

BOOK REVIEW 2006 - #2

Chagnon, Stanley A., James R. Angel, Kenneth E. Kunkel, and Christopher M.B. Lehmann. *Climate Atlas of Illinois*. 2004. x + 309 pages; tables; figures; black and white photographs; colored photographs; three chapters with literature citations; bibliography; glossary; two appendices. Illinois State Water Survey, Informational/Educational Material 2004-02 (ISWS IEM 2004-02), Champaign, Illinois. Soft Cover. Price: \$20.00. Available from: Illinois State Water Survey, Attention: Gloria Marsh, 2204 Griffith Drive, Champaign, IL 61820

Cold waves, heat waves, droughts, floods, and storms of all types; "If you don't like the weather, just wait, it will change" is a common expression used to describe weather conditions in mid-latitudinal locations, as exemplified by the continental interior of the United States, especially the state of Illinois. Sometimes dramatically, sometimes rapidly, but most likely in a regular and recurrent fashion, the weather of Illinois is often changeable and unpredictable.

What are the key factors that control the climate of Illinois? First of all, the state's continental location, mentioned above, eliminates the potential moderating influences of oceans. Therefore, continentality is the dominant control, save for the localized effects of Lake Michigan in the northeastern part of Illinois. Because of the mid-latitudinal location, the amount of solar energy varies greatly from summer, with its longer days and higher sun angles, to winter's short days and low sun angles. As a consequence, summers tend to be rather warm while winters are cold, conditions reinforced by the continental location as well. Secondly, the central location of Illinois allows the state to be affected by cold, dry air masses originating far to the north and northwest in northern Canada (dominant in winter), as well as by warm, humid air masses from the Gulf of Mexico to the south (dominant in summer). Pacific air from the West Coast frequently reaches Illinois, but in a modified form, having lost most of its original moisture supply crossing up and over the Western mountains. Thirdly, active weather systems, including high pressure centers, low pressure systems, and frontal boundaries, cause highly variable weather conditions as they move across the state in a general west-to-east direction following the large-scale westerly circulation found in the mid-latitudes. Also, typical of mid-latitudinal continental climatic regions are four distinct seasons, each characterized by different climatic conditions.

Furthermore, the authors identify several distinctive and unique aspects of the climate of Illinois. Significant north-south contrasts in temperature are found within the state. A wide variety of different types (and amounts) of precipitation occur as well, with both strong monthly and seasonal variations found. Weather conditions often exhibit marked variability between different areas of the state, and particularly from year to year. Finally, large numbers of different storms occur in all seasons (snow and ice storms in winter, and severe weather - thunderstorms, hailstorms, flash floods, and tornadoes - during the warmer months). In addition, particular areas of Illinois experience special local and regional climatic conditions: lake effects adjacent to Lake Michigan in northeastern Illinois; urban effects produced by the large metropolitan areas of Chicago and St. Louis; and topographic effects caused by the hilly terrain in southern Illinois. The *Climate Atlas*

of Illinois provides a comprehensive and detailed examination of the state's climate encompassing these local and regional effects, and other climatic impacts as well.

One of the most interesting features (to me) contained in the Climate Atlas of Illinois is the detailed descriptions of noteworthy weather events. Many of these have occurred in the last 10-15 years, a time frame in which our lives may have been personally affected. Summer heat waves and outbreaks of Arctic cold in the winter are not uncommon occurrences in Illinois. Record-setting heat waves have affected the state in July 1936 (during the Dust Bowl era), July 1954 (setting the highest temperature ever recorded in Illinois, 117°F in East St. Louis), and again more recently in July 1995 and 1999. Heat can prove deadly as well, with a record 753 deaths in Chicago in 1995. It is interesting to note that heat waves represent the single, most deadly climate hazard in Illinois. Cold waves rank second; record cold temperatures were felt in February 1899 (more than 100 years ago) and more recently in February 1996.

