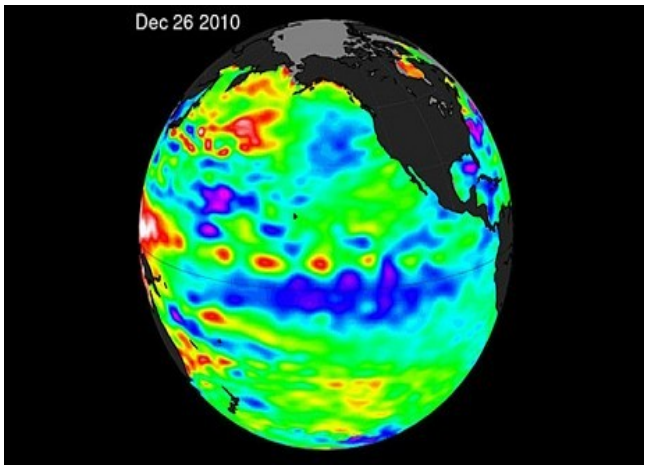
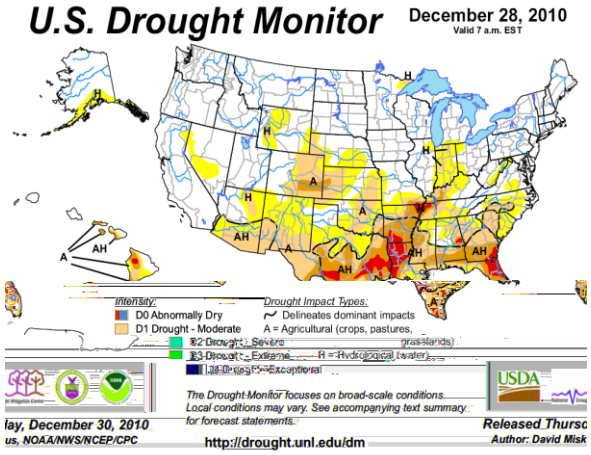
THE STATE CLIMATOLOGIST

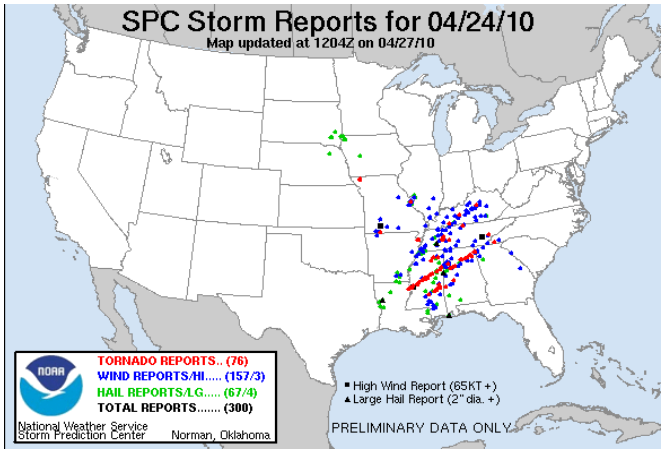
2010 Annual Summary

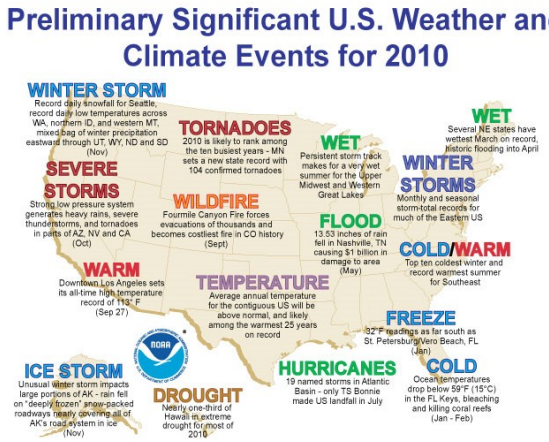
Volume 29, Issue 1

***The State Climatologist* is a publication of the**
American Association of State Climatologists









Editor's Note

The State Climatologist is an annual report of the activities of the members of the American Association of State Climatologists. It has been a pleasure to be the editor of this year's edition spanning the period of January – December 2010 (with some reports also extending into early 2011).

We would like to express appreciation to all of the state climate offices, regional climate centers, AASC partners and others who contributed to this year's edition.

Mathieu R. Gerbush
Office of the NJ State Climatologist
Rutgers University

July 14, 2011

Table of Contents

Summer 2011

Dear Fellow Climatologists, Partners and Friends of the AASC:

This publication of The State Climatologist summarizes the practical, applied work of state climate offices across the country in serving their constituency and the larger climate community in many different ways through data, analysis and interpretation. You will also find people responding to needs of their states when climate and weather issues arise.

Most states across the country have experienced very serious budget issues. Climate offices and affiliated universities have felt that resource pinch. Despite the limited resources, needs and demands to serve the public have even been greater because of huge climate and weather events and their associated impacts. Severe drought in the south has led to crops losses and water rationing. Record floods in the north have displaced home-owners and caused many infrastructure issues. Various amounts of severe weather have damaged crops and structures. During these events offices continue to step up and serve needs where they exist.

Enclosed you will find innovative, useful ways of climatologists finding ways to deliver a wide variety of climate services at state and local levels to all segments of the public, business and government through their own resources, partnerships or cooperation with a variety of organizations.

I am gratified to lead this organization and honored to present this segment of the work done by state climate offices across the country.

Sincerely,

Dr. Dennis Todey
President American Association State Climatologists
South Dakota State Climatologist

About the American Association of State Climatologists

The American Association of State Climatologists (AASC) is a professional scientific organization composed of state climatologists (one per state), directors of the six Regional Climate Centers and associate members who are persons interested in the goals and activities of the Association. State Climatologists are individuals who have been identified by a state entity as the state's climatologist and who are also recognized by the Director of the National Climatic Data Center of the National Oceanic and Atmospheric Administration as the state climatologist of a particular state.

State Climatologists currently exist in 47 states and Puerto Rico. They are typically either employees of state agencies or are staff members of state-supported universities. Associate members may be assistant state climatologists or other climatologists under the employ of the state climatologist, representatives of federal climate agencies, retired state climatologists, or others interested in climate services. The total membership of the Association is approximately 150. For more info, see

http://lwf.ncdc.noaa.gov/oa/climate/stateclimatologists.html.

ARSCO

A state climate office may gain status as the AASC-Recognized State Climate Office (ARSCO) by providing:

1. A document detailing current and planned activities meeting ARSCO requirements;
2. A letter of support from the state's Regional Climate Center Director;
3. A letter of support from at least one National Weather Service Forecast Office serving the state.

Candidate offices must demonstrate the following capabilities:

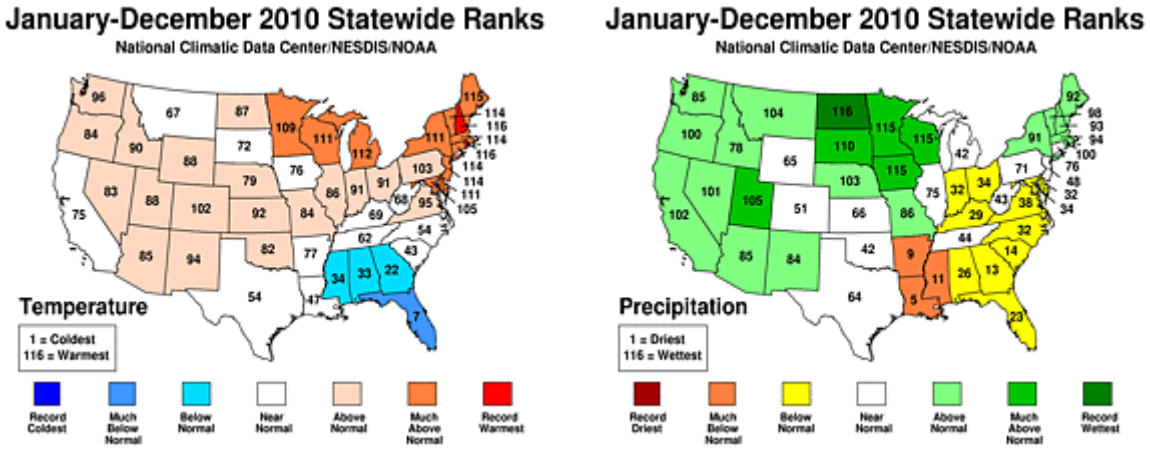
- Communication capabilities – the office must be able to communicate with its clientele via multiple media, including telephone, Internet, mail, E- mail, and fax;
- Information services – the office must be capable of providing a range of data and information;
- Research – the office must conduct research on climate and human activities;
- Outreach – the office should design products and services for education, climate information, awareness, and the media;
- Monitoring and assessments – monitoring climate conditions, evaluating future impacts, and providing historical context to events are activities conducted by ARSCOs.

Upon receipt of the materials and approval of the AASC Executive Board, a Memorandum of Agreement (MOA) with the National Climatic Data Center shall be issued. Currently, 38 states have received ARSCO status.

2010 SUMMARY OF THE UNITED STATES CLIMATE

Compiled from reports by the National Climatic Data Center

National Temperatures



In 2010, the contiguous United States (CONUS) average annual temperature of 53.8 degrees F (12.1 degrees C) was 1.0 degrees F (0.6 degrees C) above normal, and was the 23rd warmest year on record. Since 1895, the CONUS has observed a long-term temperature increase of about 0.12 degrees F (0.07 degrees C) per decade. Precipitation across the CONUS in 2010 was 1.02 inches (25.9 mm) above the long-term average (LTA). Over the long-term, precipitation averaged across the CONUS, is increasing at a rate of about 0.18 inches (4.6 mm) per decade.

Seasonal highlights in 2010 included a winter with abnormally cold temperatures and abundant moisture, which resulted in a historic December-February period in the East and Northeast. Several locations broke monthly and seasonal snowfall records. During the spring period, record warmth dominated much of the Northeast contributing to the limited amount of snow fall across the country. Satellite measurements indicated that the U.S. had its 8th smallest April snow cover extent in the 44-year period of record. The North Atlantic High played a large role in the summer weather pattern along the east coast, contributing to record heat in the South and East. A persistent storm track brought prolific summer rains to the Northern Plains and Upper Midwest. The number of tornadoes, as reported by the Storm Prediction Center (SPC), during the summer was abnormally high—sixth busiest in 60 years. Drought conditions, while record low at the beginning of the summer period, expanded in area by late summer. Nonetheless, the U.S. footprint of drought reached its smallest extent which help limit wildfire activity in 2010. For the second consecutive year, no hurricanes made landfall in the U.S., despite the active tropical cyclone season in the Atlantic Basin.

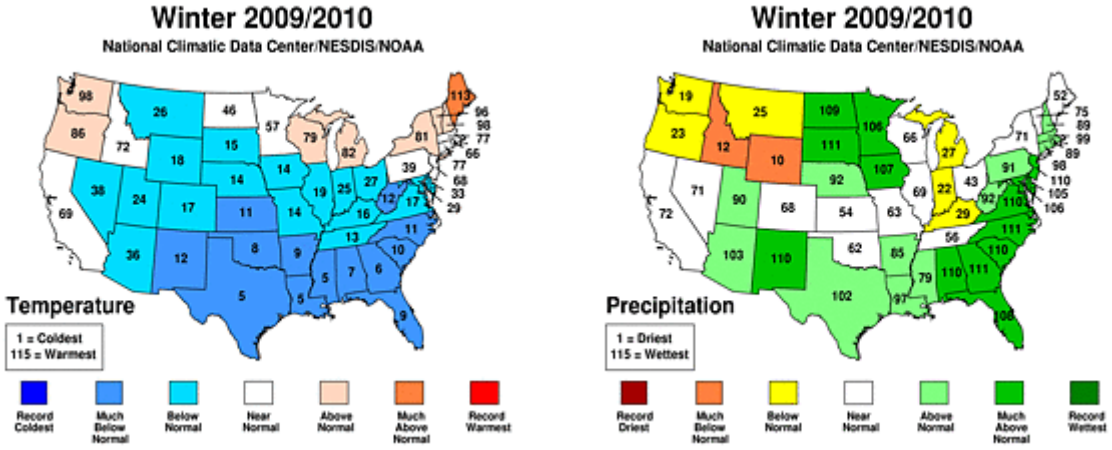
This annual report places the temperature and precipitation averages into historical perspective, while summarizing the notable events that occurred in 2010. More detailed analysis on individual months can be found through the Climate Monitoring home page.

Top Ten U.S. Weather/Climate Events for 2010

The following is a list for the top ten U.S. weather/climate events which occurred during 2010. These events were selected by a panel of weather/climate experts from around the country.	
Rank	**Event**
1	Consecutive Winter Blizzards/ Extreme Snow Season
2	Nashville and Central TN flooding
3-tie	Hot Summer in the East
3-tie	Midwest Super Storm
5	Hawaiian Drought
6	No hurricanes made U.S. landfall despite active Atlantic
7	Near Eradication of CONUS Drought
8	Vivian, SD Hailstone
9	New England Flooding
10	Minnesota as tornado leader

Temperature and Precipitation Seasonal Analysis

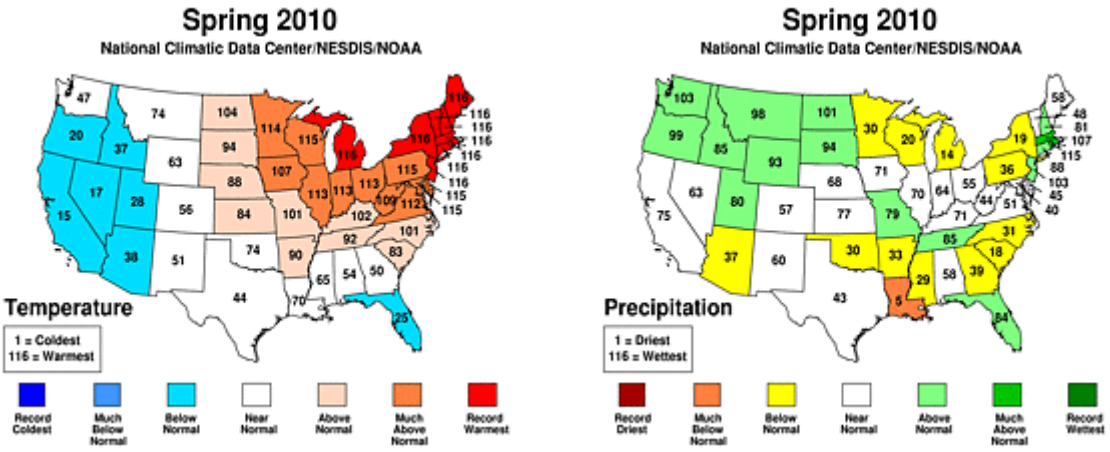
Winter



The 2009/2010 winter season was marked by anomalously cold air in the South and East. Temperatures for the three-month period (December–February) were dominated by the historically strong negative phase of the Arctic Oscillation (AO). The negative AO allowed cold Arctic air to slide south while warmer air was displaced to the north. This created warmer-than-normal conditions in some of the Northeast, Great Lakes and Northwest, while below to much-below-average temperatures were present from the Rockies eastward into the Mid-Atlantic. The coldest temperature anomalies for the period occurred in the Southeast and Southern Plains. Florida was greatly affected by the persistence of the cold air. In January, its citrus crop sustained heavy damages from sub-freezing temperatures as an estimate by the U.S. Department of Agriculture totaled the crop losses to be more than $450 million. Florida then experienced its fourth coldest February on record. Temperature anomalies were nearly eight degrees F (4.4 degrees C) below the 20th average. Meanwhile, Maine had its third warmest winter, nearly six degrees F (3.3 degrees C) above the 20th century average. The average winter temperature across the contiguous U.S. was 1.8 degrees F (1.0 degrees C) below the 20th century average, or 15th coolest on record.

The strong presence of El Niño coupled with the negative AO, greatly influenced the jet streams and general weather pattern across the U.S. during the winter period. The average precipitation for the period was 0.88 inch (22 mm) above normal partly due to a series of winter storms that were generated by the subtropical and polar jets. As a result of the persistent pattern, much of the South, East, and Upper Midwest experienced above to much-above-normal precipitation. One of the noteworthy events during the season were the back-to-back winter storms that affected the Washington D.C. area in February. The first occurred on February 4th when the Reagan National Airport received 32.4 inches (82.3 cm) of snow, a record amount for that location. On February 9th-11th, while digging out from the previous storm, D.C. residents suffered through another storm as 10.5 inches (26.7 cm) of snow fell at the Reagan National Airport. While there were no record precipitation amounts statewide, monthly and seasonal snowfall records were shattered.

Spring

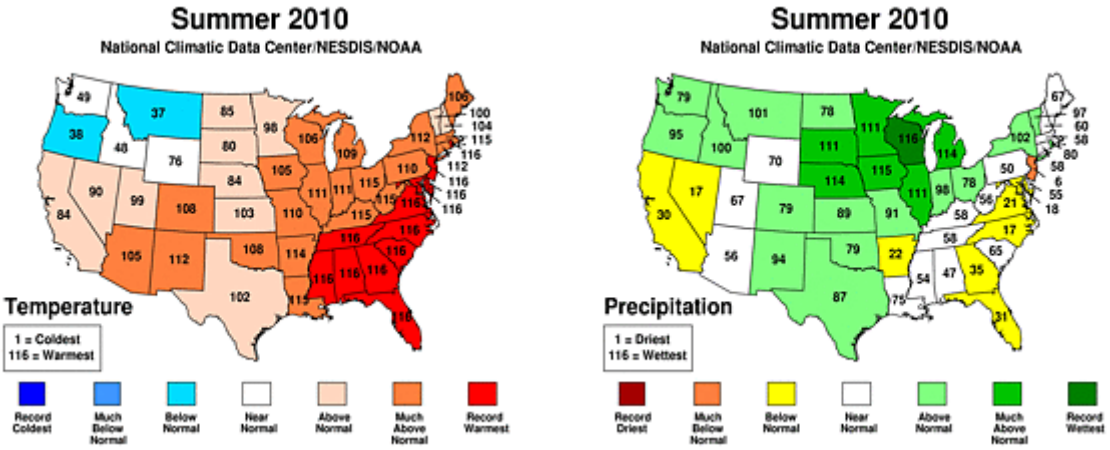


The nationally averaged temperature for the spring period (March-May) was 1.4 degrees F (0.8 degrees C) above the LTA. The season brought record warmth to the Northeast, which was 5.3 degrees F (2.9 degrees C) above normal. Eight northeastern states experienced their warmest such period on record: Connecticut, Rhode Island, Maine, Massachusetts, New Hampshire, New Jersey, New York, and Vermont. Michigan also had its warmest spring period. It was one of the ten warmest spring seasons for ten other states. Conversely, the majority of the western U.S. experienced temperatures that were 2-4 degrees F (1.1-2.2 degrees C) below normal during the spring season. A persistent pattern of a high pressure ridge (associated with warmer conditions) in the East and a western trough (cooler conditions) was especially evident during the period. Much of the coolness in western U.S. can be attributed to unrelenting troughs which filtered in cool moist Pacific air during April and May.

As is typical, precipitation was variable throughout the country during the spring season (March–May) resulting in a near-normal value based on the LTA. Only three states were in the top or bottom tenth percentile. Louisiana had its fifth driest period while Rhode Island and Massachusetts had their second and tenth wettest period, respectively. During the period, warm conditions across the Northeastern quadrant of the country helped limit U.S. snowfall. Several cities in New York did not receive any snow during the month of March for the first time on record. Satellite measurements indicated that the U.S. had its 8th smallest April snow cover extent in the 44-year period of record, while North America as a whole had its smallest spring snow cover extent. As estimated by the U.S. Drought Monitor (USDM), the area of drought in the CONUS increased

slightly from 8.8 percent at the beginning of March to 9.3 percent near the end of May. Flooding occurred in Nashville, Tennessee when a stagnant storm system brought more than 13.0 inches (330.0 mm) of rain to the area on May 1st-2nd. It was estimated that over $1 billion worth of damages were done. By the second day of the month, Nashville had recorded its wettest May and fifth wettest month on record.

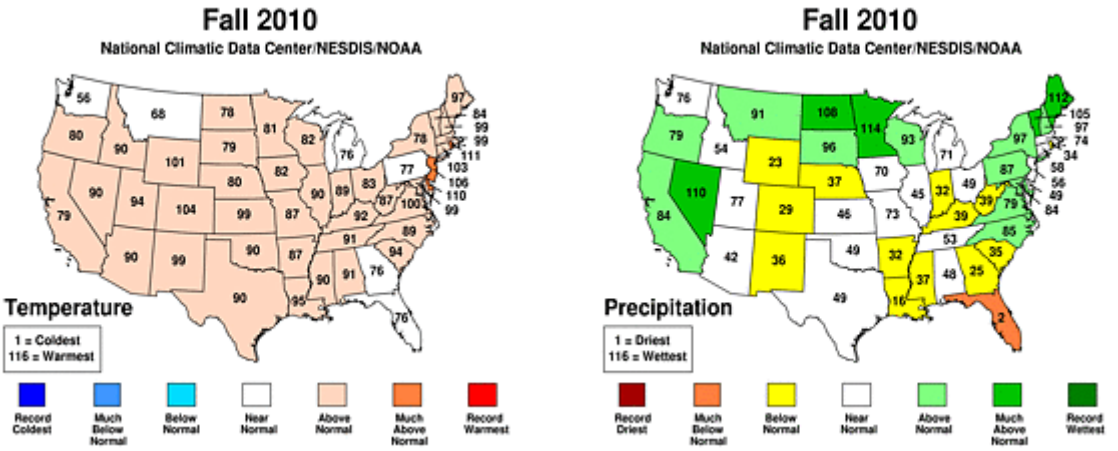
Summer



The summer of 2010 was marked by the persistent Bermuda High that parked itself in the western Atlantic. This area of high pressure was situated abnormally west ushering in warm humid conditions along the east coast and as far inland as the Midwest. This not only lead to record heat in a vast area of the country, but also acted as a block preventing smaller storm systems from entering into the regions. It was the hottest June on record for several states along the mid-Atlantic Coast as well as Louisiana. Nationally, it was the eighth warmest June and August on record. During the first week of July, an oppressive heat wave led to soaring temperatures throughout the eastern half of the CONUS. Hundreds of maximum high and minimum high temperatures were broken, contributing to the third and the fifth warmest July on record for the Southeast and Northeast climate regions, respectively. For the entire summer period (June-August), 12 states were record warm, while only two experienced average temperatures below normal. Overall, it was the fourth warmest summer on record for the CONUS with an average temperature of 1.9 degrees F (1.0 degrees C) above the 20th century average.

Despite record warm temperatures during the summer period, the nationally averaged precipitation was the ninth wettest in 116 years, 1.09 inches (27.7 mm) above the LTA. As a result of the persistent track of storm systems across the northern-tier states, areas around the Upper Midwest and Great Lakes had an anomalously wet summer. Wisconsin had its wettest June–August on record, while many other surrounding states, including Iowa, Michigan, Nebraska, South Dakota, Minnesota, and Illinois, had near record precipitation averages. New Jersey was the only state to experience a summer that ranked in the bottom ten percent (6th driest), based on data that date back to 1895. Regionally, both the West and Southeast had below-normal precipitation averages during the summer season.

Fall

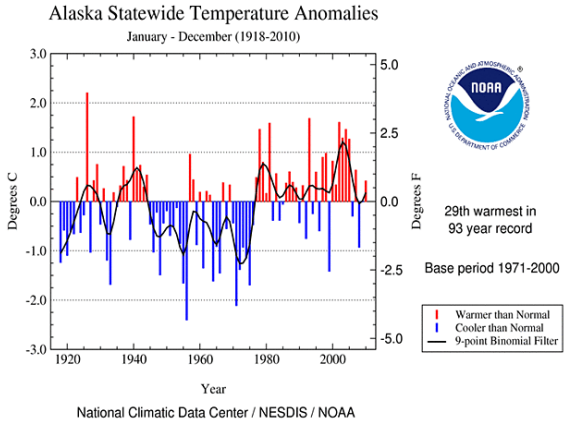


Warmer-than-normal temperatures were predominant throughout much of the country during the fall season (September–November). Based on divisional temperature averages, no state experienced a below-normal fall period. These conditions were mostly reflective of the above-average warmth during September and October, a result of the lingering Bermuda high in the Atlantic. The average fall temperature for the CONUS was 1.5 degrees F (0.8 degrees C) above the 20th century average, ranking 14th warmest. The constant lack of precipitation in Florida resulted in the second driest September-November period on record. Meanwhile, the tireless storm track over the upper Midwest resulted in much-above-normal precipitation for Minnesota and North Dakota. Maine, Vermont, and New Hampshire also averaged precipitation amounts that were among their wettest ten percent. Overall, precipitation when averaged nationally was about average for the fall period.

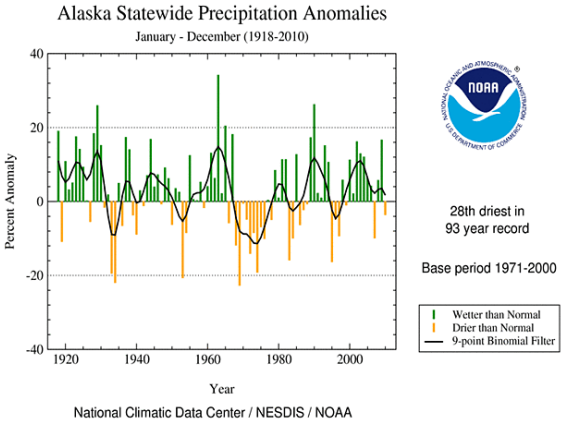
Fall highlights consisted of:

- On September 27th Los Angeles, California experienced its all-time warmest day (113 degrees F or 45 degrees C) since record keeping began in 1877.
- Major flooding occurred along the Atlantic coast attributable to the remnants of Tropical Storm Nicole
- Severe weather caused eight tornadoes in a single day in Arizona, which only averages four per year
- A powerful low pressure system developed in the Upper Midwest and broke state records for lowest atmospheric pressure observed in Wisconsin
- Winter weather impacted areas in the Upper Midwest as Duluth, Minnesota had its sixth snowiest autumn on record.

Alaska Annual Summary

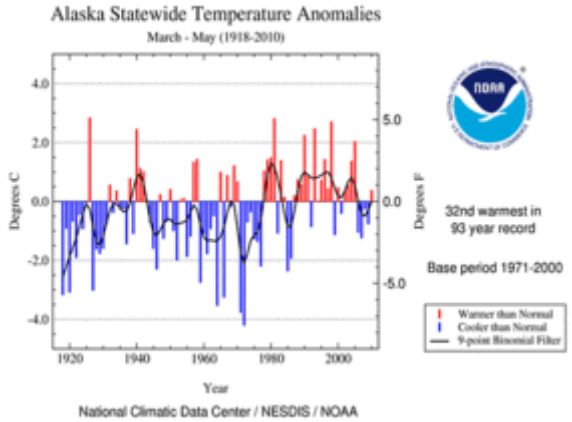


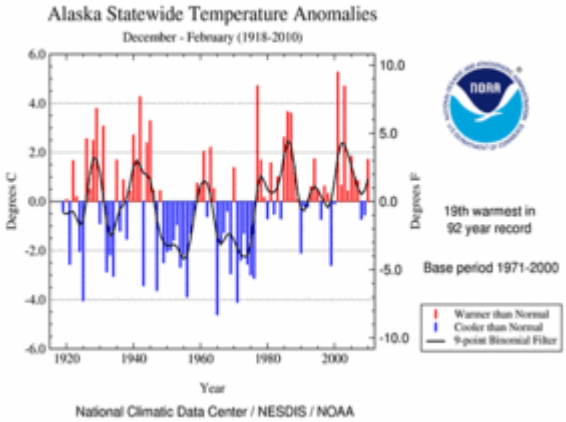
Jan-Dec 2010 Alaska Temperature Time series



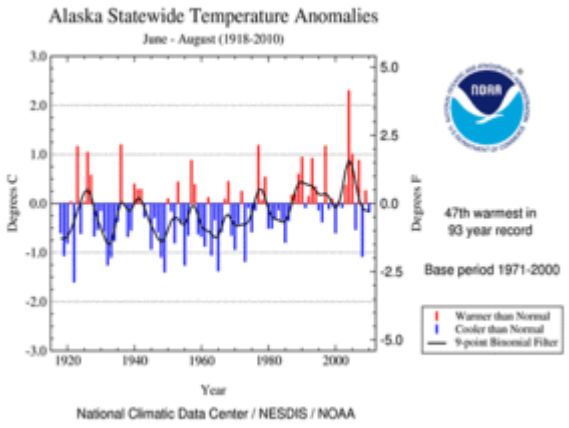
Jan-Dec 2010 Alaska Precipitation Time series

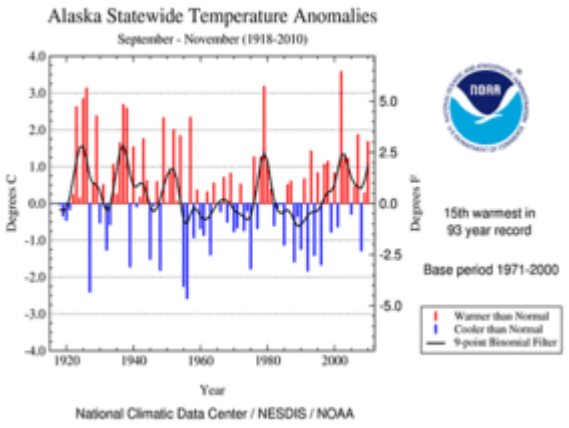
Alaska temperatures in 2010 were above the 1971-2000 average, continuing the upward trend of the last 20 years. Winter temperatures in 2009-2010 were 3.1 degrees F (1.7 degrees C) above average.

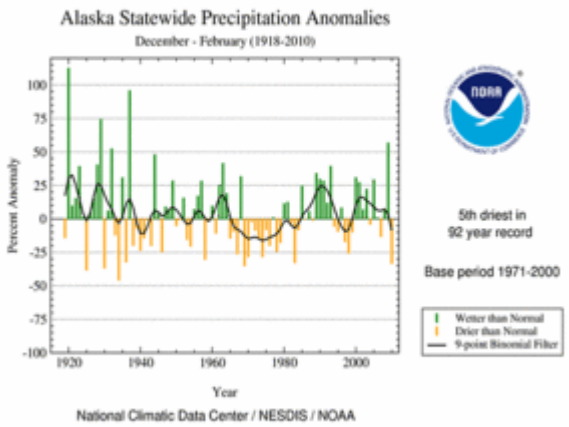


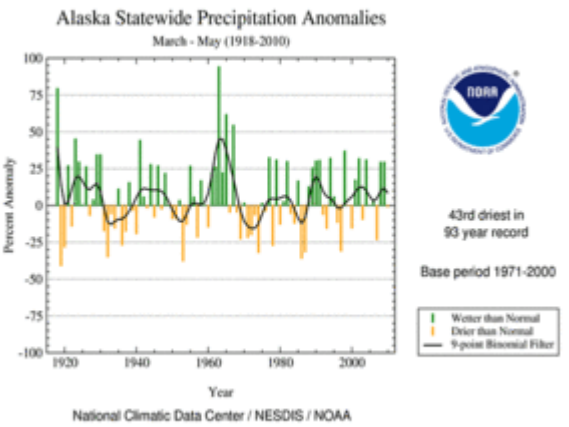


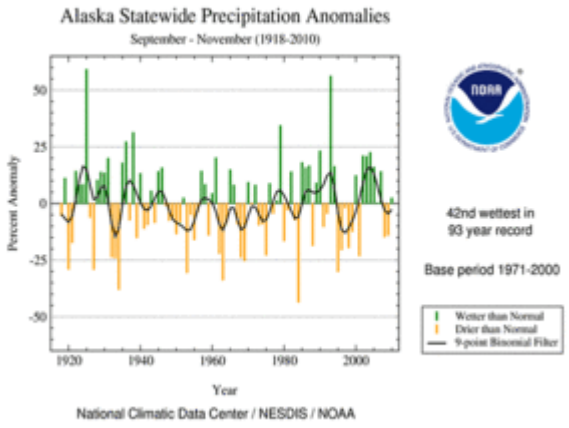
Spring temperatures were 0.7 degrees F (0.4 degrees C) above average, summer was 0.4 degrees F (0.2 degrees C) above average, and fall was 3.1 degrees F (1.7 degrees C) warmer than the average. Precipitation in Alaska in 2010 was near normal. While it was the fifth driest winter and spring was near normal. Summer precipitation was about 11 percent above the 1971-2000 average and fall precipitation was near normal. In November, a widespread rain-event coupled with sub-freezing surface temperatures in Alaska resulted in a major ice storm. It was reported that the affected area was the combined sizes of Texas, Oklahoma, and New Mexico. The rainfall amount was the second largest daily rainfall amount between November and March in Fairbanks since record keeping began in 1904.


Alaska Statewide Temperature Anomalies
June - August (1918-2010)
Degrees C
Degrees F
47th warmest in
93 year record
Base period 1971-2000
Warmer than Normal
Cooler than Normal
9-point Binomial Filter
Year
National Climatic Data Center / NESDIS / NOAA

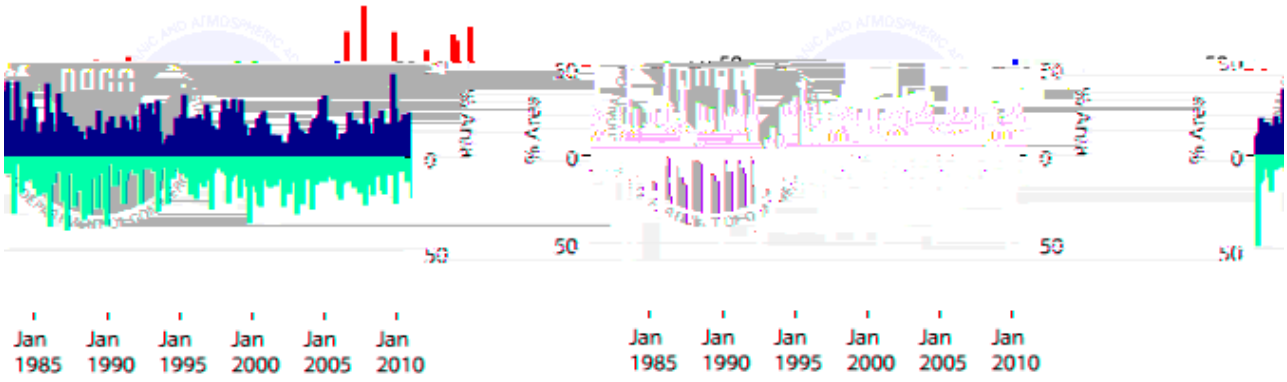

Alaska Statewide Temperature Anomalies
September - November (1918-2010)
Degrees C
Degrees F
15th warmest in
93 year record
Base period 1971-2000
Warmer than Normal
Cooler than Normal
9-point Binomial Filter
Year
National Climatic Data Center / NESDIS / NOAA


Alaska Statewide Precipitation Anomalies
December - February (1918-2010)
Percent Anomaly
5th driest in
92 year record
Base period 1971-2000
Wetter than Normal
Drier than Normal
9-point Binomial Filter
Year
National Climatic Data Center / NESDIS / NOAA


Alaska Statewide Precipitation Anomalies
March - May (1918-2010)
Percent Anomaly
43rd driest in
93 year record
Base period 1971-2000
Wetter than Normal
Drier than Normal
9-point Binomial Filter
Year
National Climatic Data Center / NESDIS / NOAA


Alaska Statewide Precipitation Anomalies
September - November (1918-2010)
Percent Anomaly
42nd wettest in
93 year record
Base period 1971-2000
Wetter than Normal
Drier than Normal
9-point Binomial Filter
Year
National Climatic Data Center / NESDIS / NOAA

Very Warm/Cold and Wet/Dry Percentages

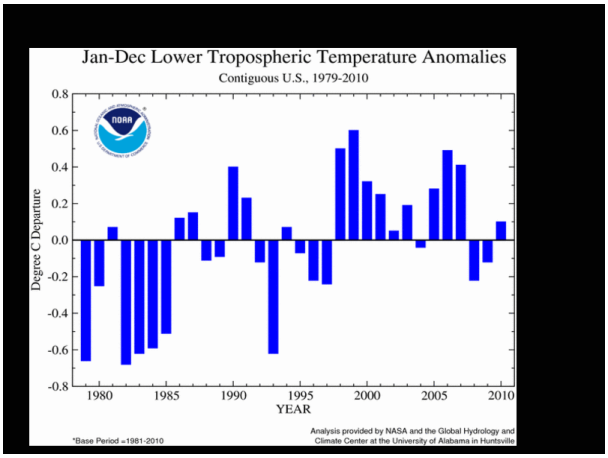


One way to assess the magnitude of warm/cold and wet/dry episodes is to compute the percent area of the contiguous United States that was "very warm/very cold" and that which was "very wet/very dry". The figures above depict these values for each month in the past 30 years. These percentages are computed based on the climate division data set. Those climate divisions having a monthly average temperature/precipitation in the top ten percent (> 90th percentile) of their historical distribution are considered "very warm/very wet" and those in the bottom ten percent (< 10th percentile) are "very cold/very dry".

During 2010, the U.S. experienced an extremely cold winter which transitioned into a record breaking warm summer. In terms of the area of the contiguous U.S., 38 percent experienced temperatures that were in the bottom 10th percentile or categorized as "very cold" in December. This definition correlates well with "much below normal" in terms of NCDC ranking methods. The anomalously cold temperatures infiltrated into the U.S again in February when 27.4 percent of the country was categorized as "very cold". Influenced by a weakening El Niño and a strengthening Bermuda High, "very warm" conditions prevailed in the spring and culminated in the summer months. During April, June, and August, at least 30 percent of the country experienced conditions that are categorized as "very warm".

Conditions that are categorized as "very wet" existed throughout the U.S. during January–December, resulting in a historically low drought footprint on July 6th. While the high pressure systems, which typically deliver very little precipitation, dominated the east, the persistent upper level jet stream over the northern tier states produced copious amounts of precipitation for the Upper Midwest. During six of the first seven months of the year (each month except March) conditions categorized as "very wet" prevailed over conditions categorized as "very dry". Furthermore, conditions categorized as "very dry" only existed for greater than 10 percent of the country during three months—March, September and December.

Lower Tropospheric

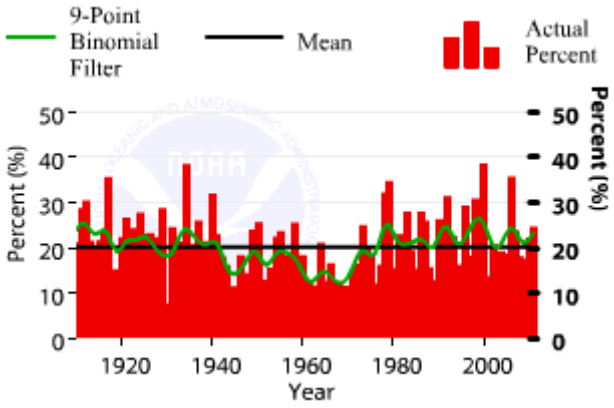


MSU January-December Temperature Departures

The 2010 temperature in the lower troposphere was slightly above-average. Data collected by NOAA's TIROS-N polar-orbiting satellites and adjusted for time-dependent biases by NASA and the Global Hydrology and Climate Center at the University of Alabama in Huntsville, indicate that temperatures in the lower half of the troposphere (lowest 8 km of the atmosphere) over the U.S. were approximately 0.2 degrees F (0.1 degrees C) above the 1979-1998 average.

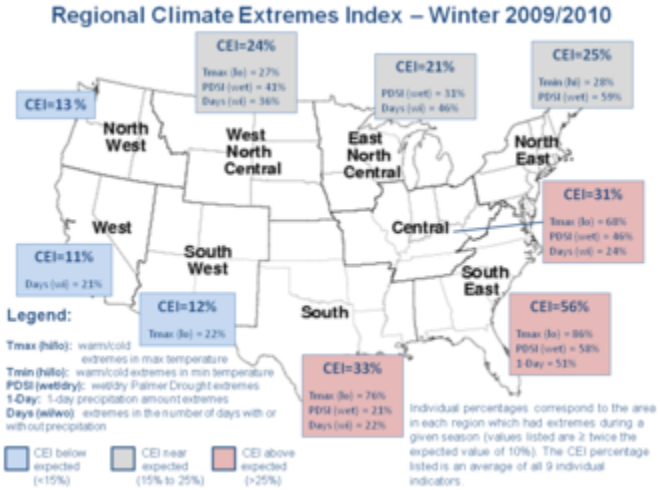
Climate Extremes Index

U.S. Climate Extreme Index



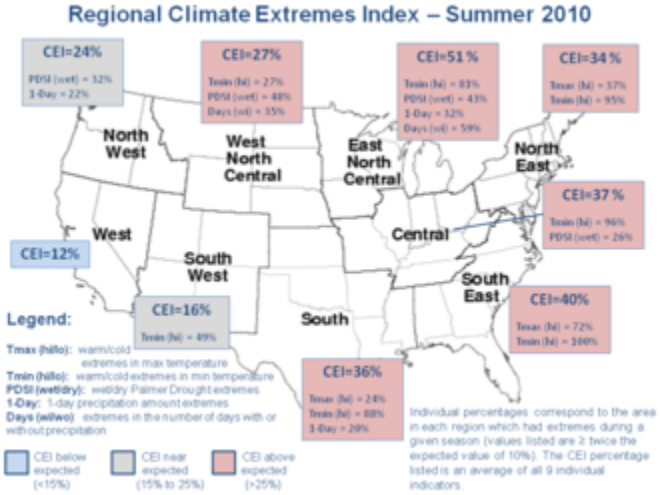
The U.S. Climate Extremes Index (CEI) measures the occurrence of several types of climate extremes, such as record or near-record warmth, dry spells or rainy periods. During 2010, the most prominent and wide-spread extremes occurred during two seasons: winter and summer. At the National level, the winter season ranked as the 15th coldest winter on record, while the summer ranked as the 4th warmest based on records which date back to 1895. The change in seasonal temperatures was a record in the Southeast, which experienced its 11th coldest winter and its hottest summer on record. Winter precipitation was above average across the nation with the Southwest and the Southeast ranking among the top ten wettest such periods on record. Summer

ranked 9th wettest for the nation, with the bulk of the precipitation occurring in the West North Central and East North Central regions.



