WeatherZine

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In This Issue

Comments? Send us email at thunder@ucar.edu

Editorial

--Roger A. Pielke, Jr.

Floyd the Fire Drill

Hurricane Floyd was in many places the equivalent of a fire drill – it was a trial run for future storms. (Unfortunately, for many in North Carolina in particular, it was a fire, not a drill.) It revealed ample opportunities to improve hurricane preparedness, response, and particularly evacuation based on forecasts and warnings. It also revealed that we as a nation are lacking critical information necessary to improve our priorities and preparedness, not only for hurricanes, but extreme weather in general.

Floyd holds the dubious distinction of being the first billion-dollar storm in which the costs of the evacuation rival the costs of the storm's impacts. How can this be? Assuming that the costs of evacuation are in the neighborhood of the oft-cited $1 million per coastal mile, then an evacuation of about 2,000 miles of coast totals $2 billion. According to the insurance industry, insured losses associated with Floyd totaled more than $1 billion, and flood costs add at least several billion to that.

This distinction is significant because it dramatically reveals one of the hidden costs (http://www.heinzctr.org/Programs/coastal-marine.htm#The Hidden Costs of Coastal Hazards) of hurricanes – that of overwarning. Because forecasts are uncertain, a larger area of coast must be warned than actually experiences a hurricane's impact. Consider that a hurricane typically directly affects about 100 miles of coast, and the average length of coastline warned per storm is 400 miles. This means that, on average, 300 miles of coast are warned but do not experience the direct effects of the hurricane. Floyd was obviously an extreme example of overwarning but perhaps also an indication of the sorts of problems faced in the future as more and more people move to coastal locations.

Improved forecasts offer the promise of reducing the costs of overwarning by providing greater accuracy and reliability to emergency management officials who must make difficult evacuation decisions (in concert with the National Hurricane Center, the Federal Emergency Management Agency, and in some cases, elected officials). How might this occur and what might be saved? Based on work done by Mark Demaria (formerly with the Tropical Prediction Center (http://www.nhc.noaa.gov/), in 1997, the average error in hurricane track forecasts at 24 hours was about 90 miles (where error is the difference between where a storm is predicted to go and where it actually does go). And 95% of such forecast errors were less than 200 miles. By inference, this means that the average 400 miles of coastline warned per storm equates to a 95% confidence level (i.e., +/- 200 miles = 400 miles). Thus, only 1 in 20 storms will cross the coast over an area that was not warned at 24 hours.

About Us

WeatherZine is a bimonthly newsletter on the societal aspects of weather. It contains opinion pieces, news, and a brief summary of developments at the *Societal Aspects of Weather* Web site.

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If improved forecasts can reduce the magnitude of the 95% error in miles of coastline warned by, say, 20% from 200 miles to 160 miles, then all else being equal, this would lead to a reduction in miles-of-the-coastline-warned from 400 miles to 320 miles (+/- 160 miles) or a cost savings of $80 million per storm (80 miles times $1 million per mile), without changing the level of risk faced by coastal communities.

Some have suggested that instead of reducing the level of overwarning, it would be more important to increase the lead time available to the emergency management community. This argument makes good sense, given how long it takes to evacuate many communities and how those times are increasing. But it is impossible to effectively compare the relative benefits of reducing miles-of-coastline-warned versus increased lead time, because we simply do not know the value of improved lead time. And the back-of-the-envelope calculation in the paragraphs above of the benefits of reducing overwarning is no substitute for a rigorous empirical analysis. In our April 1999 issue Jerry Jarrell, National Hurricane Center Director, provided a list of such needed analyses (What Does the National Hurricane Center Need from Social Scientists?, http://www.dir.ucar.edu/esig/socasp/zine/15.html#2).

The hurricane case is representative of a broader problem. Simply put, in the area of weather we as a nation lack the information necessary to make informed public policy decisions about scientific research priorities, forecast tradeoffs, and community risks. The need clearly exists and there are experts with skills appropriate to the task, so why hasn't the community seen fit to prioritize this important area? Until we do public policy will suffer. Floyd is the most recent example of some important lessons. When will we finally learn them?

