Final Project Report
Social and Behavioral Influences on Weather-Driven Decisions

Submitted to: NOAA OAR Office of Weather and Air Quality, Dorothy Fryar, Program Officer

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Introduction

The goal of the Social and Behavioral Influences on Weather-Driven Decisions (SBI) project is to develop an understanding, characterization, and prioritization of the major social and behavioral influences on weather-driven emergency management (EM) decision-making to protect life and property, and to make recommendations to the National Weather Service on how to minimize negative influences in their products and services and accentuate the positive.

Our team from Arizona State University, East Carolina University, the University of North Carolina, and the University of Oklahoma explored the major influences on EM decisions in complex social networks and collaborated with National Weather Service entities including the Storm Prediction Center, Central Region Headquarters, and the Tulsa WFO. We used efficient agile approaches to highlight significant issues that inhibit the understanding of risk and the employment of good risk management practices. This project is organized around the National Research Council's Risk Paradigm that connects hazards to personal and institutional risk management. Influences manifest themselves in a disruption of the risk connections.

This report is organized as follows:

1. Background
2. A focus on the objectives set out in our proposal and the results relating to each
3. Documentation of our proto-typing activities
4. Responses to the specific questions set out on December 23, 2015
5. A list of presentations
6. An appendix that includes all of the surveys and interview protocols along with an overview of results as well as sample results.

Background

This report builds upon results previously documented in status reports and various presentations. The critical points of those documents are:

1. The Emergency Management community that the National Weather Service interacts with is a confederation of many organizations, called Emergency Support Functions (ESF), at many levels of government from federal, state, county, and local. Each ESF has its own operational needs for weather information that is usually, at best, obtained indirectly from multiple sources with operational leads interpreting for their own purposes.

2. The Emergency Manager (EM) is a coordinator of information in support of the ESFs who are making actual safety decisions. The NWS usually provides its weather information to the EM, and upon occasion, to the ESF decision makers.
3. The combination of the ESF and EM work within a "system" that, while organized, is dynamic in practice and may involve hundreds of decision makers needing weather information with varying time, space and operational considerations.
4. Knowledge within the system varies with each member and ranges from data (actual facts of the weather), information or the combining of data to add meaning, and decisions that relate the information to actions. This Information-Knowledge-Decision flow is complex and needs to be understood in order to appreciate that the National Weather Service is an "information" provider into this system and currently has little control of how interpretation and application of decisions are ultimately made.
5. The public is not part of the formal emergency management system and obtains its understanding through a myriad of sources, but is usually dependent upon the media to provide interpreted information on the weather and decision advice. There is a gap of knowledge that exists between the EM system and the public understanding. The weather knowledge is deficient with the ESF network, and can only be assumed to be even less for the public systems where a direct relationship with the NWS does not usually exist.
6. This study did not focus on the public which is informally organized, but used the EM community which has formal organizations connected in an ad hoc system.
7. The government organizations focus on managing risk to events, and therefore loosely follow the Risk Paradigm.
8. The information flow within the EM social networks is a constant evolution of the knowledge hierarchy of IKD, with multiple points of information injection, interpretations, and decision making.

Objectives

1. Identify the most critical influences on weather related decisions to protect life and property including their placement within the risk paradigm.

Using information learned from an earlier project, we generated a first list of influences that affect EM decision-making and categorized them based on the risk paradigm components. These are: hazard information, impact assessment, vulnerability assessment, message packaging, message reception, operational/processing considerations, and a combination of confidence, comfort and competence. From this, a list of influences and prioritization of influences was developed, based on team discussions and the results of surveys. Further surveys and interviews led to the identification of six elements that surfaced every time as critical for EM decision-making:

- What is the hazard
- Timing
- Location
- Duration
- History
- Forecaster confidence

Given the universality of the stated importance of these criteria, they served as our focus throughout the remainder of the project. Further, because of the influence these elements have on EM decision-making, every effort needs to be made to provide this information in communications between NWS and the EM Community. It can be noted that the first five elements lead to a risk characterization while the last, confidence, establishes a threshold link between factual information and the willingness of the recipient to act on the information, or said another way, to make a decision.

2. Characterize the influences, when they occur, who or what causes them, and how they manifest themselves within the risk paradigm.

Through directed interviews and observations, we found the following with respect to how the influences play out:

- The six critical elements (risk characterization) are dominant factors being sought to which every NWS communication (product) can be measured against for effectiveness;
- *Informal* advance notice from forecasters on time, severity, and location is a significant influence on EM decision-making; formal advance notice follows in importance (risk characterization and risk communication). This is the enabler for decision makers to continually build and modify a mental model of what is happening and assessing potential actions.
- The structure of text products is an important influence on EM decision-making as is missing information; as much is gleaned from what is not included as from what is included (risk communication); The recipient of the information is wanting to rapidly understand the six critical elements. Communications that are clear, concise, and consistent enable the decision makers to process knowledge more rapidly, understand the intent of weather communications, and more consistently make decisions within the proper context of the hazard risk.
- Confidence, competence and comfort are influenced, for better or for worse, by missing information, inconsistent information from different sources, the ability (or lack) of EMs to characterize the risk, and familiarity with NWS staff, among other factors. These were ranked highly as important influences (risk communication and risk management). Information provided by the NWS influences along two tracks, building the competence or factual understanding, and building confidence to act on the information. Though interrelated, these pathways are very different. Both understanding and confidence need to exist to enable good decision making. However, because of the informal, indirect gathering of both, decisions are made based on running out of time.
- Real or perceived “cues” are given by NWS through tone and words, for example (risk communication and risk management). When the information provided by the NWS is less than ideal to build an actionable mental model, decision makers or their information gatherer surrogates rely on how the information is provided and less on the factual content. This is the link between a less than competent decision with one of higher confidence.

Survey results allowed us to determine how the influences rank compared to each other for instance with severity (*hazard*) and *location* being the most important, with *timing* close behind.

3. Define a scale of relative importance and priority for assessment of influences on decisions.

A scale of the influences was not developed because the surveys showed what the most important influences are (see above). What became evident through the project is the importance of the EM's confidence in his/her decision –and that is influenced by the six critical elements.

As a result, we used the six critical elements to develop a matrix that provides a systematic means of scaling them relative to the categories in the risk paradigm, an example of which is shown below, with the scoring rubric following.

		Risk Characterization	Risk Communication	Risk Management
1	Threat and its magnitude			
2	Timing			
3	Location			
4	Duration			
5	History			
6	Forecaster Confidence			

5	Extremely Effective: Covers all elements appropriately and as accurately as possible; clearly meets needs of all parties
4	Very Effective: Covers all or almost all elements well; meets needs of all but a few parties
3	Effective: Covers almost all element; meets needs of most parties but variable
2	Somewhat Effective: Covers some elements but not all; meets some needs but not all, and not necessarily well
1	Not Effective: Doesn't meet needs; missing critical elements
0	Don't know enough

An example of an application of this scoring matrix as applied to Impact Based Warnings (IBW) is shown below. Several caveats are necessary. The scoring represents the judgments of the project team, as based on the results of surveys before IBW was implemented. Thus, this is not a true application of the scoring matrix, but is only an example of how it might be operationalized using the results of survey or interview data, with the matrix as the centerpiece. The team believes this matrix and scoring system provide a nice framework for evaluation of NWS products, focusing on the needs of the partners

	Risk Communication			
	Message Packaging/Receiving	Message Delivery	Operational Considerations	Confidence, Competence, Comfort
Threat and its magnitude	3	3	2	4
Timing	2	2	2	2
Location	2	2	2	2
Duration	2	2	2	2
History	2	2	2	2
Confidence	3	2	2	4

4. Demonstrate through prototyping, what changes to products and services can be made to minimize negative influences on decisions.

Because our focus is on the decisions, influences, and actions of EMs, our purpose in prototyping was to learn the reasoning behind actions and words used by the NWS and EMs. Specifically, we sought to understand what correctly and efficiently conveys knowledge to EMs. For clarity, a prototype is a means of exploring the effect of providing information and not necessarily building a new, complete, "product." Prototyping is a means to systematically explore improvement. In our case, we were interested in understanding social influences, not necessarily a final output for improving a specific communication. Originally, we centered on four main areas for prototyping:

1. Informal and formal cues from NWS to EM: ways to express tone, confidence, and thinking, all of which have a major influence on EM decision-making; In these cases, we sought to understand how the information gathering process within the system context enables or inhibits the building of mental models of what the hazard is, it associated risk, and how the information is conveyed across the social network. The implication is that, despite the NWS goal of providing the most competent factual information, the information gathering process is influenced more by the competence of

the gatherer to identify and apply the information, and the ability to reach a level of confidence in the mental model and act. The complexity of this two-fold mental system cannot be underestimated nor merely accounted for by a "better" product. More information may actually work against the NWS due to issues such as Paradox of Choice, and the inability of decision makers to build a proper mental model.

2. The Outlook – Watch – Warning Continum: O-W-W is a continuum of understanding of the six critical elements and what may be missing in a mental model. While the NWS may view the O-W-W system as thresholds of risk, the EM sees the continuum as a means to build understanding and confidence. Often the system fails to enable decision makers to evolve their understanding due to the gaps in timing of information release, "get ready, go" instead of "ready, set, go." Prototyping shows that the influence of building a mental model in time is critical to taking preparatory actions by ESFs who need longer lead times to act properly.
3. Post-warning while event is in progress: This is often as critical as the warning itself. Since many decisions are "warning" based, it is absolutely necessary for the warning continuum to extend further in time in order for the ESFs to continue to take actions. For example, where is a storm headed next, is it likely to build, and where else is vulnerable but not warned yet? This part of the continuum has huge resource allocation decisions that are left without updated information in a timely manner.
4. Messaging: How does the packaging of knowledge to be conveyed, and the media through which it is disseminated influence understanding in communication? At the heart of the EM social network is the knowledge flow that seeks to empower decision makers with what the NWS understands. To accomplish this effectively, the competence of the EM network needs to be understood, the channels for communicating need to be examined, the knowledge needs (six elements) need to be transfixed, and the role and capabilities of gatherers and conveyors need to be understood.

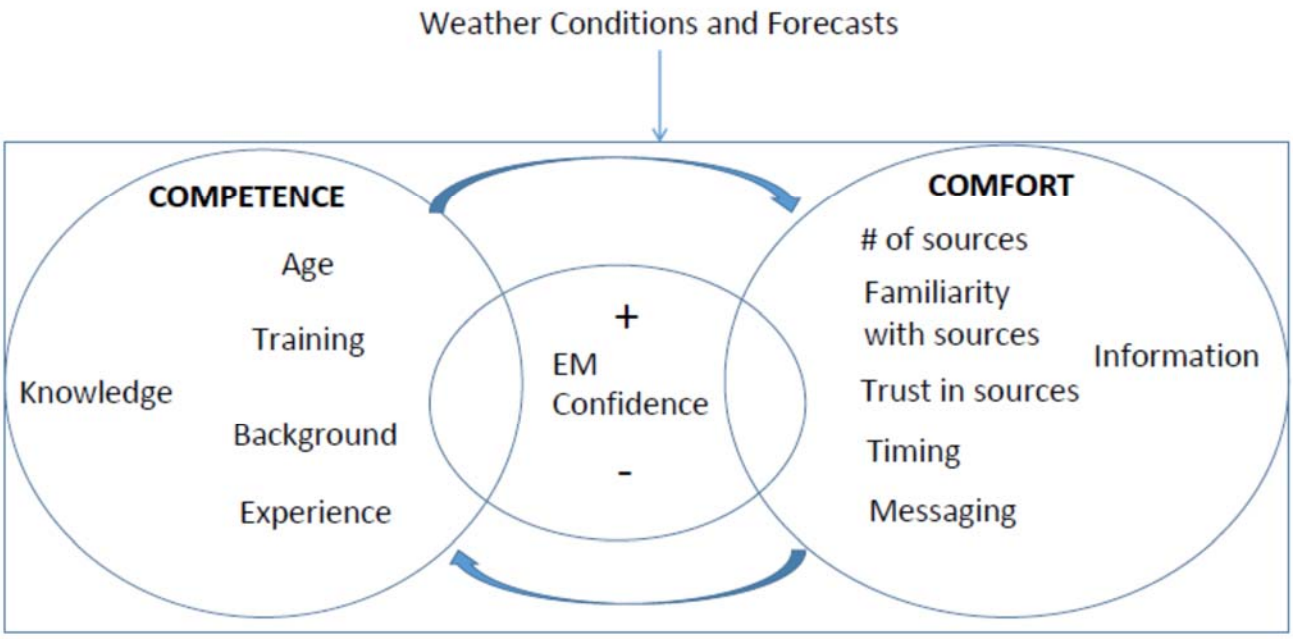
After focusing on these four main areas for prototyping, we moved to a consideration of other influences on EM decisions beyond products, and specifically on their confidence in making decisions. We recognized that the system in which EM decisions are made is a complex one of which NWS products and services are only a part. At the same time, NWS communications, in various forms, can influence that confidence both negatively and positively.

Continuing with the risk paradigm, we centered our efforts on gathering information from partners on:

1. Risk Characterization: Developing and encapsulating the knowledge about the severe weather hazard, its potential impact, and its risk to life and property – using IBW as one example that was tested.
2. Risk Communications: Packaging and delivering storm warnings (communicating) to convey the understanding of risk.
3. Risk Management: Understanding what knowledge of risk and the extent to which confidence/competence/comfort influence decisions.

It became clear that EMs are not necessarily looking for new or better products. That is, their needs are not product specific but rather are information specific, and not all of that information is related to the meteorology. Thus, we moved from product prototypes to address the kinds of

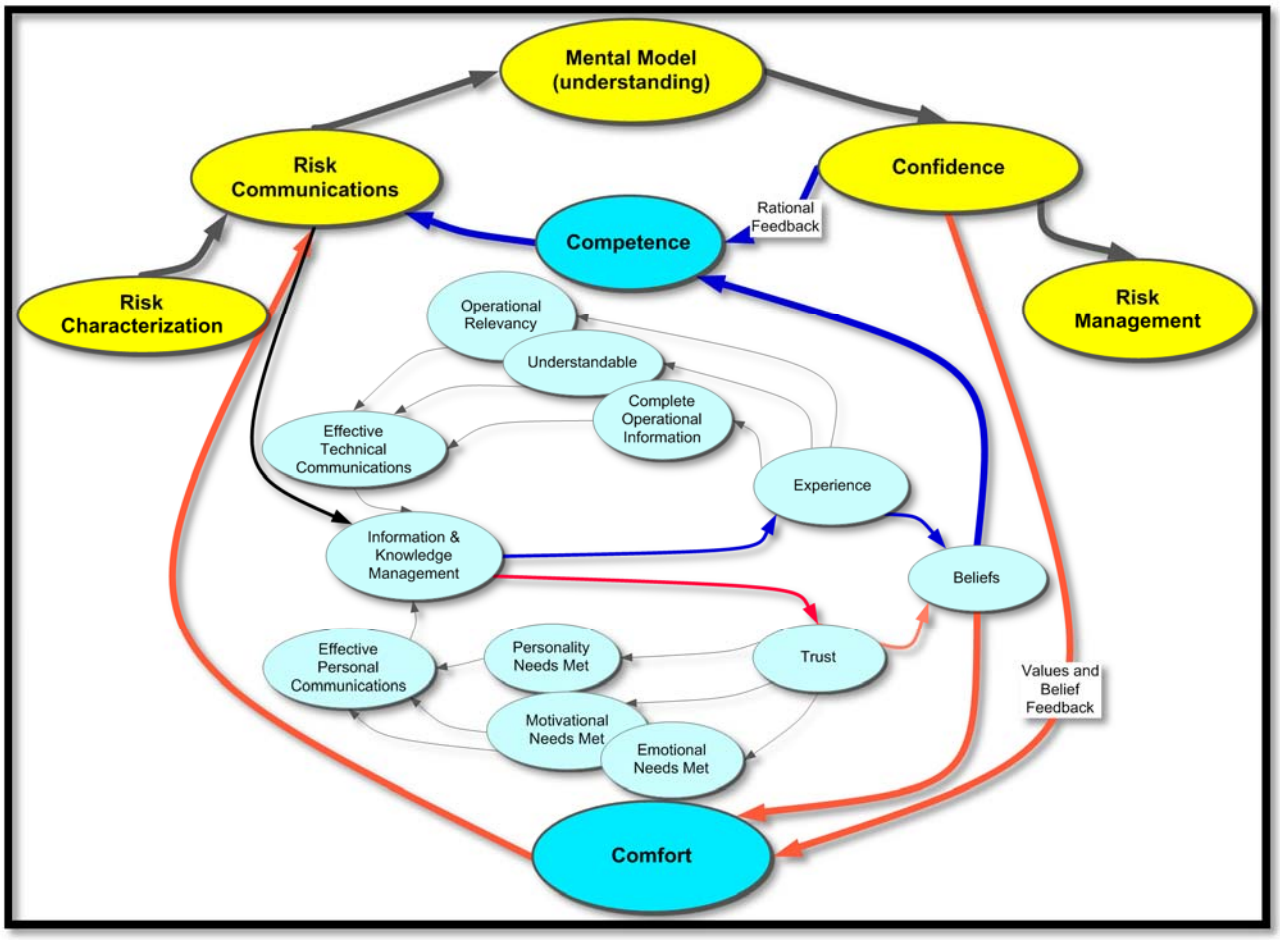
information EMs are seeking, including the forecaster's thought process and confidence in the forecast (why? how do you feel about the information you're telling us?). We chose to focus on the framework in which EM confidence is developed (see below).



5. Validate prototypes in real time with NWS case studies

We proposed to validate prototypes using a tropical event, but one did not occur. We also found from our interviews that it did not much matter what type of event was under consideration – the same six critical elements apply, as does the importance of EM confidence. As a result, we focused instead on confidence and its impact on decision making. The following diagram was developed to illustrate the findings of our work throughout this project. We see this as an important way to understand the complexity of EM decision-making and the various factors that influence it (both more and less). Only some of the factors relate to products, which is an important outcome of this project

Factors influencing EM decision-making



The formality and set procedures that exist within the NWS-EM relationship made experimentation limited due to the bias of those procedures and relations. Under this objective, we undertook a messaging experiment with emergency managers of large venues (schools, malls, sports arenas, etc. in the Tulsa, OK area) to understand how both messages and the dissemination of the messages affect their actions and decisions. We carefully chose these communities, even though they are in the public realm, as having similar needs as the government ESF but are not serviced directly by the NWS. These safety officials are more closely related to actions by the public than are the ESFs. This made for easier assessment of knowledge gaps. This experiment showed a clear need to streamline information and eliminate the multiple pathways of interpreted and re-interpreted information being created by the EM network that forms ad hoc during any severe weather event. The greatest concern is that the knowledge flow is created and controlled by non-experts that link to and within the large venues that have operational needs to protect large portions of the public. This knowledge flow is not restricted to large venues – it is found in all EM weather-related activities, and most EMs filter the information before they pass it along to their ESFs for decision making. How well they can interpret and filter information is an open question. Anecdotally, we observed a great range of ability to understand, interpret, and convey information. Each NWS message spawns numerous pathways of conveyance that, in turn, spawn many new pathways of information conveyance within the social EM networks. The public

venue experiment, though small in scope, clearly showed that information gathering and reinterpretation processes exist at all levels, and likely within all the public information pathways if heads of households are considered emergency managers.

Finally, although not testing a prototype, we undertook a national survey of EMs relating to familiarity with Impact Based Warnings and their perceptions of both the benefits and potential problems associated with IBWs. Again, this was undertaken to understand better how warning messages might influence confidence, comfort and competence. These results, combined with the results from other surveys and interviews, provide further indication of the factors that work to build the confidence of the emergency management community – a factor we know is equally important to the messages they are receiving.

6. Make recommendations to the NWS on prioritization.

This entire report represents our recommendation to the NWS. The findings of this project emphasize both the needs of the EM community and the ways in which NWS can meet those needs. The overall message is that it is as much about relationships as it is about products. The following are the overall recommendations that come from this project. The specific methods that led to these recommendations are found in previous project reports or from the PIs.

1. EMs needs to know the six critical elements. They are comfortable with forecast uncertainty, and, indeed, deal with it every day. Thus, providing more direct information on these elements, even if uncertain, is important to their decision-making. By eliminating the need to hunt for information and having one of their own do the interpretation of meaning. Each NWS product should be assessed based on the ‘ ability to quickly and accurately identify the six critical elements. Understanding of the six elements is another question that needs to be addressed with a completely revamped training program focused on application needs of ESF and less on EM meteorological understanding. For example, there is less value in the EM ability to correctly interpret a radar screen if the product showed the forecasters understanding of the six elements, where the danger is and where it is going, by when, and if it is likely to get worse or better. There are way too many products by different parts of the NWS that span the O-W-W continuum. EMs who are inundated with activities do not have time to adequately assemble all the information and correctly interpret their actions and strategy.
2. EMs need confidence to make decisions and it is information from the NWS that helps build that confidence. Products are important, but so is the forecaster’s own confidence and tone. The NWS is the trusted source for information. EMs do not ask for the NWS to make decisions but want a clearer indication of the likelihood of outcome. This, by definition, is what risk assessment is all about, according to the Risk Paradigm. If EMs are only presented with the range of possible outcomes, they will often over or under compensate for an event. A means to convey a forecaster’s understanding and confidence needs to be implemented.
3. EMs pass information along to others but most filter it first. Thus, providing the most important information up front saves them time and cuts down the error of interpretation. Similarly, clarity in any messages (i.e., to the point without jargon) is critical.

4. It is all about relationships—relationships between the NWS and EMs and relationships within the EM community.
5. A new training program needs to be devised that focuses on EM relevance and deemphasizes weather competence. This includes creating a clear, concise, and consistent product line that conveys the six elements, that is used in the training. This will facilitate the training and will build a broader base of attendance and training. EMs have little time and funding for training so they rely upon someone else to be the "weather" guy for them. This might be the NWS, the media, the county EM, but is often someone in the office who has an interest in the weather who is self-trained.

Documentation of Proto-typing Activities

The prototyping activities included such activities such as focus group discussions about priorities and information processes, interviews at conferences and meetings, displays of ideas to EMs, survey questions that posed ideas for reactions, creation of physical products and presentation to EMs. Much of this information is still being digested for publication. The survey information is provided in the appendix. In most cases, we used the actual NWS products as prototypes to assess specific EM reactions and comments about what is used, understood, and passed along. Since we were interested in influences on actions, we found that we did not necessarily need to create "new" prototypes to address how the lack of information spawned specific actions or thinking. Most of the prototype activities were mentioned in previous status reports or presentations.

Responses to Questions

After four years of working with EMs, what do you want NWS to know about their decision-making processes?

EM decision-making is context specific, depending on the imminent event, their individual responsibilities and the area (geographical and/or institutional) they serve. Thus, it is important for NWS to understand how EMs function as a collection of ESFs that come and go into a complex social network. It is very difficult to say exactly what NWS needs to know about their decision-making processes other than the fact that their information gathering, filtering, and interpreting is constantly going on in a non-optimized fashion. The NWS focus should be on streamlining the conveyance of the six critical elements with varying time and space scope, and for multiple hazard impacts that are relevant to ESFs. The diagram above showing the factors influencing EM decision-making best illustrates their decision-making. NWS information serves as an input to this process, the end result of which is risk management. Clearly it is neither a neat nor straightforward process. The NWS needs to address both the competence or factual side of information and the confidence side of information conveyance. Confidence, or lack thereof, often overrides the competence. Good information in the realm of low confidence can lead to delayed decisions, and bad information in the hands of confident EM can lead to bad decisions.

During times of severe weather, EMs are gathering information from various sources in order to understand what their situation is. This is not a problem when the various sources are consistent.

At the same time, they are getting information out to their respective network of partners, and are often getting requests for information from various entities. Thus, not only are they making decisions under uncertainty, but they are responsible for the decisions of others, including the public. The decisions that EMs make can carry economic and political consequences, so they need to be as certain as possible of a situation.

EMs may be full-time or part-time; they may have staff, they may not; they may be in the office when information comes in or they may be in the field. And different ESFs have different responsibilities. All of these differences speak to the importance of the NWS forecaster understanding the operational situations of the EMs in their CWA and constantly provide their understanding, whether they have high confidence or not. To be effective with the EM community, the NWS should find ways to measure the ability of their customers to understand and act and not measure their success of accuracy of the forecast, the latter of which will always have inaccuracies and uncertainty. Since in many cases the EMs are truly guessing in their interpretations in comparison to the NWS, it will be far more effective for the NWS to become part of the EM network and not merely an information provider. The results of our various surveys and interviews suggest that EMs value their relationship with NWS very highly and they rely on NWS as their most trusted source.

