

**SUCCESSFUL STATEWIDE PUBLIC SAFETY OUTREACH:  
CULTIVATING TECHNOLOGY AND ANDRAGOGY IN OKLAHOMA**

Derek S. Arndt\* and Andrew J. Reader, Oklahoma Climatological Survey, Norman, OK

**1. INTRODUCTION**

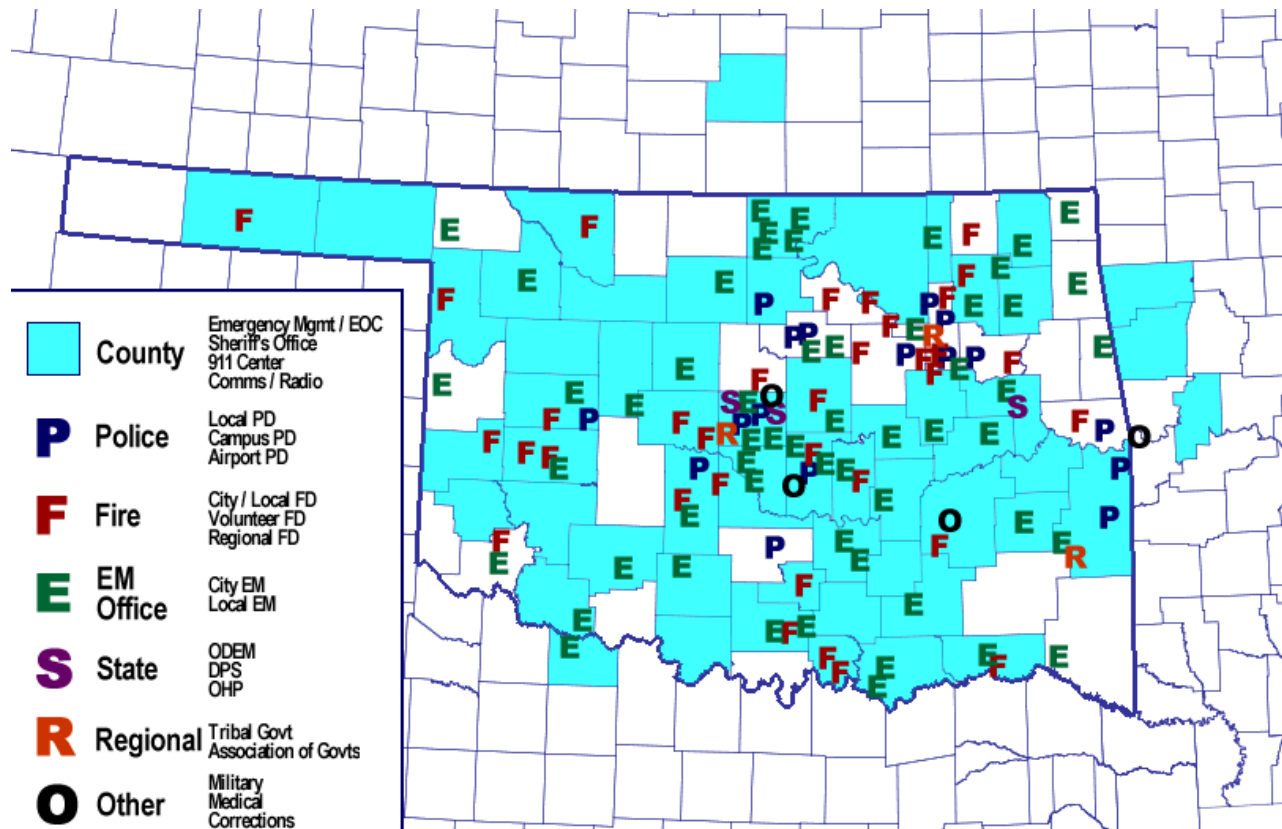
For nearly a decade, the Oklahoma Climatological Survey (OCS) has delivered training and weather data to public safety officials through the OK-FIRST (Oklahoma's First-response Information Resource System using Telecommunications) program (Morris et al. 2001). The program provides a decision-support platform to nearly 200 public safety agencies across Oklahoma, plus seven in neighboring states.

