OU-Norman Campus Weather Support Handbook



DEPARTMENT OF CAMPUS SAFETY The UNIVERSITY of OKLAHOMA

EXECUTIVE SUMMARY

Central Oklahoma is home to the strongest tornadoes, largest hail, most frequent and dangerous lightning and damaging winds on the planet. Central Oklahoma also deals with the devasting impacts of crippling ice storms and extreme cold snaps, intense periods of deadly heat and drought and wildland fire danger occurring at the urban/rural interface. In addition to recurring threats to life, the economic consequences and hardships created by Oklahoma's weather and climate has increased four-fold since the 1980s, with billion-dollar disasters occurring each year. Located in central Oklahoma, the OU-Norman campus endures 120 days each year when atmospheric ingredients are capable of producing a life-threatening weather threat.



Preparing for and monitoring the frequent dangerous weather threats to the OU-Norman campus is accomplished within the OU Department of Campus Safety, a department under the leadership of the Vice President for Operations. Exercising an innovative and national leadership approach to our duty of care and state mandate to protect students, staff, faculty and visitors, the Department of Campus Safety employs a full-time professional meteorologist for the purpose of preparing campus and its' leaders for hazardous weather conditions.

The University of Oklahoma has hundreds of weather-sensitive facilities, outdoor spaces and athletics venues and plays host to over 400 outdoor activities each year. These events range from small functions (less than 50 in attendance) such as donor ceremonies and student organization functions to large gatherings such as Commencement and OU Football (over 90,000). OU also hosts over sixty sports and academic camps during the summer attracting over 40,000 youth who spend most of their days outside during the time of year when of both elevated lightning and heat risks. Many of these activities are held in outdoor temporary structures exposed to the whims of the Oklahoma winds.

Given the pervasive weather threats to the OU-Norman campus, every event requires a weather plan that proactively documents every potential decision associated with weather safety, including postponement, cancellation, safe evacuation and sheltering, etc. Each event also has an on-site safety coordinator responsible for applying information in collaboration with the

university meteorologist who is charged with communicating and executing all weather-related decisions. In addition, there are many critical campus facilities requiring daily weather support such as OU Athletics venues and practice facilities, the OU Max Westheimer Airport, the OU Murray Case Sells Pool Complex, the OU Intramural Fields at Reaves Park, the OU Headington Family Tennis Center and Gregg Wadley Tennis Pavilion and the OU Pride Field.



In order to inform campus emergency plan creation and improvement before hazardous weather, as well as conduct forensic investigations after weather occurs, the OU Department of Campus Safety has access to a multitude of state-of-the-science weather datasets and technologies. Current weather data are used for monitoring weather hazards and supporting daily weather safety decisions. Archived weather data are used in verifying and filing insurance claims, assisting law enforcement investigations, informing FEMA public assistance grants, and assisting the Norman Fire Department, Norman Police Department and Norman Emergency Management. Campus safety professionals also have access to a robust set of messaging and communications methods designed to quickly put weather intelligence into the hands of the stakeholders and decision makers that need it.



The mission of the OU Department of Campus Safety is to assist in providing a safe environment for our University's students, staff, faculty and visitors through education, planning, preparedness, monitoring, enforcement codes, regulations and standards. The objective is to achieve a University culture that emphasizes safety. Responsibilities include maintenance of life safety systems, ensuring safe buildings, events and activities, and emergency planning in a manner that enhances the quality and efficiency of University campus operations and protects the lives of everyone in

the OU family. For the OU-Norman campus, creating and implementing a world-class weather monitoring and safety capability helps accomplish this mission.

OU-Norman Campus Weather Support Handbook

1.0 Oklahoma Weather

The University of Oklahoma Norman Campus is situated in the bull's eye of the historical maxima of multiple life-threatening weather hazards. Central Oklahoma is home to the strongest tornadoes, largest hail, most frequent and dangerous lightning and damaging winds on the planet. Central Oklahoma also experiences the devastating impacts of crippling ice storms and extreme cold snaps, intense periods of deadly heat and drought and wildland fire danger occurring at the urban/rural interface. In addition to recurring threats to life, the economic consequences and hardships created by Oklahoma's weather and climate has increased four-fold since the 1980s, with billion-dollar disasters occurring each year.



Hail Days Per Year

Damaging Wind Days Per Year



Lightning Strikes by County per/km/yr

1.1 Weather Risk

The OU-Norman campus endures 120 days each academic year when atmospheric ingredients are capable of producing a life-threatening weather threat. The chart below provides a five-year summary of the weather threats to campus, as well as the number of advisories, watches and warnings issued by the National Weather Service for the OU-Norman campus since August of 2017.

University of Oklahoma Norman Campus	SCHOOL YEAR (August 1 through July 31)					
Weather Decision Triggers	2021-2022	2020-2021	2019-2020	2018-2019	2017-2018	AVERAGE
Days with Lightning in Proximity (within 20 miles)	74	74	79	82	61	74
Days requiring Lightning Action (within 8 miles)	37	46	53	53	44	47
Days with Dangerous Cloud to Ground Lightning Strikes on Campus	15	16	28	25	25	22
	20	10	10	20	45	22
Days with SPC Tornado Risk Outlook	28	18	19	28	15	22
Days with SPC Tornado Watch	6	1	2	10	2	4
Days with NWS Tornado Warning	4	0	0	2	2	2
Days with SPC Severe Weather Risk Outlook	52	41	57	58	47	51
Days with SPC Severe Thunderstorm Watch	9	7	17	10	9	10
Days with NWS Severe Thunderstorm Warning	20	8	25	28	18	20
				_	_	
Days with NWS Flood Warning/Advisory/Watch	22	25	16	40	14	23
Days with NWS Heat Advisory/Excessive Heat Warning	24	17	24	8	13	17
Days with NWS Winter Weather Warnings/Advisories/Watch	8	17	9	16	15	13
				_	_	
Hours in an NWS Warning/Advisory, or SPC Watch for Campus	655	789	552	1118	741	771
Days Requiring Monitoring Against a Potential Weather Threat	125	119	116	122	119	120