How do they function in severe weather situations, and how do NOAA products and communication practices help them (or fail to do so)? Could you give us a few examples from your vast interactions with the EM community?

In answering these questions, several examples are included below. Other examples can be found in the appendix, in virtually all of the surveys.

EMs are comfortable with uncertainty – they deal with it every day. Of course, the less uncertainty, the better. In all situations, they need confidence in making their decisions, and that is based partly on their competence and their comfort with both the situation and the information available. This is why knowing the forecaster's confidence in the forecast (not just the probability, but the forecaster's gut reaction, so to speak) is so important. At the same time, they need information that is not usually available in NWS forecasts and other communications, at least not without a great deal of filtering through what is not needed. EMs needs to know the six critical elements – they do not need to know why. Some may want to know the why of the situation, but most do not. Forecasts often start with why and then get to what and when. This is backwards. As a result, EMs must spend valuable time filtering out information before they pass it along to partners.

As noted above, NWS is the most trusted source. NOAA products are well respected, if not fully understood. Too often, EMs have to sort through all of the information that is available to find what is relevant for them – thresholds, locations, and impacts, as examples. For instance, in a ranking of factors that influence their decision-making, under the category of Impact Assessment, "event type" was most highly ranked followed by "communication of meaningful impact information (thresholds)." IBWs get at this, and they are seen by EMs as an improvement with respect to giving them information that is more useful to them.

We found that relationships are at least equal to, or maybe even more important than, products in EM functioning. Of course, the products give them information that is helpful to them but that does not necessarily build their confidence. In the survey on confidence, we found that "confidence in the science of the forecast" is how EMs would define confidence. But, it is not their confidence in the science, as they are not meteorologists – it is the forecaster's confidence. This can be most easily discerned through relationships – perhaps through products, but not necessarily as they now exist. In other words, tweaking products help EMs' understandings of the situation, but it does not necessarily affect their confidence –and that is what is critical to decision-making.

Have you produced anything, like recommendations for products/practice, training courses, etc. that NWS could consider using or building on?

The NWS should use or develop a similar actionable critical element list by which all products should be evaluated. It should not merely be a checklist of time, location, severity, etc., but needs to account for the ability of the EM and ESFs to use that information in their decision making. Further, it should account for how quickly these elements can be ascertained. If the NWS wants to continue down a path of producing an ability for each user to set thresholds and actions, then it must be ready to deal with the diversity of skills needed for EMs to set these criteria in a dynamic way, as each event has its own challenges of resources and vulnerability. Risk management is not an engineered process where you can set it and forget it. Nor are decisions as easy as hitting a threshold. Setting of thresholds adds an element of complexity of timing of decisions and information passing in the social network the implications of which are not clearly appreciated. While thresholds may be a good indicator for situational awareness, they cannot be a surrogate for situational understanding.

Developing and applying an actionable set of elements will naturally lead to a streamlining of clear, concise and consistent products. Of all the products used by EMs, only a few are actually used though on the surface they self-report to use them all. During a potential crisis, there is just not enough time to absorb all the information and formulate a competent mental model. Most often, experience is the deciding factor on interpreting products and taking actions. Often we heard phrasing such as, "I'd rather have the NWS guess than mine," coming from the EMs, but the opposite is happening. The majority of EMs report they filter information from the NWS before passing it along their network, with many others just passing it along. Many EMs are looked upon as the weather expert. Yet the training of EMs is far from adequate according to EMs.

Training, in conjunction with critical element interpretation, needs to be addressed. Most EMs report some training but overwhelmingly say training is needed. This equates to relevant training to entice ESFs to become more competent in understanding since they are the decision makers. Many EMs are comfortable in their weather information roles while others are not because they are not directly involved with the operational decisions. The current training is described as too much meteorology though a basic understanding is appreciated. Some EMs are seeking meteorology classes in fear of missing something. The weather products are too complicated for most when only a limited amount of critical information is really needed. Training should focus on how to assess time and location of impacts, at a minimum, and less on why the weather is

occurring. We gathered a lot about what training would work and why but assessing this feedback was outside the scope of this project. For our purposes, training to develop a greater operational competence is greatly needed and will have the greatest influence on decision making since it indirectly also greatly influences confidence, the ultimate mental threshold for making decisions.

On the flip side, a training for all NWS personnel to show what emergency management is all about would go a long way to improved customer service. This does not mean all forecasters will need to accommodate every ESF but it would provide an appreciation of the complexity of decision networks. This will shed light on needs such as why hospital and medical planners need greater lead times than confidence allows, why wind forecasts may be of greater need than rainfall amounts, why ice on road potential is needed at 5:00 am not at 8:00, why no actions are taken until a warning is actually issued, why evacuations may be predicated on other considerations and not just the weather, and why public venues do not make decisions at all. Having this insight into community needs can help tailor the weather discussion to local needs.

A consistent finding for addressing understanding of storm evolution is a product that shows where the hazard is, how big, and where it is going, as best a forecaster understands it. It conveys location, time, history, and severity in one depiction without the need to interpret or filter. If this is constantly updated, the EM community has what it mostly needs. What is crucial to EM is not the path, but the area of impact. EMs are trying to assess what the impacted area will be and when, and what is vulnerable to that impact in order to adequately plan and implement a response. We found several examples of this type of depiction that shows an X marks the spot and an arrow showing where it is going. Various ways have been devised to depict the uncertainty of path and strength. It is important to note that simple is better in helping to build a mental model of an event and its implications. Trying to build a complex tool is not necessarily the right thing before one assesses how the concept will actually be applied in practice.

Graphic tools are great, if they can be correctly used by EMs. Care should be taken in how much information is trying to be portrayed. Too much information, perhaps as few as only three parameters, can lead to misinterpretation. Further, there is a wide range of capabilities of technologies to adequately communicate graphics and text. While social media and mobile devices open up new possibilities of reaching certain decision makers, we cannot assume it reaches all, just as having fast communications and computers was a bad assumption only a few years ago. Social media is already becoming a “noisy” media and may have impacts on some becoming overconfident with old or bad information. While graphics have considerable power, communications in words is still the preferred exchange, again, even though self-reporting says the opposite. This is because the same self-reporting shows a lower confidence in the EM ability to interpret the complex graphics standardly produced. EMs will read as much as they can in order to become situationally aware. The NWS should be in tune with situational understanding, not awareness alone.

Project Presentations

A number of presentations have been given on this research, as detailed below. Manuscripts will soon be prepared based on the results of this work.

Galluppi, K.J., J. Losego, B. Montz, Using the Risk Paradigm to Link Weather to Emergency Management Decisions, Society for Risk Analysis Annual Meeting 2012, December 2012, San Francisco, CA.

Galluppi, K., Decision Processes: Key to Effective "Decision Support", NWS Southern Region Science and Operations Officers Virtual Conference, February 2013.

Montz, B.E., K. Galluppi, J.L. Losego, J. Correia Jr., R. Riley, Social and Behavioral Influences on Weather-Driven Decisions, National Tornado Summit, March 2013, Oklahoma City, OK.

Galluppi, K., J. Losego, B. Montz, R. Riley, J. Correia Jr., J. Kramper, EM-NWS Partnership: Understanding Weather, Missouri Department of Public Safety State Emergency Management Agency Conference, April 2013, St. Charles, MO.

Hudson, M.J., P.A. Browning, K. Runk, K.J. Galluppi, J.L. Losego, and B.E. Montz, The Central Region Impact-Based Warning Demonstration: Findings from the 2012 Season, Second Conference on Weather Warnings and Communication, June 2013, Nashville, TN.

Galluppi, K.J., J.L. Losego, B.E. Montz, J. Correia Jr., R.E. Riley, Social and Behavioral Influences on Weather-Driven Decisions Made by Emergency Managers, Second Conference on Weather Warnings and Communication, June 2013, Nashville, TN.

Losego, J., K. Galluppi, B. Montz, Conducting Effective Verbal and Graphical Briefings: EM Community Perspective, NWS Southern Region Decision Support Webinar Series, July 2013.

Galluppi, K., J. Correia Jr., J. Losego, B. Montz, R. Riley, How to Tell Which Storms are Important: What Is Needed?, Oklahoma Emergency Management Association Conference, August 2013, Norman, OK.

Montz, B.E., K. Galluppi, J.L. Losego, J. Correia Jr., R. Riley, Social and Behavioral Influences on Weather-Driven Decisions of Emergency Managers, National Weather Association 38th Annual Meeting, October 2013, Charleston, SC.

Montz, B.E., K. Galluppi, J.L. Losego, J. Correia Jr., R.E. Riley, Social and Behavioral Influences on Weather-Driven Decisions: Prototypes for Severe Weather, 9th Symposium on Policy and Socio-Economic Research, AMS 94th Annual Meeting, February 2014, Atlanta, GA.

Mills, B., K. Galluppi, J. Demuth, Societal Aspects of Weather Forecast Information: Applications to Marine Weather, Environment Canada-NWS Marine Forecasting Workshop, February 13, 2014, Webinar.

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Appendix

Surveys, Interviews, Focus Groups:
Overview of Results

October 2012

Surveys:
North Carolina Emergency Management Association
International Emergency Management Association

Purpose of surveys is to understand the operational needs and preferences of EMs, including what is the preferred timing for being alerted to the possibility of severe weather so that they can put their operations in motion. Other questions get at the kinds of information that they want, thresholds that are operationally useful and information sources. Examples of finbdings include: 1. the maximum event threat is useful information for EMs; 2. Many EMs don't use or don't know about the Convective Outlook or Mesoscale Discussions. The specific results follow copies of the surveys.

Emergency Manager - Severe Weather Survey
NCEMA Conference
October 15-17, 2012

This survey is being conducted by East Carolina University and the University of North Carolina to understand the perspectives of emergency management in the time leading up to the issuance of a warning for a severe weather event.

1. Which National Weather Service office covers your jurisdiction?
   a. Greenville-Spartanburg, SC
   b. Blacksburg, VA
   c. Raleigh
   d. Wilmington
   e. Newport/Morehead City
   f. Wakefield, VA
   g. Morristown, TN
   h. I don't know

2. Which classification describes your primary job position?
   a. County EM Director/Asst Director
   b. State EM
   c. Fire Chief/Marshal
   d. Transportation
   e. Communications
   f. Public Health
   g. Medical Services
   h. Mass care and human services
   i. Energy
   j. Media
   k. Federal

3. What is your highest level of meteorological training? (Circle one)
   a. NWS Storm Spotter or SKYWARN Training
   b. Other training (e.g., NC-FIRST, FEMA)
   c. Meteorology Degree
   d. None
   e. Other (please specify)_____

4. If a severe weather event is going to occur, how far in advance do you need to know about it for it to be initially operationally significant?
   a. More than 4 days
   b. 3 days
   c. 2 days
   d. 1 days
   e. Less than a day

** Questions 5-12: Refer to the timeframe you identified in number 4. **

5. At this initial point in time, what do you need to know? _____

   _____

   _____

6. What do you do with this information? _____

   _____

   _____

7. At this initial point in time, do you prepare differently when you are under a moderate risk vs. a slight risk of severe weather?
    a. No
    b. Yes
    c. Don't Know

8. What is the **primary** way that you first find out that severe weather may occur in your area? (Choose one)
    a. From an NWS Weather Forecast Office webpage or email
    b. NC-FIRST
    c. Directly from the Storm Prediction Center (SPC) webpage
    d. Local TV
    e. National TV
    f. Private Company
    g. From another person in my county or organization
    h. Other: _____

9. At this initial point in time, my primary source of information tells me everything I need to know about the severe weather event.

Disagree Completely	1	2	3	4	5	Agree Completely

10. Choose your level of agreement with the statement for each product: This product provides me with all of the information I need to know.

	Completely Disagree				Completely Agree		
Convective Outlook	1	2	3	4	5	Don't use	Don't know
Mesoscale Discussion	1	2	3	4	5	Don't use	Don't know
Watch	1	2	3	4	5	Don't use	Don't know
Public Weather Outlook	1	2	3	4	5	Don't use	Don't know

11. Between the time that you identified in number 4 until the time that you receive a warning, what information or products are you looking at? _____
_____
_____

12. Between the time that you identified in number 4 until the time that you receive a warning, which is the most informative way of receiving the information? (Choose one)
    a. Text: a description of what will happen
    b. Categories: on a map, highlights the location and likelihood of what will happen using words or categories, such as slight, moderate, or high
    c. Numerical: on a map, highlights the location and likelihood of what will happen using percentages or probabilities

13. If you could have additional information that is more informative for your decision making, how useful would each of these be to you?

Worst Case Scenario

Not at all Useful 1 2 3 4 5 Extremely Useful

Maximum Event Threat: For example - Today we expect EF-2 or greater tornadoes

Not at all Useful 1 2 3 4 5 Extremely Useful

Odds of a Particular Event Occurring: For example - You have a 3 times higher chance than normal of having a tornado in your area today.

Not at all Useful 1 2 3 4 5 Extremely Useful

Probability of Event Occurrence: For example - You have a 5% chance of having a tornado in your area today.

Not at all Useful 1 2 3 4 5 Extremely Useful

14. What else would you want to know?

_____

_____

15. Assume that your jurisdiction falls within a threat area that may have severe weather that could occur within 25 miles of any point in the threat area later today. Rate the usefulness of each of these:

There is a 15% chance of a tornado.
Not at all Useful 1 2 3 4 5 Extremely Useful

There is a moderate risk of severe weather.
Not at all Useful 1 2 3 4 5 Extremely Useful

There is a 60% chance of damaging winds.
Not at all Useful 1 2 3 4 5 Extremely Useful

There is a high risk of severe weather.
Not at all Useful 1 2 3 4 5 Extremely Useful

16. What thresholds are operationally significant to you?
Hail - choose one

a. Any sized hail
b. Dime (1/2")
c. Penny (3/4")
d. Quarter (1")
e. Ping pong (1.5")
f. Golf ball (1.75")
g. Tennis ball (Greater than 2.5")
h. I don't need to know about hail
i. Other _____

Wind - choose one

a. 35 mph or below
b. 40 mph
c. 50 mph
d. 60 mph
e. 70 mph
f. Greater than 80 mph
g. I don't need to know about wind
h. Other _____

Lightning - choose one

a. Any amount of lightning
b. "Average" amount of lightning
c. Excessive amount of lightning
d. I don't need to know about lightning

Tornado - choose one

a. Any tornado
b. Funnel cloud
c. Landspout
d. Weak (EF-0, EF-1)
e. Strong (EF-2, EF-3)
f. Violent (EF-4, EF-5)

17. If you could receive the "perfect" product in the timeframe leading up to the issuance of a warning, what information would it include and what would it look like?

_____

_____

_____

18. In what timeframe would you like to see this "perfect" product issued?

_____

Emergency Manager -- Severe Thunderstorm/Tornado Survey
IAEM Conference
October 29-31, 2012

This survey is being conducted by East Carolina University and the University of North Carolina to understand the perspectives of emergency management in the time leading up to the issuance of a warning for a severe thunderstorm and/or tornado event.

1. In what state do you work?

2. Which National Weather Service office covers your area?

   _____ I don't know

3. Which classification describes your primary job position?
   a. County EM Director/Asst Director
   b. State EM
   c. FEMA
   d. Fire Chief/Marshal
   e. Transportation
   f. Communications
   g. Public Health
   h. Medical Services
   i. Mass care and human services
   j. Energy
   k. Media
   l. Other: _____

4. What is your highest level of meteorological training? (Circle one)
   a. NWS Storm Spotter or SKYWARN Training
   b. Other training (e.g., FEMA, state-run program like NC-First or OK-First)
   c. Meteorology Degree
   d. None
   e. Other (please specify)_____

5. If a severe thunderstorm and/or tornado event is going to occur, how far in advance do you need to know about it for it to be initially operationally significant?
   a. More than 4 days
   b. 3 days
   c. 2 days
   d. 1 days
   e. Less than a day

** Questions 6-13: Refer to the timeframe you identified in number 5. **

6. At this initial point in time, what do you need to know? _____

   _____

   _____

7. What do you do with this information? _____

   _____

   _____

8. At this initial point in time, do you prepare differently when you are under a moderate risk vs. a slight risk of severe weather?
    a. No
    b. Yes
    c. Don't Know

9. What is the **primary** way that you first find out that a severe thunderstorm and/or tornado event may occur in your area? (Choose one)
    a. From an NWS Weather Forecast Office webpage or email
    b. Directly from the Storm Prediction Center (SPC) webpage
    c. Local TV
    d. National TV
    e. Private Company
    f. From another person in my county or organization
    g. Other: _____

10. At this initial point in time, my primary source of information tells me everything I need to know about the severe thunderstorm and/or tornado event.

Disagree Completely	1	2	3	4	5	Agree Completely

11. Choose your level of agreement with the statement for each product: This product provides me with all of the information I need to know.

	Completely Disagree				Completely Agree		
Convective Outlook	1	2	3	4	5	Don't use	Don't know
Mesoscale Discussion	1	2	3	4	5	Don't use	Don't know
Watch	1	2	3	4	5	Don't use	Don't know
Public Weather Outlook	1	2	3	4	5	Don't use	Don't know

12. Between the time that you identified in number 5 until the time that you receive a warning, what information or products are you looking at? _____
_____
_____

13. Between the time that you identified in number 5 until the time that you receive a warning, which is the most informative way of receiving the information? (Choose one)
    a. Text: a description of what will happen
    b. Categories: on a map, highlights the location and likelihood of what will happen using words or categories, such as slight, moderate, or high
    c. Numerical: on a map, highlights the location and likelihood of what will happen using percentages or probabilities

14. If you could have additional information that is more informative for your decision making, how useful would each of these be to you?

Worst Case Scenario

Not at all Useful 1 2 3 4 5 Extremely Useful

Maximum Event Threat: For example - Today we expect EF-2 or greater tornadoes

Not at all Useful 1 2 3 4 5 Extremely Useful

Odds of a Particular Event Occurring: For example - You have a 3 times higher chance than normal of having a tornado in your area today.

Not at all Useful 1 2 3 4 5 Extremely Useful

Probability of Event Occurrence: For example - You have a 5% chance of having a tornado in your area today.

Not at all Useful 1 2 3 4 5 Extremely Useful

15. What else would you want to know?

_____

_____

16. Assume that your jurisdiction falls within a threat area that may have severe weather that could occur within 25 miles of any point in the threat area later today. Rate the usefulness of each of these:

There is a 15% chance of a tornado.
Not at all Useful 1 2 3 4 5 Extremely Useful

There is a moderate risk of severe weather.
Not at all Useful 1 2 3 4 5 Extremely Useful

There is a 60% chance of damaging winds.
Not at all Useful 1 2 3 4 5 Extremely Useful

There is a high risk of severe weather.
Not at all Useful 1 2 3 4 5 Extremely Useful

17. What thresholds are <u>operationally</u> significant to you?
Hail - choose one

a. Any sized hail
b. Dime (1/2")
c. Penny (3/4")
d. Quarter (1")
e. Ping pong (1.5")
f. Golf ball (1.75")
g. Tennis ball (Greater than 2.5")
h. I don't need to know about hail
i. Other _____

Wind - choose one

a. 35 mph or below
b. 40 mph
c. 50 mph
d. 60 mph
e. 70 mph
f. Greater than 80 mph
g. I don't need to know about wind
h. Other _____

Lightning - choose one

a. Any amount of lightning
b. "Average" amount of lightning
c. Excessive amount of lightning
d. I don't need to know about lightning

Tornado - choose one

a. Any tornado
b. Funnel cloud
c. Landspout
d. Weak (EF-0, EF-1)
e. Strong (EF-2, EF-3)
f. Violent (EF-4, EF-5)

18. If you could receive the "perfect" product in the timeframe leading up to the issuance of a warning, what information would it include and what would it look like?

_____

_____

_____

19. In what timeframe would you like to see this "perfect" product issued?

_____

Emergency Manager - Severe Weather Survey
NCEMA Conference
October 15-17, 2012

This survey is being conducted by East Carolina University and the University of North Carolina to understand the perspectives of emergency management in the time leading up to the issuance of a warning for a severe weather event.

25 Respondents

1. Which National Weather Service office covers your jurisdiction?
   a. Greenville-Spartanburg, SC 32%
   b. Blacksburg, VA
   c. Raleigh 32%
   d. Wilmington 4%
   e. Newport/Morehead City 20%
   f. Wakefield, VA
   g. Morristown, TN
   h. I don't know
   i. Other 12%

2. Which classification describes your primary job position?

No answer 4%

   a. County EM Director/Asst Director 44%
   b. State EM 12%
   c. Fire Chief/Marshal 12%
   d. Transportation
   e. Communications 16%
   f. Public Health
   g. Medical Services 8%
   h. Mass care and human services
   i. Energy
   j. Media
   k. Federal

3. What is your highest level of meteorological training? (Circle one)

   No answer 4%

   a. NWS Storm Spotter or SKYWARN Training 28%
   b. Other training (e.g., NC-FIRST, FEMA) 20%
   c. Meteorology Degree 8%
   d. None 32%
   e. Other (please specify)_____ 8%

4. If a severe weather event is going to occur, how far in advance do you need to know about it for it to be initially <u>operationally</u> significant?

   No answer 4%

   a. More than 4 days 12%
   b. 3 days 24%
   c. 2 days 32%
   d. 1 days 16%
   e. Less than a day 4%
   f. Other 8%

** Questions 5-12: Refer to the timeframe you identified in number 4. **

5. At this initial point in time, what do you need to know? _____

   _____

   _____

6. What do you do with this information? _____

_____

7. At this initial point in time, do you prepare differently when you are under a moderate risk vs. a slight risk of severe weather? No answer 4%
   a. No 32%
   b. Yes 56%
   c. Don't Know 8%

8. What is the **primary** way that you first find out that severe weather may occur in your area? (Choose one)
   a. From an NWS Weather Forecast Office webpage or email 36%
   b. NC-FIRST 12%
   c. Directly from the Storm Prediction Center (SPC) webpage 8%
   d. Local TV 20%
   e. National TV
   f. Private Company
   g. From another person in my county or organization 4%
   h. Other: _____ 20%

9. At this initial point in time, my primary source of information tells me everything I need to know about the severe weather event.
   No answer 4%

Disagree Completely	1	2 (12%)	3 (52%)	4 (16%)	5 (16%)	Agree Completely

10. Choose your level of agreement with the statement for each product: This product provides me with all of the information I need to know.
    No answer 4%

	Completely Disagree				Completely Agree		
Convective Outlook	1	2(4%)	3(4%)	4(36%)	5(4%)	Don't use(24%)	Don't know(24%)
Mesoscale Discussion	1	2(4%)	3(4%)	4(28%)	5(8%)	Don't use(28%)	Don't know(24%)
Watch	1	2(4%)	3(24%)	4(36%)	5(20%)	Don't use(12%)	Don't know
Public Weather Outlook	1	2(8%)	3(16%)	4(44%)	5(4%)	Don't use(24%)	Don't know

11. Between the time that you identified in number 4 until the time that you receive a warning, what information or products are you looking at? _____

_____

_____

12. Between the time that you identified in number 4 until the time that you receive a warning, which is the most informative way of receiving the information? (Choose one) No answer 4%
    a. Text: a description of what will happen (12%)

b. Categories: on a map, highlights the location and likelihood of what will happen using words or categories, such as slight, moderate, or high (56%)
c. Numerical: on a map, highlights the location and likelihood of what will happen using percentages or probabilities (28%)

13. If you could have additional information that is more informative for your decision making, how useful would each of these be to you?

Worst Case Scenario

Not at all Useful 1 2(8%) 3(12%) 4(40%) 5(36%) Extremely Useful

Maximum Event Threat: For example - Today we expect EF-2 or greater tornadoes

Not at all Useful 1 2(4%) 3(8%) 4(36%) 5(48%) Extremely Useful

Odds of a Particular Event Occurring: For example - You have a 3 times higher chance than normal of having a tornado in your area today.

Not at all Useful 1 2(4%) 3(28%) 4(36%) 5(28%) Extremely Useful

Probability of Event Occurrence: For example - You have a 5% chance of having a tornado in your area today.

