Participating in OSEEL's Student Engagement Fund for the Spring 2019 semester has provided me with one of the most valuable opportunities of my college career. My SEF project was my first major academic research project and it gave me an insight as to what academic research entails. Through this opportunity, I was able to confirm a career path that I had always speculated I wanted and that is conduct research in the field of meteorology.

My research topic was entitled "Flood Fatalities in the United States." The purpose was to explore the spatiotemporal distribution of deaths resulting from flood events throughout the U.S. from 2006 through 2018. This topic was suggested to me by my mentor, Dr. Walker Ashley of NIU's Department of Geographic and Atmospheric Sciences, who had done flood fatality research in the past. Seeing as though floods are the leading killer of all meteorological hazards, I knew that this project would be very time consuming but also very rewarding and extremely important for the public to hear so I was honored to accept the task. Using the National Center for Environmental Information's Storm Events Database as well as various online news sources, I created a database detailing each fatality with information such as the age and gender of victims, coordinates of the fatality, date of the event, and a description of each event. When finished, I had manually entered over 1200 lines of tabular data. From there, I imported all of my data into a geographic information systems, or GIS, software and began making maps to tell the story of my findings. Some of the maps I produced include the spatial density of all flood fatalities, number of flood fatalities by state, and number of flood fatalities by state per 100,000 people. I also generated a number of bar graphs to display distributions such as flood fatalities by age and gender, by year, and by month. After making all of my products, I created my research poster which I then presented at the University's research and artistry day. I have attached my poster to the bottom of this narrative. I received a lot of good feedback from attendees, most of

whom were shocked to hear just how much of a threat flooding poses which was the exact reason I wanted to do this project in the first place. I was even commended by a floodplain manager who happened to be there who agreed that this topic was of great importance. I also submitted my poster in the Department of Geographic and Atmospheric Sciences' annual research poster competition where I received second place for the people's choice and first place for the faculty choice. After completing the project, it wasn't long before all of my work clearly paid off and I realized that this was a big step in my career as a hopeful research meteorologist.

After completing and presenting my poster, Dr. Ashley invited me to continue to work with him further on this project. I will be merging my dataset with his that he conducted for flood fatalities since the 1960's through 2005 and analyzing the fatalities as a whole as well as any spatial or temporal trends in the fatalities. We hope to produce a manuscript and have it published through the American Meteorological Society's Weather, Climate, and Society peer-reviewed journal. The opportunity to be a published meteorologist shortly after receiving my bachelor's degree is something I never thought I would even attempt to accomplish but it is now a very real possibility. Thanks to OSEEL and its Student Engagement Fund as well as the support of Dr. Ashley, I was able to accomplish a feat that I never thought I would at such an early stage in my career.

Flood Fatalities in the United States

Kevin A. Doom

Department of Geographic and Atmospheric Sciences, Northern Illinois University

Northern Illinois University

Introduction

Flood events currently account for more weather-related fatalities annually than any other atmospheric hazard in the U.S. Moreover, floods are the only weather-related event that has seen a steady rise in resulting fatalities over the past 30 years. Despite this assertion, a comprehensive and accurate accounting of recent flood-related fatalities in the U.S. is lacking. The purpose of this study is to explore the spatiotemporal distribution of flood fatalities throughout the U.S. from 2006 through 2018. Results reveal that most flood-related deaths occurred throughout Appalachia and in Texas. Findings reveal the temporal distribution (e.g., month, year-by-year) of flood fatalities, as well as trends found in victim characteristics such as age, gender, and location or circumstance at the time of death (e.g., camping, in a vehicle, in a manufactured home, etc.). Males were found to be the prominent victims, and most of flood fatalities occurred as a result of rapid-onset, flash flood events and were generally affiliated with vehicles traversing flooded roadways. Results highlight the specific vulnerabilities and impacts associated with flood events that affect the nation each year. A more complete analysis of fatalities associated with these events is essential to improving education and mitigation efforts concerning these deadly natural hazards.

Methods

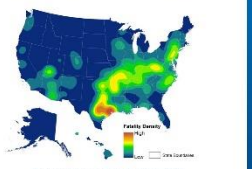
Using the National Center for Environmental Information's Storm Events Database as a primary data source as well as various online news sources, a tabular database was created illustrating details surrounding each flood fatality event such as location, date, time, and characteristics of the victims. After importing the data into a GIS, various plots and maps were generated to visualize the spatial and other statistical distributions of the flood fatality events.

Note that all fatalities resulting from 2012's Tropical Storm Sandy have been omitted from the dataset due to a lack of information regarding the underlying cause behind many of the cases.

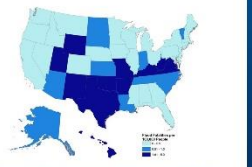
Results

Location of each individual flood fatality, 2006-2018

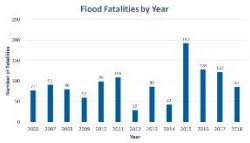
Flood fatality locations on a 40km x 40km grid, 2006-2018

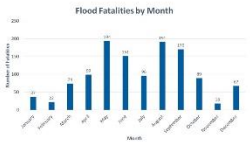


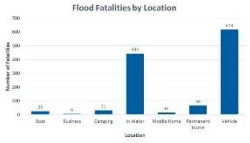
Density of flood fatalities, 2006-2018

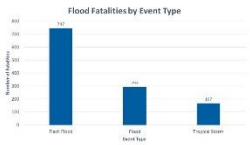


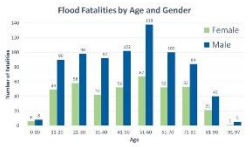
Flood fatalities by state per 100,000 people, 2006-2018

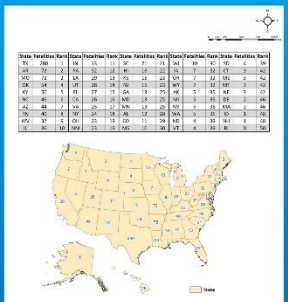












Total number of flood fatalities by state, 2006-2018

Conclusions

Spatial analysis showed that the greatest number and density of flood fatalities occurred in Texas, through the Ozark Plateau, and across much of Appalachia. Texas experienced the most flood fatalities of any state with 280 of the 1,221 reported U.S. flood deaths during the study period, with many of those deaths in the Hill Country. 2015 was the deadliest year of flooding with 192 fatalities, nearly all of them a result of flash flooding. The 51-60 age group had the most fatalities for both men and women; men were, by far, the leading gender within each age group. Victims driving into flooded roadways accounted for over 50% of the total fatalities and the majority of the fatalities occurred in late spring and summer.

Future Study

I would like to 1) extend the study to 1960 and 2) determine if there have been any trends in the spatial distribution of fatalities and asses if the trends are a result of an increase in flooding events or population exposure.

Acknowledgements

I would like to thank Dr. Walker Ashley for advising me during this research.