1.2 Weather Monitoring

Monitoring for the dangerous and continual weather threats to the OU-Norman campus is accomplished within the OU Department of Campus Safety, a department under the leadership of the Vice President for Operations. The Department of Campus Safety employs a full-time professional meteorologist for this purpose. The university meteorologist is responsible for:

- a) creation and acquisition of the necessary weather data, forecasts, nowcasts and warning information to advise campus decision makers, and to assist and inform all weather-related support and decision-making functions to preserve life safety on the OU-Norman campus when weather threatens (See Appendix for a list of data sources),
- b) providing advice to the OU Executive Policy Group in hazardous weather situations in order to facilitate campus preparation and closure decisions,
- c) creation of daily campus-specific weather forecasts highlighting any weather threats to the many stakeholders, event planners and operations professionals on the OU-Norman campus,

- d) serving as liaison between the OU Department of Campus Safety and the National Weather Service forecast office in Norman and the NOAA Storm Prediction Center, including stewardship of the NWS Storm Ready University program,
- e) generating timely weather forecasts and nowcasts for all-approved campus outdoor events, including OU Athletics (as well as commencement, donor ceremonies, ground breakings, events with pyrotechnics, Pride of Oklahoma performances and outdoor rehearsals, campus golf and tennis tournaments, summer sports camps, OU-hosted Big 12 and NCAA tournaments, OU Murray Case Sells Pool Complex, OU Max Westheimer airport, etc.),



- f) teaching a class in the College of Atmospheric and Geographic Sciences at the intersection of emergency management and applied weather forecasting, risk and decision-making (METR 4743) as well as mentoring interdisciplinary graduate students involved in weather risk education.
- g) leading campus weather safety education and training, drills and exercises for faculty, staff, students, residence halls, classroom buildings, etc.,
- h) serving as a national subject matter expert and resource through entities such as the Event Safety Alliance (ESA), the National Center for Spectator Sports Safety and Security (NCS4), National Weather Association (NWA), American Meteorological Society (AMS), etc.

1.3 Proactive Weather Planning

Daily operations on the OU-Norman campus require individuals to be outdoors participating in many different campus-related activities (OU Facilities Management, OU Police Department, OU Campus Safety, OU Athletics, OU Food Services, student, faculty and staff ingress and egress to and from parking lots to both classrooms and workspaces, over 400 outdoor campus events annually, the Jimmy Austin Golf Course, Westheimer Airport, OU Fitness and Recreation including intramural sports. the OU Murray Case Sells Pool complex, etc.). Campus also serves as host to many external vendors and customers using OU buildings and athletic venues. OU facilities serve the public good and many are revenue generating. Amidst these daily activities,

Weather Matrix for Production													
10004	-	-	-	-	-	-88	815	-		80.00			
-927	12.55	INVEDATE RETINENT TO DHELTER											
-	10102	100.00	758*	-@-	100	28 <u>5</u>	167	181	3955	1812			
-102		-10.05		-	-912	ans.	167	ans.	ans.	ans.			
-12-	-	-		-	-	민문	1827	-355	-25	10.0			
	-	-		-				-111		10.0			
-10	-100	85	82	-8-	-8-	-8-	-755	55.5	10.5	55.5			
	-	-82	-82	10.0	10.5	-	.775	10.5	12.5	10.0			
		HEATHER & R.L. CLEAR-ALL MEAN CAN REPORT KOREA, ACTIVITED											

expecting dangerous weather hazards on average twice weekly throughout the year requires a robust 24/7 weather monitoring operation paired with proactive planning (including contingency and cost-loss determination), expert weather decision-making and timely threat communication, as well as a forensic data analysis capability to evaluate and document potential damages and to inform programmatic and plan improvement. The creation of a weather decision trigger chart (example provided at left) for each outdoor

activity is a crucial planning tool to guide proactive weather monitoring, decision-making and prompt life-saving actions when the inevitable Oklahoma weather hazard occurs.

1.4 Weather Education and Training

With the dangers presented to life and property by Oklahoma's weather hazards, weather education

and training activities are recommended for students, faculty and staff. In order to address the pervasive tornado threat to the campus, the OU Department of Campus Safety conducts tornado drills year-around in conjunction with OU Housing and Food Services. Residence Life facilities participate in tornado drills each year.





Dozens of weather safety sessions are presented on campus, many in conjunction with comprehensive safety training including modules on fire safety, active shooter and the Clery Act. Several hundred OU family members attend these training sessions. Targeted weather training occurs in conjunction with college retreats and faculty meetings, staff retreats, for residence life resident assistants (RAs) and orientation for international students. Weather training is also included as part of Camp Crimson, Sooner Orientation Week, SWEEP (Safety, Wellness, Environmental, Emergency Preparedness) Week, and the Sooner Health

Safety and Wellness Fair hosted

for all employees during Staff Week. In addition, private sector companies housed on campus participate in weather safety education, training and tornado drills annually. Educational materials on Storm Safety have been created and are distributed throughout the campus and available on the OU Campus Safety web pages (www.ou.edu/campussafety). The OU Department of Campus Safety has created online weather training materials accessible through campus web sites and are also available on social media outlets. Most weather training sessions can be conducted via virtual meeting platforms when appropriate.



2.0 Weather Intelligence in Support of Campus Operations



The Emergency Operations Plan (EOP) for the OU-Norman campus outlines the framework through which OU, City of Norman and Cleveland County emergency service providers can plan and perform their respective emergency functions during a disaster. The EOP provides for ongoing emergency management planning that occurs in conjunction with city, county, state and national agencies to protect the safety of the students, faculty, staff, visitors and property. As part of the OU-Norman campus EOP, two weather annexes (Tornadoes,

Winter Weather) have been authored to provide the playbook for how significant weather threats are prepared for and managed on the OU-Norman campus. The university meteorologist maintains

the weather annexes and suggests revisions when necessary. The main premise of the two weather annexes to the OU-Norman campus EOP is to provide timely weather forecast and impact information to the OU Executive Policy Group, the OU Campus Closure Committee, the OU Department of Campus Safety, OU Operations elements such as the OU Police Department and OU Facilities Management OU Housing and Food Services and OU Fitness and Recreation.