Participation in the program is free to qualified agencies in Oklahoma, thanks to funding support through the Oklahoma Department of Public Safety and data services via the Oklahoma

Mesonet (Brock et al. 1995). Participating agencies are typically emergency management, law enforcement or fire service offices. However, many other state, regional and municipal interests participate, such as medical services, tribal governments, educational institutions and correctional facilities. As of November 2005, nearly 200 public safety agencies across Oklahoma actively participated in the program, plus seven in neighboring states (Fig. 1).

Four years have passed since OK-FIRST was named one of the nation's five most innovative government programs by the Harvard University's Kennedy School of Government (REF). Since then, technological advances and developments in the program's training regimen have allowed a further refinement of services to OK-FIRST participants and those they serve.

\*Corresponding author address: Derek S. Arndt, Oklahoma Climatological Survey, 100 East Boyd, Suite 1210, Norman, OK 73019-1012; darndt@ou.edu



**Fig. 1.** OK-FIRST agencies actively participating in the program as of Autumn 2005. Countywide agencies are noted in blue shading. All other agencies are placed in their town or near the center of their jurisdiction.

## 2. TRAINING ADVANCEMENTS

Several factors, together, have triggered further development of training materials in recent years. Among these are changes in the type of applicant entering the OK-FIRST program, and a sensitivity to some tenets of adult learning theories.

### 2.1 The Evolution of the Incoming Participant

In the mid-1990s, during OK-FIRST's first years, much of the in-person training time was necessarily spent familiarizing participants with personal computers and the internet. Many incoming participants were in their near-retirement years and came from rural backgrounds, and had never used a computer before. Ten years later, most OK-FIRST municipalities, including the more rural ones, are equipped with high-speed internet infrastructure. Rudimentary computer training is no longer necessary in the OK-FIRST regimen.

In recent years, applicants seeking training through OK-FIRST have evolved from older volunteers to a new demographic more heavily weighted in younger, more professional public safety personnel. This breed of participants is often charged with the responsibility to meet a quota of continuing education units (CEUs), whether for law enforcement, fire service or health service professions. These CEUs come in addition to those increasingly required by FEMA and related emergency management programs.

As the local importance and prestige of OK-FIRST-equipped offices have increased, so have the municipal demands on them. Time demands are often beyond the reasonable capabilities of one person. Many offices have expressed a desire to send more than one staff member to OK-FIRST training. Unfortunately, finite funds and finite time limits the number of participants OCS can fully accommodate.

Additionally, it has become obvious that the meteorological basics covered in OK-FIRST training are utilized in many situations beyond hazardous weather. Participants in many cases become their town's municipal weather consultant. By relaying forecast and weather information, they are involved in money-saving public works decisions, such as scheduling maintenance around optimum days.

The combination of these and other factors has changed the scope – but not the fundamentals – of OK-FIRST training. Firstly, the evolution of

more computer-savvy incoming participants allowed OK-FIRST to reduce initial training from two weeks to one week, with a focus almost exclusively on weather data interpretation and weather-related decision-making. Secondly, the recognition that participants will use their training and data in multiple ways – including more subtle and more sophisticated ways – has broadened the scope of OK-FIRST beyond preparing and assessing hazardous weather.

