SUMMER 1991

[illegible]LUME 15, ISSUE 2

The State Climatologist

NEW NCDC PROJECTS COORDINATOR

Contents

1 New PC

1 Missing Observations

2 OK Mesonet

5 Advisory Committee Meeting

[illegible] New CD-ROM

Dr. Kenneth D. Hadeen
Director, NCDC

Dr. Mark D. Shulman
President, AASC

John P. Hughes
Editor, The State Climatologist

I am pleased to announce that I have selected John P. Hughes to fill the position of NCDC Projects Coordinator. John's duties will include coordinating activities such as conferences and VIP visits; directing NCDC publicity and marketing efforts; and liaison with State and Regional Climatologists.

After serving four years in the Air Force, John began his career with NESDIS in 1980 working with the Satellite Applications Lab. He also spent two years as the Climatologist for the Nuclear Support Office of the National Weather Service in Las Vegas, Nevada. John has been with NCDC for nine years, both in the Operations and Support Division and the Climate Services Division.

John tells me he is delighted to be involved with the State Climatologist program and looks forward to working with each of you.

Kenneth D. Hadeen
Director, NCDC

Missing Observations

The National Climatic Data Center has started a program to digitize as many World War I and II ship weather observations as can be located to help fill in these data sparse periods. The data are important to many research efforts including those involved with the Climate and Global Change Program. The major problem with this task has been the inability to locate most of the **merchant marine weather observations** taken during the World War II period. The observations were classified during the war, similar to the U.S. Navy observations which fortunately were archived and digitized under an earlier program. NCDC has had no luck in locating these observations, which may have unfortunately been destroyed. Our hope is that someone with knowledge of these valuable records will read this note and provide information leading to the records themselves or proof that they were destroyed. If you can be of help, please contact:

Joe D. Elms
National Climatic Data Center
Federal Building
Asheville, NC 28801
Phone (704) 259-0344

U.S. DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

NATIONAL CLIMATIC DATA CENTER IN COOPERATION WITH
AMERICAN ASSOCIATION OF STATE CLIMATOLOGISTS

"...the Oklahoma economy and its citizens seem just as impacted by the whims of Nature as in times past."

"...the potential dividend from mesonetwork activities across Oklahoma appears to exceed $25 million annually."

The Oklahoma Mesonetwork: What, Where, Why and When

I. Introduction

In spite of recent technological advances designed to benefit the economy and the civilization of North America, it often seems as if our society has become more fragile and more vulnerable. For example, the Oklahoma economy and its citizens seem just as impacted by the whims of Nature as in times past.

In fact, the Oklahoma climate and weather has such a pervasive influence on people's lives and the functioning of society that observed and forecast weather information is sought eagerly by nearly everyone. Despite the need, only a minimum of current information is available in Oklahoma.

However, on September 5, 1990, Governor Henry Bellmon announced that Oklahoma State University (OSU) and the University of Oklahoma (OU) would share $2 million in oil overcharge funds to establish a statewide network of agricultural, meteorological and hydrological sensors.

Teamed with Oklahoma Department of Public Safety (DPS), the two universities pledged a joint effort to implement a $2.7 million environmental monitoring network whose infrastructure would:

*promote energy education in every school system across the state through links to network information, thereby impacting nearly one million lives by the year 2000;

*promote energy efficiency across the state by following the leadership of the 101st Congress who noted that "better application of weather and climate information will help conserve water resources, allow agricultural chemicals to be applied in a more efficient fashion with less stress on the environment, and reduce energy consumption by improved management decision making" (H.R. 2427, Title, IV, Section 402[a.6]); and

*link the combined efforts of numerous state agencies whose timely responses during environmental emergencies often play critical roles in the economic welfare of our state and its citizens.

It is very difficult to place monetary figures on lives that are changed through education or saved through arrival of life-saving information, but the potential dividend from mesonetwork activities across Oklahoma appears to exceed $25 million annually.

With Governor Bellmon's announcement, the State of Oklahoma has made a technologically-correct investment for the 1990s that will generate, in its first year of operation, direct benefits which are well in excess of the initial capital outlay.

II. Oklahoma Mesonet: What and Where?

Nearly 10 years ago, an ad hoc agrometeorological committee was formed at OSU to formulate a plan that would implement a dial-up system of weather sensors at each of the experiment station farms in Oklahoma. In the aftermath of the disastrous Tulsa flood of May 1984, OU scientists led the implementation of an urban flood warning system for metropolitan Tulsa. Shortly thereafter, the Norman group began a parallel effort to develop a statewide monitoring system.