Regional CEI Values for Winter 2010

For the contiguous U.S. (CONUS), the spatial extent of extremes, as depicted by the CEI, was approximately 6% greater than the historical average for winter (December 2009 - February 2010). Factors contributing to the elevated 2009-2010 winter value were large footprints of cold maximum temperatures, areas of extreme wetness as denoted by the Palmer Drought Severity Index (PDSI) and an abundance of days in which precipitation fell. The seasonal wetness can also be seen in the precipitation state rank map. Regions of the country which were most significantly impacted were the Central, South and Southeast regions. More than half of the Southeast region experienced extremes in cold maximum temperatures, excessive wet conditions and large 1-day precipitation events. Approximately one-third of both the Central and South regions experienced extremes in cold maximum temperatures, excessive wetness and a large number of days with precipitation. Other regions which had prolonged periods of wetness were the West North Central, East North Central and the Northeast regions.



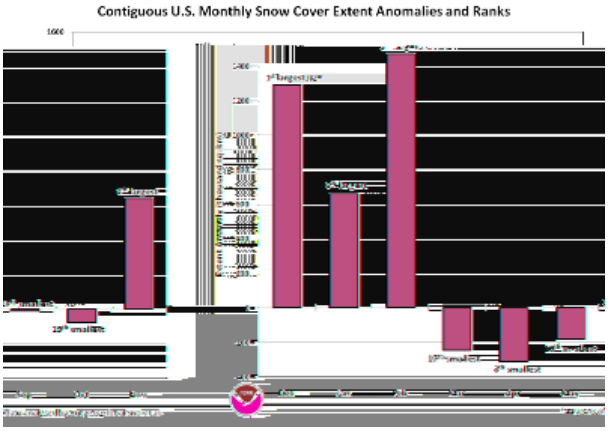
Regional CEI Values for Summer 2010

For as cold as the winter was in the Central, South and Southeastern regions, the summer months were filled with record warmth, primarily seen in the warm minimum temperatures. Approximately

30% of the CONUS was impacted by extremes during the summer (June August), which is 10% above the average spatial extent for extremes. Much of the credit for this above average value can be attributed to warmth in both maximum and minimum temperatures as well as excessive wetness across parts of the contiguous U.S. More than half of the East North Central region experienced extremes in warm minimum temperatures, excessive wetness, large 1-day precipitation values and a large number of days with precipitation. The Southeast region sweltered under large-scale heat in both maximum and minimum temperatures, which covered nearly the entire region during the summer months. Nearly all of the Northeast, Central, Southeast, South and East North Central regions experienced extreme warm minimum temperatures during this period. The Southwest and West North Central regions had large, yet less-extensive areas which experienced warm minimum temperatures during this period. Additional areas of extreme wetness were also seen in the West North Central, Northwest and Central regions.

In 2011, the regional CEI data and graphics will be updated on a monthly basis and accessible through the CEI webpage. Please visit our main CEI webpage for national CEI data as well as updates on the timing of the release of the regional CEI products.

National Snow & Ice



U.S. Monthly Snow Cover Extent Anomalies
Data Source: Rutgers Global Snow Lab

Much of the United States experienced a record breaking 2009–2010 winter. Long–standing monthly and seasonal snowfall records were shattered and record cold temperatures were set over the eastern two-thirds of the nation. According to 44 years of satellite data analyzed by the NOAA supported, Rutgers Global Snow Lab, a new monthly snow cover extent record was set during December 2009. This was partially due to snow falling across the Southern Plains, Gulf Coast, and the Southeast — regions which do not typically receive much December snowfall. Persistent cold and snow across much of the country during January and February was associated with those months ranking in their top ten largest snow cover extents for the U.S. — January was 6th largest and February 3rd largest. A far–reaching storm the second week of February brought snow to the Deep South, and every state in the U.S. had snow on the ground, including Florida and Hawaii. More information on the 2009–2010 winter can be found in the 2009–2010 Cold Season Special Report. As the season transitioned into spring, conditions were almost the complete opposite of the winter, with low snow cover extents reported across the United States during April (8th smallest) and May (10th smallest). The low spring snow cover extent was driven by anomalously warm

conditions over the regions which had experienced the heavy snow during the December–February period.

Winter and spring mountain snowpack provide a crucial water source across much of the western United States. The total annual water budget for agriculture and human use in the mountainous West is based upon the amount of snow melt that will occur in spring and is proportional to the amount of snow on the ground. The annual snowpack typically reaches its maximum values at the end of March. During the 2009–2010 Cold Season, the West generally experienced much–below average snow packs. Mountain snowpack in the Pacific Northwest was less than 25 percent of normal in several locations. The pattern was evident in the high-elevation station (SNOTEL) network, especially in maps of the end-of-March snowpack and snow water content. Some individual SNOTEL stations in the northern Rockies had early April snow water equivalent in the driest fifth percentile of the historical record (95 percent of the years for this date were wetter). Conversely, the snowpack was much above average in Arizona, New Mexico, and southern Utah.

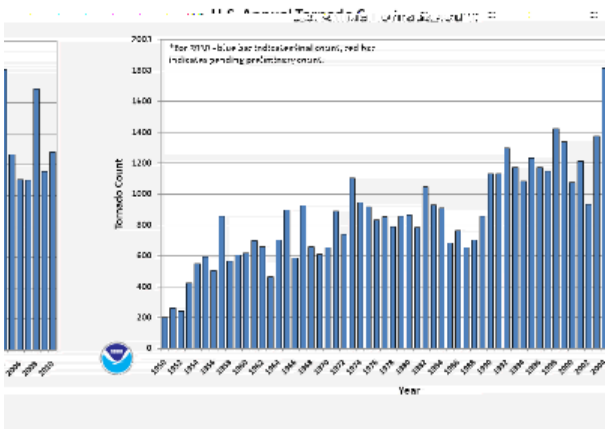
In October, the cold season returned as well as snowy conditions across the United States. During October, the U.S. experienced near average snow cover extent, while strong storms across the northern tier of the U.S. during November led to widespread snowfall. The U.S. experienced its fourth largest November snow cover extent on record.

Select 2009–2010 Cold Season Snowfall Records

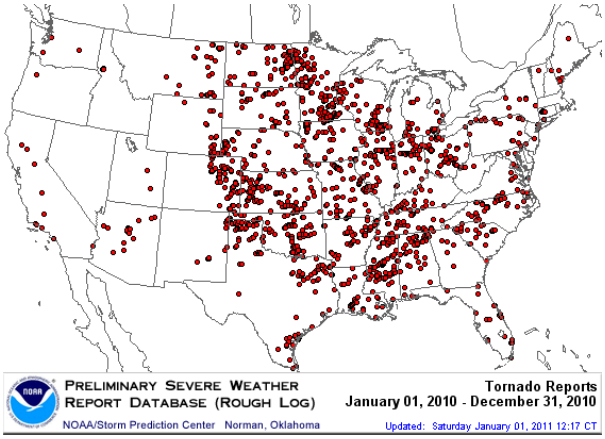
The numerous snow storms affecting the country during the late 2009 and early 2010 led to hundreds of record snowfall accumulations. Many of the records broken were along the densely-populated Northeast corridor. Provided is a table of select seasonal snowfall records. Please visit NCDC U.S. Records for additional information.

City, State	Amount	Previous Record, Date
Washington, District of Columbia–Dulles	73.2 inches (185.9 cm)	61.9 inches (157.2 cm), 1995–1996
Washington, District of Columbia–Reagan	56.0 inches (142.2 cm)	54.4 inches (138.2 cm), 1898–1899
Baltimore, Maryland	80.4 inches (204.2 cm)	62.5 inches (158.8 cm), 1995–1996
Philadelphia, Pennsylvania	78.7 inches (199.9 cm)	65.5 inches (166.4 cm), 1995–1996
Wilmington, Delaware	72.7 inches (184.7 cm)	55.9 inches (142.0 cm), 1995–1996
Atlantic City, New Jersey	58.1 inches (147.6 cm)	46.9 inches (119.1 cm), 1966–1967
Beckley, West Virginia	132.9 inches (337.6 cm)	100.1 inches (254.6 cm), 1995–1996
Wichita Falls, Texas	16.6 inches (42.2 cm)	14.3 inches (36.3 cm), 1957–1958

Tornadoes



Annual Tornado Counts
1950-2010



2010 Tornado Occurrences
Source: SPC

According to the Storm Prediction Center (SPC), the final tornado count for the U.S. during 2010 was 1,282. The final 2010 count ranks as the seventh most active year since records began in 1950. During 2010, seven months experienced above to much–above normal tornado counts — January, April, May, June, July, October, and November.

During 2010, tornadoes were reported in all but four states in the Lower 48 — Delaware, Massachusetts, Rhode Island, and Nevada. Tornadic activity during the year tended to occur in clusters, with the most active regions including the Front Range of the Rockies, the Southeast, the Central and Northern Plains, and the Great Lakes.

Two states in particular had very active tornado years. Arizona had 17 preliminary tornado reports during 2010, tying the state's annual record, which was set in 1972. The second most tornadoes occurred in 1992 with 13 reports. Eight of the tornadoes occurred on October 6th, marking the most tornadoes to strike in Arizona during a calendar day since records began in 1950. Arizona on average receives four tornadoes annually. The other state with above–normal tornado activity was Minnesota. The state experienced 113 tornadoes during 2010, the most of any state in the country this year, and the most the state has experienced on record. The 2010 tornado count surpassed the previous record which was 74 set in 2001. The annual tornado average for the state is 25. The most active day for the state was June 17th, when 48 tornadoes were confirmed. This bested Minnesota's previous one day tornado count set on June 16, 1992 when 27 tornadoes were confirmed. Minnesota was also the national tornado leader, for the first time on record.

Drought and Wildfires

The drought epicenters during 2010 were the western Great Lakes, much of the Southeast, the Ohio Valley, the Mid-Atlantic States, Hawaii, and parts of the West. The year started out with drought in the West, small parts of the Southern Plains, and the Great Lakes. During the spring, drought developed in parts of the South and intensified in the western Great Lakes. Drought conditions

contracted in the West and western Great Lakes, but intensified in the Southeast and Mid-Atlantic States during the summer. By October, moderate to extreme drought had developed in the South and spread into the Ohio Valley. Drought relief occurred in the Ohio Valley with heavy rains at the end of November. About 75% of Hawaii suffered through a prolonged dry spell for most of the year, but heavy rains brought limited relief in December. In spite of the rains, this year's drought ranked as the worst drought episode of the decade for Hawaii. In the contiguous U.S., low stream, reservoir, and stock pond levels, and depleted soil moisture combined with hot temperatures and high evaporation to ravage agricultural lands as the growing season progressed: in the Mid-Atlantic states by mid-summer, and the South and Ohio Valley by early to mid-fall. Dryness was especially severe in the Lower Mississippi Valley, with parts of Arkansas, Louisiana, and Mississippi having the driest year on record.

The United States had a below-average wildfire season for 2010. Wet conditions across the western regions of the country helped to limit the number of large fires and total acreage burned. During 2010, 71 839 fires burned nearly 1.4 million hectares. This marked the least acreage burned annually nationwide since 1998. Despite the below-average season, the Long Butte Fire in Idaho burned approximately 133 000 hectares during August, about nine percent of all acres burned in the United States during the year. The Fourmile Canyon fire near Boulder, Colorado in September only burned 2500 hectares, but containment costs and damages totaled more than $225 million (U.S. dollars)—the costliest fire in Colorado's history.

Natural Resources Conservation Service
National Water and Climate Center
1201 NE Lloyd Blvd, Suite 802
Portland, OR 97232
http://www.wcc.nrcs.usda.gov

National Water and Climate Center Overview

The National Water and Climate Center (NWCC) is part of the Natural Resources Conservation Service within the United States Department of Agriculture. The Center's mission (http://www.wcc.nrcs.usda.gov/about/nwcc-function.html) is to "*lead the development and transfer of water and climate information and technology that support natural resource conservation*." The primary goal of the NWCC is to be "*a globally recognized source for quality snow, water, and climate information and technology*."

Additionally, The Center's Snow Surveys and Water Supply Forecasting (SSWSF) is to provide water and climate information, and technology support for natural resource management in the 12 Western States (Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming).

Staffing

The NWCC consists of three branches under the Center's Director, Mike Strobel; Tom Perkins, Water and Climate Services (WCS), Garry Schaefer, Water and Climate Monitoring (WCM) and Laurel Grimsted, Information Systems (IS). Water and Climate Services has two main functions: produce water supply forecasts for the western U.S. and provide climate services for the NRCS and other cooperating USDA agencies nationwide. The key climate staff members of this Center are:

- Jan Curtis, Applied Climatologist, jan.curtis@por.usda.gov, 503-414-3017
- Jim Marron, Resource Conservationist, jim.marron@por.usda.gov, 503-414-3047

Data Interpretation

With the close of 2010, the NWCC commenced calculation of the 1981–2010 Normals. Climate Normals typically refer to the latest three-decade averages of climatological variables, such as temperature and precipitation. This new product will be replacing the current 1971–2000 Normals product. We expect the final input data will be ingested and processed by 1 October 2011. The adjusted stream flow data will be available after 31 December 2011.

Spatial Climate Services

NWCC coordinates and manages datasets produced in cooperation with Oregon State University and the PRISM Group, also located at the university. This cooperative effort produces and makes available the spatially distributed precipitation and temperature data at an 800 meter resolution for the entire United States and its possessions. These data are used directly in the Conservation Tool

Kit, in CEAP evaluations and programs, animal waste analysis programs, wetlands evaluations and mitigation, as well as direct input to conservation planning and evaluations. These data are also primary input to the Basin Analysis GIS (BAGIS) application that is used to evaluate monitoring station distribution and evaluation for new climate stations. The BAGIS application was designed by the NWCC and developed by Portland State University. PRISM data is directly used for erosion estimation in the Revised Universal Soil Loss equation, RUSLE, and its updated version RUSLE II.

PRISM information is being incorporated into the Risk Management Agencies operations for Crop Insurance and compliance. A new agreement between the Risk Management Agency, Oregon State University and NRCS, being developed through efforts by the NWCC, will provide crop production information directly to the NRCS for conservation planning purposes along with new PRISM products, including daily PRISM precipitation and temperature layers, spatial evapotranspiration, plant hardiness impacts and much more.

PRISM information on a daily and month time interval will be basic input to the tools under the Conservation Division Streamlining Initiative.

Climate Data Services

NWCC coordinates and manages the Agriculture Applied Climate Information System (AgACIS) in cooperation with the Regional Climate Center program under NOAA and the National Climate Data Center. This system provides basic input data sets to most of the current hydrologic and ecological sciences evaluation programs. AgACIS is a main component of the online version of the Field Office Technical Guide and is the only official source of the Wetlands Climate tables which are in use by all federal agencies that provide wetlands evaluations and determinations. The use of the Wetlands Climate tables is mandated by law in the Wetlands Legislation (http://www.wcc.nrcs.usda.gov/climate/wets_doc.html#Section1). The federal agencies required to use these tables include the three agencies responsible for wetlands determinations: Natural Resources Conservation Service, Corp of Engineers and the Environmental Protection Agency.

NWCC provides the basic input data and evaluations for Soil Climate Narratives. These narratives and climate evaluations are required for each and every soil survey completed in the United States and its possessions.

Data Retrieval Tool

The Snow Survey and Water Supply Forecasting Program is in the process of developing tools to prepare products that integrate data and interpret them dynamically, eventually replacing and upgrading current products and access to those products. The first step in that process is the release of a beta version data retrieval tool. This release is meant to provide users the opportunity to give feedback, identify any difficulties in operation of the tool, and suggest improvements in its process. Data provided through the tool is from the NRCS Air and Water Database.

http://www.wcc.nrcs.usda.gov/reportGenerator/

Recent Publications

Leavesley, G., O. David, D. Garen, A. Goodbody, J. Lea, J. Marron, T. Perkins, M. Strobel, and R. Tama (2010). A modeling framework for improved agricultural water supply forecasting. Proceedings, Joint Federal Interagency Conference on Sedimentation and Hydrologic Modeling, Las Vegas, Nevada. http://www.wcc.nrcs.usda.gov/ftpref/downloads/factpub/wsf/Leavesley_et_al_JFIC_2010.pdf.

Perkins, T. (2010). ArcGIS technique to evaluate the SNOTEL data network. . Proceedings, Joint Federal Interagency Conference on Sedimentation and Hydrologic Modeling, Las Vegas, Nevada.

Announcing the release of "A Measure of Snow"

NRCS has released the report "A Measure of Snow: Case Studies of the SSWSF Program," available for download (see link below). The report, authored by Dr. Julie Suhr Pierce, Agricultural Economist, NRCS Utah State Office, is an overview that uses a case study approach to highlight some of the various applications of data and forecasts produced by this program. In addition, it estimates the market and non-market values of the information provided by the program and evaluates the merits of keeping it publicly funded program as opposed to privatizing the program.

We are very pleased to share this report and hope it serves to inform those not familiar with the program. It illustrates the value of the program, and addresses some of the frequently asked questions we receive on a regular basis. Download from: http://www.wcc.nrcs.usda.gov/.

Midwestern Regional Climate Center

Illinois State Water Survey
2204 Griffith Drive
Champaign, IL 61820
mrcc@sws.uiuc.edu
http://mrcc.sws.uiuc.edu

Steve Hilberg, Director

Administration

Tom Workoff joined the MRCC staff in September 2010 as Service Climatologist. Tom received his B.S. in Meteorology from SUNY College at Brockport, and his M.S. in Atmospheric Science at the University of Illinois.

The home institute for the Illinois State Water Survey officially changed its name in May. The former Institute for Natural Resources Sustainability at the University of Illinois is now the Prairie Research Institute.

Climate Services and Collaborations

A number of additional products were completed and operational on the MRCC online data system, MACS.

In response to State Climatologists requests, we are working to add ThreadEx stations to MACS. Often there are media/public requests that want rankings of events beyond the top-3 listings available from the ThreadEx website. Because these stations are available in ACIS, we are working to develop some ThreadEx data products that meet this need. At this time, we have created a metadata database for the ThreadEx stations that will allow us to continue MACS development of ThreadEx products.

An enhanced version First Fall Freeze map, which is produced for the Midwest and High Plains, was made active on the Midwest Climate Watch page on August 1, 2010. Additions to this product include dot maps and contours maps of the median freeze dates for 32°F and 28°F, and the ability to view state maps separately. We will soon begin working on the development for a suite of maps for the last spring freeze, as well as further enhancements to the fall freeze maps.

As a complement to the Fall Freeze Map, the MRCC has created a new map product that tracks freezing temperatures in the spring combined with baseline growing degree day (GDD) information. The map is available on the Midwest Climate Watch page (http://mrcc.isws.illinois.edu/cliwatch/watch.htm), and is updated daily. The map includes shading to indicate those areas that have accumulated 150 GDD. The implication is that plant development may have occurred in these areas to the extent that another freeze could cause damage to vegetation.

A meeting of MRCC staff, the nine Midwest State climatologists, and NOAA staff was held in Champaign November 9-10, 2010. In addition to MRCC staff and the SCs, also attending were Doug Kluck, NOAA Regional Climate Services Director; John Eise, NWS Central Region Climate Services Program Manager; Heather Stirratt, NOAA NOS/NMFS and Great Lakes Regional Collaboration Team Climate Working Group Lead; and Brian Miller, Director of Illinois-Indiana Sea Grant. The meeting provided an overview of the progress toward a National Climate Service, updates on NWS central Region activities, and updates from each of the State Climatologists. Nancy Westcott presented an update on the CDMP Forts project.

John Haase, a forecaster from the NWS Quad Cities WFO visited the MRCC on March 24-25 as part of the NWS Climate Services Division Partners Exchange Program. John met with staff about the projects they were working on. He also spent some time in the Service Office learning what they do and how they respond to requests, and also spent a considerable amount of time learning more about our data ingest and processing.

New county-level soil moisture maps of the Midwest region were placed on the MRCC web site this spring. The maps are produced using a multi-level soil model responding to daily temperature and precipitation. The maps are generated for the 0-4 inch, 0-20 inch, and 0-72 inch levels.

Southeast Regional Climate Center

University of North Carolina at Chapel Hill
Department of Geography
Saunders Hall
Campus Box 3220
Chapel Hill, NC 27599-3220
Tel: 919-843-9721
http://www.sercc.com/

Charles E. Konrad II, Interim Director

As one of six federally funded Regional Climate Centers, the Southeast Regional Climate Center (SERCC) provides a wide range of climate services for public and private interests across the region. SERCC offers a rich website with weekly updated links to relevant climate information and reports on recent climate patterns and weather events.

Several personnel changes have occurred at SERCC over the last year. Peter Robinson retired as the Director in early 2010, and Chip Konrad formally took over his duties in July of that year. Chris Fuhrmann was hired as the Regional Climatologist that same month. William Schmitz continues to serve as the Service Climatologist for the Center.

The SERCC continues to maintain a close relationship with the State Climatologists of the region and leads a conference call with them on the first Wednesday of each month. The State Climatologists serve on the Technical Advisory Committee for the SERCC. They met with SERCC personnel in La Parguera, PR in February 2010 to discuss various challenges and opportunities in climate research and service climatology.

The Center is engaged in a broad and ambitious research program that is currently focused in four general areas

1. Assessments of climate service needs by economic sector across the region. The SERCC has partnered with the Carolinas RISA and the State Climatologists in this endeavor, which is funded as a part of the National Climate Assessment. The Center's effort is largely focused towards the identification of public health vulnerabilities associated weather and climate extremes. The SERCC has developed a network of connections with epidemiologists in the School of Public Health at UNC-Chapel Hill and the NC Department of Public Health in Raleigh. The SERCC's ultimate objective is to build web-based tools that provide public health officials with tailored weather and climate-driven information that point to the potential emergence of a public health threat (e.g. heat wave that may lead to morbidity/mortality for a particular demographic in a given locale).

2. The identification of the regional scale character of heat waves and their effects on morbidity across North Carolina, with particular emphasis on the vulnerability of laborers in rural regions. So far, this research has yielded one refereed publication on the meteorological factors associated with a major recent heat wave in the region. In addition, two manuscripts are being prepared that address

the impacts of heat waves on emergency department visits in NC as well as the community-level determinants of vulnerability to heat stress.

3. The analysis of public health impacts from inland tropical systems in the southeastern U.S. Maggie Kovach, a 2nd year Masters Student, is focusing her Master's Thesis on this research.

4. The assessment of links between climate and tourism. D. J. Perkins, a 2nd year graduate student, is developing working relationships with several tourist businesses, including the NC Zoological Park and the Atlanta Zoo, with the goal of developing models for explaining the influence of weather on zoo attendance.

The overarching goal of the SERCC research program is to facilitate deeper collaborations between research groups and service organizations, while it gains a deeper understanding of climate sensitivities and needs across the different economic sectors of the region. SERCC continues to increase its expertise in the realm of climate – public health. Over the past year, the Center has partnered with researchers in the School of Public Health and the Department of Emergency Medicine at UNC-Chapel Hill to investigate various public health threats, including heat waves and harmful algal blooms (HABs). The SERCC has also partnered with the NC Department of Public Health to hold a climate-health workshop on the UNC-Chapel Hill campus on August 19th. This workshop will focus on the sensitivities of public health to climate extremes across NC.

The SERCC's biggest accomplishment is the completion of the Climate Perspectives web tool (http://www.sercc.com/perspectives/), which has been developed in close collaboration with the NC State Climate Office (SCO). This tool provides the user with a daily-updated, near real time perspective on how recent weather and climate patterns compare with periods in the past. Its use has increased exponentially, and a rapidly expanding number of weather media outlets (e.g. The Weather Channel and local television stations) are using it to identify what is most unusual in the weather and climate of their viewing area. The tool allows the user to compare the recent weather and climate at most weather stations across the region. Plans are to expand the coverage to the entire country. The Center and the NC SCO are also developing an add-on called "Forecast Perspectives," which allows the user to identify the extremeness of an ongoing or emerging extreme event through a combined analysis of National Weather Service gridded forecasts for the next five days and the historical climate record.

Alabama Office of the State Climatologist (AOSC)

University of Alabama in Huntsville
Cramer Hall, Room 4040
320 Sparkman Drive
Huntsville, AL 35805
Tel: 256-961-7763
http://vortex.nsstc.uah.edu/aosc

John Christy, Alabama State Climatologist
Bob Clymer, Assistant State Climatologist

It is the role of the Alabama Office of the State Climatologist to provide weather and climate information to public and private interests to improve decision-making activities that affect environmental quality and the economic efficiency of the State. Activities include providing specific weather data for the state and for the world, developing plans to mitigate the economic impacts of weather and climate variability and providing consultation on the use, interpretation and availability of weather and climate information. The Alabama Office of the State Climatologist also directly engages in important societal debates, such as global warming, through workshops, congressional testimony, and educational activities.

2010 Conditions

Starting in October 2010, the AOSC began posting a monthly summary of climate information which includes information from many sources such as NCDC, CoCoRAHS, and AOSC and news reports (see http://nsstc.uah.edu/alclimatereport/). Responses from stakeholders have been universally positive. Of key interest are the stories that are included about specific events or features from the past. Also popular is the listing of all record events (though this is a little misleading as we note because some of the NOAA period-of-records are shorter than is actually the case, so "records" tend to occur more frequently than in reality.) Moisture indices are important as we experienced drought, especially in the southern portion of the state for much of the year.

The most unusual feature of the climate of 2010 was the average summer nighttime temperatures. These easily exceeded record values for most of the state, while daytime temperatures, though above normal, were not at record-breaking levels. These exceedingly warm nighttime minima were, as expected, extremely humid. This is in contrast to 2009 in which several legitimate cool fronts penetrated Alabama, bringing unusual periods of low temperatures and low humidity.

These warm temperatures prompted the NWS/BHM to check daily high TMin records and were surprised to find periods in the mid 1890's with even warmer temperatures. An investigation by the SC, NCDC and NWS/BHM concluded that the temperatures from the 1890's were spuriously warm (there were notes in some records of the slippage of the thermometer index or separated mercury), thus the records of 2010 were then established as actual records.

Drought Monitor

While there had been an informal collaboration-of-opportunity when preparing the Alabama drought level lines of the Drought Monitor each week, in 2010 we began a formalized, state-wide process. Every Monday a.m., the SC emails all entities involved in drought monitoring and impacts at the four NWS offices, the State Office of Water Resources, other state agencies, industry and municipal users with a preliminary assessment. Through the day on Mondays and mornings of Tuesday, information is passed among the players and by Tuesday afternoons the SC sends to the DM our consensus recommendations. This centrally-planned process has helped greatly in expressing the best recommendations we can generate.

Historical Climate Network upgrades

The AOSC continued to work with the NWS and NCDC to establish a robust climate monitoring network in Alabama. All but one of the 15 HCN stations is now HCNM, being modernized to the CRN-lite status.

CoCoRaHS

On 1 November 2007, Alabama became an official member of the CoCoRaHS network. As of 12 Mar 2009 there were 670 stations registered, as of 21 Apr 2010 there were 742 and as of 17 Mar 2011 there were 779. The AOSC is the state coordinator with each NWS WFO serving as Regional Coordinators for their appropriate counties. Again, the cooperation with the NWS WFO's and Southern Region HQ has been superb in promoting this very public service activity. A few media stories still appear in which we ask for volunteers. During the year, five CoCoRaHS members reported a 24-hour total exceeding 7.00" which is more those from COOP and NWS stations. One other report of 6.60" in Scottsboro (17 Aug 2010) was significant as the official (and expensive) HCN-M Geonor rain gage had not been emptied and overflowed after recording 4.5", so the CoCoRaHS observer provided critical information needed for an understanding of the flooding that followed. Of great interest too are the snow reports which are much denser than the NWS network and we nearly always are able to find stations with reports greater than the sparse NWS network. In the winter of 2010-11, there were more than the usual heavy snow events (2nd snowiest season ever for Huntsville), including a white Christmas across northern Alabama.

NIDIS

The AOSC is participating in the early-drought warning pilot program established by NIDIS for the Apalachicola, Chattahoochee, and Flint River basins. We had several conference calls in 2010 and are participating in a pilot program to provide drought briefings for stakeholders potentially on a weekly basis. The thrust of this effort is to bring all stakeholders together and provide a system by which early warnings for droughts can be developed.

AWEP Program

With efforts from the AOSC and the Alabama Universities Irrigation Initiative, the USDA budgeted over $60M for farmers to develop better water resources. In Alabama, over 20 projects were funded, mostly to build irrigation ponds. The AOSC was involved in pond sizing based on

climatological rainfall estimates. In 2010, the project began and there are now some completed projects as a result of this effort.

Economic Development

The AOSC was again contacted by several industries wanting climate information necessary to make decisions about locating in Alabama and what their facilities might expect from various weather events. The AOSC continues heavily involved in the agricultural community by assessing water resources and the potential for irrigation expansion. The AOSC is involved at the state and federal level on water policy formulation.

Various economic interests contacted the AOSC in 2010 for information and speaking engagements related to climate change legislation. The SC appeared before state legal hearings (in and out of Alabama) on various climate issues as states struggle with legislation on carbon emissions. Because Alabama is a manufacturing and industrial state, the prospect of paying higher prices for energy (fuel, electricity, etc.) has caused considerable concern among those who have established our economic base. Alabama is one of the few states which produces more electricity than it consumes, exporting over 45 million MWt-hrs (30%) out of state. This "product" is in jeopardy if rates are forced to rise. As a result of research on climate-change issues and impacts of legislation, the AOSC was able to provide hard metrics for business and congressional leaders, including congressional testimony, for the development of policy.

Alaska Climate Research Center

Geophysical Institute
University of Alaska Fairbanks
903 Koyukuk Drive
Fairbanks, AK 99775
Tel: 907-474-7378
http://akclimate.org

Gerd Wendler, Ph.D. Director and Professor Emeritus
Martin Stuefer, Ph.D., Research Assistant Professor
Heather Angeloff, Webmaster
Blake Moore, Programmer
Reddy Narravula, Student Assistant
Konakanchi Srikanth, Student Assistant

PURPOSE

The purpose of the center is threefold:

- Dissemination of climatological data (free of charge)
- Research on climate variability and climate change in Alaska and Polar Regions, and
- Education

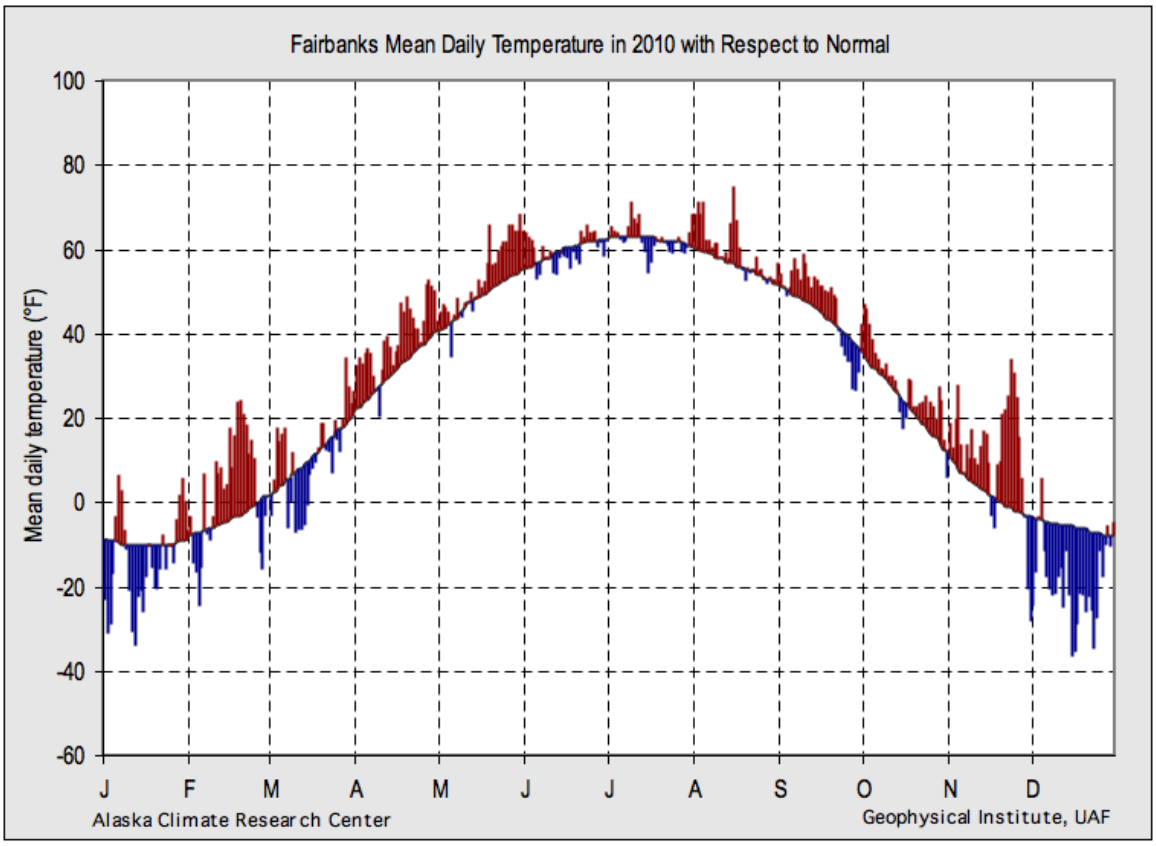
Dissemination

For nearly three decades we have made climatological data available to the public, research organizations, and interested industries. Today, this is mostly accomplished via our website (http://akclimate.org/) which received on average 29,000 hits a day in 2010. Assuming that the average stake-holder opens 7 pages, this represents some 4000 stakeholders daily. Analyzing by domain, .net is the most frequent source of visitors, followed by .edu. From the international realm not surprisingly Canadians visit our site the most often, followed by the English. Over the course of a year, December is the busiest month, probably due to the fact that frequently very cold temperatures (down to -40° and colder) occur paired with ice fog, which makes driving difficult, if not dangerous.

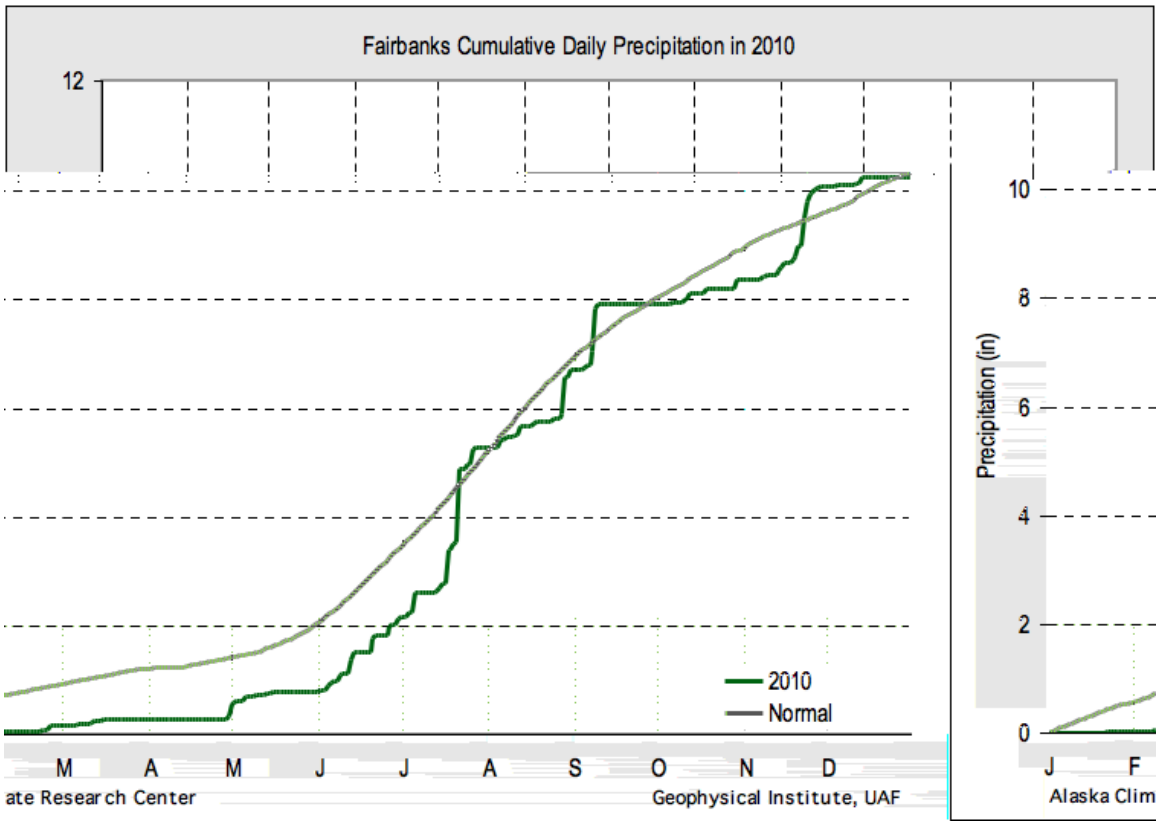
The ACRC website contains many summaries, products, and meteorological and climatological information. Furthermore, from our home page, users can select any number of links: Fairbanks weather and climate, our popular webcam and on-campus weather station, climatological data, up-to-date summaries, Alaska weather, information for tourists, seasonal and other weather and climate links, and a 'spotlight on climate' section giving a list of the latest features posted.

Specific request of data, normally received online, by telephone, and sometimes by walk-ins are filled free of charge. It should be noted that we neither make predictions on future climate change nor assess the socio-economic and biophysical impacts of such predicted climate projections. The focus is research on observations.

As an example, visitors to the website can find a summary of the weather of 2010; more details can be seen from our website, but here is a shorted version. The average annual temperature in 2010 for Fairbanks was 28.9°F, a positive departure of 2.0°F from normal. The beginning of the year (January), as well as the end of the year (December) was colder than normal (see Figure). Temperatures substantially above normal were observed in February and November and, to a lesser extent, in late spring.



The mean annual precipitation (see Figure below) was 10.31", very close to normal of 10.34". Snowfall, however, was far below normal, recording only 28.8" in the calendar year. This is 39.2" below average for Fairbanks. The year started out very dry for the first 5 months of the year, with less than half of the expected values. June and especially July reported above normal values, which brought the accumulated value of 2010 close to normal, where it stayed for the rest of the year.



RESEARCH

A substantial number of publications on the climate of Alaska and Polar Regions have been produced over the years. In 2010 we published (besides conference proceedings) two journal articles, namely:

- Wendler, G., M. Shulski and B. Moore 2010*:* Changes in the climate of the Alaskan North Slope and the ice concentration in the adjacent Beaufort Sea. ***Theor. Appl. Clim*** 99: 67-74.
- Wendler, G., J. Conner, B. Moore, M. Shulski and M. Stuefer 2010*:* Climatology of Alaskan wildfires with special emphasis on the extreme year of 2004. ***Theor. Appl. Clim*.** October 2010, DOI 10-107.

Following are some of the major results from the second paper: Wildfires are a common experience in Alaska where, on average, 3,775 km^2 burn annually. More than 90% of the area consumed occurs in Interior Alaska, where the summers are relatively warm and dry, and the vegetation consists predominantly of spruce, birch, and cottonwood. Summers with above normal temperatures generate an increased amount of convection, resulting in more thunderstorm development and amplify number of lightning strikes. The resulting dry conditions facilitate the spread of wildfires started by the lightning. Working with a 55-year dataset of wildfires for Alaska, an increase in the annual area burned was observed. Due to climate change, the last three decades have shown to be warmer than the previous decades. Hence, in the first 28 years, only two years were observed with a total area burned greater than 10,000 km^2, while there were four in the last 27 years. Correlations between the Palmer Drought Severity Index and the Canadian Drought Code,

against both the number of wildfires and the area burned, gave relatively low but in some cases significant correlation values. Special emphasis is given to the fire season of 2004, in which a record of 27,200 km^2 burned, a larger area than each of the 7 smallest states of the union. These widespread fires were due in large part to the unusual weather situation. Owing to the persistent anticyclonic conditions of the summer of 2004, the composite anomaly of the 500 hPa geopotential heights showed above normal values. The dominance of a ridge pattern during summer resulted in generally clear skies, high temperatures, and below normal precipitation. Surface observations confirmed this; the summer of 2004 was the warmest and third driest for Interior Alaska in a century of climate observations. The fires lasted throughout the summer and only the snowfalls in September terminated them (at least one regenerated in spring 2005). Smoke from the forest fires affected the air quality. This could be demonstrated by measurements of visibility, fine particle matter, transmissivity of the atmosphere, and CO concentration.

EDUCATION

In 2010, we employed two student assistants who worked on climate change in the Bering Sea. In contrast to the Beaufort Sea, the Bering Sea has not seen a substantial ice retreat over the last 30 years. Further, we looked at the decadal trend of the temperatures in Alaska. The first decade of the new century showed for all first order climatological stations (19) in Alaska a cooling trend instead of the expected warming. The only exception was Barrow (Arctic Alaska), where a strong warming continued. It is believed that the cooling is related to the PDO (Pacific Decadal Oscillation), which has changed from dominantly positive to dominantly negative values during this time frame.

Office of the Arizona State Climatologist (ASCO)

Office of Climatology
School of Geographical Sciences & Urban Planning
Arizona State University
Tempe, AZ 85287-1508
Tel: 480-965-6265
Fax: 480-965-1473
selover@asu.edu
http://azclimate.asu.edu/

Nancy J. Selover, Ph.D. State Climatologist

The Arizona State Climate Office (ASCO) is located within the Office of Climatology of the School of Geographical Sciences & Urban Planning (SGSUP) at Arizona State University (ASU) in Tempe, AZ. Currently, the office includes the State Climatologist, Dr. Nancy J. Selover, one part-time student worker, and three affiliated faculty in SGSUP (Brazel, Cerveny, Ellis). The mission is to: (1) manage and disseminate climatological information about the State of Arizona, (2) monitor the climate of Arizona and the region, (3) collaborate with state agencies in need of climate data and advisement, and (4) conduct research aimed at an improved understanding of the spatial and temporal variability of the climate of Arizona.