Extreme seasonal variability also characterizes precipitation patterns. Droughts are a recurring part of climatic conditions. The driest conditions were found during the decade of the 1930s, with 1934 and 1936 standing out because these years were accompanied by intense summer heat, which exacerbated the effects of the drought, especially on agriculture. The drought of summer 1988 was actually the middle of a consecutive three-year period of dryness. Not only were crop yields significantly reduced, the lack of sufficient rainfall created serious shortages in municipal water supplies. Low water levels in streams and rivers also led to disruptions in river transportation on the major rivers in the state. As it turns out, flooding in Illinois actually causes the most financial damage, and flood losses have increased significantly in recent years. Since 1983, average annual losses from flooding have amounted to \$257 million, the third highest total in the United States. The Great Flood of 1993 was unprecedented in its magnitude, duration, and impact. A persistent weather pattern led to an extended period of heavy rainfall, and resulted in widespread catastrophic flooding on all major rivers across the Upper Midwest, including the Illinois and Mississippi Rivers. Damage from the Great Flood totaled \$1.6 billion in Illinois alone, from agricultural losses, flooded homes, levee failures, damage to roads, bridges, and other structures, and transportation disruptions (road, railroad, and barge traffic).

Severe storms also cause considerable damage, and some deaths, as a result of heavy rain-producing thunderstorms (and flash floods), lightning, hail, wind, and tornadoes. The list of outstanding weather events features all of these types of storms. Notable on the list is the Tri-State Tornado on March 18, 1925, the single longest tornado track on record. The storm covered 219 miles from southeastern Missouri across southern Illinois into southwestern Indiana, moving rapidly at speeds exceeding 60 mph. This monster tornado was one-half to one mile in width and resulted in 695 deaths and more than 2000 injuries. The more densely populated coal-mining region around Murphysboro, Illinois suffered the most death and destruction. The Climate Atlas of Illinois describes other major storm events as well.

Not to be overlooked are severe winter storms with their often deadly combinations of heavy snowfall, strong winds, and biting cold. Based on snowfall totals, areal coverage, and damage costs, the authors identified the January 26-27, 1967 storm as the worst

(Chapter 8, Page 235). A record 24 inches of snow fell in Chicago, while freezing rain plagued southern Illinois. High winds caused excessive drifting of snow, completely paralyzing travel across the state, and in the city of Chicago in particular. Storm losses totaled \$197 million (in 1967 dollars; \$1.6 billion in 2002 dollars) from the combination of economic losses, business closings, power outages (especially in the ice-covered parts of south-central Illinois), and snow removal efforts. Snowstorms can be expected during any year. Another January blizzard, this time in 1999, again created major economic problems for transportation, businesses, and schools. Who in Chicago can forget the 40 inches of snow that fell in the first two weeks of 1979? The lack of snow removal from the streets of the city became the main focal point for Jane Byrne's successful mayoral campaign when she defeated incumbent Michael Bilandik and was swept into office under an avalanche of popular support. During the recent winter season of 2004-05, the Chicago area was twice hit with nearly a foot of snow. Of course, things could easily be worse. Just ask any residents of Boston or adjacent coastal areas of Massachusetts, buried under 2-3 feet of the white stuff in the Blizzard of 2005 on January 22-23, 2005! It is indeed fascinating to examine this detailed series of significant storms and often notable climate events that have occurred in the last century. This section represents the high point of the Climate Atlas of Illinois.

The U. S. Weather Bureau (now the National Weather Service) has been collecting weather data for more than 100 years. In Illinois, the establishment of the Illinois State Water Survey (ISWS) has enabled detailed information of the weather and climate in the state to be recorded and analyzed over an intensive 50-year period of time. In point of fact, "more data and information exists about the climate of Illinois than about any other area in the world" (Chapter 1, Page 6). Utilizing more than 100 years of collective experiences in weather and climate service, scientists from the ISWS (Stanley Chagnon, James Angel, Kenneth Kunkel, and Christopher Lehman) have published a definitive atlas on the climate of Illinois.

In addition to the considerable expertise of the authors, the atlas was able to fully utilize the wide-ranging amount of long-term data collected on the climate of Illinois. Three definitive aspects stand out. The scientific affiliation with the ISWS proves to be critically important. The survey operated 13 dense networks, for time periods ranging from 5 to 20 years, to obtain detailed precipitation and storm data for different areas across the state. Secondly, the ISWS has conducted a number of intensive studies (since 1954) focusing on all aspects of the state's climate. Fifty years of detailed research are represented in the atlas as a direct result. Finally, the survey established a statewide network of 18 recording stations, measuring temperature, precipitation, solar radiation, winds, soil moisture and soil temperature. This systematic climate data set provides a detailed and unique record which has been in operation for more than 20 years at this point.

