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An Assessment of the Relationship of Online Technical Resources Developed by The National Weather Service (NWS) and United State Geological Survey (USGS) and the Analysis of Their Usage by Kentucky Emergency Managers during Preparedness, Response, Recovery, and Mitigation

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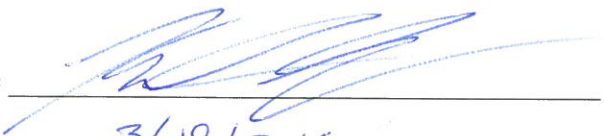
Signature 

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Dedication

This thesis is dedicated to my parents Keith Joy Sr. and Bridget Joy. It is also dedicated to my brother Mckenzie Joy and sister Keila Joy. It is dedicated to my future children and the mother of my first born, Teresa Mcfadden. I love you all. I want to also dedicate this to all those who have helped me throughout the years from Cedar Bluff in Knoxville to Chattanooga and Memphis, Tennessee.

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Abstract

Emergency management tasks are essentially uncertain. They require information sharing and quick decision making that incorporates coordination across a vast array of individuals and organizations. During an emergency, communication is key during all four phases of the emergency management process; preparedness, response, recovery, mitigation. In order to communicate effectively and systematically with the incident management team, emergency managers must establish situational awareness during a disaster. Obtaining optimal situational awareness requires emergency managers to use an assortment of technologies in order to relay the most accurate information in real time. The focus of this research is on those technologies and the analysis of their usage by Kentucky emergency managers during preparedness, response, recovery, and mitigation.

This research uses both qualitative and quantitative methodology to analyze the trends observed between Kentucky emergency managers and online technical resources used to assist them in establishing situational awareness during weather events. The research looks at 10 different technologies developed by two top government science agencies. National Weather Service (NWS) and United States Geological Survey (USGS). This research will take into account the county emergency manager's years of experience, county disaster number, and county population to determine areas where a relationship exists between the technology and the county attributes. Implications for research as well as direction for future research will be discussed.

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CHAPTER I

INTRODUCTION

Record tornado outbreaks, record flooding of the Mississippi River, intense summer heat coupled with devastating droughts in the Midwest; these were all natural disasters in 2011 and 2012 that affected many lives in Kentucky. Since the research is limited to technology intended to establish situational awareness during hydrometorological events, the study will use the definition of *natural disaster* presented in Piers Blaike's publishing "At Risk: Natural Hazards, People's Vulnerability and Disasters." A *natural disaster* is, ″the consequence or effect of a natural, hazardous event, occurring when human activities and natural phenomenon (a physical event, such as a volcanic eruption, earthquake, hurricane, tsunami, landslide, etc.) become enmeshed (Blaikie, 1994).″ Our preparedness abilities must be congruent with the technological age we live in to achieve the greatest results of public safety. This leads to the underlying research question; "Are there trends that exist between Kentucky Emergency Managers and their knowledge of technologies recommended to them by the USGS and NWS?"

The Disaster Declaration webpage under the FEMA website is used to observe the state and county disaster declarations that required federal assistance (FEMA, 2014). Tallying the number of disasters requiring federal assistance in Kentucky over the past 5 years (2008-2013), we see there were 380 disasters over the 120 counties in Kentucky. One of the reasons this research is being conducted is an interest, by the researcher, in emergency response after the March 2, 2012, tornado outbreak in Kentucky. March 2, 2012, was the largest tornado outbreak on record in the U.S. during the month of March.

It is also the worst tornado outbreak in Kentucky in over three decades. There were over 39 deaths in the U.S. with 19 of those being in Kentucky. Millions of dollars in damages were reported in mountain cities that haven't seen a tornado in their recorded history. This reason, along with other weather hazards that affect Kentucky, is why emergency managers need to possess a working knowledge of available technology they have at their disposal. Technology will help assist them in predicting areas that will be affected the most by weather emergencies. With this knowledge, emergency managers will be better-prepared to establish situational awareness.

Problem

In order to make the most prudent decisions during weather or flood emergencies, emergency managers need to have basic knowledge of online resources recommended to them by two government science agencies (National Weather Service and U.S. Geological Survey). Also, other attributes such as an emergency manager's years of experience, county population and the number of county disaster declarations could have an impact on an emergency manager's awareness of certain technology. For example, if an emergency manager has a low number of disaster declaration in his county he might be less inclined to research certain technologies that will help him prepare for weather emergencies. This could impair the emergency manager's judgment in making the best decisions possible for public safety. Emergency managers can gain greater accuracy in planning, warning, and preparing for a weather or flood situation if they can utilize the technologies available to them. If an emergency manager does not have a working knowledge of online technologies available, this could cause a delay or an inaccurate assessment of the area of greatest concern.

Emergency managers are responsible for planning and responding to people in vulnerable areas as well as non-vulnerable areas. The NWS and USGS have recommended certain technologies that Kentucky emergency managers should be aware of, and have proper training with, to assist them in establishing situational awareness (Cavallucci, 2012; Griffin, 2012). There are not sufficient data to show that Kentucky emergency managers possess a working knowledge and awareness of the technologies recommended by these agencies. This research addresses selected technologies recommended by these agencies.

Research Question

This research project will answer the primary question: "Are there trends that exist between Kentucky emergency managers and their knowledge of technologies recommended to them by the USGS and NWS?" The research conducted will attempt to answer the question," Do county attributes such as; county population, number of county disaster declarations, and county emergency managers' years of experience have an effect on the knowledge emergency managers have about the tools being researched?" This should result in better knowledge towards warning of the public and equipping the emergency managers in the disaster response process. Moreover the primary question will explore:

- Selected online resources recommended by the USGS and NWS developed to assist Emergency Managers,
- Kentucky county emergency managers' awareness of each technology,
- How often they use the resources,

- The helpfulness of the resources in assisting emergency managers with establishing situational awareness,
- The helpfulness of the resources in answering questions brought up by city officials.

Target Audience

The audience for this research will consist mostly of federal, state, and local emergency managers, especially throughout Kentucky. Since interviews will be conducted with county emergency management directors, the audience is largely public sector. The two science agencies used in the research (USGS and NWS) are also among the audience addressed in the research. The audience will also consist of scientists at the National Weather Service and the U.S. Geological Survey who provide these online technologies for public safety purposes

Purpose of the Research

The purpose of this research is to study if an emergency manager's attributes have an effect on the awareness they have of online resources created to assist them in weather hazards. This study was chosen because after the deadly March 2, 2012, tornado outbreak in Kentucky, research was conducted by the author to determine if emergency managers had sufficient knowledge of online technology available to them. There was no research that suggested Kentucky emergency managers had knowledge of the online resources. The knowledge derived may also have a general application to emergency management in other states and commonwealths. Additionally, the purpose of this research is to show the areas in Kentucky that are the most vulnerable to weather or flood emergencies.

Hypothesis

A hypothesis is a tentative assumption made in order to draw out and test its logical or empirical consequences. It can be stated as a testable “if and then” statement”. The main hypothesis researched in this thesis is

- “If there are differences in county attributes/emergency manager attributes, then trends should appear amongst their knowledge and usage of these technologies.”

This hypothesis was chosen to observe strengths and weaknesses based trends of Kentucky emergency manager attributes.

Research Modeling

As a result of testing this hypothesis, a research model was developed depicting how the data can be expressed as a schematic. "Successful modeling simplifies reality down to its essentials without losing credibility" (Alexander, 2002, 41). The simplest model contains no details and merely connects inputs with outputs (Alexander, 2002). The research model developed in this thesis is based on a cause input leading to an effect output. This model was created because the data collected from the survey demonstrated relationships between the attributes and the statistical results.

Research Assumptions

There are a variety of assumptions that are in place when discussing an emergency manager's task of warning the public. The emergency manager’s job is to work with different organizations as part of the incident management team. Emergency

managers work with many offices including public works, public health, public non-profits, private non-profits, National Guard, etc. An emergency manager is the Emergency Operations Center coordinator of emergency actions. An emergency can occur at any time of the day or night with little or no warning. An emergency or disaster may be declared if information indicates that such conditions are developing or probable.

Limitations of the Research

A limitation of this research is that data collection from the emergency managers is purely voluntary. Therefore, there are populations that will agree to do the survey and those that will not agree to do the survey. Emergency managers have stringent day-to-day tasks. For this research, there were 39 responses from 120 counties, or about 33 percent. A majority of the emergency manager's counties are adjacent or near rivers, streams, or lakes.

Thesis Organization

This thesis conforms to the Eastern Kentucky University Graduate School thesis and APA guidelines on organization (Eastern Kentucky University, 2012). The structure of the thesis will be organized first by presenting the Introduction chapter. Next, a review of literature related to the subject will be provided. Then, the Methodology chapter will describe the context of the study, the selection of participants, the research questions, the data-collection methods, the data-analysis methods, and the issues or biases. The Analysis and Results chapter will analyze the survey to observe trends between attributes and emergency management knowledge of the technology. The discussion and Implications chapter will give an overall summary of the study, the researcher's

interpretations of the study, and the future impact of this study. The Bibliography will cite the sources used for the research and data in this thesis.

CHAPTER II

REVIEW OF LITERATURE

Definition of Situational Awareness

The U.S. Coast Guard Office of Auxiliary and Boating Safety provides an accurate description of situational awareness in the Coast Guard's Team Training Coordination Manual. The training manual describes *situational awareness* as; "the ability to identify, process, and comprehend the critical elements of information about what is happening to the team with regards to the mission. More simply, it's knowing what is going on around you" (Team coordination training, 2004). For this research's purpose, we shall use this description as it provides a very thorough meaning for the term *situational awareness*. This research focuses on the knowledge Kentucky emergency managers have of 11 weather technologies created by the USGS and the NWS to establish situational awareness.