The Arizona State Climate Office is a designated ARSCO, committed to supporting the objectives of the AASC. Below is a brief description of the activities of the Office over the past year that addresses each of the ARSCO qualifications:

Communication Capabilities

- We maintain an ASCO web page (http://azclimate.asu.edu/) to provide real-time weather data with a climate context, and provide climate products online. The website includes general climate and real-time weather information, statewide monthly temperature and precipitation maps used in the drought status report, the monthly Arizona Climate Summary, daily rainfall and evaporation tables for the Phoenix area, daily North American Monsoon updates (in summer), and links to climate education information and other climate data resources. We also have contact links on the website for data, presentation, or interview requests, or questions.
- Maintain a voicemail system to take data and information requests when the office is not physically staffed. All calls are answered or returned within 24 hours. Most data requests come through the phone or e-mail, generated by the forms available on the website. The data are served back through the phone, fax, e-mail, postal service, or the Internet. This year we will establish a Facebook presence.

Information Services

- In 2010 (relative to 2009), we filled 199 (-21%) e-mail requests for data or information, and 94 (-46%) voicemail requests for data. We also had 1,793

(+191%) downloads on our website in 2011. The most popular product downloads were the Arizona Climate Extremes, Phoenix rain day table, Tempe daily evaporation table, Monthly Climate Summaries, and the monthly climate calendars for six Arizona cities. Four percent of our users make their request by voice mail, 10% by e-mail and 86% (downloads) by Internet. Users, other than the web hits, include university researchers 43%, government agencies 8%, the public 14%, commercial 16%, and legal 5% communities. We did 12 media interviews, including 2 researchers, and 10 newspapers, and were involved in 6 legal cases as consultants or expert witnesses. The trend this year is a decrease in e-mail and phone data requests and a large increase in web downloads of data or products.

Research

Looking at landscaping effects on the urban heat island

- Gober, P., A. J. Brazel, S. Myint, R. Quay, A. Miller, S. Rossi, and S. Grossman-Clarke. 2010. Using watered landscapes to manipulate urban heat island effects: how much water will it take to cool Phoenix? **Journal of the American Planning Association.** 76: 109-121**.**
- Svoma, B. M. and A. Brazel, 2010. Urban effects on the diurnal temperature cycle in Phoenix, Arizona, **Climate Research**. Vol 41, No 1, 21-29.
- Heisler, G. M. and A. J. Brazel, 2010. The urban physical environment: temperature and urban heat islands, book chapter **Urban Ecosystem Ecology** (editor J. Aitkenhead-Peterson and A. Volder), Pub. Agronomy Society of America. 29-56.
- Soe W. Myint, Anthony Brazel, Gregory Okin, Alexander Buyantuyev. 2010 Combined Effects of Impervious Surface and Vegetation Cover on Air Temperature Variations in a Rapidly Expanding Desert City, **GIScience & Remote Sensing**, 47, 301-320.
- Winston T. L. Chow & Ronald L. Pope & Chris A. Martin & Anthony J. Brazel. Observing and modeling the nocturnal park cool island of an arid city: horizontal and vertical impacts, **Theoretical and Applied Climatology,** DOI 10.1007/s00704-0.

Looking at NWS Phoenix UV index compared to local measurements

- Bohumil M. Svoma, Kimberly DeBiasse, Jessica Nolte, Bradley Busby, Carolyn Beeson and Randall Cerveny, 2010**.** .Evaluation of the Environmental Protection Agency / National Weather Service Ultraviolet Index Forecast against independent UV measurements: Phoenix Arizona (2000-2006), International **Journal of Climatology.**
- Using isentropic analysis to detect various weather/climate events:
    - Randall S. Cerveny Kimberly DeBiasse Matthew B. Pace, Andrew W. Ellis, Robert C. Balling, Jr. 2010. Re-Analysis and Extension of Namias's Climatological Isentropic Analysis in Detection and Evaluation of Monsoonal, Severe Storm, Drought, and Flood Events. **Annals of the Association of American Geographers**.

- Investigating the effect of the moon on river stream flow:
    - The lunar tidal influence on inland river stream flow across the conterminous United States, Randall S. Cerveny, Bohumil M. Svoma, and Russell S. Vose. **Geophysical Research Letters**, 37, L22406, doi:10.1029/2010GL045564.
    - Verifying extreme wind speed record:
      Joe Courtney, Steve Buchan, Randall S. Cerveny, Pierre Bessemoulin, Thomas C. Peterson, Jose M. Rubiera Torres, John Beven, John King, Blair Trewin, and Kenneth Rancourt. 2010. Documentation and Verification of the World Extreme Wind Gust Record: 113.3 m s^{-1} on Barrow Island Australia during passage of Tropical Cyclone *Olivia.* **Australian Meteorological and Oceanographic Journal**.

The Moisture Balance Drought Index is now available on our website, based on:

Ellis, A.W., Goodrich, G.B., and G. M. Garfin. 2010. "A hydroclimate index for examining patterns of drought in the Colorado River Basin", *International Journal of Climatology*, **30(2):**236-255.

Outreach & Service

- Presentations included "Local Scale Climate Services" at the Atlanta AMS meeting; the drought monitoring panel at the AASC Lake Tahoe meeting; "Tempe Town Lake and the Salt River" keynote speaker at the October AZ Geographic Alliance GeoFest in Mesa, AZ; precipitation measurement talks to potential CoCoRaHS observers in Flagstaff, Peoria, Mesa, Glendale and Tucson; Arizona weather and climate talks to K, 1st, 2nd, 5th grades at Mitchell Elementary School Phoenix, Guerrero Elementary School in Gilbert the ASU Ecosystem engineering seminar, the Southern Arizona chapter of the AMS, and the Arizona Science center; urban heat island presentation to the northern Arizona chapter of the AMS, guest lecturer on solar radiation and measurement at ASU.
- Field and instrumentation advisement for Engineers Without Borders at ASU on wind power energy project in several locations within Arizona; mentor in the AMS Datastreme Climate program.
- Presented the Navajo Nation climate data to the CDMP and secured a third year of funding for digitizing the Navajo data. So far five stations have been digitized.
- Interviews for feature stories in local newspaper, radio, and television on El Niño and the current drought, the North American monsoon, heat stress, record snow events, climate change, urban heat island, and the seasonal and annual outlooks for temperature and precipitation.
- Service on the Arizona Flood Warning System, Drought (co-chair), and Hazard Mitigation Plan Task Forces.

Monitoring and Impact Assessments

- Reviewer for Probable Maximum Precipitation Study (2009-11) funded by Arizona Department of Water Resources.
- Prepare monthly statewide temperature and precipitation updates and calculation of watershed SPI for drought monitoring for the Governor's Drought Task Force.
- Web-publish monthly newsletter summary of Arizona climate, and contribute monthly temperature and precipitation summaries to the Arizona-New Mexico – CLIMAS publication "Southwest Climate Outlook".
- Archive data from the PRISMS network for Phoenix, Flood Control District of Maricopa County, and the Phoenix first-order weather station, and the AZMet network for Arizona.
- Statewide coordinator for CoCoRaHS precipitation monitoring in Arizona (678 observers).

Office of the California State Climatologist (OSC) and CalClim (California Climate Data Archive)

Office of the State Climatologist
California Department of Water Resources
Division of Flood Management
3310 El Camino Ave Rm 200
Sacramento, CA 95821
Tel: 916-574-2830
http://www.climate.water.ca.gov

California Climate Data Archive
Western Region Climate Center
Desert Research Institute
University of Nevada, Reno
Reno, NV 89512
Tel: 775-674-7016
http://www.calclim.dri.edu

Michael Anderson, State Climatologist

The California Office of the State Climatologist (OSC) is housed in the California Department of Water Resources (DWR) Division of Flood Management. Interacting with other divisions within DWR which makes up the state climate office (SCO) and the California Climate Data Archive (CalClim) at the Western Regional Climate Center (WRCC), the OSC provides a growing range of climate services for California.

Work continued on many fronts over the past year. NOAA is working to produce an update to its rainfall frequency product for California which should be released sometime in spring 2011. California's Bulletin 195, a compilation of depth duration frequency curves, continues to be updated with the help of retired State Climatologist, Jim Goodridge. Efforts are underway to bring Jim's computational methods into an automated structure within DWR and examine ways to address climate change in the Bulletin 195. Both of these products will be used in an effort to produce hydrologic information for floodplain mapping and other hydrologic and hydraulic studies associated with California's FloodSAFE program (http://www.water.ca.gov/floodsafe/).

Collaboration with NOAA and Scripps Institute of Oceanography continues on the development of an extreme precipitation monitoring network that will include GPS-Met stations to monitor atmospheric water vapor, soil moisture sensors, and vertically pointing radar to detect freezing level in the atmosphere. The project, born out of NOAA's Hydrometeorological Testbed work in the American River watershed, is a five-year effort to lay out the initial components to a statewide monitoring network to improve precipitation forecasts and increase lead time for flood mitigation actions. Four snow-level-radar installations have been completed and are reporting data to the California-Nevada River Forecast Center. On the soil moisture monitoring front, a soil moisture workshop was held in May 2010 Several agencies and researchers showed up to share their work in soil moisture monitoring and discussions were held on how to patch together a potential statewide network. Since the workshop interest has grown in soil moisture monitoring and more sites are likely to be installed. A follow up to the workshop will be held later in 2011. Another development this past year for this collaboration is the expansion of the effort to include four partial atmospheric river observatories along the coast of California. This effort will expand the investment in the network from $7.5 million to $10.5 million. The final configuration of the initial investment of the network is shown in Figure 1.

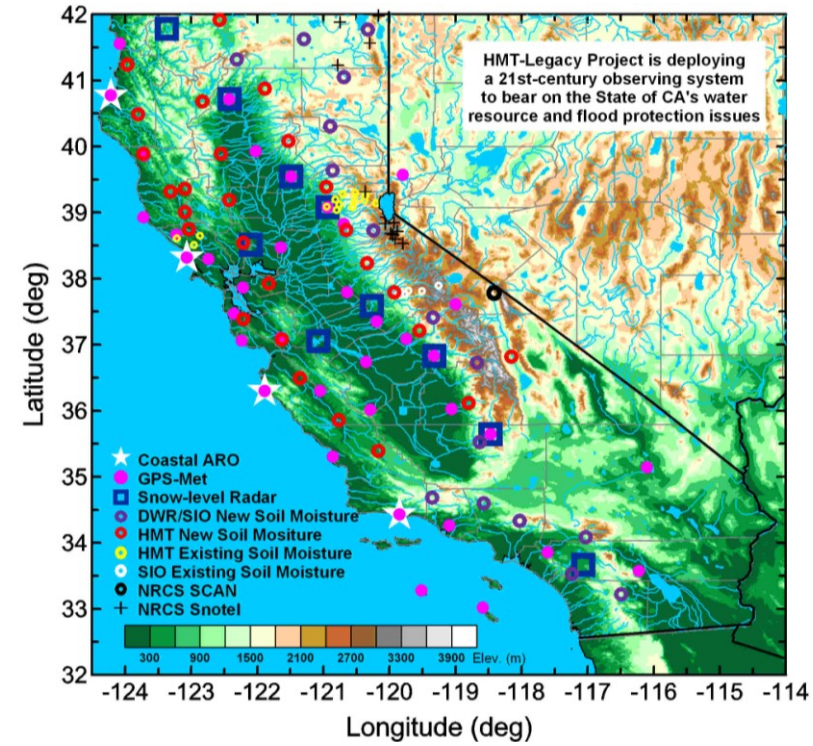


Figure 1. Final build out plan for 21st Century Observing Network project with NOAA ESRL and Scripps.

The California State Climatologist is also partnering with NOAA for a National Interagency Drought Information System (NIDIS) pilot project in California. This effort will include participation from several federal agencies, DWR, the California-Nevada Applications RISA and Western Region Climate Center. Two organizational meetings have been held so far. A strategy for carrying out the pilot effort is expected by summer of 2011.

California is now in year 3 of CoCoRaHS. Over 780 volunteers have signed up with NWS Weather Forecast Offices taking the lead as regional coordinators with help from some DWR personnel. Observers are located in 52 of California's 58 counties. Approximately 9000 reports are submitted per month from California's CoCoRaHS volunteers. A summary of activity is provided in the State Climatologist monthly summaries.

Data serving for California climate data improved this past year with the help of a collaborative project between DWR and Western Region Climate Center. The effort looks to identify quality control routines to run through data coming in from the California Data Exchange Center and develop tools to help analyze the data. Histogram and wind rose graphics are some examples of these new tools. The tools are housed in the California Climate Data Archive. A final report for the project was submitted in March of 2011. Further collaborations are being explored. Data serving continues via the web, phone and email. A new interface for spatial depictions of data in the California Data Exchange Center is expected to be released in summer of 2011.

Travel and presentations were prominent again this past year. Presentations and/or session moderating duties included meetings for the California Water and Environment Modeling Forum,

California Cooperative Snow Surveys Annual Meeting, invited talks at different locations within California including the Long Beach Aquarium. Out-of-state travel was limited this past year due to budget problems and will continue to be a challenge in the coming year.

California, with help from the Nevada State Climate Office, hosted the 2010 annual meeting of the American Association of State Climatologists. The meeting was held in South Lake Tahoe from July 12-15. The meeting was a large success with over 30 SC's in attendance. At the meeting the California State Climatologist was presented a meritorious service award from DWR leadership and was also voted to become the AASC treasurer from 2011 to 2013.

The annual WERA-102 Committee meeting, a meeting of western State Climatologists, the Western Region Climate Center, and federal resource agency partners was hosted by the OSC and the Monterey Weather Forecast Office for the second year. Three new members attended and good discussions were held on data collection, state of the National Climate Service, and climate change work being carried out in different states.

The State Climatologist has also been involved in the Department's climate change matrix team and FloodSafe's Central Valley Hydrology Study and Central Valley Flood Protection Plan. The matrix team meets quarterly to discuss all things climate change related to the Department. The Central Valley Hydrology Study is developing new design hydrology data to help the Department's floodplain mapping and flood project studies activities. This effort will include a climate change component in which the State Climatologist will be taking a lead role. The Central Valley Flood Protection Plan (CVFPP) is a 5-year plan that lays out the flood protection project activities that need to be carried out for the State. The climate change working group developed a threshold method to account for climate change in flood management planning. The document is available on the CVFPP website.

Nine task orders have been approved for the climate services contract with the University of California system. Activity ranges from water year outlook workshops to modeling studies for flood management to field monitoring installation programs. The contract greatly expands the capabilities of project execution for the State Climate Office.

Looking ahead to the coming year, the California OSC plans to continue coordination of activities with the CalClim Group and the WRCC, and continue development of the website and its capabilities to improve data serving. The State Climatologist will also continue efforts to engage climate researchers active in the State and continue collaborative efforts with NOAA personnel and others.

Colorado Climate Center (CCC)

Atmospheric Science Department
Colorado State University
Fort Collins, CO 80523-1371
Tel: 970-491-8545
Fax: 970-491-3314
nolan@atmos.colostate.edu
wendy@atmos.colostate.edu
nnewman@atmos.colostate.edu
http://ccc.colostate.edu

Nolan J. Doesken, State Climatologist
Wendy Ryan, Staff
Noah Newman, Staff
Julian Turner, Staff
Henry Reges, Staff
Zach Schwalbe, Staff
Rebecca Smith, Graduate Student
Morgan Phillips, Graduate Student

Introduction and background

The Colorado Climate Center (CCC) was established by the State in 1973 through the Colorado State University Agricultural Experiment Station. The initial purpose was to provide information and expertise on Colorado's complex climate. After 37 years, the Colorado Climate Center continues to support the climate information needs of Colorado through a threefold program of ***climate monitoring*** (data acquisition, analysis, and archiving), ***climate services*** (outreach), and ***climate research***. The Center monitors climatic conditions on both broad, regional scales and very local scales. By documenting climate variations in time and space, the relationships between climate, water supplies, other natural resources, agriculture and societal responses are better understood and applied to support appropriate planning and decision making.

Priorities of the Colorado Climate Center in 2010

1) Conduct and coordinate climate monitoring and research specific to practical needs and applications. The CCC continues its commitment to long-term climate monitoring – completing the 122nd year of uninterrupted climate monitoring at the historic Fort Collins weather station. Climate data are assembled each month from all NWS Cooperative stations. Precipitation and temperature patterns and anomalies are mapped monthly. Colorado has a long history of active involvement in drought monitoring and the development of tools and indices for communicating properties of drought. As a part of the National Integrated Drought Information System's (NIDIS) Upper Colorado River Basin Pilot Project, CCC began holding weekly drought status report webinars during critical times of the year and coordinated input to the U. S. Drought Monitor weekly update cycle. A study assessing best practices in the generation and use of drought indexes was completed to support the 2010 update of the Colorado Drought Response and Mitigation Plan.

2) Assess and communicate the observed trends and variations in key climatic elements such as temperature, precipitation, snow and evapotranspiration. A collaborative project began in 2010 to produce timely monthly updates geared for public audiences featuring climate rankings, time series and regional impact assessments. The Cooperative Institute for Research in the Atmosphere (CIRA) will be launching this new product in summer 2011. We continued to support and refine the Colorado Climate Trends website: http://climatetrends.colostate.edu.

In various ways, the CCC strives to present credible objective depictions of climate variability and trends for public audiences. Dozens of talks were given in 2010 to diverse audiences.

3) Support and coordinate the Colorado Agricultural Meteorological Network (CoAgMet), expand the network where appropriate, and promote the use of these data in decision making (http://climate.colostate.edu/~coagmet/). 2010 was a landmark year for CCC and CoAgMet as we fully took over the support, operations and maintenance of the network. Long-term support is still in question, but in the short term, the network of over 60 automated weather stations is operating well and providing excellent data and derived climate information.

4) Engage the citizens of Colorado in backyard climate monitoring through the Community Collaborative Rain, Hail and Snow network (CoCoRaHS) and related activities. http://www.cocorahs.org. 2010 was a very good year for CoCoRaHS as we were funded by both the National Science Foundation and NOAA's Office of Education to expand, improve and assess citizen engagement in climate observations and exploration.

5) Broadly disseminate climatic information, expertise and applications, and assist others in applied climate research.

Recent publications are available from the CCC's web site at (http://ccc.atmos.colostate.edu).

Publications

Schlatter, T.W., and Nolan Doesken, 2010: Deep Hail: Tracking an Elusive Phenomenon. Weatherwise, Vol. 63, No. 5, September-October, 2010.

Doesken, N. and H. Reges, 2010: The Value of the Citizen Weather Observer.

ARSCO Qualifications

The Colorado Climate Center is designated by the AASC as the official state climate office for Colorado. The following sections describe ways in which CCC addressed each of the ARSCO qualifications in 2010:

Communication Capabilities

Communication and outreach remain the highest of priorities for the Colorado Climate Center. The CCC website is central to our communications strategy. Through partnership with the Colorado State University Public Relations Department, CCC has direct access to print, broadcast, and e-media in Colorado. Many interviews are conducted and some press releases are issued. Webinars became a standard way of providing climate updates in the spring and summer of 2010, and this approach to communication will be expanded in 2011. The CCC benefits from close ties with NOAA's National Weather Service, National Climatic Data Center, and other state and federal agencies that are providers and/or users of climate information. The Colorado Climate Center

works closely with the Colorado Water Institute (CWI) and publishes climate updates through the CWI newsletter throughout the year. A semiformal association with the Western Water Assessment at the University of Colorado (one of several NOAA Regional Integrated Science Assessments – RISAs – across the country) leverages additional communications capabilities. CCC participates in the Colorado Water Availability Task Force, Colorado Water Congress and Colorado's State Flood Review Task Force providing year-round updates on water supplies and flood/drought status and potential.

The Colorado Climate Center has been working with the Poudre School District educational TV studio since 2008 utilizing the talent of local high school students to produce "The Water Report" -- a monthly cable TV show to help students and others in the community help track climatic conditions in northern Colorado and the impact on water supplies (http://www.psdschools.org/services/channel10/wtwy.aspx). Funding for this program ended in 2010 but some aspects of the work will be continued.

Information Services

The Colorado Climate Center staff routinely responds to requests for climatic data and expertise. The number of individualized phone and e-mail requests is significant, but continues to dwindle as most users go directly to the web for nearly all climate information requests and services. The CCC website http://ccc.atmos.colostate.edu serves tens of thousands of users and provides access to real time and archived data, climate information products, narrative climate descriptions and publications. Examples of tailored climate information for Colorado include our weekly water supply summaries, water year precipitation compilations and drought index information. We post many of our slide presentations so that others can utilize the graphics generated for public talks and classroom instruction. CCC features access to the CoAgMet (Colorado Agricultural Meteorological Network) automated weather station network for near real time and historic data gathered specifically for agricultural applications. CoAgMet provides computed estimates of reference, crop and turf evapotranspiration using classic Kimberly Penman ET computation methodologies and the Standardized ASCE Penman-Monteith method.

The Community Collaborative Rain, Hail and Snow network (CoCoRaHS) has become the most utilized information service we provide. Daily precipitation data from CoCoRaHS – rain, hail and snow information – is publically available and used daily by many individuals and organizations for both operational and research applications. Special data export features are heavily used by organizations such as the National Weather Service. CoCoRaHS is now ingested in NCDC's Global Historical Climate Network. Drought impact reporting is now encouraged through CoCoRaHS, and this information feeds the National Drought Mitigation Center's drought impact reporting system.

Research

Current and ongoing research at the Colorado Climate Center is focused in these areas.

1) Detection, interpretation, and communication of observed climate trends in the Rocky Mountain region.

2) Drought monitoring and drought early warning for state drought response and mitigation efforts and in support of the National Integrated Drought Information System. Three

specific research areas initiated in 2010 that will be continuing include climate and seasonal precipitation predictability (Becky Smith, PhD student), regional snow sublimation and its impact on surface water supplies (Morgan Phillips, MS student) and the perceived needs and uses of climate information for drought planning and response by water managers.

3) Precipitation characteristics and statistical properties. The ever-growing precipitation data resources from CoCoRaHS and the data analysis tools provided by the system lend themselves to studies of various statistical properties and physical characteristics of precipitation events. We continue to investigate frequency distributions of daily precipitation amounts. In-depth hail climatologies for Colorado are being developed and extended. Extreme precipitation frequencies and magnitudes are also being explored.

4) High elevation evapotranspiration research began in 2009 and will continue for several years. A small number of CoAgMet weather stations were installed in mountain meadows of the North Platte River in conjunction with the Division Engineer's efforts to maintain a seasonal lysimeter. In 2011, we will be adding a station collocated with another hay meadow lysimeter near Hayden, Colorado.

Outreach

The Colorado Climate Center maintains an outreach focus with nearly all of our activities. We participate in as many outreach efforts as we can; ranging from children's water festivals, school programs, hosting field trips to the CSU Weather Station and giving guest lectures at several Colorado universities. We are currently on the planning committee for Water 2012 – a year-long celebration of water in Colorado. The Colorado Climate Center has an aggressive goal of engaging all schools in Colorado in precipitation measurement for 2012 so that teachers, students, schools and communities all across Colorado can actively participate in the Water 2012 Colorado water education extravaganza.

The single largest outreach effort continues to be the Community Collaborative Rain, Hail and Snow network (CoCoRaHS) http://www.cocorahs.org. With the help of renewed multi-year funding, CoCoRaHS will be improving cyberinfrastructure, incorporating social networking, enhancing education and training opportunities, conducting webinars, adding the measurement of evapotranspiration and adding thousands of new volunteers in the years ahead. This effort is only possible with the help of state climate offices and National Weather Service forecast offices all across the U.S. that locally lead this outreach effort.

Nolan Doesken served as President of the American Association of State Climatologists until his term ended in July 2010. He continues to serve as "Past President" on the AASC Executive Council until July 2011.

Connecticut State Climate Center (CSCC)

Natural Resources Management and Engineering
University of Connecticut
1376 Storrs Road
Storrs, CT 06269-4087
Tel: 860-486-0135
http://www.canr.uconn.edu/nrme/cscc/

Xiusheng (Harrison) Yang, Professor and State Climatologist

The Advisory Board

Due to the increasing demand for climatic data from scientists, government agencies, and the general public, an advisory board has been established since 2011 to initiate discussions for CSCC to improve its service and broaden its mission. The board consists of the following faculty members from various academic units:

Dr. Michael Willig, Center for Environmental Sciences and Engineering,
Dr. John Volins, Department of Natural Resources and the Environment,
Dr. Glenn Warner, Department of Natural Resources and the Environment,
Dr. Richard Anyah, Department of Natural Resources and the Environment,
Dr. Anji Seth, Department of Geography, and
Dr. Guiling Wang, Department of Civil and Environmental Engineering (starting 2012)

Support

The CSCC has been running with support to satisfy the minimum NCDC requirement for the program. The Department of Natural Resources and the Environment has provided secretarial support to the Center for day-to-day needs. A graduate student has been working on website maintenance, data transmission, processing, and dissemination. The graduate support has been provided by the University of Connecticut Graduate School/Research Foundation and the College of Agriculture and Natural Resources. Due to budget issues, CSCC was unable to obtain any travel funds for the annual AASC meeting.

Past and current CSCC activities

During the past year, CSCC has committed a substantial amount of time and effort in making the Center a valuable asset to the research, education and outreach communities at University of Connecticut, state and local government agencies, and the general public in the State of Connecticut.

Research

- CSCC has supported UConn researchers by providing NCDC quality-insured data, mainly in the fields of climate change, air pollution, environmental engineering, and agriculture for several projects.

- CSCC has actively participated in the establishment of the University of Connecticut Atmospheric Science Group, which has brought in the recognition of UConn as a UCAR (University Corporation for Atmospheric Research) university.
- CSCC has been actively participating in the application for the DOI Climate Science Center. The effort is coordinated by the University of Connecticut Center for Environmental Science and Engineering (CESE).

Education

- CSCC has provided up-to-date climatic data and live images for several courses taught at the University of Connecticut, including NRE 3145 Meteorology and NRE 3146 Climatology. The latter is a newly developed course focusing on the current issues of global climate change.
- CSCC is working with other faculty members to develop more structured educational and training programs at the University of Connecticut. In the past year, we have submitted two large collaborative proposals (such as IGERT or NASA global climate change programs) for establishing integrated training programs related to climate change.

Outreach

- CSCC has updated its website data pages for public to access climatic data for the State of Connecticut. The web site now provides processed climatic data for more stations across the State. The climatic data have been updated to 2010, with normal computed for the most recent past 30 years (1981-2010). For the majority stations, data includes statistics for the past 100 years, 30 years, and 10 years for various purposes.
- In addition to the website, CSCC also delivers climate information via the joint web page with Connecticut IWR http://www.ctiwr.uconn.edu, feature articles in various local media, traditional ways through our cooperative extension system, posters and demonstrations at university and college organized events (such as Cornucopia), and peer-reviewed publications.
- CSCC has delivered over a hundred of services per semester to university research community, governmental agencies and general public by providing processed and certified climatic data sets in various formats through email, telephone, fax, and mail.
- As the Director of CSCC, I have provided many impact analyses to various media (newspapers, magazines, and radio talks), local governments and schools, and state government agencies on climate change, El Niño, drought, and abnormal wintry weather. Recommended by the Dean of CANR and the NRE Department Head, I also have served on the Governor's working group on climate change. Our services have been widely accepted and appraised. Recently, a group of UConn students has sent Yang a letter of appreciation with many signatures (See the attachment).

Future planning

CSCC is currently under major updating and expansion. A graduate student has been working on a project to organize process, analyze, and report the spatial variation and temporal change of the climate data for the State of Connecticut and neighboring states. With that, CSCC plans to:

- Re-construct the CSCC website to include the most comprehensive data and graphs from the results of the study. The new database will include statistics and derived climatic variables for more than 100 stations with a period longer than 100 years. To our knowledge, this will make CSCC the most authentic source of climatic data in the state.
- Finish and publish a new edition of the source book "The Climate of Connecticut," which was originally published in 1965.
- Apply for NCDC fellowship and send a graduate student to the national climatic data center for training. Such training is anticipated to greatly improve the effectiveness of services provided by CSCC.
- Develop teaching modules of climate analysis for classroom and online instruction. Such modules will enable students to study the fundamental theories of meteorology and climatology using information from the very current weather and climate events.
- Actively participate in the AASC organized activities of research, education, and outreach, and take full advantages of the climate initiatives at the federal, state, and local governments.
- Recruit one or more Associate State Climatologist(s).

Office of the Delaware State Climatologist

111A Robinson Hall
University of Delaware
Newark, DE 19716-2541
Tel: (302)-831-8255
http://www.deos.udel.edu/osc

Daniel J. Leathers, *State Climatologist*
David R. Legates, DEOS Director & Assoc. State Climatologist
Kevin R. Brinson, Assistant State Climatologist

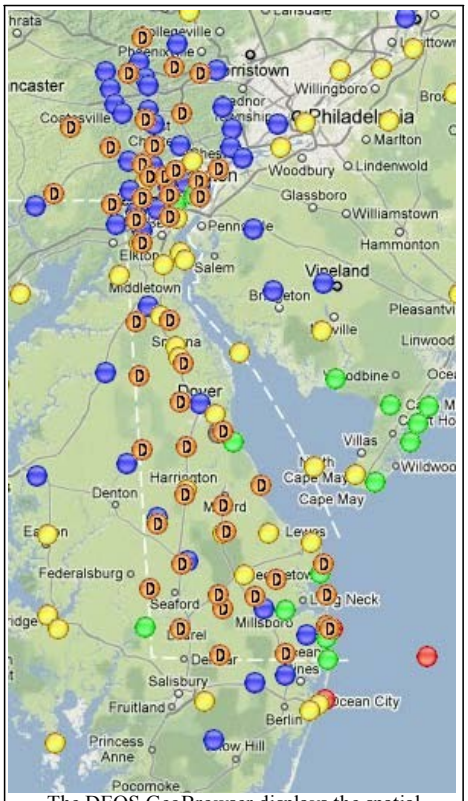
The Office of the Delaware State Climatologist is located in Newark, Delaware at the University of Delaware and is co-located with the Delaware Environmental Observing System (DEOS). The Office of the State Climatologist continues to provide climate support services to the State of Delaware, albeit without state or federal funding.

The Office of the Delaware State Climatologist is an AASC Recognized State Climate Office (ARSCO) and partners with the National Climatic Data Center, the Northeast Regional Climate Center, and the National Weather Service in Mt. Holly, NJ to provide data and climate services to the citizens of the State of Delaware. As with most State Climate Offices, we provide climate data and expertise to the public and private sector as well as conduct newspaper, radio, and television interviews, give public lectures, and provide legal expertise and court testimony. The Delaware State Climatologist's Office also serves in the Technical Assistance Center of the Delaware Emergency Management Agency during critical weather events. The State Climatologist is also a statutory member of the Water Supply Coordinating Council (WSCC), and presents water related climate information at quarterly meetings. The Office currently has two main projects:

The Delaware Environmental Observing System (DEOS)

Our main funding effort has been the maintenance of a real-time system dedicated to monitoring environmental conditions across the Delmarva Peninsula. The Delaware Environmental Observing System (DEOS) is designed as a tool for decision makers involved with emergency management, natural resource monitoring, transportation, and other activities throughout the State of Delaware. DEOS also provides both State agencies and the citizens of Delaware with immediate information as to environmental conditions in and around the State. Being that it is supported by the Office of the Delaware State Climatologist, DEOS also provides a climate archive of the five-minute data to support the developing needs of high-resolution requests for environmental data (http://www.deos.udel.edu).

Our network has now grown to a total of forty-five stations located in the three counties of Delaware, Chester County in Pennsylvania (in cooperation with Chester County Emergency Management), and Cecil County in Maryland. Data is collected and disseminated from our website from approximately 200 additional observing platforms. With new projects focusing on coastal flood monitoring and enhancing agricultural weather information, we expect that several more stations – including the development of a portable DEOS system – will be available in the coming years.



The DEOS GeoBrowser displays the spatial distribution of stations (by type) on the Delmarva Peninsula. The orange symbols with a 'D' in the center are stations maintained by DEOS. http://www.deos.udel.edu/geobrowser.html.

DEOS consists of three main components: (1) the DEOS Environmental Monitoring and Observing Network (DEMON), a network of thirty-one new meteorological observation sites coupled with existing weather and other environmental observation sites in and around Delmarva, (2) the DEOS Integrated Visualization and Analysis System (DIVAS), a GIS-based integration of surface weather observations with National Weather Service WSR-88D radar estimates of precipitation, thereby providing estimates of meteorological and environmental variables over a high spatial resolution grid, and (3) a number of DEOS Analysis Systems (DAS), designed to provide decision support in a variety of environmentally-sensitive areas. One such system will provide transportation and emergency management officials with real-time assessments of coastal and stream flood risk potentials.

To make appropriate decisions that depend upon the environmental conditions, decision makers must have environmental data with the highest spatial and temporal resolution possible. Data needs include weather information, observations of stream flow, bay and ocean conditions, and water and air quality. DEOS integrates existing observations from federal, state, and local sources and augments these existing observation with approximately twenty additional observing sites (primarily weather stations, but installed sensors also have included water temperature, wave period, and water quality for the Delaware Bay) around Delaware, Maryland, and Pennsylvania. These observations are connected to a central data collection facility through existing telecommunications capabilities. DEOS currently provides timely data dissemination to State agencies, the National Weather Service, and the public and also is in the process of developing reliable data quality control and quality assurance procedures.

The Delaware Green Energy Spatial Calculator

DEOS has developed the Delaware Green Energy Spatial Calculator. It allows the user to determine the frequency and intensity of wind speed and/or solar radiation from the nearest DEOS station to their proposed location (interpolation is unnecessary owing to the relatively

www.deos.udel.edu

DEOS

Delaware Environmental Observing System

Specified location: 39.538°N Latitude, 75.730°W Longitude
DEOS Station Selected: Glasgow-SPB, Delaware
Distance from Address to Station: 4.7 miles
Based on Data From 2006/10/13 to 2009/05/15.

Solar Radiation	Estimated Wind Speed at Turbine Height								All Wind Speeds
	Calm	1 - 4 MPH	4 - 7 MPH	7 - 11 MPH	11 - 14 MPH	14 - 18 MPH	18 - 26 MPH	>26 MPH	
> 800 W.m^{-2}	0.02%	1.26%	2.06%	0.34%	0.03%	0.00%	0.00%	0.00%	3.71%
601-800 W.m^{-2}	0.06%	2.29%	2.86%	0.71%	0.11%	0.00%	0.00%	0.00%	6.04%
401-600 W.m^{-2}	0.20%	2.97%	3.69%	1.22%	0.21%	0.02%	0.00%	0.00%	8.32%
201-400 W.m^{-2}	0.85%	4.01%	3.69%	1.24%	0.19%	0.02%	0.00%	0.00%	10.00%
1-200 W.m^{-2}	6.85%	9.91%	5.27%	1.29%	0.21%	0.04%	0.00%	0.00%	23.58%
Night (0 W.m^{-2})	25.38%	14.31%	6.65%	1.70%	0.28%	0.03%	0.00%	0.00%	48.35%
Total	33.37%	34.75%	24.23%	6.51%	1.03%	0.11%	0.00%	0.00%	100.00%

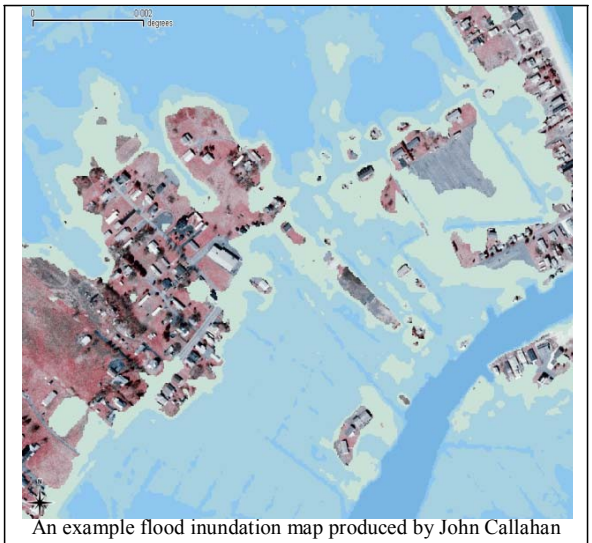
Data may not sum to exactly 100% due to rounding.

An example of a tabular output for solar radiation and wind speed produced by the Delaware Green Energy Spatial Calculator for Glasgow, Delaware.

dense DEOS network). For users who specify both wind speed and solar radiation, a contingency table is displayed to show what percentage of the time they can expect to receive significant effects from solar power, wind power, both, and neither. Row and column sums provide the marginal probabilities. Data are updated monthly and stored on the computer so each table is not regenerated each time a request is made (see http://www.deos.udel.edu/dgep).

The Delaware Coastal Flood Monitoring Project

Being a peninsula, isolated by the Delaware Bay, the Delaware River, and the Chesapeake Bay, the Delmarva Peninsula is very much affected by coastal storms and processes. Much of the damage during tropical and extra-tropical weather systems is associated with severe coastal flooding. The Delaware coastline is extremely vulnerable to such events, examples being the great March 1962 storm and the recent coastal flooding incident of May 12, 2008. A GAP Analysis of pertinent coastal data needs and a comprehensive survey of inland inundation levels during previous coastal flooding events have been completed as part of a cooperative effort between the University of Delaware and several Delaware State Agencies. The goal is to better monitor conditions along the Delaware coastline and to provide advance warning of impending coastal flooding events.



An example flood inundation map produced by John Callahan (Delaware Geological Survey) for Bowers Beach at 6 feet above Mean High Higher Water.

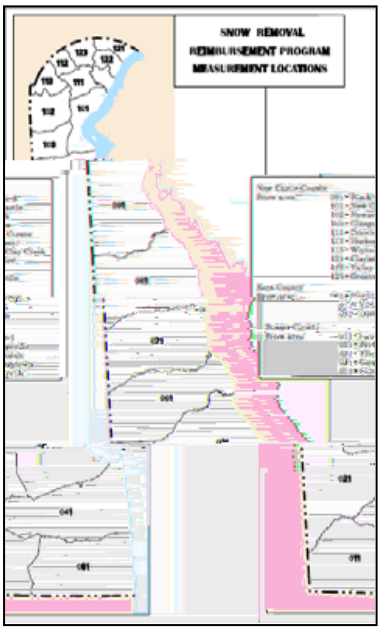
This project included an exhaustive inventory of real-time and archived data suitable for coastal flood monitoring and research. The inventory includes meteorological, tidal, stream flow and buoy data sources, along with ancillary sources of coastal information (i.e. research publications, non-digital records, modeling, etc.). The inventory has led to a series of recommendations as to the data needed to reach an "optimum" coastal monitoring network, and the spatial placement and temporal resolution of additional sensors that may need to be deployed to reach the optimum configuration.

Work has begun siting sensors to better interpret model output for the Delaware Bay as a part of the Coastal Flood Monitoring System Expansion project. In addition, we will be extending the warning area north to New Castle, DE and south to Lewes, DE. Following this expansion we anticipate extending our coverage to the Inland Bays of Sussex County, DE. In order to ensure that first responders statewide utilize the Coastal Flood Monitoring System fully, DEOS will conduct training sessions beginning in the summer of 2011.

The DEOS Snow Monitoring Network

DEOS supports the Delaware Department of Transportation (DelDOT) Snow Removal Reimbursement Program with at least one snow depth measurement in each of the 12 transportation districts statewide. The three northernmost areas each have three snow depths

measurements and all other areas have one measurement for a total of 18 snow monitoring stations. Sonic ranging depth sensors are installed at each location during October through April. The 1-, 6-, and 24-hour totals as well as storm total snow depth are available real-time on the DEOS snow depth monitoring website, http://www.deos.udel.edu/odd-divas/snow_current.php?network=DEOS&units=english. If it is not actively snowing, the snow depth page displays N/A (not applicable) for all columns except storm total; which contains the total from the most recent event.



Locations of the 18 snow districts for which DEOS measures snowfall in conjunction with DelDOT's snow removal reimbursement program.

The measurement technique has two distinct characteristics which separate the DEOS snow depth data from the National Weather Service snowfall totals. The first difference is that the measurements are fully automated and reported real-time in the same manner as other DEOS data. The second difference is that the snow is never cleared from the pad during the snow event, which allows for the natural compaction of snow with time.

The measurement technique has two distinct characteristics which separate the DEOS snow depth data from the National Weather Service snowfall totals. The first difference is that the measurements are fully automated and reported real-time in the same manner as other DEOS data. The second difference is that the snow is never cleared from the pad during the snow event, which allows for the natural compaction of snow with time.

The Delaware Community Collaborative Rain, Hail, and Snow (CoCoRaHS) Network

The State of Delaware transitioned from the DEOS Environmental Monitors Program (DEMs) into CoCoRaHS on September 1, 2009. DEMs was a statewide spotter network DEMs system which the State Climate Office used to identify those people that were truly interested in taking long-term climate measurements and make them official cooperative observers by providing them with more accurate equipment.

In summary, the Office of the Delaware State Climatologist is growing – and changing. In the past several years, we have obtained support for three undergraduate and three graduate students working on specific projects with DEOS and State Climate personnel. We also have obtained permanent support for two technicians and a programmer to continue with the development of DEOS. Moreover, Deputy Dean Daniel J. Leathers will once again resume his duties as the Delaware State Climatologist in 2011 following the request of the Dean's office for the resignation of the previous State Climatologist, Dr. David R. Legates, who had served since 2005

Florida Climate Center

Center for Ocean-Atmospheric Prediction Studies
Florida State University
Tallahassee, FL 32306-2840
Tel: 850-644-3417
http://www.coaps.fsu.edu/climate_center/index.shtml

David Zierden, State Climatologist
James J. O'Brien, Emeritus State Climatologist
Melissa Griffin, Assistant State Climatologist
Preston Leftwich, Climate Research Assistant

About the Florida Climate Center

The Florida Climate Center is housed at the Center for Ocean-Atmospheric Prediction Studies (COAPS) in the Fuqua Research Complex at Tallahassee's Innovation Park. Though physically located off-campus, COAPS and the Florida Climate Center are part of the Department of Earth, Ocean and Atmospheric Science at The Florida State University (FSU). The Florida Climate Center is a public service center sponsored by the FSU's Institute of Science and Public Affairs. The office space, facilities, and equipment are provided by COAPS, but the Climate Center receives ongoing state financial support that covers the salaries of 1.5 full-time employees. The Florida Climate Center staff currently consists of David F. Zierden, State Climatologist; Melissa Griffin, Assistant State Climatologist; and Preston Leftwich, a part-time research associate. Dr. Mort Winsberg, author of *Florida's Weather* and professor emeritus of geography at FSU, collaborates with the Florida Climate Center staff on relevant projects; and Dr. James J. O'Brien, former State Climatologist and Professor Emeritus, remains actively involved and provides welcomed leadership to the Florida Climate Center.