2.1 OU Executive Policy Group

A primary responsibility of the university meteorologist is to inform the OU-Norman Campus Executive Policy Group of all anticipated weather threats to the campus. Communication of weather information to the Executive Policy Group typically occurs via email in the days prior to a forecasted weather threat, with more frequent email updates occurring as the date of the threat approaches. Group text messaging is utilized on the day of the weather threat, with additional updates occurring just before, during, and immediately after the weather threat.

<u>OU Norman Campus Executive Policy Group</u> University President Senior Vice President and Provost Vice President and General Counsel to the University of Oklahoma Board of Regents Executive Secretary of the University of Oklahoma Board of Regents President and CEO of the University of Oklahoma Foundation Vice President for Intercollegiate Athletic Programs Vice President for Marketing and Communications Institutional Equity Officer Senior Vice President and Chief Financial Officer Vice President, Student Affairs, Dean of Students Vice President, Chief Operating Officer Vice President, Chief Operating Officer Vice President, Office for Diversity and Inclusion Vice President for Executive Affairs

2.2 OU Campus Closure Committee



Weather that would necessitate a campus closure or changes to the OU Norman campus operations schedule includes dangerous ice, snow, and bitter subzero temperatures during the winter months or the threat of tornadoes that can occur at any time of year. The decision to close campus due to potential or imminent weather hazards is determined by the Campus Closure Committee (C^3). C^3 consists of

administrators and experts from University Operations, Campus Safety, Marketing and Communications, Student Affairs, and the Office of the Provost (see listing below) in conjunction with guidance from the university meteorologist.

Campus Closure Committee

Vice President for University Operations Vice President for Student Affairs & Dean of Students Senior Vice President and Provost Associate Vice President for Finance and Operations, OU Health Science Center Campus Vice President for Marketing and Communications Chief of Police Director Facilities Management University Meteorologist Director, Department of Campus Safety Associate Vice President, University Operations Executive Associate Athletic Director

2.3 OU Emergency Operations Center

The OU Department of Campus Safety maintains a "hot" (available to be activated in a moment's notice in the case of emergency) emergency operations center (EOC) in the OU Facilities compound at the center of campus. The EOC has the capability to receive timely weather warning information via internet-accessible datasets (See Appendix), NWS Chat, NOAA Weather Radio, the Oklahoma Mesonet NOAAPort feed, DTN WeatherOps Commander interface, local television station, cellular phone and amateur radio. The EOC serves as a central weather monitoring hub

during weather threats, including the capability to send emergency and timely notifications to the campus when life threatening weather approaches. The OU EOP Tornado and Winter Weather Annexes specify that the OU EOC be activated for continuous weather monitoring at the discretion of the university meteorologist, or when a weather watch, advisory or warning (tornado, severe thunderstorm, flood, winter weather, heat, etc.) is issued by either the National Weather Service Norman Forecast Office or the NOAA Storm Prediction Center (SPC).



As part of emergency preparedness continuity of operations plans, the university meteorologist also maintains an identical weather monitoring capability at home, including the ability to send emergency notifications to everyone on the OU-Norman campus. This back-up monitoring capability can be activated during a multitude of circumstances when monitoring from campus is deemed unsafe (i.e. during/after damaging hazardous weather on campus, during a pandemic, etc.).

2.4 OU Police Department and Department of Facilities Management

The OU-Norman campus Police Department (OUPD) officers and Department of Facilities Management (OUFM) employees are the most likely to be at risk when threatening weather occurs.



OUPD and OUFM workers provide critical first responder and service restoration functions during and after weather hazards of all types. These duties can result in employees working outdoors, exposed to the elements and in harm's way. The university meteorologist is responsible for providing timely weather intelligence concerning risks (i.e. lightning storms, hail, wind, heavy rainfall, ice and snow, heat and cold,

etc.) to OUPD and OUFM in support of outdoor workers. Timely weather information allows supervisors to manage risk for individual employees, prepare staffing plans, proactively stage necessary restoration equipment, mitigate damage and implement property saving measures (i.e. road closures and sandbag operations in advance of flooding, and road, parking lot and sidewalk treatment for ice, etc.).



2.5 OU Parking and Transportation Services

OU Parking and Transportation maintains all campus surface parking lots and garages and operates Campus Area Rapid Transit (CART) buses in conjunction with the City of Norman. CART



transports over 700,000 riders annually as OU's shuttle bus system. Efficient and cost-effective transportation on the OU-Norman campus can be hampered by adverse weather conditions. Therefore, weather information is provided to OU Transportation dispatchers so that drivers are immediately aware of local weather hazards. Protocols have been established to suspend shuttle bus service during severe lightning storms with hail, flooding, damaging winds or a

tornado risk. Drivers have pre-determined locations on campus for providing refuge to passengers should a tornado warning be issued for campus, and routes can be modified should localized flooding occur.

2.6 OU Residence Life

OU Residence Life maintains tornado refuge areas at residence halls for students living on the OU-Norman campus. These refuge areas include newly constructed stand-alone refuge areas at Couch, Walker, Kraettli, Traditions West and Traditions East, basement refuge areas at Adams, Headington College and Dunham College, and reinforced stairwell refuge areas at David L. Boren Honors College and Headington Hall. The OU EOP's Tornado Annex specifies the protocols for



opening, staffing and closing OU residence hall tornado refuge areas. The university meteorologist is responsible for preparing and training all housing leadership, staff and resident assistants (RAs)

on the approved campus protocols for operating these refuge areas. Housing leadership is informed in advance of campus tornado threats and regular training and drills are conducted so that students



in campus housing are aware of the refuge areas and the rules for their use. The OU-Norman campus also actively participates in the NWS Safe Place Selfie program, engaging faculty, staff and students across campus in learning about the location of each severe weather refuge area on campus. The OU Department of Campus Safety maintains a web-based, searchable

database listing all severe weather refuge areas on campus. This database is dynamic given the constant changes to campus buildings and ongoing construction projects each year.