By 1987, the two universities joined forces on this ambitious project and approached the Governor's office for direction and support. A joint network proposal was redrafted to garner oil overcharge funds.

In the meantime, a solution was found to the most critical problem in operating a statewide mesonetwork with a real-time component for sharing its information: namely, the telecommunication of remotely-sensed observations into a central processing site. Fortunately, the DPS' Oklahoma Law Enforcement Telecommunications System (OLETS) operated a telecommunications system capable of processing almost 5 million messages daily with its 225+ remote terminals. In exchange for mesonetwork information to help meet its public safety mission, OLETS agreed to provide a backbone communications capability that would yield a cost-savings of approximately $1.5 million annually to mesonet operations. There can be no doubt that a solution to this critical mesonetwork component permitted a serious funding initiative to progress another step toward reality.

"A 'cooperative agreement' between OSU and OU was signed that would convey half of the oil overcharge funds from OU to OSU for mesonet activities."

As funding support from the U.S. DOE became assured, a formal statement-of-work was signed by OU and the Oklahoma Department of Commerce. Two months later, a "cooperative agreement" between OSU and OU was signed that would convey half of the oil overcharge funds from OU to OSU for mesonetwork activities.

A Steering Committee, composed of three scientists from each campus, was formed and charged with "designing and implementing the Oklahoma Mesonetwork." Their mission had a fourfold goal:

(1) to implement an automated weather-station network composed of 107 sensor-sites that observed 9-10 agricultural, hydrological and meteorological parameters every 15 minutes (back cover);

(2) to relay that information via OLETS to a central processing site in Norman for quality assurance, archival, and product generation and dissemination;

(3) to share this new data-stream with the research community in Norman and Stillwater and to combine network data with other remotely-sensed data (digital precipitation estimates from the new WSR-88D weather-radar network and strike information from the national lightning network); and

(4) to provide an efficient, cost-effective mechanism to share network data with a host of federal, state, and local government users (including the public schools) along with private agencies whose fortunes often are "weather controlled".

It is this latter goal--of making network information available to grass-roots levels across Oklahoma and doing so in real time--that separates the unique Oklahoma initiative from all other "statewide" networks.

Network sites will be located in all 77 counties of Oklahoma. An additional 30 sites will be located at "targets of opportunity" (e.g., the Wildlife Refuge in southwest Oklahoma). The first 20 sites will be located on the agricultural experiment farms operated by OSU. Locations of the remaining sensor sites remain an open issue, though most will go on public land (e.g., small county airports).

"observations. . . from the 107 automated weather stations will be taken every 15 minutes."

"...relatively few public investments materialize which generate, in a single year, direct benefits in excess of the investment cost."

Once operational, observations of the agricultural, hydrological and meteorological conditions from the 107 automated weather stations will be taken every 15 minutes. Next, that information is telecommunicated via the Department of Public Safety to the central processing site in Norman. From there, the data are shared with a host of university, government, and private users (including the public schools of Oklahoma).

A variety of graphics and value-added products will be developed from network data.

In addition to the planned mesonet activities, three county-wide hydrological networks are in operation across Oklahoma: Tulsa with 35 sites, Lawton with 19 sites and Stillwater with 15 planned sites. Each local-use network is built around technology similar to the state-wide system. Furthermore, it appears the Little Washita River basin (southwest of Oklahoma City) soon will be modernized with an automated network of 36 sensor sites. The state-wide mesonetwork plans to incorporate information from these local-use networks into its data infrastructure--producing a network data stream from over 200 sites.

III. Oklahoma Mesonet: Why?

The Oklahoma Mesonetwork was conceived for numerous important reasons:

(1) Improved Density of Observations.
(2) Improved Availability of Observations.
(3) Improved Ability to Solve Applied Problems.
(4) Improved Agricultural Efficiency.
(5) Improved Data Base for Developing New Technology.
(6) Improved Educational Opportunities.
(7) Improved Efficiency in Energy-Generation.
(8) Improved Capability for Water Management.
(9) Improved Winter Forecasts.
(10) Improved Response to Toxic Chemical Spills.
(11) Improved Opportunities to Develop Renewable Energy Resources.
(12) Improved Range Management.
(13) Improved Opportunities for Scientific Research.