The Warning System

To understand the relationship between the research agencies who develop these technology providers and the technology users we must first look at the processes of having a warning system. A warning system consists of; "gathering information about an impending emergency, communicating that information to those who need it, and facilitating good decisions and timely response in a disaster" (Mileti & Sorensen, 1990, 2-1). Studies show that variations in the structure of the warning system can alter its effectiveness. Researchers found the most effective warning system is an integrative system composed of three subsections.

- The Detection Subsystem:
    - “This subsystem focuses on the relatively routine monitoring of the natural, technological, and civil environments that could induce an emergency"(Mileti & Sorensen, 1990 2-1). These organizations, gather, test, and analyze environmental information based on historical and natural conditions. They gather this information in order to create technologies that will assist emergency managers with planning for, responding to, warning against, and mitigating weather emergencies.
- The Management Subsystem:
    - "After receiving information from the detection subsystem, managers must interpret that information in terms of potential losses (e.g. loss of life and property). They must decide if the risk warrants a “public warning" (Mileti & Sorensen, 1990, 2-1). The management subsystem is typically the domain of local government.
- The Response Subsystem:
    - The response subsystem is important when information being received by the emergency manager is delivered to the public. "People respond to warnings received from the management subsystem on the basis of their own interpretations that might differ from that of the managers" (Mileti & Sorensen, 1990, 2-1).

Emergency Management and Technology

Emergency managers need technology in order to assist with establishing situational awareness during weather or flood emergencies. When discussing technology's role in emergency management, Hurricane Katrina is a disaster that emergency managers must reference. “Even with the creation of the National Incident Management System (NIMS) and the National Response Framework (NRF), emergency managers and the various incident management teams had major problems in coordinating their response during Katrina” (Rose-Smith, 2012, p. 2). Effective knowledge of the different technologies might have provided a better outcome in the Gulf of Mexico area.

Developing Situational Awareness and Common Operating Picture (COP)

The common operating picture (COP) must be established in order to create effective situational awareness. "A true COP requires that data be not only gathered, but shared. It further requires the data to be filtered, analyzed, and verified to become actionable information" (Irias, 2010). The study: "Action and Information Networks in Disaster Management” by Robert Lee Skertich, describes the planned, reported, perceived and desired (PRPD) networks in emergency management response operations. The study also describes the information needs of the emergency manager during a disaster to build an effective COP. Through the identification of the PRPD networks, emergency managers can; "revise, train, and exercise with technology to create more effective networks for subsequent operations" (Skertich, 2008, p. 5). The study analyzes the social networks in which emergency managers obtain and share information within

natural, social, and built environments affected by a disaster (Skertich, 2008, p. 30). The study identifies commonalities between local emergency managers in order to assess their knowledge of the technical resources developed by the science agencies. The data found that trends exist between the personal attributes of the emergency managers and the use of technological networks in disaster management.

Information Technology in Emergency Management and Public Health

History has shown us that technologies in the emergency management system are pivotal in the communication networks during a disaster. Information Technology (IT) Management in Local Health Departments (LHD): Implications for Emergency Preparedness by Yvonne Claudio, discusses an event in which IT systems failed thus causing a lack of information sharing during September 11, 2001. The research was created to better understand existing challenges and progress made thus far in developing the IT emergency management infrastructure (Claudio, 2008). The study uses the response during September 11, 2001, and the Anthrax incidents that followed to show how the lack of IT capabilities leads to failures in responses to public emergencies. The findings from the research suggest that work is still needed to effectively establish a relevant IT and communication in emergency responses (Claudio, 2008). Inadequate funding, training, and staff to perform the IT functions were among the negative feedback found in the study's public health survey (Claudio, 2008).

Complexity of Coordination

Coordination is very important when establishing situational awareness**.** "The lack of precise information leads to moderate structuring of problems" (Dunn, 2004).

Managers forced into decisions under conditions of uncertainty lead to response operations that are not optimally efficient or effective. "Emergency managers have unnecessarily been victims of this uncertainty; bits of valuable data existed and unfortunately may have been kept from the decision makers, not by avarice, but simply by someone holding the information who didn't realize that it was important to pass along" (Skertich, 2008, 2). As the number of people involved with the disaster grows the complexity of communication progresses as well. Establishing situational awareness means that everyone needs to be on one page. "Situational awareness is difficult to achieve in networks where technical information for effective orientation and decision is unavailable "(Skertich, 2008, 5)**.**

News Media's Importance in Emergency Management

Technology assists emergency managers with delivering precise information to the public. Emergency managers must gather the most accurate components during a disaster while conducting and managing various responders out in the field. However, they have an even greater responsibility to establish a (COP) and deliver the facts to the public (Schneid & Collins, 2000). This is important because there are various factors that are important to realize when public information is being delivered from one source to another. The emergency manager needs to realize that "facts and truth of the situation are often lost in the shuffle of delivering accurate information over the news to the public" (Schneid & Collins, 2000). Therefore, the emergency manager needs to have all the truth and facts to make prudent decisions. The information acquired may be slanted or otherwise editorialized.

The Importance of Real-Time Technology

Real-time sensor technologies intended to warn the public in real time are important because Kentucky has 90,000 miles of streams which means it has the most expansive stream systems in the nation (The Nature Conservancy, 2013). “Kentucky has both the largest artificial lake east of the Mississippi River in water volume (Lake Cumberland) and surface area (Kentucky Lake)” (The Nature Conservancy, 2013). It is the only U.S. state to be bordered on three sides by rivers, and it’s major internal rivers include the Kentucky River, Tennessee River, Cumberland River, Green River and Licking River. In 2011, floods caused seven fatalities and more than five million dollars’ worth of damage in Kentucky. Stream gage sensors and water level communication technologies need to be thoroughly understood by emergency managers because of the many bodies of water that pose a threat from flooding to Kentucky's population. With response personnel receiving this knowledge in real time, response towards a change in water quality or level can occur accurately. The following are examples of real-time technologies used in this research.

Real-Time Technology- USGS WaterAlert

“WaterAlert sends out an e-mail or text (SMS) messages when certain parameters, as measured by USGS real-time data-collection stations, exceed user-definable limits" (waterdata.usgs.gov). Parameters measured by the USGS include: water level elevations, water quality chemical parameters, and precipitation. The user will specify the certain limit to which a signal will be sent to the phone to alert when capacity or over capacity has been reached (waterdata.usgs.gov).

Real-Time Technology- iNWS

Another tool that can assist the emergency manager in warning the public in real time is InteractiveNWS (iNWS). This application suite allows National Weather Service (NWS) partners to receive National Weather Service products in new and innovative ways. These ways include text messaging, emails, and mobile-enabled web pages. “iNWS strives to fulfill our mission of protecting life and property by using new technology to reach out to our customers" (iNWS).

NOAA Weather Prediction Center

The NOAA Weather Prediction Center (WPC) is a leader in the collaborative weather forecast process delivering responsive, accurate, and reliable national forecasts and analyses. The WPC website (http://www.hpc.ncep.noaa.gov/) provides information and data that can be very useful to emergency managers. The website provides forecasts of various weather events that take place in the United States including; winter weather, excessive rainfall, short range forecast, surface analysis, etc. This can be a very useful tool for emergency managers to help them accurately prepare for and warn the public for weather events taking place in their area.

Importance of Social Media

Webster Dictionary defines social media as, "a form of electronic communication through which users create online communities to share information, ideas, personal messages, and other content (as videos)." Facebook is an example of a social media website. The Weather Channel, news outlets, and government emergency response agencies all have social media meant to keep the public informed about emergency-

related events. It allows people to instantly share pictures, photographs, videos, and announcements about real time events happening in their area and around the world. This can provide emergency managers the information they need in order to warn the public of a natural or manmade event and allocate the proper resources to respond to events in the field.

Anthony Cavallucci, Warning Coordination Meteorologist at the National Weather Service in Morristown, TN, said during an interview on September 4, 2012 that social media was one of their most important tools. Social media sites help emergency managers warn the public that oncoming disasters are prone to affect a certain area. It can also help the emergency manager stay informed on the severity of the event, and where assistance is needed the most. For example, in the 2011 tsunami that struck the northern provinces of Japan, social media sites became a major outlet for communication. Countless survivors shared what they witnessed through their own personal posts, pictures, and videos. During the March 2, 2012, tornado outbreak in Kentucky hundreds of videos, pictures, and comments were uploaded to various news channels social media sites as events were unfolding. "Social media was used both to gather and disseminate information. This resulted in a more complete picture for citizens and officials alike," said Toby Harmsel, IT Officer for the NWS in Louisville (Puckett, 2012). Chad Hinton, a worker at Heartland Pavement Systems in Jefferson Co. Indiana, uploaded pictures and videos of a massive funnel cloud near his home in Borden, IN, to social media (Puckett, 2012). Within 15 minutes Chad was receiving calls from international media community requesting interviews of his experiences (Puckett, 2012).

Summary

Most of the previous research dealing with technologies and emergency management dealt with the importance of the adoption of information technology into general emergency management infrastructure. This research focuses on emergency management attributes and if the attributes affect the knowledge emergency managers have of specific online resources. Awareness of these online resources by local emergency managers will increase the impact technology has on planning, preparedness, response, recovery, and mitigation.