### 2.2 Dimensions of Andragogy

OK-FIRST has delivered effective training since its inception. In recent years, however, the program has undergone a focused effort to further embrace tenets of andragogy, a term introduced to America by educator Malcolm Knowles. Andragogy refers to the art and science of teaching adults (Knowles, et al., 1998). The term itself contrasts with the more familiar educational term, pedagogy, whose etymologic roots refer to training of children. Practices related to andragogy utilize a set of assumptions about the adult learner and how he/she is different than the traditional (school-aged) learner. A subset of these assumptions are (adapted from Knowles, et al, 1998):

- *The need to know.* Adults have a strong need to know *why* they are learning when – or before – they learn it.
- *Learner self-concept.* Adults bring a self-concept of being responsible for their own education.
- *The role of experience.* Adults come into educational activity with a substantial volume and quality of experience.
- *Orientation to learning.* Adults are task-centered in their orientation to learning.

### 2.3 A Growing Diversity of Educational Options and Services

OK-FIRST's educational services have evolved in response to its changing participants and available technologies (see next section). They are also informed by the tenets of andragogy listed above. Some examples of these new or evolved services are:

*Streamlined self-directed learning modules.* These modules feature real hazardous weather cases from Oklahoma and a few from other states. They are added at rate of two or three per year, in an effort to appeal to the recent experiences of OK-

FIRST participants (many of whom were likely involved in the pre-response, response and recovery related to the event). The modules are provided on OK-FIRST training web pages in two formats. The first format is a self-navigable library of data and documentation related to the event. In this format, the learner can sample data of his/her choosing. This may appeal to the self-directed learner who likes to explore datasets more fully. The second option is a more streamlined and guided presentation of the data. Learners are guided in a step-by-step fashion through the sequence of the event, and asked probing questions about the data and its interpretation. Face-to-face workshops typically use this second option, with participants responding to the questions in a team environment.

*Regionally-held recertification and assistants' workshops.* To save time and travel expenses for participants, many OK-FIRST recertification courses are held away from OCS's offices in Norman. Two-day assistants' courses, which offer multiple participants a subset of the week-long OK-FIRST certification course, are also held regionally. The reasoning is simple: it is more cost-effective and time-effective to move two or three OCS personnel into the region than to move the region's emergency managers to Norman. The state's network of 56 regional Technology Campuses (which serve both K-12 and Adult Education interests) provides an excellent venue for training.

*Continuing education credits for workshops.* In response to the increasing needs for CEUs by our professional participants, OK-FIRST began seeking public safety accreditation for its courses in 2005. Law enforcement and peace officers may now meet a substantial portion of their annual CEU requirements with their OK-FIRST coursework. Accreditation requests for health service and fire service programs are under review and are hoped to be available in 2006.

*Re-furbished face-to-face training materials.* OK-FIRST's face-to-face training materials have always provided a clear meteorological or engineering explanation of many fundamentals, processes and interpretations. However, the vast majority of OK-FIRST participants are neither meteorologists nor engineers. Care has been taken to incorporate the participants' experiences, perspectives and language into the OK-FIRST workshop training, without sacrificing the high-quality training already established. Some tangible examples are: radar velocity lectures now make

reference to law-enforcement radar training (for traffic control), and three-dimensional conceptual models of storms with strong updrafts hearken to fire service structure fire training.

*An increased presence of operational NWS personnel.* OK-FIRST certification workshops and re-certification workshops are frequented by operational personnel from the National Weather Service. This is because, in most day-to-day situations, OK-FIRST participants will deal with operational NWS personnel more than they will with OCS personnel. Healthy interaction with field personnel from local Forecast Offices and the Storm Prediction Center helps underscore the importance of OK-FIRST to the decision-maker in the field. Additionally, the influence and support of the Warning Decision Training Branch is vital to the quality and validity of OK-FIRST training.

### 3. TECHNOLOGICAL ADVANCEMENTS

In recent years, technological advancements inside and outside of OCS allowed OK-FIRST to improve and expand its data services, as well as its training and education. The implementation of a self-contained NOAAport system allows OCS to custom-process NOAA products for its OK-FIRST participants. These are packaged with products from the Oklahoma Mesonet into decision-support and self-briefing web portals that are tailored by hazard and by the participant's geographic location.