IV. Oklahoma Mesonet: When?

Here are a few milestones: 8/91 - decision on tentative sites and sensor accuracy; 12/91 - awarding of sensor contract; 4/92 - data archiving and quality assurance begins; and 12/92 - commissioning of the mesonetwork.

V. Summary

No doubt many would label the mesonetwork project as bold and ambitious. The Mesonetwork Steering Committee considers the project technologically feasible and in sync with environmental needs of the 1990s. Furthermore, it seems relatively few public investments materialize which generate, in a single year, direct benefits in excess of the investment cost. Based on conservative estimates, it appears that a statewide automated mesonetwork would produce benefits of $25 million annually while yielding many inherent environmental benefits.

Kenneth C. Crawford, Director
Oklahoma Climatological Survey

Meeting of the Advisory Committee on Water Data for Public Use May 13/16, 1991

"The AASC has been nominated for permanent membership on the committee..."

During the second week of May I was pleased to represent the AASC at the annual meeting of the Advisory Committee on Water Data for Public Use (ACWDPU) in Bloomington, Minnesota. The committee was organized by the USGS as a means of sharing information on water data needs between state and federal agencies. The AASC has been nominated for permanent membership on the committee; a decision on this nomination should be made in a few weeks. Even though the AASC presently does not have a representative on the permanent committee, individuals from AASC have been active in working with the committee for several years. In fact, a number of committee members mentioned an unforgettable keynote speech given several years ago by Pat Michaels, the Virginia SC (does he ever give any forgettable ones?).

The topic of this year's meeting was "Water Resources Information Needs for Wetlands and Habitat Management;" however, I found that most of the discussion centered on wetlands identification rather than management. One interesting comment I heard in the Working Group meeting on Information Needs for Wetlands and Habitat Management was that climatological data have seldom been used in the process of identifying wetlands. This can lead to fairly large discrepancies in estimates of wetland size and quality, depending on the year in which the determinations were made. One of the recommendations of the Working Group was that a uniform definition of a wetland should be written for use by all federal, state, and local agencies; we may wish to consider if a climatological component should be included in such a definition.

I was also struck by the large number of interagency coordinating committees that are working to share tasks and data among agencies. Several committee members commented that the number of these coordinating groups has never been higher. In particular, Paul Dresler of USGS reported on the Committee on Earth and Environmental Sciences, which is coordinating "greenhouse" activities, and Gene Thorley, also of USGS, described the Spatial Data Coordination effort underway to convince agencies to use uniform mapping techniques which would facilitate data sharing among agencies. Both men indicated that the committees are looking for ways to expand beyond federal agencies to encourage cooperation with state efforts in these areas. They suggest that regional committees might be an appropriate way to enhance coordination among state agencies.

Finally, Nancy Lopez of USGS mentioned that a workshop on NEXRAD was scheduled to be held in Norman, Oklahoma, later this year. At the workshop, participants will be looking for ways to improve the use of NEXRAD data to meet water resource management needs. Since several people in Wisconsin have expressed concern over the availability of historical NEXRAD data for storm and watershed studies in the future, I am glad to see that we will hear an update on this topic at the meeting in August.

"The next meeting of the committee is planned for May 1992..."

If you would like more details on the ACWDPU meeting, please feel free to call or write me in Wisconsin. The next meeting of the committee is planned for May 1992 in Orange County, California, where they will discuss water use and conservation

"The historical climatology series is very useful for putting a particular period of the climate record into historical perspective."

"...the files for the polygon outlines required close to 800 Mb of storage for the three map series."

issues. By that time, we may have an "official" AASC member on board.

Pam Naber
Wisconsin State Climatologist

Climatology, CD-ROM, and AutoCAD

Three of NCDC's frequently referenced historical data sets are precipitation, temperature, and the Palmer Hydrological Drought Index (PHDI) for the 48 contiguous states. These data were last published in map form in 1984 through 1986. The total thickness of the 10 paperback atlases is about six inches. Printing, storing, and mailing this much paper is expensive, so it was decided to publish the 1990 update series on CD-ROM. There were three requirements for the CD:

1. At least 4180 shaded maps must be stored.
2. The disc must include software to conveniently access and accurately display the maps.
3. Hard copy is required.