Guest Editorial

Results of Investigations into Annual U.S. Lightning Costs and Losses

--R. Kithill

ABSTRACT: Researchers who attempt to describe the economic impact of lightning in the U.S. are confronted with contradictory data. National Weather Service (NWS) figures place the most recent yearly losses at some $35 million. Such a severe understatement of costs from an official source tends to inhibit attention focused on lightning problems. In general, lightning safety issues are not taken seriously by individuals, businesses, or government. If actual dollar losses were understood more fully, then awareness and mitigation measures might be raised to a higher priority.

INTRODUCTION: *Storm Data* is the NWS reporting vehicle for collecting and describing severe weather information. Each NWS field office has an appointed Warning Coordinating Meteorologist or other staff person responsible for collecting local news to be forwarded to *Storm Data*. Newspaper accounts are a frequent source of this information. If an incident does not appear in the newspapers, or is overlooked by the reviewer, it may not get into the *Storm Data* statistical base.

RECENT CONFIRMED ECONOMIC CONSEQUENCES

Source: St. Paul Insurance Company, St. Paul, MN. During the five-year period 1992 through 1996 around $USD 1.7 billion was paid out in lightning-related claims. All claims were commercial in nature. Lightning accounted for 8.7% of the total number of claims and 3.8% of the property dollar losses. The average annual paid claims for this period totaled $340 million.

Source: Anonymous Large Insurer, Holle, et al., 1995: *Insured Property Damage Due to Lightning in Three Western States*. Proceedings. Williamsburg, VA, IAGCLSE. Lightning losses to residential and commercial property in Colorado, Utah, and Wyoming were sampled over a six-year period. Most claims (90%) were individual homeowners. When extrapolated into national averages, 307,000 annual claims totaling around $332 million were made each year.

Source: The National Fire Protection Association (NFPA), Quincy, MA. NFPA publishes *Annual Averages of Fires and Losses Reported to U.S. Fire Departments Caused by Lightning*. Information is collated by property classification and source of origin. In the most recent reporting period, 1991-1995, each year lightning caused 30,190 fires, resulting in annual losses of $175.2 million.

Source: Insurance Information Institute (III), NY, NY. A 1989 press release from III reported that 5% of all insurance claims were lightning-related, amounting to more than $USD 1 billion per year. In 1997 and 1998, press releases from III said that "lightning strikes are responsible for over $250 million per year."

Source: Clausen Miller PC, Chicago, IL. During July 23, 1997, a lightning-induced fire broke out at 5120 Race Court, Denver, Colorado, in the CS Integrated refrigerated warehouse. There was a total loss to building and contents of around $72 million. This is believed to be the largest structural loss due to lightning on record.

Source: Weber et al., 1998: An Assessment of the Operational Utility of a GOES Lightning Mapping Sensor*, Project Report NOAA – 18.* MIT Lincoln Laboratory. "The FAA currently estimates that thunderstorms cost the airlines and the U.S. public approximately $2 billion per year in operating costs and passenger delay."

Source: Bernstein, R. and Diehls, et al., Electric Power Research Institute (EPRI), Palo Alto, CA, 1997. On an annual average, approximately 30% of all power outages are lightning-related, with total costs approaching $ 1 billion.

Source: The Ohio Insurance Institute, Columbus, OH, reports that 18% of all lumberyard fires are originated by lightning. Further, 30% of all church fires are started by lightning.

Source: *Journal of Hazardous Materials* **40**, 43-54 (1995). Lightning accounts for 61% of all accidents in storage and processing activities where natural events were the root cause. In North America, 16 out of 20 accidents involving petroleum products storage tanks were due to lightning strikes.

Source: Hasty, G., National Park Service, Risk Management. "We have determined that about half the wildfires in the western USA are lightning-related. About 10,000 such fires cost about $100 million annually. In 1996 the National Park Service experienced 517 lightning-induced fires which cost $19,576,128. In 1997, the Boise National Forest fire cost $47 million and took 45 days to bring under control."