CHAPTER III

METHODOLOGY

Design and Sample

This observational study was conducted by surveying county emergency managers in the state of Kentucky. A Google Documents electronic survey was developed and distributed to all 120 county emergency managers via email from the President of the Kentucky Emergency Management Association (KEMA) as an attachment to the monthly association newsletter. A follow-up reminder email was sent one week later to all 120 county emergency managers. The following week, phone calls were made to attempt to collect data from county emergency managers that had not completed the survey. Emergency manager participation was voluntary; 39 of the 120 emergency managers participated.

*In Appendix A, if an emergency manager did not answer one of the questions or answered "no" for the first question then their response was excluded from analysis.

Data Collection

Information regarding emergency managers' knowledge and use of the following11 online weather technologies was collected via electronic survey:

- WebEOC Professional Version
- NWS Chat
- USGS WaterWatch
- USGS WaterAlert

- National Weather Service (NWS) website
- NOAA- Interactive NWS (iNWS)
- NOAA Storm Prediction Center
- NOAA Weather Prediction Center
- Social Media
- EAS Weather Radio
- NOAA Spot Forecast Request

The technologies in question have been developed and used by the United States Geological Survey (USGS) and the National Weather Service (NWS) to inform emergency managers (and public) about natural hazards. All of the technologies can be accessed from any computer with a working internet connection. Responses from the 39 participating emergency managers were collected in Google Documents and converted to Microsoft Excel for data storage. For each of the 11 technologies, emergency managers were asked the following questions:

- Have you heard of the researched technology?
- If so, how often do you use the technology?
- How helpful has the technology been to you in establishing your situational awareness during weather events?

- Is the technology helpful in answering questions brought up by city officials?
- Are the guidance and directions using the technology easy to understand?
- Is there anything you would add or change to the technology to make it more beneficial or helpful to you?

In addition to these questions, emergency managers were also asked to provide their gender, education, years of experience as an emergency manager, and status of employment (full time/part time/volunteer). For each participating county, county population was determined from the U.S. Census Bureau and the number of county disaster declarations from FEMA.

Data Analysis

Data were summarized using descriptive statistics, primarily frequency distributions. Predictors of emergency managers' knowledge about the different technologies were determined using logistic regression; the Hosmer-Lemeshow test was used to assess the fit of the model to the data. Data analysis was performed using SAS 9.2 for Windows (SAS Institute, Inc., Cary, NC, USA); an alpha level of .05 was used throughout. The statistical results could then be interpreted to answer the research question and test the hypothesis.

Biases

All research testing hypotheses will be fully objective and will be limited in opinion. However, the research results are based on a voluntary response sample which

might produce some bias. Emergency management is a very critical endeavor that requires accurate and sound decisions to protect public safety. Emergency managers should have knowledge of the technologies and online resources available to them to achieve the greatest situational awareness for decision-making during an emergency.

CHAPTER IV

RESULTS

The majority of the sample (responders) was male, had at least some college, and worked as a full time county emergency manager (Table 1). The dependent variable of the logistic regression models was determined by the question "Have you heard of (the specific technology)." Potential predictors included the county emergency manager's years of experience, number of county disaster declarations, and county population. A logistic model was used to analyze predictors of the emergency manager's knowledge of the 11 technologies separately; however, only models for the two technologies with significant predictors are presented here (Table 2). The Hosmer-Lemeshow lack of fit test was not significant for any of the models suggesting that the models fit the data well.

Table 1. Demographics of County Emergency Managers (N=39)

Variable		n (%)
Gender		
Male		36 (92.3%)
Female		3 (7.7%)
Education		
High School		6 (15.4%)
Some College		16 (41.0%)
Associate's degree or vocational school		8 (20.5%)
Bachelor's degree		7 (18.0%)
Graduate degree		2 (5.1%)
EM Years' Experience		
1-10 years		7 (17.9%)

Table 1 (continued)

11-20 years		6 (15.3%)
21-30 years		15 (38.4%)
31-40 years 41-50 years		9 (23.0%) 2 (0.5)

The research model uses logistic regression. Our outcome must be a two-category variable; in this case, either the emergency managers know about the technology or they don't know about the technology. The research examines which of these 3 independent variables (county population, emergency manager's years of experience, and county disaster declarations) might be potential predictors of whether an emergency manager would know about these technologies.

NOAA Weather Prediction Center

The NOAA Weather Prediction Center (WPC) shows significance between the county disaster declaration and the emergency manager's awareness of the technology. Among the 39 counties that participated in the survey, 38 counties indicated they have heard of WPC. For WPC the number of county disaster declarations is significant because the p-value (.04) is less than .05. This means disaster declaration numbers are a predictor of emergency manager's knowledge of WPC. Therefore, we take the difference between 1 and the odds ratio .47, which is 53%. For every additional disaster, the emergency manager is 53% less likely to know about WPC. As disaster declaration numbers increases the emergency managers are less likely to know about WPC.

USGS WaterAlert

The USGS WaterAlert shows significance between the county population and the emergency manager's knowledge of the technology. For USGS WaterAlert, county population is significant because the p-value (.02) is less than .05. This means county population is a predictor of emergency manager's knowledge of USGS WaterAlert. Therefore, we take the difference between 1 and the odds ratio .96, which is 4%. As the population increases by 1000 the emergency managers are 4% less likely to know about USGS WaterAlert. So the more populated counties are less likely to know USGS WaterAlert. The indicated result seems counterintuitive, but results will be explained later in the thesis.

Table 2. Logistic Regression of Emergency Manager's knowledge of technologies (N=39)

Technology Predictors	Odds Ratio	95% Confidence Interval for Odds Ratio	*p*-value
WPC (n=38)			
EM years' experience	0.95	(0.85-1.07)	.4
Number of county disaster declarations	0.47	(0.23-0.95)	.04
County population (per 1000)	0.98	(0.95-1.01)	.1
USGS WaterAlert (n=37)			
EM years' experience	1.00	(0.87-1.15)	.9
Number of county disaster declarations	0.56	(0.24-1.30)	.2
County population (per 1000)	0.96	(0.93-0.99)	.02

CHAPTER V

DISCUSSION

According to the results, there is an association between the emergency manager's knowledge of technologies and attributes of the emergency manager. The research suggests that there needs to be better communication between emergency managers and science agencies regarding the development and application of new technologies. The research also shows the most populated of these counties lack the necessary knowledge of these certain tools which could be detrimental to public safety. While interviewing county emergency managers at the 2014 Kentucky Emergency Services Conference (KESC) the conclusion was made that larger counties in the state simply rely on the NWS for all of their information and this information comes to them automatically through their mobile devices. Therefore, they know little about the technology. This may happen more and more as technologies become more automatic and user friendly. This is leading to larger counties simply being unaware of the details and the natures of these recommended technologies. Emergency managers in more populated counties are usually much busier during a disaster and therefore don't have time to study or understand the details of the sources of the findings coming from these different technologies. Therefore, the reliance of watches/warnings/advisories sent only by the NWS is leading to the increase in population being less aware of the sources of the recommended technologies. Also, emergency managers in the larger counties have a better chance of being political appointees and thereby have little to no learned knowledge of the subject.

Model

Emergency managers use the information/data provided by the technologies, but are not particularly familiar with the details of the technology because of the automatic and user-friendly nature of the technology.

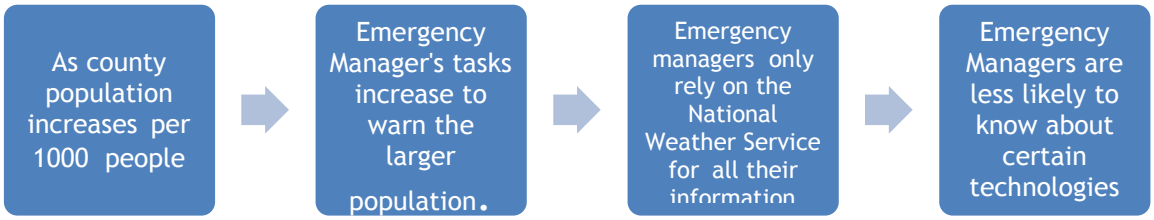


Figure 1. Model of EM Situational Awareness

The six most populated counties in Kentucky all have major bodies of water that border or go through the county. Both of these technologies were developed to assist emergency managers with the threat of weather and/or flood. All but six counties in Kentucky (Jackson, Rockcastle, Laurel, Metcalfe, Powell, Shelby) are near or close to sources of water. The science agencies need to focus on introducing these technologies to emergency management in the most populated counties of the state.

As disaster declarations increase emergency managers are 4% less likely to know about WPC. Therefore, a concept can be proposed, that the lack of knowledge emergency managers have of WPC could be leading to increased disaster consequences. The smaller populated counties of Kentucky are geographically located near major bodies of water. The lack of knowledge about a major hydrometorological observation system like WPC is leading to a rise in smaller county disaster declarations. The NWS should observe the

survey as a whole in order to reach out to all county emergency managers within the state to assist them in establishing situational awareness about WPC.

As county population increases by 1000 the emergency managers are 4% less likely to know about USGS WaterAlert. There are several reasons this might seems counter intuitive. As said previously, the reliance on watches/warnings/advisories only sent by the NWS is leading to the increase in population being less aware of recommended technologies. USGS WaterAlert was developed in 2010. At the time of this survey, the program was only three years old with constant program updating to make the readings more accurate. This coupled with a lack of information sharing between the USGS and emergency managers in large cities in Kentucky may have led to the results of the data. The survey showed that only about 25% of the emergency managers knew Water Alert existed. This product is free to emergency managers. This could be detrimental as major population hubs of Kentucky, such as the Ohio River counties, exist closest to bodies of water. Better communication between emergency managers of larger populated counties and the USGS is needed to improve through enhanced knowledge of the public safety technologies.