It is no secret that AutoCAD has been involved in many mapping applications. It seemed to us that AutoCAD was a logical choice for producing our electronic atlas as well. The first problem was figuring out which of the AutoCAD output formats that we would use. Some early experiments with prototype shaded maps showed that .DWG files consumed approximately 400Kb, .DXF files about twice that, and .SLD files from 60-80Kb. It immediately became obvious that we would be using Slide files for the CD. The second problem was finding software to fulfill requirements 2 and 3 above. After some searching, the SLICK! software from CAD Systems Unlimited, Inc., was chosen; more on this later.

The historical climatology series is very useful for putting a particular period of the climate record into historical perspective. Many of us, from the Northern Rockies, through the Great Plains, to the Southeast, remember the severe drought of '88. By mid-summer many crops had failed and streams and reservoirs were at record low levels. Comparisons were made to the "dust bowl" days of the 1930s. While the '88 drought was severe, comparison to the 30's drought shows that it was not as widespread nor as prolonged. In a similar way, it is interesting to compare recent hot or cold spells to those occurring in the past.

Making the maps was a two-stage process. Since AutoCAD requires closed polygons for hatching, the first step was to build the polygons according to pre-defined categories. The spatial resolution of the data is that of a climatological division. These are regions that are reasonably homogeneous with respect to climatic and hydrologic characteristics. There are 344 climatic divisions across the lower 48 states. The data were classified for each division and then the areas of identical coverage were aggregated using Geographic Information System (GIS) software running on a minicomputer. The polygons were then downloaded via a local area network to a PC. In total, the files for the polygon outlines required close to 800Mb of storage for the three-map series. The storage requirements were easily accommodated using an Alphatronix erasable-optical system. Each removable cartridge has a capacity of nearly 650Mb and is reliable enough to obviate the need for a separate backup.

"How does one create 4180 shaded maps using AutoCAD?"

"How long did all this take? The answer is about four months of Compaq 386/20 time running nearly every minute..."

