Flood Risk and Uncertainty

Assessing the National Weather Service’s Flood Forecast and Warning Tools

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DRBC
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Nurture Nature Center is a non-profit organization in Easton, PA, that has been working to educate the public about flooding. NNC has undertaken several projects with NOAA and NWS, including its “Focus on Floods” education campaign, to understand and share information about how the public perceives and acts upon flood risk.
2008: Identifying the Need

Science on a Sphere: Realizing the Dream!
Social Science: A Key Step in Building a Weather-Ready Nation

- One of four social science projects awarded in 2012 to look at decision-making during extreme weather events.

- These projects support NOAA’s Weather-Ready Nation Initiative.

- Projects are managed through the Office of Weather and Air Quality in the NOAA Office of Oceanic and Atmospheric Research with funding from the U.S. Weather Research Program and the NOAA National Weather Service (NWS).
Partners

- East Carolina University
- National Weather Service (NWS) Mid-Atlantic River Forecast Center
- (NWS) Mt. Holly, NJ Weather Forecast Office
- (NWS) Binghamton, NY Weather Forecast Office
- RMC Research Corporation (evaluators)
NWS flood forecast and warning tools offer tremendous amounts of timely, accurate data.

But: People often don’t respond the way they should to protect life and property.

“What we need now is to package and communicate weather warning information so that people understand it and take the right action with the time they are given. “

Gary Szatkowski, Meteorologist in Charge of the NWS Philadelphia, PA/Mt. Holly NJ WFO
Research Questions:

- How do people living in the Delaware River Basin understand and use NWS products and services in understanding flood risk?

- What strategies are important for NWS to consider in preparing/revising its flood forecast and warning products to better motivate flood preparedness and warning response among rural and urban public audiences in the Delaware River Basin?
What Are the Tools?

NWS Flood Forecast and Warning Tools:

• Advanced Hydrologic Prediction Service (including hydrograph and flood inundation mapping)

• Flood Forecast and Warnings (including flash flooding)

• Meteorological Model-Based Ensemble Forecasting System (demonstrate uncertainty in forecasts)
What Methods Are We Using?

Focus group participants respond to flood tools through an extreme flood scenario that produces rainfall akin to that of the flood of record in the region, the Flood of 1955.

- Total of eight focus groups
- Four in urban Easton, PA area
- Four in less dense Lambertville, NJ
- Both are very flood-prone communities with heavy residential impacts from flooding
Flood Scenario:
An East Coast Hurricane

The 7-day scenario includes a series of products issued by the NWS, including:

- Hurricane cones
- Hydrographs
- Significant River Flood Outlooks
- Quantitative Precipitation Forecasts
- Flood Watch and Warnings
- Ensemble forecasts showing uncertainty
Focus Groups:

A facilitated discussion about the tools

• Four focus groups held in early June 2013; two in Easton, PA and two in Lambertville

• 15 participants per session, average, including a large number of flood-affected individuals

• Participants discussed their understanding of graphics and how they would respond to each one as it was issued
What Kind of Feedback Did Participants Give?

Information about:
• Timing of products
• Graphic design and visual clarity
• Ways the products motivated action
• How they share the information with others
River Levels Matter

HYDROGRAPH was the highest-ranked product:

- Participants noted it was “Very clear, easy to read & useful.”
- High results for visual clarity, usefulness and location specificity.
GEOGRAPHIC SPECIFICITY helps understanding of risk: people wanted hyper-local info wherever possible

- Participants expressed serious confusion about what the SRFO product intended to show because of a lack of geographic specificity
Use Color, and
Use It Carefully

USE OF COLOR in graphics came up repeatedly and served as an aid or a stumbling block to understanding:

• Participants cited the helpful use of color in products including the quantitative precipitation forecast.

• Participants complained about confusing use of color and patterning in other products, including the SRFO and flood inundation maps.

• Participants complained about the lack of color variations in some products, including Flood Watches and Warnings.
Uncertainty

UNCERTAINTY MESSAGES need to be carefully considered.

• Current ensemble forecast graphics were very confusing
• Some participants did want to receive uncertainty information
• Almost no participants could properly interpret the information from the current suite of Meteorological Model Ensemble River Forecasts (MMEFS) graphics
What Are We Doing with the Feedback?

The project team has analyzed all the data from the groups, which includes qualitative data from the sessions as well as quantitative data from pre and post-session surveys.

Based on this feedback, we are making revisions to the tools.

We will re-test these mocked-up tools with a second set of focus group participants in early December 2013.
Example of a Draft Mocked-Up Hydrograph

Incorporates various focus groups recommendations, including the careful use of text, and color variation.
What is Next?

After the next round of focus groups, we will analyze the feedback about the mocked-up graphics. From the complete analysis, we will:

- **Recommend changes to the design and implementation** of the flood forecast and warning tools
- **Write a white paper about extreme flood risk scenarios** and the public response to such an event
- **Author a manuscript** summarizing the findings
- **Create three 5-minute videos** summarizing the findings for NOAA/NWS audiences, emergency managers and the public
Socialscience.Focusonfloods.org

Includes already:

- research bibliography on social science related to flooding
- project information and focus group registration

In development:

- a series of educational materials, including posters, a traveling display and other tools, to explain flood risk and uncertainty
- final reports and papers

Check back regularly for updates! Visit also www.focusonfloods.org for more on Nurture Nature Center’s flood outreach.
FOCUS GROUPS: ROUND 2

FOCUS GROUP STUDY SEeks PARTICIPANTS

Do you live near a floodplain? Do you rely on flood warnings and alerts to know when to prepare? Do you wish you had more information about your flood risk?

Nurture Nature Center is recruiting participants for two focus groups, as part of a research project with National Oceanic and Atmospheric Administration, about the use of National Weather Service flood forecast and warning tools.

Participants should live in the Lambertville, New Jersey area and be at least 18 years of age. Participants will receive $30 and will be asked to answer questions and provide input about various flood warning tools and products issued by the National Weather Service. Coffee and light refreshments will be provided.

Register online at www.focusonfloods.org/socialscience or by contacting Rachel Hogan Carr at 610-253-4432 or rhogan@nurturenature.org.

Please indicate which session you would like to attend:

Thursday, December 5th in Lambertville, New Jersey:
Session #1: 1:00 p.m. to 3:00 p.m. at Lambertville Justice Center (old ME Building), 25 S. Union Street, Lambertville
Session #2: 6:00 p.m. to 8:00 p.m. Creekside Room at Inn at Lambertville Station, 11 Bridge Street, Lambertville

Did you participate in Round 1 and want to help? Please refer a friend or relative!

The Nurture Nature Center is a non-profit organization whose focus is on flood education. 518 Northampton Street, Easton, PA 18042 610-233-4432 www.nurturenaturecenter.org

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Thank You!

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