CHAPTER VI

CONCLUSION

The following data from the survey were used, gathered, and tabled in order to grant the analysis the most accurate readings possible. The research conducted answered the primary research question, “Are there trends that exist between Kentucky emergency managers and their knowledge of technologies recommended to them by the USGS and NWS?" The research also answered the question," Do county attributes such as; county population, county disaster declarations, and county emergency manager's years of experience have an effect on the knowledge emergency managers have of the online resources being researched. Through the research conducted we clearly see that certain parameters do, in fact, have an effect of emergency manager's knowledge of certain technologies. Two analytical results were counterintuitive, requiring interpretation by emergency managers from larger counties in Kentucky. The USGS WaterAlert showed significance between the county population and the emergency manager's knowledge of the technology. The NWS Weather Prediction Center website (WPC) showed significance between the number of Federal disaster declarations and the emergency manager's knowledge of the technology. Interpretations made by emergency managers during the 2014 Kentucky Emergency Services Conference concluded that, emergency managers in more populated counties are usually much busier during a disaster and, therefore, don’t have time to study findings by different technologies. Therefore, the reliance of watches/warnings/advisories only sent by the NWS is leading to the increase in population being less aware of recommended technologies. The knowledge from this

study will be used to assist Kentucky Emergency Managers with displaying areas of technological awareness of strengths and weaknesses.

Future Research

Future research needs to be conducted on proper and effective ways of training emergency managers to use the technologies created to assist them in a disaster. Future research will treat a more comprehensive listing of the online technologies. This present thesis deals with a selected group of these technologies. Emergency managers work in an environment of rapidly increasing technology. Considering that Kentucky has 120 counties, it is difficult for science agencies to meet the technology awareness needs statewide. Assistance from the Kentucky Division of Emergency Management (KYEM) and their statewide networking could prove helpful. Further research should be conducted to show which technologies will benefit certain areas rather than others. More thorough, or complete, survey results (statewide) will provide more accurate results. Additionally, research conducted in neighboring states should be done for comparative purposes.

REFERENCES

Alexander, D. (2002). Principles of Emergency Planning and Management. (p. 41). Hertfordshire, England: Terra Publishing. Retrieved from http://books.google.com/books?id=iLqMSDgecHQC&pg=PA41&lpg=PA41&dq=black box model in emergency management&source=bl&ots=_UrntY41L-&sig=dDT-22hyCYUOm2YNqlmlTNwpb_0&hl=en&sa=X&ei=lDadUZSPGKaDywHEvYHICw&ved=0CFEQ6AEwBA

Blaikie, P. (1994). At Risk: Natural Hazards, People's Vulnerability and Disasters. Routledge.

Brown, A. (2012). Importance of Communication in Disaster Management. Retrieved from http://www.ehow.com/about_6726625_importance-communication-disaster-management.html

Cavallucci, A. (2012, September 04). Interview by K Joy [Personal Interview]. Technologies recommended by the NOAA for emergency managers.

Claudio, Y. (2008). Information Technology Management in Local Health Departments: Implications for Emergency Preparedness. University of Maryland University College). ProQuest Dissertations and Theses, , 265-n/a. Retrieved from http://search.proquest.com/docview/304822065?accountid=10628. (304822065).

Dunn, W. N. (2004). Public policy analysis: an introduction (3rd ed). Upper Saddle River, NJ::Pearson Prentiss Hall.

Eastern Kentucky University. (2012). Guide to the preparation of theses, specialist projects and doctoral disserttation. Informally published manuscript, Graduate School, Eastern Kentucky University, Richmond, KY, . Retrieved from http://gradschool.eku.edu/sites/gradschool.eku.edu/files/files/student_forms/thesis_guidelines_Sept2012 .pdf

FEMA. (n.d.). Social Media in Emergency Management. Retrieved from http://emilms.fema.gov/is42/BPSM0105000.htm

FEMA. (2014). Disaster Declarations. Retrieved from https://www.fema.gov/disasters

Griffin, M. (2012, October 22). Interview by K Joy [Personal Interview]. Interview with USGS-Louisville about Technologies Recommended for Emergency Managers.

INWS - Interactive NWS. (n.d.). Retrieved from http://inws.wrh.noaa.gov/

Irias, X. (2010). Talk: Open Technology Approaches for Enhancing the Common Operating Picture. Manuscript submitted for publication, Engineering and Construction, Carnegie Mellon University, Silicon Valley, Retrieved from http://www.cmu.edu/silicon-valley/dmi/workshop/talk-open-technology-approaches-for-enhancing-the-common-operating-picture.html

Hosmer, David W.; Lemeshow, Stanley (2000). Applied Logistic Regression. New York: Wiley. ISBN 0-471-61553-6.

Hosmer D.W. and Lemeshow S. (1980) " A goodness-of-fit-test for the multiple logistic regression model" communications in statistics A10: 1043-1069

McDonald, J.H. 2009. Handbook of Biological Statistics (2nd ed.). Sparky House Publishing, Baltimore, Maryland.

Mileti, D., & Sorensen, J. (1990). Communication of Emergency Public Warning. Informally published manuscript, Department of Sociology, Colorado State University, Retrieved from http://emc.ed.ornl.gov/publications/PDF/CommunicationFinal.pdf

NOAA.gov. (n.d.). Nwschat. Retrieved from https://nwschat.weather.gov/

NOAA's National Weather Service. US Department of Commerce, National Oceanic and Atmospheric Administration. (n.d.). Weather Prediction Center. Retrieved from website: http://www.WPC.ncep.noaa.gov/

NWSchat. (n.d.). Install and Configure for US Army Corps of Engineers Partners . Retrieved from https://nwschat.weather.gov/coe.php

Puckett, J. (2012, March 03). Social media: Videos and tweets spread the word about tornado destruction. Courier-Journal. Retrieved from http://www.courier-journal.com/article/20120303/NEWS01/303030069/Social-Media-Videos-tweets-spread-word-about-tornado-destruction?nclick_check=1

Rose-Smith, C. (2012). A Correlation Analysis of Leadership Traits and Styles of Emergency Managers. (Doctoral dissertation, Walden University), Available from ProQuest LLC. (3543786).

SAS Institute Inc., SAS 9.1.3 Help and Documentation, Cary, NC: SAS Institute Inc., 2000-2004.

Schneid, T. & Collins, L. (2000). Disaster Management and Preparedness. Boca Raton, Florida: CRC Press.

Skertich, R. (2008). Action and Information Networks in Disaster Management. (Doctoral dissertation, University of Pittsburgh), Available from ProQuest LLC. (UMI No. 3335831).

The Nature Conservancy. (2013). Rivers Run Through Kentucky. Retrieved from http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/kentucky/howwework/mississippi-river-floodings-affects-in-kentucky.xml

U.S. Coast Guard, Office of Auxiliary and Boating Safety. (2004). Team Coordination Training. Retrieved from website: http://www.uscg.mil/auxiliary/training/tct/chap5.pdf

USGS. (n.d.). USGS WaterAlert. Retrieved from http://water.usgs.gov/wateralert/index.html

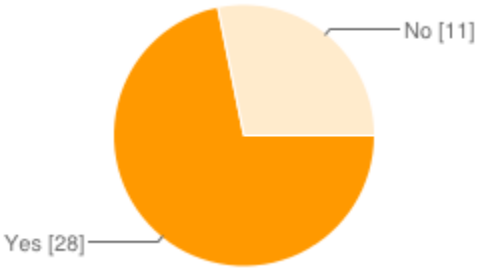
APPENDICES

APPENDIX A:

Results of “Research Survey 2”

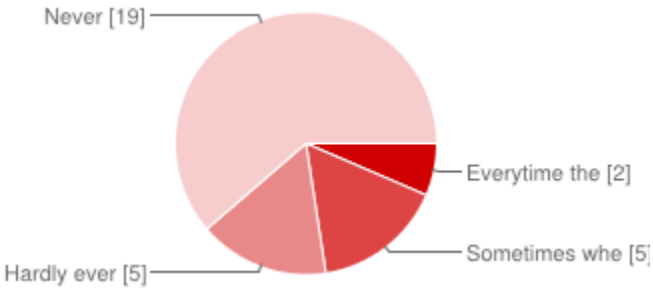
*If an Emergency Manager did not answer one of the questions or answered “no” for the first question then their tally was thrown out. This can lead to other totals than 39.

Have you heard of WebEOC® Professional Version {If "NO' proceed to the next technology}



Yes	**28**	34%
No	**11**	13%

If YES, how often do you use the WebEOC® Professional Version



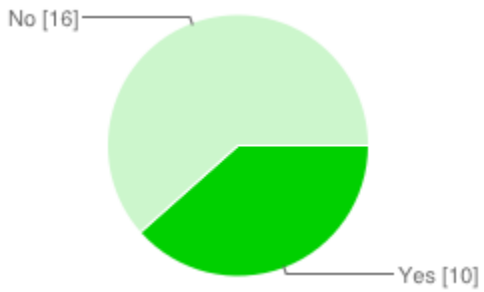
Everytime there is an event	**2**	2%
Sometimes when there is an event	**5**	6%
Hardly ever	**5**	6%
Never	**19**	23%

Figure 2. Survey results for the knowledge county emergency managers have of WebEOC Professional Version.

On a scale from 1 to 10 how helpful has WebEOC® Professional Version been to you in establishing your situational awareness during events, or other.