2.7 OU Panhellenic Association and Interfraternity Council (Greek Houses)

The OU Interfraternity Council (IFC) sponsors sixteen fraternities while the Oklahoma Panhellenic Association (OPA) is home to eleven chartered sororities. The OU Department of Campus Safety has conducted tornado refuge assessments for all twenty-seven fraternity/sorority houses on the OU-Norman campus and developed specific tornado safety protocols for each house. IFC and OPA leadership are included in all advance weather correspondence provided to campus leadership before anticipated weather hazards. The university meteorologist provides weather planning, forecasting decision-support and real time monitoring for every fraternity and sorority philanthropic event held on campus. At the beginning of each academic year over



1,500 students are involved in "rush." Rush includes several days of outdoor activities and sanctioned events that each have an event safety plan that specifies all weather-related decisions and weather monitoring and support protocols.

2.8 OU Housing & Food Services

OU Housing and Food Services operates a number of indoor and outdoor eateries throughout campus, conducts a robust catering operation and operates outdoor food trucks daily. Popular



events such as the Brickwalk Bites food trucks every Tuesday and Thursday can draw hundreds of students. The university meteorologist advises OUHFS on all potential weather threats and provides weather monitoring services during all food truck operations. Food truck personnel are notified to shut down and evacuate to pre-determined indoor refuge spaces if lightning or other severe weather threatens.

3.0 Weather Intelligence in Support of Comprehensive Campus Safety

The University of Oklahoma has hundreds of weather-sensitive facilities, outdoor spaces and athletics venues and plays host to over 400 unique outdoor activities each year. These events range from small functions (less than 50 in attendance) such as donor ceremonies and student organization functions to large gatherings such as Commencement and OU Football (over 90,000). OU also hosts over sixty sports and academic camps during the summer attracting over 40,000 youth who spend most of their days outside during the time of year when we experience elevated lightning and heat risks.



OU has commissioned an event safety committee that evaluates, approves and monitors all campus events, including requiring that each event have a unique event emergency plan. Given the pervasive weather threats to the OU-Norman campus, each event must have a weather plan that proactively documents

all potential decisions associated with weather safety, including postponement, cancellation, evacuation and sheltering, etc. The university meteorologist serves on the event safety committee and works with each event organizer to create the weather section in the event emergency plan. Every event also has an on-site safety coordinator responsible for applying information from the university meteorologist and communicating and executing all weather-related decisions.

Other notable campus facilities requiring daily weather support are the OU Max Westheimer Airport, the OU Murray Case Sells Pool Complex, the OU Intramural Fields at Reaves Park, the OU Headington Family Tennis Center and Gregg Wadley Tennis Pavilion and the OU Pride Field.

3.1 OU Max Westheimer Airport

Although not located on the OU-Norman Campus, the OU Max Westheimer Airport on OU North Base is operated by OU Department of Campus Safety employees. The university meteorologist

notifies OU Airport personnel in advance of every weather threat and delivers real-time weather notifications via group texts during lightning and weather watches, advisories and warnings issued by the NWS. The airport operates from 6am until midnight daily. Forensic data on wind gusts, lightning strikes, hail size, etc. are provided after each weather event to inform airport documentation and to efficiently target locations where maintenance and repairs can be conducted.



3.2 OU Athletics

Nearly 100 outdoor OU Athletics events occur on the OU-Norman campus every year. These include football, baseball, softball, track and field, cross country, soccer, tennis, golf and rowing.



Each of these sports requires hundreds of hours of outdoor individual workouts and formal team practices held during every month of the year. Athletic contests not only invite tens of thousands of visitors to the OU-Norman campus, but many are accompanied by fan festivals, tailgating, temporary structures, pyrotechnics, photography and autograph opportunities, etc. Each of these athletic events are uniquely weather sensitive with weather policies and actions specified by the National Collegiate Athletic Association (NCAA). For example, the NCAA specifies

the establishment of lightning safety radii aligned with attendance and evacuation timing metrics as well as heat protocols associated with specific values of the wet bulb globe temperature (WBGT) index. The university meteorologist works directly with OU Athletics Game Operations staff, athletics trainers and coaches to make sure that each sport is prepared to defend against the entire playbook of Oklahoma weather hazards.



Indoor athletics events such as basketball, gymnastics, indoor tennis, indoor track and field, wrestling and women's volleyball are also weather sensitive, as tornado threats during practices and games/matches/meets would require timely refuge of all athletes and spectators. It is also important for game operations staff to be aware of any hazardous weather outside of these indoor venues so that actions can be taken to prevent participants and spectators from leaving indoor venues if dangerous weather conditions (lightning, hail, damaging winds, localized flooding) are occurring outside. Multiple text groups have been created so that OU athletics decision makers are always aware of potential weather threats to campus and the potential impacts to their events. Select coaches, trainers and staff are included in daily weather notifications sent to all campus



decision makers by the university meteorologist. Weather forecasts are also created for and supplied to OUPD for each Incident Action Plan (IAP) created for OU Athletics events. When adverse weather is anticipated to impact competition, the university meteorologist also supplies input that seeks to result in a competitive advantage for OU athletic teams (i.e. wind direction, wind speed, uniform style, footwear choice, timing of rain/snow and/or lightning, etc.).