Source: Hasbrouck, R., National Lightning Safety Institute, Director of Engineering. "Low voltage electronic components, e.g. transistors and microprocessors, are particularly vulnerable to lightning induced transient voltages. Effects range from 'sudden death' of the component, resulting in failure of associated circuitry, to a latent failure where the weakened component dies days or months after the lightning event. Transient voltages also can cause computer systems to generate corrupted data, or experience a momentary glitch or crash. Although the costs associated with the component damage and lost time (and revenue) resulting from system down time are not currently documented, it is reasonable to expect that they are significant."

Source: Department of Energy (DOE), Occurrence Reporting & Processing System (ORPS), September 1990—September 1998. ORPS-reported lightning incidents at DOE sites for the eight-year period totaled 461 incidents, or 57.6 accidents per year on average. Types of losses, but no costs, were identified. An examination of the incidents can be summarized:

- ORPS reporting frequency is not related to localized lightning frequency. Hanford Site, for example, located in a low lightning area, was second in numbers of reported incidents. Savannah River site was the leader in reported lightning problems.
- Lightning-caused incidents included failure of protective devices, equipment malfunctions, standby generator failures, grass and range fires, power pole destruction, and injury to personnel.
- Voltage surges accounted for about 80% of the physical damage reported. Affected equipment in this category included: transient limiters (arrestors, fuses, switches); telephones, pumps and motors, and generator systems.
- Alarm systems suffered the most damage. Areas affected included perimeter security intrusion alarms, fire and radiation alarms (both failures and activations were reported), as well as communications systems equipment (pagers, public announcement speakers, telephone and radio communications).

Source: Computer Security News (http://www.secureit.com/newsletters.Statistics98.htm) In 1997, lightning accounted for 101,000 laptop and desktop losses amounting to $125,417,000.

CONCLUSION: Accurate lightning cost and loss reports are elusive. There is no good agreement between sources. The NWS *Storm Data* reporting system appears to be flawed since there is evidence that annual lightning losses are in excess of the "official" $35 million figure. Further investigation is needed to provide better statistical data. A reasonable estimate is that there may be $4-5 billion in lightning costs and losses each year in the U.S.

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REFERENCES: Kithil, R., *A Risk Management Approach to Lightning Safety,* IAGCLSE, Williamsburg, VA, 1995.

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Dear WeatherZine:

As usual Chuck Doswell's (August 1999 WeatherZine Guest Editorial, http://www.dir.ucar.edu/esig/socasp/zine/17/zine.pdf) comments are provocative. I agree with him about the lead time issue. We all need to come to some sort of consensus about the optimal length of a warning. There are examples of 45 minute warnings where people have come out of their shelters after 30 minutes only to get whacked by a tornado. I take issue with Chuck's assertion about what it will take to reduce the false alarm rate (FAR) and increase the probability of detection (PODs) (and his characterization of the NWS goals). I think everyone should take a look at what happened at Sterling, VA in 1998 with the test of the new decision support system called "System for Convective Analysis and Nowcasting" (SCAN) which combines the NSSL Warning Decision Support System (WDSS) and the NCAR Autonowcaster into one system on AWIPS. This decision software PLUS TRAINING (I agree with Chuck on this point) allowed the forecasters in 1998 to increase the POD from .65 to greater than .80 and reduce the FAR from above .50 to below .30 for all severe weather warnings (and increase the lead time too). I am sure that Steve Smith (from TDL) and Steve Zubrick (from Sterling) would be willing to engage Chuck in a healthy debate as to what contributed to this success that gives hope for the NWS meeting its new strategic goals. My view is that the information inherent within the new observing systems and models is not accessed or utilized very effectively; and that the systems inherent within SCAN allow the forecasters to quickly access the data and associated information to make better and more informed decisions.

Louis Uccellini, NOAA/NCEP

Weather-Related News

A New Bibliography on Forecast Use and Value

This month we are releasing the first edition of a bibliography on the use and value of weather and climate forecasts. We have put it together to satisfy an increasing demand for such information. So share it with colleagues and let us know how to improve it.