*NOAAport ingest.* OCS now ingests National Weather Service text, radar and satellite products via satellite and has transitioned away from internet options. The system reduces the number of obstacles and potential points-of-failure between OCS and the data origin. It also allows for further customization (see below) of NWS products for OK-FIRST users.

*Five-minute updates of Oklahoma Mesonet data.* In the last year, the update cycle for Mesonet data and almost all related real-time products improved from quarter-hourly to every five minutes. This change provides much more up-to-date surface weather conditions to inform emergency managers during critical situations, such as wind shifts during fire-fighting or hazardous materials operations

*New "Weather Briefing" page.* OK-FIRST handles and potentially serves hundreds of weather products. Traditionally, the OK-FIRST user would drill into detailed data directly from the web site's

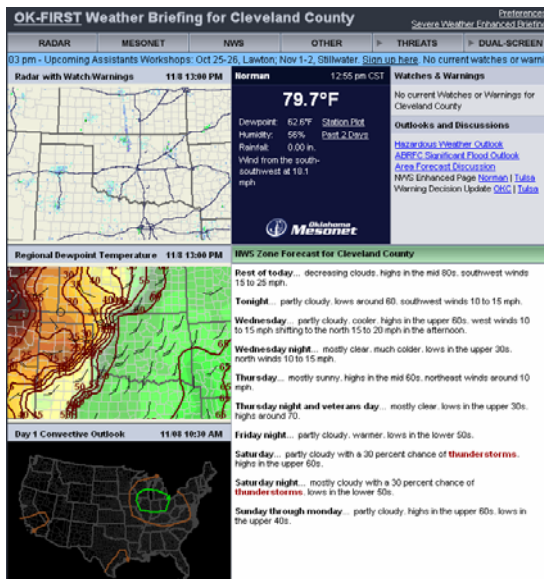
menu system. A new "Weather Briefing" page now allows the user the same access to the OK-FIRST decision-support pages, but informs the navigation decision with a "quick look" at regional-scale weather conditions, hazards and advisories (Fig. 2). The page is designed to increase situational awareness - an element of OK-FIRST training - for the decision-maker. Each panel in the situational awareness window checks for new data every 60 seconds. The site is customizable so the emergency manager can see some local details (such as conditions at the local Mesonet station, and relevant NWS watches and warnings) in context with larger- and longer-scale data.

*More pervasive local customization.* On each OK-FIRST data page, a scrolling situational awareness banner alerts the user of any hazardous weather advisories (such as watches or warnings from the NWS) in effect for their county. The bar will change color and provide cursory information within 60 seconds of an advisory's issuance. It will also direct the OK-FIRST user to more detailed information about the advisory. The geographic outlines of watches and warnings have been integrated into compatibility with OCS's WxScope viewing software, and are provided as a visible layer over all Mesonet and

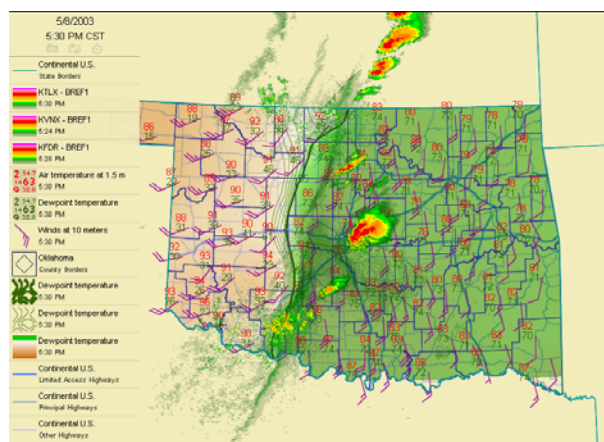
radar data OK-FIRST serves.