The Florida Climate Center is an American Association of State Climatologists (AASC) Recognized State Climate Office (ARSCO) and works in partnership with the National Climatic Data Center (NCDC), Southeast Regional Climate Center (SERCC), and National Weather Service (NWS) to provide data and climate services to the citizens of the State of Florida. We have a standing memorandum of understanding with NCDC and letters of support from the NWS Forecast Offices.

Florida Climate Center's Approach to Climate Services

One of the primary missions of the office is to provide routine climate data and services. In addition to the inquiries that come straight to the office, we receive referrals from NCDC, the regional climate centers, and the National Weather Service Forecast Offices. The Florida Climate Center receives dozens of phone calls, emails and faxes each week requesting everything from answers to simple climate and weather questions to detailed data requests and analyses. We have developed a unique philosophy on climate services that allows us to best serve the needs of our "customers". The keys to our philosophy are as follows:

- Maintain and provide access to historical data archives
- Listen to and respond to the needs of our customers
- Look beyond traditions weather variables, using derived quantities and other products
- Charge for services, where applicable
- Certify data for legal cases
- Provide education/outreach on weather and climate issues across the state

Research and Involvement with the Southeast Climate Consortium

The Florida Climate Center is a leading authority on climate variability in Florida, particularly as related to El Niño Southern Oscillation (ENSO). The Florida Climate Center has long been an active partner with the Southeast Climate Consortium (SECC), one of the Regional Integrated Science and Assessment (RISA) teams funded by NOAA's Office of Global Programs. Through this involvement, we conduct research into downscaled and localized climate forecasts and their application to the sectors of agriculture, forestry, and water resources. Recent expansion of the consortium now includes the State Climate Offices of Georgia, Alabama and North Carolina, as well as agriculturists, hydrologists, and social scientists from the University of Florida, University of Miami, University of Georgia, University of Alabama Huntsville, Auburn University, North Carolina State University and Clemson University. The SECC now receives additional funding through USDA and USDA Risk Management Agency.

The primary mechanism for disseminating climate forecast information for the SECC is *AgroClimate*, a web-based decision support system for climate and agriculture in the Southeast U.S. The Climate Center has been a key participant in the development of *AgroClimate* (www.agroclimate.org), a web-based decision support system facilitating the effective use of climate forecast information in agriculture and forestry in the Southeast U.S. *AgroClimate* displays information on ENSO climate variability based on historical weather data from over 300 cooperative observer stations in the Southeast. In addition, *AgroClimate* provides probabilistic information on how climate variability affects yields of crops such as peanuts, tomatoes, and potatoes. *ArogClimate* also provides background information on ENSO and climate as well as management options of crops and forests during the various ENSO phases.

Community Outreach and Education

In October 2007 Florida became the 23rd state to join the Community Collaborative Rain Hail and Snow (CoCoRaHS) volunteer observer program and now boasts over 500 active observers across the State of Florida. Melissa Griffin, Florida's Assistant State Climatologist, is the State Coordinator for CoCoRaHS and provided the momentum to initiate the program in this state. As a non-profit organization, CoCoRaHS stresses training and education and welcomes volunteers from all walks of life to take part in monitoring precipitation.

In addition to the CoCoRaHS activities, members of the climate office staff have taken part in numerous outreach events across portions of the state, including weather and climate classrooms at elementary and middle schools, university open houses, and summer camps.

The State Climatologist has also become active in education and community outreach on the subject of climate change in the State of Florida. David Zierden is now an adjunct member of the University of Florida Extension Service's climate variability and change focus group, a grassroots group of extension agents and faculty that are initiating programs on coping with climate change in agriculture, community planning, and sustainable living. Through this focus group, David Zierden has presented material on the science of climate change and its impacts on Florida in the last year at the UF Extension virtual symposium and a climate change in-service training program. We have videotaped the presentation and made it available via webcast. The Florida Climate Center is also collaborating with other scientists at COAPS and educators at the University of South Florida in a NASA project on climate change education for public school teachers.

State and Regional Climate Issues

The Florida Climate Center had teamed up with the University of Florida and plays an important and active role in the formation and development of the Florida Climate Institute (http://www.floridaclimateinstitute.org). Through this partnership, top biological, social and agricultural scientists work with climatologists in order to bring together the best science expertise in the state to address the complex issues associated with climate change and societal response. In addition to providing expert knowledge and understanding of the climate of Florida, the center has been tasked with providing high-quality datasets for a variety of climate scenarios for the institute.

The Florida Climate Center is actively involved in the National Integrated Drought Information System (NIDIS) pilot project in the Southeast U.S. David Zierden has also recently presented information on climate variability and its impacts on natural resources at the Tampa Bay Water Resource Summit and at a meeting of the Tampa Bay Regional Planning Council. The State climatologist routinely provides input to the weekly U.S. Drought Monitor.

Monitoring and Impact Assessment

The Florida Climate Center produces monthly state climate reports with an emphasis on impacts to agriculture and water resources. These climate summaries were started in 2009 under the AASC State Climate Exchange Program, which aims to detail the recent weather and climate in each state and put it into historical context. The state climate summaries are released on the third working day of each month and contain the following information:

- A list of average temperature and precipitation across the state, including departures from normal, historical ranks, and a more local breakdown if necessary. The same breakdown may be given for longer time periods (3 months, 6 months, etc.) if pertinent.
- A summary of extreme weather, severe events, and storm reports over the past month.
- An overview of how recent climatic conditions are affecting ongoing or developing drought, if applicable.
- With input from Extension specialists, a summary of how the past month's weather and climate affected agricultural production and practices for key commodities.

- A review of how the past month's temperature and precipitation patterns followed the seasonal climate forecasts or known ENSO patterns.
- Any appropriate maps, graphs, or tables of climate information needed to support the above elements.
- Supplemental information or observations from non-standard sources such as state mesonets.

These monthly climate reports or summaries are used to supplement the monthly reports from the SERCC and NCDC and in conjunction with periodic climate outlooks produced by the SECC and disseminated through AgroClimate.org.

The State Climatologist has organized a group of NWS personnel, Water Management District, and other interested parties in providing input to the weekly *U.S. Drought Monitor*. Each week there is a free exchange of emails and phone calls assessing the severity and impacts of drought across the state, then providing input to the *U.S. Drought Monitor* in a unified voice.

Georgia State Climatology Office

University of Georgia
Biological and Agricultural Engineering Dept.
Driftmier Engineering Center
Athens, GA 30602
Tel: 706-542-6067
http://climate.engr.uga.edu/

David Stooksbury, Associate Professor and State Climatologist
Pam Knox, Assistant State Climatologist
Ankit Arte, Programmer

The Georgia State Climatology Office is located in Athens, GA, on the campus of The University of Georgia in the Biological and Agricultural Engineering Department. The office houses two full-time climatologists: Dr. David Stooksbury, the State Climatologist and Associate Professor, and Pam Knox, the Assistant State Climatologist. In early 2011 we acquired the half-time services of Ankit Arte, who provides programming help on some of our research projects.

The Georgia State Climatology Office continues to be involved in a variety of research and public outreach activities. We maintain a web site (http://climate.engr.uga.edu) and actively interact with users from around the state. These contacts include university scientists, educators, lawyers, construction and insurance companies, government agencies, reporters, and private citizens. Many of these data requests come by way of email, but we also receive phone calls, walk-ins and the occasional letter.

The State Climatology Office has been heavily involved this year with the Southeast Climate Consortium on a variety of research projects. We are continuing to develop a web site for water managers (to be called sewaterclimate.org). This site will provide assistance in planning for drought and wet conditions using ENSO phase information and Climate Prediction Center projections of current and upcoming precipitation amounts. Interviews with a variety of water managers and stakeholders have helped us continue to hone the content of the site and our understanding of how water managers use climate information. In conjunction with this we are involved in two SARP proposals to survey water managers from a variety of utilities across the Southeast to determine their climate sensitivities. We also contribute to the National Drought Monitor and write a monthly climate summary for use by the Southeast Regional Climate Center and our web visitors as well as in a press release to the media. Pam is also involved in a Department of Energy grant with several professors in the Department of Geography on the UGA campus.

In addition to research activities, we provide guidance to a number of state agencies on weather and climate conditions and severe weather, including the State Drought Monitoring Committee (which Dr. Stooksbury co-chairs with the Director of the Georgia Environmental Protection Division) and the Georgia Emergency Management Agency (GEMA). The State Climatologist regularly monitors water conditions across the state and issues drought statements and other special climate statements when conditions warrant it. He also provides guidance to GEMA in the event of an approaching tropical storm or other dangerous weather situation.

Dr. Stooksbury is on the National Integrated Drought Information System (NIDIS) implementation team. The office is working with NIDIS on a pilot project identifying early warnings for drought on the Appalachicola-Chattahoochee-Flint River basin and has co-hosted several planning meetings. Dr. Stooksbury is the coordinator for the upper basin subcommittee and Pam Knox is the leader of the database group.

In May of 2008 Georgia joined the CoCoRaHS network, founded in Colorado by Nolan Doesken and collaborators. Pam Knox assisted in setting up the network and continues as a regional coordinator for Regions 1 and 3 in Georgia. As of April 20, 2011 there were over 700 observers signed up. On a typical day we expect more than 200 observations to come in from observers all over the state, and close to 300 on rainy days.

One of the most noteworthy items from this past year is the potential demise of the Georgia Automated Environmental Monitoring Network. This network of about 80 stations across the state has been run for many years by Dr. Gerrit Hoogenboom of the Biological and Agricultural Engineering Department of the University of Georgia. He funded the network using a combination of state funds, grant money, and private support of individual stations by interested users. When he left for another position at Washington State University, Dr. Stooksbury was given oversight of the network. As of the time of the writing of this report, the network is only funded through the summer. Dr. Stooksbury is continuing to identify potential funding sources and political support for this frequently used network.

Hawaii State Climate Office (HSCO)

Department of Meteorology
School of Ocean and Earth Science and Technology
University of Hawaii
Honolulu, HI 96822
Tel: 808-956-2324
http://www.soest.hawaii.edu/MET/Hsco/

Pao-Shin Chu, State Climatologist
Andrew Desnoyers, Research Assistant
Sean Newsome, Student Assistant

The Hawaii State Climate Office (HSCO) continued providing its services on multiple fronts during 2010-2011. Part of the service of the HSCO is to provide data upon request. In the past year, the HSCO has responded to a wide range of requests. Government workers monitoring hydrological data, biological researchers studying tree ring patterns, and tourists planning vacations were among the many individuals and groups that the HSCO was able to help. Access to unpublished paper records and a familiarity with navigating various databases allowed us to easily serve all submitted requests.

A continued project was the submission of monthly state climate reports to the Western Regional Climate Center, as part of an AASC's SCEP award aimed at improving communication between the HSCO, WRCC, and NCDC. Every month, a summary of the state's climate (including precipitation patterns and ENSO affects) and weather-related impacts on the people and society of Hawaii was written and sent to the WRCC. These reports are then used by the WRCC in their regional assessment submitted to the NCDC.

A new project, funded by a SCEP grant from AASC, is to provide metadata for Maui County and Oahu as well as shipping the historical Oahu's rainfall data to a NCDC/CDMP designated contractor for imaging and digitizing. This short-term project (from February to June 2011) is mainly intended to supplement a multi-year project with the CDMP (Climate Database Modernization Program) to rescue historical rainfall data for Hawaii. The HSCO has maintained paper copies of precipitation totals that have been unavailable to the NCDC. However, due to the recent lack of funding for CDMP, CDMP informed the HSCO to temporarily suspend our tasks for shipping the data to contractors on March 15, 2011.

Funded by the University of Hawaii Sea Grant Program office, a new study begun in statistical downscaling for rainfall over the state of Hawaii. The spatial resolution of most climate models is too coarse to resolve island-scale variations in precipitation over our state. Hawaii, however, is home to some of the steepest annual rainfall gradients in the world. Projecting changes in rainfall distribution across the island chain is important for both agriculture and the public water supply. Islands like ours are very dependent on rainfall for fresh water, and the drought of the last few years showed how vulnerable the state can be to changes in precipitation.

Idaho State Climate Services (ISCS)

Department of Biological and Agricultural Engineering
P.O. Box 440904
University of Idaho
Moscow, ID 83844-0904
Tel: 208-885-7004
Fax: 208-885-7908
rqualls@uidaho.edu
http://snow.ag.uidaho.edu/

Russell J. Qualls, Associate Professor and State Climatologist
Ayodeji Arogundade, Graduate Student
Yohannes G/Eyesus Getahun, Graduate Student

Climatic information is essential to every citizen of Idaho. To help people obtain the climatic and water data and information necessary to planning and every day work, the State Climatologist Program strives to acquire, archive, process and disseminate, in the most cost effect manner possible, climate and weather information which is or could be of value to policy and decision makers in the state and to provide climatic services which are important to the people of Idaho.

The functions of the State Climatologist and State Climate Services are to:

- act as liaison between Idaho weather information users and the National Climatic Data Center
- maintain a data bank of climatological and hydrological data and information
- supply data in a form useful to users
- perform requested climate analyses or refer requests to other appropriate persons, agencies or consulting firms
- maintain contact with users of climatic and hydrological data in order to ascertain their needs for data and analyses
- maintain a bibliography of publication pertinent to Idaho and Pacific Northwest climate

In May 1978, an agreement was concluded among the National Climatic Data Center, the National Weather Service and the University of Idaho to provide climate services which had been provided by a former National Weather Service program. ISCS became the AASC Recognized State Climate Office (ARSCO) for the State of Idaho in 2001.

Idaho State Climate Services is housed in the Department of Biological and Agricultural Engineering and is directed by the Idaho State Climatologist. It is supported by the Idaho Agricultural Experiment Station and the Idaho Cooperative Extension System in cooperation with the Idaho Water Resources Research Institute.

ARSCO Qualifications

ISCS is designated by the AASC as the official state climate office for Idaho. The following describes the ways in which ISCS addresses each of the ARSCO qualifications:

Communication Capabilities

- ISCS maintains a website and internet, email, telephone, and fax communication links.

Information Services

- Idaho joined CoCoRaHS in January 2009; the Idaho SC serves as the statewide coordinator of the precipitation network, which now has 150 observers.
- Maintain an online archive of the complete period of record for all Idaho Cooperative Observer data sets in cooperation with the University of Idaho Library, which may be downloaded by user-selected station (http://inside.uidaho.edu/asp/liststations.asp).
- Responded to numerous e-mail requests for climate data/information/services.
- Addressed telephone requests for information, services and research.
- Interviewed by local, state and national newspapers, radio stations, and other media outlets.
- Maintain three automated weather stations, a Cooperative Observer Station with over 110 years of data, a CoCoRaHS non-recording precipitation gage, and a recording precipitation gage, and partially fund a Sno-Tel site.
- ISCS provides numerous reports including Intensity-Duration-Frequency spreadsheets for many cities in Idaho.
- Established three Idaho Transportation Department Road Weather Information System Weather Stations.

Research

- Use remote sensing to simulate snowmelt runoff from the Upper Snake River.
- Examine the effect of climate change scenarios on snowpack and runoff volumes and timing for the eastern Snake River Plain, the principal water supply for southern Idaho.
- Evaluate the impact of current water rights on distribution of irrigation water under changing supplies associated with various climate change scenarios.
- Evaluate the impact of climate change scenarios to evapotranspiration on irrigation water demand and the resulting economic impact on agricultural revenues.
- Analyzing historical temperature trends at climate stations across Idaho
- Developing algorithms and models to assimilate remotely sensed data for use in spatially distributed land surface-atmosphere exchange models
- Maintain a 130 foot tall eddy covariance forest research tower to study water and carbon exchange in complex mountainous, forested topography.

- Conducting studies for the Idaho Transportation Department on the interaction of inclement weather and road slope and curvature on the frequency of accident occurrences.

Outreach

Participation and collaboration of the following outreach activities:

- Presentations to Idaho State Legislative committees on climate and climate change issues in the state.
- Climate products made available through ISCS website, and the printed volume, *Climates of Idaho* (Abramovich, R., M. Molnau, and K. Craine, University of Idaho, College of Agricultural and Life Sciences).
- Participate in discussion and meetings regarding formation of National Climate Services.
- Climate presentations to local elementary schools.
- Interviewed by print, radio and television media contacts.
- Serve as a climate expert on Idaho Public Television talk shows.
- Work with Boy Scouts of America as a merit badge counselor for Environmental Science and Weather

Monitoring and Impact Assessment

- ISCS archives Cooperative Observer Network data and makes it available to the public through http://inside.uidaho.edu/asp/liststations.asp.
- ISCS helps monitor current and historical precipitation through the CoCoRaHS network (http://www.cocorahs.org/) and QA/QC analyses of the Idaho network.
- ISCS is conducting studies of the impact of climate scenarios on state climate, water supply, agricultural water demand, and agricultural revenue for the Snake River Plain of southern Idaho. These are related to historical observations from the Cooperative Observer Network, SnoTel (http://www.wcc.nrcs.usda.gov/snow/), and an agricultural meteorology network (AgriMet, http://www.usbr.gov/pn/agrimet/).

Illinois State Climatologist Office

Illinois State Water Survey
Institute of Natural Resource Sustainability
University of Illinois Urbana-Champaign
2204 Griffith Drive
Champaign, IL 61820-7495
Tel: 217-333-0729
Fax: 217-244-0220
jimangel@uiuc.edu
http://www.sws.uiuc.edu/atmos/statecli/

Jim Angel, State Climatologist

The State Climatologist Office (SCO) for Illinois is located at the Illinois State Water Survey (ISWS) in Champaign, Illinois, under the new Prairie Research Institute on the campus of the University of Illinois. The office also operates the NWS coop site for Champaign-Urbana.

ARSCO Qualifications

The AASC has designated the Illinois SCO as the state climate office for Illinois. The following describes the ways in which the office addresses each of the ARSCO qualifications:

Communication Capabilities

The Illinois SCO has phone, fax, and email services with high-speed Internet service. The state climatologist maintains a web site http://www.isws.illinois.edu/atmos/statecli/ and blog http://climateillinois.wordpress.com/ devoted to climate data and information on a wide variety of climate topics.

Information Services

Angel is actively engaged in providing information services within Illinois. In the past year, he made over 100 contacts with the media. In addition, regular monthly press releases on conditions of the last month are used widely throughout the state. Each year he gives 18 to 24 talks around the state to a wide range of audiences. Approximately 500 phone calls and emails for specific climate information were received. Many such requests are now fulfilled by the web site. For 2010, the Illinois SCO web site (http://www.isws.illinois.edu/atmos/statecli/) received 2.2 million hits from 326k visits by 140k unique visitors (as determined by IP addresses). The blog http://climateillinois.wordpress.com/ started in 2010 and has had 25k hits to date.

Research

The Illinois SCO maintains an active research program, with applied research focused on Illinois and the Midwest. Two articles have been published (Angel and Kunkel (2010) and Changnon et al. (2010)). Two journal articles and two book chapters are currently under review. In the fall of 2010, Angel received an adjunct appointment with the Department of Atmospheric Science at the

University of Illinois and sponsored three students in Spring 2011 for senior-level Capstone Projects involving a tornado climatology of the state, the impact of the Artic Oscillation on Illinois temperatures, and historical trends in climate extremes in Illinois.

Outreach

The Illinois SCO engages in a number of outreach activities. Angel writes regular contributions to the monthly ISWS Water and Climate Summary. He has provided data and guidance to agencies in Illinois, including the Illinois Drought Response Task Force, the Illinois Department of Transportation, the Illinois Attorney General's office, and the Illinois Emergency Management Agency. He has worked closely with University of Illinois Extension on a number of issues that included: a) training of CoCoRaHS weather observers, b) teaching a section on climate to Master Naturalists in Champaign and Madison Counties, c) speaking at University of Illinois Extension Seminars around the state, d) speaking to other groups that are either part of or hosted by Extension such as marketing clubs, and e) occasional guest (April and October) on the Illinois Gardener program on WILL-TV. He was a guest lecturer for an environmental science class on the campus of the University of Illinois.

The Illinois SC has worked closely with the National Weather Service on a variety of issues that included: a) training of CoCoRaHS weather observers, b) supporting the cooperative weather observer network through contributions to newsletters, letters of appreciation, attending award ceremonies, etc., and c) coordinating climate services needs in Illinois amongst the five NWS offices that serve Illinois.

Angel is a member of the American Meteorological Society, Illinois State Academy of Science, and the American Association of State Climatologists.

Monitoring and Impact Assessment

The Illinois SCO regularly monitors the climate conditions within the state. The noteworthy events of 2010 and early 2011 were the wet springs that hampered planting, a dry fall and wet winter/spring, especially in southern Illinois. He provides input on drought and their impacts to both the state drought task force and the U.S. Drought Monitor.

In December 2010, Angel became the interim manager of the Water and Atmospheric Monitoring program http://www.isws.illinois.edu/warm/ at the Illinois State Water Survey. This program coordinates the data collection and monitoring programs conducted at the Water Survey. The program includes observations of soil temperature and moisture, solar radiation, surface water and groundwater levels, and in-stream sediment.

References

Changnon, S. A., **J. R. Angel**, and D. A. R. Kristovich, 2010. The unusual weather of 2009 in Illinois created major impacts. Illinois State Water Survey Report of Investigation 120, 26 p. [available at http://www.isws.illinois.edu/pubdoc/RI/ISWSRI-120.pdf]

Angel, J.R., and K.E. Kunkel, 2010. The response of Great Lakes water levels to future climate scenarios with an emphasis on Lake Michigan-Huron. *Journal of Great Lakes Research*, Supplement 2, Vol. 36, 51-58.

Indiana State Climate Office (IClimate)

Department of Agronomy– *Crops, Soil, Environmental Sciences*
Purdue University
West Lafayette, IN 47907
Tel: 765-494-6574
Fax: 765-496-2926
iclimate@purdue.edu
http://www.iclimate.org

Dev Niyogi, State Climatologist
Ken Scheeringa, Associate State Climatologist

IClimate is an American Association of State Climatologists (AASC) Recognized State Climate Office (ARSCO). In addition to permanent staff the office provides work opportunities to graduate and undergraduate students in research projects and customer service interactions. This office fulfills the ARSCO requirements in the following ways:

Information Services

A priority of *IClimate* is to collect and archive historical and current climate data for Indiana and to make these publicly available on the *IClimate* web site www.iclimate.org.
Databases are maintained for observation networks including NWS cooperative stations, ASOS stations, and a Purdue statewide automated agricultural weather network. A web charting option was added in 2010. Web visitors can now receive output in either table or graphical format. Clients may also email data questions to us via the online web form. We also assist clients to interpret these data as needed to solve their climate related problems.

Research

Iclimate is involved in several research projects primarily supported through NSF, NASA, DOE, USDA, and other federal agencies. One continuing project is related to the assessment of the role of land use and land cover including urbanization on the regional hydro-climatology. A second is on the development of a regional drought information portal and an environmental cyber-infrastructure prototype for heterogeneous data access and processing. A drought workshop is planned for June 2011. Other projects involve the role of land use change on the surface temperature datasets and rainfall trends across the continental or eastern US. Projects are underway related to the design framework of land use planning as a tool for climate change adaptation in greener cities with particular focus on Indianapolis, Indiana. A series of projects are also underway related to climate literacy and education for middle schools and informal educators. Details regarding these projects and resulting publications can be found at http://landsurface.org.

Field work concluded in 2010 under a two-year grant provided by Purdue Ag Research Programs (ARP) to monitor reference evapotranspiration (RefET) throughout Indiana. A final report is being written. Although formal field measurements for the grant have ended, warm season ET monitoring will continue in 2011 as the data are now integrated into the Purdue automated weather station network with hourly web database updates.

Selected 2010 Publications in climate research

Dirmeyer, P. A., Niyogi, D., de Noblet-Ducoudré, N., Dickinson, R. E. and Snyder, P. K., 2010: Impacts of land use change on climate. International Journal of Climatology, 30: 1905–1907. doi: 10.1002/joc.2157

Fall, S., Diffenbaugh, N. S., Niyogi, D., Pielke, R. A. and Rochon, G., 2010: Temperature and equivalent temperature over the United States (1979–2005). International Journal of Climatology, 30: 2045–2054. doi: 10.1002/joc.2094

D. Niyogi, 2010, An observational analysis of urban effects on heavy rainfall Climatology, Abstract B11J-04, presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec 2010.

K. Mallick, A. Jarvis, D. Niyogi, S. Fall, U. Charusambot, B. Bhattacharya, 2010, Retrieving latent heat flux from MODIS Aqua and its comparison with ARM CLASIC 2007 observations, LDAS and recent reanalyses products over US Southern Great Plains, Abstract H23J-07, presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec 2010.

Outreach

Media interviews, outreach meetings, and press releases continued through the office, particularly during times of significant weather events and as new seasonal outlooks are released. Invited talks included the local Kiwanis Club where the everyday application of climate data was explained. Other presentations to various clientele described climate change and agriculture's future, the role of agriculture in mitigating climate change in the Midwest, drought vulnerability and mapping, and climate change education.

IClimate continued as the state co-manager of CoCoRaHS Indiana. *IClimate,* NWS staff, and local coordinators again conducted CoCoRaHS training sessions for new observers in 2010 with a free rain gauge as a training incentive. At the end of our fifth year in 2010 more than 1390 volunteers have joined CoCoRaHS Indiana. Two issues of the *Counting Drops* newsletter were sent to all Indiana CoCoRaHS volunteers. A short article describing the climate of Indiana was written and submitted for the *States Climate* feature page on the national CoCoRaHS web site.

A CoCoRaHS state and local coordinators meeting was held at Purdue on 3 Dec 2010. On the agenda was development of strategies for observer retention and recruitment. The coordinators recognize that young observers are underrepresented. To connect with this age group a new CoCoRaHS mascot poster has been introduced in schools and a virtual rain gauge game has been hosted at county and 4-H events. New ideas proposed include starting an Indiana CoCoRaHS Facebook page and developing a smart phone app. An award certificate program may help motivate current observers. It was decided to compose newsletters on a more robust schedule and email copies to all former and current observers in attempts to reconnect with inactive volunteers. Another major topic was data applications and improvements. Specific ideas were local CoCoRaHS precipitation mapping, writing a COMET proposal toward enhancement of data quality control, and documenting specific examples of data uses. An eventual web page dedicated to Indiana CoCoRaHS data and activities was also discussed.

Monitoring and Impact assessment

IClimate participated in the inaugural meeting of the *Indiana Climate Change Response Team*. The meeting was called by the state Dept. of Natural Resources (DNR) to inventory existing independent efforts towards climate change education and gauge future interest in assembling a state team to include state government, universities, and other agencies. The first meeting was held in downtown Indianapolis in summer 2010 in a roundtable open discussion format. A second meeting of the group was called in autumn on the Purdue campus in a seminar format. Various sectors of government and academia presented talks on the potential impact of climate change in their area of expertise. Staff from *IClimate* also attended this second meeting.

IClimate continued as a member of the assessment group known as the *Purdue Flood Team*. The purpose of the group is to build strategies to assist communities in the mitigation, prevention, preparation, response, and recovery from flood disasters in Indiana in conjunction with county based Community Organizations Active in Disaster (COADs). In 2010 we received updates on a state flood summit held in Indiana and the national flood summit in Louisiana. Purdue flood resource publications were highlighted at the national conference and thousands of copies of the handouts were ordered by attending states. Twelve new chapters of COADS were formed in Indiana in 22 counties in 2010. Monthly phone calls between chapters help share ideas. Our *Purdue Flood Team* discussed organizing an internal Floods Seminar to enhance communication between those of us who do some work in this area. Topics could include flood mapping, climatology, building new COADS, structural engineering, and road and bridge design.

IClimate received its second AASC SCEP grant in 2010 to compile a monthly state climate impact summary. The grant period is August 2010 through July 2011. Weather statistics and impacts are compiled and written as weekly and monthly narratives. At the end of each month data tables and maps are added to the summary. Starting in late 2010 an abbreviated highlights version of the monthly summary was sent to MRCC to supplement the full report. The completed full monthly report is posted to our *IClimate* web site:

> http://www.iclimate.org/summary.asp and as required by the grant, to the AASC web site: http://www.stateclimate.org/state.php?state_id=IN.

Collaboration with our NWS and RCC partners continues. The local NWS offices sought *IClimate* input when release of an April freeze warning was uncertain after an early warm spring had significantly advanced fruit crops but before weekly crop progress reporting had begun. *IClimate* is a regular participant in the NWS Central Region bimonthly Climate Services webinars. The webinars were suspended for a time after June but returned in November under a new name, *Climate Meeting Time*. *IClimate* routinely accesses climate data from the MRCC MACS system when compiling the monthly weather impact summaries and in response to some client data requests.

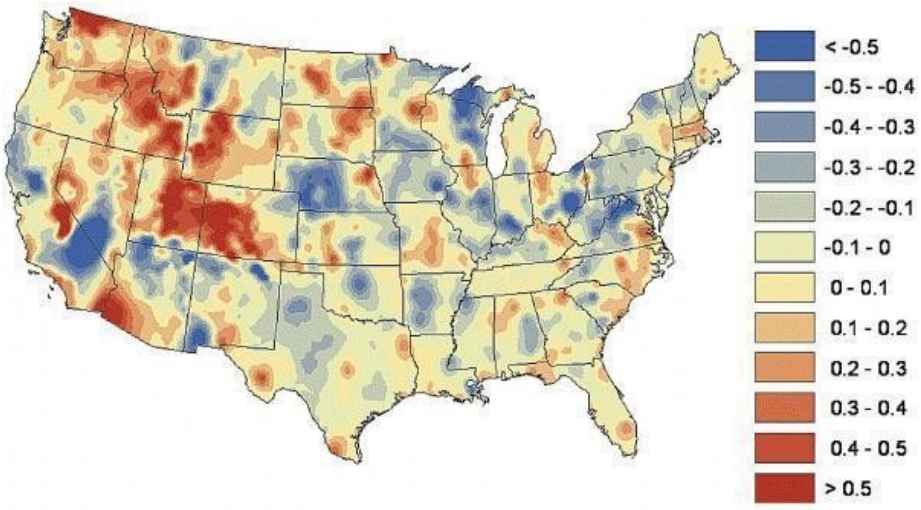
Weekly and monthly Indiana total precipitation GIS maps based on CoCoRaHS observations are posted to our web site: http://www.iclimate.org/precip/images/precip.asp. As in past years *IClimate* provided weekly rainfall, heat unit, and growing degree day GIS maps to the Purdue Entomology Department in 2010 for publication in their *Pest and Crop Newsletter*: http://extension.entm.purdue.edu/pestcrop/2010/index.html.

IClimate participates in environmental quality monitoring. Ken Scheeringa continues as the observer at the IN41 station of the National Atmospheric Deposition Program (NADP), which monitors precipitation chemistry at over 200 locations nationwide.

Purdue researchers and students consult *IClimate* staff routinely for assistance in specific projects. In 2010 a Botany project required hourly forecast data to run a turf disease prediction model. *IClimate* wrote a script for them to schedule downloads from the National Forecast Database pages which fit their needs exactly. An Agronomy researcher sought to explain unusual corn ear rot in the summer of 2010. *IClimate* was able to generate a short analysis showing the extreme summer 2010 dew points could be a factor at work in this field disease episode.

Education

Through separate NSF and NOAA grants, *IClimate* continues working with a network of teachers and educators in developing and delivering a curriculum and professional development material on climate science with a focus on the Midwest US. The website http://iclimate.org/ccc is being used by teachers to access climate change curriculum modules that can be integrated into middle school activities. The office also developed an exhibit on climate change education for the Indiana State Fair regarding climate and the role of oceans (as part of COSIA-UC Berkeley) where more than 500,000 visitors are expected on Purdue Day. A comic book targeted for younger audiences was also developed.



Selected 2010 publication in climate education:

Choi*, S., Shepardson, D., Niyogi, D. & Charusombat*, U., 2010, Do Earth and Environmental Science Textbooks Promote Middle and High School Students' Conceptual Development about Climate Change? : Textbooks' Consideration of Students' Conceptions. Bull. Amer. Meteorol. Soc., 91, 889-898. http://journals.ametsoc.org/doi/pdf/10.1175/2009BAMS2625.1

Page out of the "life size" comic book developed on climate change education.

Iowa State Climatologist Office

Iowa Dept. of Agriculture & Land Stewardship
Wallace State Office Bldg.
Des Moines, IA 50319
Tel: 515-281-8981
Fax: 515-281-8025
harry.hillaker@iowaagriculture.gov
http://www.iowaagriculture.gov/climatology.asp

Harry J. Hillaker, State Climatologist

The State Climatologist Office (Iowa SC) is a bureau of the Iowa Dept. of Agriculture & Land Stewardship. The State Climatologist is appointed by the Iowa Secretary of Agriculture (an elected state official). The Iowa SC office was founded in Iowa City at the University of Iowa on October 1, 1875 and was initially known as the Iowa Weather Service. In 1890 the Iowa Weather Service operations were moved to Des Moines and came under the supervision of the Iowa Weather & Crop Service. The Iowa SC was co-located with the National Weather Service from 1890 until 2003 and has worked very closely with that agency since its inception. Finally, the Iowa SC was made a division of the newly created Iowa Department of Agriculture in 1923.

Information Services

The Iowa SC office maintains archives of NWS co-op and first order station data back to the beginning of records. This would include the regular NCDC reports such as *Storm Data, Iowa Climatological Data* and *Local Climatological Data*, as well as the original observations. Access to a multitude of federal and state weather and climate data archives are also maintained. With 135years of continuous operation the Iowa SC Office has an unusually large archive of original federal and state books, reports and manuscripts from the 19th and early 20th Century.

Research

The Iowa SC office primarily is involved with the acquisition, processing, dissemination and archiving of weather and climate data. However, research activities are performed as funding permits and have been conducted in cooperation with agencies such as the National Climatic Data Center (NWS co-op network metadata), the Midwestern Regional Climate Center (pre-1948 data keying project), the National Science Foundation (crop-hail climatology), U. S. Army Corps of Engineers (evaporation, snow, short-duration precipitation studies) and the Iowa Dept. of Natural Resources (development of more timely temperature data resources).

Work has continued in developing a monthly data base of historical Iowa precipitation records with about 19,900 station-years compiled. Preliminary work in developing statewide averages of various weather statistics beyond average monthly temperature, precipitation and snowfall is also in progress. These new averages include the number of days per year reaching or exceeding maximum temperatures of 90ºF or 100º and minimum temperatures at or below 0ºF, dates of last spring and first fall freeze, as well as extreme annual maximum and minimum temperature and maximum daily precipitation amount.

Outreach

The office maintains very open communication with the news media with a total of 512 news media contacts this past calendar year. This, combined with preparation of Public Information Statements issued in cooperation with the National Weather Service, and weekly and monthly crop-weather summaries prepared for the USDA provides very wide dissemination of climate products and information. A total of 2,858 inquiries were answered during the past year. Most inquiries were received from government agencies (31%), the news media (18%), attorneys (9%) and insurance (6%). Virtually every major branch of State government utilizes the Iowa SC Office data on a regular basis.

The office also prepares regular monthly climate reports, the *Preliminary Iowa Monthly Weather Summary* and the *Iowa Climate Review*. The Preliminary Monthly Weather Summary is issued within the first few work days of each month and provides a brief summary of Iowa's weather conditions for the previous month. This report is available on-line and is also sent free of charge via regular mail. The Iowa Climate Review is a monthly report containing daily data for all official Iowa weather stations and is available by subscription. The Climate Review report is not currently on-line; however, the raw data are provided to Iowa State University's Iowa Environmental Mesonet web page and made available at that site. As part of the AASC/NCDC exchange program work began in providing monthly weather summaries to the Midwestern Regional Climate Center (MRCC), via the AASC web page, beginning with the November 2008 summary. Occasional special storm event summaries have also been prepared for the MRCC as part of this grant.

The Iowa State Climate Office works closely with the National Weather Service in monitoring the co-op and ASOS data networks so as to improve the quantity, quality and timeliness of Iowa climate observations. The State Climatologist has served on several NWS regional and national committees involved with climate and data issues. Finally, the Iowa SC attended the AASC annual meeting in South Lake Tahoe, CA in July 2010 and served as the Secretary-Treasurer of the AASC in 2009 and 2010.

Monitoring and Impact Assessments

The Iowa State Climate Office is a member of the Governor's Drought Task Force and Flood Task Force. The office provides regular updates of monthly temperature and precipitation data to the USDA Farm Service Agency for their use in evaluating county-by-county eligibility for disaster relief programs. The office also assists the Iowa Homeland Security and Emergency Management Division in their operations and occasionally provides guidance for county and regional emergency response offices. Special weather summaries and analyses are also prepared for the USDA and U.S. Geological Survey and the office is a regular contributor to the U.S. Drought Monitor. Some notable weather events of the past year include a persistently cold and snowy winter season, an unusually mild spring, a record wet June, localized major flood events in July and August, a persistently warm growing season (but with few temperature extremes) and an ideal fall harvest season which was the opposite of what occurred in 2009. Overall, 2010 went into the books as the second wettest calendar year (behind 1993) among 138 years of records. The severe thunderstorm season was unusually quiet with the latest start to the tornado season since 1978 and earliest end to the season since 1996. Only one tornado exceeded EF-2 intensity.

Kentucky Climate Center (KCC)

Department of Geography & Geology
Western Kentucky University
1906 College Heights Boulevard
Bowling Green, KY 42101
Tel: 270-745-5983
Fax: 270-745-6410
kyclim@wku.edu
http://kyclim.wku.edu

Stuart A. Foster, State Climatologist and Director
Rezaul Mahmood, Associate Director

The Kentucky Climate Center (KCC) observed its 33rd year of operation in 2010. As a member of Western Kentucky University's Applied Research and Technology Program (ARTP), the KCC received funding to support both undergraduate and graduate students and provide opportunities for them to participate in a variety of research and service activities, including presentations at statewide, regional, and national meetings. The KCC currently supports students from programs in geography, meteorology, and mathematics.

The KCC is recognized by the AASC as the State Climate Office for Kentucky in the National Climate Services Partnership. Therein, the KCC had developed strong relationships with the five National Weather Service forecast offices that serve portions of Kentucky, which include Jackson, KY, Louisville, KY, Paducah, KY, Wilmington, OH, and Charleston, WV. The KCC also enjoys supportive relationships with the Midwestern Regional Climate Center and the National Climatic Data Center.

In addition to housing the Office of the State Climatologist, the Kentucky Climate Center is home to the Kentucky Mesonet and the Climate Research Laboratory. The Kentucky Mesonet is a statewide network of automated weather and climate stations that is recognized as the official source of climatological observations for the Commonwealth of Kentucky. The Climate Research Laboratory houses several Linux workstations running WRF, WRF-Chem, MM5, and RAMS and supports atmospheric and atmospheric chemistry modeling focusing on impacts of land use and land cover change.

Information Services

The KCC provides climate data and information through a variety of channels. These include communication via telephone, fax, and e-mail. Our primary source of service delivery is via our website, which includes a variety of narratives, tables, maps, and graphs summarizing Kentucky's historical climate. The website emphasizes interactive graphics to help users find the data and information they need. The Kentucky Climate Center produces monthly climate summaries for Kentucky. These reports are submitted to the Midwestern Regional Climate Center and disseminated through the AASC website, as well as the KCC website. In addition, the KCC maintains the Kentucky Mesonet website (http://www.kymesonet.org/). The Kentucky Mesonet, a partnership with the National Weather Service, is a past winner of the Best of Kentucky

Technology Award for Best Application Serving Public Agencies as recognized by the Kentucky's Commonwealth Office of Technology.

Research

Faculty and students associated with the Kentucky Climate Center are involved in a variety of applied research projects. A current focus is on the analysis of data from the Kentucky Mesonet, including mountain/valley temperature differences and temperature bias due to station exposure and instrumentation. Modeling research continues to assess impacts of model physics parameterization scheme selection on forecasts, impacts of model initialization dataset on forecasts, impacts of land-use/land-cover change and soil moisture on planetary boundary layer, precipitation, and air quality dispersion. Papers on these topics were published in Bulletin of the American Meteorological Society, Progress in Physical Geography, Theoretical and Applied Climatology, and Water, Air, and Soil Pollution. The KCC also contributed to a monograph addressing the bias in daily mean temperature when calculated using different formulas for NCDC's Climate Database Modernization Program.

Faculty, staff, and students affiliated with the Kentucky Climate Center presented research papers at the Association of American Geographers, the Kentucky Academy of Sciences, and the Southeast Division Association of American Geographers.

Outreach

The KCC provides outreach via the media, including interviews through the television, radio, and newspaper media addressing significant weather events, climate change, and the Kentucky Mesonet.

The State Climatologist plays an active role on the Kentucky Drought Mitigation Team organized through the Kentucky Division of Water within the Kentucky Cabinet for Energy and Environment. Drought plagued portions of Kentucky during the latter half of 2010, and the KCC played a key role in advising the Governor's Office.

The KCC was a contributing sponsor of the Kentucky Weather Workshop organized by the Kentucky Division of Emergency Management. Multiple presentations on weather analysis and monitoring were given by associates of the KCC to a large audience of emergency managers and first responders.

Monitoring and Impact Assessments

Expansion of the Kentucky Mesonet continued. Fifty-seven research-grade automated weather and climate monitoring stations are currently operational throughout the state and installation is in progress for four new stations. One of the mesonet stations is now upgraded and has also become an eddy-covariance flux measuring site. The network envisions upgrading several mesonet stations to this type of site throughout the state.

Mesonet staff continues to enhance relationships with NWS forecast offices serving Kentucky, statewide TV stations, and various public and private entities. Data from the Kentucky Mesonet are freely available to the public at http://www.kymesonet.org/.

The Kentucky Mesonet was a key source of data used in assessing both record flooding in May of 2010 and later drought during the summer and fall months.