1	**14**	17%
2	**2**	2%
3	**2**	2%
4	**1**	1%
5	**4**	5%
6	**2**	2%
7	**1**	1%
8	**1**	1%
9	**1**	1%
10	**1**	1%

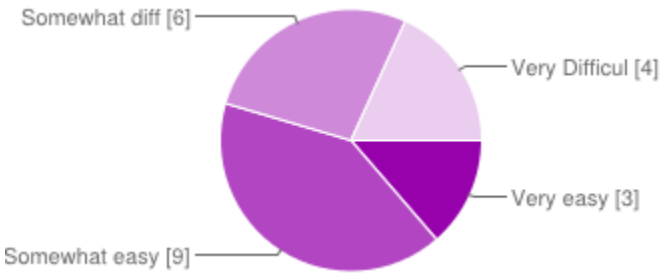
Is WebEOC® Professional Version helpful in answering questions brought up by city officials?



Yes	**10**	12%
No	**16**	20%

Figure 2 (Continued). Survey results for the knowledge county emergency managers have of WebEOC Professional Version.

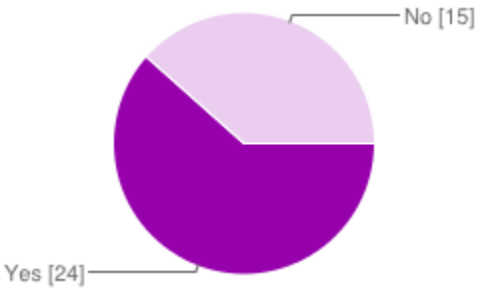
Are the guidance and directions using WebEOC® Professional Version easy to understand?



Very easy	**3**	4%
Somewhat easy	**9**	11%
Somewhat difficult	**6**	7%
Very Difficult	**4**	5%

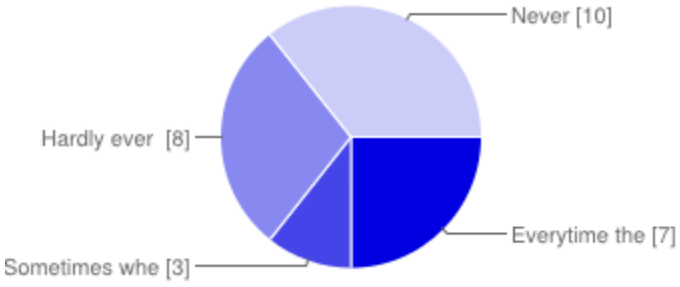
Figure 2 (Continued). Survey results for the knowledge county emergency managers have of WebEOC Professional Version.

Have you heard of NWS Chat {If "NO" proceed to the next technology}



Yes	**24**	29%
No	**15**	18%

If YES, how often do you use NWSChat**.**



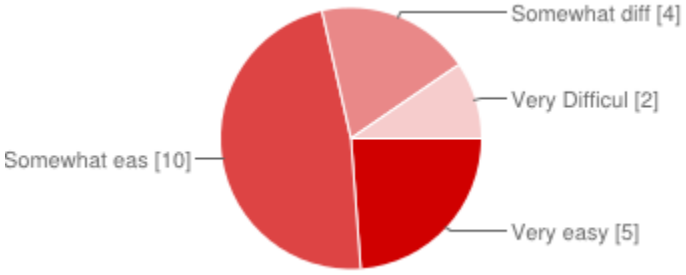
Everytime there is a weather-related event	**7**	9%
Sometimes when there is a weather related event	**3**	4%
Hardly ever	**8**	10%
Never	**10**	12%

Figure 3. Survey results for the knowledge county emergency managers have of NWS Chat

On a scale from 1 to 10 how helpful has NWSChat been to you in establishing your situational awareness during events, or other.

1	**9**	11%
2	**2**	2%
3	**2**	2%
4	**2**	2%
5	**1**	1%
6	**1**	1%
7	**1**	1%
8	**3**	4%
9	**0**	0%
10		5%

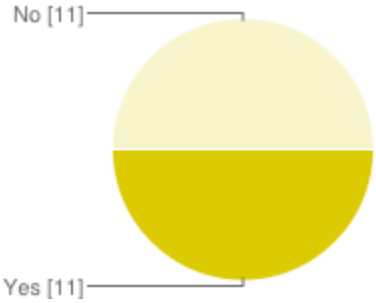
Are the guidance and directions using NWSChat easy to understand?



Very easy	**5**	6%
Somewhat easy	**10**	12%
Somewhat difficult	**4**	5%
Very Difficult	**2**	2%

Figure 3 (Continued). Survey results for the knowledge county emergency managers have of NWS Chat

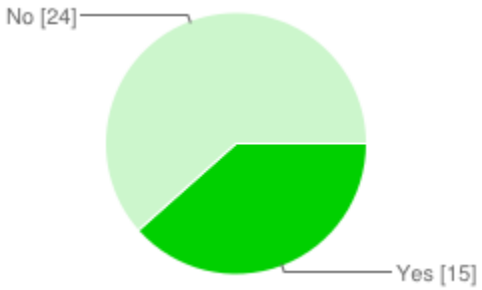
Is NWSChat helpful in answering questions brought up by city officials?



Yes	**11**	13%
No	**11**	13%

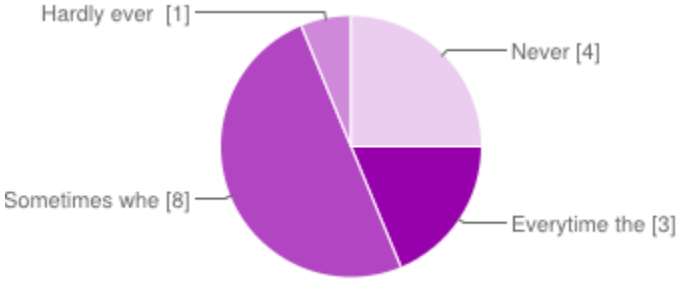
Figure 3 (Continued). Survey results for the knowledge county emergency managers have of NWS Chat

Have you heard of USGS WaterWatch {If "NO" proceed to the next technology}



Yes	**15**	18%
No	**24**	29%

If YES, how often do you use USGS WaterWatch.



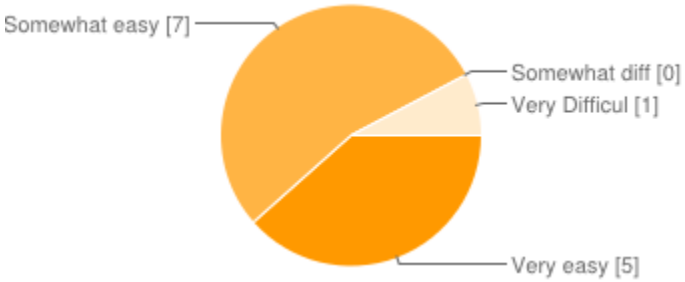
Everytime there is a weather-related event	**3**	4%
Sometimes when there is a weather related event	**8**	10%
Hardly ever	**1**	1%
Never	**4**	5%

Figure 4. Survey results for the knowledge county emergency managers have of USGS WaterWatch

On a scale from 1 to 10 how helpful has USGS WaterWatch been to you in establishing your situational awareness during events, or other.

1	**1**	1%
2	**1**	1%
3	**0**	0%
4	**0**	0%
5	**2**	2%
6	**2**	2%
7	**3**	4%
8	**2**	2%
9	**0**	0%
10	**2**	2%

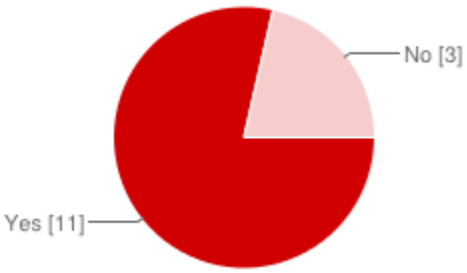
Are the guidance and directions using USGS WaterWatch easy to understand?



Very easy	**5**	6%
Somewhat easy	**7**	9%
Somewhat difficult	**0**	0%
Very Difficult	**1**	1%

Figure 4 (Continued). Survey results for the knowledge county emergency managers have of USGS WaterWatch

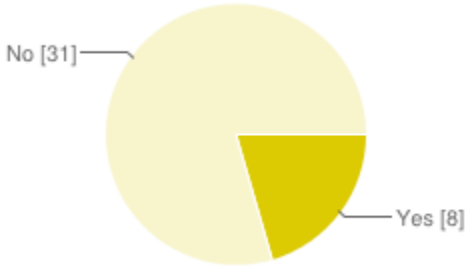
Is USGS WaterWatch helpful in answering questions brought up by city officials?



Yes	**11**	13%
No	**3**	4%

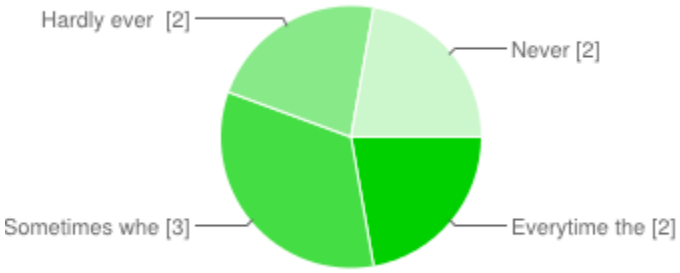
Figure 4 (Continued). Survey results for the knowledge county emergency managers have of USGS WaterWatch

Have you heard of USGS WaterAlert? {If "NO" proceed to the next technology}



Yes	**8**	10%
No	**31**	38%

If YES, how often do you use USGS WaterAlert?