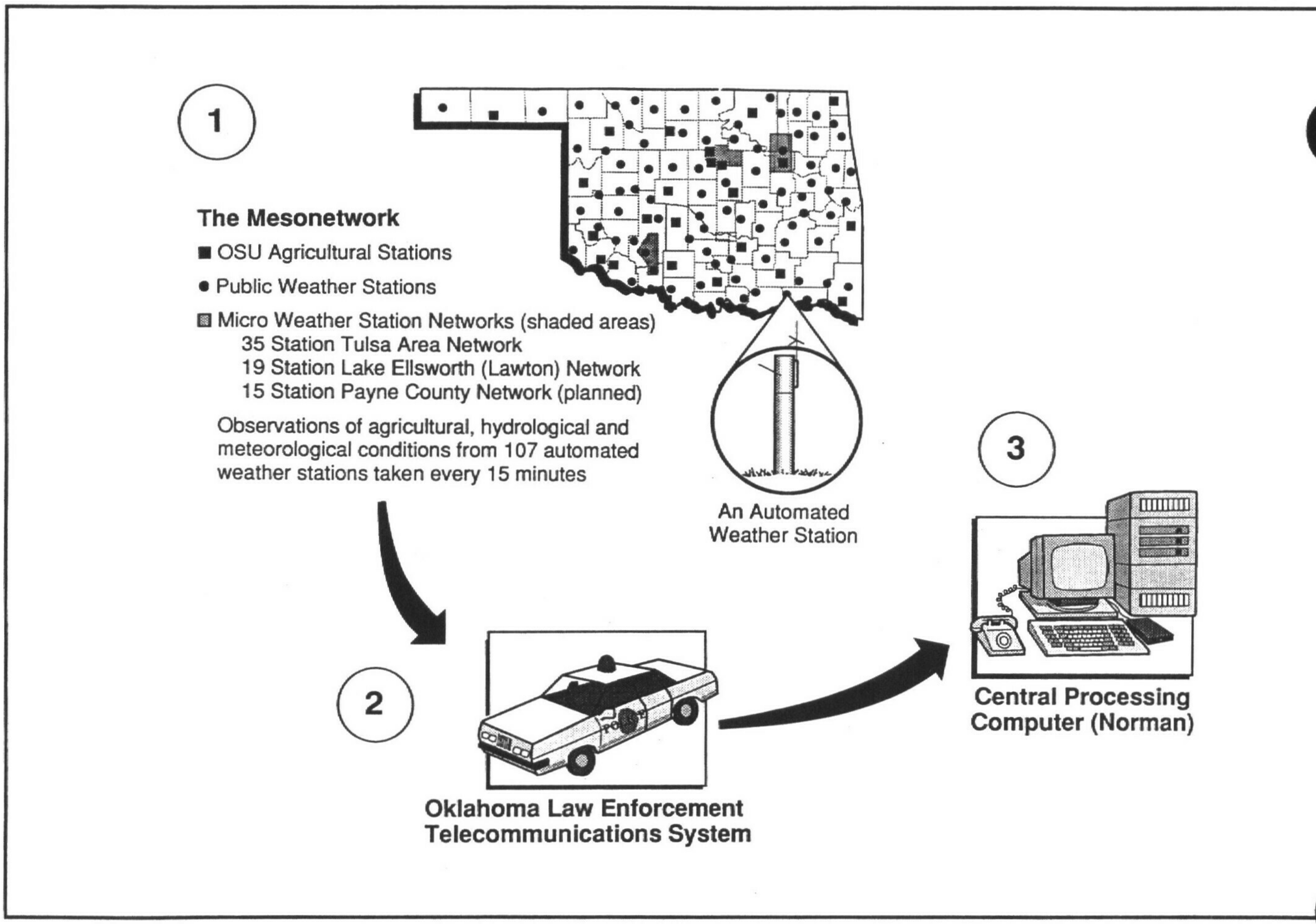
Now the polygons are stored away and ready to be converted into maps. The question arises, How does one create 4180 shaded maps using AutoCAD? Obviously if the process couldn't be automated it wouldn't be done. Fortunately, all of the processing can be done completely unattended in batch mode using what is probably AutoCAD's most powerful feature: the script file. Script files were written using a FORTRAN program to enter the commands to a file exactly as an operator would enter them on a keyboard. First the polygon outlines were written to their respective layers simply named 1 through 6 in the prototype map. Next, the layers were frozen, then thawed one at a time for the hatching process. Upon completion of the shading, the date was added and the MSLIDE command was issued. The slides were named according to their date; e.g., September 1934 becomes 193409.SLD. The only real trick to the script-writing process is the rigorous control of leading and trailing blanks which AutoCAD generally interprets the same as the ENTER key. This was accomplished with a single subroutine which finds the exact length of each command and writes only the command followed by the FORTRAN-supplied carriage-control, line-feed characters to the script file.

How long did all of this take? The answer is about four months of Compaq 386/20 time running nearly every minute when the author was out of the office at night, on weekends, and on vacation. This time could have been reduced by about 40% if AutoCAD had been run from the hard disk.

Now back to the access software. The SLICK! viewing package turned out to be ideal. It provides an easy-to-use graphical user interface for the selection of files, screen display of the slides, and optional printing/plotting of the selected maps. First-time users have little difficulty learning to use SLICK! in minutes after reading two paragraphs of documentation provided with the CD. After typing the name SLICK, directory trees will appear with a directory tree highlighted on the left and a list of slide files on the right. The UP/DOWN arrow keys are used to move to the desired directory. Upon pressing ENTER, the cursor will highlight the first map file. Again, use of the UP/DOWN cursor keys moves the highlighted box to the required file. Entering V displays the map in a few seconds. The function keys F7 and F8 allow the user to browse backward or forward within the selected directory. These keys automatically interrupt the drawing of the current display so that there is no need to wait for the current selection to be completed before moving on to another map. This is all that is required to begin using the CD. After reading several more paragraphs of the documentation, the user will learn how to zoom, pan, or tag up to four files for a multiple-viewport display. These paragraphs also tell how to print the maps to Epson-compatible printers or to HP Laser Jet Series II and III printers. Plotting can be done on HP-GL plotters.

By the way, the CD entitled National Climate Information Disc - Volume I is available and can be purchased for $50, plus $11 service and handling charge. In addition to the maps, the disc contains time-series graphs as well as the raw data files used in the processing. To order call NCDC at (704) 259-0682 or FAX (704) 259-0876.

Richard Knight
National Climatic Data Center



U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
NATIONAL CLIMATIC DATA CENTER
FEDERAL BUILDING
ASHEVILLE, NORTH CAROLINA 28801

The State Climatologist