Not at all Useful 1 2(8%) 3(16%) 4(32%) 5(40%) Extremely Useful

14. What else would you want to know?

_____

_____

15. Assume that your jurisdiction falls within a threat area that may have severe weather that could occur within 25 miles of any point in the threat area later today. Rate the usefulness of each of these: No answer 4%

There is a 15% chance of a tornado.
Not at all Useful 1 2(8%) 3(16%) 4(32%) 5(40%) Extremely Useful

There is a moderate risk of severe weather.
Not at all Useful 1 2(12%) 3(24%) 4(44%) 5(16%) Extremely Useful

There is a 60% chance of damaging winds.
Not at all Useful 1 2(4%) 3(8%) 4(36%) 5(48%) Extremely Useful

There is a high risk of severe weather.
Not at all Useful 1 2(4%) 3(8%) 4(40%) 5(44%) Extremely Useful

16. What thresholds are operationally significant to you? No answer 4%
Hail - choose one
a. Any sized hail (48%) b. Dime (1/2") (16%)

c. Penny (3/4") (12%)
d. Quarter (1") (16%)
e. Ping pong (1.5") (4%)
f. Golf ball (1.75")
g. Tennis ball (Greater than 2.5")
h. I don't need to know about hail
i. Other _____

Wind - choose one

a. 35 mph or below (12%)
b. 40 mph (44%)
c. 50 mph (12%)
d. 60 mph (16%)
e. 70 mph (12%)
f. Greater than 80 mph
g. I don't need to know about wind
h. Other _____

Lightning - choose one

a. Any amount of lightning (32%)
b. "Average" amount of lightning
c. Excessive amount of lightning (64%)
d. I don't need to know about lightning

Tornado - choose one

a. Any tornado (92%)
b. Funnel cloud (4%)
c. Landspout
d. Weak (EF-0, EF-1)
e. Strong (EF-2, EF-3)
f. Violent (EF-4, EF-5)

17. If you could receive the "perfect" product in the timeframe leading up to the issuance of a warning, what information would it include and what would it look like?

_____

_____

_____

18. In what timeframe would you like to see this "perfect" product issued?

_____

Emergency Manager -- Severe Thunderstorm/Tornado Survey
IAEM Conference
October 29-31, 2012

This survey is being conducted by East Carolina University and the University of North Carolina to understand the perspectives of emergency management in the time leading up to the issuance of a warning for a severe thunderstorm and/or tornado event.

35 Respondents (no answer 3% for most questions, but where responses don't add to 100%, the remaining are no answer)

1. In what state do you work?

2. Which National Weather Service office covers your area?

   _____ I don't know

3. Which classification describes your primary job position?

a.	County EM Director/Asst Director (46%)	g.	Public Health (3%)
b.	State EM (3%)	h.	Medical Services (3%)
c.	FEMA	i.	Mass care and human services
d.	Fire Chief/Marshal	j.	Energy
e.	Transportation	k.	Media
f.	Communications	l.	Other: (43%)

4. What is your highest level of meteorological training? (Circle one)

a.	NWS Storm Spotter or SKYWARN Training	(40%)
b.	Other training (e.g., FEMA, state-run program like NC-First or OK-First)	(14%)
c.	Meteorology Degree	(3%)
d.	None	(11%)
e.	Other (please specify)	(3%)

5. If a severe thunderstorm and/or tornado event is going to occur, how far in advance do you need to know about it for it to be initially <u>operationally</u> significant?

a.	More than 4 days	(3%)
b.	3 days	(14%)
c.	2 days	(20%)
d.	1 days	(40%)
e.	Less than a day	(20%)

** Questions 6-13: Refer to the timeframe you identified in number 5. **

6. At this initial point in time, what do you need to know? _____

   _____

   _____

7. What do you do with this information? _____

   _____

   _____

8. At this initial point in time, do you prepare differently when you are under a moderate risk vs. a slight risk of severe weather?
    a. No (20%)
    b. Yes (74%)
    c. Don't Know (3%)

9. What is the **primary** way that you first find out that a severe thunderstorm and/or tornado event may occur in your area? (Choose one)
    a. From an NWS Weather Forecast Office webpage or email (63%)
    b. Directly from the Storm Prediction Center (SPC) webpage (11%)
    c. Local TV (3%)
    d. National TV
    e. Private Company
    f. From another person in my county or organization (3%)
    g. Other: _____ (17%)

10. At this initial point in time, my primary source of information tells me everything I need to know about the severe thunderstorm and/or tornado event.

Disagree Completely 1 2(6%) 3(26%) 4(57%) 5(9%) Agree Completely

11. Choose your level of agreement with the statement for each product: This product provides me with all of the information I need to know.

	Completely Disagree			Completely Agree			
Convective Outlook	1(3%)	2(3%)	3(15%)	4(43%)	5(9%)	Don't use (6%)	Don't know (17%)
Mesoscale Discussion	1(3%)	2	3(14%)	4(26%)	5(20%)	Don't use(11%)	Don't know (20%)
Watch	1	2	3(20%)	4(40%)	5(26%)	Don't use	Don't know (9%)
Public Weather Outlook	1	2(6%)	3(9%)	4(43%)	5(14%)	Don't use(9%)	Don't know(17%)

12. Between the time that you identified in number 5 until the time that you receive a warning, what information or products are you looking at? _____
    _____
    _____

13. Between the time that you identified in number 5 until the time that you receive a warning, which is the most informative way of receiving the information? (Choose one)
    a. Text: a description of what will happen (14%)
    b. Categories: on a map, highlights the location and likelihood of what will happen using words or categories, such as slight, moderate, or high (60%)
    c. Numerical: on a map, highlights the location and likelihood of what will happen using percentages or probabilities (23%)

14. If you could have additional information that is more informative for your decision making, how useful would each of these be to you?

Worst Case Scenario

Not at all Useful 1(3%) 2(3%) 3(9%) 4(34%) 5(46%) Extremely Useful

Maximum Event Threat: For example - Today we expect EF-2 or greater tornadoes

Not at all Useful 1(3%) 2 3(6%) 4(23%) 5(63%) Extremely Useful

Odds of a Particular Event Occurring: For example - You have a 3 times higher chance than normal of having a tornado in your area today.

Not at all Useful 1(3%) 2(6%) 3(17%) 4(31%) 5(37%) Extremely Useful

Probability of Event Occurrence: For example - You have a 5% chance of having a tornado in your area today.

Not at all Useful 1 2 3(17%) 4(37%) 5(40%) Extremely Useful

15. What else would you want to know?

_____

_____

16. Assume that your jurisdiction falls within a threat area that may have severe weather that could occur within 25 miles of any point in the threat area later today. Rate the usefulness of each of these:

There is a 15% chance of a tornado.

Not at all Useful 1(6%) 2(17%) 3(14%) 4(37%) 5(20%) Extremely Useful

There is a moderate risk of severe weather.

Not at all Useful 1 2(11%) 3(26%) 4(40%) 5(14%) Extremely Useful

There is a 60% chance of damaging winds.

Not at all Useful 1(3%) 2 3 4(46%) 5(49%) Extremely Useful

There is a high risk of severe weather.

Not at all Useful 1 2(3%) 3(23%) 4(20%) 5(49%) Extremely Useful

17. What thresholds are <u>operationally</u> significant to you?

Hail - choose one

a. Any sized hail (37%)
b. Dime (1/2") (6%)
c. Penny (3/4") (29%)
d. Quarter (1") (9%)
e. Ping pong (1.5") (9%)
f. Golf ball (1.75")
g. Tennis ball (Greater than 2.5")
h. I don't need to know about hail (6%)
i. Other _____

Wind - choose one

a. 35 mph or below (14%)
b. 40 mph (49%)
c. 50 mph (30%)
d. 60 mph
e. 70 mph
f. Greater than 80 mph
g. I don't need to know about wind
h. Other _____ (6%)

Lightning - choose one

a. Any amount of lightning (68%)
b. "Average" amount of lightning (6%)
c. Excessive amount of lightning (24%)
d. I don't need to know about lightning (3%)

Tornado - choose one

a. Any tornado (83%)
b. Funnel cloud (9%)
c. Landspout (3%)
d. Weak (EF-0, EF-1)
e. Strong (EF-2, EF-3) (3%)
f. Violent (EF-4, EF-5)

18. If you could receive the "perfect" product in the timeframe leading up to the issuance of a warning, what information would it include and what would it look like?

_____

_____

_____

19. In what timeframe would you like to see this "perfect" product issued?

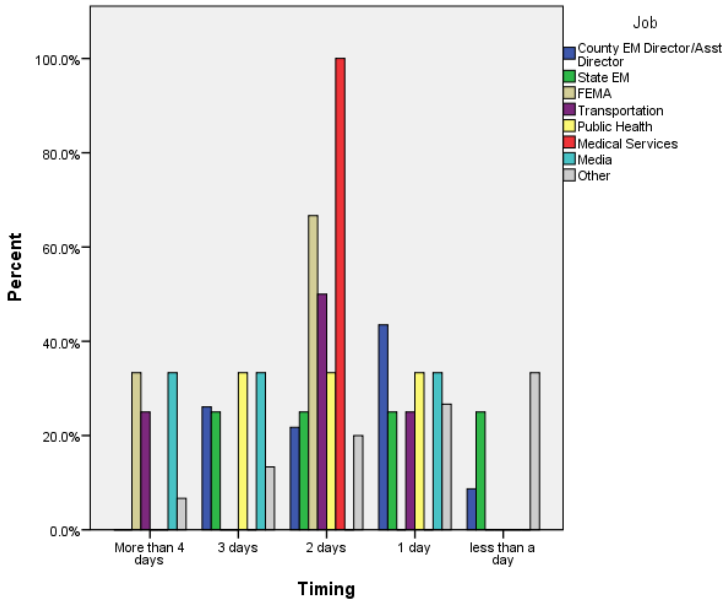
_____

Graphs illustrating the combined results of NCEMA and IAEM Surveys, October 2012. There are about 100 pages of these graphs, so the ones here are just a small sample.

Question 4

If a severe weather event is going to occur, how far in advance do you need to know about it for it to be initially operationally significant?

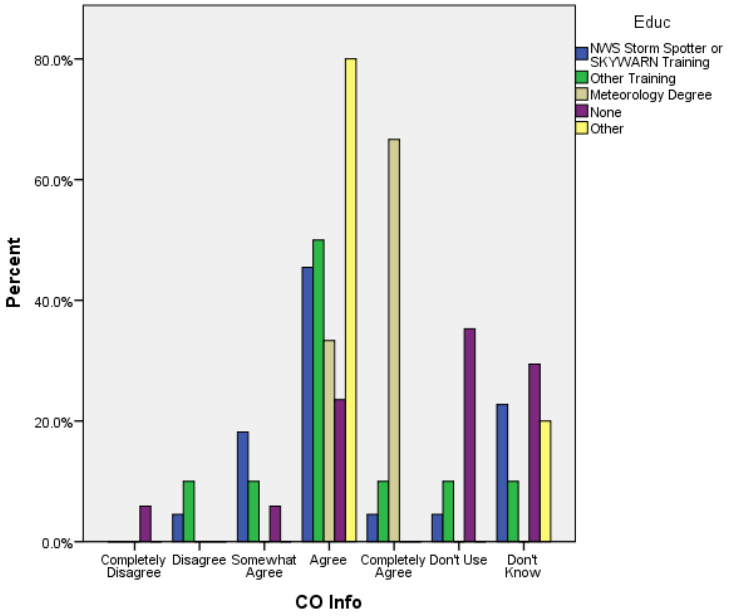
a. More than 4 days
b. 3 days
c. 2 days
d. 1 days
e. Less than a day



Question 10

Choose your level of agreement with the statement for each product: This product provides me with all of the information I need to know.

	Completely Disagree				Completely Agree		
Convective Outlook	1	2	3	4	5	Don't use	Don't know

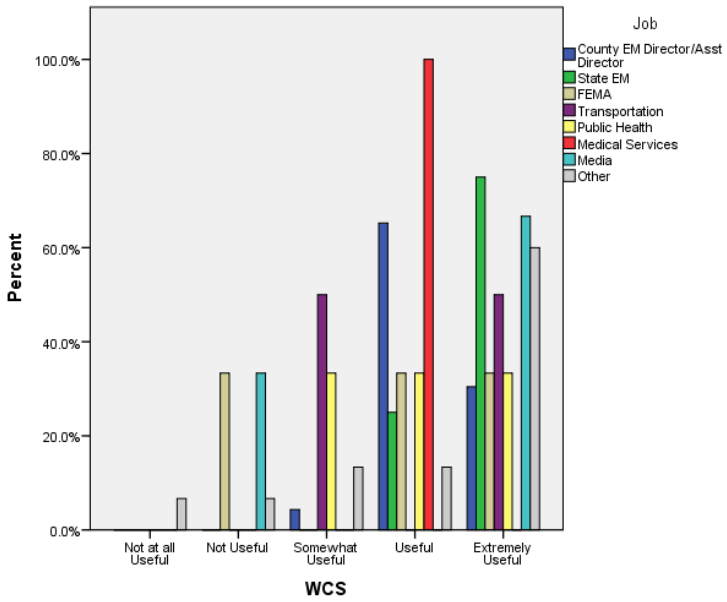


Question 13

1. If you could have additional information that is more informative for your decision making, how useful would each of these be to you?

Worst Case Scenario

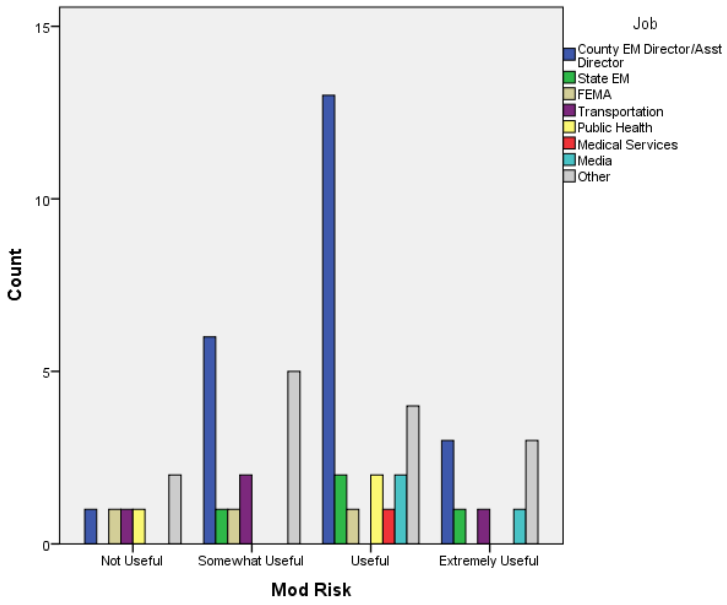
Not at all Useful 1 2 3 4 5 Extremely Useful



Question 15

There is a moderate risk of severe weather.

Not at all Useful 1 2 3 4 5 Extremely Useful



November 2012:

Focus groups conducted in Norman/Tulsa area with EMs and forecasters.

14 total participant between 2 focus groups. Participants included:

County and city EM directors
City Assistant EMs
University EMs
Dispatcher
Red Cross
State Health ESF

Summary of Findings:

1. Watches are not helpful for the operational needs of EMs
2. Briefings serve as indirect cues to EMs.
    i. They could be more direct with some indication of potential severity
    ii. Live briefings rather emailed briefings indicates an event is more severe
3. There is too much meteorology talk
    i. Currently looking for key words
4. Someone needs to determine how far NWS goes beyond science and toward communicating risk.
5. EMs often prefer the NWS best guess, then a discussion of probabilities and what could change the forecast
6. EMs are okay with the number of warnings (not worried about false alarms)
    i. Public different story.

March 2013

Tornado Summit Survey and Interviews

Based on research undertaken in the WxEM project and the results of the SBI research to date, a number of influences were identified. We administered a survey at the March, 2013 Tornado Summit in Oklahoma City, to have participants rank these influences. Specific results are shown, along with survey. Results need to be interpreted within categories and not between, as we already know that each category is important to EMs. The most influential factor is highlighted in each category. However, it is also important to look at the number of factors within a category and the differences in ranks. For instance, under Operational/Processing Considerations, “amount of advance notice” is by far the most influential. Yet, under confidence, competence, and comfort, “technology-the ability to receive or provide information” is, not surprisingly, most influential, but “EM confidence in understanding and applying weather information and explaining to others” and “forecaster confidence” are not far behind.

In addition, interviews were undertaken with participants in the conference. Project staff had a table in the exhibit hall, and participants were invited to the table to be interviewed. In addition, project staff approached individuals to be interviewed. The interview protocol follows the survey results. One interviewers set of notes is also provided with key comments highlighted. The highlights represent themes heard by other interviewers.

Tornado Summit Survey for EMs
March 11-12, 2013

This survey is being conducted by the University of Oklahoma, Arizona State University, University of North Carolina, and East Carolina University as part of research project funded by NOAA.

We are interested in learning about what social and behavioral influences affect your decision making during a severe weather event that includes severe thunderstorms and tornadoes. By understanding how you prioritize these influences, we hope to help improve NWS decision support to the EM community.

In each section, rank each influence in the order of importance to your decision making, with 1 indicating it is the most important influence and higher numbers indicating influences of less importance.

*****Job Title**: _____

Hazard: rank influences 1-4 or 1-5 if you use "Other"

	Average Rank
Forecaster confidence	2.35
Informal advance notice from forecaster (time, severity, location)	3.45
Formal advance notice from forecaster (time, severity, location)	2.6
Event type (time, severity, location)	1.45
Other:	

Impact Assessment: rank influences 1-4 or 1-5 if you use "Other"

Media coverage	2.85
Communication of meaningful impact information (thresholds)	2.25
Event type (time, severity, location)	1.55
Information needs for EM vs. public	2.9
Other:	

Vulnerability Assessment: rank influences 1-4 or 1-5 if you use "Other"

Location	2.3
Population exposure (number and demographics)	1.65
Infrastructure exposure	2.95
Time of day and day of week of event	2.55
Other:	

Message Reception: rank influences 1-7 or 1-8 if you use "Other"

Ease of retrieval of information	1.94
Missing information	4.67
Ineffective communication of information	4.06
Reception of inconsistent information from NWS and other sources	4.11
NWS method of communication (NWSChat vs. email vs. phone vs. NWR)	3.28
Structure of text products	4.78
Structure of graphical products	4.17
Other:	

Operational/Processing Considerations: rank influences 1-12 or 1-13 if you use “Other”

Cues, perceived or real, given by NWS	5
Years on job, Lessons learned from past experiences	6.07
Ability to interpret information	4.8
EM level of interest in weather	7.86
NWS method of communication (NWSChat vs. email vs. phone vs. NOAA Weather Radio)	5.93
Number of EM staff	9.71
Media coverage	6.13
Amount of advance notice	3.57
Time of day and day of week of event	4.6
Technology – mode to receive or provide information	5.33
Working from EOC, home or vehicle	7.07
Standard operating procedures triggering actions	7.07
Other:	

Confidence, Competence, Comfort: rank influences 1-12 or 1-13 if you use “Other”

Relationship/familiarity with NWS staff	7.4
Cues, perceived or real, given by NWS	6.13
EM confidence in understanding and applying weather info and explaining to others	4.6
Training of EM	6.14
Experiences of EM	5.29
EM interpretation and use of information	5.38
EM level of interest in weather	7.33
Ease of use of information	5.67
Missing information	8
Reception of inconsistent information from NWS and other sources	7.6
Forecaster confidence	4.8
Technology – ability to receive or provide information	3.93
Other:	

Risk Perception: rank influences 1-5 or 1-6 if you use “Other”

Ability to understand weather risk information	2.4
Ability to characterize risk (NWS and EM collaboration goal)	3.47
Ability to communicate risk	2.33
Ability to decipher inconsistent information from NWS and other sources	3.93
Ability to discern and interpret information	2.73
Other:	

Decision-Making: rank influences 1-4 or 1-5 if you use “Other”

Public/political pressure	2.87
Current policies that are triggered by NWS products	2.27
Resource constraints	2.2Te
Inconsistent information from NWS and other sources	2.93
Other:	

Interview Notes from NSWW

County EM and Deputy EM: Oklahoma

One day out – watch the weather. Conference calls bring attention to what is happening and that influences their decisions. Uses NWS and SPC webpages – no specific product – looks at "pictures." May call WFO (Rick Smith – WCM). IRIS – has county divided in half. Sends information out. Puts it all together to make a decision.

Dispatcher OK Highway Patrol

Checks weather.gov every day. Convective outlook is very important. Briefings are an important cue. Rewords them and sends out via e-mail to highway patrol in the field (are also spotters). Uncertainty is a problem but he understands it. Forecaster confidence is very important.

County EM and Deputy EM: Oklahoma

Follows Convective Outlook daily. OK First – knows a lot. Uses a Facebook page. Rick Smith (WCM) issues briefings and posts them on YouTube. County posts a link to the YouTube briefing on their Facebook page Have 1800 followers. Facebook and Twitter automatically linked. Always keeping track but if there is a briefing, they definitely pay attention. Doesn't call NWS much, but will. Distributes briefings verbatim. On Facebook, sometimes puts them in "normal" language. What comes out of NWS can be too meteo-speak so they translate it. Get confidence from: NWS, OK-First, experience. Will ask NWS about confidence. Does NOT look at media.

County EM: Oklahoma

Very knowledgeable. Uses OK-First and weather.gov. Looks at both graphics and discussion. Discussion in very important. Briefings are important cues. Sees something, brings people together and informs them. Sends briefings as they are - -thinks they are easy to understand. Forecaster confidence is very important. Says Oklahoma is a "crap shoot" so understands probabilities and confidence. Important factors in decision-making: Experience, Spotters, Information gathered, Call to NWS. Does NOT look at media.

County EM: Oklahoma

OK-First. If there is a watch, sends information out to schools, nursing homes, and similar facilities. Also tells people in courthouse, where EM office is. Sources of information = NWS and OK-First. Briefings very important. Had CASA radars in area, and were important. Complained that county is ignored by Oklahoma City, wishes there was an Amarillo connection. Wants more specific information especially with watches (when have they passed their area). Also wants history of the event/system.

City EM, Illinois

Gets watches and warnings from EMNet (?). Sends text messages via Nixle. Has 6 computer screens on desk – TV, Weather Channel, NWS… Monitors it all. Briefings are most important – forwards them and puts info on Facebook and Twitter. Has confidence in NWS no matter what. If conflict among sources, goes with NWS. Activates sirens with a warning. Does not call NWS, but heavily reliant on NWS. Interested in knowing what and why. Gets what, needs more on why. Wants more training from NWS.

City Police Chief, Illinois

One day out – called people together in EOC. Activates spotters (police are trained spotters). Briefing is key. Calls NWS with questions.

County EM: Oklahoma

Very rural. Relies on NWS. Gets confidence from wording. Doesn't worry much about watches except if there is different information. Radarscope – spotter locations. Lack of cell service so uses radio. EM in office – gents info to E911. Radar on phone. Outdoor county – lots of agriculture and oil – outside. EM coordinator not full time job. All volunteer fire. Looks for something "new" in NWS watches and warnings. Uses Facebook. Pulls info from SPC and NWS every morning. Reads products and knows "today is the day." When confusion between sources and products, calls NWS. Believes SPC needs to get on chat. Media shouldn't communicate through Chat. SPC not well branded. Insists spotters in training read what is on SPC and NWS websites. Sends out info and sometimes with SPC products to many people. OK-First. Does own training. Uses forecast tools – soundings etc.

April and May 2013
Post-Event Follow-up Interviews

Following severe weather events in April and May, phone interviews were undertaken with EMs and other ESFs in the Birmingham, Huntsville, and Mobile, Alabama, in Tulsa, Oklahoma, in Dallas-Fort Worth, Texas, and in Detroit, Michigan. The interview protocol is present on the next page. As shown on that document, the purpose of the interviews was to learn more about

1. The influences that affect EM decision making in order to confirm what we have understood to date and to determine what is missing and
2. Which influences are the biggest impediments to decision making.

