University: University of South Florida

Name of University Researcher Preparing Report: Dr. Jennifer Collins

NWS Office: Tampa Bay Area (Ruskin)

Name of NWS Researcher Preparing Report: Charles Paxton

Type of Project (Partners or Cooperative): Partners

Project Title: A warning system for considering social characteristics of population at risk

UCAR Award No.: Z10-83394

Date: 2/2/2012

Section 1: Summary of Project Objectives

Through a collaborative effort conducted by Jennifer Collins (University of South Florida - USF), Charles Paxton (NWS: Tampa Bay Area office) and a student at USF, a detailed study of vulnerable populations in the path of ensuing severe weather will be considered. This project will also be a proof of concept toward a planned segment of the new Integrated Hazard Information Services (IHIS) being developed by [Earth System Research Laboratory (ESRL)](#) [Global Systems Division (GSD)](#) in Boulder, CO for AWIPS II.

Using the knowledge and skills of local experts (operational meteorologist and researchers), our primary objectives included evaluating the key population characteristics of people potentially in the area of significant weather to provide decision making resources to emergency management planners and response officials, and developing a web-based, graphical interface to display key population characteristics of those in the path of significant weather.

Section 2: Project Accomplishments and Findings

The project involved creating a Python script that creates polygons from weather warnings and returns census data of the affected areas. The resulting script has been tested with NOAA's

Integrated Hazards Information Services prototype. This system will allow forecasters, government officials, and citizens to graphically examine current hazard warnings. The addition of this script to the web application allows users to discover the count of age groups, racial and ethnic groups, and household information within each hazard warning. A key goal in the use of this tool is the integration of characteristics that can indicate social vulnerability. The addition of these data for forecasters and government planners can assist in decisions for disaster planning and decisions of which communities to prioritize during a weather event.

The python script provides an integrated platform between the weather warning system and U.S. Census Summary File 3 data. The tool has excellent performance generating census information for warning polygons. This script can be integrated to any system that provides latitude/longitude coordinates. Future improvements to this script include the use of stronger areal interpolation methods and integration of the U.S. 2010 Census data. This script was written due to a lack of a 'clip' function in GDAL, and may contribute to this gap in the library.

Section 3: Benefits and Lessons Learned: Operational Partner Perspective

This was a terrific Hazards Services collaboration between USF, GSD and the NWS! A Python program was developed that ingests incoming NWS watch, warning, and advisory products for hazardous weather by either: zone, county, or polygon and parses necessary information including valid times and area affected. The program then creates a polygon of the area and the population statistics within the polygon area are pulled from the census database. Infrastructure kml files were also gathered for interface inclusion. The program works in two primary ways: 1) internally - within the NWS interface as the forecaster selects a polygon area; 2) externally – on a Google map interface public website with the area displayed and a dropdown of population statistics. The initial benefits were related to an understanding of the census data, the new warning tool and providing and influence on development of the next generation integrated warning tools. The new warning interface continues under development and is facing significant budget cuts. Discussions are underway regarding Hazards Services development prioritizations within current funding confines.

Section 4: Benefits and Lessons Learned: University Partner Perspective
Benefits are broader than the initial scope of project. Collaborating on this project has resulted in NWS and USF discussion on other topics. Such discussion has resulted in:

- The project allowed for 1 undergraduate student to be involved and a four graduate student. For the undergraduate student, this was their first time being involved in a research project. This undergraduate student presented at the Undergraduate Research Symposium at the University of South Florida and this gave them their first experience presenting.

- Interdisciplinary project bringing together the expertise of meteorologists, geographers, computer programmers, GIS experts to name a few.
- Dr Collins and her students learnt about IHIS and AWIPS II.
- The development of a grant proposal to COMET Partners which was submitted in January 2012, titled, "Long Range prediction of atmosphere and ocean conditions associated with rip current drownings in the United States"
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- **Section 5: Publications and Presentations**
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Collins, J.M., C. H. Paxton, T. L. Hansen, T. J. LeFebvre, L. J. Smith, J. L. Simms, K. Hirvela and S. K. Kotiyal, 2012: Integrated Hazard Information Service: A Warning System for Considering Social Characteristics of Population at Risk. *Bulletin of the American Meteorological Society*. **This paper has passed the BAMS proposal review and is currently under final paper review.**

Poster Presentations:

- Collins, J.M., C.H. Paxton, D.R. Roache, T.L. Hansen, K. Hirvela, J.L. Simms, S. Kotiyal, Integrated Hazard Information Service: A Warning System for Considering Social Characteristics of Population at Risk**.** Annual Meeting of the Association of American Geographers, NY, February 2012.
- Collins, J.M., C.H. Paxton, T.L. Hansen, K. Hirvela, J.L. Simms, S. Kotiyal, A Warning System Which Considers Social Characteristics of Population at Risk. Annual Meeting of the Association of American Geographers, Seattle, WA, April 2011.
- Paxton, C.H. and J.M. Collins, T.L. Hansen, J.L. Simms, K. Hirvela, S. Kotiyal**,** A new weather warning tool that incorporates census data. American Geophysical Union 2011 Meeting.

Oral Presentations:

- Paxton, C.H. and J.M. Collins, T.L. Hansen, J.L. Simms, K. Hirvela, S. Kotiyal**,** A new weather warning tool that incorporates census data. American Meteorological Society 2012 Annual Meeting.
- Paxton, C.H. and J.M. Collins, T.L. Hansen, J.L. Simms, K. Hirvela, S. Kotiyal**,** A new weather warning tool that incorporates census data. National Weather Service Webinar Presentation. Feb 2012. Ruskin, FL.

Section 6: Summary of University/Operational Partner Interactions and Roles
Describe the responsibilities of the various project participants over the course of the entire project.

Charles Paxton was the primary interface between the GSD personnel and Dr. Collins. He presented the development at AMS and AGU meetings.

Dr. Jennifer Collins was the primary interface to the students who were working on the project. She was responsible for project reporting, management and coordination of the large multi-institutional, multi-disciplinary research team. She presented the work at the AAG meetings.

Several students were involved with the development.

Garrett Speed - an undergraduate student gathered census data and infrastructure kml files.

Sandor Hadju - a graduate student set up the prototype interface on a laptop computer.

Jason Simms - a graduate student and geography department IT, solicited python programmers to write the extraction program.

Kyle Hirvela and Saurabh Kotiyal - worked together to prepare the Python census data extraction script.

David Roache – a graduate student who has published work on severe weather provided advice to the PIs on the project at various stages of project development.