country. These images were then provided to NCDC on CD-ROM. Data from these images will be keyed by CDMP partner contractors. The data will then be converted, quality controlled and eventually added to the NCDC global upper air database. Other projects include keying daily and monthly U.S. pre-1949 upper air observations.

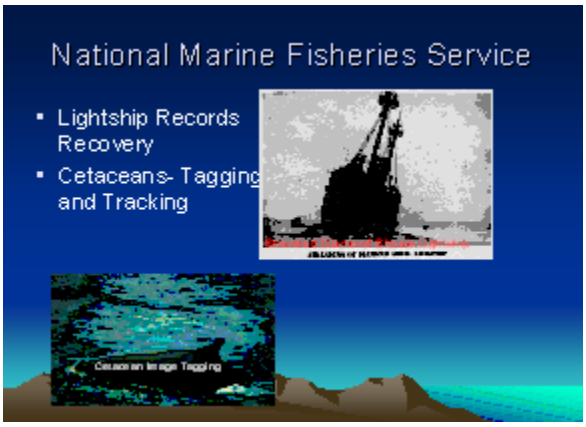

Figure 7. National Marine Fisheries Service CDMP Tasks

Figure 8. National Weather Service CDMP Tasks

NOAA's Oceanic and Atmospheric Research laboratories are also involved in data recovery projects (Figure 9). Two major tasks include the imaging and digitization of World Meteorological Organization (WMO) Publication #47, "Metadata for Volunteer Ships". This publication has existed in paper format only. CDMP in conjunction with the WMO will scan each yearly update and format from 1955-1972. CDMP will also develop a keying format to be used for station history files.

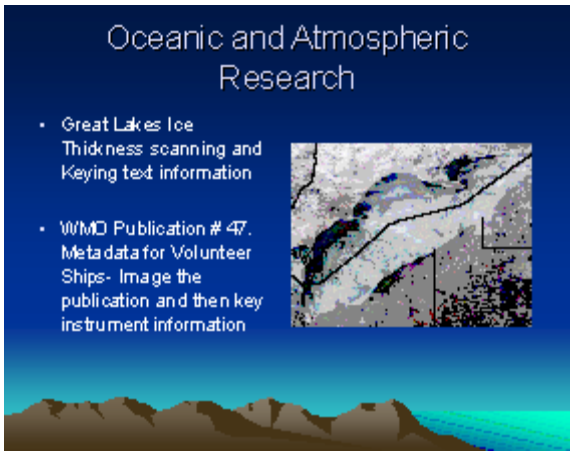

Figure 9. Oceanic and Atmospheric Research CDMP Tasks

Several additional projects are also underway in conjunction with the NOAA library. Two of the most popular are making accessible via the web the "Daily Weather Maps - Weekly Series," and the Monthly Weather Review. Figure 10 shows samples from the historical "Daily Weather Map Series." The daily surface and upper air maps are now available at the NOAA Central Library web site: http://docs.lib.noaa.gov.

CDMP is also funding a project to develop software to convert analog charts to digital output (Figure 11). This software will be able to read various traces and curves which depict climate and environmental data. The software will convert the time series measurements of the line to discrete digital data points. The software will be designed to run on a variety of computers in a stand alone mode. A current international project is to convert 30,000 analog image precipitation trace charts to digital formatted data.

The software automation will be capable of digitizing a variety of environmental data from various global meteorological services.

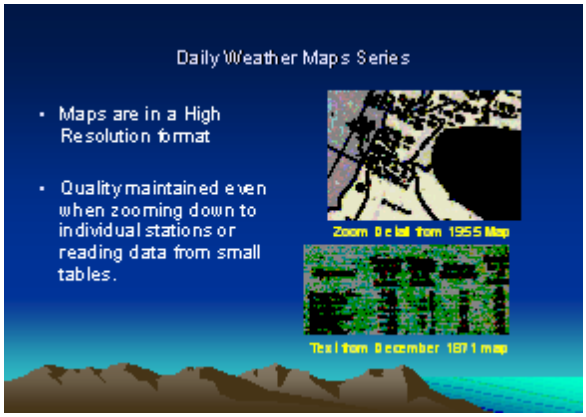

Figure 10. Sample from 1955 and 1871 Daily Weather Maps

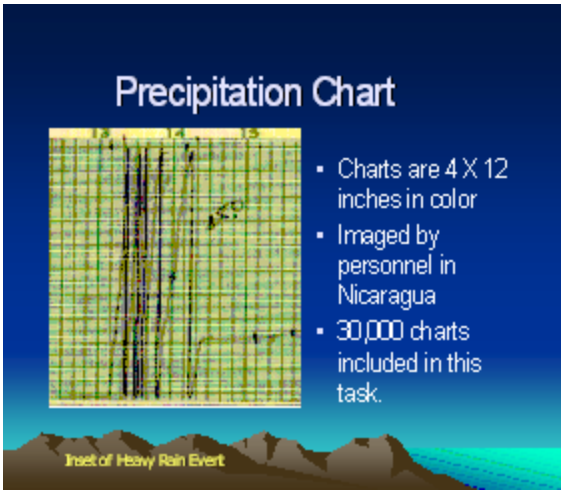

Figure 11. Sample Precipitation Chart

3. PARTNERS and PEOPLE

The CDMP could not exist without the extraordinary efforts of people within NOAA, and those in the private sector who perform the keying, imaging, and database development. The three prime contractors for CDMP include Information Manufacturing Corporation, Rocket Center, West Virginia; Image Entry, Inc., London, Kentucky; and Lason Systems, Inc., Beltsville, Maryland. The staffs of the RCCs also play a major role in assisting with data conversion and quality control, as do the staff members of STG Corporation who work alongside the NCDC staff in Asheville, North Carolina (Figure 12).

Figure 12. CDMP Team

4. CONCLUSION

NOAA and CDMP believe that the effort to preserve the Nation's climatic and environmental data archives, along with high speed technological access to these data, are a vital service to our Nation. If you would like additional information on any topics in this paper or have additional questions, contact Tom Ross at NCDC.

Telephone: 828-271-4499
CDMP Web Site: www.ncdc.noaa.gov/cdmp.html
NCDC Home Page: www.ncdc.noaa.gov/oa/ncdc.html