*The WeatherScope application.* OCS's latest visualization tool, WeatherScope, is stand-alone software that runs independently of internet browser or platform (Wolfinbarger et al. 2006). It allows the OK-FIRST participant to overlay numerous data sets on one map, and zoom, scroll or project to any location on the planet (Fig.3). In addition, users can create and save different "modes" or configurations of weather data for different weather scenarios. The software can also access OCS radar and surface observation archives. This access to archived data yields training in a "near real time" simulation mode for recent weather events, and allows for quickly-assembled case studies. This is crucial for introducing events while still fresh in the memory of the participant, and therefore more relevant training material. While many of OK-FIRST's decision-support capabilities are not yet supported by WeatherScope, it is already a valuable training tool and remains a promising platform for future development.

*Lightning data.* Through OK-FIRST, public safety personnel now have access to a nationwide lightning detection network, whose data can be overlaid with radar data for quick interpretation. As



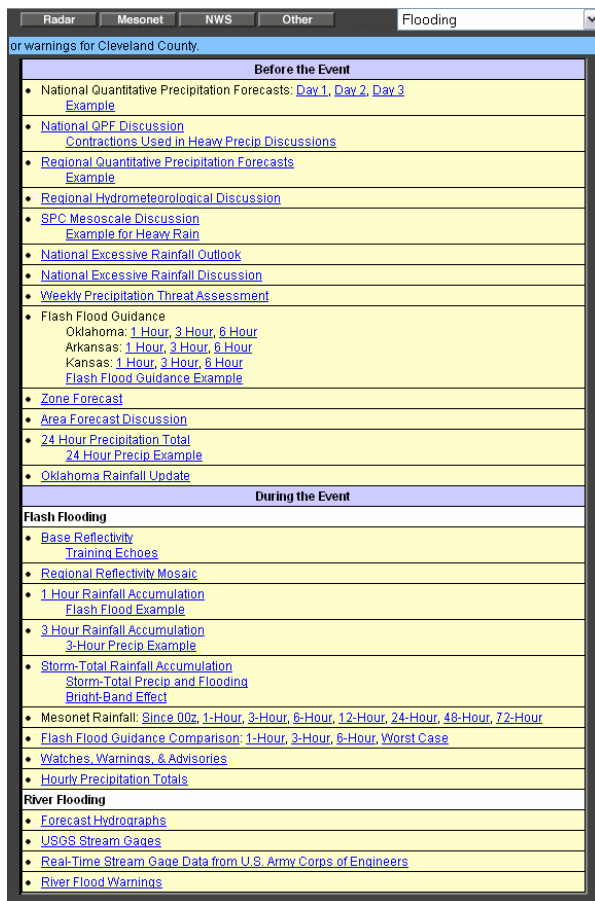
**Fig. 2.** The OK-FIRST Weather Briefing page, showing current surface observations, regional radar reflectivity, and advisories. In this example, custom advisory preferences are set for Ottawa County, and custom surface observations are set for Miami. Both are in far northeastern Oklahoma.



**Fig. 3.** A screen capture of OCS's WeatherScope visualization software, with time and date set to 2230 UTC, 8 May 2003. Data shown are: Oklahoma Mesonet air and dewpoint temperature (red and green numerals), wind observations (purple bars), objectively analyzed dewpoint temperature (green-brown shading), and base reflectivity from WSR-88D units KTLX (Oklahoma City), KVNK (Enid, OK) and KFDR (Frederick, OK).

a result, training on the uses of lightning data and lightning safety has been developed. This educational material has even propagated through the public safety office into several Oklahoma schools and communities.

*Decision-support pages.* To help support OK-FIRST participants after their initial training, a number of "decision support" pages have been made more visible to the participant. These decision support pages - one for each of six common weather hazards - provide a clear link between their training and the situation at hand (Fig. 4). They guide the user through a checklist of typical products, assessments and decisions made before and during each of these scenarios.



**Fig. 4.** OK-FIRST's decision-support presentation for flooding. Links to real-time data are included, along with interpretation guides, sample products and alternative sources of information. For a particular hazard, products are organized according to pre-event decisions and during-event decisions. Similar decision support pages exist for severe weather, winter weather, fire danger, heat and drought, and tropical systems.