About the Bibliography

With this bibliography we are beginning the task of providing a single resource for published, peer-reviewed articles on the use and value of weather and climate forecasts. This area is a subset of the broader area of forecasting in the earth sciences, which you can learn more about here (Prediction in the Earth Sciences, http://www.dir.ucar.edu/esig/prediction/).

The bibliographies were put together based on searches of meteorological and geophysical abstracts (http://www.mganet.org), UnCover (uncweb.carl.org), and Dialog@CARL (dialog.carl.org:3028), including the following journals: Applied Social Science, Chemical Safety, Electric Power Data, Federal News Service, Harvard Business Review, Insurance Periodicals, Journal of Commerce, Science, and Thompson Risk Management.

We have organized the overall list of more than 500 entries into a set of "sub"-bibliographies in order to facilitate finding useful information. We recognize that there is much not included here and would like your help in making the bibliography as comprehensive and up-to-date as possible. To that end, please send us relevant citations for inclusions in the bibliography. Note that the forecast value bibliography will also be integrated with our larger Weather Impacts Bibliography (http://www.dir.ucar.edu/esig/socasp/biblio.html) on the societal aspects of weather.

Contributors who made the bibliography happen are Aaron Nutter (University of Colorado), Jen Oxelson (ESIG), and Bobbie Klein (ESIG).

National Symposium on the Great Plains Tornado Outbreak of 3 May 1999

Call for Participation

On 3 May 1999, some of the most intense tornadoes ever observed tore through parts of the southern Great Plains, devastating metropolitan areas and nearly destroying entire communities. Despite the ferocity of the storms, the number of deaths was exceedingly low as a result of advanced storm detection and warning technology, effective information dissemination, and rapid response by public safety and emergency officials. The extensive body of information collected during and after the May 3 event affords a unique opportunity to study, in a single venue, all components of this significant natural disaster, including: research and operational meteorology, economic and societal impacts, public safety and emergency response, information dissemination by the media, and post-disaster relief and reconstruction. Consequently, the

Oklahoma Weather Center, in collaboration with local, state, and federal agencies, is organizing a National Symposium on the Southern Great Plains Tornado Outbreak of 3 May 1999. The Symposium seeks to bring together the natural science, social science, policymaking, public safety, and information dissemination communities as a means for evaluating successes and failures on May 3, and for stimulating future interaction.

The Symposium will be held from 2-5 May 2000 in the Oklahoma City metropolitan area and will be broadcast live on the Web. Oral and poster presentations will be supplemented by invited and keynote speakers, along with panel discussions and general-interest sessions. A special issue of an American Meteorological Society journal will be dedicated to selected papers in all topical areas resulting from presentations made at the Symposium. To facilitate research by the national community, the Oklahoma Weather Center has established a web site (http://caps.ou.edu/wx/info/3may99) that contains most of the observational data, or links to them, collected during the May 3 event.

Persons wishing to present oral or poster presentations on topics directly related to the May 3 event should send a 200 word abstract to Prof. Kelvin Droegemeier, Conference Chairman, School of Meteorology, University of Oklahoma, 100 East Boyd, Suite 1310, Norman, Oklahoma, 73019 (kkd@ou.edu; phone 405-325-0453; fax 405-325-7614). Papers are especially encouraged from the social science, public safety, media, and engineering/construction science communities. **The deadline for receipt of abstracts is 15 January 2000**, and speakers will be notified of the disposition by 1 February 2000. The abstracts will be published on the Web and made available at the Symposium.