The influences on decision-making that were most often mentioned during these interviews with the category of influence shown in parentheses, include:

1. Informal and formal advanced notice from forecasters (re: hazard) -- by far the most discussed influence
2. Media coverage (ranging from using it, to ignoring it, to feeling ignored by it) (re: impact assessment)
3. Cues, perceived or real, given by NWS (re: operational considerations and confidence, competence, comfort)
4. Current policies triggered by NWS products or non-NWS info (re: decision-making)
5. Ease of retrieval of information (re: message reception)
6. Forecaster confidence (re: hazard and confidence, competence, comfort)
7. Event type (re: hazard)
8. Advanced notice from non-NWS entities (re: hazard)
9. Location, population exposure, time of day/day of week (re: vulnerability assessment)
10. Ineffective communication of information (re: message reception)
11. NWS method of communication (re: message reception)
12. Structure of text and graphical products (re: message reception)
13. Years on job (re: operational considerations)
14. Ability to interpret information (re: operational considerations)
15. Time of day and day of week (re: operational considerations)
16. Technology (re: operational considerations)
17. EM confidence in understanding and applying info, explaining it to others (re: confidence, competence, comfort)
18. Training of EM (re: confidence, competence, comfort)
19. EM interpretation and use of information (re: confidence, competence, comfort)
20. Ability to characterize risk (re: risk perception)
21. Public/political pressure (re: decision-making)

Script for Calls to AL and MS EMs
Follow-Up to April 11, 2013 Severe Weather

What We're After

1. What is influencing any decision they're making?
2. Why are things the way they are? (Looking at operation differences across states, WFOs, counties, etc.)
3. Not focus, but looking for opportunities for prototypes, e.g. if you had xx product/info/service, would that impact your decision-making?

Questions to EMs about schools and to school officials are at the end.

Hi, my name is _____ from _____. I'm working with the NWS office in _____ to gather your feedback for the severe weather that occurred in your area on Thursday, April 11. Do you have a few minutes to talk?

Starting 3 Days Out – Tuesday, April 9 (area was in categorical slight risk, 15-30% probabilistic)

Establishing Timeline for Receiving Information

1. What kind of advance notice did you have before the event? Was there anything from the NWS prior to a formal watch or warning?
    a. If yes: What information was there?
        i. What did you do after receiving that information?
2. Did you receive a watch and/or warning or more formal advance notice from the NWS?
    a. If yes: What information was there? (Probe for time, severity, location)
        i. What did you do after receiving that information?
3. Did you get a sense of the confidence of the forecast/forecaster?
    a. If yes: How did that influence what you did? Why?
    b. If no: Same question
4. Of the things we just talked about, forecaster confidence, informal and formal notice, and characteristics of the anticipated event, which do you think had the greatest influence on your decisions? Why? Which was the next influence? What had the least or no influence of no influence?
5. How easily were you able to get the information you needed?
    a. Where did you get it?
    b. Was there inconsistent information between the different sources you use?
    c. If yes: How did you handle that?
    d. What kind of influence did it have on your decision?
6. Do you typically use text or graphical products, or both?
    a. What exactly did you look at?
    b. How effective was it?
    c. Was any information that you needed not available or missing?
    d. If yes: What? How did it influence your decision-making?
7. [If not answered above] Did you consult the local media?
    a. What were they saying?
    b. Was there information on what to expect?
    c. If yes: What?
8. Did you receive information on the timing, potential severity of the event or its location?
    a. If yes: What?
    b. From Whom?
    c. How did it influence your decisions?
9. Did you receive any information on potential impacts?
    a. If yes: What?
    b. From whom?
    c. How did it influence your decisions?

10. Of the things we just talked about, media, information about impacts and about the event, which has the greatest influence on your decisions? Why? Which had the least impact? Why?

11. As you were thinking about the information you had been receiving and as you were making your decisions, how much did the following influence what you did?
    a. The location of the storm
    b. The population likely to be affected
    c. The infrastructure in the expected path?
    d. Were any of these more important considerations than the others?
    e. Did the time of day/day of the week make a difference in your decisions? (be specific about the time of day and day of the week). Did this affect the vulnerability of your area? How? How much?

12. Given all the ways in which you receive information, and considering multiple sources, what has the biggest influence on your decisions? (probe here with why, trying to bring in topics from above).

Operational/Processing Considerations

13. We know there are many factors that influence your decisions, some of which relate to the NWS, some of which relate to your experience, and some of which are specific to a given situation. Let me list a few factors and as I do, please tell me if they made a difference in your decisions with this event.
    a. List factors – and probe on each a bit

14. I'd like to ask you a few questions about your background and working situation – to understand how each might have influenced your decisions.
    a. How much do you rely on the NWS directly with specific information? What information?
    b. What cues, if any, do they give you that they are expecting something significant?
    c. How much contact do you have with the WFO? Did you get a sense from the forecasters how much confidence they had?
    d. How much general interest do you have in weather? How much training? How many similar experiences have you had?
    e. How comfortable are you with interpreting uncertain information?
    f. Once you receive information from whatever sources, how comfortable are you in determining what the risk is – not the event itself but the potential impacts of the event in your area?
    g. Once you get information from whatever sources, do you believe you are able to characterize the risk for others?
    h. What do you think influences you the most? The least?

15. What are the policies that are triggered by NWS products like advisories, watches, and warnings?
16. How much political and public pressure is there with respect to watches and warnings?
17. What constraints do you work under with respect to resources?
18. Of these three factors, which has the greatest influence (for better or for worse) on your decisions?

If Calling an EM about Schools: Questions

19. Did the schools in your county close or have an early dismissal on April 11?
20. What do you think of that decision?
21. What type of interaction do you have with your school officials, if any?
22. We'd like to follow-up with someone at schools who may be involved in the decision to remain open, close, or have an early dismissal. Can you provide me their name and phone number?

Questions to School Officials

Can use some of the questions above to get at influences, but we need to make sure to establish how and why various decisions were made (shelter in place vs. dismiss; remain open vs. dismiss; what were done with kids on bus routes during warnings, assuming they were out during the warning).

1. Did your school remain open, close entirely, or dismiss early on April 11?
2. How did you arrive at this decision?
    a. Where did you get the information to make your decision?
    b. When did you make your decision?
    c. Have you made similar decisions in the past based on the information you received?
3. What are some major influences in your decision making process? [If they can't come up with any could mention some randomly from our list, such as confidence, past experience, communication with others. They'll probably start with safety of kids, but it'd be good to get more than that.]
4. How did you decide to close/dismiss early/shelter in place/remain open?
5. [For a small number of schools] A tornado warning was issued around the time that you'd normally be dismissing or kids would be on the bus. What actions were taken?
6. How did you feel about your decision at the end of the day?
7. Is there anything you think you would do differently next time? If yes, what? Why?

April-June 2013
IBW Surveys

The implementation of impact based warnings provided an opportunity for the team to evaluate influences on decision-making, particularly the inclusion of impact information in warnings, while at the same time collect data on reactions to and perceptions of IBW. Three surveys were undertaken during this time period – one to EMs, one to forecasters, and one to the media in the Central Region. The first two are of primary importance to this project, but the third is relevant because of the influence the media has on responses (and on what EMs do and say). Responses were excellent with 812 EMs responding, 50 forecasters, and 230 media partners. The surveys were all on-line surveys through the survey software Qualtrics, administered through East Carolina University. In this section is each survey, followed by some of the results.

With respect to the EM survey, among the important findings are

1. Most EMs believe that IBW will provide either more or better (or both) information
2. 88% of believe IBW will 'help them somewhat' or 'a great deal'
3. The majority of the comments provided showed positive attitudes towards IBW

At the same time, concerns centered on worries about public complacency, concern over predictability of impacts, and the possibility that IBW will just confuse people.

With respect to the forecaster survey:

1. Overall, forecasters have a positive opinion of the IBW system/impact statements.
2. In order for forecasters to have confidence using the 'significant' tornado damage threat tag, they noted spotter reports, radar data, and tornado observed and not only radar-indicated as providing the confidence they need
3. Most of those using IBWs are at least somewhat confident that no damage threat tag still communicates potential tornado impacts while a majority of respondents in the non-IBW offices believe that without a tag, the warnings wouldn't be effective in communicating the message
4. Results suggest that forecasters like the concept of the impact statements/tags, yet they believe either wording or thresholds need to be changed or made clearer

Media respondents were quite positive about IBW with 2/3 believing it will help them somewhat or a great deal. In addition, the large majority stated that it will provide them with more and better information.

IBW Expansion

Q1 Which of the following most closely describes your job?

- ❍ Transportation
- ❍ Communications
- ❍ Public Works/Engineering
- ❍ Firefighting
- ❍ Emergency Management
- ❍ Mass Care, Emergency Assistance, Housing, Human Services
- ❍ Logistics Management/Resource Support
- ❍ Public Health and Medical Services
- ❍ Search and Rescue
- ❍ Oil and HazMat Response
- ❍ Agriculture & Natural Resources
- ❍ Energy
- ❍ Public Safety and Security
- ❍ Long-term Community Recovery
- ❍ External Affairs

Q2 In what State do you work?

- ❍ Colorado
- ❍ Illinois
- ❍ Indiana
- ❍ Iowa
- ❍ Kansas
- ❍ Kentucky
- ❍ Michigan
- ❍ Minnesota
- ❍ Missouri
- ❍ Nebraska
- ❍ North Dakota
- ❍ Ohio
- ❍ South Dakota
- ❍ Utah
- ❍ Wisconsin
- ❍ Wyoming

Q3 In what County do you work?

Q4 How old are you?

- ❍ Under 30
- ❍ 30-40
- ❍ 41-50
- ❍ 61-60
- ❍ Older than 60

Q5 How long have you been in your current position?

- ❍ Less than 1 year
- ❍ 1-5 years
- ❍ 6-10 years
- ❍ 1-20 years
- ❍ 20+ years

Q6 What is your primary National Weather Service Office?

- ❍ Aberdeen, SD
- ❍ Bismarck, ND
- ❍ Central Illinois/Lincoln, IL
- ❍ Cheyenne, WY
- ❍ Chicago, IL
- ❍ Denver/Boulder, CO
- ❍ Des Moines, IA
- ❍ Detroit/Pontiac MI
- ❍ Dodge City, KS
- ❍ Duluth, MN
- ❍ Gaylord, MI
- ❍ Goodland, KS
- ❍ Grand Forks, ND
- ❍ Grand Junction, CO
- ❍ Grand Rapids, MI
- ❍ Green Bay, WI
- ❍ Hastings, NE
- ❍ Indianapolis, IN
- ❍ Jackson, KY
- ❍ Kansas City/Pleasant Hill, MO
- ❍ La Crosse, WI
- ❍ Louisville, KY
- ❍ Marquette, MI
- ❍ Milwaukee/Sullivan, WI
- ❍ North Platte, NE
- ❍ Northern Indiana/North Webster, IN
- ❍ Omaha/Valley, NE
- ❍ Paducah, KY
- ❍ Pueblo, CO
- ❍ Quad Cities, IA/IL
- ❍ Rapid City, SD
- ❍ Sioux Falls, SD
- ❍ Springfield, MO
- ❍ St. Louis, MO
- ❍ Topeka, KS
- ❍ Twin Cities, MN
- ❍ Western and Central/Riverton, WY
- ❍ Wichita, KS
- ❍ I don' know

Q7 Have you heard about the impact based tornado and severe thunderstorm warnings that the NWS will begin using soon?

- ❍ Yes
- ❍ No

Q8 How did you hear about the new warnings?

- ❍ From the National Weather Service
- ❍ From the media
- ❍ Someone told me (if so, who?) _____
- ❍ Other (please specify) _____

Q9 What does the modification mean to you? (Click all that apply)

- ❑ It provides me with more information
- ❑ It will make my job easier
- ❑ I will have better information to pass along to others
- ❑ I will have more confidence in the forecast
- ❑ It won't make a difference to me
- ❑ Other (please specify) _____

Q10 From what you understand, how much do you think this new messaging will help you?

- ❍ It will help me a great deal
- ❍ It will help me somewhat
- ❍ It might help me
- ❍ It won't help me directly but I think it could help the public
- ❍ Not sure

Q11 How aware do you think the other emergency support functions (or your partner agencies) are of this modification?

- ❍ Extremely aware
- ❍ Aware
- ❍ Somewhat aware
- ❍ Not at all aware
- ❍ I don't know

Q12 Do you have any comments?

My Report

Last Modified: 06/03/2013

1. Which of the following most closely describes your job?

#	Answer		Response	%
1	Transportation		3	0%
2	Communications		43	5%
3	Public Works/Engineering		3	0%
4	Firefighting		33	4%
5	Emergency Management		622	78%
6	Mass Care, Emergency Assistance, Housing, Human Services		10	1%
7	Logistics Management/Resource Support		2	0%
8	Public Health and Medical Services		26	3%
9	Search and Rescue		0	0%
10	Oil and HazMat Response		0	0%
11	Agriculture & Natural Resources		2	0%
12	Energy		1	0%
13	Public Safety and Security		50	6%
14	Long-term Community Recovery		1	0%
15	External Affairs		0	0%
	Total		796	100%

2. In what State do you work?

#	Answer		Response	%
1	Colorado		35	4%
2	Illinois		97	12%
3	Indiana		43	5%
4	Iowa		53	7%
5	Kansas		79	10%
6	Kentucky		73	9%
7	Michigan		68	9%
8	Minnesota		55	7%
9	Missouri		119	15%
10	Nebraska		36	5%
11	North Dakota		46	6%
12	Ohio		6	1%
13	South Dakota		25	3%
14	Utah		2	0%
15	Wisconsin		36	5%
16	Wyoming		22	3%
	Total		795	100%

4. How old are you?

#	Answer		Response	%
1	Under 30		23	3%
2	30-40		95	12%
3	41-50		210	27%
4	51-60		300	38%
5	Older than 60		152	19%
	Total		780	100%

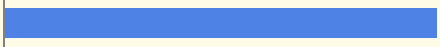
5. How long have you been in your current position?

#	Answer		Response	%
1	Less than 1 year		55	7%
2	1-5 years		220	28%
3	6-10 years		217	28%
4	11-20 years		173	22%
5	20+ years		124	16%
	Total		789	100%

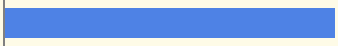
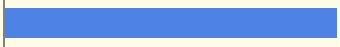
7. Have you heard about the impact based tornado and severe thunderstorm warnings that the NWS will begin using soon?

#	Answer		Response	%
1	Yes		639	81%
2	No		153	19%
	Total		792	100%

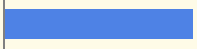
8. How did you hear about the new warnings?

#	Answer		Response	%
1	From the National Weather Service		566	91%
2	From the media		28	4%
3	Someone told me (if so, who?)		18	3%
4	Other (please specify)		12	2%
	Total		624	100%

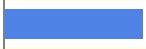
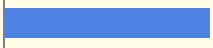
9. What does the modification mean to you? (Click all that apply)

#	Answer		Response	%
1	It provides me with more information		431	69%
2	It will make my job easier		197	32%
3	I will have better information to pass along to others		433	70%
4	I will have more confidence in the forecast		186	30%
5	It won't make a difference to me		31	5%
6	Other (please specify)		33	5%

10. From what you understand, how much do you think this new messaging will help you?

#	Answer		Response	%
1	It will help me a great deal		248	40%
2	It will help me somewhat		240	38%
3	It might help me		61	10%
4	It won't help me		8	1%
5	It won't help me directly but I think it could help the public		35	6%
6	Not sure		34	5%
	Total		626	100%

11. How aware do you think the other emergency support functions (or your partner agencies) are of this modification?

#	Answer		Response	%
1	Extremely aware		23	4%
2	Aware		180	29%
3	Somewhat aware		269	43%
4	Not at all aware		89	14%
5	I don't know		64	10%
	Total		625	100%

IBW Forecaster Survey

Q1 At which forecast office do you work?
- ❍ St Louis
- ❍ Springfield
- ❍ Pleasant Hill
- ❍ Topeka
- ❍ Wichita

Q2 In what type of position do you work at your office?
- ❍ Management
- ❍ Lead Forecaster
- ❍ General Forecaster
- ❍ Intern
- ❍ Other

Q3 How well do you think you can convey severity in the warnings you issue, given the tools that you are given?
- ❍ Extremely well
- ❍ Very well
- ❍ Well
- ❍ Somewhat well
- ❍ Poorly

Q4 How well do you think you can convey urgency in the warnings you issue, given the tools that you are given?
- ❍ Extremely well
- ❍ Very well
- ❍ Well
- ❍ Somewhat well
- ❍ Poorly

Q5 What real-time information do you need in order to have confidence in using the significant tornado damage threat tag in a tornado warning? Rank the following with 1 being the most needed and 7 the least

_____ Spotter reports indicating (fill in with what you would need to hear)
_____ Radar data showing (fill in with what you would be looking for)
_____ Tornado is observed and not only radar-indicated
_____ Live video feed of storm
_____ Size of city or town the tornado is approaching
_____ Knowledge of pre-storm environment
_____ Other (please specify)

Q6 What factors help you distinguish between using the tornado damage threat tag "catastrophic" versus using "significant"? Rank the following with 1 being the most needed and 7 the least

_____ Spotter reports indicating (fill in with what you would need to hear)
_____ Radar data showing (fill in with what you would be looking for)
_____ Tornado is observed and not only radar indicated
_____ Live video stream of storm
_____ Size of city or town the tornado is approaching
_____ Knowledge of pre-storm environment
_____ Other (please specify)

Q7 How well do you think the tornado damage threat tags communicate the threat?

- ❍ Extremely well
- ❍ Very well
- ❍ Well
- ❍ Somewhat well
- ❍ Poorly

Q8 When no damage threat tag is used in the tornado warning, what do you believe is the effect on communication of the potential severity?

- ❍ The severity will not be communicated sufficiently without a tag
- ❍ The severity will be communicated sufficiently just because there is a warning
- ❍ portanThe severity will be communicated sufficiently because the tag is not imt

Q9 When no damage threat tag is used in the tornado warning, what do you believe is the effect on communication of the potential urgency?

- ❍ The urgency will not be communicated sufficiently without a tag
- ❍ The urgency will be communicated sufficiently just because there is a warning
- ❍ The urgency will be communicated sufficiently because the tag is not important

Q10 How confident are you that the use of no damage threat tag in tornado warnings communicates potential tornado impacts?

- ❍ Extremely confident
- ❍ Very confident
- ❍ Confident
- ❍ Somewhat confident
- ❍ Not at all confident

Q11 As a reminder, here are the current damage threat tags and accompanying impact statements: Base or no damage threat tag: Significant house and building damage possible. Mobile homes completely destroyed if hit. Some trees uprooted or snapped. Vehicles will likely be thrown by tornadic winds. Significant damage threat tag: Major house and building damage likely and complete destruction possible. Numerous trees snapped. Major power outages in path of tornado highly likely. Some roads possibly blocked

by tornado debris. Complete destruction of vehicles likely. Catastrophic damage threat tag: This is a life threatening situation. You could be killed if not underground or in a tornado shelter. Complete destruction of entire neighborhoods is likely. Many well built homes and businesses will be completely swept from their foundations. Debris will block most roadways. Mass devastation is highly likely making the area unrecognizable to survivors. To what extent do you believe the impact statements are properly aligned with the chosen tornado damage threat tag?

- ❍ To a very great extent
- ❍ To a great extent
- ❍ Somewhat
- ❍ Not at all

Q12 Does the wording of the impact statement section of the warning affect your choice of tornado damage threat tag?

- ❍ No
- ❍ Yes (please state how) _____

Q13 How comfortable are you in your ability to provide accurate storm motion using WARNGEN?

- ❍ Extremely comfortable
- ❍ Very comfortable
- ❍ Confortable
- ❍ Somewhat comfortable
- ❍ Not at all comfortable

Q14 How comfortable are you in using this storm motion to provide time of arrival of the threat to specific locations?

- ❍ Extremely comfortable
- ❍ Very comfortable
- ❍ Comfortable
- ❍ Somewhat comfortable
- ❍ Not at all comfortable

Q15 In your opinion should pathcasts be provided in warnings?

- ❍ Yes
- ❍ No
- ❍ Not sure

Q16 WARNGEN defaults to providing a list of cities/towns in the warning area. Are there situations when you would prefer to use the pathcast option instead?

- ❍ Yes (describe when) _____
- ❍ No
- ❍ Not sure

Q17 If pathcasts were required in warnings and you could choose how long a pathcast is valid, how far into the future should it provide time of arrival?

- ❍ 45 minutes
- ❍ 30 minutes
- ❍ 15 minutes
- ❍ 10 minutes
- ❍ It varies depending on the forecaster's confidence

Q18 If a list of cities in the warning was provided, how should they be listed?

- ❍ By time of expected arrival
- ❍ Alphabetically
- ❍ Other (please specify) _____

Q19 In your opinion, which way do you believe your core partners in emergency management want to see the information about cities affected displayed in a warning?

- ❍ Pathcasts
- ❍ Lists of cities affected
- ❍ Both

Q20 How confident are you in your ability to accurately indicate the expected hail size in the warning tag?

- ❍ Extremelyconfident
- ❍ Very confident
- ❍ Confident
- ❍ Somewhat confident
- ❍ Not at all confident

Q21 What do you think the hail size represents?

- ❍ Maximum size
- ❍ Most likely size
- ❍ Average size
- ❍ Other (please specify) _____

Q22 Above what hail size would you consider the hail to be dangerous or life threatening?

- ❍ Less than 1 inch
- ❍ Quarter sized (1")
- ❍ Golf ball sized (1&frac34")
- ❍ Baseball sized (2¾")
- ❍ Tea cup sized (3")
- ❍ Grapefruit sized (4")
- ❍ Softball sized (5")

Q23 How well do you think we are communicating the threat when very large hail is expected?
- ❍ Extremely well
- ❍ Very well
- ❍ Well
- ❍ Somewhat well
- ❍ Poorly

Q24 How well do you think are we communicating the threat for 1 to 2 inch hail?
- ❍ Extremely well
- ❍ Very well
- ❍ Well
- ❍ Somewhat well
- ❍ Poorly

Q25 As a reminder, here is the current impact statement for 1 inch hail and winds of 60 mph: Minor damage to vehicles…roofs and windows. Minor tree damage…with limbs up to one inch in diameter broken. In your opinion, do the impact statements for severe thunderstorm warnings when the hail threat is 1 inch and winds of 60 mph are expected properly communicate the damage threat?
- ❍ Yes
- ❍ No
- ❍ Not sure

Q26 Above what speed would you consider the wind to be damaging or life threatening?
- ❍ 60 mph
- ❍ 70 mph
- ❍ 80 mph
- ❍ 90 mph

Q27 In your opinion, do the impact statements for severe thunderstorm warnings when high winds >75 mph are expected properly communicate the damage threat?
- ❍ Yes
- ❍ No
- ❍ Not sure

Q28 In your opinion, should there be wind damage threat tags in severe thunderstorm warnings?
- ❍ Yes (describe what these might be like, with labels and thresholds)

  _____
- ❍ No
- ❍ Not sure

Q29 What do you think the “tornado possible” means within a SVR?

Q30 Would you use the “tornado possible” tag in a SVR?
- ❍ Yes
- ❍ No
- ❍ Not sure

Q31a When a watch is issued, do you provide any information concerning the following prior to warning issuance for this area?Location?
- ❍ Yes
- ❍ No

Q31b Timing?
- ❍ Yes
- ❍ No

Q31c Impacts of potential severe weather?
- ❍ Yes
- ❍ No

Q32 If such pre-warn information is provided, what in your opinion is the best way to communicate it?
- ❍ In a watch
- ❍ In a product that is an update to a watch, such as a briefing package or conference call
- ❍ A product should be created to provide an update to a watch with this information
- ❍ Other (please specify) _____

Q33 To what extent do you believe we have the skill to provide pre-warning information concerning development of an emerging threat?
- ❍ To a very great extent
- ❍ To a great extent
- ❍ Somewhat
- ❍ Not at all

Q34 To what extent do you believe we have the skill to provide pre-warning information concerning timing of a developing threat?
- ❍ To a very great extent
- ❍ To a great extent
- ❍ Somewhat
- ❍ Not at all

Q35 To what extent do you believe we have the skill to provide pre-warning information concerning location of a developing threat?

- ❍ To a very great extent
- ❍ To a great extent
- ❍ Somewhat
- ❍ Not at all

Q36 How useful do you think this pre-warning information would be to our partners in the media?

- ❍ Extremely useful
- ❍ Very useful
- ❍ Useful
- ❍ Somewhat useful
- ❍ Not at all useful

Q37 How useful do you think this pre-warning information would be to our partners in emergency management in the communities affected?