Louisiana Office of State Climatology (LOSC)

Department of Geography and Anthropology
Louisiana State University
Baton Rouge, LA 70803
Tel: 225-578-6870
Fax: 225-578-2912
http://www.losc.lsu.edu

Barry Keim, State Climatologist
Kyle Brehe, User Services Coordinator
Malcolm Moe Moreau, NWS Liason

Mission

The mission of the Louisiana Office of State Climatology (LOSC) and the LA State Climatologist is to serve as the State focal point for activities pertaining to the climate of Louisiana.

Responsibilities include:

- to collect, archive, and make available climate data for the state of Louisiana
- to provide climate education and information to the citizens of the region through various outreach programs including the media
- to maintain an active research program pertaining to the climate of Louisiana and the region

To achieve these goals, the LOSC cooperates with LSU, the National Weather Service (NWS), the Southern Regional Headquarter of the NWS, the Southern Regional Climate Center (SRCC), and the National Climatic Data Center (NCDC). LSU provides the infrastructure for the LOSC, and the National Weather Service Offices maintain the quality of weather observations in the region, with climate data exchanged between the LOSC, NWS, SRCC, and the NCDC.

Need and Relevance

A primary role of the LOSC is to collect and archive high quality climate data for Louisiana and then make these data available to the general public, often with some interpretation or forensic application. Users of these data include researchers, attorneys, construction companies, federal and state planning agencies, private consultants, power companies, insurance companies, teachers and students, among others. Hundreds of requests are still handled annually and in 2010, the LOSC serviced 859 requests for climatic data for Louisiana. We also collaborate with the Louisiana Office of USDA's National Agricultural Statistics Service, where data is shared.

The LOSC has taken on the responsibility of producing a weekly summary of the State's weather and climate in the form of the *Louisiana Weekly Climate Review* available on the LOSC website at the following URL: www.losc.lsu.edu. This report is also e-mailed to over 100 recipients across Louisiana, including most television weather-casters in the State, concerned State Office Officials, as well as the National Weather Service Offices that serve Louisiana. The Office also provides a weekly summary of Louisiana Climate Data to the National Agricultural Statistics Service (NASS) that is published weekly in the *Louisiana Crop Weather Summary*. In addition to these weekly products, the LOSC also produces monthly summaries of the State's Climate data which

is also available on the LOSC website. The office also produces event-based summaries for significant weather events that impact Louisiana. The LOSC is also active on the ad hoc committee of the *U.S. Drought Monitor*. We cooperate and coordinate efforts closely with the NWS Offices in the region. We also remain primed and ready to work with Louisiana Office of Emergency Preparedness when needed.

Outreach

The LOSC conducts frequent interviews with radio, newspaper, and magazine media. Several hundred media contacts were logged in 2010. In 2010, I was quoted in the following newspapers; *Toronto Star*-1*, Bloomsberg News*-1, *Farm Journal*-1, *The Advocate*-13 (Baton Rouge), *Times-Picayune*-7, *Hammond Daily Star*-2, *The* Reveille-6, *Daily Review* (Morgan City)-1, *Pensacola News*-1, and others. I was interviewed at least 70 times for radio by *Louisiana Network* on a variety of weather topics involving Louisiana- LA Network has 75 radio station affiliates in Louisiana. I was a guest on *Sunday Journal* with John Pastorek twice on WBRZ, Channel 2-first on May 21, 2010 to discuss the opening hurricane season, and again on August 27, 2010 discussing the 5th anniversary of Hurricane Katrina. I was interviewed by WBRZ-Channel 2 live 2 times on August 7, 2010 about the Hot Air Balloon Championships and on August 26, 2010 about the upcoming hurricane season. In 2010, I was interviewed by WAFB - Channel 9 Baton Rouge 1 time, by KMAR Radio 11 times, by WJBO Radio 4 times, by the Associated Press 3 times. I was interviewed live on the Canadian Broadcasting Corporation (CBC) twice; once on May 27, 2010 on hurricanes and the BP oil spill, and on August 29, 2010 on the 5th anniversary of Hurricane Katrina. I appeared on NPR – "To the Point" on May 28, 2010 about the hurricanes and the BP Oil Spill, and I was interviewed by KATC-TV (Lafayette) on March 16, 2010 about upcoming hurricane season.

Research

Piazza, B.P., M.K. La Peyre, B.D. Keim. 2010. Relating Large-scale Climate Variability to Local Species Abundance: ENSO forcing and Brown Shrimp *(Farfantepenaeus aztecus*) in Breton Sound, Louisiana, USA. *Climate Research* 42:195-207, doi: 10.3354/cr00898.

Nogueira, R., and B.D. Keim. 2010. Annual Volume and Area Variations in Tropical Cyclone Rainfall Over the Eastern United States. *Journal of Climate* 23(16):4363-4374, doi: 10.1175/2010JCLI3443.1

Keim, B.D. 2010. The Lasting Scientific Impact of the Thornthwaite Water Balance Model. *Geographical Review* 100(3):295-300.

Hamilton, LC., B.D. Keim, and C.P. Wake. 2010. Is New Hampshire's climate warming? New England Policy Brief No. 4. Durham, NH: Carsey Institute, University of New Hampshire, 8 pp.

Keim, B.D. 2010. Weather Review: Louisiana 2009 and Average Temperature and Precipitation Summary, Louisiana 2009. *National Agricultural Statistics Service - 2009 Annual Louisiana Statistical Bulletin*, p. 10.

Maryland State Climatologist Office

University of Maryland
Department of Atmospheric and Oceanic Sciences
College Park, MD 20742
Tel: 301-405-7223
climate@atmos.umd.edu
http://www.atmos.umd.edu/~climate

Konstantin Vinnikov, Acting State Climatologist
Russell R. Dickerson, Professor

Abstract

Activities by the State Climatologist Office for Maryland include routine climate services for citizens and climate research that should be important for citizens and for the Government of Maryland. The work relates to analysis of climatic and air quality records in Maryland and its vicinity. The most attention was paid to studying climatology of diurnal and seasonal variations of major air pollutants and related physical processes. Work has been partly supported by University of Maryland and NASA. Analysis of CO and NO_2 from Piney Run and Beltsville shows annual cycles with minima in summer when OH production is at a maximum as well as diel cycles related to PBL dynamics and traffic patterns. In Beltsville, CO concentrations are about 50% higher and NO_2 concentrations twice as high as at Piney Run. Analysis of PM2.5 shows a bimodal distribution with an absolute maximum in the summer afternoon associated with sulfate and SOA production, and a relative maximum in winter rush-hours. Temporal variability provides insight into lifetimes with respect to transport and transformation. CO, with a relative long chemical lifetime is controlled by meteorological variability with a dispersion lifetime of about 10 hr. Assuming that SO_2 is dispersed equally, its chemical lifetime is estimated at 10 hr – reasonably close to the 17 hr from budget calculations (Lee et al., 2010). Preliminary analysis of Lidar data shows promise for determining the depth of the PBL. Lidar actually indicates the maximum altitude of the aerosol layer. Because aerosols heights are related to PBL depths, we may be able to use these data to evaluate WRF PBL estimates. Finally, an initial investigation of Profiler wind speeds suggests that these data may be indicative of LLJ's; the analysis is ongoing.

Climatic Service: Summary of Activities in 2010

The office of the State Climatologist of Maryland is the center for all climactic data for the state of Maryland. Climate data is provided to a wide variety of agencies, businesses, students, researchers, and citizens of Maryland. We maintain links with many cooperative meteorological stations in the state, as well as the National Climactic Data Center, National Weather Service Forecasting Office, and the National Oceanic and Atmospheric Administration.

The office of the State Climatologist of Maryland received approximately 100 data requests in 2010. The majority of these requests were received via email to climate@atmos.umd.edu. Data requests are also received by mail and by telephone. The office of the State Climatologist of Maryland is responsible for responding to these requests in a timely and respectful manner. A large portion of the requests received are inquiries to obtain temperature or precipitation data. Nearly all

precipitation and temperature data requests are handled by accessing the data from the National Climactic Data Center and forwarding the data to the recipient. Another type of request, usually asked for by lawyers, is a weather report for a certain day, and in some cases, a certain time. Lawyers have specific requests due to the nature of the claims they handle. Other requests, such as those looking for wind histories, seasonal outlooks, or hydrological outlooks, are usually asked for by students, researchers, and employees of governmental agencies. We have been contacted with requests for data from students attending the University of Maryland – College Park, Loyola University of Maryland, and Morgan State University. Some governmental agencies that have requested data are the Department of Health and Mental Hygiene, the Maryland State Highway Administration, and the National Oceanic and Atmospheric Administration. One other main type of request we receive is for an interview. We have been contacted by FOX 5 and some local newspapers asking for interviews.

In general, most requests are handled with data from the National Climactic Data Center. Data from Maryland COOP stations has been used in data requests, along with data from the National Weather Service Forecasting Office. All previously stated sources of data are official. The only instances where unofficial data are used are in the case of Weather Underground, which has a collection of unofficial weather stations that update weather conditions quite regularly. Whenever data from Weather Underground is used, it is always stated that the data are unofficial and, if at all possible, the closest official data are sent along with any unofficial data.

The office of the State Climatologist also works with Maryland COOP stations. We receive and archive monthly climate data records from approximately thirty sites from all over the state of Maryland. These COOP stations are managed and operated by private citizens.

Study of diurnal/seasonal cycles of atmospheric pollutants

In our report for 2009, we discussed diurnal/seasonal cycles of atmospheric O_3 and SO_2. Here we are looking to understand diurnal/seasonal cycles in four other major atmospheric pollutants (CO, NO_2, PM2.5) observed at Maryland Air Quality stations. (Please click here to read the research portion of this report).

Climate change at Maryland

Detailed report "Maryland: Observed and Model Simulated Climate Change. Temperature, Precipitation & Theirs Variability" have been prepared for *35th Annual Meeting of the American Association of State Climatologists.* It is available from http://www.atmos.umd.edu/~kostya/Sclim/Reports/AASC_REPORT_2010.ppt. This report contains updated materials based on newest versions of climatic data obtained from NOAA/NCDC. No new work in this direction has been done later in 2010.

Michigan State Climatological Resources Program (MRCP)

Room 236 Geography Building
Department of Geography
Michigan State University
East Lansing, MI 48824
Tel: 517-432-4756
Fax: 517-432-1076
andresen@msu.edu
http://climate.geo.msu.edu/

Jeff Andresen, State Climatologist

The Michigan Climatological Resources Program (MRCP), home of the Office of the Michigan State Climatologist within MSU's Dept. of Geography, is the archival and service center for climatological data and related information for Michigan. Leadership of MCRP is the responsibility of the State Climatologist, who supervises operational and research activities under the direction of the Chair of the Geography Department. Operational and research support in the program are provided by Peter Kurtz and Aaron Pollyea, while technical and clerical support is provided by Cathy Sernick.

ARSCO Qualifications

The MRCP is an American Association of State Climatologists (AASC) Recognized State Climate Office (ARSCO) and fulfills a number of qualifications as outlined below. Major objectives of the MCRP are consistent with the AASC-defined role of a state partner in provision of climate services, including: 1) Collection of observations for the purpose of climate monitoring, summarization and dissemination of weather and climate information to the user community; 2) Demonstration of the utility of climate information in the decision making process and assessment of climate impacts; 3) Development of an active research program addressing climate-related issues in the state and region; and 4) Development of an educational element of the program which allows and encourages students to participate in climatological research, gain operational job experience on internships, and provide training in applied use of climatological information.

Communication Capabilities

The majority of public requests for climate data and information are placed via telephone and email exchanges. While a fraction of requests are still filled through conventional mail service, a growing proportion of responses are through email. MCRP also provides information through dedicated worldwide web sites (see below). Climate data are collected operationally in the program via internet (Unidata's Internet Data Distribution system) and dedicated satellite receiver connections, and via internet and telephone through the program's Enviro-Weather information access system.

Information Services

The total number of public requests for climate-related data and information in 2010 was just under 900, most of which were received via phone or email. The majority of these requests were from law firms, the insurance industry, and other researchers. While the 114 total formal billable user requests filled in FY 2010 were less than the 145 filled last year, the average amount of payment received per billable request was $23.95 greater in 2010, the result of several large research-related contract requests. Use and data access from our internet sites, climate.geo.msu.edu, www.agweather.geo.msu.edu/mawn and www.enviro-weather.msu.edu, continued to expand, with collectively more than 4500 hits per day on average in 2010.

Outreach Activities

The MCRP in conjunction with MSUE (through the SC's formal appointment) also maintains an active outreach program through traditional venues, providing climate-related information in formats ranging from public speaking engagements to regular columns in the popular press. During 2010, the MCRP staff provided 16 interviews to print, radio, and television media and 13 talks or seminars to the public. The SC and some MCRP staff also write weather- and climate-related columns on a daily (MSUE Crop Advisory Team, see www.ipm.msu.edu/aboutcat.htm) and bimonthly (Michigan Farm Bureau) basis. During 2010, 90 columns were written.

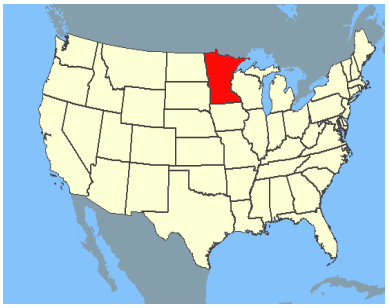
Research

MCRP maintains an active research program addressing climate-related issues in the state and region. Current projects involve investigation of past and projected future climate changes in the region and potential impacts of weather and climate on regional agriculture. We also continued work on the Enviro-Weather project, the primary objective of which is the development and implementation of www-based techniques and tools that address weather- and climate-related processes in agricultural and natural resource management in Michigan. During 2010, staff at MCRP authored or co-authored 2 refereed journal articles and 4 non-refereed articles and technical reports. MCRP was awarded 2 new external grants during 2010, had 7 grants in force from previous years, and 8 new grant proposals were submitted for review.

Minnesota State Climatology Office (MN_SCO)

439 Borlaug Hall, University of Minnesota
1991 Upper Buford Circle
St. Paul, MN 55108-6028
Tel: 651-296-4214
Fax: 612-625-2208
climate@umn.edu
http://climate.umn.edu

Jim Zandlo, State Climatologist



The Minnesota State Climatology Office (MN_SCO) exists to manage, analyze, and disseminate climate information in service to the citizens of Minnesota. The MN_SCO is funded by the State of Minnesota Department of Natural Resources - Division of Ecological and Water Resources, and housed at the University of Minnesota - Department of Soil, Water, and Climate. This partnership was formed in 1973.

The MN_SCO assists its customers in their investigations of the climate's impact on various components of the natural environment, and on socioeconomic activities. The MN_SCO uses its climate monitoring resources to quantify weather conditions and to place these conditions within historical and geographical context. The MN_SCO also provides quantitative summaries of historical climate conditions, allowing users to make informed decisions about future activities.

In order to provide its services, the MN_SCO requires an extensive historical climate data set. The climate database managed by the MN_SCO consists of over 100 million data points. The database features data collected by Minnesota's high spatial density precipitation monitoring program, formed in the early 1970's. This "network of networks" utilizes the efforts of water-oriented state and local agencies to assemble precipitation data from approximately 1500 observers each year. Additionally, the National Weather Service (formerly the U.S. Weather Bureau) has maintained a large scale, volunteer-based climate monitoring network in Minnesota since 1890. Other, smaller scale climate monitoring efforts extend the historical record earlier into the 19th century. The MN_SCO also archives multi-element hourly weather data gathered at Minnesota's airports.

The MN_SCO provides customers with free access to a comprehensive electronic climate database. The MN_SCO also serves its customers by offering a variety of value-added analyses of climate data in the form of narratives, maps, graphs, and tables. Customers access MN_SCO products and services via a Web site, e-mail, telephone, and office visits.

The customers of the MN_SCO are many and varied. Customers can be grouped in the following categories:

- Minnesota Department of Natural Resources (sponsoring agency)
- State, Federal, and Local Governmental Agencies
- Private Sector Professionals
- Academic Community
- General Public

ARSCO Qualifications

The MN_SCO is designated by the AASC as the official state climate office for Minnesota. The following describes the ways in which the MN_SCO addresses each of the ARSCO qualifications:

Communication Capabilities

- full-featured Web site
- fully staffed information line
- near-immediate response to e-mail inquiries

Information Services

- Web site – the MN_SCO Web site hosts approximately 3000 users per day. The Web site offers free access to nearly all of Minnesota's digitized climate data, as well as a number of value-added products such as narratives, maps, and tabular summaries.
- The Web site offers on-line daily data entry and data maintenance capability to volunteer precipitation observers. These near real-time data are automatically transferred to the National Weather Service North Central River Forecast Center.
- Phone and e-mail – the MN_SCO answers dozens of phone calls and e-mails per week from customers with climate questions.

Research

- In 2010, the MN_SCO extended a project that creates 24-hour total precipitation grids for every ending-hour from 1948 through 2008. Areas of selected 24-hour precipitation amounts (e.g. 1 inch, 2 inch, etc.) within the boundaries of Minnesota were tallied for each year and analyzed for trends.
- The State Climatologist is a principle member of two advisory committees tasked to provide guidance concerning climate change adaptation research and outreach.

Outreach

- The State Climatologist was a planner and participant in the "Clean Water and Climate Adaptation Summit", a successful two-day conference attended by government officials and staff, industry leaders, natural resource professionals, scientists, and citizens.
- Staff is commonly requested to attend multi-agency, multi-disciplinary meetings where a climatological perspective is required.
- Staff gives frequent interviews to electronic and print media.

Monitoring and Impact Assessments

- The MN_SCO works with the National Weather Service to coordinate Minnesota's role in the *CoCoRaHS* program.
- Web site offers a variety of routinely prepared summaries of weekly and monthly temperature, degree day, precipitation, and snow depth data.

- Web site offers a chronological journal of significant weather events, providing a description of the event, impacts, and historical context.
- The MN_SCO utilizes a list server to deliver a monthly electronic newsletter summarizing climate conditions observed during the previous month and the resulting impact on water resources.
- The MN_SCO is in frequent communication with authors of the U.S. Drought Monitor.

Office of the Mississippi State Climatologist

Department of Geosciences
Mississippi State University
PO Box 5448
Mississippi State, MS 39762-5448
Tel: 662-325-3915
http://www.msstate.edu/dept/geosciences/stateclimatologist.htm

Charles Wax, State Climatologist
Michael Brown, Assistant State Climatologist

Dr. Charles L. Wax was appointed Mississippi State Climatologist upon nomination by Governor William Winter and the execution of a Memorandum of Agreement between NCDC, NWS Southern Region, and Mississippi State University dated April 21, 1983. The MOA was signed by University President James McComas and the SC Office was vested in the Department of Geosciences at Mississippi State University, where the office remains today. The SC is not funded beyond one-quarter time release from teaching in the department. The SC is involved in teaching, research, and service through the university, and has been granted ARSCO status. A new Memorandum of Agreement between NCDC and Mississippi State University dated October 17, 2008 recognizes the Mississippi State Climate Office as the ARSCO State Climate Office for the State of Mississippi with Dr. Charles L. Wax as State Climatologist. The 2008 MOA was signed by Dr. Vance Watson, University President, and Dr. Tom Karl, NCDC Director. After serving for 28 years, Dr. Wax is planning to resign as State Climatologist this year, and a new Memorandum of Agreement between NCDC and Mississippi State University will recognize Dr. Michael E. Brown as his replacement.

Service activities of the SC this past year included the routine handling of daily requests for data or information, and provision of data analyses for more complex requests. The same sort of climate data consumers are found in Mississippi as elsewhere—lawyers, engineers, professors, researchers of all types, businessmen, housewives, farmers, teachers, students with science fair projects, and every other imaginable user. Much time is spent providing weather summaries to other government agencies upon request, but no routine publication of this sort is attempted. An estimated 50 email requests are handled daily in the SC office.

This past year the SC was co-principal investigator for a geoscience education project sponsored by the Mississippi Department of Education called TANS—Teacher Academy in Natural Sciences. This involved a two-week summer workshop for 60 teachers, three weekend workshops through the year, and co-teaching visits to 10 school districts in Mississippi. The SC's contribution was instruction on using weather and climate material in middle school science classes.

Outreach activities this past year have continued to be heavily focused on the perceptions and possible effects of climate change, and on severe weather threats in Mississippi. The SC office continues to be overwhelmed with requests for information and for presentations about potentially changing weather characteristics to groups throughout the state and region. The SC has been cast in the unwelcome role of "expert" on climate change! The Mississippi public is also manifesting a heightened awareness of the effects of weather and climate on all types of activities, especially

severe weather, due to several violent outbreaks of severe weather this past year and to increased media coverage of weather and climate in general.

Research activities this past year included modeling the physical and cultural impacts on groundwater resources from the shallow alluvial aquifer of the Mississippi Delta region; defining effective precipitation for irrigation demand; distribution of tornadoes, thunderstorms, and lightning strikes in Mississippi**;** and effectiveness of holding surface water in field impoundments for use in irrigation in place of groundwater. A book, *Weather and Climate of Mississippi*, has been accepted for publication by the University Press of Mississippi.

This past year the SC concluded development of a disaster mitigation plan for Mississippi State University. The work was funded by FEMA and resulted in a document detailing vulnerabilities of the university to everything from earthquakes, tornadoes, hurricanes, ice storms, lightning, and wildfires to all man-made hazards such as terrorism and crime.

The following specific outreach activities and public educational presentations on weather and climate were conducted this year:

- Served as co-state coordinator for the CoCoRAHS network. Over 250 observers are enlisted across the state at present, and the State Climate Office has used a little over $3000 of grant money to buy rain gauges and pamphlets for recruitment.
- Presented a guest lecture to the Broadcast Meteorology Program Summer Workshop at Mississippi State University.
- Sponsored a program on "Women in Meteorology" with former student Nancy Lopez, UADA Physical Scientist from Stoneville, MS.
- Taped a televised interview for WTVA-TV, Tupelo, MS, on lightning in Mississippi
- Taped one video interview with Delta Farm Press about climate change and a second interview and article about groundwater conservation in the Delta region
- Taped a video about flooding in Mississippi for GIS Day at Mississippi State University
- "Severe Weather." Presentation to MSU Human Sciences Club
- "Climate Change." Presentation to the Starkville, MS Civitan Club.
- "Severe Weather." Presentation to Faith Baptist Church, Starkville, MS Senior Citizens group.
- Weather Processes and Stability Classes in Mississippi." Short course for Southern Region Foresters on Prescribed Burning, Mississippi Cooperative Extensive Service, Mississippi State University, Mississippi State University.
- Delivered the dinner speech at the student NWA/AMS End-of-year banquet
- "Climate Change." Guest lecture presented to the Environmental Science class at Jackson Preparatory School, Jackson, MS
- "Severe Weather." Guest lecture presented to 400 students at Park Place Christian Academy, Jackson, MS as a part of Science Month activities.
- Attended and spoke at a workshop for the Climate Literacy Program in the Southeast, sponsored by NSF.
- Taped a televised interview for WTVA-TV, Tupelo, MS, on the Arctic Oscillation and changing weather in Mississippi.

- "Global Climate Change." Presentation to Friends of the Library annual membership meeting, Dothan Public Library, Dothan, AL.

Invited Conference presentations:

"Refining effective precipitation estimates for a model simulating conservation of groundwater in the Mississippi Delta Shallow Alluvial Aquifer." Mississippi Water Resources Conference, Bay St. Louis, MS.

"Teacher Academy in the Natural Sciences (TANS): Geosciences Share-a-thon for middle school science teachers." Mississippi Science Teachers Association Annual Conference, Jackson, MS.

"Changing Climate Trends and Cycles." Agriliance Farmer's Exposition, Verona, MS.

"Climate Change and Agriculture." Women in Agriculture annual conference, Mississippi State University.

"Modeling groundwater conservation strategies in the Mississippi Delta Shallow Alluvial Aquifer." Presentation to the Advisory Board, Mississippi Water Resources Research Institute, Mississippi State University.

Grants funded:

Mississippi Institutions of Higher Learning Board. Development and Implementation of a Multi-Hazard Mitigation Plan for Mississippi State University." $84,611.

Mississippi Water Resources Research Institute: "Refining effective precipitation estimates for a model simulating conservation of groundwater in the Mississippi Delta Shallow Alluvial Aquifer." $106,616.

Grant proposals submitted:

USDA National Institute for Food and Agriculture, Agriculture and Food Research Initiative Competitive Grants Program: "Optimization of on-site water storage and re-use to reduce nutrient runoff." $240,000. (Co-PI)

***Publications*:**

2010. Brown, M.E. and C. L. Wax. "Disaster Resistant University Hazard Mitigation Plan, Mississippi State University." FEMA Document--Mississippi State University, 126pp.

In Press. C. Wax. "Mississippi's Climate." The Mississippi Encyclopedia, Ed. Charles R. Wilson. University Press of Mississippi.

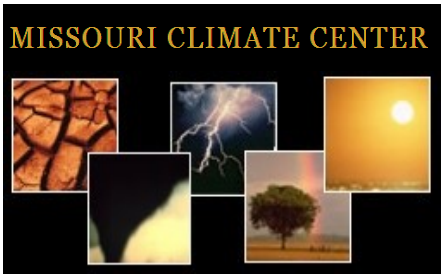
In Press. Brown, M.E. and C. L. Wax. "Thunderstorms, Lightning Strikes, and Tornadoes in Mississippi." MAFES Bulletin, Mississippi Agricultural and Forestry Experiment Station, Mississippi State University.

In Press. C. Wax. "Climate Change—Evidences and Contrarian Viewpoints." Handbook of Climate Change Mitigation. Wei-Yin Chen, J. Seiner, T. Suzuki, and M. Lackner, Eds. Springer Science Business Media, LLC. New York.

Accepted. Sherman-Morris, K., C. Wax and M. Brown. Weather and Climate in Mississippi. University Press of Mississippi.

Missouri Climate Center (MCC)

Soil, Environmental and Atmospheric Sciences
302 ABNR, University of Missouri-Columbia
Tel: 573-882-5908
Fax: 573-884-5133
GuinanP@missouri.edu
http://climate.missouri.edu



Patrick Guinan, State Climatologist
Jane Niemeyer, Undergraduate Assistant
Jeffery Hall, Undergraduate Assistant

The Missouri Climate Center is designated by the AASC as the official state climate office for Missouri. As State Climatologist for Missouri and Director of the Missouri Climate Center, I serve as resource for weather and climate information. The State Climatologist collects and maintains an extensive historical climate database of Missouri weather records for monitoring and dissemination to the citizens of the state and beyond. This includes performing and assisting in the primary functions of the center whose mission is to advance the use of climate information for the economic and environmental benefit of Missouri and the public safety of its citizens through climate monitoring, research, education, and extension and information services. In 2010, alone, we fulfilled hundreds of climate data requests and gave educational presentations in dozens of venues around Missouri. The following information provides information over the past year of how the Missouri Climate Center addressed each of its ARSCO qualifications.

Communication Capabilities

- The MCC website provides easy access to weather and climate information including links to specialized websites for real-time and historical weather in Missouri. In September 2010, the Missouri Climate Center began posting monthly weather and climate impact reports for the state of Missouri as part of the State Climatologist Exchange Program.
- An agricultural weather forecast is developed by the undergraduate assistants every morning and e-mailed to all the county extension offices in Missouri
- Over 4000 lines of data arrays are collected daily from a network of 30 automated weather stations. The daily and hourly arrays are posted on a server for free access.
- The Meteorological Assimilation Data Ingest System (MADIS) incorporates 5-minute weather conditions from 17 real-time weather stations in Missouri associated with the Commercial Agriculture Automated Weather Station network.
- Continued development and recruitment for an e-mail delivery agricultural weather product called Horizon Point. Horizon Point is a custom weather analysis system for farmers and provides an opportunity to have specific weather reports sent directly to their e-mail address. Currently over 500 Missouri agricultural producers and agents are enrolled.

Information Services

- Submitted numerous press releases and updates to the Extension news service related to weather, climate and the environment
- Serve as an information source for the media including national, state, and local mediums
- Fulfilled hundreds of requests for climate information and provided climatological expertise to numerous individuals, groups, and agencies
- Submit weather and soil information published in a national bulletin **Weekly Weather and Crop Bulletin:** http://www.usda.gov/oce/weather/pubs/Weekly/Wwcb/
- Run the black cutworm forecasting program over the internet for public utility: http://agebb.missouri.edu/weather/reports/weabcws.asp
- Run the rice model program to predict rice growth stages: http://agebb.missouri.edu/weather/reports/ricedds.asp
- Provide weather data from the automated network to be used in a risk assessment tool for wheat scab prediction: http://www.wheatscab.psu.edu/
- Provide a weekly climate summary table for the **Integrated Pest and Crop Management** Newsletter: http://ppp.missouri.edu/newsletters/ipcmindex.htm
- Provide a 2-inch and 6-inch soil temperature table for the Agricultural Electronic Bulletin Board (AgEBB): http://agebb.missouri.edu/weather/reports/soilTemp2.asp http://agebb.missouri.edu/weather/reports/soysoil6.asp
- Campus weather station linked to main MU web site: http://www.missouri.edu/
- Campus weather station and forecast linked to College of Agriculture web site: http://cafnr.missouri.edu/
- The real-time stations are providing 5-minute weather conditions to the Meteorological Assimilation Data Ingest System (MADIS)

Research

- Providing real-time weather status to 18 weather stations in the Commercial Agriculture Automated Weather Station Network for Integrated Pest Management
- Provide climate data for graduate students and faculty research projects
- One of the participants in a multi-state 5-year USDA/NIFA grant awarded in 2010 Grant title: Useful to Usable (U2U): Transforming Climate Variability and Change Information for Cereal Crop Producers.
- Co-authored a paper submitted to the Missouri Academy of Science titled "A Long-Term Study on Tropical Systems Impacting Missouri". Dawson, N.W., Guinan, P.E. and A.R. Lupo. 2010.
- Co-authored a paper published in the Missouri Academy of Science titled "COCORAHS in Missouri: Four Years Later, The Importance of Observations." Moon, III, J.T., P.E. Guinan, and A.R. Lupo. 2010.
- Co-authored a journal article published in Atmosfera titled "The interannual variability of Midwestern temperatures and precipitation as related to the ENSO and PDO". Birk, K., A.R. Lupo, P.E. Guinan, and C.E. Barbieri. 2010.

Outreach: Education, Awareness, and Contact Activities

- Instructor for People, Plants, and Environment. Reid Smeda and Mary Ann Gowdy, Instructors. University of Missouri, Columbia. Topic: Climate Change and More
- Instructor for Allen Thompson's Ag Systems Management class. Topic: Automated Weather Application for Agriculture;
- Weather presentation to numerous field days across the state;
- Agricultural weather presentation associated with MU's Winter Crop Conferences in Lamar, St. Joseph, Wentzville and Wellington, MO
- Missouri Climate Change session at MU's Annual Crop Management Conference
- Gave several "Historical Climate Trends" and "Climate Change talks across the state including Master Gardener and Master Naturalists groups
- Weather updates for MU Extension Quarterly Ag-Marketing Teleconferences
- Weather updates weekly for MU's IPM Agronomy and Horticulture Teleconferences (April-August)
- State Co-Coordinator of the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) in Missouri
- Member of the Missouri Drought Assessment Committee
- Member of the Plant Protection Programs steering committee
- Member of the North Central 1018 Regional Climate Committee: Food, Feed, Fuel and Fiber: Security Under a Changing Climate
- Member of the WERA 1012 Regional Coordinating Committee: Managing and Utilizing Precipitation Observations from Volunteer Networks
- Information resource for the following media outlets: Missouri Net, Brownfield Network, Cooperative Video Group, and numerous local television, radio, and newspaper outlets across the state;
- Participated in several NOAA Climate Service webinars hosted by the National Weather Service Central Region.

Nevada State Climate Office (NVSCO)

Department of Geography &
Atmospheric Sciences Graduate Program
University of Nevada
Reno, NV 89557-0048
Tel: 775-784-6999
nclimate@scsr.nevada.edu
jeffu@unr.edu
http://www.climate.unr.edu

Jeffrey Underwood, State Climatologist
Jeffrey Thompson, Assistant State Climatologist

The Nevada State Climate Office (NVSCO) was established under Nevada Revised Statute 396.595 with the mission of maintaining descriptions of information on the climate in the state including atmospheric conditions and levels of precipitation.

The NVSCO is currently undergoing a staff change. The Nevada State Climatologist, Dr. Jeffrey Underwood, has left the University of Nevada and taken a new position at Georgia Southern University. Dr. Kate Berry has taken on the position of interim state climatologist and the Department of Geography is currently working to search and acquire a permanent replacement for Dr. Underwood. Jeff Thompson, Assistant Nevada State Climatologist, continues in his role to maintain office operations and projects.

Data Collection and Reporting

The NVSCO continues its state mandated responsibility of providing a quarterly state climate summary. These reports have expanded in scope and content, with improved coverage of eastern and southern Nevada. The office is currently working to update and expand its team of cooperative observers, to grow the body of data available in these summaries. Davis Vantage Pro-2 weather stations and four-inch rain gauges were purchased to improve existing observer reports and help get new observers started. A federal earmark is also pending that would considerably grow the office and expand the NVSCO statewide data network. The network of precipitation storage gauges under NVSCO operation has also been repaired, recharged, and expanded, with past data reorganized and available for statistical use. The storage gauge number grew from 12 to 17 in 2010, and will expand to 30 by fall of this year.

Outreach

The NVSCO is connecting with the citizens of the Silver State in a number of new and exciting media and outreach efforts. In 2010, the Nevada Climate Office developed a facebook page, providing weather and climate information and office activities for a number of followers. The office continues to write a monthly article on weather and climate for several newspapers around the state. The NVSCO website was completely overhauled in 2009, and utilizes video, twitter, and flicker, allowing the public new ways to learn about and interact with the office. This site is again being reorganized and expanded to embrace other current projects.

Research

Several projects are underway, including the investigation of upper tropospheric rivers in the development of heavy flooding in the Sierra, thunderstorm climatology in relation to the Las Vegas Valley, the relationship of downslope flows and lightning, and lake-effect snowfall on Lake Tahoe.

AARSCO

The NVSCO co-hosted the 2010 annual meeting at Lake Tahoe with the Office of the California State Climatologist. Due to staffing and budget challenges, the office will be unable to send a representative in 2011.

New Hampshire State Climate Office (NHSCO)

University of New Hampshire
Department of Geography
73 Main Street
Durham, NH 03824
Tel: 603-862-3136
Fax: 603-862-4362
mary.stampone@unh.edu
http://www.unh.edu/stateclimatologist/

Mary Stampone, State Climatologist

The New Hampshire State Climate Office (NHSCO) resides within the Department of Geography at the University of New Hampshire – Durham, a land-, sea-, and space-grant institution. In concert with the mission of the University of New Hampshire, the goal of the NHSCO is to:

- Provide New Hampshire citizens and other constituents with climate information at the local, county, and state levels.
- Conduct research on climate-related issues relevant to the state of New Hampshire and its residents.
- Be a resource in climate science for educational and outreach purposes.

In keeping with this mission, the NHSCO has focused on providing the public with quality and timely information on weather and climate though research, outreach and educational activities. The NH State Climatologist participates in AASC activities, including attending the 35th Annual Meeting of the American Association of State Climatologists in July of 2010.

ARSCO Qualifications

The following activities address the NHSCO's qualifications as an ARSCO.

Communication Capabilities

The NHSCO regularly provides information on weather and climate to a wide variety of users including state agencies, local businesses, law enforcement, concerned citizens, K-12 and university faculty and students. Data and analyses are disseminated via the internet, email, telephone, regular mail and in person through interviews and presentations. The NHSCO also participated in the State Climatologist Exchange Program (SCEP), providing monthly weather and climate summaries for New Hampshire to the Northeast Regional Climate Center for publication in the monthly *New England Climate* reports. The NHSCO has continued to maintain a website that allows users, with various interests and skill levels, direct access to climate data from a variety of data repositories. The FAQ section of the website has been updated and the main page is regularly updated with information on current weather events and links to monthly reports, special reports, press releases and presentations available for download. A test page linking to the new, improved design is active and a transition to the new website will begin this summer.

Information Services

The NHSCO has responded to data requests from New Hampshire citizens, businesses, schools, and organizations and maintained a regular presence in local print, radio and television media. Through support provided by the SCEP, the NHSCO produced and disseminated monthly weather and climate summaries for New Hampshire beginning with August 2010. These documents provide state average and station temperature and precipitation statistics and graphics as well as a summary of recent weather patterns and events.

The NH State Climatologist regularly works with UNH Media Services to produce and disseminate information on significant weather and climate events. This work includes compiling and analyzing data for and writing press releases, conducting media interviews via the UNH skype connection as well as in person and telephone interviews with television, radio and print news journalists. Throughout the year, the NH State Climatologist provided winter weather information and seasonal outlooks to statewide media outlets and was quoted in both the regional and national news media. The NHSCO also serves as a resource of UNH journalism students and student reporters, providing information on a wide variety of scientific topics including weather, climate and natural hazards.

The NHSCO was consulted by the media on a wide variety of local topics including the summer 2010 heat and drought conditions, fall foliage, heavy winter snowfall, New England tornado and hurricane frequency, and climate change as well as national and international topics including the Gulf of Mexico oil spill and the Japanese earthquake and tsunami. Media communications include:

- Live interviews on the June 2010 Gorham tornado appeared on the WMUR/ABC9 evening newscast (6/7/2010), WTSN 1270 AM – *Morning Information Center* (6/11/2010), and 107.7FM *New Hampshire Today* (6/23/2010) as well as several print media articles.
- Webcasts for the WMUR/ABC9 "Storms that Changed New Hampshire"
- UNH Press Releases on the chances for a "White Christmas" and the 2010 "Warmest Year on Record"

Research

NHSCO staff presented results of ongoing research at regional conferences including the New England-St. Lawrence River Geographical Society Annual Meeting and the NWS-Weather Forecast Office at Gray, ME Spring Meeting.

- **Stampone, M.D.** (2010). New Hampshire Winter 2009/2010: Summary and Historical Context. New England - St. Lawrence Valley Geographical
- Cole, K.E. and **M.D. Stampone** (2010), New England Tornado Occurrence, Trends and Impacts – 1980 to 2009. New England - St. Lawrence Valley Geographical Society (NESTVAL) 2010, October 29 – 30, 2010, Storrs, CT.
- **Stampone, M.D.** (2010). New Hampshire Precipitation: Patterns and Trends. National Weather Service Weather Forecast Office – Gray, Maine Spring Meeting. May 20, 2010.

Work on data acquisition and analysis for a New England heat index climatology began in the fall of 2010. Results of this research, co-authored with NWS personnel, will be presented at the AMS 19th Conference on Applied Climatology

Outreach

Given the importance of community engagement and the public demand for quality, scientific information on climate science issues, the NHSCO is very involved in a variety of outreach programs and activities. The state climatologist is a co-coordinator for NH CoCoRaHS and supported community outreach proposals submitted by:

- TERC for the "Climate Literacy and Energy Awareness Network - New England (CLEAN-NE)" to the National Science Foundation Climate Change Education project;
- UNH-EOS for the "Albedo Climate Regulation" project proposed as part of the NSF EPSCoR RII Track-1 project entitled "Climate Change Science, Ecosystem Impacts and Mitigation through Efficiency and Alternative Energy."

In June 2010, the NH State Climatologist was appointed to the Mount Washington Observatory (MWO) Board of Trustees. As a trustee, the State Climatologist serves as a member of the Scientific Advisory Committee and was a member of the search committee for the Director of Research position, a joint academic position between Plymouth State University and the MWO.

Monitoring and impact assessment

The NHSCO continues to work closely with the NWS Forecast Offices in Gray, ME and Taunton, MA as well as the Mount Washington Observatory, Plymouth State University faculty, and UNH/NOAA National Ocean Service research faculty to coordinate and launch the NH CoCoRaHS network. In addition to leading and participating in regular CoCoRaHS training sessions, the State Climatologist worked with K-12 teachers and UNH faculty to develop coursework and classroom activities on precipitation monitoring. Now in the second year of CoCoRaHS New Hampshire, the network has more than 250 volunteer observers statewide.

In addition to hosting a CoCoRaHS station, the State Climatologist is also a NWS COOP observer. On August 1, 2010, the NHSCO assumed responsibility for daily NWS COOP observations at the UNH-Durham COOP station, which had been monitored by UNH Maintenance and Facilities personnel. Daily observations since August 1, 2010 have been recorded by NHSCO staff and reported to the NWS by the State Climatologist. Additionally, the NHSCO continues to be the point of contact for the two NOAA Climate Reference Network (CRN) stations located in southern New Hampshire.

The NHSCO worked with the National Climatic Data Center (NCDC) Climate Database Modernization Program, providing the NCDC Archives Manager with NH COOP records that were missing from the NCDC archive. The State Climatologist is also involved as a Co-PI with UNH faculty and Cooperative Extension personnel to work with NHDES on a funded to project to revise the State Drought Management Plan. Work on New Hampshire drought analysis and management plan revisions are scheduled to begin July 2011.

Office of the New Jersey State Climatologist (ONJSC)

Center for Environmental Prediction
NJ Agricultural Experiment Station
School of Environmental and Biological Sciences
Department of Geography
Rutgers University
54 Joyce Kilmer Ave.
Piscataway, NJ 08854
Tel: 732-445-4741
Fax: 732-445-0006
drobins@rci.rutgers.edu
http://climate.rutgers.edu/stateclim

David A. Robinson, NJ State Climatologist
Mathieu Gerbush, Assistant State Climatologist/Climate Services
Keith Arnesen, Assistant State Climatologist/Agricultural
Chad Shmukler, Technical Director
John Read, Technical Assistant

Founded in 1979, the Office of the New Jersey State Climatologist (ONJSC) resides within the Rutgers University Center for Environmental Prediction. Our mission is to monitor and understand the diverse weather and climate conditions experienced across the Garden State on various temporal and spatial scales. Included are efforts to inform and educate, thus making the 8.7 million residents of this most densely populated state weather and climate aware.