3.3 OU Pride of Oklahoma Marching Band



The Pride of Oklahoma marching band has created a comprehensive Health and Wellness Guide that prescribes a set of emergency preparedness principles and policies to ensure the safety of all performers, staff and leadership. The university meteorologist is a coauthor of the Guide and has developed weather safety protocols specific to the demands faced by marching arts performers. From summer rehearsals in intense heat and humidity to winter performances in extreme cold, members of the Pride of Oklahoma are

exposed to and must prepare for the entire spectrum of Oklahoma weather hazards. The Pride has a unique portfolio of outdoor activities that span daily rehearsals, football game days (including an early morning rehearsal, a campus concert, a parade to the stadium, pre-game and halftime shows, and a post-game concert), alumni pep rallies and functions, lengthy parades such as those associated with Homecoming and Bowl games, travel to regions of the country where the weather can be very different than in central Oklahoma, lengthy bus caravans, air travel, etc.

In order to support the daily weather requirements of the Pride of Oklahoma, the university meteorologist has implemented weather monitoring protocols that include mobile instrumentation that gathers weather data at the rehearsal field as well as in the Pride's seating area in the football stadium. This site-specific weather intelligence is used by the Pride for indoor/outdoor rehearsal scheduling, work/rest balance at rehearsals, hydration protocols, uniform choices, etc. The



university meteorologist provides regular forecasts and nowcasts for all Pride activities and travel and works to make sure that emergency plans at road venues/parades are in order so that appropriate refuge can be provided for all performers and staff regardless of the location or time of day of the performance.



As is tradition in college athletics, the Pride of Oklahoma typically hosts visiting university marching bands - typically for OU football games. Weather intelligence is provided to the leadership of visiting university bands to make their stay in Norman as safe as possible. It is likely that individual performers in each visiting band are acclimated to the weather conditions at their home campuses. Therefore, the weather information provided focuses on the appropriate acclimation strategies to mitigate weather risk while they are in Norman. Visiting bands are also provided with detailed emergency plans that instruct their membership on OU weather and refuge protocols. The university meteorologist meets with visiting band leadership to go over these protocols upon their arrival on the OU-Norman campus.

3.4 OU Spirit (Cheer, Pom, RUF/NEKS & Lil' Sis, Sooner Schooner, Live Mascots)

Like the Pride of Oklahoma marching band, the OU Spirit Squads face unique weather challenges associated with their athletic and ambassadorial responsibilities both on the OU-Norman campus and on the road. The university meteorologist provides weather information, forecasts, nowcasts and real-time weather hazard information to OU Spirit Squad





leadership for rehearsals, game day activities, campus functions, road games and travel. This guidance also includes information on weather refuge protocols and the types of weather to prepare for at each event both at home and on the road. Weather information is also provided to the handlers that maintain the "Sooner Schooner" and OU's iconic live mascots "Boomer" and "Sooner", including specific information on extreme heat or cold conditions that can adversely affect live animals.

3.5 OU Fitness & Recreation

OU Fitness and Recreation offers hundreds of diverse programs, services and educational opportunities to enhance the lifelong health and wellness of the OU-Norman campus, City of

Norman and surrounding communities. Most of the daily OU Fit & Rec activities and classes are weather sensitive. For example, the OU Murray Case Sells Swim Complex offers daily programs including group swim lessons and classes for children, students, staff, faculty and adults. The OU Pool also hosts dozens of birthday parties, private swim lessons, American Red Cross certification classes for lifeguards and water safety instructors, swim stroke clinics and private adult group classes. The university meteorologist provides daily weather monitoring for all activities at the OU pool, most of



which begin at 6am daily. All pool staff are included in group texts issued by the university meteorologist that provide immediate notification if weather hazards are imminent. The university meteorologist also provides weather decision making for the pool through proactive event and class safety plans and evacuation orders when lightning in the area renders pool activities to be unsafe. Weather safety sessions are conducted each summer as part of new lifeguard training.



The OU-Norman campus has one of the most active campus intramural sports programs in the country, logging more than 28,000 active participants each year. Many intramural sports are held outdoors including thousands participating in softball, soccer, flag football, volleyball, swimming, golf and tennis. Many of the outdoor intramural sports contests are played at Reaves Park, located adjacent to the OU-Norman campus, while others are played on the OU-Norman campus. The university meteorologist has created weather safety plans including protocols to evacuate all playing fields well before weather hazards arrive. Weather

support and warning information is provided via group text to onsite OU Fit & Rec. personnel during all outdoor intramural sports activities.

3.6 OU-Approved Campus Events

Hundreds of OU-Norman campus events are approved each year by the OU event safety committee. Approximately 20% of these events are threatened by hazardous weather, requiring proactive contingency decisions or implementation of refuge protocols. The university meteorologist is responsible for reviewing the weather plan for each event to select the appropriate evacuation and refuge strategies, working with on-site event organizers to make sure safety personnel know the plan and monitoring for weather hazards such as lightning



know the plan, and monitoring for weather hazards such as lightning, gusty winds, severe storms, and heavy rain. Even mundane weather occurrences such as light rain can be important depending



on the weather sensitivity of the event. For example, outdoor events with food service, electrical equipment, temporary structures, etc. will have different weather sensitivity than a 5K road race through campus. Large events such as OU Commencement, College Convocations, Homecoming Week activities and the Homecoming Parade, student MOVE-IN, Sooner Orientation Week, Camp Crimson, Greek activities such as "rush," etc. require careful advance planning, robust weather decision triggers, contingency and continuity plans, careful monitoring, quick decisions and actions, efficient communications and adequate refuge space for every participant should the weather turn dangerous.

3.7 Weather Planning and Support for Temporary Structures

Almost all of the outdoor events on the OU-Norman campus now include installation of temporary structures. These structures range in size from the graduation stage used for Commencement and

stages for large concerts at the football stadium, to small recreational inflatables like the "bounce house" or "water slide" used at parties hosted by student organizations, as well as tents of all sizes used to provide shade. Since 2011, dozens of people in the U.S. have been killed or permanently injured in temporary structures that were not secured appropriately for the existing weather conditions, or operators failed to adhere to appropriate evacuation protocols when severe weather threatened. Deaths have



occurred in temporary structures of all types and sizes, including stages, inflatables and tents.