Selected Web Site Additions

General Weather Resources—Section 1

http://www.weather.com/breaking_weather/encyclopedia/
The Weather Channel Storm Encyclopedia

This Web site provides basic information about severe and extreme weather events, including flooding, heat waves, hurricanes and tropical storms, severe thunderstorms, tornadoes, and winter storms.

http://www.nationalgeographic.com/infocentral/web/weather.htm
National Geographic's Weather, Natural Hazards, and Disasters page

This site covers topics ranging from weather forecasts to historical weather data, El Nino, floods, hurricanes, tornadoes, severe storms, and even K-12 educational materials.

http://www.nssl.noaa.gov/resources/wxresource.html
National Severe Storms Laboratory (NSSL) Resource Listing for Weather and Climate Instruction

NSSL provides this site to assist teachers of weather and climate by listing some of the available instructional resources. Included are sections such as "General Instruction," " Audiovisual," "Print," "Instruments/Equipment," "Software," "Data Sources," "Professional Organizations," and "Additional Resource Contacts," as well as a list of abbreviations and acronyms.

Summer/Winter

http://md.water.usgs.gov/drought
Drought Watch '99

Because the mid-Atlantic region is suffering its worst drought in 30 years, the USGS has developed this new Web site - Drought Watch '99 - to monitor water levels and rain prospects. This site includes nationwide information about water levels and rainfall trends.

http://www.drought.noaa.gov/
NOAA's Drought Information Center

NOAA's Drought Information Center provides breaking news including current drought assessments of various kinds; monthly roundups; and background information on drought.

http://www.westgov.org
The Western Drought Experience

On July 16, 1998, President Clinton signed the National Drought Policy Act of 1998 (Public Law 105-199), creating the National Drought Policy Commission to advise Congress "on the creation of an integrated, coordinated Federal policy designed to prepare for and respond to serious drought emergencies." The Western Governors' Association's Western Drought Coordination Council (WDCC) recently prepared a report entitled "The Western Drought Experience: The Western Drought Coordination Council's Report to the National Drought Policy Commission" - to assist the national effort. To access the report, go to the URL above, select "WGA Publications," scroll down to the Policy Reports section, and click on the link for the drought report.

http://enso.unl.edu/ndmc/watch/watch.htm
Drought Watch

The National Drought Mitigation Center's "Drought Watch" page includes links to sites monitoring current droughts in the U.S., forecasts, information on global climate and drought monitoring, information about current drought-related impacts and humanitarian issues, as well as drought news. The site is a clearinghouse for the many sources of drought information now available on the Web.

http://qsilver.queensu.ca/~icestudy/
Ice Storm 1998 Emergency

The Ice Storm of January 1998 was the largest natural disaster recorded in Canada. The general perception is that, overall, the response was surprisingly effective even if it was not according to plan. This site offers numerous interviews with emergency responders and volunteers who were involved in the restoration effort, as well as several post-storm reports and photographs.

Tornadoes General Resources—Section 2

http://tgsv5.nws.noaa.gov/om/omdis.html
Oklahoma/Southern Kansas Tornado Outbreak of May 3, 1999

The latest "Service Assessment" from the National Weather Service Office of Meteorology examines the May 3 tornadoes in Oklahoma and Kansas, including the devastating F5 vortex that struck Oklahoma City.

Floods—Section 2

http://www.wkap.nl/sample.pdf?166422
Assessing the Vulnerability of Coastal Communities to Extreme Storms: The Case of Revere, MA, USA

This paper is available in the periodical "Mitigation and Adaptation Strategies for Global Change" (Vol. 3, pp. 59-82). For more information about the journal see: http://www.wkap.nl/journalhome.htm/1381-2386

JOBS

STUDY DIRECTOR, Board on Atmospheric Sciences and Climate

The Board on Atmospheric Sciences and Climate (BASC) is seeking a self-motivated individual to direct studies conducted by expert panels of scientists. Recommendations from these studies will be used to guide the formulation of various aspects of U.S. atmospheric science policy.

Candidates must possess a Ph.D. or equivalent in the atmospheric sciences (or related discipline) and have excellent writing, verbal, organizational, and interpersonal skills. Requires demonstrated ability to serve as a team leader; organize studies, meetings, and substantive work; contribute to deliberations and guide discussions; interview agency personnel, policy makers, and senior scientists; review and synthesize information from data, reports, research articles, interviews, and meetings; prepare working papers, drafts, and summaries of panel deliberations; guide reports through review, publication, and dissemination; represent the panel and the study to government agencies and other organizations; and work on special projects as required.

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