The ONJSC operates the New Jersey Weather and Climate Network, or NJWxNet. This unique network of over 150 weather stations (http://climate.rutgers.edu/njwxnet) serves as a one-stop Internet resource for New Jersey weather and climate data. The NJWxNet is a network of networks, including, among others, NJ Dept. Transportation RWIS, NWS ASOS, South Jersey Resource Conservation and Development Council RISE, NOAA IFLOWS, USGS stations and two networks operated by the ONJSC. Stations operated by ONJSC include 15 NJ Mesonet sites, monitoring a rich suite of atmospheric and surface variables, and 25 NJ SafetyNet stations, monitoring a subset of important variables primarily at public safety agencies. Hourly observations are collected and displayed in real time as colorful maps and tables on the NJWxNet web site. This past year marked further upgrades of our various servers. Mesonet upgrades continued and renewed support was received from the NJDEP, US Forest Service and NJ Office of Emergency Management. Using network data, we have been working with NJ agriculture extension colleagues to develop indices for blueberries and apples and with these individuals and others at Cornell on a grape growth index. We continue to partner with the US Forest Service on data gathering and display associated with fire danger monitoring.

New Jersey's third year in the Community Collaborative Rain, Hail and Snow Network saw more than 200 observers submitting vital observations. Our color-filled state and regional maps of precipitation, snowfall, snow cover and snow water equivalent continue to be popular (http://climate.rutgers.edu/stateclim/?section=menu&%20target=CoCoRaHS). In addition to the

NJWxNet and NJ CoCoRaHS, the ONJSC maintains a comprehensive archive of historical data, metadata and climatologies from National Weather Service primary and cooperative stations. This is supplemented with data submitted by ONJSC volunteer observers. This information is manually processed and displayed in event, weekly and monthly maps and tables. One of the most popular pages includes snowfall observations for any event depositing 2" or more snow at any location in the state. This included 13 events this past winter, two of which deposited more than 18" in portions of the state. Over 200 observations were posted for several of the events and the webpage has been visited over 20,000 times since January 1, 2011.

Research endeavors within the ONJSC range from student projects on topics such as regional heat islands and snow climatologies to collaborative efforts with Rutgers colleagues and state and federal agencies. Century-long state wide and regional climatologies of snowfall will soon be posted on the ONJSC website. So too will research regarding the utility of NWS monthly and seasonal outlooks for the Garden State soon be posted. Examples of ONJSC outreach activities include participation in the Liberty Science Center teacher training program, the creation of online weather training materials for NJ public safety officials, and a wealth of interviews and presentations. The office gave approximately 150 interviews in the first five months of 2011.

The ONJSC continued our monthly reports of NJ weather and climate highlights, including societal impacts. Reports are shared with the Northeast Regional Climate Center, posted on the AASC national website and on the ONJSC website, and published in the "Weather Shelter" newsletter of the North Jersey Weather Observers.

ARSCO Qualifications

The ONJSC is an American Association of State Climatologists (AASC) Recognized State Climate Office (ARSCO). As such, the office fulfills a number of qualifications outlined below.

Communication Capabilities

- Ingest, process, archive and disseminate historic and real time climate data.
- Maintain numerous web sites related to the ONJSC mission (http://climate.rutgers.edu/stateclim).

Information Services

- More than 500 specific requests for data and products each year.
- More than 500 unique visits to ONJSC web sites each day.
- Weekly and monthly climate summaries in map and tabular form.

Research

- Collaborate with Rutgers colleagues, as well as state and federal agencies on projects associated with issues such as forest fire management, pest management, agriculture, transportation, water resources, public safety, homeland security.

- Student research on topics such as urban heat islands, state snow cover variability, ocean influences on state weather and climate.

Outreach

- Up to several hundred media interviews each year.
- Presentations to schools, civic organizations, Liberty Science Center, etc.
- Conference presentations to the 4-H Climate Change Workshop, the North Jersey Transportation Planning Authority, the Delaware River Flood Warning Workshop, the Pinelands Short Course program, and many others.
- The NJ State Climatologist is a member of the National Academy of Sciences Board of Atmospheric Sciences and Climate, the NOAA Climate Working Group, the NWS StormReady Community Program advisory board, the Liberty Science Center Education and Teaching Advisory Committee, and a Sustainable Jersey climate committee.

Monitoring and Impact Assessment

- Operation of the NJWxNet (http://climate.rutgers.edu/njwxnet).
- State operation of NJ CoCoRaHS
- Web site updates for significant winter events.
- The NJ State Climatologist is a member of the NJ Drought advisory committee.
- Statewide climate variability and change is being assessed through the NJ Climate Report Card project (http://climate.rutgers.edu/stateclim_v1/climreportcard/climate_report_card.html).

New Mexico Climate Center (NMCC)

Department of Plant and Environmental Science
New Mexico State University
P.O. Box 30003, MSC 3Q
Las Cruces, NM 88003
Tel: 505-646-2974
dwdubois@nmsu.edu
http://weather.nmsu.edu/

David DuBois, State Climatologist (for T. Sammis, former SC)
Stanley Engle, Database Administrator
Murali Sithraj, Graduate Student Assistant

General Information

The New Mexico Climate Center (NMCC) resides within the Department of Plant and Environmental Sciences of the Agricultural Experiment Station at New Mexico State University (NMSU) in Las Cruces, New Mexico. The climate center is comprised of one faculty position, a part-time staff position, and a graduate student assistant. By law, the duties of the NMCC are to (1) assess the effect of climate on the natural environment, agricultural production, land and natural resources and human health, (2) coordinate climate impact studies and programs, (3) consult and coordinate with the federal and state agencies government in climate related activities, and (4) disseminate climate data, information, advice, and assessments to state and local agencies and the general public.

Information Services

The NMCC collects, archives, and disseminates climate data from official U.S. government and private observing stations throughout New Mexico. Additionally, the NMCC maintains a network of 16 automated weather stations throughout the state that are used primarily for agricultural purposes. In all, daily data from approximately 179 sites is collected, processed, and distributed via the NMCC website (http://weather.nmsu.edu/). In 2010, the NMCC website had again an estimated over two million page hits for climate information and data. Many other requests were also answered by phone and email. In addition, the New Mexico Climate Center provided a variety of web based tools for decision support in the areas of agriculture, hydrology, construction, health and economic development. Drought information was posted by not only the New Mexico climate center which looked at meteorological drought but by the New Mexico Drought Task Force which posted information on all aspects of drought.

Research

Research activities in 2010 consisted of applied research in which climatic information was used for studies involving crop improvement, irrigation/water management, and air quality studies. The Climate Center continued to be heavily involved in a four year air quality and health study covering southern New Mexico. The principal investigator, Dave DuBois, directed a team of a

dozen researchers at four universities to investigate the linkages between air quality conditions and respiratory health among several communities near and along the US/Mexico border region.

Research also continued in the numerical modeling analysis of air mass trajectories for use in air quality studies in the southeast US (Koracin et al., 2010) and Minnesota (Chen et al., 2010a; 2010b; 2010b). This research was in collaboration with air quality researchers at the Desert Research Institute's Division of Atmospheric Sciences. Another research thread that we were involved with is in the area of satellite remote sensing. One project was to use satellite imagery for pecan orchard management and crop water use assessments. A graduate student investigated an approach to determine the fractional canopy cover from a combination of aerial imagery, orchard floor photographs, and satellite images. I also have a graduate student looking into estimating soil moisture using satellite remote sensing. His research "Radiometric estimation of bare soil surface moisture in a mixed pixel" will be useful in predicting the potential for wind erosion and other agricultural applications.

Outreach

A Facebook page for the Climate Center was started this year and will be used for sharing information about climate locally and abroad. In conjunction with an air quality project a blog, http://nmborderaq.blogspot.com/, was started to document air quality and climatic conditions along the New Mexico/Mexico border region. I participated in a summer science teacher training academy by giving information on climate and drought. This reached out to over 100 elementary and high school teachers across the state. I also took advantage of several opportunities to give elementary school demonstrations on climate and air quality in Las Cruces.

Goals

Plans for 2011 include the continued improvement of the Climate Center website and the roll-out of the new climate database interface. We will also be expanding our outreach using Twitter and a blog for providing climate and drought information to the public. With the financial assistance of the AASC we will be creating metadata for many NWS cooperative observation stations in southern New Mexico. The results of this will be posted on the NMCC webpage. The Climate Center will continue to work with the Climate Assessment of the Southwest (CLIMAS) program at the University of Arizona to continue work in the area of climate services. This year we will be expanding the research focus on climate assessments and more specifically looking at climate adaptation and the role of cooperative extension throughout the state. We are developing a plan for conducting a series of focus groups with diverse stakeholders, from a range of different climate sensitive sectors to capture snapshots of local climate science and services needs across rural areas of NM.

Peer Reviewed Publications

Koracin, D., R. Vellore, D.H. Lowenthal, J.G. Watson, J. Koracin, T. McCord, D.W. DuBois, L.-W. Antony Chen, N. Kumar, E.M. Knipping, N.J.M. Wheeler, K. Craig, and S. Reid (2010). Regional source identification using Lagrangian stochastic particle dispersion and HYSPLIT backward-trajectory models. Accepted for publication in the Journal of the Air & Waste Management Association

Chen, L.-W.A., J.G. Watson, J.C. Chow, D.W. DuBois, L. Herschberger (2010a). Chemical mass balance source apportionment for combined PM2.5 measurements from U.S. non-urban and urban long-term networks. Accepted for publication in Atmospheric Environment

Chen, L.-W.A., J.G. Watson, J.C. Chow, D. DuBois, and L. Herschberger (2010b). PM2.5 Source Apportionment in Minnesota, USA: Reconciling Receptor Models for Urban and Rural Monitoring Networks. Accepted for publication in the Journal of the Air & Waste Management Association

Chen, L.-W.A., J.G. Watson, J.C. Chow, D. DuBois, and L. Herschberger (2010c). PM2.5 Source Apportionment in Minnesota, USA: Application of the Chemical Mass Balance Method to Urban and Rural Monitoring Networks. Accepted for publication in Environmental Science & Technology

Technical Reports

DuBois, D., J. Greenlee, Z. Edwards, S. Sanogo, R. Fitzgerald, M. Shukla, and E. Ward. (2010). FY2011 Phase II Work Plan for the Assessment of Land-based Sources of Air Quality Contaminants in the Binational Border Region of Southwestern New Mexico, Northwestern Chihuahua and West Texas. Prepared for the Office of Border Health, Las Cruces, NM. December 31, 2010

DuBois, D., J. Greenlee, Z. Edwards, and E. Ward. (2010). Inventory of existing air quality and climatological monitoring stations in the project area. Prepared for the Office of Border Health, Las Cruces, NM. September 30, 2010

DuBois, D. (2010). Binational Border Region Air Quality Study technical report for FY 2010 prepared for the New Mexico Department of Health, Office of Border Health, Las Cruces, NM, June 30, 2010

DuBois, D., R. Tropp and I. Kavouras. (2010). Sunland Park low wind $PM_{2.5}$ exceedances study, Final Technical Report. Prepared for the New Mexico Environment Department, Air Quality Bureau, Santa Fe, NM

State Climate Office of North Carolina

1005 Capability Drive, Suite 100
Box 7236, NC State University
Raleigh, NC 27695-7236
Tel: 919-515-3056
Fax: 919-515-1441
sco@climate.ncsu.edu
http://www.nc-climate.ncsu.edu

Ryan Boyles, Director and State Climatologist
Ameenulla Syed, Associate Director and Manager, NC ECONet
Aaron Sims, Assistant State Climatologist
Mark Brooks, Climate Services Coordinator
Ashley Frazier, Environmental Meteorologist
Sean Heuser, Instrumentation Meteorologist
John Mc Guire, Environmental Meteorologist
Bic Fort, Assistant to the Director

The State Climate Office of North Carolina is a public service center at NC State University. It serves as the American Association of State Climatologists Recognized State Climate Office (ARSCO) for North Carolina. Its public service mission includes extension, research, and educational components.

Extension efforts in 2010-2011 were focused on delivery of services through direct interaction and communication with clients, partnerships with state agencies, and collaboration with extension specialists and scientists at NC State University. Significant extension activities over this period include development of several new web-tools, improvements to the climate database, development and deployment of agricultural tools with research partners, and improvements to the NC ECONet.

Research efforts in the past year focused on the study of North Carolina's climate and its interaction with the environment. Specific activities include model improvements, analysis of radar-based precipitation, impacts of climate patterns on NC weather and SE agriculture, and analysis of advanced downscaling methods.

- 2 manuscripts were successfully published and 3 additional submitted to peer-reviewed journals
- 12 presentations were given at 10 scientific conferences, and 7 staff attended 13 scientific meetings

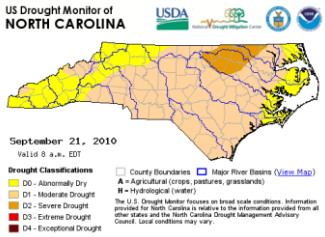
Educational outreach activities in the State Climate Office are designed so that climate scientists interact with K-12, college teachers and students, and with other community organizations on different aspects of NC climate and environment. Specific activities in 2010-2011 include undergraduate and graduate student training, middle school internships, and contributions to the NC Science Olympiad and NOAA Hurricane Awareness Tour.

Climate Service Highlights

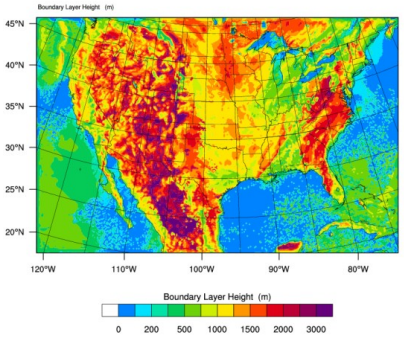
Requests for Services: Interest from clients during 2010-2011 resulted in a 12% increase in time spent directly responding to requests for services from clients as compared with the previous year. Clients request services via email, phone, and through the Climate Office website. A large percentage of time is devoted to supporting requests from faculty, staff, and students at Universities. 58% of time for requested services was in response to Universities, with 44% of all time supporting requests from within the UNC system, which is a 5-10% increase in effort as compared to previous years.

Monthly climate summaries: Climate summary reports are prepared each month to highlight climate patterns and impacts to agriculture and water resources in NC. These are distributed via a monthly online newsletter, reports to NOAA through the Southeast Regional Climate Center (SERCC), and through the Southeast Climate Consortium's (SECC) AgroClimate.org resource. The SCO also uses the newsletters to inform users about SCO products and services. Currently, monthly climate summaries and news is distributed to hundreds of users using science teacher and agriculture extension email list servers. In addition, 416 individuals have signed up to directly receive these products via email each month.

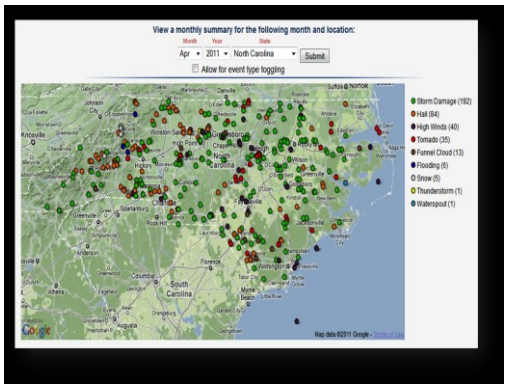
Drought Monitoring and Response: SCO is a member of the NC Drought Management Advisory Committee, participating in weekly drought monitoring conference calls and providing public presentations on drought in NC. Drought monitoring products have been developed and are used each week for discussions on depictions of drought severity as part of communicated recommendations to the US Drought Monitor. Drought has been present in NC to some extent since the summer of 2010, and the SCO has provided routine updates on drought conditions and impacts through the Drought Management Advisory Committee, monthly climate summaries and newsletters, and interviews for print and broadcast news media.



Environmental Modeling: SCO continues to produce experimental numerical weather forecast guidance using the Weather Research Forecast model. These simulations are available for use by the public, and are distributed to partners including National Weather Service. Moreover, these simulations provide guidance to support a series of agricultural projects, including peanut disease guidance, the ipmPIPE for cucurbits, and new efforts with smoke dispersion.



Weather Extremes: A dynamic web product provides weather extremes for a given region (among the entire state, climate divisions, counties and weather stations) and a given time period (among all-time data, a specific month, and a specific day). This includes up to five events for each extreme, along with a map product showing the most extreme events on a state and climate division level.



Local Storm Reports Database: This new web tool provides a searchable archive of Local Storm Reports (LSRs) issued by National Weather Service offices across the country, which includes the ability to filter by date, location and event type. This product has been used to aid users in identifying possible storm events that caused property damage, and has been used internally when creating monthly climate summaries.

Global Climate Patterns: A new series of educational pages were created to explain the influences of global climate patterns (such as ENSO, AO/NAO, PNA, and PDO) on seasonal and long-term climate variability across the Southeastern U.S. The pages include detailed explanations of each pattern, along with examples of past cases and the resultant effects on North Carolina and the Southeastern U.S. Additionally, interactions between the individual patterns are examined.

Research Highlights

Data Assimilation for Improved Model Forecasts: Work continues to improve SCO experimental forecasts and as a mechanism for developing a high-resolution model-based climatology dataset. In the past year, a new technique that combines both 3D-VAR and FDDA methods was tested and is being evaluated. In addition, a series of model sensitivities studies were performed to investigate the impacts of soil moisture, boundary conditions, and model physics options.

Evaluation of Multi-Sensor Precipitation Estimates (MPE): SCO uses MPE products provided by NWS River Forecast Centers and the National Center for Environmental Prediction in several products and tools used by DOT, DWR, TVA, and others. As part of the ongoing use of the data, SCO has completed an evaluation of MPE across the eastern United States.

Development of Q2 Climatology: Through the NOAA Cooperative Institute for Climate and Satellites (CICS), SCO is developing a radar-based precipitation climatology using NSSL's 2nd generation precipitation estimation technique, called Q2. Q2 provides very high resolution (1 km spatial, 5 minute temporal) estimates of rainfall using a combination of radar, models, and surface observations.

Global Climate Patterns: SCO continues to look at the relationship between climate patterns and NC winter weather patterns, especially the NAO and NC snowfall. Analysis includes looking at the phase and phase change of NAO and its relation to snowfall, along with how the location of the negative phase anomalies impacts NC winter weather.

Evaluation of Geospatial Downscaling of Precipitation in the Southeast US: Working with Dr. Guillermo Baigorria at the University of Florida, SCO is implementing and evaluating a technique to provide advanced geospatial downscaling for seasonal and climate change forecasts over the Southeastern US.

Educational Outreach Highlights

Undergraduate & Graduate Student Training: SCO supported 6 undergraduate and 4 graduate students over the past year.

Invited Presentations and Visitor Programs: SCO staff provided 20 presentations by invitation and tours and programs for 12 visitor groups for a total of 1471 Direct Educational Outreach Contact Hours.

Centennial Campus Middle School Internship: SCO hosted three 7th grade student interns from Centennial Campus Magnet Middle School for the period October 2010 through March 2011. SCO received the 2011 Centennial Campus Magnet Middle School's Partnership Award for its seven years of collaboration with CCMMS

NC Science Olympiad: Science Olympiad is an annual science contest for middle and high school students. The theme for the state contest in 2011 was "Severe Storms", and the SCO has worked extensively to implement a test event for the NCSU State Tournament, held on April 30.

Hurricane Awareness Tour: On May 4, 2011 the SCO participated in the Hurricane Awareness Tour at Cherry Point Marine Corps Air Station. Office staff and students helped run the SCO information tent, which was visited by the nearly 1,300 school children, VIPs, and general public who attended the event.

Science House Partnership: SCO continues to work with The Science House at NC State University to improve its educational outreach efforts. In the past year, this has led to the implementation of 2 web-based climate education resources targeted for Agriculture Extension Agents and K-12 educators. The Science House, and SCO as a partner, received the 2011 Opal Mann Green Engagement and Scholarship Award

North Dakota State Climate Office (NDSCO)

North Dakota State University
231 Walster Hall
P.O. Box 6050
Fargo, NC 58105-6050
Tel: 701-231-6577
Fax: 701-231-7861
Adnan.Akyuz@ndsu.edu
http://www.ndsu.edu/ndsco

Adnan Akyüz, Assistant Professor of Climatology and State Climatologist

---

Mission Statement

The mission of the North Dakota State Climate Office is to advance the use of climate information for the economic and environmental benefit of North Dakota and the public safety of its citizens, through climate monitoring, research, education, and extension and information services.

ARSCO Qualifications

NDSCO has been recognition by the AASC as the official state climate office for North Dakota since March 2007. NDSCO also enjoys the support from local National Weather Service Forecast office in Fargo-Grand Forks, High Plains Regional Climate Center and holds a Memorandum of Agreement between NCDC and the State Representative. In addition, the following describes the ways in which NDSCO addresses each of the ARSCO qualifications:

Observation Capabilities

The State Climate Office operates an Automated Weather Monitoring Network called The North Dakota Agricultural Weather Network (NDAWN) which consists of 72 stations distributed across North Dakota, the Red River Valley, and border regions of surrounding states.

Communication Capabilities

The North Dakota State Climate Office oversees the operation of the NDAWN Center. The access information to NDAWN Center and the services are listed below:

- North Dakota Agricultural Weather (NDAWN): http://ndawn.ndsu.nodak.edu/
- NDAWN Weather Data
  - Tables and Maps (Hourly, Daily, Weekly, Monthly, Annually, Normals, Departure from Normal)

  http://ndawn.ndsu.nodak.edu/hourly-table-form.html
- NDAWN Agricultural Applications
  - Barley, Canola, Corn, Potato, Sugar beet, Sunflower, Wheat, Small Grains, Crop Water Use, Insect Development, Degree day for the energy use. http://ndawn.ndsu.nodak.edu/applications.html

- Answers e-mails requesting climate information or asking climate related questions frequently.
- Regularly answers to telephone requests
- Frequent media contacts

Peer Reviewed Publications

- Badh, A., F. A. Akyüz, 2010: Studying Climate Change and Precipitation Trends for North Dakota, United State. International Journal of Climate Change: Impacts and Responses, Volume 2, Issue 2, pp.97-108.
- Badh, A., F. A. Akyüz, 2010: Evaluating Trend Changes in Annual Accumulated Growing Degree Days for Corn Grown in the Northern Plains, United States of America. International Journal of Climate Change: Impacts and Responses, Volume 2, Issue 2, pp.127-136.

Non Peer-Reviewed Publications

- Akyüz, F. A., B. Mullins, and D. Morlock, 2010: Agricultural Decision Making Using North Dakota Agricultural Weather Network. European Conference on Applied Climatology. EMS. September 13-17. Zurich, Switzerland.
- Willson, G. D., and F. A. Akyüz, 2010: Survival of the Western Prairie Fringed Orchid at Pipestone National Monument. Park Science. 2:1, Spring 2010. 50-51.
- Navaratnam L, F. A. Akyüz, P. Oduor, G. Padmanabhan. 2010: Geospatial Analysis of Drought Impact and Severity in North Dakota, USA Using Remote Sensing and GIS. 18th Conference on Applied Climate, AMS. Atlanta, GA. January 17-21, 2010.
- Badh, A., Akyuz, A. Climate Change as seen in thermal unit accumulation in Fargo, USA. International Seminar on Climate Change: Spatial concerns and Mitigation Strategies 2010, Institute of spatial planning and environmental research, Haryana, India 16 -18 December 2010
- Badh, A., Akyuz, A. Demonstrating the annual accumulated growing degree units under the changing climate. The International Conference on Climate Change: Impacts and Responses 2010, University of Queensland, Brisbane, Australia 8-10 July 2010.
- Badh, A., Akyuz, A. Studying Climate change and Precipitation trends of North Dakota, United States. The International Conference on Climate Change: Impacts and Responses 2010, University of Queensland, Brisbane, Australia 8-10 July 2010.
- Akyuz, F. A., B. Mullins. 2010: 2009 Growing Season Weather Summary for North Dakota. North Dakota Dry Bean Performance Testing 2009. North Dakota State University, Agricultural Experiment Station. A-654.

Invited Presentations

- Growing Degree Days Application for Soybean. North Dakota Soybean Counsel. November 18, 2010. Fargo, ND.
- Drought Monitor and Impact in ND. Missouri River Basin Drought Workshop. November 16-17, 2010. Lincoln, NE.
- Keynote Speaker: Climate Change Facts and Myths: Sierra Club. Fargo, ND. October 19, 2010.
- Agricultural Decision Making Using North Dakota Agricultural Weather Network. European Conference on Applied Climatology. EMS. September 13-17. Zurich, Switzerland
- Keynote Speaker: Global Climate Change: It is Natural. Minot Skeptical Society. August 5, 2010. Minot, ND.
- Climate Services in ND. Regional Climate Center and State Climate Office meeting. High Plains Regional Climate Center. August 11, 2010. Lincoln, NE.
- NDAWN Use in Agricultural Application: Wheat Quality Counsel Training. July 26, 2010. Fargo, ND.
- Keynote Speaker: Climate Change and its Local Implication to Oats Growers. Pepsico First Annual Oats Agro University Workshop Dinner. July 26, 2010. Fargo, ND.
- State of the Climate and Climate Services in ND. American Association of State Climatologists Annual Meeting. July 14, 2010. Lake Tahoe, CA.
- Precipitation Monitoring Networks in ND. WERA 1012 Multistate Annual Meeting. May 18, 2010. Estes Park, CO.
- NDAWN Agricultural Application Impact in ND Agriculture. Grower/Customer Meeting. March 2, 2010. Pisek, ND.
- Keynote Speaker. Climate Change Impact on ND Agriculture. Farm Management Seminar. February 25, 2010. Hankinson, ND.
- Climate Change (Session 1). North Dakota Farm Bureau Young Farmers and Ranchers Leadership Conference. January 30, 2010. Minot, ND.
- Climate Change (Session 2). North Dakota Farm Bureau Young Farmers and Ranchers Leadership Conference. January 30, 2010. Minot, ND.
- Climate Change and its Potential Implications in the Northern Plains". North Dakota Game and Fish Department Annual Meeting. January 21, 2010. Fargo, ND.
- Keynote Speaker. State Climatologist. University Staff Senate Annual Meeting. January 6, 2010. NDSU, Fargo, ND.

List of Media Presentations and Spots Made

There were total of 55 media presentations made in 2010: 15 TV, 13 Radio, and 27 Newspaper and Magazine spots.

Oklahoma Climatological Survey (OCS)

University of Oklahoma
120 David L. Boren Blvd., Suite 2900
Norman, OK 73072
Tel: 405-325-2541
Fax: 405-325-2550
ocs@ou.edu
http://climate.ok.gov/

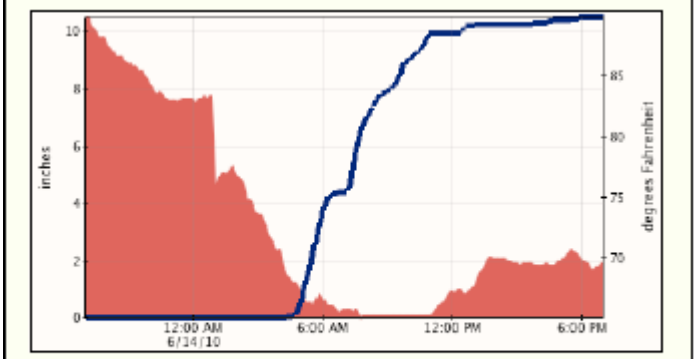
Renee McPherson, State Climatologist
Gary McManus, Associate State Climatologist
Mark Shafer, Climatologist & Director of the Southern Climate Impacts Planning Program

---

The Oklahoma Climatological Survey (OCS) worked with colleagues across Oklahoma and the Great Plains to facilitate better coordination and planning with regard to the impacts of climate variability and change. For example, OCS scientists worked with the National Drought Mitigation Center at the University of Nebraska–Lincoln and the Illinois State Water Survey at the University of Illinois to complete the Drought-Ready Communities pilot project, including a *Guide to Community Drought Preparedness* (http://www.drought.unl.edu/plan/DRC.htm). OCS teamed with the City of Norman on this pilot, developing a case study for Norman based on the final project reports of the 2010 class of Applied Climatology and Meteorology at the University of Oklahoma (OU).

OCS scientists furnished data, products, and information to the Oklahoma Water Resources Board as part of the Oklahoma Comprehensive Water Plan. OCS provided frequent assessments of and context to hazardous weather events to help document event intensity and size for the Oklahoma Department of Emergency Management. At the end of 2010, OCS scientists began work on a large proposal ($4 million) to the U.S. Department of the Interior for OU to serve as host of the South-central Climate Science Center — a major new initiative that would bring researchers from the U.S. Geological Survey to the OU campus.

OCS also participated in the American Association of State Climatologists conference, the Knowledge Management Workshop and the Sectorial and Regional Assessments Workshop for the National Climate Assessment, Annual Meeting of the American Meteorological Society (AMS), the AMS Summer Community Meeting, Governor's Water Conference, OWRRI Water Research Symposium, Norman Chamber of Commerce Weather Committee, Artificial Recharge Task Force meetings, Oklahoma EPSCoR Women in Science Conference, Moore Public Schools Discovery Night, National Severe Weather Workshop, Science Fest Oklahoma, and the Tri-County Homeschool Back-to-School night.



Observations of temperature (red) and rainfall (blue line) during the June 14, 2010 heavy rainfall event, as measured by the Oklahoma City North Mesonet site.

OCS presented for the the AMS Summer Community Meeting (*Update on the Activities of the AMS NNoN Working Group on Metadata Policy*), American Farmers and Ranchers of Oklahoma convention (*Global Climate Change and Its Implications for Oklahoma*), Bureau of Reclamation Informational Meeting on Climate Change (*Climate Variability of the Great Plains*), SAIC Regional Climate Symposium (*Global Climate Change & Its Implications for OK*), Black Sunday 75th Anniversary Conference (*The Dust Bowl: Lessons Learned ... And Lost*), Oklahoma Society of Professional Engineers conference (*The Dust Bowl: Lessons Learned ... And Lost*), Oklahoma Emergency Management Association Conference, American Society of Flood Plain Managers, and the National Weather Center Weather Festival. Our scientists taught graduate and undergraduate courses in the OU School of Meteorology, including Applied Climatology and Meteorology, Hydrometeorology, and the Honors section of Introduction to Meteorology. McPherson served as Chair of the Metadata Working Group of the American Meteorological Society (AMS) Ad Hoc Committee for a Nationwide Network of Networks, Member of the AMS Weather and Climate Enterprise Commission, Member of the American Association of State Climatologists (AASC) Review Committee for the Dissertation Medal for Applied Climatology, and Subject Matter Expert for the Committee for Integrated Observing Systems (Office of the Federal Coordinator of Meteorology). Fiebrich served as member of the AMS Committee on Measurements and PASS Science Standards Review Committee.

OCS received funding from the Oklahoma Water Resources Research Institute for a project to develop a system for tracking plant available water based on the Oklahoma Mesonet data. The goals of the project were to (1) determine the soil properties controlling the plant availability of soil moisture at each Oklahoma Mesonet site, and (2) develop a method to calculate plant available water by integrating the sensor output and the site-specific soil properties. Funding also was received from Oklahoma State University to develop a grape black rot advisor. Internationally, OCS received funding from the Province of Québec, Canada, to continue development of software tools for Mesonet-Québec.

A new OCS director was named in 2010: Dr. Kevin Kloesel, who also serves as the Associate Dean for the College of Atmospheric and Geographic Sciences. At the end of 2010, OCS employed 32 professional staff, 6 graduate students, and 8 undergraduates. We administered 30 financial accounts with a fiscal year (July 1, 2009 to June 30, 2010) budget totaling $4.3 million.

Information Services

OCS served 119 million files of data and products to our customers in 2010. On our web servers alone, we served 15.8 Terabytes of information from 1.3 billion hits to our web pages. We also fulfilled several hundred detailed information requests from phone or email, generating $12,679 in revenue.

During the summer of 2010, OCS launched a new Oklahoma Mesonet public website (see figure below) at http://weather.ok.gov. New features of the website include the following: local forecasts, enhanced radar imagery, searchable products, and thumbnail map views. The website also allows the user to view data from the closest Mesonet site by entering their zip code or town name. Along with the new public website, we released a mobile website. Users who access www.mesonet.org from a mobile device will automatically be redirected to the mobile website. The new mobile website added to the suite of information delivery systems that provide data and products to customers. Other delivery methods include our RSS feeds of news items, our Ticker email list, our state climate office page at www.stateclimate.org, and the Oklahoma Mesonet Facebook page.

During the past year, several new climate information tools were developed by the SCIPP team and evaluated with the help of stakeholders. These include the Historical Climate Trends Tool, Climograph Tool, and Historical Coastal Surge Map powered by the SURGEDAT database.

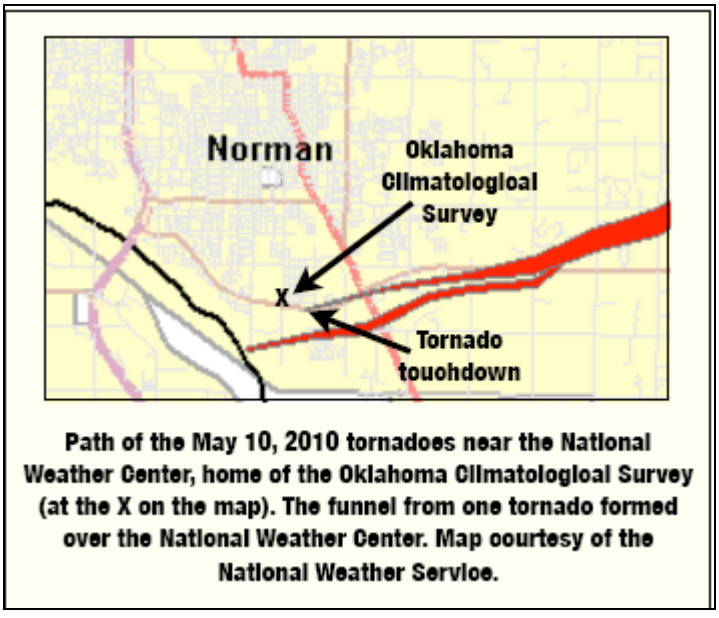
Research

OCS's legislative mandate includes the analysis and publication of studies focused on weather and climate in the state. Projects undertaken during 2010 examined high-impact winter weather over the past decade, land-atmosphere interactions across varying spatial and temporal scales, and the evaluation of forecast tools used by the National Weather Service. For examples of scientific publications and reports (OCS authors underlined), click here.

Monitoring and Impact Assessment

Statewide, 2010 was Oklahoma's 36th warmest and 43rd driest year since record-keeping began in 1895. The year saw El Nino-Southern Oscillation conditions transition from a strong El Nino in the first half of 2010 to a strong La Nina by year's end. Accordingly, the first half of 2010 in Oklahoma was generally wet while significant drought conditions had developed by early winter.

The significant winter weather that began in December 2009 continued into 2010. A powerful winter storm struck southwestern and south-central Oklahoma, depositing up to an inch of ice on power lines. About 180,000 utility customers were left without power due to the storm. May started with only three tornadoes on the record books but ended with 93. The 90 tornadoes during the month tied Oklahoma's record for most in a single month, previously set in May 1999. The annual total of 102 tornadoes ranks as the third highest in Oklahoma since 1950. A strong tornado on the year's final day punctuated the tumultuous Oklahoma weather of 2010. Five major disasters or emergencies were declared in Oklahoma during 2010 (via the Federal Emergency Management Agency), placing our state second in the nation.



Path of the May 10, 2010 tornadoes near the National Weather Center, home of the Oklahoma Climatological Survey (at the X on the map). The funnel from one tornado formed over the National Weather Center. Map courtesy of the National Weather Service.

The Oklahoma Mesonet station in north Oklahoma City measured 11.47 inches of rain on June 14th, the second highest daily total measured by the Mesonet and 16th highest in the state's history. (a cooperative observation station in Enid measured 15.68 inches on October 11, 1973.) Almost 10

inches of this rain fell in only 12 hours and resulted in significant flooding in parts of Oklahoma City and Edmond.

The Southern Climate Impacts Planning Program began conducting interviews with various state, federal, local, and tribal officials across Oklahoma as part of a statewide climate needs assessment. The needs assessment focused on the following: (1) climate-related issues that decision-makers are currently facing, (2) those they anticipate they will face in the future, (3) the spatial and temporal scales in which they make decisions, and (4) their need for information, education, and decision-support tools. This work will support the National Climate Assessment, led by the U.S. Global Change Research Program.

OCS operates and maintains weather and climate stations in partnership with the Oklahoma Mesonet, the Agriculture Research Service, and the City of Oklahoma City (decommissioned in June 2010). In 2010, we completed 1,833 laboratory calibrations of sensors, including 386 calibrations for relative humidity, 395 for air temperature, 233 for wind speed, and 555 for soil temperature. To maintain our remote sites and sensors in the field, we conducted 502 site visits to 120 Oklahoma Mesonet stations, 35 visits to 20 Little Washita Micronet stations, and 50 visits to 15 Fort Cobb Micronet stations. We found and repaired 302 sensor or communications problems in these networks.

Outreach

OCS hosted 32 K-12 programs, providing education to 2,145 students and 318 teachers and adults, and conducted 20 OK-First workshops, thereby educating 232 public safety officials. To aid our law enforcement participants, we obtained CLEET (Council on Law Enforcement Education and Training) certification for our OK-First courses. We also hosted field trips for over a dozen Oklahoma schools to the National Weather Center. Training for 258 fire management professionals were conducted through 28 basic and advanced sessions.

OCS issued 18 press releases during 2010 and contributed to well over 100 print and internet stories with the state's largest newspaper. We contributed to national stories with *USA Today*, Reuters, the Associated Press, and *The Weather Channel*. Regular contributions were made to smaller newspapers as well. Almost 100 *OCS/Mesonet Ticker* emails were sent to the media, state agencies, and weather enthusiasts, providing descriptions of current weather events and their context in Oklahoma's recorded climate history. We participated in 40 SUNUP Mesonet Weather Report television segments. Outreach of OCS scientists Illston and Basara resulted in the 2010 Special Award from the American Meteorological Society for "a new paradigm for the nation's weather forecasting enterprise based on a voluntary grassroots effort, with impressive national impact through its use in curricula at scores of universities" for work in the WxChallenge, a weather forecasting contest primarily for university and college students and faculty.

Through the OU Speaker Service, we provided the following talks across Oklahoma: *Dust bowl: Lessons Learned... and Lost* (7 talks, G. McManus) and *Climate Change* (6 talks, McManus). Other outreach presentations covered general weather and climate for youth, climate concerns for agriculture, weather tools for crop production, weather impacts on livestock, and weather tools to reduce pesticide spray drift risk.

Oregon Climate Service (OCS)

Oregon State University
Strand Ag Hall Room 326
Corvallis, OR 97331-2209
Tel: 541-737-8927
Fax: 541-737-5710
oregon@coas.oregonstate.edu
http://www.ocs.oregonstate.edu

Philip Mote, State Climatologist
Kathie Dello, Deputy Director
Darrin Sharp, Faculty Research Assistant
Daniel Brown, Faculty Research Assistant
Katy Steinmetz, Student Assistant

The Oregon Climate Service (OCS) is a part of the Oregon Climate Change Research Institute in the College of Oceanic and Atmospheric Sciences at Oregon State University.

Routine activities

Staff typically responds to 5-10 requests per week for climate data or answers to questions about climate (past, present and future) and weather. These requests are mostly from state and federal agencies, but also include interested citizens and consulting firms. In periods of unusual or extreme weather these requests often increase. Staff also routinely archives data from 26 sites around the state that do not send their monthly temperature and precipitation observations to the National Weather Service.

Website

The new Oregon Climate Service website (http://ocs.oregonstate.edu) launched in February 2011. The new website was designed to maintain favorite features and minimize staff time spent maintaining the site. The new website was well-received by the public after our fatal 2009 server crash.

Research

OCS was awarded a grant from Microsoft Corp. for climate data visualizations for the Pacific Northwest and southern British Columbia, billed as 21st century climate services. The project uses two Microsoft products as the platform: Bing maps and Worldwide Telescope. OCS teamed up with the Computer Science Department at OSU for this cross-discipline effort. A beta launch is tentatively scheduled for July 2011 to coincide with the Microsoft Faculty Summit in Redmond, WA. This event showcases research between the academic community and Microsoft. This project will reside on the Oregon Climate Service website.

OCS teamed up with its sister state climate office to the north, the Office of the Washington State Climatologist, on a study to determine heat wave criteria (both minimum and maximum temperatures) and changes in heat waves for Western WA and OR. We are also doing a case study on the blockbuster 2009 heat event, which shattered many individual station temperature records, including Sea-Tac and Portland Airports. Extreme heat is of specific concern lately, as heat wave frequency will likely increase in the future. This region, not prone to extreme heat, may be ill-prepared for such events. We are preparing a manuscript for publication and have submitted abstracts to present our finding at regional and national conferences. Oregon Department of Health Services (Public Health Division) invited us to sit on their workgroup to study extreme heat and links to hospitalizations and mortality in the Pacific Northwest.

Outreach

Staff gave numerous media interviews to outlets around the state over the past year including The (Portland) Oregonian, Eugene Register-Guard, Corvallis Gazette-Times, Bend Bulletin, Oregon Public Broadcasting (radio), KVAL-tv and KMTR-tv among others. Of particular interest to the media were the December 14, 2010 Aumsville, OR EF2 tornado, a particularly cool and wet spring 2010, and the onset of La Niña and its implications for the Pacific Northwest.

OCS was successful in winning a SCEP grant from AASC in 2010 to fund our monthly newsletter. This newsletter recaps the month's weather, highlights significant events and weather and climate related societal impacts. The newsletter sent out electronically to a mailing list and posted on our website and at stateclimate.org.

OCS also started using Twitter to engage with Oregonians and provide them brief and newsworthy bites of information about Oregon weather and climate. This has been most successful in connecting with some of the broadcast meteorologists in western Oregon and has been an effective tool for information exchange.

Partnerships

OCS staff met with climate staff from three National Weather Service offices that serve Oregon (Portland, Medford and Pendleton) and the Northwest River Forecast Center (Portland) in October 2010 to discuss the new Pacific Northwest NOAA Regional Integrated Science and Assessments project, anchored by OCCRI, and potential opportunities for collaboration. After this meeting, OCS was able to reduce time spent on archiving monthly co-op data collection after NWS staff offered access to their WXcoder databases. Time was spent talking about research in individual offices and how we can communicate better in the future. Additionally, preliminary talks have continued with NWS Medford about piloting an impacts database to align with their directive to produce impacts and not criteria based forecasting. Oregon State University extension has also expressed an interest in this project. We look forward to continued collaborations with these offices in the future.