- ❍ Extremely useful
- ❍ Very useful
- ❍ Useful
- ❍ Somewhat useful
- ❍ Not at all useful

Q38 How useful do you think this pre-warning information would be to the communities affected?

- ❍ Extremely useful
- ❍ Very useful
- ❍ Useful
- ❍ Somewhat useful
- ❍ Not at all useful

Q39 What is the most common way that you receive information about what is actually happening?

- ❍ NWSChat
- ❍ Social media
- ❍ Spotters
- ❍ Reports from emergency managers
- ❍ TV
- ❍ Other (please specify) _____

Q40 What is the least trustworthy source of information?

- ❍ NWSChat
- ❍ Social media
- ❍ Spotters
- ❍ Reports from emergency managers
- ❍ TV
- ❍ Other (please specify)

Q41 How do you handle conflicting information about the same storm?

- ❍ I talk to other forecasters
- ❍ I look for similarities in the information
- ❍ I try to confirm information by contacting trusted spotters or emergency communicators

Q42 Are there sources of information that you do not trust and wait for further confirmation?

- ❍ Yes (please specify who or what, and why) _____
- ❍ No

Q43 What best practices do you employ to get reliable information for the warning decision process?

Q44 What best practices do you employ to confirm or have confidence in your information sources?

Q45 Comments and Suggestions

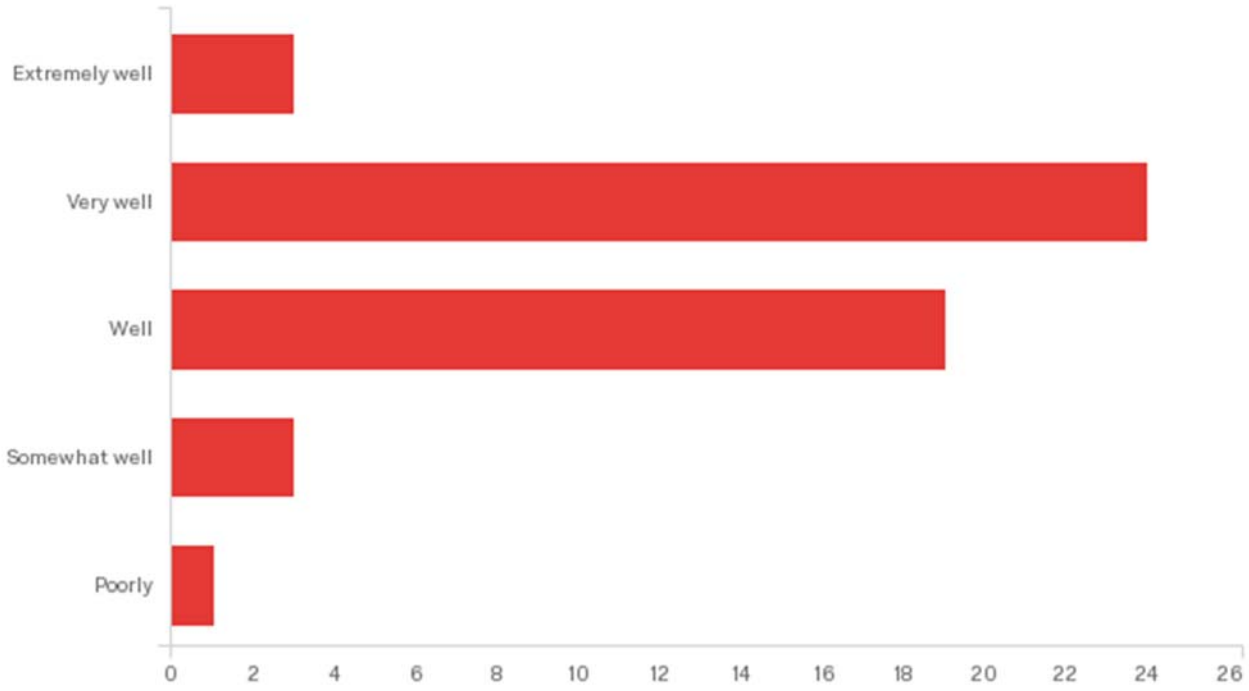
Q1 - At which forecast office do you work?

Answer	%	Count
St Louis	**17%**	**8**
Springfield	**25%**	**12**
Pleasant Hill	**13%**	**6**
Topeka	**23%**	**11**
Wichita	**23%**	**11**
Total	**100%**	**48**

Q2 - In what type of position do you work at your office?

Answer	%	Count
Management	**18%**	**9**
Lead Forecaster	**37%**	**18**
General Forecaster	**24%**	**12**
Intern	**18%**	**9**
Other	**2%**	**1**
Total	**100%**	**49**

Q3 - How well do you think you can convey severity in the warnings you issue, given the tools that you are given?



Answer	%	Count
Extremely well	**6%**	**3**
Very well	**48%**	**24**
Well	**38%**	**19**
Somewhat well	**6%**	**3**
Poorly	**2%**	**1**
Total	**100%**	**50**

Q4 - How well do you think you can convey urgency in the warnings you issue, given the tools that you are given?

Answer	%	Count
Extremely well	**0%**	**0**
Very well	**42%**	**21**
Well	**34%**	**17**
Somewhat well	**24%**	**12**
Poorly	**0%**	**0**
Total	**100%**	**50**

Q5 - What real-time information do you need in order to have confidence in using the significant tornado damage threat tag in a tornado warning? Rank the following with 1 being the most needed and 7 the least

Question	1	2	3	4	5	6	7	Total
Spotter reports indicating (fill in with what you would need to hear)	**15**	**9**	**13**	**7**	**2**	**2**	**1**	**49**
Radar data showing (fill in with what you would be looking for)	**7**	**21**	**10**	**4**	**2**	**3**	**1**	**48**
Tornado is observed and not only radar-indicated	**12**	**9**	**8**	**9**	**7**	**4**	**1**	**50**
Live video feed of storm	**6**	**3**	**4**	**13**	**17**	**2**	**3**	**48**
Size of city or town the tornado is approaching	**0**	**2**	**4**	**3**	**7**	**25**	**8**	**49**
Knowledge of pre-storm environment	**5**	**6**	**7**	**10**	**10**	**7**	**4**	**49**
Other (please specify)	**3**	**0**	**1**	**3**	**2**	**4**	**18**	**31**

Q6 - What factors help you distinguish between using the tornado damage threat tag “catastrophic” versus using “significant”? Rank the following with 1 being the most needed and 7 the least

Question	1	2	3	4	5	6	7	Total
Spotter reports indicating (fill in with what you would need to hear)	**25**	**6**	**8**	**4**	**2**	**2**	**1**	**48**
Radar data showing (fill in with what you would be looking for)	**2**	**14**	**9**	**14**	**4**	**3**	**1**	**47**
Tornado is observed and not only radar indicated	**11**	**12**	**7**	**8**	**2**	**7**	**1**	**48**
Live video stream of storm	**4**	**7**	**7**	**9**	**11**	**7**	**1**	**46**
Size of city or town the tornado is approaching	**2**	**6**	**5**	**5**	**8**	**17**	**5**	**48**
Knowledge of pre-storm environment	**2**	**3**	**9**	**7**	**13**	**10**	**4**	**48**
Other (please specify)	**2**	**0**	**1**	**0**	**5**	**1**	**15**	**24**

Q7 - How well do you think the tornado damage threat tags communicate the threat?

Answer	%	Count
Extremely well	**0%**	**0**
Very well	**38%**	**19**
Well	**38%**	**19**
Somewhat well	**24%**	**12**
Poorly	**0%**	**0**
Total	**100%**	**50**

Q8 - When no damage threat tag is used in the tornado warning, what do you believe is the effect on communication of the potential severity?

Answer	%	Count
The severity will not be communicated sufficiently without a tag	**36%**	**18**
The severity will be communicated sufficiently just because there is a warning	**54%**	**27**
portanThe severity will be communicated sufficiently because the tag is not imt	**10%**	**5**
Total	**100%**	**50**

Q9 - When no damage threat tag is used in the tornado warning, what do you believe is the effect on communication of the potential urgency?

Answer	%	Count
The urgency will not be communicated sufficiently without a tag	**47%**	**23**
The urgency will be communicated sufficiently just because there is a warning	**41%**	**20**
The urgency will be communicated sufficiently because the tag is not important	**12%**	**6**
Total	**100%**	**49**

Q10 - How confident are you that the use of no damage threat tag in tornado warnings communicates potential tornado impacts?

Answer	%	Count
Extremely confident	**0%**	**0**
Very confident	**6%**	**3**
Confident	**33%**	**16**
Somewhat confident	**43%**	**21**
Not at all confident	**18%**	**9**
Total	**100%**	**49**

Q11 - As a reminder, here are the current damage threat tags and accompanying impact statements: Base or no damage threat tag: Significant house and building damage possible. Mobile homes completely destroyed if hit. Some trees uprooted or snapped. Vehicles will likely be thrown by tornadic winds. Significant damage threat tag: Major house and building damage likely and complete destruction possible. Numerous trees snapped. Major power outages in path of tornado highly likely. Some roads possibly blocked by tornado debris. Complete destruction of vehicles likely. Catastrophic damage threat tag: This is a life threatening situation. You could be killed if not underground or in a tornado shelter. Complete destruction of entire neighborhoods is likely. Many well built homes and businesses will be completely swept from their foundations. Debris will block most roadways. Mass devastation is highly likely making the area unrecognizable to survivors. To what extent do you believe the impact statements are properly aligned with the chosen tornado damage threat tag?

Answer	%	Count
To a very great extent	**6%**	**3**
To a great extent	**63%**	**31**
Somewhat	**29%**	**14**
Not at all	**2%**	**1**
Total	**100%**	**49**

Q12 - Does the wording of the impact statement section of the warning affect your choice of tornado damage threat tag?

Answer	%	Count
No	**37%**	**18**
Yes (please state how)	**63%**	**31**
Total	**100%**	**49**

Q13 - How comfortable are you in your ability to provide accurate storm motion using WARNGEN?

Answer	%	Count
Extremely comfortable	**22%**	**11**
Very comfortable	**36%**	**18**
Confortable	**28%**	**14**
Somewhat comfortable	**12%**	**6**
Not at all comfortable	**2%**	**1**
Total	**100%**	**50**

IBW Media

With what media are you employed?

- ❍ Television
- ❍ Radio
- ❍ Newspaper
- ❍ Other (please specify) _____

What type of work do you do?

In what State do you work?

- ❍ Colorado
- ❍ Illinois
- ❍ Indiana
- ❍ Iowa
- ❍ Kansas
- ❍ Kentucky
- ❍ Michigan
- ❍ Minnesota
- ❍ Missouri
- ❍ Nebraska
- ❍ North Dakota
- ❍ Ohio
- ❍ South Dakota
- ❍ Utah
- ❍ Wisconsin
- ❍ Wyoming

How old are you?

- ❍ Under 30
- ❍ 30-40
- ❍ 41-50
- ❍ 61-60
- ❍ Older than 60

How long have you been in your current position?

- ❍ Less than 1 year
- ❍ 1-5 years
- ❍ 6-10 years
- ❍ 1-20 years
- ❍ 20+ years

What is your primary National Weather Service Office?

- ❍ Aberdeen, SD
- ❍ Bismarck, ND
- ❍ Central Illinois/Lincoln, IL
- ❍ Cheyenne, WY
- ❍ Chicago, IL
- ❍ Denver/Boulder, CO
- ❍ Des Moines, IA
- ❍ Detroit/Pontiac MI
- ❍ Dodge City, KS
- ❍ Duluth, MN
- ❍ Gaylong, MI
- ❍ Goodland, KS
- ❍ Grand Forks, ND
- ❍ Grand Junction, CO
- ❍ Grand Rapids, MI
- ❍ Green Bay, WI
- ❍ Hastings, NE
- ❍ Indianapolis, IN
- ❍ Jackson, KY
- ❍ Kansas City/Pleasant Hill, MO
- ❍ La Crosse, WI
- ❍ Louisville, KY
- ❍ Marquette, MI
- ❍ Milwaukee/Sullivan, WI
- ❍ North Platte, NE
- ❍ Northern Indiana/North Webster, IN
- ❍ Omaha/Valley, NE
- ❍ Paducah, KY
- ❍ Pueblo, CO
- ❍ Quad Cities, IA/IL
- ❍ Rapid City, SD
- ❍ Sioux Falls, SD
- ❍ Springfield, MO
- ❍ St. Louis, MO
- ❍ Topeka, KS
- ❍ Twin Cities, MN
- ❍ Western and Central/Riverton, WY
- ❍ Wichita, KS
- ❍ I don' know

NWS Offices are involved in an experiment that expands current convective warnings to include more information about threats. Have you heard about the impact based tornado and severe thunderstorm warnings that the NWS will begin using soon?

- ❍ Yes
- ❍ No

How did you hear about the new warnings?

- ❍ From the National Weather Service
- ❍ From the media
- ❍ Someone told me (if so, who?) _____
- ❍ Other (please specify) _____

What does the modification mean to you? (Click all that apply)

- ❑ It provides me with more information
- ❑ It will make my job easier
- ❑ I will have better information to pass along to others
- ❑ I will have more confidence in the forecast
- ❑ It won't make a difference to me
- ❑ Other (please specify) _____

From what you understand, how much do you think this new messaging will help you?

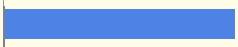
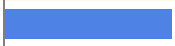
- ❍ It will help me a great deal
- ❍ It will help me somewhat
- ❍ It might help me
- ❍ It won't help me directly but I think it could help the public
- ❍ Not sure

Do you have any comments?

My Report

Last Modified: 06/03/2013

1. With what media are you employed?

#	Answer		Response	%
1	Television		105	48%
2	Radio		76	35%
3	Newspaper		31	14%
4	Other (please specify)		5	2%
	Total		217	100%

3. In what State do you work?

#	Answer		Response	%
1	Colorado		14	6%
2	Illinois		17	8%
3	Indiana		12	6%
4	Iowa		5	2%
5	Kansas		16	7%
6	Kentucky		10	5%
7	Michigan		15	7%
8	Minnesota		6	3%
9	Missouri		34	16%
10	Nebraska		28	13%
11	North Dakota		16	7%
12	Ohio		0	0%
13	South Dakota		10	5%
14	Utah		0	0%
15	Wisconsin		17	8%
16	Wyoming		17	8%
	Total		217	100%

4. How old are you?

#	Answer		Response	%
1	Under 30		28	13%
2	30-40		48	22%
3	41-50		46	21%
4	51-60		66	31%
5	Older than 60		26	12%
	Total		214	100%

5. How long have you been in your current position?

#	Answer		Response	%
1	Less than 1 year		17	8%
2	1-5 years		51	24%
3	6-10 years		41	19%
4	11-20 years		50	23%
5	20+ years		55	26%
	Total		214	100%

7. NWS Offices are involved in an experiment that expands current convective warnings to include more information about threats. Have you heard about the impact based tornado and severe thunderstorm warnings that the NWS began using April 1?

#	Answer		Response	%
1	Yes		183	84%
2	No		35	16%
	Total		218	100%

8. How did you hear about the new warnings?

#	Answer		Response	%
1	From the National Weather Service		166	94%
2	From the media		6	3%
3	Someone told me (if so, who?)		4	2%
4	Other (please specify)		0	0%
	Total		176	100%

9. What does the modification mean to you? (Click all that apply)

#	Answer		Response	%
1	It provides me with more information		114	65%
2	It will make my job easier		52	30%
3	I will have better information to pass along to others		114	65%
4	I will have more confidence in the forecast		38	22%
5	It won't make a difference to me		22	13%
6	Other (please specify)		12	7%

10. From what you understand, how much do you think this new messaging will help you?

#	Answer		Response	%
1	It will help me a great deal		45	26%
2	It will help me somewhat		70	40%
3	It might help me		25	14%
4	It won't help me		7	4%
5	It won't help me directly but I think it could help the public		17	10%
6	Not sure		11	6%
	Total		175	100%

January 2014-August 2015
Series of Surveys

Having identified the important influences on EM decision-making, we undertook a series of on-line surveys addressing these influences in order to delve more deeply into the salient elements within each. We were particularly interested in how the influences affect their processes and decisions, for better and for worse. The first survey addressed the demographics of the respondents, while subsequent ones focused on confidence, messaging, timing, media, and training. Each survey is presented in this section with an overview of some of the results. Following that are some findings and implications from the other surveys.

Demographics (650 fully completed responses): More than half of the respondents (52%) are older than 50 and 70% of respondents have 6 or more years of experience. Just over 20% have more than 20 years of experience in their current job. They are equally split between urban (52%) and rural areas (48%) and 89% work at some level of government. More than 75% have at least an Associate's degree with 20% having graduate degrees. Fully 25% reported no formal weather training.

Confidence (566 fully completed responses): The confidence that is important to EMs is confidence in the science of the forecast (41%) and the forecaster's confidence in the forecast (38%). Only 17% chose their confidence in making a decision as their definition of confidence. When given choices of how the forecaster's confidence influences their actions, more than two-thirds of those who responsed to this questions chose "because I coordinate information, including weather information, how I perceive the forecaster's confidence impacts how I communicate this information to others and it influences their decision-making." It became clear through the surveys and other work that confidence, comfort and competence work together to influence EM decision-making. Both competence and comfort are significantly affected by experience, as well as confidence, as defined by the EMs.

Training (770 respondents, with 492 fully completed responses): Some 80% of respondents said trainers must know what EMs do. With specific regard to the content of training, only 23% of respondents asked for more meteorology training, while many more said that training on assessing the impacts of weather events (72%), training on using weather information for decisions (77%) and training on making decisions when weather information is uncertain (77%) would be most helpful in increasing their understandings. Because EMs are information brokers, training influences their competence and comfort, and thus their confidence – in both their own decisions and in passing information along.

Timing (722 respondents with 515 fully completed responses): For an EM, lead time is relative. Just over 39% of EMs stated that "adequate" lead time is dependent on their general understanding of the situation, while equal numbers (22%) noted the potential consequences

and the time others need as the criteria they use for determining adequate lead time. Thus, it is important that NWS understands the processes and operations that various ESFs go through because one size does not fit all. Different emergency support functions have different responsibilities that require different amounts of time. Clearly there is no easy answer to how much lead time is needed.

Media (446 fully completed responses): While more than half of EMs who responded to the survey use the media as an information source, the percentage does not change much during severe weather. While more than half of EMs consider members of the media partners in their jurisdictions, about two-thirds of EMs say that they never or rarely meet in person with these partners and about three-quarters never or rarely correspond electronically with them. With respect to influences on confidence, two-thirds of EMs said that their confidence is not impacted if the media's messages do not align with their own. The EMs rely much more heavily on the NWS with 57% saying their reliance on the NWS compared to the media is 75% to 25% and another 26% noting that they rely 100% on the NWS

Messaging Effectiveness (843 respondents): Unfortunately, the results of the surveys do not lead to specific conclusions or recommendations about how to best cast messages to be more directly applicable to EM needs, but rather suggest that additional research is required. Some 90% of respondents ranked message content and delivery very highly, yet about 60% of EMs filter the information received from the NWS before forwarding it to others. This suggests that content is not quite what the EMs believe their partners need and this requires additional research. There are numerous questions to be addressed around these topics.

IBW Effectiveness (440 respondents): During this time period we distributed an online survey specifically addressing perceptions about the effectiveness of IBWs. Of those who responded, 54% had received an IBW and 15% were not sure. There were, overall, positive reactions to these warnings with 40% agreeing with the statement "I have better information to pass along to others," and another 27% choosing "It provides me with more useful information that previous warnings did." Only 12% chose "It won't make much of a difference." Similarly 70% said that it will either help them somewhat or a great deal, while less than 2% said it won't help them. Graphs shown following the survey indicate perceptions about whether or not IBWs provide an effective way of communicating urgency and possible public reaction.

001 Demographics Survey

Thank you for taking our survey! This is the first in a series of short surveys to better understand how various influences impact your decision making during weather events. The purpose of this survey is to gather demographic information. Other short follow-up surveys will be administered about once every 1-2 weeks.

This survey is being administered by the Weather for Emergency Management Decision Support Group that is funded by NOAA. The group consists of researchers from Arizona State University, the University of North Carolina, East Carolina University, the University of Oklahoma and National Weather Service (NWS) personnel.

The group's research focuses on studying the decision making process of the emergency management community to better understand how weather information is used and communicated. Results from this work will help the NWS improve how they provide decision support.

There are 16 questions in this survey

Profile

1 []

Where do you work in your role in Emergency Management (EM) or related field?

*

Please write your answer(s) here:

State where you work (AL, CA, DE, etc.):	
County where you work:	
Town or City where you work:	

2 []

Which is your primary National Weather Service (NWS) office? Choose "I don't know" at the top of the list if you aren't sure.

*

Please choose **only one** of the following:

- I don't know.
- Aberdeen [ABR]
- Albany [ALY]
- Albuquerque [ABQ]

- Amarillo [AMA]
- Anchorage [PAFC]
- Austin/San Antonio [EWX]
- Baltimore Md/ Washington Dc [LWX]
- Billings [BYZ]
- Binghamton [BGM]
- Birmingham [BMX]
- Bismarck [BIS]
- Blacksburg [RNK]
- Boise [BOI]
- Brownsville [BRO]
- Buffalo [BUF]
- Burlington [BTV]
- Caribou [CAR]
- Charleston [CHS]
- Charleston [RLX]
- Cheyenne [CYS]
- Chicago [LOT]
- Cleveland [CLE]
- Columbia [CAE]
- Corpus Christi [CRP]
- Dallas/Fort Worth [FWD]
- Denver [BOU]
- Des Moines [DMX]
- Detroit [DTX]
- Dodge City [DDC]
- Duluth [DLH]
- Eastern North Dakota [FGF]
- Elko [LKN]
- El Paso Tx/Santa Teresa [EPZ]
- Eureka [EKA]
- Fairbanks [PAFG]
- Flagstaff [FGZ]
- Gaylord [APX]
- Glasgow [GGW]
- Goodland [GLD]

- Grand Junction [GJT]
- Grand Rapids [GRR]
- Gray [GYX]
- Great Falls [TFX]
- Green Bay [GRB]
- Greenville/Spartanburg [GSP]
- Guam [GUM]
- Hastings [GID]
- Honolulu [PHFO]
- Houston/Galveston [HGX]
- Huntsville [HUN]
- Indianapolis [IND]
- Jackson [JAN]
- Jackson [JKL]
- Jacksonville [JAX]
- Juneau [PAJK]
- Kansas City/Pleasant Hill [EAX]
- Key West [KEY]
- La Crosse [ARX]
- Lake Charles [LCH]
- Las Vegas [VEF]
- Lincoln [ILX]
- Little Rock [LZK]
- Los Angeles/Oxnard [LOX]
- Louisville [LMK]
- Lubbock [LUB]
- Marquette [MQT]
- Medford [MFR]
- Melbourne [MLB]
- Memphis [MEG]
- Miami [MFL]
- Midland/Odessa [MAF]
- Milwaukee/Sullivan [MKX]
- Missoula [MSO]
- Mobile [MOB]
- Morristown [MRX]

- Mount Holly [PHI]
- Nashville [OHX]
- New Orleans [LIX]
- Newport/Morehead City [MHX]
- New York [OKX]
- Norman [OUN]
- Northern Indiana [IWX]
- North Platte [LBF]
- Omaha/Valley [OAX]
- Paducah [PAH]
- Peachtree City [FFC]
- Pendleton [PDT]
- Phoenix [PSR]
- Pittsburgh [PBZ]
- Pocatello/Idaho Falls [PIH]
- Portland [PQR]
- Pueblo [PUB]
- Quad Cities Ia [DVN]
- Raleigh [RAH]
- Rapid City [UNR]
- Reno [REV]
- Riverton [RIW]
- Sacramento [STO]
- Salt Lake City [SLC]
- San Angelo [SJT]
- San Diego [SGX]
- San Francisco [MTR]
- San Joaquin Valley/Hanford [HNX]
- San Juan [JSJ]
- San Juan [SJU]
- Seattle [SEW]
- Shreveport [SHV]
- Sioux Falls [FSD]
- Spokane [OTX]
- Springfield [SGF]
- State College [CTP]

- ○ St Louis [LSX]
- ○ Tallahassee [TAE]
- ○ Tampa Bay Area/Ruskin [TBW]
- ○ Taunton [BOX]
- ○ Topeka [TOP]
- ○ Tucson [TWC]
- ○ Tulsa [TSA]
- ○ Twin Cities/Chanhassen [MPX]
- ○ Wakefield [AKQ]
- ○ Wichita [ICT]
- ○ Wilmington, OH [ILN]
- ○ Wilmington, NC [ILM]

3 []

Which is your current age group?