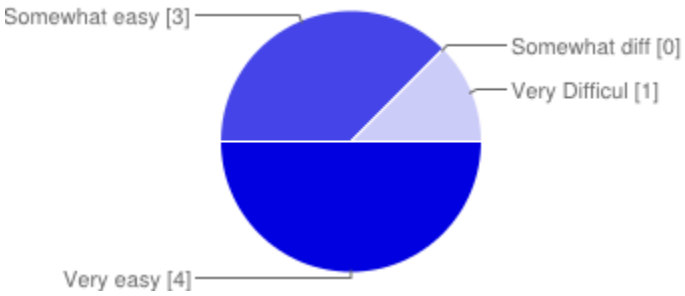
Everytime there is a weather-related event	**2**	2%
Sometimes when there is a weather-related event	**3**	4%
Hardly ever	**2**	2%
Never	**2**	2%

Figure 5. Survey results for the knowledge county emergency managers have of USGS WaterAlert

On a scale from 1 to 10 how helpful has USGS WaterAlert been to you in establishing your situational awareness during events, or other.

1	**1**	1%
2	**0**	0%
3	**0**	0%
4	**0**	0%
5	**3**	4%
6	**0**	0%
7	**2**	2%
8	**1**	1%
9	**1**	1%
10	**1**	1%

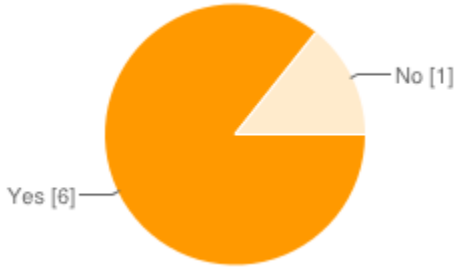
Are the guidance and directions using USGS WaterAlert easy to understand?



Very easy	**4**	5%
Somewhat easy	**3**	4%
Somewhat difficult	**0**	0%
Very Difficult	**1**	1%

Figure 5 (Continued). Survey results for the knowledge county emergency managers have of USGS WaterAlert

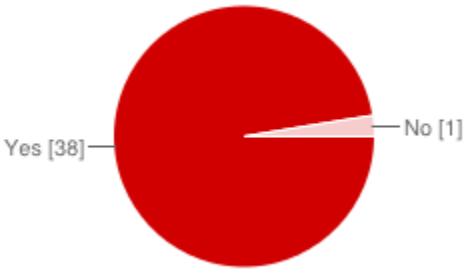
Is USGS WaterAlert helpful in answering questions brought up by city officials?



Yes	**6**	7%
No	**1**	1%

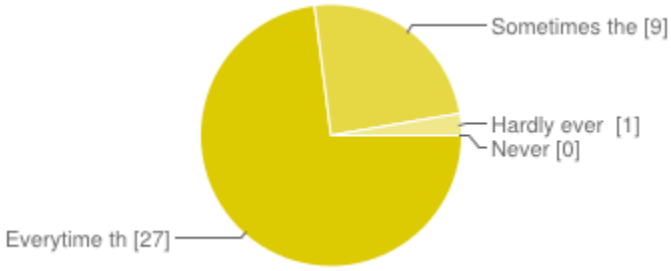
Figure 5 (Continued). Survey results for the knowledge county emergency managers have of USGS WaterAlert

Have you heard of the National Weather Service (NWS) {If "NO" proceed to the next technology}



Yes	**38**	46%
No	**1**	1%

If YES, how often do you use the NWS Website.



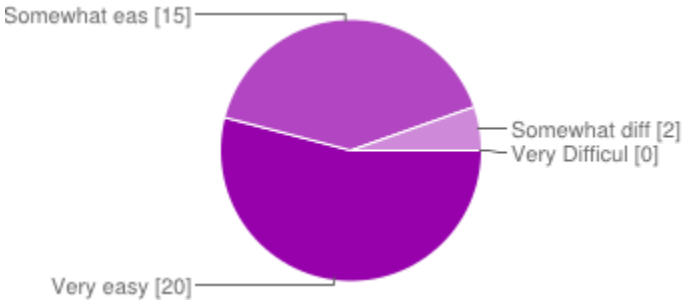
Everytime there is a weather related event	**27**	33%
Sometimes there is a weather related event	**9**	11%
Hardly ever	**1**	1%
Never	**0**	0%

Figure 6. Survey results for the knowledge county emergency managers have of the National Weather Service (NWS)

On a scale from 1 to 10 how helpful has the NWS website been to you in establishing your situational awareness during events, or other.

1	**0**	0%
2	**0**	0%
3	**0**	0%
4	**1**	1%
5	**0**	0%
6	**6**	7%
7	**3**	4%
8	**7**	9%
9	**7**	9%
10	**13**	16%

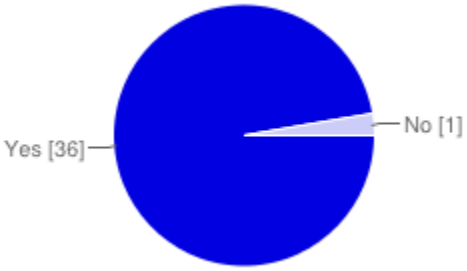
Are the guidance and directions using the NWS website easy to understand?



Very easy	**20**	24%
Somewhat easy	**15**	18%
Somewhat difficult	**2**	2%
Very Difficult	**0**	0%

Figure 6 (Continued). Survey results for the knowledge county emergency managers have of the National Weather Service (NWS)

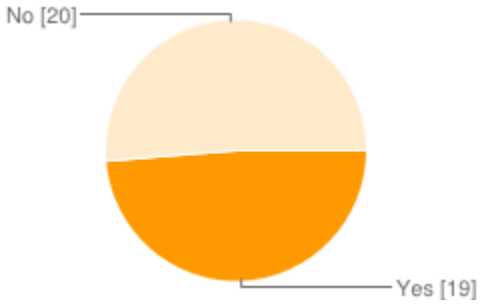
Is the NWS website helpful in answering questions brought up by city officials?



Yes	**36**	44%
No	**1**	1%

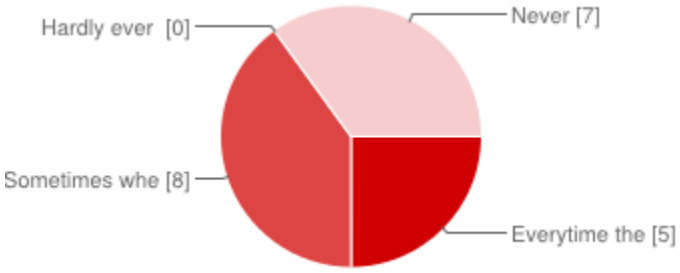
Figure 6 (Continued). Survey results for the knowledge county emergency managers have of the National Weather Service (NWS)

Have you heard of NOAA- Interactive NWS (iNWS) {If "NO" proceed to the next technology}



Yes	**19**	23%
No	**20**	24%

If YES, how often do you use INWS.



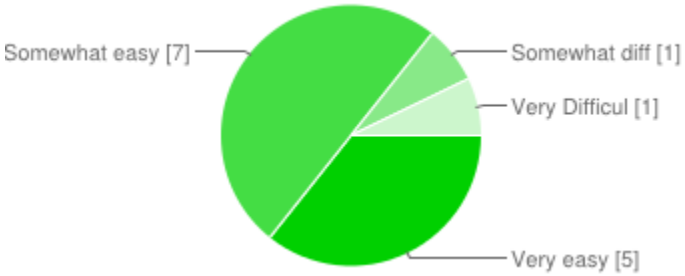
Everytime there is a weather related event	**5**	6%
Sometimes when there is a weather related event	**8**	10%
Hardly ever	**0**	0%
Never	**7**	9%

Figure 7. Survey results for the knowledge county emergency managers have of NOAA-Interactive NWS(iNWS)

On a scale from 1 to 10 how helpful has iNWS been to you in establishing your situational awareness during events, or other.

1	**1**	1%
2	**0**	0%
3	**0**	0%
4	**0**	0%
5	**3**	4%
6	**0**	0%
7	**2**	2%
8	**3**	4%
9	**2**	2%
10	**3**	4%

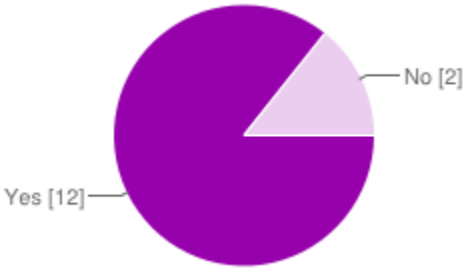
Are the guidance and directions using iNWS easy to understand?



Very easy	**5**	6%
Somewhat easy	**7**	9%
Somewhat difficult	**1**	1%
Very Difficult	**1**	1%

Figure 7 (Continued). Survey results for the knowledge county emergency managers have of NOAA- Interactive NWS(iNWS)

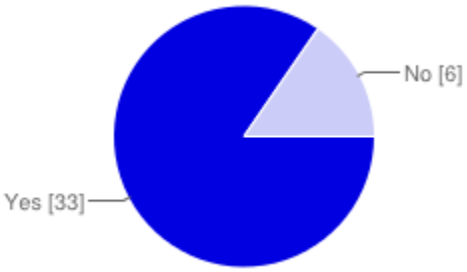
Is iNWS helpful in answering questions brought up by city officials?