In order to minimize risk on the OU-Norman campus, every temporary structure has a weather plan associated with it, and the OU Fire Marshal and fire inspectors inspect each structure to make sure it complies with OU-Norman campus safety measures and weather plans before it can be used. All events using temporary structures are monitored carefully by the university meteorologist and temporary structures are evacuated and closed if pre-agreed upon weather hazard criteria are met. The most likely temporary structure used in daily activities on the OU-Norman campus are tents. Every tent must be secured to industry and structural engineering standards appropriate for the size of the tent. Weather is monitored against the anticipated impact of wind and/or heavy precipitation

(rain/snow) on the structural integrity of each tent. Tents are not safe in lightning and must be evacuated in advance. The university meteorologist is responsible for making sure that each temporary structure is evacuated in advance of weather hazards that could compromise structural integrity, or a create life-threatening circumstance for the inhabitants.



3.8 OU Precollegiate and OU Athletic Summer Camps

Although the OU-Norman campus is host to over 30,000 students during the fall and spring academic semesters, 40,000 youth arrive on campus during the summer to attend youth sports and academic camps. Each of these camps hosts outdoor activities and occur during the period of



greatest lightning and heat risk - the months of June, July and August. The university meteorologist creates weather plans for each camp, hosts weather safety training sessions for camp counselors and staff, and monitors weather for the hundreds of individual outdoor events that take place during camp season. Special attention is given to educating all camp counselors and participants on lightning safety and mitigation of heat illness.

3.9 OU Visitor's Center & Campus Tours

The OU Division of Enrollment Management and the Office of Admissions & Recruitment host hundreds of tours of the OU-Norman campus for visitors and prospective students and their families. These tours are primarily outdoors with groups of up to thirty individuals walking around campus over a multi-hour period. Campus tours are extremely weather sensitive as participants of all ages are exposed to the Oklahoma elements. Weather information helps tour guides prepare



for alteration of tour routes if inclement weather occurs, or outright cancellation if the weather turns severe. The university meteorologist supplies the OU Visitor's Center with weather intelligence for planning purposes, and notifications are sent if weather hazards present a direct threat to the campus.

3.10 OU-Hosted NCAA Championship Events

The tradition of excellence within the OU Athletics' programs means that the OU-Norman campus plays host to conference tournaments, NCAA regional and super-regional tournaments and championships every year. These events draw fans and athletes from all over the country, most of whom are unfamiliar with the unpredictability, severity and complexity of Oklahoma weather. Special care is taken to inform visiting teams, their traveling parties and their fans on how to access weather warning information, and how to take advantage of the OU-Norman campus evacuation

and sheltering protocols. All visitors have the ability to opt-in to the campus OU Alert (Rave) emergency notification capability and receive text weather alerts should refuge from severe weather be necessary.



OU Athletics also serves as the host for the Women's College World Series held in Oklahoma City each year. The university meteorologist provides weather data, forecasts and support to OU Game Operations staff and NCAA Tournament staff as part of the comprehensive safety plan for this national showcase event. As is the case with most of the OU Athletics events on the OU-Norman

campus, national television means that the nation becomes an immediate observer to how we implement our weather decisions and safety protocols.

3.11 OU Goddard Health Services

The COVID-19 pandemic required OU Goddard Health Services to set up numerous outdoor and drive-thru virus testing locations on campus. Testing was conducted daily in temporary structures and were relocated in advance into parking garages to avoid lightning and rain. The university meteorologist provided weather information to assist in both scheduling and logistics, including the ability to cancel testing if weather hazards such as lightning or severe storms were imminent.



3.12 Emergency Situations



The university meteorologist is on-call for all nonweather-related emergencies that may occur on or near the OU-Norman campus. Past campus emergencies have included explosions/bombings, chemical leaks and train derailments. Although none of these emergencies are directly attributable to weather hazards, their occurrence immediately requires critical incident weather support to keep first responders and the campus community safe. For

example, weather intelligence such as wind speed and wind direction are important in determining appropriate evacuation strategies or finding safe refuge areas from associated smoke plumes or

hazardous chemical spills. If the incident requires an extended amount of time to achieve resolution, weather forecasting in support of safe rescue and recovery operations is typically necessary. The university meteorologist must always be prepared to brief incident commanders and law enforcement on a moment's notice regarding every possible weather influence or impact that could complicate response to emergencies of all types.



4.0 Weather Intelligence in Support of Forensic Investigations

The university meteorologist maintains a robust archive of weather plans, decision trigger charts, and weather data in order to answer questions that might occur after a weather hazard on the OU-



Norman campus. The OU Department of Campus Safety has access to archived lightning strike information via a contract with DTN WeatherOps, archived wind speed, wind direction and rainfall information from the Oklahoma Mesonet, and archived watch, advisory and warning information from the National Weather Service. Archived weather data

has been used in verifying and filing insurance claims, assisting law enforcement investigations,

informing FEMA public assistance grants, and assisting the Norman Fire Department, Norman Police Department and Norman Emergency Management.



5.0 Communicating Weather Risk to Campus Stakeholders

Although the university meteorologist maintains the capabilities to access a multitude of weather datasets, the benefits of these data and expertise cannot be realized without a robust set of communications methods designed to put weather intelligence into the hands of the stakeholders and decision makers that need it.

5.1 OU Alert (Rave)

The OU-Norman campus is served by the ATT RAVE system as the current provider of choice for mass emergency notifications. Select campus administrators have the capability to use ATT RAVE



to send an "OU ALERT" emergency notification to over 40,000 individuals that are listed in the emergency contact database. This secure database includes the phone and email contact information for all students, staff, faculty, opt-ins, and other campus partners as well as their optional emergency back-up contacts. The university meteorologist has the capability to push tornado warnings and campus closure information due to weather to everyone in the OU Family. The ATT RAVE system allows the sender to choose any or all of text, email, voice call, RSS feed, and social media as the delivery mechanism(s) for the emergency message.

