

8B.5 WEATHER DECISION SUPPORT AND SOCIETAL IMPACTS AT A LARGE OUTDOOR VENUE—A CASE STUDY FROM THE 2010 BEALE STREET MUSIC FESTIVAL

Jon W. Zeitler*[@]

NOAA/NWS Austin/San Antonio Weather Forecast Office
New Braunfels, Texas

Richard Okulski and Jonathan Howell[@]

NOAA/NWS Memphis Weather Forecast Office, Tennessee

1. INTRODUCTION

The Memphis, TN, Weather Forecast Office (WFO) has developed a close relationship with the Shelby County Sheriff's Office by providing on- and off-site decision support services for the annual Beale Street Music Festival (BSMF) since 2008. The BSMF is one of our nation's premier outdoor music events, with up to 50,000 people attending daily in Tom Lee Park, which is bordered by the Mississippi River and downtown Memphis.

WFO Memphis deployed an emergency response/decision support meteorologist to the BSMF site on 30 April, to maintain continuous contact and support for the Shelby County Sheriff's Office. Metropolitan Memphis experienced a historic flood and high impact tornado event the weekend of 30 April – 2 May, 2010. Ten to fifteen inches of rain fell across northern portions of the metropolitan area, and 14 tornadoes were confirmed. Although rainfall amounts were between five and six inches at the BSMF site, the flood event diverted county emergency response resources from the BSMF to flooded areas.

Due to the magnitude of the flooding and ongoing severe weather, and in collaboration with the Shelby County Sheriff, decision support transitioned from on-site to off-site for 1 and 2 May. The combined flood and severe event required every available WFO Memphis staff member for continuous high impact operations over a 36-hour period. Off-site support consisted of telephone briefings on 1 May, as multiple rounds of supercell thunderstorms moved through Shelby County. Around 0300 UTC on 1 May, WFO Memphis advised that a supercell thunderstorm over east central Arkansas was tracking directly

toward the BSMF site. The Shelby County Sheriff and BSMF organizers ordered evacuation of the estimated 30,000 people attending the festival. The supercell did not produce a tornado as it passed over the BSMF site, however, it did produce two tornadoes later in its lifecycle, including one just 10 miles northeast of the BSMF near Millington, TN.

Section 2 highlights best practices and challenges of the weather decision support effort provided by WFO Memphis. Section 3 focuses on observations of the societal impacts from the evacuation, and provides suggestions for large event venue managers. Section 4 contains conclusions.

2. WEATHER DECISION SUPPORT

2.1 Best Practices

Tornadoes and flooding had occurred the week before, the day before, and earlier on 1 May, 2010, leading to a high level of awareness for the potential of severe weather among BSMF attendees. Nearly all had rain gear (e.g., ponchos, rubber boots) and many anticipated the possibility of further delays or cancellation (the event had already been delayed by nearly five hours from heavy rain and flooding early in the day). The actionable item for WFOs is to utilize Hazardous Weather Outlooks, graphiccasts, conference calls, webinars, and heads-up emails to work with media and emergency management partners in highlighting the potential for hazardous weather, and to engage public awareness. The potential for heavy rain and severe weather was well advertised by the NWS and media the week preceding 1 May, so nearly everyone had a base level understanding of the potential for severe weather.

More specifically from the event, WFO Memphis's decision support services facilitated

* Corresponding author address: Jon W. Zeitler, National Weather Service, Austin/San Antonio Weather Forecast Office 2090 Airport Road, New Braunfels, TX 78130; e-mail: jon.zeitler@noaa.gov.

[@] This work represents the views of the authors and not necessarily those of NOAA/NWS.

execution of pre-set plans, which led to decisive action by law enforcement and event organizers. This was evident to attendees, who were given a short explanation of the need to cancel the event, and instructed to evacuate the park immediately. Attendees were told where the nearest shelter was located (the AutoZone parking garage). However, the start of the evacuation process was the decision by WFO Memphis to issue a tornado warning approaching the maximum effective lead time (i.e., one hour), in anticipation of the threat to BSMF attendees and Downtown Memphis. WFOs supporting public safety officials and private sector meteorologists supporting event managers should strongly consider in-depth and continuous contact as a means of establishing and maintaining trust and open communications. The effectiveness of safety plans and execution of specific actions such as evacuation are directly proportional to the ability of officials to take decisive action, which in turn is directly proportional to trust established through working prior events or through simulation training.

2.2 Challenges

This event brought into reality previous hypothetical discussions on the limits of weather decision support services, especially during widespread high impact events. While the flexibility and trust established between WFO Memphis and law enforcement allowed for a successful transition from on-site to off-site support, the takeaway is weather decision support levels should be rigorously examined prior to events, and specifically tested through high fidelity simulations. Not only does that ensure effective services and the best possible event decisions, but it may also open up new avenues for support (e.g., live, remote briefings) that provide effective services with the least possible disruption to other mission activities (e.g., severe weather warnings).