Yes	**12**	15%
No	**2**	2%

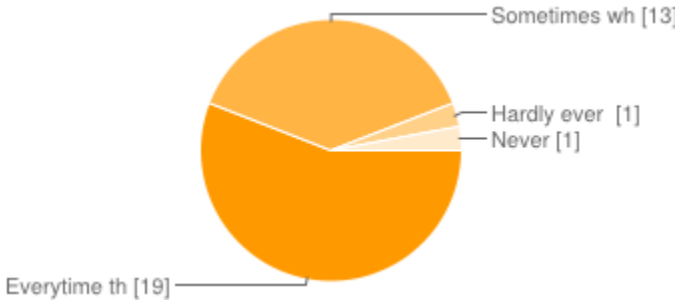
Figure 7 (Continued). Survey results for the knowledge county emergency managers have of NOAA- Interactive NWS(iNWS)

Have you heard of NOAA Storm Prediction Center {If "NO" proceed to the next technology?}



Yes	**33**	40%
No	**6**	7%

If YES, how often do you use NOAA Storm Prediction Center?



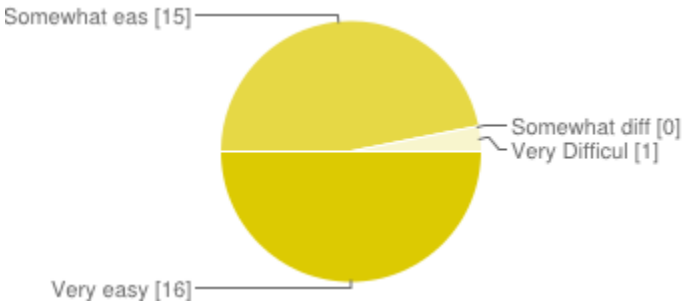
Everytime there is a weather-related event	**19**	23%
Sometimes when there is a weather-related event	**13**	16%
Hardly ever	**1**	1%
Never	**1**	1%

Figure 8. Survey results for the knowledge county emergency managers have of NOAA Storm Prediction Center

On a scale from 1 to 10 how helpful has NOAA Storm Prediction Center been to you in establishing your situational awareness during events, or other.

1	**0**	0%
2	**0**	0%
3	**0**	0%
4	**1**	1%
5	**1**	1%
6	**3**	4%
7	**2**	2%
8	**11**	13%
9	**7**	9%
10	**8**	10%

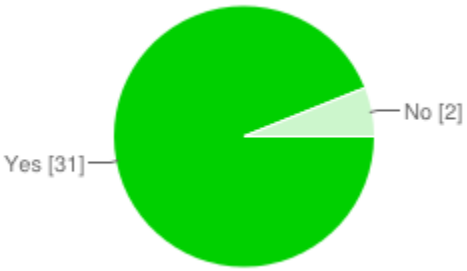
Are the guidance and directions using NOAA Storm Prediction Center easy to understand?



Very easy	**16**	20%
Somewhat easy	**15**	18%
Somewhat difficult	**0**	0%
Very Difficult	**1**	1%

Figure 8 (Continued). Survey results for the knowledge county emergency managers have of NOAA Storm Prediction Center

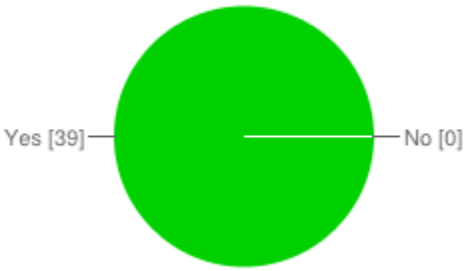
Is NOAA Storm Prediction Center helpful in answering questions brought up by city officials?



Yes	**31**	38%
No	**2**	2%

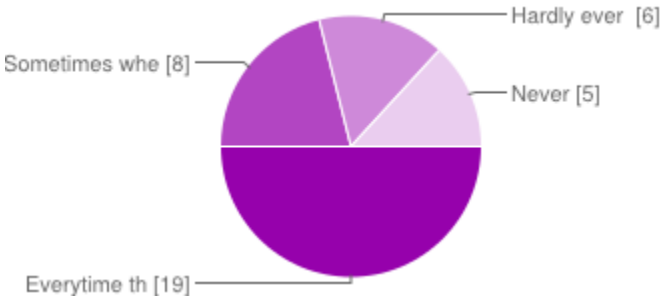
Figure 8 (Continued). Survey results for the knowledge county emergency managers have of NOAA Storm Prediction Center

Have you heard of Social Media (Facebook, Twitter, Instagram, Etc.?) {If "NO" proceed to the next technology}



Yes	**39**	48%
No	**0**	0%

If YES, how often do you use Social Media?



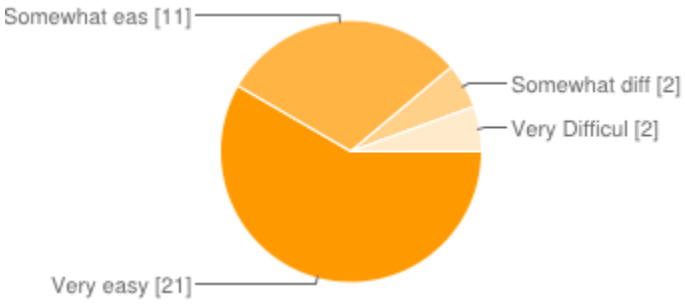
Everytime there is a weather-related event	**19**	23%
Sometimes when there is a weather-related event	**8**	10%
Hardly ever	**6**	7%
Never	**5**	6%

Figure 9. Survey results for the knowledge county emergency managers have of Social Media

On a scale from 1 to 10 how helpful has Social Media been to you in establishing your situational awareness during events, or other.

1	**5**	6%
2	**3**	4%
3	**1**	1%
4	**0**	0%
5	**2**	2%
6	**2**	2%
7	**3**	4%
8	**2**	2%
9	**8**	10%
10	**11**	13%

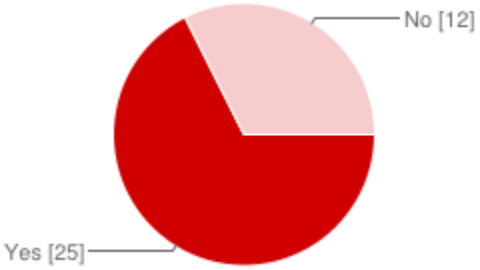
Are the guidance and directions using Social Media easy to understand?



Very easy	**21**	26%
Somewhat easy	**11**	13%
Somewhat difficult	**2**	2%
Very Difficult	**2**	2%

Figure 9 (Continued). Survey results for the knowledge county emergency managers have of Social Media

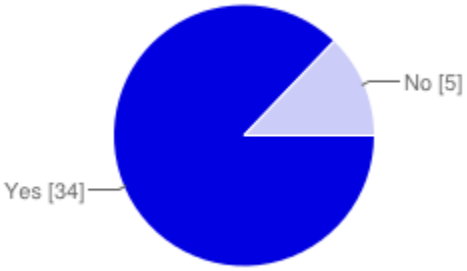
Is Social Media helpful in answering questions brought up by city officials?



Yes	**25**	30%
No	**12**	15%

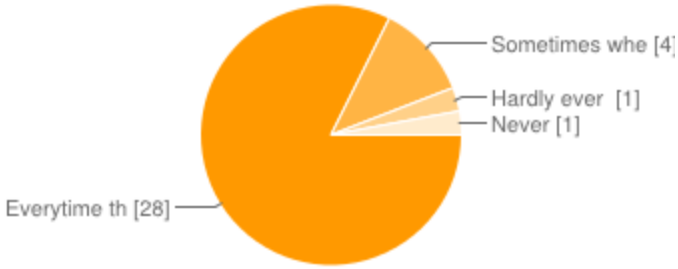
Figure 9 (Continued). Survey results for the knowledge county emergency managers have of Social Media

Have you heard of EAS Weather Radio {If "NO" proceed to the next technology}



Yes	**34**	41%
No	**5**	6%

If YES, how often do you use EAS Weather Radio?



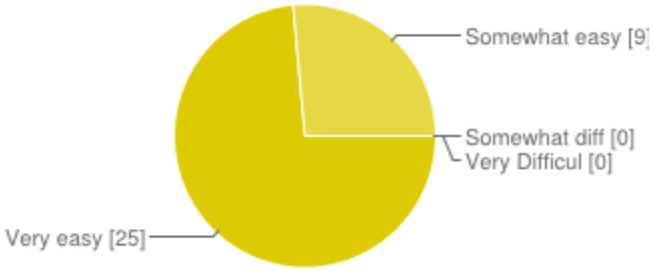
Everytime there is a weather related event	**28**	34%
Sometimes when there is a weather related event	**4**	5%
Hardly ever	**1**	1%
Never	**1**	1%

Figure 10. Survey results for the knowledge county emergency managers have of EAS Weather Radio

On a scale from 1 to 10 how helpful has EAS Weather Radio been to you in establishing your situational awareness during events, or other.

1	**1**	1%
2	**0**	0%
3	**0**	0%
4	**1**	1%
5	**2**	2%
6	**1**	1%
7	**3**	4%
8	**4**	5%
9	**9**	11%
10	**13**	16%

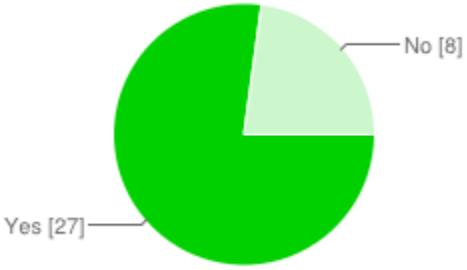
Are the guidance and directions using EAS Weather Radio easy to understand?