*Interpretation guides, online glossaries and online instructional material.* The OK-FIRST website also has a number of products to help bring OK-FIRST training into the participant's home or office. These online case studies, glossaries, training modules, posted lectures and interpretation guides are designed to help the self-directed learner re-visit past training and explore new and emerging OK-FIRST datasets before coming to re-certification courses.

#### 4. REPLICATION BY OTHER STATES

By accepting the Innovations in American Government Award from Harvard University's Kennedy School of Government in 2001, OK-FIRST was charged with helping other states replicate its function in their setting. Elements of OK-FIRST's training, data service and decision support have been shared with representatives through a number of venues with varying degrees of success (Morris, et al., 2006).

In March 2005, OCS hosted "Innovations in Managing Weather-Impacted Situations", a workshop for officials from state-level emergency management offices. The meetings were held in Oklahoma City and designed to help participants replicate and adapt the OK-FIRST program for use in their states. Thirteen representatives from eleven states attended.

As of August 2005, four of the states have made substantial progress toward implementing or improving their own public safety decision-support systems. The Illinois Emergency Management Agency recently upgraded to a NOAAport data feed to support some operations. Representatives from Pennsylvania have returned to further evaluate OK-FIRST's training regimen and discussions with representatives in New Jersey and North Carolina are ongoing.

#### 5. SUMMARY

The OK-FIRST program continues its efforts to implement innovative ways of teaching and serving its participants. In coming months, OCS staff will publish the first of what will hopefully be an ever-growing set of distance learning modules which combine audio, video, interactivity and evaluation in an asynchronous delivery. In this way, public safety officials can participate in OK-FIRST training and educational exercises from the

comfort of their office or home at the time of their choosing.

The advent of the National Weather Center in Norman offers exciting collaborative opportunities with several academic and operational units of the University of Oklahoma and the National Weather Service, respectively. In fact, the OK-FIRST program will be in the same building – literally across the hall. OK-FIRST will also be present in the local forecast office's "situation room" when conditions warrant. This real-time cooperation is a testament to the continued success and dedication of OK-FIRST participants and the innovative and imaginative approach to weather decision support by OK-FIRST's partners.

## 6. REFERENCES

Altshuler, Alan A and Robert D. Behn, 1997. *Innovation in American Government: Challenges, Opportunities and Dilemmas*. Washington, D.C., The Brookings Institution Press.

Brock, Fred V., Kenneth C. Crawford, Ronald L. Elliott, Gerrit W. Cuperus, Stephen J. Stadler, Howard L. Johnson and Michael D. Eilts, 1995: The Oklahoma Mesonet: A Technical Overview.

*Journal of Atmospheric and Oceanic Technology*, **12**, 5-19.

Knowles, Malcolm S., Elwood F. Holton III and Richard A. Swanson, 1998: *The Adult Learner* (5<sup>th</sup> Edition). Woburn, Massachusetts, Butterworth-Heinemann.

Morris, Dale A., Mark A. Shafer, Derek S. Arndt, 2006: Replicating Innovation: Successes and Challenges. Preprints, *First Symposium on Policy Research*. Atlanta, Georgia, Amer. Meteor. Soc.

Morris, Dale A., Kenneth C. Crawford, Kevin A. Kloesel, and J. Michael Wolfinbarger, 2001: OK-FIRST: a meteorological information system for public safety. *Bulletin of the American Meteorological Society*, **82**, 1911-1923.

Wolfinbarger, J. Michael Justin R. Greenfield, Thomas A. Cannon, Thomas B. Stanley, Nicki L. Levit, and Renee A. McPherson, 2006: A powerful and easy-to-use weather display tool for PCs and Macs. Preprints, *22<sup>nd</sup> International Conference on Interactive Information Processing Systems for Meteorology, Oceanography, and Hydrology*. Atlanta, Georgia, Amer. Meteor. Soc.