3. SOCIETAL IMPACTS

3.1 Best Practices

Activation of civil defense sirens and lightning increasing to nearly continuous strikes gave environmental cues supporting the need for evacuation, and changed initial grumbling among attendees about the event being cancelled into calm, orderly movement toward the park exits.

While the calm, orderly movement facilitated evacuation, the BSMF security infrastructure was in place to sweep up stragglers, including use of

bullhorns to repeat the evacuation order and location of the nearest shelter. At the conclusion of each BSMF event night, security (local law enforcement, fire, and emergency medical services) start at one end of the long and narrow Tom Lee Park and sweep attendees toward exits at the other end of the park. Many attendees are used to this practice from prior years, and thus are familiar with the process, which expedited the evacuation. In short, the evacuation was just like the end of a routine BSMF event night. Large venue managers should consider how evacuation could be practiced through normal end-of-event activities. For example, an announcement could be made at the end of a football game that attendees should immediately exit the stadium as a drill for a potential future evacuation. Such high fidelity drills would allow venue managers to test plans and correct deficiencies in staffing, identify choke points, etc.

3.2 Challenges

While the evacuation within Tom Lee Park went smoothly, there are two related issues for large event venue managers to consider. First the crowd was generally younger (< 25 years age), with an estimated 25% meeting the definition of legal intoxication (primarily alcohol, secondarily marijuana). These factors could potentially lead to poor decision making, unwillingness to follow evacuation orders, etc. While the proportions of young and/or intoxicated attendees will differ by event, most large events will generally have younger crowds and a proportion with degraded judgment due to intoxication. Other venues with elderly or physically-challenged crowds may also face significant evacuation or sheltering challenges.

Second, controlling foot and motor traffic outside Tom Lee Park was chaotic – creating potential for people to be sitting in cars or exposed on foot to severe weather. While evacuating a large event venue may reduce the concentration of people and liability for the venue and event managers, the evacuation may simply shift the threat to areas adjacent to the venue, which may offer even less shelter and lack facilities (medical, locker room) where first aid could be provided.

Only a small proportion of BSMF attendees sought shelter on the lowest floor or basement of buildings and parking ramps. Since many of the attendees were under 25, this suggests weather

safety training in schools or through media partners would be the primary means of accomplishing a higher proportion of correct safety actions, since life experience would be limited.

Civil defense sirens had already been activated county-wide twice for storms earlier in the day, once under partly cloudy skies at the BSMF as that particular storm was in the southeast part of Shelby County, more than 10 miles away. The impact of non-sectorized vs. sectorized sirens needs further study. Given the uncertainty in severe storm projection, especially at longer lead times, there may be little adverse impact for county-wide activation.

Despite many attendees having smart phones, a high proportion still had little or no idea how to access weather data, nor how to interpret it. The meteorological community may be assuming a greater capability for the public than reality, likely because our assumptions/ observations are from an echo chamber of educated scientists passionate about meteorology. One counter example is some attendees used cell phones to let family know about their status, post their status on social media, or to warn other family members in the path of the storm. In one case, a person Zeitler advised provided 15 minutes warning for their relatives in the suburb where the tornado actually touched down.

Finally, the risk/reward for event organizers providing earlier notice of a potential evacuation needs further study. The decisiveness and clear instructions on 1 May made for a successful evacuation. It is unknown whether the uncertainty from an earlier announcement about a potential evacuation would be counter-productive, especially if hazardous weather did not occur. What is known is a portion of the crowd were agitated at the event's cancellation on 1 May, which carried over to the next day and resulted in beer bottles being thrown at the BSMF President when he announced a band would be unable to perform due to widespread flooding in Nashville, TN, where the band was staying.

4. CONCLUSIONS

The culmination of beforehand forecasts and heads-up messages, decision support directly to public safety officials, a pre-set evacuation plan, decisive decision-making, clear evacuation instructions, familiar end-of-event sweep

procedures, and environmental cues led to the successful evacuation of 30,000 people in 28 minutes.

There is a great opportunity for meteorologists to observe public safety actions and societal impacts from hazardous weather events. While well-planned surveys or research may be difficult, especially for high-impact events, anecdotal results can lead to confirmation or counter examples of societal impact research, as well as suggest actions for further study.

5. ACKNOWLEDGMENTS

We thank Joe Arellano (Meteorologist-in-Charge, NWS Austin/San Antonio), and Jim Belles (Meteorologist-in-Charge, NWS Memphis) for supporting this work.