*

Please select at most one answer

Please choose **all** that apply:

- ☐ Under 30
- ☐ 30-40
- ☐ 41-50
- ☐ 51-60
- ☐ 61 or older

4 []

What is your highest level of education?

*****

Comment only when you choose an answer.
Please select at most one answer

Please choose all that apply and provide a comment:

☐ High School diploma or equivalent	
☐ Associates degree(s). List field of study:	
☐ Bachelor's degree(s). List field of study:	
☐ Graduate degree(s). List field of study:	

5 []In your role in Emergency Management (EM) or related field, do you work for the public/government sector, the private sector, or a non-government organization (NGO)? *

Please select at most one answer

Please choose **all** that apply:

- ☐ Government/Public Sector
- ☐ Private Sector
- ☐ Non-government Organization

6 []For what area of the public sector do you work in Emergency Management (EM) or a related field? *

Only answer this question if the following conditions are met:
Answer was at question '5 [DS001Q05]' (In your role in Emergency Management (EM) or related field, do you work for the public/government sector, the private sector, or a non-government organization (NGO)?)

Please choose **all** that apply:

- ☐ City
- ☐ County
- ☐ State
- ☐ Federal
- ☐ University
- ☐ Tribal
- ☐ Other (specify):: _____

7 []For what type of business do you work in Emergency Management (EM) or a related field? *

Only answer this question if the following conditions are met:
Answer was at question '5 [DS001Q05]' (In your role in Emergency Management (EM) or related field, do you work for the public/government sector, the private sector, or a non-government organization (NGO)?)

Please choose **all** that apply:

- ☐ Agriculture, Forestry, Fishing and Hunting
- ☐ Mining, Quarrying, and Oil and Gas Extraction
- ☐ Utilities
- ☐ Construction
- ☐ Manufacturing
- ☐ Retail
- ☐ Transportation
- ☐ Information
- ☐ Finance and Insurance
- ☐ Real Estate, Rental, and Leasing
- ☐ Professional, Scientific, and Technical Services
- ☐ Management of Companies and Enterprises
- ☐ Administrative and Support and Waste Management and Remediation Services
- ☐ Educational Services
- ☐ Health Care and Social Assistance
- ☐ Arts, Entertainment, and Recreation
- ☐ Accommodation and Food Services
- ☐ Other Services (except Public Administration)
- ☐ Public Administration
- ☐ Other: _____

8 []For what type of organization do you work in Emergency Management (EM) or a related field? *

Only answer this question if the following conditions are met:
Answer was 'Non-government Organization' at question '5 [DS001Q05]' (In your role in Emergency Management (EM) or related field, do you work for the public/government sector, the private sector, or a non-government organization (NGO)?)

Please choose **all** that apply:

- ☐ Agriculture, Forestry, Fishing and Hunting
- ☐ Mining, Quarrying, and Oil and Gas Extraction
- ☐ Utilities
- ☐ Construction
- ☐ Manufacturing
- ☐ Retail
- ☐ Transportation
- ☐ Information
- ☐ Finance and Insurance
- ☐ Real Estate, Rental, and Leasing
- ☐ Professional, Scientific, and Technical Services
- ☐ Management of Companies and Enterprises
- ☐ Administrative and Support and Waste Management and Remediation Services
- ☐ Educational Services
- ☐ Health Care and Social Assistance
- ☐ Arts, Entertainment, and Recreation
- ☐ Accommodation and Food Services
- ☐ Other Services (except Public Administration)
- ☐ Public Administration
- ☐ Other: _____

9 []

In your role in Emergency Management (EM) or related field, is your area of responsibility primarily Urban or Rural?

*

Please select at most one answer

Please choose **all** that apply:

- ☐ Urban (>50,000 people)
- ☐ Rural (<50,000 people)
- ☐ I don't know

An urban population is greater than 50,000 people

10 []

How long have you served in your current role in Emergency Management (EM) or related field?

*

Please select at most one answer

Please choose **all** that apply:

- ☐ Less than a year
- ☐ 1-5 years
- ☐ 6-10 years
- ☐ 11-20 years
- ☐ 20+ years
- ☐ N/A

11 []

How long have you worked in your current profession?

*

Please select at most one answer

Please choose **all** that apply:

- ☐ Less than a year
- ☐ 1-5 years
- ☐ 6-10 years
- ☐ 11-20 years
- ☐ 20+ years

12 []

Do you have any formal training in weather? Check all that apply.

*

Please choose **all** that apply:

- ☐ FEMA training
- ☐ NWS training
- ☐ Military
- ☐ Aviation
- ☐ Meteorology class
- ☐ Meteorology degree
- ☐ No, I do not have any formal training in weather.
- ☐ Other (list): _____

13 []Which "official" emergency support function (ESF) do you most closely align with? (Please answer "Other" if your role is not described by the official structure). *

Please choose **only one** of the following:

- ○ ESF #1 – Transportation
- ○ ESF #2 – Communications
- ○ ESF #3 – Public Works and Engineering
- ○ ESF #4 – Firefighting
- ○ ESF #5 – Emergency Management
- ○ ESF #6 – Mass Care, Emergency Assistance, Housing and Human Services
- ○ ESF #7 – Logistics Management and Resource Support
- ○ ESF #8 – Public Health and Medical Services
- ○ ESF #9 – Search and Rescue
- ○ ESF #10 – Oil and Hazardous Materials Response
- ○ ESF #11 – Agriculture and Natural Resources
- ○ ESF #12 – Energy
- ○ ESF #13 – Public Safety and Security
- ○ ESF #14 – Long-term Community Recovery
- ○ ESF #15 – External affairs (public information officer, media)
- ○ I don't know
- ○ Other [ ]

14 []

Which best describes your current role in Emergency Management (EM) or related field?

*

Please choose **all** that apply:

- ☐ Full-time
- ☐ Part-time
- ☐ Volunteer

15 []Since your Emergency Management role is not full-time, what else do you do? *

Only answer this question if the following conditions are met:
Answer was at question '14 [DS001Q11]' (Which best describes your current role in Emergency Management (EM) or related field?)

Please write your answer here:

16 []

Rank on a scale of 1 to 5, where 1 is very minor and 5 is catastrophic, how bad the worst weather event you've experienced was.

*

Please choose **only one** of the following:

- 1
- 2
- 3
- 4
- 5

Thank you for taking our survey! Please proceed to our second short survey in the original email we sent you.

If you have any questions please contact Jessica Losego at the University of North Carolina at admin@emweather.org.

Submit your survey.
Thank you for completing this survey.

002 Confidence Survey

Thank you for taking our survey! This is a short survey to better understand how various influences impact your decision making during weather events. It is one of several short surveys that will be administered about once every 1-2 weeks for the next few months.

If you haven't taken our demographic survey yet (Survey 1) please do so here first.

This survey is being administered by the Weather for Emergency Management Decision Support Group that is funded by NOAA. The group consists of researchers from Arizona State University, the University of North Carolina, East Carolina University, the University of Oklahoma and National Weather Service (NWS) personnel.

The group's research focuses on studying the decision making process of the emergency management community to better understand how weather information is used and communicated. Results from this work will help the NWS improve how they provide decision support.

There are 28 questions in this survey

Introduction Questions

1 []

Based on our interactions with members of the emergency management (EM) community across the country, we've heard that these six elements are important to your decision making during weather events. How would you rank these in order of importance to your decision making?

*

All your answers must be different.

Please number each box in order of preference from 1 to 6

- [ ] Timing of the event
- [ ] Duration of the event
- [ ] Location of the event
- [ ] What type of event is it
- [ ] History of the event
- [ ] Confidence

2 []

Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.

*

Please select at most one answer

Please choose **all** that apply:

- ☐ Your confidence in making a decision
- ☐ A forecaster's confidence in giving you information
- ☐ The confidence in the science of the forecast
- ☐ None of these. I think confidence means...(fill in on next page)

3 []None of these. I think confidence means... *

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

You chose a. "Your confidence in making a decision."

4 []

Your level of confidence can make you take different actions. Which of these actions is most influenced by your level of confidence? Please choose only one answer.

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please select at most one answer

Please choose **all** that apply:

- ☐ My ability to assess impacts and consequences.
- ☐ My ability to speak more or less definitively to people in my chain of command.
- ☐ My ability to more or less definitively optimize how my resources are used.
- ☐ Because I coordinate information, including weather information, how I perceive the confidence impacts how I communicate this information to others and it influences their decision-making
- ☐ Other action (fill in on next page)

5 []You chose "Other" when asked what action is most influenced by confidence. Please tell us about this other action. *

Only answer this question if the following conditions are met:
Answer was at question '4 [SCS002BR1Q03]' (Your level of confidence can make you take different actions. Which of these actions is most influenced by your level of confidence? Please choose only one answer.)

Please write your answer here:

6 []

Please rank the following, based on how much these items help you build your confidence.

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

All your answers must be different.

Please number each box in order of preference from 1 to 5

- [ ] Check many sources and they all say the same thing
- [ ] Check many sources to build my understanding
- [ ] Talk to forecaster one-on-one
- [ ] Talk to higher management in a forecast office
- [ ] Right words, right tone from forecaster leading me to a better understanding of urgency/severity

7 []Are there any other ways that you build your confidence?

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

8 []

If you could change something in the information flow that would improve your confidence what would it be (whether it's feasible or not)?

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

9 []

What is the impact on your actions if you have low confidence?

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

You chose b. "A forecaster's confidence in giving you information."

10 []

The forecaster's level of confidence can make you take different actions. Which of these actions is most influenced by the forecaster's level of confidence? Please choose only one answer.

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please select at most one answer

Please choose **all** that apply:

- ☐ My ability to assess impacts and consequences.
- ☐ My ability to speak more or less definitively to people in my chain of command.
- ☐ My ability to more or less definitively optimize how my resources are used.
- ☐ Because I coordinate information, including weather information, how I perceive the forecaster's confidence impacts how I communicate this information to others and it influences their decision-making.
- ☐ Other action (fill in on next page)

11 []

You chose "Other" when asked what action is most influenced by confidence. Please tell us about this other action.

*

Only answer this question if the following conditions are met:
Answer was at question '10 [RELS002BR2Q03]' (The forecaster's level of confidence can make you take different actions. Which of these actions is most influenced by the forecaster's level of confidence? Please choose only one answer.)

Please write your answer here:

12 []How do you get a feel for a forecaster's confidence? *

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

13 []

Below is a list describing different ways a forecaster could convey their confidence. Please rank them in order of preference, with the option you like the most at the top and the option you like the least at the bottom.

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

All your answers must be different.

Please number each box in order of preference from 1 to 5

- [ ] Colors, green-yellow-red
- [ ] Numbers, like DEFCON 1-5
- [ ] Words, like high-medium-low
- [ ] Probability with numbers, such as 20% confident, 80% confident, etc.
- [ ] Probability with words: likely, probable, etc.

14 []Do you have other ideas for how you would like to see a forecaster express confidence?

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

15 []If you think a forecaster's confidence is low, how does that impact your decision-making? *

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

16 []

If you could change something in the information flow that would improve your understanding of the forecaster's confidence what would it be (whether it's feasible or not)?

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

You chose c. "The confidence in the science behind the forecast."

17 []

The level of confidence in the science can make you take different actions. Which of these actions is most influenced by the level of confidence in the science? Please choose only one answer.

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please select at most one answer

Please choose **all** that apply:

- ☐ My ability to assess impacts and consequences
- ☐ My ability to speak more or less definitively to people in my chain of command.
- ☐ My ability to more or less definitively optimize how my resources are used.
- ☐ Because I coordinate information, including weather information, how I perceive the confidence in the science impacts how I communicate this information to others and it influences their decision-making
- ☐ Other action (fill in on next page)

18 []

You chose "Other" when asked what action is most influenced by confidence. Please tell us about this other action.

*

Only answer this question if the following conditions are met:
Answer was at question '17 [SNCS002BR3Q03]' (The level of confidence in the science can make you take different actions. Which of these actions is most influenced by the level of confidence in the science? Please choose only one answer.)

Please write your answer here:

19 []

Which of these describes what you most want to know about the forecast? Please choose only one answer.

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please select at most one answer

Please choose **all** that apply:

- ☐ I want to understand the likelihood of various scenarios occurring, range of impact.
- ☐ I want to understand the forecaster's thinking and interpretation of the weather data for the most likely scenario.
- ☐ I want to understand the weather myself.
- ☐ Other: [ ]

20 []

How do you usually determine what the confidence in the science is? Please choose only one answer.

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please select at most one answer

Please choose **all** that apply:

- ☐ I gather information from official NWS sources and they tell me the confidence.
- ☐ I gather information from official NWS sources and they tell me the confidence. I then confirm with media or other sources.
- ☐ I look at multiple sources that tell me about confidence and then I interpret that for myself based on my own experience and operational needs.
- ☐ I usually determine what the confidence in the science is by:

[ ]

21 []How does low confidence in the science impact your decision-making? *

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

22 []

If you could change something in the information flow that would improve your understanding of the confidence in the science what would it be (whether it's feasible or not)?

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

You chose d. “None of these. I think it means:”

23 []

The level of confidence can make you take different actions. Which of these actions is most influenced by confidence? Please choose only one answer.

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please select at most one answer

Please choose **all** that apply:

- ☐ My ability to assess impacts and consequences
- ☐ My ability to speak more or less definitively to people in my chain of command.
- ☐ My ability to more or less definitively optimize how my resources are used.
- ☐ Because I coordinate information, including weather information, how I perceive the confidence impacts how I communicate this information to others and it influences their decision-making
- ☐ Other action (fill in on next page)

24 []You chose "Other" when asked what action is most influenced by confidence. Please tell us about this other action. *

Only answer this question if the following conditions are met:
Answer was at question '23 [SCS002BR4Q03]' (The level of confidence can make you take different actions. Which of these actions is most influenced by confidence? Please choose only one answer.)

Please write your answer here:

25 []

Rank in order of priority how these help you build your confidence.

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

All your answers must be different.

Please number each box in order of preference from 1 to 5

- [ ] Check many sources and they all say the same thing
- [ ] Check many sources to build my understanding
- [ ] Talk to forecaster one-on-one (thru NWSChat or phone)
- [ ] Talk to higher management in a forecast office
- [ ] Right words, right tone from forecaster leading me to a better understanding of urgency/severity

26 []Are there any other ways that you build your confidence?

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

27 []If you could change something in the information flow that would improve your confidence what would it be (whether it's feasible or not)? *

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

Please write your answer here:

28 []

What is the implication on your actions if you have low confidence?

*

Only answer this question if the following conditions are met:
Answer was at question '2 [CGS002Q02]' (Confidence can be defined from different viewpoints. When you think of confidence which of these comes to your mind first? Please choose only one answer.)

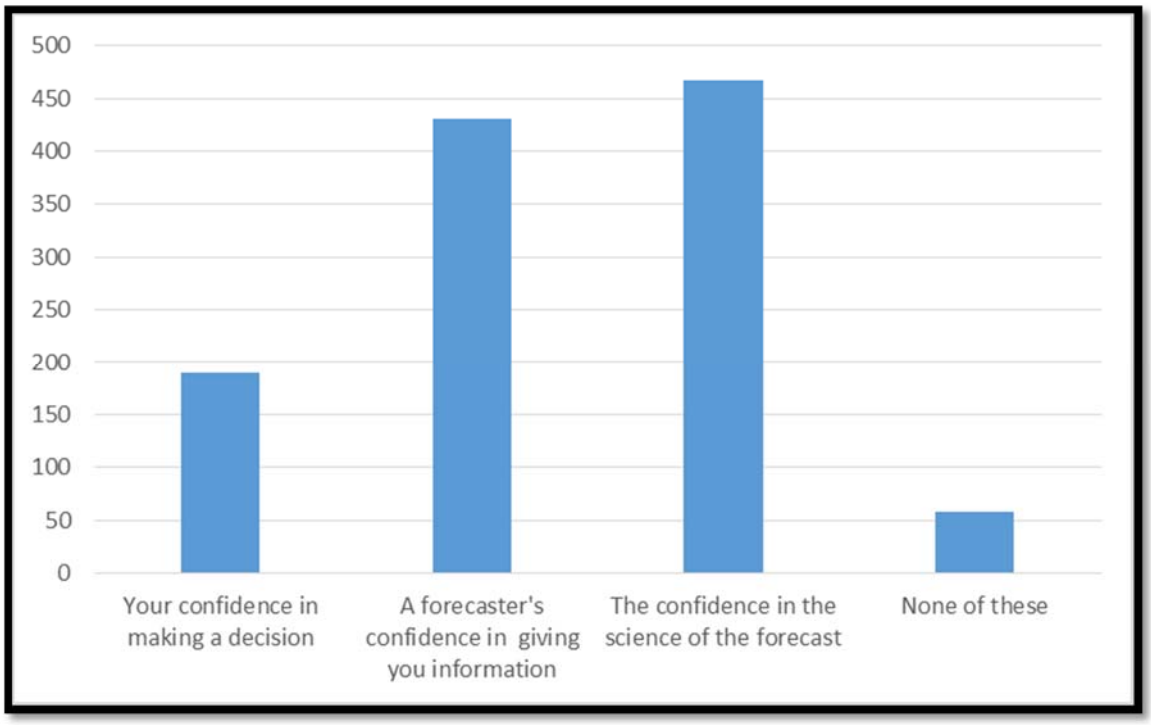
Please write your answer here:

Thank you for your time! If you have any questions please contact Jessica Losego at the University of North Carolina at admin@emweather.org.

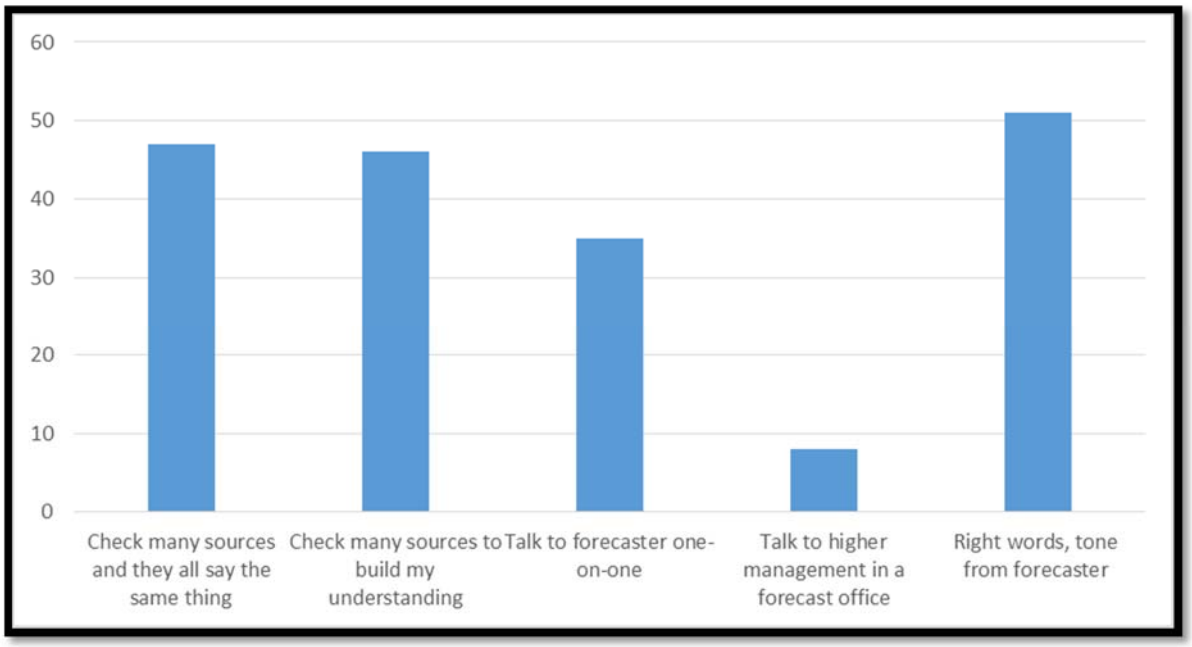
Submit your survey.
Thank you for completing this survey.

Sample Confidence Survey Results

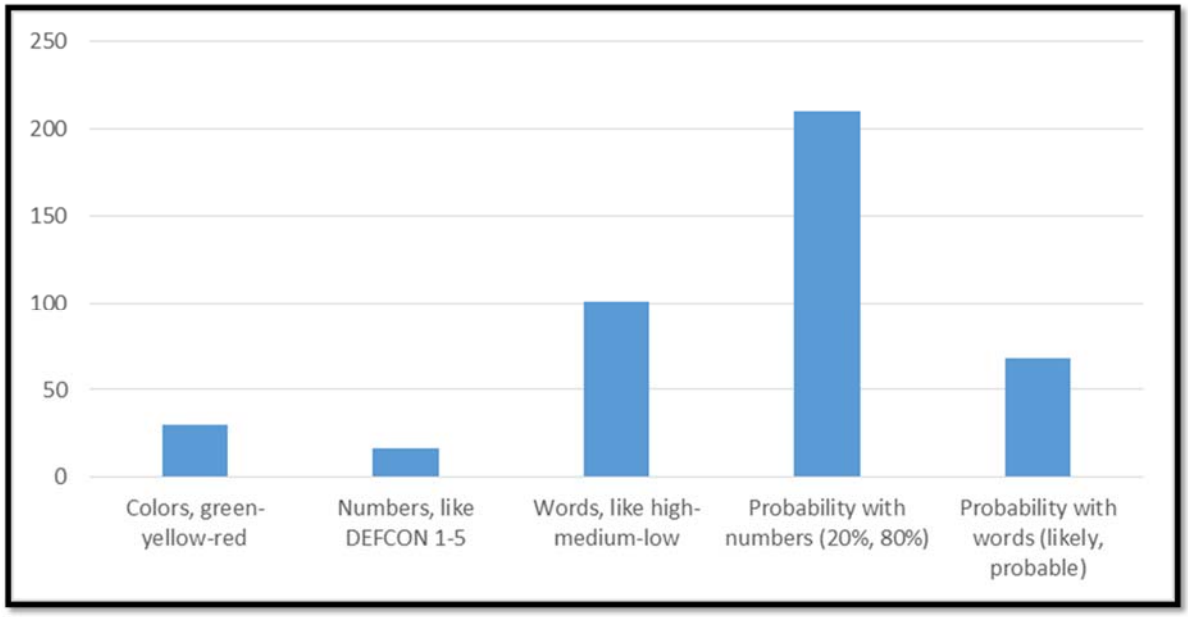
Question 2. When you think of confidence, which of these comes to your mind first?



Question 6. Please rank the following, based on how much these items build your confidence. (Ranking 1)



Question 13. Below is a list describing ways a forecaster could convey their confidence. Please rank them in order of preference. (Ranking 1)



004 Training Survey 1

Thank you for agreeing to take the following survey! This is a short survey to better understand how various influences impact your decision making during weather events. It is one of several short surveys that will be administered about once every 1-2 weeks for the next few months.

This survey is being administered by the Weather for Emergency Management Decision Support Group that is funded by NOAA. The group consists of researchers from Arizona State University, the University of North Carolina, East Carolina University, the University of Oklahoma and National Weather Service (NWS) personnel.

The group's research focuses on studying the decision making process of the emergency management community to better understand how weather information is used and communicated. Results from this work will help the NWS improve how they provide decision support.

There are 20 questions in this survey

Preliminary

1 []Have you ever received formal training in weather for emergency management or meteorology? *

Please choose **only one** of the following:

- ○ Yes
- ○ No

Training Effectiveness

2 []Please rate how effective for you and your organization the following formats are for weather training, from 1 (not effective) to 5 (very effective). Effectiveness can be described as successful at teaching you the topics presented. *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose the appropriate response for each item:

	1	2	3	4	5
Online	○	○	○	○	○
Seminar (a brief, single-topic presentation)	○	○	○	○	○
Classroom training (multi-topic, s1 day or less)	○	○	○	○	○
Multi-day training (2-3 days)	○	○	○	○	○

3 []

On a scale of one (not at all effective) to five (extremely effective), how effective was the instruction you received in teaching you the material?