The lead author, senior scientist and Chief Emeritus at the Water Survey, Stan Chagnon, has served both as the Illinois State Climatologist (office established at the ISWS in 1954) and director of the Midwestern Regional Climate Center (established in 1982). Co-author Jim Angel is the current State Climatologist while Ken Kunkel served previously as MRCC director. Christopher Lehmann, on staff with the National Atmospheric Deposition Program (part of the ISWS), brings expertise on air quality. Needless to say, the authors have brought their extensive backgrounds, and wealth of experience, together to

produce a detailed atlas that focuses on climatic conditions experienced during the 20th Century in Illinois.

The Climate Atlas of Illinois is divided into ten chapters. The initial introductory chapter provides an overview of the climate of Illinois, covering climatic controls and taking a look at the historical record as well. Chapters 2 and 3 are devoted to the fundamental aspects of climate, temperature and precipitation. Chapter 4 examines the statewide energy budget, particularly radiation, cloud cover, and winds. The specialized local-regional effects of Lake Michigan, topography, and human activity on climate conditions are discussed in detail in Chapter 5. Air quality is the focus of another human-induced climate concern in Chapter 6. Climate extremes (such as droughts) and all types of storms (rain-, hail-, thunder-, etc.) are treated in Chapter 7. Chapter 8 (my personal favorite) covers outstanding weather and climate events of the 20th Century. See how many you can remember! Chapter 9 deals with synoptic climatology - an examination of the frontal systems and air masses that control weather and climate conditions around the state. The final chapter (10) looks into climate issues of recent and potentially future concerns, including global warming, El Nino/La Nina, and climatic change. The atlas also contains an extensive bibliography, glossary, and two appendices. The first appendix describes weather instruments, climate statistics, and terminology. Appendix B contains climatological data summaries for 11 locations in Illinois. The atlas checks in at more than 300 total pages and contains extensive photographs and figures, along with a number of useful data tables. This publication is first class of high quality printed on glossy paper. Many of the photographs are in color; all are sharp, clear, and well suited in illustrating important points described in the writing. Graphics are also worthy of praise, well designed to highlight textual discussions, especially those illustrations which use color tones, which make them very easy to read.

Why develop a climate atlas of Illinois? Who is this volume intended for? The authors recognized that "climate is critically important to the state's economy, environmental conditions, and human health" (Chapter 1, Page 2). Climate conditions such as weather extremes and storms exert notable impacts on agricultural activities, businesses, economic conditions, transportation, and human health and safety. The atlas is a most welcome treatise intended for a wide variety of users, ranging from scientists and educators to agricultural and economic interests to the general public. Anyone who either uses climatic data, or simply has an abiding interest in weather, will no doubt find the atlas to be informative as well as helpful.

Although the atlas is indeed well written and informative, there are areas for improvement. Most of these are inherent to the nature of climatic data. When were the data used in analyses collected? In some cases, it appears that recent data are lacking, most noticeably in the chapter on severe storms. For example, many of the maps and graphs depicting tornado statistics only extend through 1969. Information about hailstorms are based on data through 1980, while snow and ice storms only cover the period up to 1960. The oldest climatic data set is that for windstorms, good through 1948. These examples point out difficulties due to limitations found in existing data sets, and suggest a need for updated studies. When working with climate data, there will always be areas of improvement, a future research topic to be investigated, or additional work to include the most recent developments in the data set. Also, the atlas lacks a comprehensive index, which would

be quite useful to users unfamiliar with climate data and anyone interested in a particular subject.

Fortunately, the drawbacks are relatively minor, and certainly do not detract from the overall usefulness of this excellent work. As a meteorologist/climatologist at Western Illinois University, I welcome the production of the Climate Atlas of Illinois. The authors were indeed able to combine their own wealth of knowledge with extensive sets of wide-ranging climatic data to produce an extremely detailed analysis of climatic conditions in Illinois. The atlas is very easy to read and follow, and abundantly illustrated. I highly recommend this book to anyone fascinated (as I am) with the highly volatile but always interesting weather and climate found in the state.

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