OC7S maintains strong relationships with the Western Regional Climate Center, NWS Western Region Headquarters, the American Association of State Climatologists, Federal and State agencies and other state climate offices.

Pennsylvania State Climate Office

Pennsylvania State University
605 Walker Building
University Park, PA 16802
Tel: 814-863-1842
Fax: 814-865-3663
psc@mail.meteo.psu.edu
http://climate.psu.edu/

Paul Knight, State Climatologist

The Pennsylvania State Climate Office database continues to incorporate observations from more than a half dozen separate networks within the Commonwealth. More than 800 hourly reporting stations (primarily from the Citizen Weather Observation Program) are now being ingested into the office's relational database. When combined with hourly reports from the FAA and Pennsylvania's DEP, there are nearly 1000 observations of temperature, dew-point and wind each hour in the PA region. The State Climate Office is changing its data archive tools for users to make it easier to locate and retrieve the data.

The CoCoRaHS network continues to expand across Pennsylvania under the auspices of the state climate office and with the name FROST. By the end of the year, about 240 volunteer observers had enrolled and typically, 140 faithfully report each day.

Information Technology Capabilities

• About thirty-five web data requests were logged each month (besides those by phone and US mail)
• Primary users are commercial, educational, and government organizations
• The entire North American Regional Reanalysis data set (approximately 4.9 terabytes) has been augmented so that the complete data set is through 12/31/10 and this constitutes a 30+ year data base.

Communication Capabilities

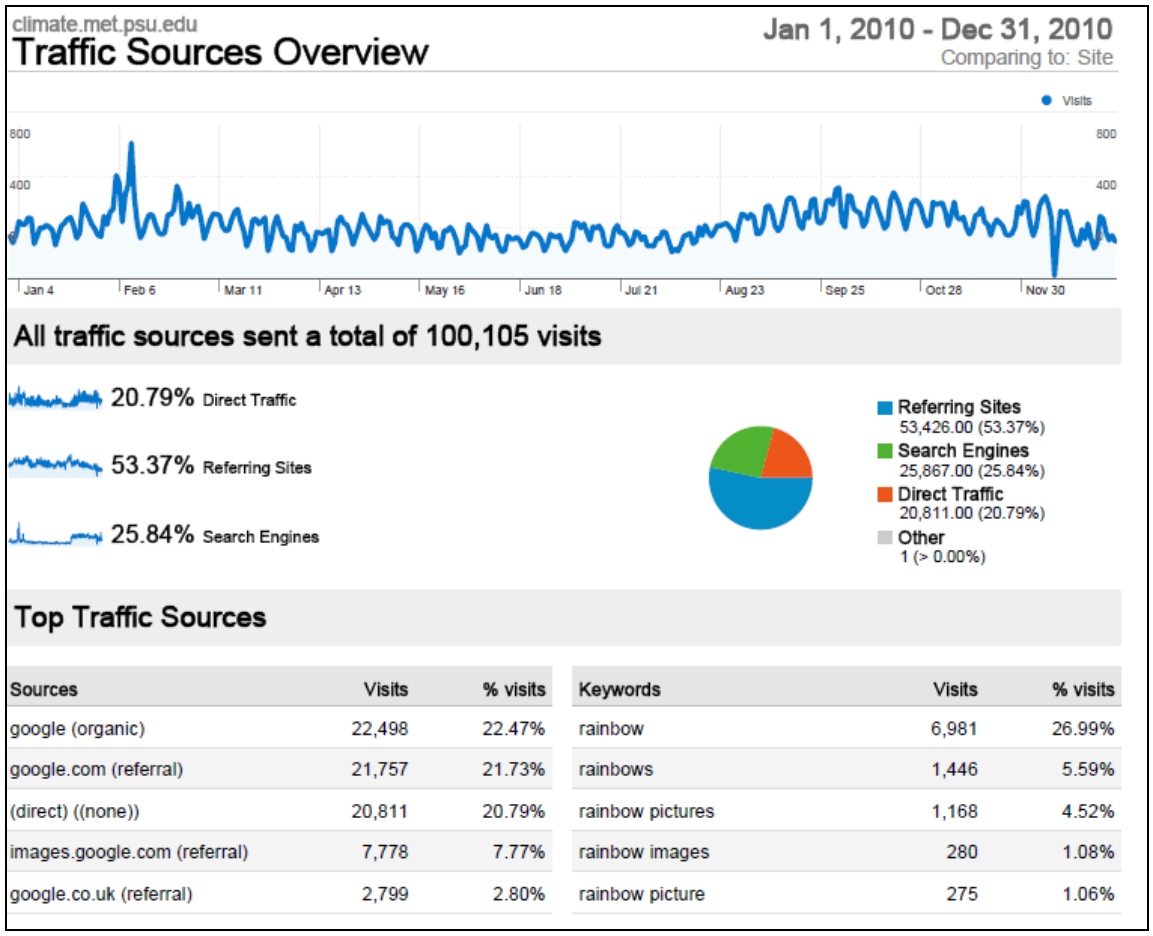
- The web server is now separated from the database host to increase the capacity of numerous web inquiries simultaneously. Development of new products and data retrieval has mainly focused on grant-related items, such as those connected with a data inventory for the National Park Service and Wheat Scab model predictions.

Information Services

- The Interactive Data Archive has been expanded to include data queries for specific dates and strings of dates. A collaborative effort with the Northeast Regional Climate Center continues to bring evapo-transpiration data to users and is part of a water budget project.

User Base Growth

- The number of user hits has risen by ~25% during the past year. The following charts show the 2010 user volume and city probes:



Sources	Visits	% visits
google (organic)	22,498	22.47%
google.com (referral)	21,757	21.73%
(direct) ((none))	20,811	20.79%
images.google.com (referral)	7,778	7.77%
google.co.uk (referral)	2,799	2.80%

Keywords	Visits	% visits
rainbow	6,981	26.99%
rainbows	1,446	5.59%
rainbow pictures	1,168	4.52%
rainbow images	280	1.08%
rainbow picture	275	1.06%

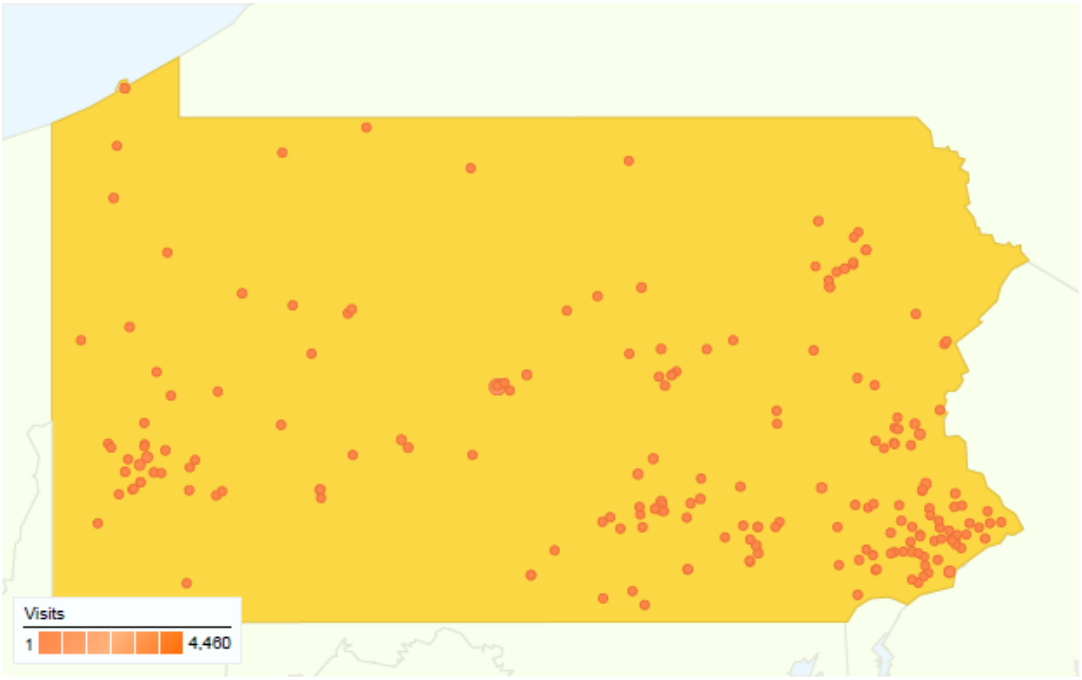
climate.met.psu.edu

State Detail:

Pennsylvania

Jan 1, 2010 - Dec 31, 2010

Comparing to: Site



This state sent 24,653 visits via 993 cities

Site Usage

Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
24,653 % of Site Total: 24.63%	5.36 Site Avg: 2.65 (101.92%)	00:03:33 Site Avg: 00:01:24 (152.67%)	62.18% Site Avg: 86.02% (-27.71%)	50.14% Site Avg: 64.14% (-21.82%)

City	Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
State College	4,460	6.42	00:04:50	40.11%	42.53%
Philadelphia	1,307	4.85	00:02:39	75.21%	52.56%
Pittsburgh	1,032	4.79	00:02:48	73.16%	52.03%
State College	958	7.33	00:07:36	44.26%	37.37%
Harrisburg	919	7.19	00:03:42	49.29%	35.91%
Altoona	793	4.85	00:03:03	37.45%	45.52%
Selinsgrove	326	2.54	00:00:49	21.17%	76.99%
Lancaster	317	5.09	00:02:22	68.77%	49.21%
Philadelphia	300	4.73	00:02:55	74.67%	49.67%

1

Google Analytics

Data Quality Control/Assurance

- The PA Climate office takes advantage of the sophisticated DQ control routines provided by MADIS. This year, we implemented a QA program on all COOP data. Other data is manually QA with student support. A test case of surface temperature extremes (comparing COOP sites with a nearby NARR grid point data) has shown the quality of both data sets for long-term trends.

Climate Office Projects

- In collaboration with the National Park Service, a climate data inventory project is now in its sixth year. Annual and seasonal summaries have been designed which will have applicability to Pennsylvania climate stations (and DCNR) that are not part of this project.

Special Projects

- Collaboration with experts in the College of Agricultural Sciences continues with the refinement of environmental data monitoring systems for a Wheat Scab project and development of phenology models for Organic Growers of Cucurbits and the implementation of an Apple Disease forecast systems. A project with Pennsylvania DOT and the top forecasters from the forecasting practicum course continued to provide an early alert for hazardous winter weather for surface transportation in Pennsylvania. Collaboration continues between ZedX, Inc. and the state climate office in providing forecast charts and commentary for the Soy Bean Rust project with USDA that also includes various Stem Rusts too.

SCEP

- The Pennsylvania State Climate Office contributed monthly state weather summaries including its societal impacts to the Northeast Regional Climate Center during all of 2010 as per Task 2.1 of the 2010-2011 NCDC-SCEP agreement. In addition, the state climate office in collaboration with the department tv studio staff and facilities, designed and produced the final 6 video vignettes highlighting the climate products from NCDC, RCC's and State Climate Offices.

South Carolina Office of Climatology (SCO)

1000 Assembly Street
P.O. Box 167
Columbia, SC 29202
Tel: 803-734-9568
Fax: 803-734-9573
Mizzellh@dnr.sc.gov
http://www.dnr.sc.gov/climate/sco

Hope Mizzell, State Climatologist
Wes Tyler, Assistant State Climatologist for Service
Mark Malsick, Severe Weather Program Liaison
Administrative Assistant (Vacant)
Climate Intern (Vacant)

Created in 1986, the Office of State Climatology (SCO), as mandated by the South Carolina General Assembly (Section 49-25-10 et seq., Code of Laws of South Carolina, 1976), represents the State in all climate and meteorology matters. The SCO resides within the South Carolina Department of Natural Resources (SCDNR). The SCO serves as liaison between the National Weather Service and State agencies, such as the Governor's Office, SCDNR, SC Department of Public Safety, and the SC Emergency Management Division. The SCO assists other State and Federal agencies in data acquisition and interpretation before, during, and after periods of severe weather.

The SCO provides a unique service to the state by archiving and distributing climate and meteorological data, reports, and research that date back to the late 1800s. The SCO administers the *South Carolina Drought Response Act*, which requires the office to formulate, coordinate, and execute a comprehensive drought response program for the State of South Carolina.

ARSCO Qualifications

The following describes the ways in which the SCO addressed each of the ARSCO qualifications during 2010:

Communication Capabilities

- The office expanded the SCO website (http://www.dnr.sc.gov/climate/sco).
- The office operates an email notification system focused on severe weather notification and tropical advisories. The address list increased from 736 in 2009 to 978 in 2010. The breakdown of subscribers is Agriculture 2, Commercial 127, Education 68, Government 484, Health 27, Media 7, Personal Interest 249, and Utility 14.
- The office maintained the on-line Regional Drought Monitor Application. The application was developed through a partnership with Carolinas Integrated Sciences and Assessments (CISA) and Duke Energy (https://www.dnr.sc.gov/drought/).

Information Services

- During 2010, the SCO averaged 50 monthly phone and email requests for climate data and 28,000 information retrievals from the SCO web site.
- Staff assisted SCD NR Law Enforcement and SC Highway Patrol with 43 accident investigations.
- Media inquiries averaged 15 per month.
- The office issued weekly and annual summaries of the State's weather and climate in the *South Carolina Weekly Weather and Climate Report* and the *South Carolina Year in Review,* both of which are available on the SCO website. The SCO also provided a weekly summary of South Carolina Weather and Climate Data to the National Agricultural Statistics Service (NASS) that is published weekly in the South Carolina *Crop Weather Summary*.
- A S.C. "Climatologist history", beginning in 1889 to present, was researched and prepared to include all names of those who served in our state's role of providing continuous weather observations and summaries.
- The office issued 15 weekly weather forecast summaries for the SC Soybean Rust Newsletter. The newsletter is distributed electronically by Clemson to over 300 subscribers including county agents, soybean growers, seed/chemical & fertilizer industry personnel, and consultants.
- The Drought Response Program requires regular correspondence with 48 Drought Response Committee Members, four major power companies, and over 2,000 water utilities. Correspondence includes drought projections, official declarations, and suggested response. During 2010, the SC Drought Response Committee was convened three times to review the drought conditions and issue declarations. Bi-weekly drought updates were distributed by email to committee members and list serve subscribers. Staff utilized an online application to monitor water conservation actions implemented by SC water systems http://www.dnr.sc.gov/climate/sco/Drought/drought_water_restriction.php.
- The office worked with hydroelectric dam operators and other resource agencies to enhance drought mitigation efforts as a part of the implementation of their Federal Energy Regulatory Commission's (FERC) hydro-power dam license. Staff served as a member on the Catawba-Wateree and Yadkin Pee Dee Drought Management Advisory Committees participating in monthly meetings or conference calls. Staff also served on a special subcommittee focused on revising the Catawba-Wateree Low Inflow Protocol.

Research

- The office is a cooperating institution in the Carolinas Integrated Sciences and Assessments (CISA) project focused on integrating climate science and water management in North and South Carolina.
- Through funding and guidance provided by CISA, the SCO developed and implemented a systematic procedure to identify and document the nature and scope of requests received. Customers were surveyed to determine how they integrate

climate information into their day-to-day operations as well as their long-term plans. This project was developed in conjunction with a broader effort by State Climatologists in the Southeast region and the Southeast Regional Climate Center to conduct client assessments.

Outreach

- The SCO provided approximately 45 annual presentations to various governmental, private sector, and civic organizations.
- Staff attended state and national conferences such as the Annual Meeting of the American Meteorological Society, Southeast Regional Climate Center's Technical Advisory Committee's Annual Meeting, and the American Association of State Climatologists Annual Meeting. Staff serves on the Water Resources Committee for the S.C. American Water Works Association.
- Staff provided five weather and climate segments on the South Carolina Educational Television show "Making It Grow."
- The Assistant State Climatologist serves as commissioned law enforcement officer to assist SCDNR during weather emergencies.
- The State Climatologist serves as chair of the SCDNR Climate Change Technical Working Group.
- The State Climatologist completed the 18-month Certified Public Managers (CPM) Course. The CPM is a nationally recognized professional development program for supervisors and managers in government.

Monitoring and Impact Assessment

- 180 active volunteers provide daily observations for the COCORAHS network.
- Staff worked closely with the National Weather Service to monitor the COOP and ASOS data networks to maintain the quality of SC climate observations.
- As a member of the State's Emergency Operations Team, SCO staff participated in quarterly hurricane task force meetings, the PALMETTO_EAGLE 2010 WMD/Hurricane annual exercise, the Governor's Hurricane Roundtable Exercise, and training. SCO staff conducted 9 winter weather activation briefings, 6 hurricane activation briefings and 13 weather and oceanography support briefings for State Agencies during the Gulf of Mexico oil spill. Staff issued 16 severe thunderstorm/tornado advisories, 41 tropical cyclone advisories, 31 weekly tropical updates, and 15 winter weather advisories. Staff presented "South Carolina Tornado Climatology" at NWS Columbia Severe Weather Workshop.

South Dakota Office of Climate and Weather (SDOCW)

Agricultural and Biosystems Engineering
SAE 213 Box 2120
South Dakota State University
Brookings, SD 57007
Tel: 605-688-5678
Fax: 605-688-6764
dennis.todey@sdstate.edu
http://climate.sdstate.edu

Dennis Todey, State/Extension Climatologist

The South Dakota Office of Climate and Weather is part of the Cooperative Extension Service at South Dakota State University. Consequently the mission of the state climate office of providing data and information to the people of the state overlaps the mission of the extension service in providing science-based information to the people of the state. As part of the SD CES, the state climate office has connections in every county of the state to communicate with people of the state providing for a direct set of users as well as contacts to transfer information back to the on state impacts and needs. The South Dakota Office of Weather and Climate (SDOCW) was granted ARSCO status in 2005.

Personnel

Dr. Dennis Todey continues as state climatologist and director of the climate office. During 2009 he completed a 6 month assignment as Acting Director of the High Plains Regional Climate Center (August 2008 – January 2009) during an extended health absence of Dr. Ken Hubbard. Since March of 2009, he is back at SDSU full time. At the 2009 American Association of State Climatologists' annual meeting Dr. Todey was elected president-elect of the AASC.

Several undergraduate and graduate students (mainly with computing background) filled short-term positions in maintaining and processing data from weather stations, fixing computer issues and developing some new products. The office is in various states of hiring for two computer positions and another climate position.

Reporting

The state climate office continues to supply data and create reports through a contract with South Dakota Agricultural Statistics Service. This data is used for official reports weekly during the growing season and monthly during the off-season.

During the year the SCO completed monthly climate impact reports as funded through a SCEP funded climate reporting project. These reports were compiled and posted on the SD state climate site, the AASC site and forwarded to HPRCC for use in their monthly report.

The SCO also reports on climate information weekly during the summer fire season. In cooperation with the South Dakota School of Mines and Technology (state fire meteorologist) and

South Dakota Wild land Fire Suppression, we publish a weekly discussion of fire conditions, weather and climate impacts on potential fire issues.

The state climate office manages and archives data from a 42 station automated weather station network across the state. In 2010 the SCO acquired instrumentation for 10 additional stations. These are still awaiting deployment. Locations have been surveyed for a few. Additional Activities on the network during the year included general maintenance and trouble-shooting communications. Searching out additional funding to support the network's ongoing needs continued. Data from this network is used for/by:

National Weather Service for forecasting and verifying severe weather
Local crop and weed sprayers for decision-making of spraying
Farmers and others in ag business tracking soil temperatures

Though drought conditions have been minimal recently, the SCO has maintained a presence on the USDM list for minor conditions when they have appeared.

Media

The SCO did over 50 media interviews ranging from record precipitation to winter conditions and usual outlooks for farmer/producers. Dr. Todey does a weekly one minute spot on an SDSU-produced garden show (Garden Line) during the spring and fall seasons.

Extreme Events Reporting

Wet conditions pervaded the state during the year from winter through summer leading to various amounts and scales of flooding. The SCO reported on record precipitation amounts throughout the year and about annual totals (where nearly 10 stations set annual precipitation records.)

Research

The SCO contracted with USDA Risk Management Agency to develop a web tool in response to the wet conditions across the northern Plains. Because of the recent wet period over the last 20 years many crop insurance claims have occurred because of excessive wetness. The web tool is designed to display summarized data for RMA, crop insurance companies and producers how precipitation compares to historical levels.

Dr. Todey was part of two other USDA-funded projects during 2010, which were announced in 2011. These were funded to do work on climate change issues and the corn system across the Midwest. The projects will collect data on greenhouse gas emissions from crops, assess people's understanding of climate and climate needs for their operations, develop tools to help producers use climate information and do climate education at multiple levels. Both are 5-year funded projects, one through Iowa State and one through Purdue.

Outreach

The state climate web site has maintained its central access point for various data in the state including federal and non-federal data. The site serves the general public, other researchers and a variety of clientele across the state.

The web site and individual responses continue to supply data for various users in the state and outside the state. Over 100 individual data request and several legal data requests have been supplied by the SCO during the last year.

Dr. Todey continues to be a source for climate information locally, regionally and nationally. Planting conditions, outlooks and reports on records continue to be a popular media need.

Dr. Todey and the SCO continue various outreach efforts. The most frequent requests are talks on outlooks, climate trends and climate change impacts. He has done over 30 talks within the state and region in the last year. The SCO did four Master Gardener trainings through SD Cooperative Extension.

The SCO continues as the state coordinator for Cocorahs. Interest in Cocorahs seems to have surged through some advertizing efforts in person and through a local media outlet. The recent wet period seems to have caused an increase in interest, also. Master Gardener trainings have also been a source of observers. Recent trainings have each led to at least 2 new observers.

AASC Presidency

Dr. Todey served as AASC president-elect and president in 2010. In addition to conducting usual AASC business, including the SCEP program, coordinating with new states and other various issues, he has become involved regularly in the discussion of the new climate service in NOAA.

He represented AASC at several meetings regarding climate services and partnerships with other climate service providers including NOAA and NDMC sponsored meeting in Washington during the fall.

Office of the Texas State Climatologist

College of Geosciences
Department of Atmospheric Sciences
Texas A&M University
3150 TAMUS
College Station, TX 77843-3150
Tel: 979-845-5044
osc@ariel.met.tamu.edu
http://atmo.tamu.edu/osc/

John W. Nielsen-Gammon, Texas State Climatologist
Brent McRoberts, Research Associate
Marissa Pazos, Undergraduate Assistant

Physical Location and Funding

The Office of the State Climatologist (OSC) is housed in the Department of Atmospheric Sciences, Texas A&M University. Direct University support for this fiscal year was approximately $47,000. Office space is provided free of charge by the University. The OSC team includes the Texas State Climatologist, John Nielsen-Gammon, graduate student Brent McRoberts, and undergraduate student Marissa Pazos. Steven Quiring, a faculty member in the Geography Department, also assisted with OSC activities. Cost recovery is available for large data requests. External funding is provided for sponsored research projects. Late this year, OSC headed a three-SC consortium that received a grant of $496,000 from the United States Department of Agriculture for refining and expanding tools for monitoring drought at the sub-county scale.

Communication and Information Services

In 2010, about 220 electronic climate requests were received and responded to. Annually, the Office receives approximately 100-150 phone calls and sends dozens of facsimiles and mailings.
On the Office website, http://atmo.tamu.edu/osc, monthly climate summaries for the state and the Bryan/College Station area are posted. The Texas Monthly summary includes a crop report, precipitation and temperature deviations from normal for the major cities in Texas, and a summary of the previous month's weather. Over the past year, the Office has developed an online library of climate resources that includes OSC publications, publications from the State of Texas, and links to other climatic resources.

Research

The Office of the State Climatologist completed a project directed toward producing a homogeneous climate division precipitation data set. The basis of this project was the use of an interpolation technique to estimate missing monthly precipitation observations from surrounding stations, thereby eliminating biases associated with changes in network configuration. The resulting climate division information is much more suited to long-term variability and climate change studies than the original NCDC climate division data. A paper describing the data set has been accepted for publication. Meanwhile NCDC is developing a separate version of climate division

data based on spatial analysis that will also be an improvement over the original data. In another project, the Office has been producing high-resolution, precipitation products that encapsulate the state of drought and/or wetness in Texas. This includes analyses of percent of normal precipitation, the Standardized Precipitation Index (SPI), and the SPI Blend, all available at http://atmo.tamu.edu/osc/drought. The SPI Blend is a product created by the Office that modifies the SPI by giving a higher influence to more recent precipitation. These products utilize the Advanced Hydrologic Prediction System (AHPS) daily, 4 km precipitation analyses available at http://water.weather.gov. The products are produced on a weekly basis and are utilized for drought severity assessments in the US Drought Monitor.

The year 2010 saw the publication of three papers describing the role of convection and convective parameters in modulating summertime precipitation in Texas and around the world. Our study found that precipitation on monthly time scales during the summer in Texas is primarily controlled by variations in convective inhibition (CIN) and is almost unaffected by CAPE.

Outreach

The Office's primary means of outreach is through data access and publications available on the OSC web site. In addition, the OSC responds regularly to media requests and requests for guest lectures. During the past year, the greatest interest among the public has been with regard to topics related to drought and climate change. During 2010, the Texas State Climatologist gave invited lectures to the following groups and venues: the Texas chapter of the American Fisheries Society, the Texas Wine and Grape Growers Association, the Gideon Lycecum Master Naturalist Class, The Texas Forestry Association, the 2010 Beef Cattle Short Course, the Workshop on Climate Change and Potential Adaptation Responses to Protecting the Natural Resources of the Big Bend Region of the Chihuahuan Desert, the Bryan/College Station Master Naturalist Class, the Texas Nursery and Landscape Association, the Texas Forest Service, and Rice University.

A newer form of outreach is the blog ClimateAbyss, hosted by the Houston Chronicle and located at the URL http://blog.chron.com/climateabyss. The blog focuses on climate change, with some discussion of current weather events as well. The blog is written by the State Climatologist and is updated about twice a week.

Monitoring and Impact Assessments

The State Climatologist is an appointed member of the Texas Drought Preparedness Council, a statewide interagency committee created by the Texas Legislature in 1998 to monitor drought conditions and coordinate drought mitigation activities. The Council meets monthly in Austin. The State Climatologist is also an active participant in the United States Drought Monitor mailing list.

Since December 2008, with partial assistance from SCEP funding from NOAA, the Office has produced a monthly climate impacts report that documents the print media coverage of weather and climate effects on the general public and is posted on both the OSC and AASC websites. Because of the diversity of climate impacts in Texas, reports include more than a hundred impact reports. Reports are gathered from newspapers and other sources throughout the state with links to the original source material. The reports are posted on our own web site at http://atmo.tamu.edu/osc/socimpacts as well as on http://www.stateclimate.org.

Utah Climate Center (UCC)

Utah State University
4825 Old Main Hill
Logan, UT 84322-4825
Tel: 435-797-2664
http://climate.usurf.usu.edu/

Robert Gillies, State Climatologist
Esmaiel Malek, Associate Director
Shih-Yu Wang, Postdoc Research Associate
Alan Moller, Meteorologist
Marty Booth, Meteorologist
Jonathan Carlisle, Research Technician

The climate center continued service for the State of Utah during 2010.

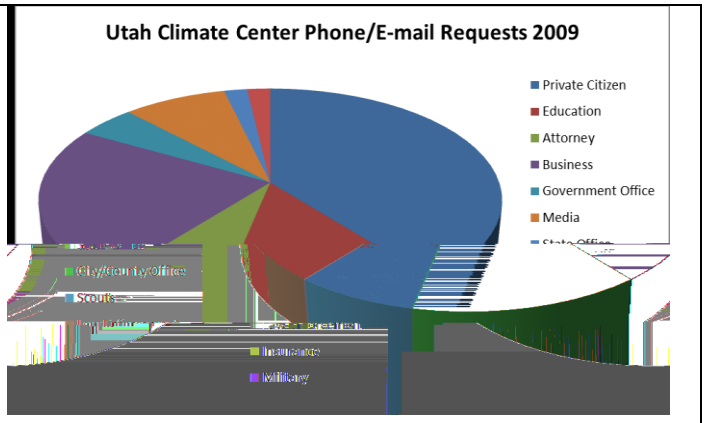
2010 was the 5 year program review (March 29 – April 2) of Plants, Soils and Climate by the National Institute of Food and Agriculture. The final report recognized the UCC (Section 7 – Outreach Centers) as "an active, highly visible outreach program, is particularly impressive".

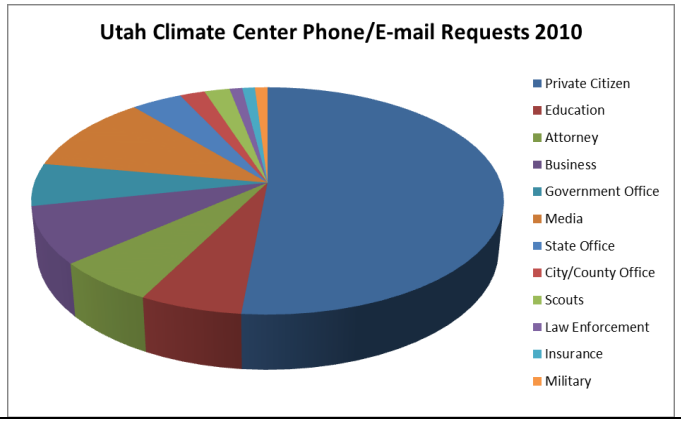
Dr. Gillies represented the Utah Climate Center at the American Association of State Climatologists (AASC) and at Western Extension and Research Administrative (WERA) committees WERA 102. Dr. Davies represented the Utah Climate Center at WERA 1012. In addition, Dr. Gillies represented the Utah Climate Center at the National Weather Service and the Western Regional Climate and Colorado Basin River Forecast Centers in Salt Lake City.

The number of telephone and e-mail data requests in 2010 was commensurate with 2009 and are shown. Calls originated from a variety of sources with general inquiries from private citizens being the most dominant source. The following tabular and figure summaries encapsulate the distribution of phone calls to the Climate Center for 2009 and 2010.

Utah Climate Center Call Log Statistics

	2009	2010
Private Citizen	42	51
Education	15	6
Attorney	8	6
Business	24	8
Government Office	5	6
Media	9	11
State Office	2	4
City/County Office	2	2
Scouts	0	2
Law Enforcement	0	1
Insurance	0	1
Military	0	1
Total	107	99





This phone call report is restricted to types of calls in which a climate/data/service related request or question was made to the Climate Center.

As was mentioned in previous years' reports, the website continues to be the major source that clients are using as a resource to retrieve their data / information as was intended at the outset. The climate data download continues to be the most visited /used page.

As per last year, the statistics of use is monitored by Google analytics. The statistics are particularly interesting for 2010: First, there was an overall increase in visits of 28% with an accompanying slight (4.5%) decrease in page views – likely a result of more familiarity with the website. What is prominent, however, was a marked spike in April through May that was a result of inquiries to the freeze dates tables.

Dr. Gillies made 9 presentations (all **invited**) at various venues on the subject of climate and climate change (click here to see a list of these presentations).

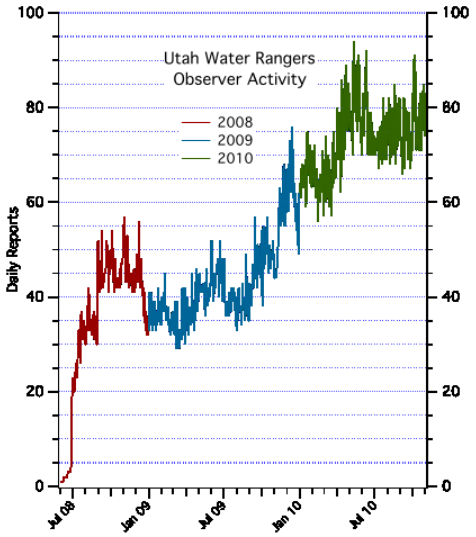
A summary of other activities are as follows:

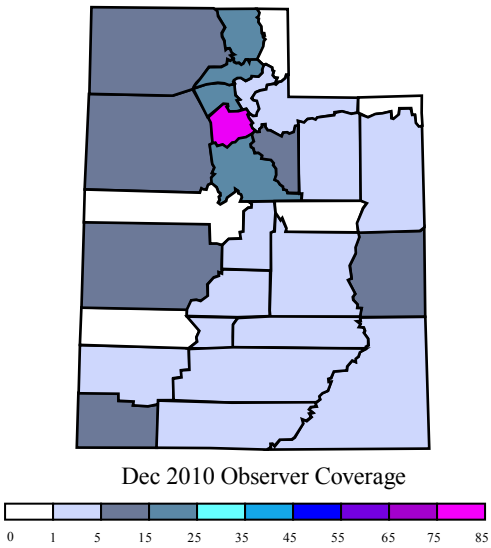
I. CoCoRaHS (Utah Water Rangers)

We've had a steady year, increasing our number of registered observers and, significantly, the

average number of daily reports. Some numbers for 2009 vs. 2010.

Registered Observers — Up 21% (214 ➛ 259)
Reporting Observers — Up 61% (49 ➛ 80)





II. Education, Communication and Outreach

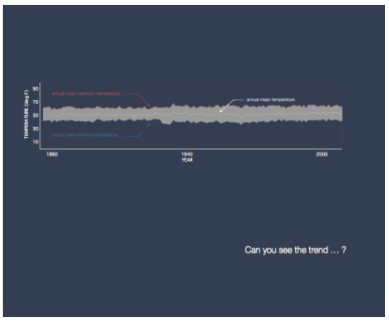
Climate change, both globally and here in Utah, remains a topic of intense interest. UCC supports requests from USU professors for single lectures and entire subsections. These lectures cover climate and climate change science, as well as aspects of *communicating* climate change science. In 2010, Dr. Gillies ceded a number of these to Dr. Davies unless the request was for him personally; the purpose being, to focus more on building the research component of the Center.

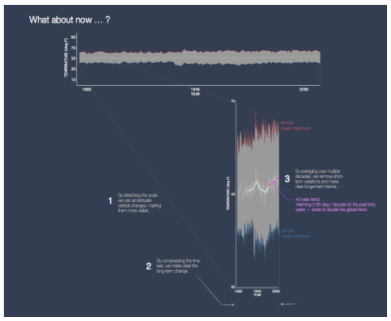
- *Guest Lecturer* — Dr. Davies presented 20 such lectures, supporting 9 USU faculty, 11 courses from 7 different departments in 4 colleges in 2010.

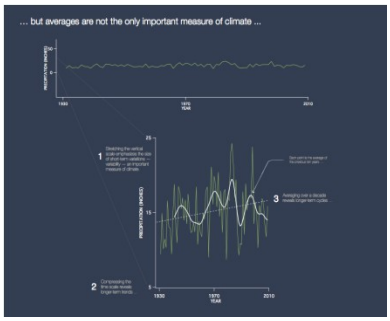
- *Community Lecturer* — Dr. Davies also delivered invited lectures on climate change science and communicating climate change science in broader, community settings. Events this year have included a house talk (Todd and Liz Fallis); USU Museum (Ecovisionaries Series); Utah Bioneers, Swaner Ecocenter; and the Springdale Community Center.

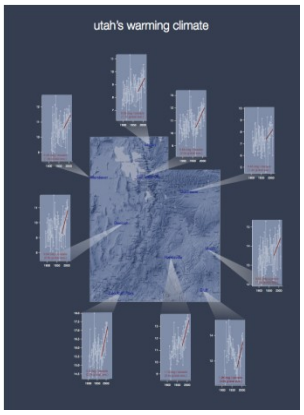
- The center has been actively involved in educational presentations and activities for elementary, middle and high school students as well as other venues.

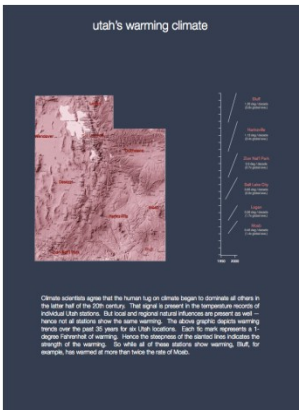
- *Utah Museum of Natural History* — The Utah Museum of Natural History is preparing an exhibit involving "Utah Sky." Examples of visualizations created for them by the Climate Center are shown below.









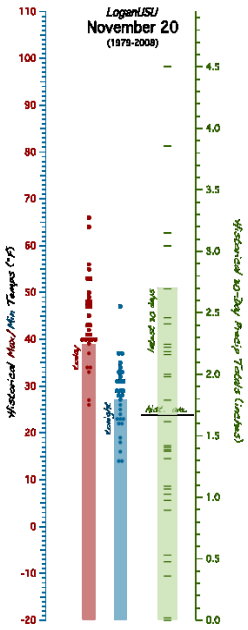


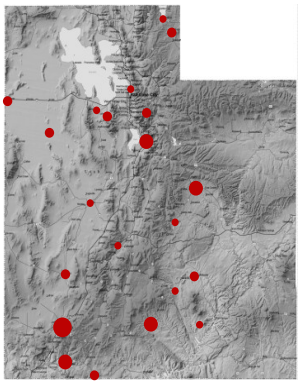
- *Media work* — Dr. Davies prepared graphics for Judy Fays of the Salt Lake Tribune illustrating Salt Lake City summer temperatures, pertaining to a story she did regarding ozone pollution. Mr. Booth contributed to over 10 articles with specialist knowledge pertaining to weather and climate for the Herald Journal.
- *Utah Public Radio* — these comprise not only weather forecasts, but short tutorials in meteorology and climate science.

III. New Products / Visualizations

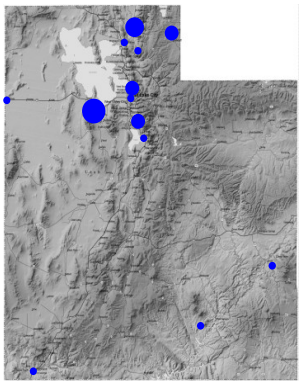
With the climate database now digitized and deposited on the web, our task is to utilize substantial leaps in graphics capabilities to develop and issue new, novel and useful visualizations.

- *Monthly Newsletter* — Beginning in September, D. Davies took primary responsibility for the UCC monthly climate newsletter. He redesigned the format and began including experimental visualizations of some of our data.
- *Daily Temperature / Precipitation Summaries* — one example of such visualizations is a station-specific summary for temperature and precipitation in graphical form. The idea is to give people a product that is far more informative than just 'normals' or 'averages.' We currently produce this product only for Logan (ref., left-hand panel in figure below); the mid-term plan is to create such graphics for a full set of Utah locations and make them readily available on the website.
- *Max / Min temperature records* — another visualization, developed for depicting maximum and minimum temperature records at various locations in the state, is presented below, where the size of the dot indicates the number of records for a given time period (month of September, in this case).





September Record Highs



September Record Lows

IV. On-going Research

Publications and Internet Resources (click here to see a listing of the articles)

- Articles (refereed journal): 7
- Articles (other): 2
- Article, misc. magazine/newspaper/newsletter: 4
- Posters : 3
- Scholarly Paper Presentation (other) : 2
- Scholarly Paper Presentation (Invited, Selected, Reviewed): 5

Website

Posted monthly – are the Utah Climate Updates – newsletters were continued in 2010 through a small grant from the American Association of State Climatologists (AASC) State Climatologists Exchange Program (SCEP)

Special news items – e.g.," Scientists find that Utah's bad air is connected to the arctic"
http://climate.usurf.usu.edu/news_article.php?id=155
Climate researchers at Utah State University have found that a connection exists between an atmospheric pattern known as the Arctic Oscillation and Utah's bad air days. The phase and strength of the Arctic Oscillation influences the development of high pressure over the Western U.S. and, consequently, the intensity and persistence of inversions which trap urban pollution near the surface.

Continual update of data resources – COOP, AWOS, GSOD, SCAN, CRN, ISD-Lite and MESOWEST.

Vermont State Climate Office (VTSCO)

Department of Geography
University of Vermont
94 University Place
Burlington, VT 05405-0114
Tel: 802-656-2146
Fax: 802-656-3042
State.Climatologist@uvm.edu
http://www.uvm.edu/~ldupigny/sc

Lesley-Ann L. Dupigny-Giroux, State Climatologist

The Vermont State Climate Office (VTSCO) received its ARSCO recognition in June 2005. The office is housed within the Department of Geography at the University of Vermont (UVM) & State Agricultural College, a land-grant institution that emphasizes outreach as one of its core missions. The VTSCO is located in a laboratory setting donated by the Geography department. Climate Database Modernization Program (CDMP)-funded equipment, archival publications and documents are housed there, with adequate facilities for the undergraduate and graduate assistants.

The core mission of the VTSCO is to provide climate research and services to Vermonters and other constituents (university researchers, policy makers, state agencies, legal firms or school children) in a timely and efficient manner. This is facilitated via a dedicated website and e-mail address.

Over the course of the AY 2010, the VTSCO was defunded by the Graduate College of the University of Vermont. The work completed by the Ph.D. student from the Plant and Soil Science department on the use of high resolution aerial photography and satellite imagery to quantify wetland dynamics across the state, was presented as a poster at the December Meeting of the American Geophysical Union (AGU) in San Francisco.

ARSCO Qualifications

The VTSCO is the AASC-designated state climate office for Vermont. The following activities address each of the Office's ARSCO qualifications.

Communications capabilities

- The VTSCO website moved to its new location at http://www.uvm.edu/~vtstclim following the redesign by the undergraduate student of the previous academic year. The VTSCO is now working with Dr. Michael Brewer and team at the Climate Monitoring branch of NCDC (initiated during a SCEP funded visit in February 2011) to create a seamless geospatial data portal for this site.
- Provide free data, expert opinions and recommendations via the telephone, facsimile, electronic mail and regular mail

Information services

- Seasonal contributions on aspects of Vermont's weather and climate for the Rutland Herald newspaper.
- Provided four interviews on NSF-funded SWAC (Satellites, Weather and Climate) professional development program, cold air damming, significance of minimum temperature time series, winter of 2010-2011 relative to teleconnections and climate change issues to the Rutland Herald, Common News, Stowe Reporter, Burlington Free Press.
- Handled 43 requests (40 email, 1 mail and 2 telephone requests). These were primarily for undergraduate and graduate students seeking specific weather information, but also included requests from growers of specialty crops or building questions related to energy.