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

4 []

Emergency managers generally need to know six elements of weather information to meet their operational needs: what the event is, the expected time, the duration, location, confidence and what the weather is doing now (history). For each of these elements, how well did your training prepare you to find, interpret, and apply appropriate information?

Please choose a number below, with one representing not at all well and five representing extremely well.

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose the appropriate response for each item:

	1	2	3	4	5
The history of the event	○	○	○	○	○
The timing of the event	○	○	○	○	○
The duration of the event	○	○	○	○	○
Confidence that the event will occur	○	○	○	○	○
The type of event and magnitude	○	○	○	○	○
The location of the event	○	○	○	○	○

Training Relevance

5 []

How strongly do you agree or disagree with this statement?

"There are others connected to my organization that could benefit greatly from using Weather Service products and services, directly or indirectly, that do not use them now."

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose the appropriate response for each item:

	Greatly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Greatly agree
"There are others connected to my organization that could benefit greatly from using Weather Service products and services, directly or indirectly, that do not use them now."	○	○	○	○	○	○	○

6 []

From the weather training you have taken, what percent of the content would say is relevant (useful) to your day to day operations? Please fill in the appropriate percentage number.

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Each answer must be between 0 and 100
Only integer value may be entered in this field.

Please write your answer here:

7 []What percent of the weather training you have received do you think you have retained? *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Each answer must be between 0 and 100
Only integer value may be entered in this field.

Please write your answer here:

8 []

How relevant was the weather training you received in helping you fulfill your operational needs during all phases of emergency management? Please choose a number below, with one representing not at all relevant and five representing extremely relevant.

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose the appropriate response for each item:

	1	2	3	4	5
Mitigation	○	○	○	○	○
Preparedness	○	○	○	○	○
Response	○	○	○	○	○
Recovery	○	○	○	○	○

Training Availability

9 []

Which statement do you most closely agree with, concerning the availability of training you need for weather-related emergency operations?

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose **only one** of the following:

- ○ Relevant training is not generally available
- ○ Relevant training is somewhat available
- ○ Relevant training is usually available
- ○ Relevant training is always available

10 []

Check all statements below with which you agree.

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose **all** that apply:

- ☐ Weather training is not accessible to me
- ☐ I don't know if weather training is available
- ☐ No funding is available for weather training
- ☐ Training currently offered is not relevant to my professional role
- ☐ I cannot get time off or away from my other responsibilities for training
- ☐ Available weather training is not that useful
- ☐ Other: _____

Training Products

11 []

Have you ever received formal training on the NWS products (texts and graphics) you use? Check the most applicable answer.

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose **only one** of the following:

- ○ I don't use NWS products
- ○ I use NWS products but have not been trained
- ○ I have received training on some NWS products but not the ones I routinely use
- ○ I have received training on some of the NWS products I routinely use
- ○ I have received training on most of the NWS products I routinely use
- ○ I have received training on all of the NWS products I routinely use

12 []

How did you find the NWS products that you use most often? Check all that apply.

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose **all** that apply:

- ☐ I found them myself without being trained
- ☐ A colleague or another EM recommended them
- ☐ NWS staff recommended them
- ☐ My training taught me where to look for relevant products and then I found them
- ☐ My training told me which products to use
- ☐ I don't use NWS tools
- ☐ Other: _____

Training Needs

13 []

Please rank the following in order, with those you most need training on at the top and those you least need training on at the bottom. I need to know...

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

All your answers must be different.

Please number each box in order of preference from 1 to 6

- [ ] Where to find NWS products
- [ ] Which NWS products are appropriate for each weather event
- [ ] How to interpret and use the information on the NWS products to understand impacts
- [ ] How to combine products together to get a greater understanding of the weather situation
- [ ] Deeper understanding of the weather and what it means to my operations
- [ ] Better understanding of weather forecasting and forecaster's confidence that the event will occur

Confidence

14 []

Prior discussions with emergency managers have indicated that training increases their confidence. Which of aspects of confidence has your training increased? Please rank in order, with the area in which your confidence most increased at the top and the area where it increased least at the bottom.

*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

All your answers must be different.

Please number each box in order of preference from 1 to 5

☐	My ability to use NWS tools for decision making
☐	My ability to make timely operational decisions
☐	My ability to understand the weather
☐	My ability to explain and justify weather-related decisions to my superiors and the public
☐	My confidence in using NWS predictions and forecasts

No Training

15 []

You've indicated that you have never taken formal weather training. What is the main reason for this?

*

Only answer this question if the following conditions are met:
Answer was 'No' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose **only one** of the following:

- ○ Understanding the weather is not required for my job
- ○ I depend on others to understand the weather and make related decisions
- ○ Training is not available to me
- ○ I don't know if training is offered
- ○ No funding available for training
- ○ Training currently offered but I don’t believe it will help
- ○ The training offered is not relevant to my professional role
- ○ I cannot get time off or away from my other responsibilities for training
- ○ Other [ ]

16 []

How strongly do you agree or disagree with this statement?

“I believe weather training would be of great benefit to me.”

*

Only answer this question if the following conditions are met:
Answer was 'No' at question '1 [TRNS004Q01]' (Have you ever received formal training in weather for emergency management or meteorology?)

Please choose the appropriate response for each item:

	Greatly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Greatly agree
“I believe weather training would be of great benefit to me.”	○	○	○	○	○	○	○

Future Trainings

17 []Which training format do you prefer most? *

Please choose **only one** of the following:

- ○ Online
- ○ Seminar (a brief, single-topic presentation)
- ○ Classroom training (multi-topic, 1 day or less)
- ○ Multi-day training (2 -3 days)
- ○ Other [ ]

18 []If you could create your own ideal training, regardless of feasibility or cost, can you describe the content would it cover?

Please write your answer here:

[ ]

19 []

Ideally, how often would you like to see refresher training on weather?

*

Please choose **all** that apply:

- ☐ Seasonally, to refresh training for specific weather events such as ice storms or hurricanes
- ☐ Follow-up course on general trainings once a year
- ☐ Brief training seminars on specific topics every month
- ☐ Other: [ ]

20 []

Ideally, who should be providing weather for emergency management training?

*

Please choose **all** that apply:

- ☐ National Weather Service
- ☐ FEMA
- ☐ State EM Offices
- ☐ Local emergency managers
- ☐ Other: _____

Thank you for your time! If you have any questions please contact Jessica Losego at the University of North Carolina at admin@emweather.org.

Submit your survey.
Thank you for completing this survey.

Sample Training Survey Results

Question 2. Please rate how effective for you and your organization the following formats are for weather training, from 1 (not effective) to 5 (very effective). Effectiveness can be described as successful at teaching you the topics presented.

Type of training	% ranked as 4-5 (very effective)	% ranked as 1-2 (not effective)
On-line	47	18
Seminar	74	7
Classroom	78	8
Multi-day	53	25

Example comments:
Seminars & Classroom Training:
"Allows for asking questions"
"Good group environment"
"Engage in active discussion"
"Interaction with participants extremely valuable"
… but
"Difficult to schedule"
"Too much information"

Online Training:
"Work at own pace on own schedule"
"[Good] for simple concepts or review"
… but
"No interaction"
"Lack of participation with instructor and colleagues

Question 13. Please rank the following in order, with those you most need training on at the top and those you least need training on at the bottom. I need to know… (Preference from 1 to 6)

Preference	% ranked as 1 or 2
Where to find NWS Products	18
Which NWS products are appropriate for each weather event	23
How to interpret and use the information on the NWS products to understand impacts)	19
How to combine products together to get a greater understanding of the weather situation	32
Deeper understanding of the weather and what it means to my operations	47
Better understanding of weather forecasting and forecaster's confidence that the event will occur	58

Question 14. Prior discussions with emergency managers have indicated that training increases their confidence. Which of aspects of confidence has your training increased? Please rank in order, with the area in which your confidence most increased at the top and the area where it increased least at the bottom.

Aspect Increased	% ranked as 1 or 2
My ability to use NWS tools for decision making	36
My ability to make timely operational decisions	47
My ability to understand the weather	43
My ability to explain and justify weather related decisions to my superiors and the public	38
My confidence in using NWS predictions and forecasts	36

005 Timing Suvey 1

Thank you for agreeing to take the following survey! This is a short survey to better understand how various influences impact your decision making during weather events. It is one of several short surveys that will be administered about once every 1-2 weeks for the next few months. This survey is being administered by the Weather for Emergency Management Decision Support Group that is funded by NOAA. The group consists of researchers from Arizona State University, the University of North Carolina, East Carolina University, the University of Oklahoma and National Weather Service (NWS) personnel. The group's research focuses on studying the decision making process of the emergency management community to better understand how weather information is used and communicated. Results from this work will help the NWS improve how they provide decision support.

There are 12 questions in this survey

Lead Time

[]

Given that every weather event has a different time frame associated with it, how would you describe the ideal lead-time for receiving actionable information?
*****

Please choose **only one** of the following:

- ○ The amount of time I need for an operational briefing to my staff.
- ○ The amount of time I need to pass information along for others to act on.
- ○ The amount of time I need to start operations in advance of the event.
- ○ The amount of time I need to complete operations in advance of the event.
- ○ The onset time when weather begins to cause impacts that I need to worry about.
- ○ The onset time when the weather begins, regardless of potential impact.
- ○ The amount of time specified in the Standard Operating Procedures (SOP) or Emergency Action Plans (EAP) for the type of event.
- ○ Operationally, lead time means something else (specify): [ ]

[]How much lead time do you usually need in advance of a weather event? (Provide a time in hours or minutes if possible.) *

Please choose **only one** of the following:

- ○ It's too dependent on the event type for me to specify.
- ○ Time in hours or minutes [ ]

[]

Can you usually determine needed lead-time from NWS products, or do you reach out to NWS offices or personnel for additional clarification? Please pick the statement that most applies.
*****

Please choose **only one** of the following:

- ○ I can easily ascertain operational lead-time from products with no additional NWS assistance.
- ○ I can ascertain lead-time most of the time with occasional additional NWS assistance.
- ○ I can ascertain lead-time but usually obtain additional NWS assistance to make sure I understand the situation.
- ○ I generally seek additional NWS assistance to make sure I understand the lead-time.
- ○ The NWS products I see don't help me understand the lead-time I need. I need to get that information from other sources.

[]How do you determine if you have adequate lead-time? *

Please choose **only one** of the following:

- ○ It is based on potential consequences.
- ○ It is based on how much time I need to move resources.
- ○ It is based on how much time others that I pass information along to need.
- ○ It is based on SOPs or other action plans.
- ○ It is based on my general understanding of the situation and everything I need to do.
- ○ It is based on something else (specify): [ ]

Time Pressure

[]All operational decisions are made under time pressure. Which of these statements do you most closely align with? *

Please choose **only one** of the following:

- ○ Time pressure is mostly related to how well I can understand the weather situation.
- ○ Time pressure is mostly related to how well I am able to act.
- ○ Time pressure is mostly related to how confident I am in the weather information.
- ○ Time pressure is mostly related to my experieence dealing with similar events.
- ○ Time rpessure is mostly related to the impacts and consequences that may happen.
- ○ I think time pressure is related to something else (specify): [ ]

[]

What do you do if you perceive you are running out of time to understand the weather information from the National Weather Service? *

Please choose **only one** of the following:

- ○ I go with the best information I have.
- ○ I try to contact the Weather Service.
- ○ I ask my peers what they think.
- ○ I rely on my previous experience and training.
- ○ I seek out other soruces of information.
- ○ I do something else (specify): [ ]

[]When time pressure increases or decreases, does it affect your confidence in your operational decisions? Please chose a number from the scale below, with 1 indicating time pressure does not impact your confidence and 7 indicating that time pressure greatly impacts your confidence. *

Please choose the appropriate response for each item:

	1	2	3	4	5	6	7
Relationship between time pressure and confidence	○	○	○	○	○	○	○

Time Proximity

[]As a weather event gets closer in time, how do you think your understanding of the weather changes? *

Please choose **only one** of the following:

- ○ It gets a lot better as the event gets closer in time.
- ○ It gets a little better as the event gets closer in time.
- ○ It stays about the same.
- ○ It gets a little worse as the event gets closer in time.
- ○ It gets a lot worse as the event gets closer in time.
- ○ Time does not affect my understanding.

[]As weather events get closer in time, how does your confidence in your operational decisions change? *

Please choose **only one** of the following:

- ○ It gets a lot better.
- ○ It gets a little better.
- ○ It stays about the same.
- ○ It gets a little worse.
- ○ It gets a lot worse.
- ○ Time has nothing to do with my confidence.

General Time

[]During a weather-driven event, there never seems to be enough time. What single thing could the National Weather Service do that would most help you with time management?

Please write your answer here:

[]In relation to when an event starts, how important is knowing when the event will end? *

Please choose **only one** of the following:

- ○ Start of an event is much more important than when it ends.
- ○ Start of an event is somewhat more important than when it ends.
- ○ Start of an event is about as important as when it ends.
- ○ When it ends is not important to me.

[]How important is it to know during a weather event what is happening where and when? *

Please choose **only one** of the following:

- ○ It is critical to my operations.
- ○ It is important to my operations.
- ○ It is somewhat useful to know for my operations.
- ○ It is not needed for my operations.

Thank you for your time! If you have any questions please contact Ken Galluppi at Arizona State University at admin@emweather.org.

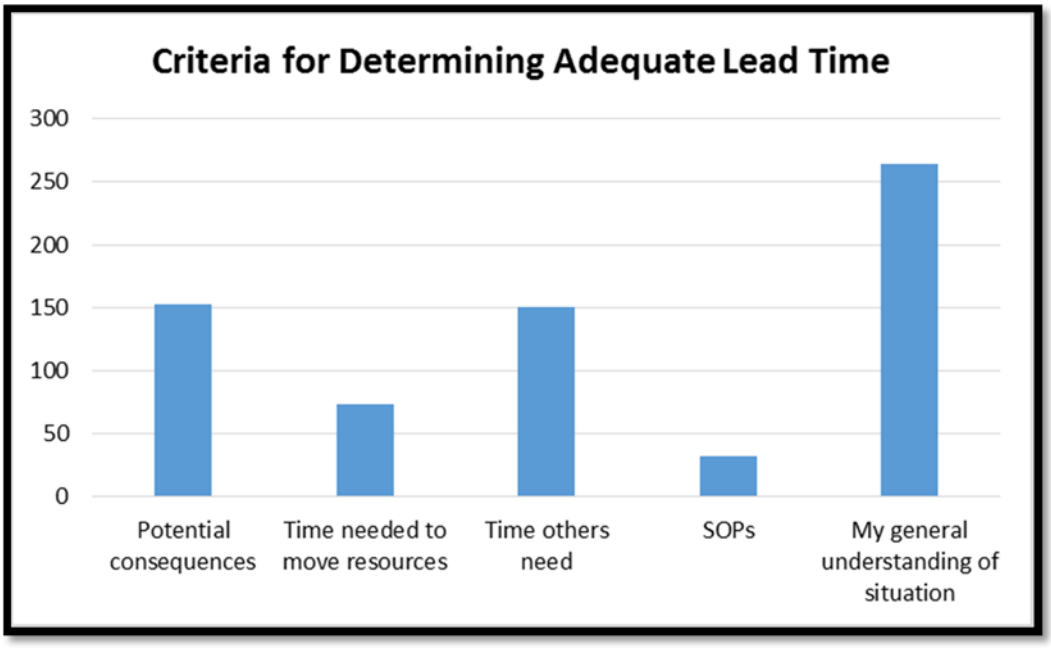
Submit your survey.
Thank you for completing this survey.

Sample Timing Survey Results

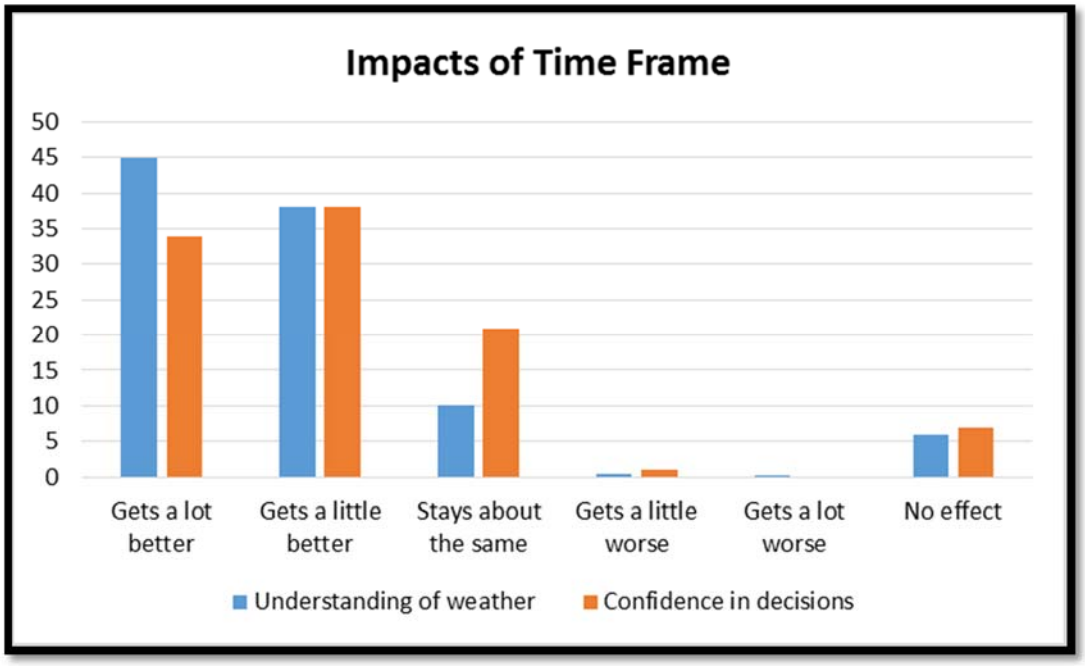
Question 1. Given that every weather event has a different time frame associated with it, how would you describe the ideal lead-time for receiving actionable information?

Ideal lead time criterion	% choosing option
The amount of time I need for an operational briefing to my staff	5
The amount of time I need to pass information along for others to act on	35
The amount of time I need to start operations in advance of the event	26
The amount of time I need to complete operations in advance of the event	13
The onset time when the weather begins to cause impacts that I need to worry about	11
The onset time when the weather begins, regardless of potential impact	8
The amount of time specified in Standard Operation Procedures or Emergency Actions Plans for the type of event	2

Question 4. How do you determine if you have adequate lead time?



Question 8. As a weather event gets closer in time, how do you think your understanding of the weather changes?
Question 9. As weather events get closer in time, how does your confidence in your operational decisions change?



 006 Media Survey 1

Thank you for agreeing to take the following survey! This is a short survey to better understand how various influences impact your decision making during weather events. It is one of several short surveys that will be administered about once every 1-2 weeks for the next few months. This survey is being administered by the Weather for Emergency Management Decision Support Group that is funded by NOAA. The group consists of researchers from Arizona State University, the University of North Carolina, East Carolina University, the University of Oklahoma and National Weather Service (NWS) personnel. The group's research focuses on studying the decision making process of the emergency management community to better understand how weather information is used and communicated. Results from this work will help the NWS improve how they provide decision support.

There are 16 questions in this survey

Preliminary Questions

1 []Which of the following best describes your professional role? *

Please choose **only one** of the following:

- ○ Emergency manager or related role
- ○ Other

Relationship with Media

2 []

Before severe weather events, how often do you use the media as an information source? Please note that for the purpose of this survey we use the term media to refer to local tv meteorologists.
*****

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Frequently
- ○ Very frequently

3 []During severe weather events, how often do you use the media as an information source? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Frequently
- ○ Very frequently

4 []

How often do you use media reports (e.g., spotter reports of severe weather) for situational awareness? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Frequently
- ○ Very frequently

5 []

How often do you pay attention to more than one TV station? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Frequently
- ○ Very frequently

6 []How often do you meet (in person) with one or more members of the media who cover your jurisdiction? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Frequently
- ○ Very frequently

7 []How often do you electronically correspond (via email or social media) with one or more members of the media who cover your jurisdiction? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Frequently
- ○ Very frequently

8 []How often do you interact with one or more members of the media who cover your jurisdiction on NWSChat? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Frequently
- ○ Very frequently

9 []Do you consider one or more members of the media who cover your jurisdiction a partner? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

Impact of Message Inconsistency

For the next section, **please only consider the National Weather Service and the media.** We acknowledge that you might use other sources in addition to or instead of the NWS and the media, but for this question we are interested in only NWS and the media.

10 []Which of the following most closely aligns with how much you rely on the National Weather Service (NWS) and media for weather information? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

Please choose **only one** of the following:

- ○ 100% NWS
- ○ 75% NWS, 25% media
- ○ 50% NWS, 50% media
- ○ 25% NWS, 75% media
- ○ 100% media
- ○ I don't use NWS or local media as a source.

11 []If the media's message(s) aligns with your own thinking, how is your confidence impacted? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?) *and* Answer was '100% NWS' *or* '75% NWS, 25% media' *or* '50% NWS, 50% media' *or* '25% NWS, 75% media' *or* '100% media' at question '10 [MSGS006Q10]' (Which of the following most closely aligns with how much you rely on the National Weather Service (NWS) and media for weather information?)

Please choose **only one** of the following:

- ○ Positively
- ○ Not impacted
- ○ Negatively

12 []If the media's message(s) does not align with your own thinking, how is your confidence impacted? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?) *and* Answer was '100% NWS' *or* '75% NWS, 25% media' *or* '50% NWS, 50% media' *or* '25% NWS, 75% media' *or* '100% media' at question '10 [MSGS006Q10]' (Which of the following most closely aligns with how much you rely on the National Weather Service (NWS) and media for weather information?)

Please choose **only one** of the following:

- ○ Positively
- ○ Not impacted
- ○ Negatively

13 []How is your confidence impacted if the media and NWS do not agree? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?) *and* Answer was '100% NWS' *or* '75% NWS, 25% media' *or* '50% NWS, 50% media' *or* '25% NWS, 75% media' *or* '100% media' at question '10 [MSGS006Q10]' (Which of the following most closely aligns with how much you rely on the National Weather Service (NWS) and media for weather information?)

Please choose **only one** of the following:

- ○ Positively
- ○ Not impacted
- ○ Negatively

14 []How often do you rely on media products (e.g., interactive radar, mobile apps, broadcasts) in addition to or instead of NWS products? *

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?) *and* Answer was '100% NWS' *or* '75% NWS, 25% media' *or* '50% NWS, 50% media' *or* '25% NWS, 75% media' *or* '100% media' at question '10 [MSGS006Q10]' (Which of the following most closely aligns with how much you rely on the National Weather Service (NWS) and media for weather information?)

Please choose **only one** of the following:

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Frequently
- ○ Very frequently

15 []Please explain what products you use and why you use them.

Only answer this question if the following conditions are met:
Answer was 'Emergency manager or related role' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?) *and* Answer was '100% NWS' *or* '75% NWS, 25% media' *or* '50% NWS, 50% media' *or* '25% NWS, 75% media' *or* '100% media' at question '10 [MSGS006Q10]' (Which of the following most closely aligns with how much you rely on the National Weather Service (NWS) and media for weather information?) *and* Answer was 'Rarely' *or* 'Sometimes' *or* 'Frequently' *or* 'Very frequently' at question '14 [MSGS006Q14]' (How often do you rely on media products (e.g., interactive radar, mobile apps, broadcasts) in addition to or instead of NWS products?)

Please write your answer here:

NonEM

16 []Thank you for your assistance! At this time, we are only surveying emergency managers and others in an emergency management role about their relationship to the media and NWS products. Please expect us to contact you soon via email about additional surveys targeted towards individuals in other roles. We look forward to your contributions on a future survey!

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was 'Other' at question '1 [ROLS006Q01]' (Which of the following best describes your professional role?)

-------- or Scenario 2 --------

Answer was 'I don't use NWS or local media as a source.' at question '10 [MSGS006Q10]' (Which of the following most closely aligns with how much you rely on the National Weather Service (NWS) and media for weather information?)

Thank you for your time! If you have any questions please contact Ken Galluppi at Arizona State University at admin@emweather.org.

Submit your survey.
Thank you for completing this survey.

Sample Media Survey Results

Question 2. Before severe weather events, how often do you use the media as an information source? Please note that for the purpose of this survey we use the term media to refer to local tv meteorologists**.**

Never + Rarely	16.8%
Frequently + Very Frequently	57%

Question 3. During severe weather events, how often do you use the media as an information source?