5.2 Alertus

OU-Norman also contracts with Alertus to facilitate the display of emergency weather messages on all OU-owned, network-connected devices. Personal computers on the OU network can also receive Alertus weather messages if the Alertus software is downloaded from the OUIT Store and installed.

5.3 E-mail Distribution Lists

The university meteorologist maintains a set of comprehensive e-mail distribution lists to provide campus weather information ranging from forecasts well in advance of hazardous weather to imminent watches, advisories and warnings.

Weather Email Distribution Groups include: OU Executive Policy Group OU Campus Closure Committee **OU** Police Department **OU** Facilities Management OU Department of Campus Safety **OU** Athletics **OU** Athletics Football Game Operations **OU** Athletics Trainers OU Pride of Oklahoma/Spirit OU Fitness and Recreation (including intramurals, OU Pool and OU Tennis Center) **OU** Camps OU Event Safety Committee **OU Building Safety Coordinators OU Food Trucks** OU Housing and Food Services OU Student Affairs (including IFC and OPA) OU Residence Life OU Goddard Health Services (outdoor COVID19 testing)

5.4 Web and Social Media

The university meteorologist maintains a weather web page within the OU Department of Campus Safety web presence at https://www.ou.edu/campussafety/university-meteorologist/weather. This

web site also links to the database of campus weather refuge locations to be used when severe weather threatens. The web page also is a resource for weather safety information, including a daily campus weather threat assessment, the weather forecast for campus, real-time Oklahoma Mesonet data for Norman and a loop of radar imagery. The university meteorologist also shares timely weather information via the OU Department of Campus Safety Facebook page https://www.facebook.com/ouemergencypreparedness/ and live-tweets every campus weather threat at the OU Department of Campus Safety Twitter feed https://twitter.com/ouemergencyprep.



5.5 Text Messaging

In addition to text messages sent through the OU ALERT (ATT RAVE) mechanism, the university meteorologist has the capability to send individual text messages to each safety coordinator for every outdoor event on the OU Norman campus.

5.6 Group Text

The university meteorologist maintains a set of comprehensive group text distribution lists to provide campus weather information ranging from forecasts well in advance of hazardous weather to imminent watches, advisories and warnings.

Weather Group Text Distribution Groups include:

OU Executive Policy Group OU Campus Closure Committee **OU** Police Department **OU** Facilities Management OU Department of Campus Safety **OU** Athletics **OU** Athletics Football Game Operations **OU** Baseball **OU** Softball **OU** Athletics Trainers OU Pyro Team **OU** Spirit OU Pride of Oklahoma OU Fitness and Recreation (including intramurals, OU Pool and OU Tennis Center) **OU** Camps OU Event Safety Committee OU Food Trucks **OU** Housing and Food Services OU Student Affairs (including IFC and OPA) **OU** Residence Life OU Tornado Refuge Area Staff OU Events (individual, MOVE-IN, RUSH, SOW, Camp Crimson, etc.) OU Goddard Health Services

6.0 Culture of Safety & OU's Academic Mission

The mission of the OU Department of Campus Safety is to assist in providing a safe environment for the University's students, faculty, staff, and visitors through education, planning, monitoring, enforcement codes, regulations and standards. The objective is to achieve a University culture that emphasizes safety. This includes maintenance of life safety systems, safe buildings, events and activities, and emergency planning in a manner that enhances the quality of the University's campus operations and the lives of students, faculty, staff, and visitors.



One way to promulgate a culture of safety on the OU-Norman campus is to directly engage students in the process of weather planning and decision making in support of a safe campus. To meet this objective, the university meteorologist teaches an upper division class (METR 4743) in the School of Meteorology for students interested in the intersection of weather hazards and emergency preparedness.

Students are required to address difficult questions regarding weather risks, weather decisions, the consequences of forecast uncertainty and the potential costs of each decision. Students also meet with and learn from the federal and private sector meteorologists that issue weather forecasts, watches, advisories and warnings; and the administrators, state officials, emergency managers, and other decision makers that use these forecasts to protect schools, athletic events, concert venues, transportation infrastructure and more.

METR 4743 allows students to explore various types of weather forecasts, and how those weather forecasts are created, customized, and utilized by those responsible for the life safety of others. The class immerses students into the world of decision makers who each deal with weather as but one factor in a complex web of information streams and external demands that pit the protection of life and property against



profit and enjoyment/entertainment. Guest speakers have included decision makers from NASCAR, NFL, MLB, NCAA, Lollapalooza, the Olympics, and multiple touring recording artists as well as venue managers from the NFL Super Bowl, the MLB All-Star Game, the College Football Playoff Championship Game and NASCAR's Daytona 500.

Appendix: OU EOC Weather Data Catalog

NWS Watches, Advisories and Warnings:

For timely preparation for imminent life-threatening weather to the OU-Norman campus, the university meteorologist must be able to acquire timely National Weather Service watches, advisories and warnings from redundant sources. This information is currently accessible from the following sources:

Oklahoma Department of Emergency Management Paging Service I-NWS Text Message NOAA Weather Radio DTN WeatherOps (private weather provider) OK-FIRST (Oklahoma Mesonet) NWS-Chat (account must be active and logged in) NWS Twitter Feeds (monitored via TweetDeck) (incl. @NWSNorman, @NWSTornado, @NWSSevereTstorm, @NWSFlashFlood)

Real-Time Radar Data:

Real-time National Weather Service WSR-88D radar data acquisition is a critical component for weather forecasting and nowcasting efforts required to provide weather support to campus events. The university meteorologist should be an

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expert in radar imagery interpretation and application, including both traditional and dualpolarization radar data. Refresher professional radar training is available from the National Weather Service's Warning Decision Training Division (WDTD), as well as from the University Corporation for Atmospheric Research (UCAR) Cooperative COMET MetEd program. Requisite radar data is currently accessible from the following sources:

NOAAPORT feed from Oklahoma Mesonet

OK-FIRST from the Oklahoma Mesonet

DTN WeatherOps interface

RadarScope (multi-platform (private weather provider contract - including data provision and visualization capabilities for smart devices, streaming services, etc.)