Research

- "Exploring the Challenges of Climate Science Literacy: Lessons from Students, Teachers and Lifelong Learners," *GeoCompass*, 4 / 9 (2 0 1 0) : 1 2 0 3 – 1 2 1 7 ,10.1111/j.1749-8198.2010.00368.x .
- National Science Foundation award - Track 2: Satellites, Weather and Climate: A professional development teacher collaborative to enhance literacy in the climate, atmospheric and geospatial sciences"[PI with R. Toolin (CESS), L. Morrissey (RSENR), B. Berryman & J.Shafer (Lyndon State College] $489, 381
- "Changes in heavy precipitation over northern New England (1895- present)" - collaboration with Ken Kunkel (NCDC) [begun at the NCDC during SCEP funded visit in February 2011]
- "Relating phenological trends over New England to hemispheric teleconnections using the IDRISI Earth Trends Modeler" - collaboration with J. Ron Eastman (Clark University)
- CDMP-related data collection of weather and climate data in personal diaries from the 1800s at the Rutland Historical Society and Shirley (Massachusetts) Historical Society. Databases of the contacts, findings and progress of visits around the state were updated.

Outreach

- 5 presentations on Vermont's perspective in terms of climate change; forest hazards
- Liaise with the Farm Service Agency on submitting a Presidential Disaster Declaration for drought- affected farmers in southern Vermont in September 2010.
- Hosted a visit by Ellen Mecray, NOAA's Climate Services Division Director for the Eastern Region at the University of Vermont on 2 September 2010. That visit spawned the creation of the Vermont Weather and Climate Research group dedicated to the quantification of weather and climate needs of state and federal agencies in Vermont and New Hampshire over the short and long terms. Current membership stands at 54 and includes the following institutions: University of Vermont, Lyndon State College, Vermont Emergency Management, VTrans, National

Wildlife Federation, Audubon Society, NOAA/NWS, NOAA Climate Services, US Forest Service, USGS, Atmospheric Research, Vermont Agency of Natural Resources/DEC/Air Quality, Vermont Agency of Natural Resources/DEC/Water Quality, Vermont Agency of Natural Resources/Forests, Parks and Recreation, NESCAUM, USDA/Farm Service Agency, USDA/NRCS, Lake Champlain Basin Program.

University of Virginia Climatology Office

Department of Environmental Sciences
University of Virginia
Clark Hall
291 McCormick Road
Charlottesville, VA 22904-4123
Tel: 434-924-7761
Fax: 434-982-2137
climate@virginia.edu
http://climate.virginia.edu

Philip J. Stenger, Director

The University of Virginia Climatology Office is a Research and Public Service Center in the Department of Environmental Sciences. The office is also an integral member of the Southeast Regional Climate Center and the director sits on the center's Technical Advisory Committee.

The office provides information and conducts research on the atmospheric environment and the impact of weather and climate on economic and ecologic systems to government, education, industry, the media and individuals. Its on-line, "Climate Advisories" feature climate research and/or educational material, and its web site offers an extensive array of climatic information and guidance to a broad spectrum of climatic data services.

ARSCO Qualifications

The AASC has designated the Climatology Office at the University of Virginia as the state climate office for Virginia. The following describes the ways in which the office addresses each of the ARSCO qualifications:

Communication Capabilities

The University of Virginia Climatology Office has phone, fax, email and videoconferencing capabilities with high-speed Internet service for the rapid transfer of data. The office maintains a website devoted to a variety of its educational, informational, data provision and outreach goals. In addition, the office plans to add lightning detection system access in the near future.

Information Services

The University of Virginia Climatology Office serves as the official repository and provider of climatic records within Virginia. It handles thousands of requests for information annually, and provides general guidance on climate issues of all spatial and temporal scales. Its web-based information services are accessed tens of thousands of times a year, with an estimated total download of information in the hundreds of thousands of pages. These inquiries come from individuals, industry, the media and dozens of governmental and educational entities, worldwide. In addition, the office's monthly video "Climate Advisory," a brief discussion of relevant topics

regarding the climate of Virginia, is televised statewide on Public Television, public access channels and agricultural information networks.

Research

For over three years, the office was an integral participant in the ShenAir Institute Research Program, designed to expand understanding of the atmospheric environment of the Shenandoah Valley of Virginia. Under this program, the office was involved with the following projects:

- Air Quality Climatology for the Shenandoah Valley
- Asthma Alert System for Shenandoah Valley
- Demographic Relationship to Respiratory Health in the Shenandoah Valley

After the formal conclusion of the contract period, the office continues to be involved in follow-up discussions and impact planning based on this work.

In addition, continued major research efforts of the office included:

- Examination of the relationships between climatic regimes and exacerbation of respiratory distress — in collaboration with the U.Va. Health Sciences Center. This work includes studies being conducted on patients in Central America.
- Investigation of the relationships between large-scale atmospheric teleconnections and tropical cyclone impacts in Virginia.
- Effects of short-term weather conditions and statewide elections in Virginia.
- Drought and drought impact monitoring

Outreach

- Provides data and expertise to dozens of state, federal and local government entities, and educational institutions each year.
- The office distributes information via hundreds of contacts with the print, radio, on-line and television media.
- The office serves as a lead scientific contributor to the Virginia Drought Monitoring Task Force, with periodic conferences, drought reports and analyses.
- Video Climate Advisories regarding aspects of Virginia climate are produced monthly for television and web-based distribution, including the PBS network and YouTube.
- The office has been increasing emphasis on its website as a vehicle for making information available to potential users. This has succeeded in reaching larger numbers of individuals and organizations in a more cost-effective fashion. The estimated amount of information accessed continues to increase substantially each year.
- Presentation of education and training lectures for the Virginia Master Naturalist Program. This includes core instruction requirements for chapters around the state.
- Informational presentations before local government and advisory groups

regarding climate-related topics of community concern.

- Involvement with school and related groups regarding climate topics.
- Work with graduate and undergraduate students at the University of Virginia and other institutions on degree research and class-related projects.
- The office has been recognized by the National Weather Association as an approved institution for seal holders to receive recertification education and experience.

Monitoring and Impact Assessment

- Continuing work regarding short-range forecasting of human health impacts in relation to changing weather conditions.
- Provision of data and impact assessment for and service as a member of the Virginia Drought Monitoring Task Force
- Participation as a member of the Virginia Hazard Mitigation Steering Committee, including development of climatic hazards analyses. The final version the Virginia Hazard Mitigation Plan was formally accepted by FEMA, and now provides the guidelines for planning across the state. Initial assessment work has begun on an update to the plan.
- Participation in the development of a new proposal for the Regional Integrated Science and Assessment Program of NOAA, which focuses on climate change related impacts to the Chesapeake Bay region. Entitled *Climate Resilient Chesapeake Region*, it involves collaboration with 6 other institutions.

Papers Published in 2010

Davis, R.E., C.P. Normile, L.J. Sitka, D.M. Hondula, D.B. Knight, S.D. Gawtry, P.J. Stenger. A Comparison of Trajectory and Air Mass Approaches to Examine Ozone Variability, *Atmospheric Environment*.

Hondula D.M., L. Sitka, R.E. Davis, D.B. Knight, S.D. Gawtry, M.L. Deaton, T.R. Lee, C.P. Normile, and P.J. Stenger, A Back-Trajectory and Air Mass Climatology for the Northern Shenandoah Valley, USA, *International Journal of Climatology*.

In Preparation

Stenger, P.J., J.M. Rawley, A.T. Evan. Secular Changes in the Relationship of Virginia Tropical Cyclones with ENSO and NAO, *Journal of Service Climatology*.

Office of Washington State Climatologist (OWSC)

University of Washington
3737 Brooklyn Ave NE
Box 355672
Seattle, WA 98195
Tel: 206-543-3145
http://www.climate.washington.edu

Nicholas Bond, State Climatologist
Karin Bumbaco, Assistant State Climatologist
Robert Norheim, Assistant State Climatologist

This report will focus on the Office of the Washington State Climatologist (OWSC) activities in the last 12 months (May 2010 through April 2011). The previous year included many staff transitions as documented in the last report, but no changes of this kind have occurred in the last 12 months. The objectives of OWSC continue to be as follows: (1) to provide climate data for Washington for users ranging from the public to state agencies to professional meteorologists, (2) to represent a resource in the analysis and interpretation of the past, present, and future climate of the state, and (3) to conduct outreach and educational activities on behalf of the residents of Washington state. The office is affiliated with the Joint Institute for the Study of the Atmosphere and Ocean (JISAO) of the University of Washington and receives the majority of its financial support from the State of Washington. It seeks additional support from federal agencies to conduct research on issues related to regional climate.

Outreach and Support

A variety of outreach and support activities took place during the last twelve months. The main support provided was in the form of answering weather/climate questions and providing data and/or analysis. Requests in the last 12 months came from people in a variety of different fields including university staff and students, the WA State Department of Ecology, the US Fish and Wildlife Service, various transportation-focused offices, lawyers, architects, the US Forest Service, and, of course, WA citizens. OWSC expertise was also used in 3 separate court cases in the last 12 months, and our services were provided pro bono for one of those cases in which the State of Washington was a co-defendant.

Other activities included the continued distribution of a monthly newsletter on WA climate by the 3rd weekday of each month. OWSC has continued to support the WA CoCoRaHS (Community Collaborative Rain Hail and Snow Network) effort both by recruiting new volunteers and recruiting county coordinators to volunteer more of their time to the organization. Three additional county coordinators came on board in the last 12 months bringing the total to 9 for the state. There are approximately 350 active and consistent CoCoRaHS observers for WA at the time of this writing.

OWSC has also been a source of climate information for statewide news outlets. The State Climatologist has appeared regularly on a local TV station as an expert on climate. Other outreach activities include the use of hands-on activities at an elementary school's Science Night,

the AMS sponsored WeatherFest held in Seattle, at numerous events at the Pacific Science Center in Seattle, at the annual NOAA Science Camp, and at the University of Washington's Gear Up program for high school students. OWSC staff has also given lectures to the public; some recent examples include a local Beachwatchers group and a science class at Central WA University. We also participated in the American Meteorological Society's annual meeting held in Seattle in January by giving talks at the Student Conference, a poster at the regular conference, and hosting a CoCoRaHS Appreciation event for WA volunteers.

Website: www.climate.washington.edu

Maintenance has been the primary focus for the OWSC website in the last 12 months. A few notable updates include the addition of the 2010-2011 season to our Mountain Snow Depth plotting tool (http://climate.washington.edu/snowdepth/) and updates of monthly precipitation totals on our Precipitation Ranking utility (http://www.climate.washington.edu/precipranking/). New features on the website include a brief analysis of the relationship between low elevation snow and the phase of ENSO (http://www.climate.washington.edu/events/2010lowlandsnow/), a summary of the 2009-2010 winter conditions and the influence that the El Niño may have played (http://www.climate.washington.edu/events/2010winter/), and a similar summary for the 2010-2011 winter with comparisons to past La Niña events (http://www.climate.washington.edu/events/2011winter/). Water year precipitation has also been monitored for a location near a dam southeast of Seattle (Howard Hanson Dam) due to below normal capacity resulting from damage from the January 2009 heavy rain event (http://www.climate.washington.edu/events/2010howardhanson/).

Research: Pacific Northwest Heat Waves and Drought Study Publication

A collaborative research effort studying Pacific Northwest heat waves has recently begun between OWSC and the Oregon Climate Service. The study mainly focuses on historical heat events in WA and OR with an emphasis on the recent and impressive 2009 event. Typical regional circulation patterns and trends in the heat events are also examined. Results from preliminary data exploration have been presented local conferences in the Northwest with additional presentations forthcoming.

Previous OWSC research carried out on Pacific Northwest droughts was published in the September 2010 issue of the Journal of Applied Climatology and Meteorology. The official citation is as follows:

Bumbaco, K.A. and P.W. Mote, 2010: Three Recent Flavors of Drought in the Pacific Northwest. *J. Appl. Meteor. Climatol.*, **49**, 2058-2068. doi: 10.1175/2010JAMC2423.1

AASC Activities

OWSC has received SCEP funding from February 2011 through June 2011 to work on gathering AASC-developed climate web tools into a catalog. OWSC will be writing summaries for each of the tools to be featured on the AASC website on a monthly basis. OWSC is collaborating with the State Climate Office of North Carolina and the AASC webmaster, Lou Vasquez, on this effort. The work will be presented at the annual AASC meeting in July.

West Virginia State Climate Office (WVSCO)

Marshall University
Department of Geography
211 Harris Hall
1 John Marshall Drive
Huntington, WV 25755
Tel: 304-696-2503
law14@marshall.edu

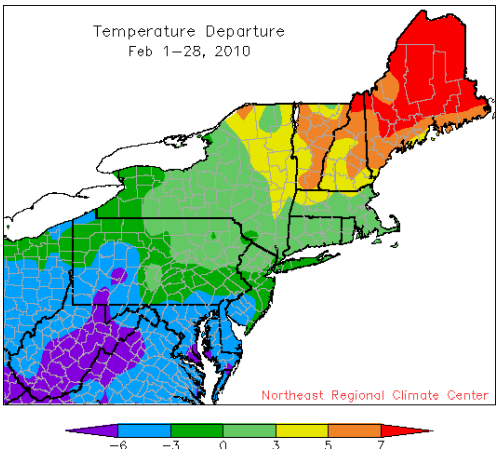
Kevin Law, State Climatologist

The West Virginia State Climate Office (WVSCO) continues to provide consultation concerning weather and climatic issues to various public and private entities around the state. In order to further climate education, the WVSCO helped provide climate data and information to research institutions, private firms, media outlets, as well as other agencies and the general public. The CoCoRaHS network has been established in the state for two years and the volunteers have increased to 121 active members. The WVSCO has taken part with many recruiting efforts and educational outreach projects in the community.

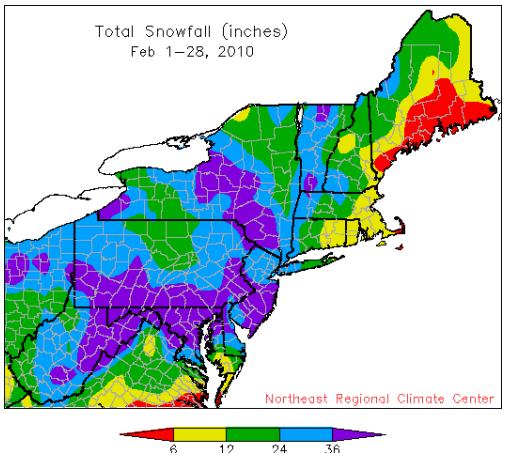
One example of a current collaborative effort is with the National Weather Service in Charleston, West Virginia, Marshall University, and a local engineering firm to create better flood inundation visualization tools. Flooding is by far the worst weather related hazard when it comes to loss of life and property damage in West Virginia. To mitigate these impacts, flood inundation mapping could have a remarkable influence. Funding has been allocated for Marshall University students to use Geographic Information Systems (GIS) to help produce maps to provide better visualization for real-time flooding. Public-private joint ventures such as this will provide a great service to the citizens of the state.

2010 Weather in Review

The winter of 2010 was one for the record books as below normal temperatures and above normal precipitation was exhibited. February was 6.9°F below normal statewide and the precipitation was 107% of normal. Much of the precipitation fell in the form of snow as three major weather systems struck the state during the month. Many cities such as Beckley broke their seasonal snowfall records (124.6”). The State Climate Extremes Committee was called to evaluate the February snowfall totals at Bayard. It was concluded that Bayard’s 158.2” will mark a new state record for February.

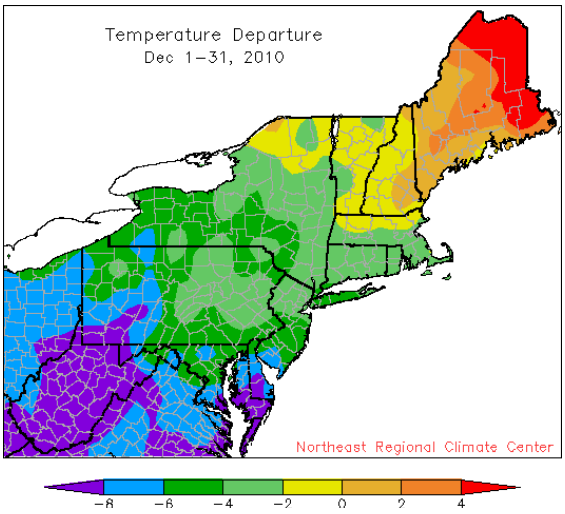


February 2010 Temperature Departures



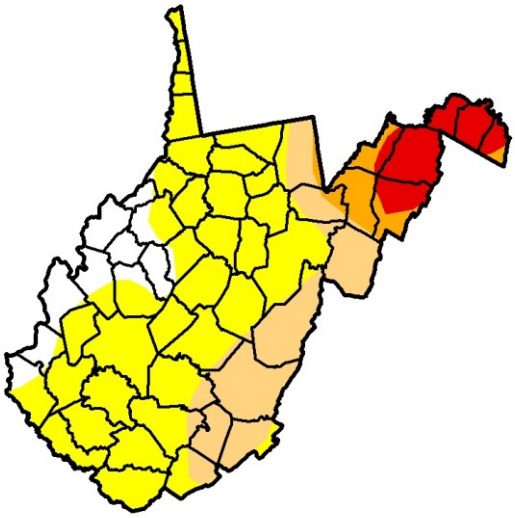
February 2010 Snowfall Totals

However, by spring the trend reversed. April temperatures started to warm considerably as the statewide averages were 4.1°F above normal and precipitation was 55% of normal. Above normal temperatures remained throughout the rest of the year until November and December when temperatures returned below normal. In fact, December was the 4th coldest in West Virginia history since 1895 ranging anywhere from 7°F – 10°F below normal.



December 2010 Temperature Departures

The below normal precipitation also remained the majority of the year. After three consecutive months (July, August, and September) the U.S. Drought Monitor showed many areas of the eastern panhandle in severe or extreme drought while the rest of the state was abnormally dry. The end of November brought much needed rainfall to the state which continued through to the end of the year.



September 28, 2010 Drought Monitor
Red: D4 Exceptional; *Orange*: D3 Sever

Wyoming State Climate Office

Water Resources Data System
University of Wyoming
Dept. 3943, 1000 E. University Ave.
Laramie, WY 82071
Tel: 307-766-6651
stateclim@wrds.uwyo.edu
http://www.wrds.uwyo.edu/sco/climate_office.html

Steve Gray	***Director and State Climatologist***
Tony Bergantino	Assistant State Climatologist
Chris Nicholson	Outreach and Technology Coordinator
Barbara Muller	Librarian and Archivist
Jodi Preston	Office Administrator and Data Manager
Scott Laursen	Data Services/Research Associate
Michelle Ogden	Data Services/Research Associate

The **Wyoming Water Resources Data System** (WRDS; http://www.wrds.uwyo.edu/) and its **State Climate Office** branch (SCO; http://www.wrds.uwyo.edu/wrds/wsc/wsc.html) are the single largest providers of water and climate-related data in the state. Housed within the Department of Civil and Architectural Engineering at the University of Wyoming, WRDS and the SCO are funded primarily through contracts with the Wyoming Water Development Commission.

The WRDS-SCO staff provides a variety of services, ranging from the development of enhanced drought-monitoring products to the online dissemination of water and climate data. WRDS and the SCO also support a wide range of groups by assisting in the development of the State Water Plan and helping to coordinate climate- and hydrologic-monitoring efforts throughout Wyoming.

Activities Related to the ARSCO Mission

Providing Support for Resource Management in the State and Region

- Commenced work on an AFRI-funded planning project aimed at exploring potential cropping-system shifts under climate change for areas currently in dryland wheat production.
- Concluded a federally-funded project that examines the effects of drought and climate variability/change on a group of ecologically important pine species in the Northern Rocky Mountains.
- Conducted and collaborated-on a variety of research projects aimed at developing a long-term history of water resources and climate for agricultural areas within the state. One recently concluded study was aimed at compiling long-term records of snowpack variability in Wyoming and surrounding states. Another ongoing project looks at changes in water availability in several key agricultural areas spanning northern Wyoming and southern Montana.

- CoCoRaHS participation also addresses a key problem within the state, namely a lack of precipitation monitoring sites in many areas. By combining these observations with PRISM (http://www.prism.oregonstate.edu/) we are also working to place these real-time measurements in a longer, historical context.

Coordinating and supporting the collection of weather and climate data

Over the past year, WRDS/SCO's primary focus has been to ensure that data generated by several new state and federal monitoring programs and various research initiatives can be applied to "real world" problems related to drought and climate change. First and foremost over the past year, this has taken the form of numerous coordination efforts related to the creation of new DOI Climate Science Centers and Landscape Conservation Cooperatives. In short, we are working closely with our local, state, and federal partners to ensure that these efforts bring the greatest possible benefit to Wyoming agriculture and natural resource management in the region. As another example, a large consortium of University of Wyoming researchers has continued to request $20 million in National Science Foundation funding for a project that would explore the interactions between climate change, vegetation, snowpack, and runoff across complex terrain. This so-called FoSTER (Forest, Steppe and Tundra Ecosystems Research) initiative is of tremendous interest to stakeholders in the region because it would directly address *"...how major vegetation disturbances associated with drought and pest outbreaks will impact snow accumulation and ablation, soil moisture storage, deep percolation, evapotranspiration, and runoff..."* WRDS and the SCO will summarize and distribute data from this project. We are also providing historical water and climate data from our extensive archives, and helping to design aspects of this research program so that it best meets the needs of our stakeholders.

Other related activities include

- Continued work on a 3-yr, $60,000 project linking soil moisture and rangeland productivity at 26 sites around Wyoming. This project also supports a PhD student in renewable resources and soil science.
- Continued work with the Wyoming Department of Agriculture on updates and maintenance of the Wyoming Soil Moisture network.
- Published new results from a project aimed at understanding the links between temperature variability/change and water availability in the region.
- Continued to work with the NWS to address monitoring needs related to natural hazards (e.g. flooding) and irrigation water-availability throughout the state.
- Continued work with the National Park Service's Rocky Mountain Network and Greater Yellowstone Inventory and Monitoring Program to develop climate-monitoring and reporting protocols for parks in Colorado, Wyoming and Montana.
- Continued to offer ready access to a large suite of water and climate-related data via the World Wide Web.
- Hosted a variety of seminars and meetings on the issues of drought and climate change in Wyoming and the West at large.
- Continued active participation in the CoCoRaHS program.

Promote access to, and use of, weather- and climate-products

- Produced a series of climate summaries and reporting products for the National Park Service and Regional Climate Centers that are then distributed widely throughout regional agricultural and resource management communities.
- Continued development of a series of ArcIMS interfaces that allow users to explore spatial data in an online-mapping framework. Access to related products can be found at:
    - http://www.wrds.uwyo.edu/sco/gis/IMS.html
- Continued development of our online resources, and introduced or refined a variety of graphical products that allow farmers, ranchers, and natural resource managers easier access to weather and climate-related data. Many of these products blend data from existing sources and multiple agencies to produce new, value-added resources for agriculture and natural resource management.

Representative Publications

Service/Outreach Publications

- Cleary, K., and others. 2010. Assessment of Groundwater Resources in the Green River Basin, Wyoming. Wyoming Water Development Commission, Cheyenne, Wyoming. In Press.
- Frakes, B., I. Aston, J. Burke, M. Britten, D. Pillmore, S. Ostermann- Kelm, R. Daly, C. Jean, M. Tercek, S. Gray, and T. Kittel. 2010. Rocky Mountain Climate Protocol: Climate Monitoring in the Greater Yellowstone and Rocky Mountain Inventory and Monitoring Networks. Natural Resource Report NPS/IMRO/NRR–2010/222, National Park Service, Fort Collins, Colorado.
- Gray, S.T., C.M. Nicholson, and M.D. Ogden. 2010. Greater Yellowstone Network: Climate of 2008. Natural Resource Technical Report NPS/GRYN/NRR–2010/173. National Park Service, Fort Collins, Colorado.
- McWethy, D.B., S.T. Gray, P.E. Higuera, J.S. Littell, G.T. Pederson, A.J. Ray, and C. Whitlock. 2010. Climate and terrestrial ecosystem change in the U.S. Rocky Mountains and Upper Columbia Basin: Historical and future perspectives for natural resource management. Natural Resource Report NPS/GRYN/NRR—2010/260. National Park Service, Fort Collins, Colorado.
- Nicholson, C.M., A.B. Bergantino, S.T. Gray. 2010. How Wyoming shares water data. *ArcNews*, 31(4).

Research Publications

Pederson, G.T., S.T. Gray, L.J. Graumlich, D.B. Fagre and J.J. Shinker. Snowpack in the North American Cordillera and its relation to long-term climate variability and change. *Science,* In review.

Tercek, M.T., S.T. Gray and C.M. Nicholson. Climate zone delineation: Evaluating approaches for use in natural resource management. *Journal of Applied Meteorology and Climatology*, In review.

Gray, S.T., J.J. Lukas and C.A. Woodhouse. Millennial-length records of streamflow from three major Upper Colorado River tributaries. *Journal of the American Water Resources Association*, Accepted.

Woodhouse, C.A., G.T. Pederson and S.T. Gray. 2011. An 1800-year record of decadal-scale hydroclimatic variability in the Upper Arkansas River basin from bristlecone pine. *Quaternary Research,* In press.

Pederson, G.T., S.T. Gray, T. Ault. W. Marsh, D.B. Fagre, A.G. Bunn and L.J. Graumlich. 2011. Climatic controls on trends and variability in snowmelt hydrology of the northern Rocky Mountains. *Journal of Climate*, In press.

Aziz, O.A., G..A. Tootle, S.T. Gray, and T.C. Piechota. 2010. Identification of Pacific Ocean sea surface temperature influences of Upper Colorado River Basin snowpack. *Water Resources Research*, 46, W07536, doi:10.1029/2009WR008053.

Barnett, F.A., S.T. Gray and G.A. Tootle. 2010. Upper Green River Basin (USA) streamflow reconstructions. *Journal of Hydrologic Engineering*, 15:567-579, doi:10.1061/(ASCE)HE.1943-5584.0000213.

Gray, S.T. and G.J. McCabe. 2010. Combined water balance and tree-rin approaches to understanding the potential hydrologic effects of climate change in the Central Rocky Mountain Region. *Water Resources Research*, 46:W05513, doi:10.1029/2008WR007650.

AASC 2010 Annual Meeting
Business Meeting Minutes

American Association of State Climatologists 35th Annual Meeting South Lake Tahoe, California
Business Meeting Minutes, July 15, 2010
Harry Hillaker, AASC Secretary/Treasurer

Meeting called to order at 9:59 a.m.

President Nolan Doesken opened with a review of AASC activities for 2009/2010. At last year's meeting Marjorie McGuirk noted that she had optimism that greater AASC funding opportunities may be available in the future. Although the details are not clear, this new funding appears to be coming as part of the National Climate Assessment process. Lou Vasquez took over administration of the AASC web page and listserve in the past year and has done an excellent job. He has been extremely responsive to our needs and quick to implement changes as needed.

Secretary/Treasurer Harry Hillaker presented the Treasurer's report. The AASC bank account balance as of July 1, 2010 stood at $48,235.68. This total is much lower than one year ago as most of the State Climatologist Exchange Program (SCEP) funding has been received but only some of the research grants payments have been made. Nevertheless, this year's balance is temporarily inflated owing to much of the 2010 annual meeting registration income being received while few expenses have been paid. Savings in 2010 compared to 2009 have come as a result of no dissertation award winner in 2010, no printing of the AASC annual report, less funds going to AASC web page support (thanks to Lou Vasquez's voluntary efforts in 2010 and payments made to Oklahoma in 2009 for work not paid in previous years). Also, David Stooksbury reported that he will not submit an invoice for Journal of Service Climatology (JSC) editorial duties until the workload increases. Hillaker also noted that he was very impressed when taking over the Treasurer duties to learn how careful the AASC Executive Committee has been with administration expenses in recent years. It was also noted that all of the 'Service Charges' shown in the budget are for PayPal service fees (well worth it for the reduction in paperwork it allows) and none are for credit union fees. Finally, the 2011 proposed budget is pure guess work owing to the difficulty in knowing the level of grant income. Hillaker also reminded the 2010 Travel Grant awardees that they must submit a brief report discussing the value to them of having attended the 2010 AASC annual meeting (as well as basic documentation of actual travel expenses) prior to receiving their travel grant funding. Unlike last year, these travel grant reports are one of the SCEP 2010 deliverables, thus cannot be neglected. A motion to approve the Treasurer's report was made by David Stooksbury, seconded by Ryan Boyles and approved by unanimous voice vote without amendments. The business meeting minutes of the 2009 meeting had been previously approved by an email vote.

Incoming President Dennis Todey summarized the AASC's Congressional activities for the past year. These activities primarily have been related to the National Climate Service (NCS) which in turn has been tied to proposed carbon cap and trade legislation.

While proposed legislation has not specifically mentioned SC's by name our presence is implied

and we have had some positive interactions with congressional staffers as had some individual SC's (and their institutions) with Congress. However, our primary Congressional contact has moved on to another position and very little action on NCS seems to have occurred since Fall 2009. David Stooksbury commented that UGA's congressional liaison says that we need to find a champion for our cause and preferably one on the appropriations committee. Doug Kluck noted that Eileen Shea may have some ideas in that regard. Nolan Doesken noted that this has been a major learning experience for many of us and that he has had more congressional interaction than ever over the past year. Dennis Todey stated that the AASC has the advantage of having wide geographic coverage and established climate service operations. We do not have to build from scratch. Nolan Doesken notes that development of the NOAA Climate Service seems to have cooled the NCS discussion. NOAA already has the authority to have such a service, but not the money. It is nearly certain that there will be no NCS developments prior to the Fall 2010 elections. George Jacobson points out that NOAA is not in the business to get money for the AASC (i.e., we need to do our own work) but they may be willing to speak about us. We need to develop a specific proposal and answer basic questions such as, what is it that we want Congress to do? What do we want? Obviously, funding is important and $5 million would probably be a minimum. We need a single well organized request. Kevin Robbins notes that NOAA is currently reorganizing but isn't actively seeking new money at the moment. We need a champion, we need supporters. This is a process that the RCC's have had to go through every year. David Stooksbury notes that we need to be thoughtful on how we structure our effort. The funding will probably need to be funneled through NOAA but not be NOAA's own effort. We need a committee to draft what we will do and then get someone in Congress to reword our proposal to fit their needs. Jan Curtis notes that Congress wants to create jobs thus, that should be an important element of our efforts. Ryan Boyles says that we need to keep the 'big picture' in mind and thus not alienate our potential partners. Mark Shafer suggests that the National Governor's Association (and Western Governor's Assn.) should be involved since we are state entities. Nolan Doesken suggests that we form an ad hoc committee. George Jacobson will be the chair with Mike Borengasser, Mark Shafer and another person to be appointed by the Executive Committee.

Nolan then described the 2010 SCEP process. We have a signed and approved contract for $99,900 for the period through April 28, 2011 but no money in hand yet. A request for proposals has been sent for monthly state climate summaries with funding of $3K for 18 states anticipated (3 per RCC region). However, less than 18 proposals have been received. Awards will be announced shortly. Additional funding opportunities will be announced in the coming weeks. The completion of the Climate Vignettes initiated by Paul Knight in 2009, the AASC Annual Meeting travel grants, AASC web page support and a small AASC grant administration charge also comes from the SCEP funds. Thus, additional SCEP 2010 funding opportunities will be relatively small but will be announced in the coming weeks.

In regard to climate assessments, RISAs and RCCs have budgets for this and are developing a plan. In discussions with Anne Waple of NCDC there is a realistic chance that FY10 money will come to the AASC very soon. This to include travel grants to every SC that applies to attend assessment related meetings (about $2.5K per state). It is also anticipated that grants of about $10K for 15 states with a $10K match will be made available. However, we do not have anything with clearly defined deliverables and must have that to proceed. It still has not been

determined if state matches of 'inkind' funds will be allowed but Anne is aware that 'cash' matches will be difficult for many of us to provide. The RISAs have no match requirement but the RCCs do. The funding source is different for the RISAs than for the RCCs/SCs. Ryan Boyles says it would be wise to coordinate with the RCCs. Nolan Doesken would like to see a 12.5% indirect cost for the AASC instead of the 5% we had with the 2009 SCEP. This may move us closer to being able to hire staff within the AASC Executive Committee offices or hire an Executive Director.

Fiona Horsfall has given us the invitation to participate in the exchange program with the NWS Climate Services Division.

At the last AASC annual meeting we did not settle upon a location for the 2011 annual meeting with possible hosts of Florida (probably Panama City area) or North Carolina (probably at Asheville). An email SC survey found virtually equal support for either Florida or North Carolina. In the meantime recent negotiations have been held with the AMS Applied Climate committee. It was decided that the AMS Applied Climate meeting and the AASC annual meeting will be held during the same week at some point in mid-July 2011 in Asheville. Tim Owen and Ryan Boyles will be the lead planners and they would like our input. There will probably be two separate registrations but many details remain to be worked out. Florida is still on the table for hosting the 2012 meeting. Good airfares are now available to Panama City with service from Southwest Airlines. Jim Angel offered Illinois as a potential host for 2012 as well with a probable meeting location in Springfield, IL possibly with help from Missouri. Adnan Akyuz also offered to host in North Dakota for 2012. David Stooksbury suggests that we try to meet in Asheville about every five years but not count it as an east coast meeting since NCDC, and not an SC, will be the host. Nolan Doesken says we will not take a vote on 2012 at this time. Nolan and Dave Dubois are talking about hosting the 2013 meeting in Colorado or northern New Mexico.

Last year a decision to split the Secretary/Treasurer position into separate Secretary and Treasurer positions was approved. However, the specific language to describe this change is yet to be made in our constitution. The Executive Committee will go through the Constitution to make sure the online version is up to date. The AASC Nomination Committee provided the Executive Committee a slate of potential new officers with Lesley-Anne Dupigny-Giroux suggested for Secretary and Michael Anderson for Treasurer. It was moved, seconded and approved by unanimous voice vote to accept these two nominations. Paul Knight noted that if both positions had two year terms (as did the previous combined Secretary/Treasurer) that there would be a major turnover in the Executive Committee membership every two years. Ryan Boyles suggested that we make a one year term for the Secretary. David Stooksbury says we could let the new Secretary and Treasurer decide which one would prefer to serve for just one year. Dave Robinson says the Treasurer position should have a two year term owing to the steeper learning curve for filling that position. It was decided that initially the Secretary position will have a one year term and will begin serving immediately but will be up for reelection in July 2011. The Secretary will then be up for reelection every odd year for a two year term that begins after the annual meeting (i.e., midyear). The new Treasurer will begin a two year term beginning January 1, 2011 and will be up for reelection in every even year and will begin their term at the end of the calendar year (i.e., next election in July 2012 with a two year term

beginning January 1, 2013).

The following were nominated for associate memberships:

Proposed Associate	Affiliation	Nominated by
John Andrew	CA Dept of Water Resources	Mike Anderson
Elissa Lynn Gruner	CA Dept of Water Resources	Mike Anderson
Kevin Brinson	U. of Delaware	David Legates
Ken Crawford	Korea Meteorological Agency	Nolan Doesken
Kathie Dello	Oregon SCO	Phil Mote
Howard Diamond	US Global Climate Observing Sys	Nolan Doesken
John Eise	NWS Central Region	Nolan Doesken
Beth Hall	Towson U.	Nolan Doesken
Wayne Higgins	NWS Climate Prediction Center	Nolan Doesken
Jan Null	Golden Gate Weather Services	Mike Anderson
Tim Kearns	NWS Aberdeen	Nolan Doesken
James Hocker	SCIPP/OCS	Renee McPherson
Sean Heuser	North Carolina SCO	Ryan Boyles
Heather Dinon	North Carolina SCO	Ryan Boyles
Bethany Hale	NWS Central Region	Nolan Doesken
Heather Angeloff	Alaska SCO	Nolan Doesken
Tia Mia Taylor	UC Davis	Dennis Todey

Ryan Boyles commented that he thought we had made it automatic for former SC's to become associate members but that we need to verify this and update our Constitution to reflect this. John Nielsen-Gammon moved and it was seconded and approved by unanimous voice vote to accept these associate member nominations. Nolan Doesken stated that he had taken the liberty to add people to the list serve prior to their formal associate member nomination. Dennis Todey also noted that this practice is helpful to insure that potential new members receive annual meeting information.

Committee Reports:

Education/Curriculum: David Stooksbury (chair), Lesley-Ann Dupigny-Giroux, John Nielsen-Gammon, Marina Timofeyeva, Ken Hubbard, Adnan Akyuz. The committee has been attempting to draft educational standards for service climatologists. It was considered to use the broader term of 'research' climatologist but this would probably have a PhD requirement and did not act upon this. An extensive survey was drafted and distributed on the AASC list serve. About a 20% response was received. David Stooksbury presented a list of respondents and their academic degrees. We will not make final decisions today on these requirements. The currently suggested coursework would take about seven years to complete, thus needs to be pared down considerably. A Master's degree is the recommended level of training owing to the depth and breadth of the subject. The requirements include an internship and a research project. Introductory statistics was the most highly recommended course. Recommended undergraduate majors would come from the natural sciences such as atmospheric science, environmental science, geography, meteorology, earth science, oceanography, agricultural engineering, etc.

Ryan Boyles noted that some climatologists may be more in the service area and less in the application area. Paul Knight suggests that the course list be sent back to the respondents for feedback in paring down the list. Kevin Robbins notes that most universities prefer degree programs to be 120 hours or less. Mark Shafer says that we should interact with the AMS Curriculum Committee. It was decided that prerequisites not be listed, only the core requirements.

Nominating Committee: Paul Knight (chair), Jim Angel, Tim Brown. In discussion of honorary members we need to have written requirements. Honorary members would not be expected to pay dues.

Dissertation Committee: met and considered applicants for the AASC Applied Climate Dissertation Award but chose not to select a winner this year.

Meetings Committee: Adnan Akyuz, Phil Mote, Jeff Andresen, Henry Reges, Lesley-Ann Dupigny-Giroux. This committee hasn't been utilized. The plan was for them to help the local host for the Annual Meeting. Lesley-Ann Dupigny-Giroux suggests that we could make it an ad hoc committee which the local host could utilize if they want. Harry Hillaker volunteered to help as well. The Executive Committee plans the annual meeting agenda and the local host is in charge of the logistics.

Strategic Planning: Kelly Redmond, Mark Shafer, John Nielsen-Gammon, Jim Angel, David Stooksbury, Deke Arndt and Mike Anderson. Not utilized in the past year. No chair appointed.

Policy & Procedures Committee: Ken Crawford, Jim Zandlo, Pat Guinan, Dave Robinson, Stuart Foster, John Young. Metadata standards, policy statements.
Finance Committee: Hope Mizzell, Harry Hillaker, John Christy, Mike Anderson. Not utilized in the past year.

Partners & Communications: Scott Archer, Ryan Boyles, Dennis Todey, Art DeGaetano, Jan Curtis, Dave Robinson. Paul Knight, Nolan Doesken and Jim Angel added. Ryan Boyles will become new chair.

Membership Committee: Ryan Boyles, Barry Keim, Deke Arndt, Al Dutcher, Paul Knight. Purpose is to improve the new member nomination process and keep members involved and paying dues.

Journal/Editorial Committee: David Stooksbury notes that we haven't been busy enough with the JSC to warrant additional members at this time. He reminds everyone that they need to act when an article is submitted for review as the review process has been a major bottleneck.

Ryan Boyles notes that it is tough to be involved with the AASC by only attending the annual meeting. He suggests that we make committee membership a requirement for SC's to retain ARSCO status.

AASC statement on standards for a national surface based mesonet: Ryan Boyles says Ken Crawford's document was very thorough work but was network based instead of station based. He says one conference call was held but did not receive enough feedback to move forward. Mike Palecki notes that NOAA and AMS are active on the topic and will set the standard but that we could have input. Renee McPherson notes that the AMS work is based mostly on metadata standards (best practices). AMS did not set any 'tiering' of networks. Mark Shafer notes that the next AMS summer meeting will focus on the Network of Networks.

Climate Change Statement: Phil Mote, George Jacobson, Mike Anderson, Ryan Boyles, John Nielsen-Gammon. John Nielsen-Gammon states that we need to get the opinions of voting members. They will send out a poll in the coming months to the AASC VoteList. Mike Palecki asks if the poll could be sent to the entire AASC List Serve. Dennis Today: George Mason poll showed SC's were the most trusted source of climate change information.

AASC Executive Director: The Executive Committee thinks an Executive Director would be good to have if we can obtain the needed resources. However, we also need a candidate that knows us. Nolan notes that higher membership dues proposed last year, in the range of $1K per year, received a very cool reception. Ryan Boyles notes that the dues must be institutional, not individual. John Nielsen-Gammon notes that we must set the bar high enough so that we will not have to come back the next year and ask for more money. Mark Shafer notes that an ARSCO status requirement for SC's to be eligible for grants could be a good incentive. Nolan Doesken states that he really wants to act upon this. Ryan Boyles notes that North Carolina could probably handle higher dues and Harry Hillaker states that Iowa probably could as well.

The role of RISAs in the AASC. Ryan Boyles states that National Climate Service involves AASC, RCCs and RISAs. He suggests that we invite RISAs to participate in the AASC and eventually allow them voting privileges. John Young says that we would not want them if RISAs are not keeping us involved. We could request participation in RISA activities and vice versa. RCCs will ask RISAs to extend an invitation to SCs to attend their annual meeting in DC in November. Harry Hillaker suggests that we specifically invite RISAs to our annual meeting.

Nomination procedures: Nolan Doesken asks if we can change the associate member nomination process so that new members can be approved between business meetings as long as an SC has made the nomination. Paul Knight notes that we need to amend the Constitution to do this. Nolan Doesken says it is too late in this meeting to draft the necessary language at this time but that we should move toward this goal. David Stooksbury notes that we are sort of doing this now by placing potential new member on the list serve prior to their formal nomination at the annual meeting.

Finally, special thanks are extended to Mike Anderson, Jeff Underwood and Jeff Thompson for their excellent work in arranging our 2010 annual meeting. Harry Hillaker states that Mike Anderson was great to work with in the planning process and was very responsive to all requests. Also, thanks extended to Sam McCown for his work as the NCDC AASC liaison over the past year. The meeting was adjourned at 12:27 p.m.