Never + Rarely	12.7%
Frequently + Very Frequently	58.1%

Question 7. How often do you electronically correspond (via email or social media) with one or more members of the media who cover your jurisdiction?

Never + Rarely	74.7%
Frequently + Very Frequently	7.4%

Question 9. Do you consider one or more members of the media who cover your jurisdiction a partner?

Yes	56.5%
No	43.5%

Question 10. Which of the following most closely aligns with how much you rely on the National Weather Service (NWS) and media for weather information?

100% NWS	26.1%
75% NWS/25% media	57.0%
50% NWS/ 50% media	15.1%
25% NWS/ 75% media	1.4%
100% media	0.2%

Question 12. If the media's message(s) does not align with your own thinking, how is your confidence impacted?

Positively	3.4%
Not impacted	67%
Negatively	29.6%

Question 13. How is your confidence impacted if the media and NWS do not agree?

Positively	2.9%
Not impacted	48.2%
Negatively	48.9%

003 Messaging Survey 1 - Messaging Effectiveness

Thank you for agreeing to take the following survey! This is a short survey to better understand how various influences impact your decision making during weather events. It is one of several short surveys that will be administered about once every 1-2 weeks for the next few months.

This is the third survey in the series. Please make sure that you have already taken the first two surveys before completing this survey.

This survey is being administered by the Weather for Emergency Management Decision Support Group that is funded by NOAA. The group consists of researchers from Arizona State University, the University of North Carolina, East Carolina University, the University of Oklahoma and National Weather Service (NWS) personnel.

The group's research focuses on studying the decision making process of the emergency management community to better understand how weather information is used and communicated. Results from this work will help the NWS improve how they provide decision support.

There are 15 questions in this survey

Message Awareness Questions

[]

1. The National Weather Service offers a wide array of national and local products and services to inform emergency managers of impending weather. Some emergency managers or support resources use the products and services directly while others have information passed to them. Which of these statements best describes your situation?

*

Please choose **only one** of the following:

- ○ I use many of the products directly, for my operations only.
- ○ I use many of the products for my operations, and I forward information to others after filtering it to appropriate levels of need.
- ○ I use many of the products for my operations, and I forward information to others without filtering it.
- ○ I do not use directly but pass weather information along after filtering it to appropriate levels of need.
- ○ I do not use directly but pass weather information along without filtering it.
- ○ I do not use weather service information directly but receive it from someone else after they have filtered it for me.
- ○ I do not use weather service information directly but receive it from someone else who passes it along unfiltered.

[]

2. The National Weather Service offers a wide array of national and local products and services to inform emergency managers of impending weather. Which of these statements most closely align to your perception about your awareness of the range of products?

*

Please choose **only one** of the following:

- I am fully aware of all the products and services
- I am mostly aware of the products and services
- I am moderately aware of the products and services available to me
- I am somewhat aware of the products and services.
- I am not particularly aware of the products and services

Clear Message Questions

[]

3. It is important that weather information be clear for your understanding. Which of these statements most closely align with your general perception of the CLARITY of the Weather Service's text information?

*

Please choose **only one** of the following:

- ○ The information in the text products is presented clearly for me to understand easily.
- ○ Most of the information in the text products is presented clearly for me to understand.
- ○ Some of the information in the text products is presented clearly for me to understand.
- ○ Little of the information in the text products is presented clearly for me to understand.
- ○ The text products are not clear to me.
- ○ I do not use text products.

[]

4. What recommendations do you have that would improve the clarity of the text products?

Please write your answer here:

[]5. Another form the information is disseminated from the Weather Service is in the form of graphics. Which of these statements most closely align with your general perception of clarity of the weather service graphical information? *

Please choose **only one** of the following:

- ○ The information in the graphical products is presented clearly for me to understand easily.
- ○ Most of the information in the graphical products is presented clearly for me to understand.
- ○ Some of the information in the graphical products is presented clearly for me to understand.
- ○ Little of the information in the graphical products is presented clearly for me to understand.
- ○ The graphical products are not clear to me.
- ○ I do not use graphical products.

[]6. What recommendations do you have that would improve the clarity of the graphical products?

Please write your answer here:

Concise Message Questions

[]7. It is important that weather information be CONCISE (to the point) for your operation needs. Which of these statements most closely align with your general perception of how concise the weather service text information is? *

Please choose **only one** of the following:

- ○ The text products are concise enough for my purposes.
- ○ The text products can be made a little more concise.
- ○ The text products need to be made more concise.
- ○ The text products need to made much more concise.
- ○ The text products are not concise so I don't use them.
- ○ I do not use text products

[]8. What recommendations do you have that would improve the CONCISENESS of the text products?

Please write your answer here:

Consistent Message Questions

[]9. There is an abundance of weather information available through the Weather Service, media, and third party courses. It is important that this information be consistent to avoid confusion and other problems. Which of these statements most closely aligns with your perception of problems caused by inconsistent information? *

Please choose **only one** of the following:

- ○ Inconsistency does not impact my operations.
- ○ Inconsistency sometimes creates problems for me.
- ○ Inconsistency occasionally causes problems for me.
- ○ Inconsistency often creates problem for me.
- ○ Inconsistency usually creates problems for me.

[]10. Does the consistency of information change as an event gets closer or is it about the same? *

Please choose **only one** of the following:

- ○ Gets worse as the event gets closer in time.
- ○ Gets better as the event gets closer in time.
- ○ Stays about the same regardless of time.
- ○ I don't perceive a consistency problem.

[]11. What recommendations do you have that would improve the CONSISTENCY of the weather information?

Please write your answer here:

Message Content & Delivery Questions

[]12. Clarity, Conciseness, and Consistency of information all influence our understanding. If any of these are causing a problem in your understanding the weather and its potential impacts, which of these actions are you likely to take first to improve your understanding? *

Please choose **only one** of the following:

- ○ Spend more time to figure it out from the information you have.
- ○ Watch the TV media to see what they are saying.
- ○ Seek out more information from sources other than TV.
- ○ Call the Weather Service or get on its chat session.
- ○ Seek opinion from someone else other than the Weather Service.
- ○ Other [ ]

[]13. We have heard that EMs need localized information about the event, its timing, location impact, duration, confidence, history, and it must be timely. On a scale of 1 (very well), to 5 (very poorly), how well do the Weather Service products deliver these critical elements? *

Please choose the appropriate response for each item:

	1	2	3	4	5
Event type and size	○	○	○	○	○
Time of event	○	○	○	○	○
Location of the impacts	○	○	○	○	○
Confidence in the information	○	○	○	○	○
Duration of the event	○	○	○	○	○
History of the event	○	○	○	○	○
Timeliness of information	○	○	○	○	○

[]14. This survey is oriented to helping improve weather products and services. As an overall, general measure of message content (not delivery) effectiveness, how would you rank the usefulness of the content you receive for your operations? (1 is extremely useful, 10 is not useful at all). *

Please choose the appropriate response for each item:

	1	2	3	4	5	6	7	8	9	10
Content Usefullness	○	○	○	○	○	○	○	○	○	○

[]15. This survey is oriented to helping improve weather products and services. As an overall, general measure of message delivery (not content) effectiveness, how would you rank the usefulness of delivery for your operations? (1 is extremely useful, 10 is not useful at all). *

Please choose the appropriate response for each item:

	1	2	3	4	5	6	7	8	9	10
Delivery Usefullness	○	○	○	○	○	○	○	○	○	○

Thank you for your time! If you have any questions please contact Jessica Losego at the University of North Carolina at admin@emweather.org.

Submit your survey.
Thank you for completing this survey.

Sample Timing Survey Results

Question 1. The National Weather Service offers a wide array of national and local products and services to inform emergency managers of impending weather. Some emergency managers or support resources use the products and services directly while others have information passed to them. Which of these statements best describes your situation?

Situation	% choosing option
I use many of the products directly, for my operations only	11
I use many of the products for my operations, and I forward information to others after filtering it to appropriate levels of need	59
I use many of the products for my operations, and I forward information to others without filtering it	20
I do not use directly but pass information along after filtering it to appropriate levels of need	3
I do not use directly but pass information along without filtering it	2
I do not use weather service information directly but receive it from someone else after they have filtered it for me	3
I do not use weather service information directly but receive it from someone else who passes it along unfiltered	2

Question 3. It is important that weather information be clear for your understanding. Which of these statements most closely align with your general perception of the CLARITY of the Weather Service's text information?
Question 5. Another form the information is disseminated from the Weather Service is in the form of graphics. Which of these statements most closely align with your general perception of clarity of the weather service graphical information?

Perception	Text: % response	Graphics: % response
The information is presented clearly for me to understand easily	37	47
Most of the information is presented clearly for me to understand	48	42
Some of the information is presented clearly for me to understand	7	7
Little of the information is presented clearly for me to understand	<1	<1
The products are not clear to me	<1	<1
I do not use the products	7	3

Question 9. There is an abundance of weather information available through the Weather Service, media, and third party courses. It is important that this information be consistent to avoid confusion and other problems. Which of these statements most closely aligns with your perception of problems caused by inconsistent information?

Perception	% response
Inconsistency does not impact my operations	14
Inconsistency sometimes creates problems for me	38
Inconsistency occasionally causes problems for me	28
Inconsistency often creates problems for me	11
Inconsistency usually creates problems for me	8

Question 14. This survey is oriented to helping improve weather products and services. As an overall, general measure of message content (not delivery) effectiveness, how would you rank the usefulness of the content you receive for your operations? (1 is extremely useful, 10 is not useful at all).
Question 15. This survey is oriented to helping improve weather products and services. As an overall, general measure of message content (not delivery) effectiveness, how would you rank the usefulness of the content you receive for your operations? (1 is extremely useful, 10 is not useful at all).

Usefulness Score	Content: % response	Delivery: % response
1	38	35
2	33	36
3	15	15
4	4	5
>5	10	9

IBW Effectiveness

Q1 In what state do you work? (Please enter the 2 letter identifier)

Q2 How old are you?
- ❍ Under 30 (1)
- ❍ 30-40 (2)
- ❍ 41-50 (3)
- ❍ 51-60 (4)
- ❍ Older than 60 (5)

Q3 How long have you been in emergency management?
- ❍ Less than 1 year (1)
- ❍ 1-5 years (2)
- ❍ 6-10 years (3)
- ❍ 11-20 years (4)
- ❍ More than 20 years (5)

Q4 How long have you been in your current position?
- ❍ Less than 1 year (1)
- ❍ 1-5 years (2)
- ❍ 6-10 years (3)
- ❍ 11-20 years (4)
- ❍ More than 20 years (5)

Q5 Are you aware of the NWS tornado warning message changes that include Impact Based Warnings (IBW)?
- ❍ Yes (1)
- ❍ No (2)
- ❍ I'm not sure (3)

If No Is Selected, Then Skip To End of Block

Q6 Have you received an Impact Based Warning (IBW) message?
- ❍ Yes (1)
- ❍ No (2)
- ❍ I'm not sure (3)

Q7 How did you first hear about the IBW changes?
- ❍ From the National Weather Service (1)
- ❍ From the media (2)
- ❍ Someone told me (3)
- ❍ Other (please specify) (4) _____

Q8 How well do you think you understand the differences in the levels of risk indicated by the IBW?

- ❍ Very well (1)
- ❍ Moderately well (2)
- ❍ Somewhat (3)
- ❍ Not real sure (4)
- ❍ Not at all (5)

Q9 From what you know about the IBW, which of the following statements applies the MOST to you?

- ❍ It provides me with more useful information than previous warnings did (1)
- ❍ It will make my job easier (2)
- ❍ I have better information to pass along to others (3)
- ❍ I have more confidence in the forecast (4)
- ❍ It won't make much of a difference (5)
- ❍ It will make my job more difficult (6)
- ❍ Other (7) _____

Q10 From what you understand about the IBW, which of the following statements applies the MOST to you?

- ❍ It will help me a great deal (1)
- ❍ It will help me somewhat (2)
- ❍ It might help me (3)
- ❍ It won't help me (4)
- ❍ It won't help me, but might help others (5)
- ❍ It will make my job more difficult (6)
- ❍ Not sure (7)

Q11 How aware do you think your emergency management partners are of the Impact Based Warnings?

- ❍ Very aware (1)
- ❍ Aware (2)
- ❍ Somewhat aware (3)
- ❍ Not at all aware (4)
- ❍ I don't know (5)

Q12 How aware do you think the public is of the Impact Based Warnings?

- ❍ Very aware (1)
- ❍ Aware (2)
- ❍ Somewhat aware (3)
- ❍ Not at all aware (4)
- ❍ I don't know (5)

Q13 Which of these is the MOST effective aspect of the change to Impact Based Warnings?

- ❍ They communicate a better sense of the size of the storm (1)
- ❍ They communicate a better sense of urgency (2)
- ❍ They communicate a better sense of the impacts that may occur (3)
- ❍ They communicate better location and time information (4)
- ❍ They provide a better sense of confidence (5)
- ❍ They communicate the same information, but are easier to digest than previous warnings (6)

Q14 Please choose your level of agreement with the following statementsMessaging should be streamlined as there are too many risk products and communications that need to be assessed before I take action

- ❍ Strongly disagree (1)
- ❍ Disagree (2)
- ❍ Neutral (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)
- ❍ No opinion (6)

Q15 It would be effective if I could combine MY action messages with NWS warning products to streamline and emphasize the hazard and actions that should be taken.

- ❍ Strongly disagree (1)
- ❍ Disagree (2)
- ❍ Neutral (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)
- ❍ No opinion (6)

Q16 To be effective, warning messages need to be based on impacts rather than on hazards associated with a forecast event.

- ❍ Strongly disagree (1)
- ❍ Disagree (2)
- ❍ Neutral (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)
- ❍ No opinion (6)

Q17 To be effective, warning messages need to be non-routine in order to catch attention and prompt action.

- ❍ Strongly disagree (1)
- ❍ Disagree (2)
- ❍ Neutral (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)
- ❍ No opinion (6)

Q18 Using tiering of threat/risk (e.g., 1-5, colors, enhanced words) is an effective way to convey an elevated sense of risk and/or urgency.

- ❍ Strongly disagree (1)
- ❍ Disagree (2)
- ❍ Neutral (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)
- ❍ No opinion (6)

Q19 Using threat tags such as "considerable" and "catastrophic" is an effective way to communicate an elevated sense of risk and/or urgency.

- ❍ Strongly disagree (1)
- ❍ Disagree (2)
- ❍ Neutral (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)
- ❍ No opinion (6)

Q20 Using threat tags such as "considerable" and "catastrophic" will likely lead to public complacency when there is no tag.

- ❍ Strongly disagree (1)
- ❍ Disagree (2)
- ❍ Neutral (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)
- ❍ No opinion (6)

Q21 Using threat tags such as "considerable" and "catastrophic" will help the public understand the urgency of taking actions.

- ❍ Strongly disagree (1)
- ❍ Disagree (2)
- ❍ Neutral (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)
- ❍ No opinion (6)

Q22 Warning products need to be easier for non-meteorologists to understand.

- ❍ Strongly disagree (1)
- ❍ Disagree (2)
- ❍ Neutral (3)
- ❍ Agree (4)
- ❍ Strongly agree (5)
- ❍ No Opinion (6)

Q23 Which of these statements aligns MOST closely to your role with respect to warning messages?

- ❍ I use warning messages for my organization's actions only (1)
- ❍ I use warning messages and pass them along to others (2)
- ❍ I primarily pass warning messages along to others (3)
- ❍ I do not use warning messages directly. (4)

Q24 Improvements in warning messages are always being explored. Which TWO of these issues are the most important to consider in making changes?

- ❑ Messages are too long to digest and understand (1)
- ❑ More precise resolution of time and location is needed (2)
- ❑ Messages are too technical to understand (3)
- ❑ Too many messages/products require our precious time to assess (4)
- ❑ Capabilities are falling behind local emerging technologies (5)
- ❑ Messages don't convey urgency well enough (6)
- ❑ Messages are not timely enough (7)
- ❑ There are too many false alarms (8)

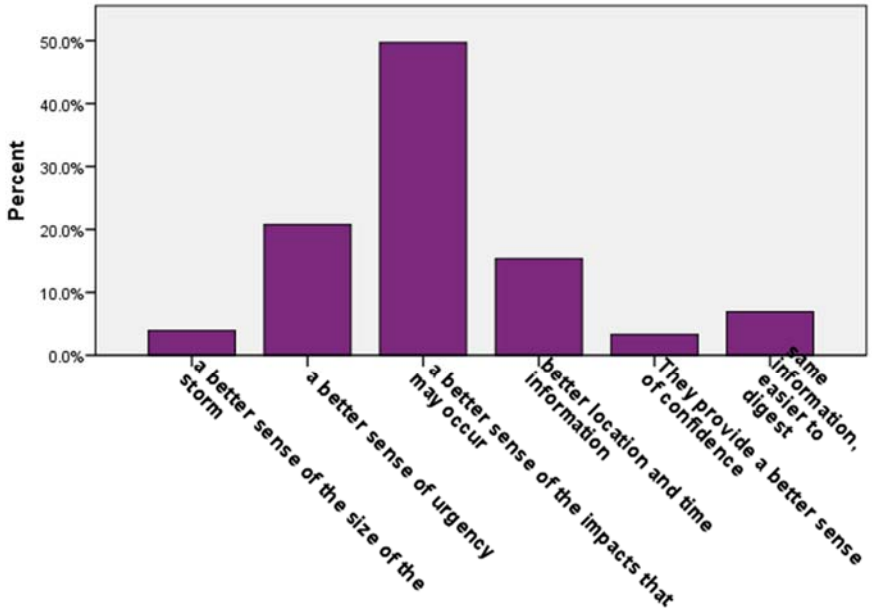
Q25 Given the improvement in providing levels of storms and associated potential impacts, which statement MOST closely represents your opinion of Impact Based Warnings?

- ❍ They will help me with my operational decisions (1)
- ❍ They are on the right track and help somewhat with decisions (2)
- ❍ I can see how it might help, but I have no experience to know for sure (3)
- ❍ I don't think they will help much (4)
- ❍ I think they may be a detriment compared to the traditional warning (5)

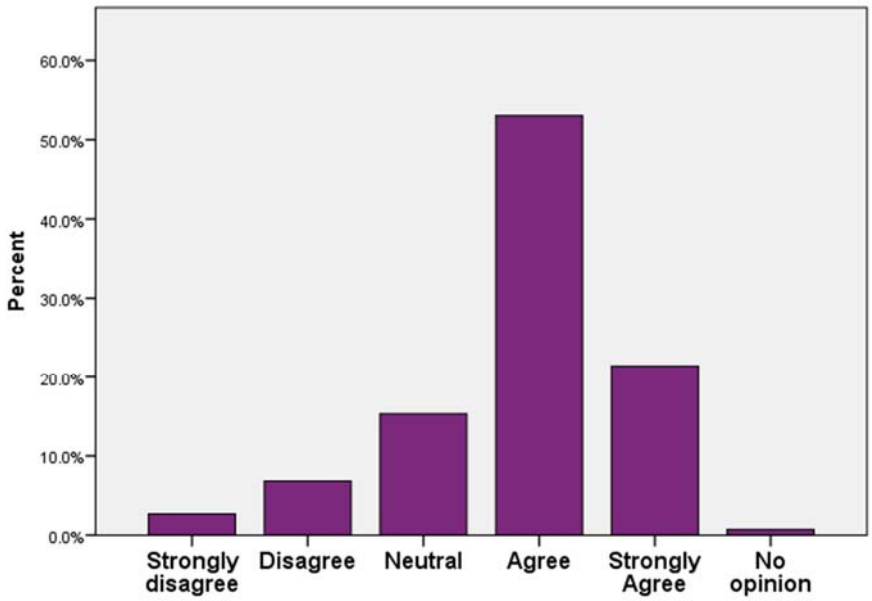
Q26 Which of the following hypothetical product or service improvements would be the MOST effective for you and your operations?

- ❍ A continuous video briefing where I can understand what the forecaster is thinking (1)
- ❍ An online product that continuously shows the current storm and projected path and timings (2)
- ❍ Consistent messages that are multi-formatted to reach more people such as on PA systems, text, web, mobile/smart phone, radio and other modes of communications (3)
- ❍ Something else (please specify) (4) _____

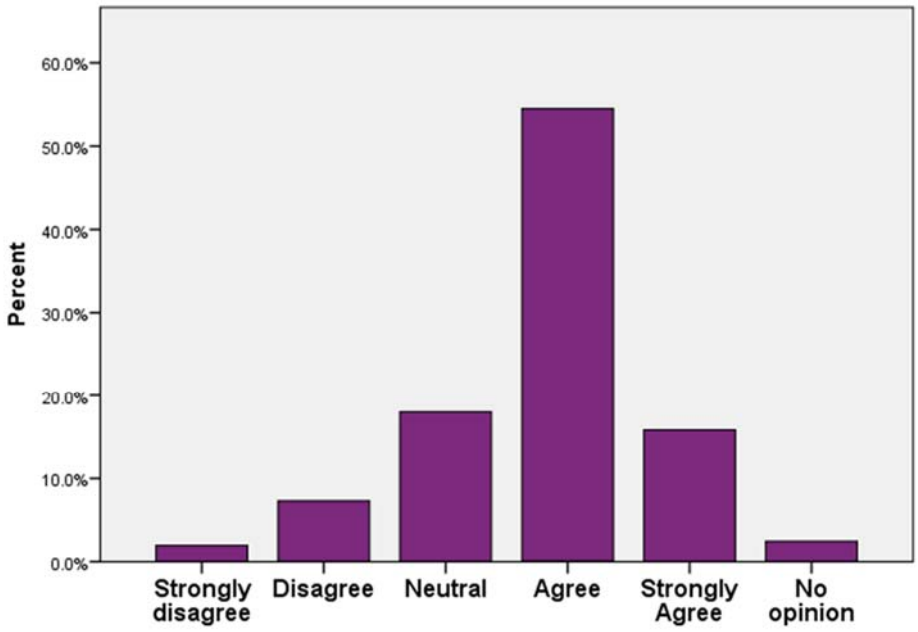
IBW Effectiveness Survey – Example Results



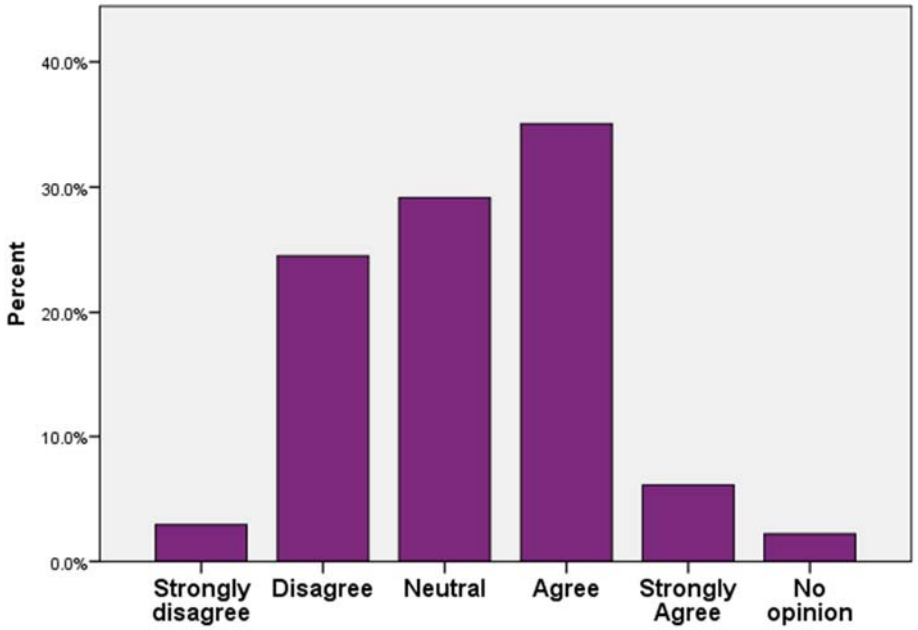
Which of these is the MOST effective aspect of the change to Impact Based Warnings? They communicate...



Using threat tags such as "considerable" and "catastrophic" is an effective way to communicate an elevated sense of risk and urgency



Using threat tags such as "considerable" and "catastrophic" will help the public understand the urgency of taking actions



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