WeatherScope from the Oklahoma Climate Survey

NSSL Multi Radar/Multi Sensor system

WeatherLab (private weather provider contract)

RadarOmega (private weather provider contract)

Satellite Data:

Real-time weather satellite data acquisition is a critical component for the weather forecasting and nowcasting efforts required to provide weather support to campus events. The university



meteorologist should be an expert in multi-band, multi-product satellite imagery interpretation including derived products such as "Sandwich" and "Day Cloud Phase" products. A full suite of GOES-EAST and GOES-WEST products are available from multiple public-facing internet sites. Capabilities should exist to overlay all data types for effective and efficient query of atmospheric conditions.

Real Time Lightning Strike Data:

Real-time lightning strike acquisition is a critical component for the weather forecasting and nowcasting efforts required to provide weather support to campus events. The university

meteorologist should be an expert in lightning strike monitoring and application. Requisite lightning data is currently accessible from the following sources:

> DTN WeatherOps (private weather provider) NSSL Lightning Mapping Array (in-house research network) Spark from Weatherbug (private weather provider) Lightning Pro (private weather provider) Storm Shield (private weather provider)



Surface Weather Observations:

The Oklahoma Mesonet is a world-class network of environmental monitoring stations designed



and implemented by scientists at the University of Oklahoma and Oklahoma State University. There is at least one Mesonet station in each of Oklahoma's 77 counties. At each site, the weather is observed by a comprehensive set of instruments located on or near a 10-meter-tall tower. The measurements are packaged into "observations" every 5 minutes, then the observations are transmitted to OU every 5 minutes, 24 hours per day year-round. The Mesonet is the gold standard of surface observing systems in the world.

Upper Air Data:

The National Weather Service (NWS) Upper-air Observations Program is managed by the Office

of Observations, which is part of NWS Headquarters located in Silver Spring, Maryland. There are 92 radiosonde stations in North America and the Pacific Islands and 10 more stations in the Caribbean. Radiosondes provide upper-air data that are essential for weather forecasting. The NOAA Storm Prediction Center maintains a public-facing upper air data page including upper air maps and radiosonde soundings.



Numerical Weather Forecast Models (accessible via Pivotal Weather, College of DuPage, WeatherModels.com, Weathernerds.com, Tropical Tidbits):

Access to and appropriate application of numerical weather prediction models and techniques is key to formulating campus forecasts and nowcasts. There are a multitude of models and techniques that each have strengths and weaknesses in certain situations. The suite methods used for campus weather operations and forecasting include the following:

<u>High Resolution Rapid Refresh</u>: The **HRRR** is a NOAA real-time 3-km resolution, hourly updated, cloud-resolving, convection-allowing atmospheric model, initialized by 3km grids with 3km radar assimilation. Radar data is assimilated in the HRRR every 15 min over a 1-h period adding further detail to that provided by the hourly data assimilation from the 13km radar-enhanced Rapid Refresh (RAP)

<u>Rapid Refresh</u>: The **RAP** is a regional weather forecast model of North America with separate sub-grids (with different horizontal resolutions) within the overall North America domain. RAP generates forecasts every hour with forecast lengths going out 18 hours.



<u>Global Ensemble Forecast System</u>: The **GEFS** is a global-coverage weather forecast model made up of 21 separate forecasts, or ensemble members, used to quantify the amount of uncertainty in a forecast. GEFS produces output four times a day with weather forecasts going out to 16 days.

<u>Global Forecast System</u>: The **GFS** model is a coupled weather forecast model, composed of four separate models that work together to provide an accurate picture of weather conditions. GFS covers the entire globe down to a horizontal resolution of 28 km.

<u>North American Mesoscale</u>: The **NAM** is a regional weather forecast model covering North America down to a horizontal resolution of 12 km. Dozens of weather parameters are available from the NAM grids, from temperature and precipitation to lightning and turbulent kinetic energy. There is also a 3km high resolution version available. **NAM-3**

<u>Texas Tech Weather Research and Forecasting Model</u>: The **Texas Tech WRF** is a result of a collaborative effort of several agencies and laboratories across the globe in the 1980s. It is applicable globally and can take local geography and topography into account. It has a wide range of different physical parameters and demands vast resources to process. Texas Tech uses the WRF as a base to develop its own regional model over the Southern Plains.

National Severe Storms Laboratory Weather Research and Forecasting Model: The NSSL WRF is a result of a collaborative effort of several agencies and laboratories across the globe in the 1980s. It is applicable globally and can take local geography and topography into account. It has a wide range of different physical parameters and demands vast resources to process.

<u>The European Center for Medium-range Weather Forecasting model</u>: The **ECMWF**, known as the EURO, is the European Union's stalwart modeling system providing global forecasts of severe weather, hurricanes, snowstorms, etc. Historically the ECMWF has been the best performer in many weather situations.

<u>The European Center for Medium range Weather Forecasting Ensemble Prediction System</u>: For each day, the **EPS** is a 15-day forecast initialized at 00 UTC. The forecast provides a multitude of solutions to assess the uncertainty associated with a given forecast. Forecast output is available at one-degree resolution daily.

<u>National Digital Forecast Database</u>: The **NDFD** is an hourly forecast of various weather parameters prepared by the NWS on a 5km grid. In many instances, a NWS forecaster will use a hybrid human/model approach to generate this forecast product.

<u>NWS Model Blend</u>: The **NMB** is a forecast product of the NWS that incorporates multiple model output statistics in generating the forecast for a location.

EOC Weather Data Graphical User Interface:

Weather Ops Commander from DTN Weather Ops OK-FIRST Public Safety Dashboard from Oklahoma Mesonet

Direct Communications Capabilities with the National Weather Service:

NWS Chat