Very easy	**25**	30%
Somewhat easy	**9**	11%
Somewhat difficult	**0**	0%
Very Difficult	**0**	0%

Figure 10 (Continued). Survey results for the knowledge county emergency managers have of EAS Weather Radio

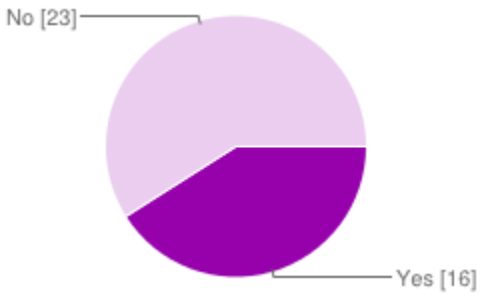
Is EAS Weather Radio helpful in answering questions brought up by city officials?



Yes	**27**	33%
No	**8**	10%

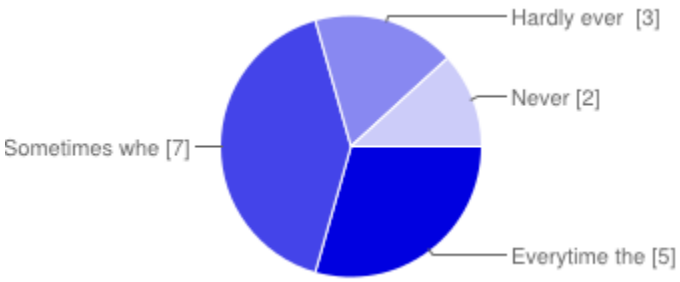
Figure 10 (Continued). Survey results for the knowledge county emergency managers have of EAS Weather Radio

Have you heard of NOAA Spot Forecast Request {If "NO" proceed to the next technology}



Yes	**16**	20%
No	**23**	28%

If YES, how often do you use NOAA Spot Forecast Request?



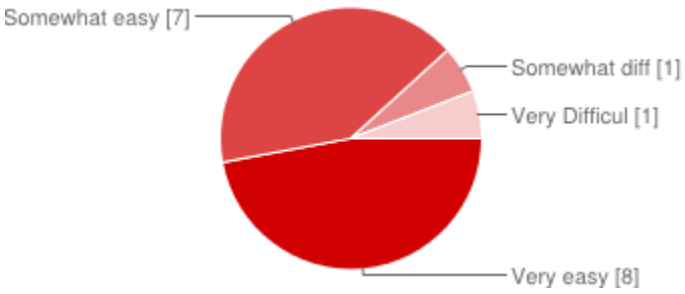
Everytime there is a weather-related event	**5**	6%
Sometimes when there is a weather-related event	**7**	9%
Hardly ever	**3**	4%
Never	**2**	2%

Figure 11 (Continued). Survey results for the knowledge county emergency managers have of NOAA Spot Forecast Request

On a scale from 1 to 10 how helpful has NOAA Spot Forecast Request been to you in establishing your situational awareness during events, or other.

1	**1**	1%
2	**0**	0%
3	**0**	0%
4	**1**	1%
5	**0**	0%
6	**0**	0%
7	**3**	4%
8	**7**	9%
9	**1**	1%
10	**4**	5%

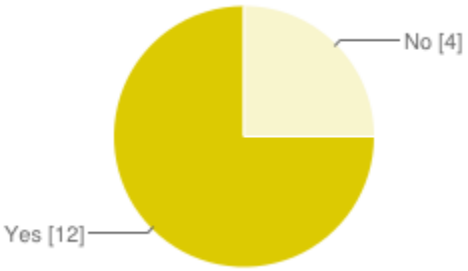
Are the guidance and directions using NOAA Spot Forecast Request easy to understand?



Very easy	**8**	10%
Somewhat easy	**7**	9%
Somewhat difficult	**1**	1%
Very Difficult	**1**	1%

Figure 11 (Continued). Survey results for the knowledge county emergency managers have of NOAA Spot Forecast Request

Is NOAA Spot Forecast Request helpful in answering questions brought up by city officials?



Yes	**12**	15%
No	**4**	5%

Figure 11 (Continued). Survey results for the knowledge county emergency managers have of NOAA Spot Forecast Request

APPENDIX B:

Definition of Terms and Descriptions

- *Disaster*: On the as a sudden calamitous event bringing great damage, loss, or destruction. training.fema.gov/EMIWeb/edu/docs/terms%20and%20definitions/terms%20and%20Definitions.pdf
- *EAS Weather Radio*-On broadcasts real-time and forecasts Watch/Warning/Advisory throughout the Emergency Alert System. http://www.nws.noaa.gov/nwr/
- *Emergency*-an unforeseen combination of circumstances or the resulting state that calls for immediate action. training.fema.gov/EMIWeb/edu/docs/terms%20and%20definitions/terms%20and%20Definitions.pdf
- *Emergency Management* is the managerial function charged with creating the framework within which communities reduce vulnerability to hazards and cope with disasters. (training.fema.gov)
- *Emergency Operations Center* (EOC) is the physical location where an organization comes together during an emergency to coordinate response and recovery actions and resources. training.fema.gov
- *HURREVAC*- as a support tool is a storm tracking and decision support tool. The program combines live feeds of tropical cyclone forecast information with data from various state Hurricane Evacuation Studies (HES) to assist the local emergency manager in determining the most prudent evacuation decision time and the potential for significant storm effects such as wind and storm surge.www.hurrevac.com

- Kentucky Emergency Management Association (KEMA) it describes KEMA as an Kentucky-based non-profit corporation seeking to develop professionalism among those persons in Kentucky actively engaged in emergency management activities. www.KEMA.org
- *National Interagency Coordination Center Website (NICC)*-the NICC is the focal point for overseeing all interagency wildfire coordination activities throughout the United States. www.nifc.gov/nicc/
- *National Oceanic and Atmospheric Association* (NOAA)-It is a government science agency that researches the environment through the atmosphere and the ocean. www.NOAA.gov.
- *NOAA – Interactive NWS* (iNWS)- allows NWS partners to receive National Weather Service products in new and innovative ways such as; text messaging and mobile-enabled webpages. inws.wrh.noaa.gov
- *NOAA Weather Prediction Center*- This system prepares and issues forecasts of accumulating (quantitative) precipitation, heavy rain, heavy snow, and highlights areas with the potential for flash flooding. www.WPC.ncep.noaa.gov
- *NOAA Spot Forecast Request*-provides users a way to request fire weather spot forecasts and National Weather Service (NWS) forecasters a way to post those forecasts to a national web server. www.erh.noaa.gov
- *NOAA-Storm Prediction Center*-provides timely and accurate forecasts and watches for severe thunderstorms and tornadoes over the contiguous United States. www.spc.noaa.gov

- *National Weather Service* (NWS) It is a component of the National Oceanic and Atmospheric Administration whose mission is to provide weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy. www.weather.gov.
- *NWS Chat*- It is the NWS based Instant Messaging service used for sharing critical warning decision expertise and other types of significant weather information between the NWS and partners in all levels of government, emergency managers, and the media. nwschat.weather.gov.
- *Mitigation* the effort to reduce loss of life and property by lessening the impact of disasters. www.fema.gov/what-mitigation
- *Social Media* is a form of electronic communication (as Web sites for social networking and microblogging) through which users create online communities to share information, ideas, personal messages, and other content (as videos) ie, Facebook, Twitter, Instagram. www.merriam-webster.com/dictionary/social%20media
- On *United State Geological Survey* (USGS) it describes the as a science organization that provides impartial information on the health of our ecosystems and environment, the natural hazards that threaten us. www.USGS.gov
- *USGS WaterAlert* On it describes the service as a program that sends e-mail or text (SMS) messages when certain water-based parameters, as measured by a USGS real-time data-collection station, exceed user-definable thresholds. maps.waterdata.usgs.gov/mapper/wateralert.

- *USGS Water Watch* -a U.S. Geological Survey (USGS) World Wide Web site that displays maps, graphs, and tables describing real-time, recent, and past streamflow conditions for the United States. waterwarch.usgs.gov
- *Warn*- to give notice to beforehand especially of danger. Merriam-Webster dictionary
- *WebEOC professional version*-On the Emergency Services Integrators website it describes a program known as. *WebEOC* is the original web-enabled crisis information management system and provides secure real-time information sharing to help managers make sound decisions quickly.-www.esi911.com

APPENDIX C:

List of Abbreviations

Common Operating Picture.....COP

Department of Homeland Security.....DHS

Emergency Alert System.....EAS

Emergency Management.....EM

Emergency Operations Center.....EOC

Faith-based organizations.....FBO

Federal Communications Commission.....FCC

Federal Emergency Management Agency.....FEMA

Geographic Information System.....GIS

Hurricane Evacuation Studies.....HES

Weather Prediction Center.....WPC

Incident Command System.....ICS

Information Technology.....IT

Instant Messenger.....IM

Interactive National Weather Service....INWS

Kentucky Emergency Management Association.....KEMA

National Incident Management System.....NIMS

National Interagency Coordination Center.....NICC

National Oceanic and Atmospheric Administration.....NOAA

National Response Framework.....NRF

National Streamflow Information Program.....NSIP

National Weather Service.....NWS

Non-Government Organizations.....NGO

Planned, Reported, Perceived and Desired.....PRPD

Storm Prediction Center.....SPC

United States Geological Survey.....USGS

VITA

Keith S. Joy Jr., was born in Knoxville, TN on June 22, 1988. He attended elementary schools in the Oak Ridge City and Knox County Area School District. He graduated high school from Grace Christian Academy in May, 2006. The following August he entered Tennessee Tech University and in December 2010 received the degree of Bachelor of Science in Biology with an emphasis in Microbiology. He entered Eastern Kentucky University in August of 2011 pursuing the Master of Science in Safety, Security, Emergency Management.