

Risk Perceptions and Emergency Communication Effectiveness in Coastal Zones Preliminary Findings on Interpretations of Weather Related Messages and Maps

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As part of a North Carolina Sea Grant funded project, we conducted 133 face-to-face interviews with residents in eastern NC about severe weather communication. In this research, we collected data about the ways that people interpret texts and maps by asking participants to discuss National Weather Service (NWS) “watch” and “warning” statements and two versions of NWS hurricane advisory maps (attached).

Findings in Brief

Our preliminary analysis suggests that interpretation of weather information challenges many people because it requires the simultaneous application of multiple forms of knowledge to comprehend several kinds of information. Both problematic and successful interpretive tasks show that evaluating weather information involves synthesizing information about space (geographical), time, direction, graphic representation (e.g., shading and lines), probability, and use of textual tools (such as the key on a map). We are continuing analysis of these data. Later analysis will look at these preliminary findings alongside additional data gathered in other projects at ECU, with the goal of suggesting ways that presentations of weather information can be optimized to meet the cognitive needs of diverse populations.

Interpretation of Watch and Warning Statements

We asked participants to identify which of the following describes a hurricane watch and which a warning to determine how easily residents could distinguish between them.

Sustained winds 74 mph or higher associated with a hurricane are expected in this area in 24 hours or less.

	Number	Valid Percent
Residents identifying statement as a Watch	30	24.2
Residents identifying statement as a Warning	93	75.0
Not sure	1	.8
Total	124	100.0
No/missing answer	9	
	133	

Hurricane conditions are possible within 36 hours for this area.

	Number	Valid Percent
Residents identifying statement as a Watch	92	74.2
Residents identifying statement as a Warning	31	25.0
Not sure	1	.8
Total	124	100.0
No/missing answer	9	
	133	

- About a quarter of respondents incorrectly identified “watches” and “warnings.”
- The length of time that respondents have lived in the area does not seem to make a difference in how accurately or inaccurately they distinguish between watches and warnings.
- Those who identified correctly generally did so quickly with little apparent confusion.
- Those who took more time to evaluate the statements, and came to a correct conclusion, relied on the words “expected” and “possible,” the difference in the time (24 vs. 36 hours) noted in the

statements, and the phrase “sustained winds 74 mph or higher” in the warning to arrive at their interpretations.

- Those who misidentified the statements and were able to articulate why most often identified the words “watch” and “warning” as the problem. In these cases, participants interpreted the word “watch” to indicate that a condition was visible, as in watching the storm coming, or seeing the storm, and therefore more serious. The word “warning,” for these participants, seemed to indicate a less imminent condition.
- Several people reported that they always get the two confused. It is conceivable that the sound of the “wa” at the beginning of both words contribute to this difficulty.

Interpretation of Advisory Maps

We asked participants to look at two different types of advisory maps and to answer several questions about them including: (1) What do these images mean to you? (2) Where do you live relative to the probability of landfall? (3) Based on the graphics, what would you do if these illustrated actual situations? The purpose for the questions was to determine whether participants could understand the maps relatively unaided, to assess whether participants’ map reading ability contributed to any misinterpretations, and to find out in what ways such presentation might factor into residents’ decision-making about behavior in a storm situation.

The National Weather Service advisory maps we used are from Hurricane Isabel (attached), though we eliminated the name of the storm and the year from the images. Participants looked at the maps and talked through their interpretations.

Overall, the interview participants viewed the conditions depicted by the maps as very serious. Interestingly, those who more accurately interpreted the maps were more likely to say that in such a scenario they would have time to wait to see how the storm developed and tracked before making a decision about whether to evacuate or stay. People who were less accurate in their interpretations more frequently said that, based on the maps alone, they would leave or prepare to leave. Most participants said they would seek additional information from other sources.

For both maps, participants most frequently interpreted the shaded cone as areas that are, or would be, affected by the storm (wind and rain). While it’s likely that the areas in the cone would in fact be affected, the majority of people did not directly indicate that the shading represented a range for the probable or potential passage of the center of the storm even though the keys provide that information.

- **Time.** Participants noted time more often when interpreting Map A, possibly because days and times are marked on the map. Often, participants didn’t mention the time intervals presented in both maps.
- **Direction.** Few people had difficulty in recognizing that the storm was moving on shore from east to west. In the few cases that direction was a problem, these occurred with Map B.
- **Graphic Representations.** The shaded cones were often interpreted as areas that would be affected more or less along a storm path. While the line in Map A suggested a storm track, the white shaded area was often described as the areas that would be affected by the storm on its current track. The colors in Map B were often interpreted as areas that would be more or less affected (e.g., more or less wind, rain, and flooding depending on the color).
- **Numerical data** (probability). Many participants didn’t discuss the concept of probability (or potential) that is presented in Map B particularly.
- **Use of the key.** Participants used the key more frequently when interpreting Map A. One reason may be that the cone did not include multiple colors; another factor might be the placement of the key relative to the shaded area it explained. For Map B, people tended to assume they understood the colors (red is “dangerous,” orange, green, and yellow successively less so.) Some people transferred their understanding of the uses of color in weather forecasts from other media (TV primarily) to their interpretations of the maps.

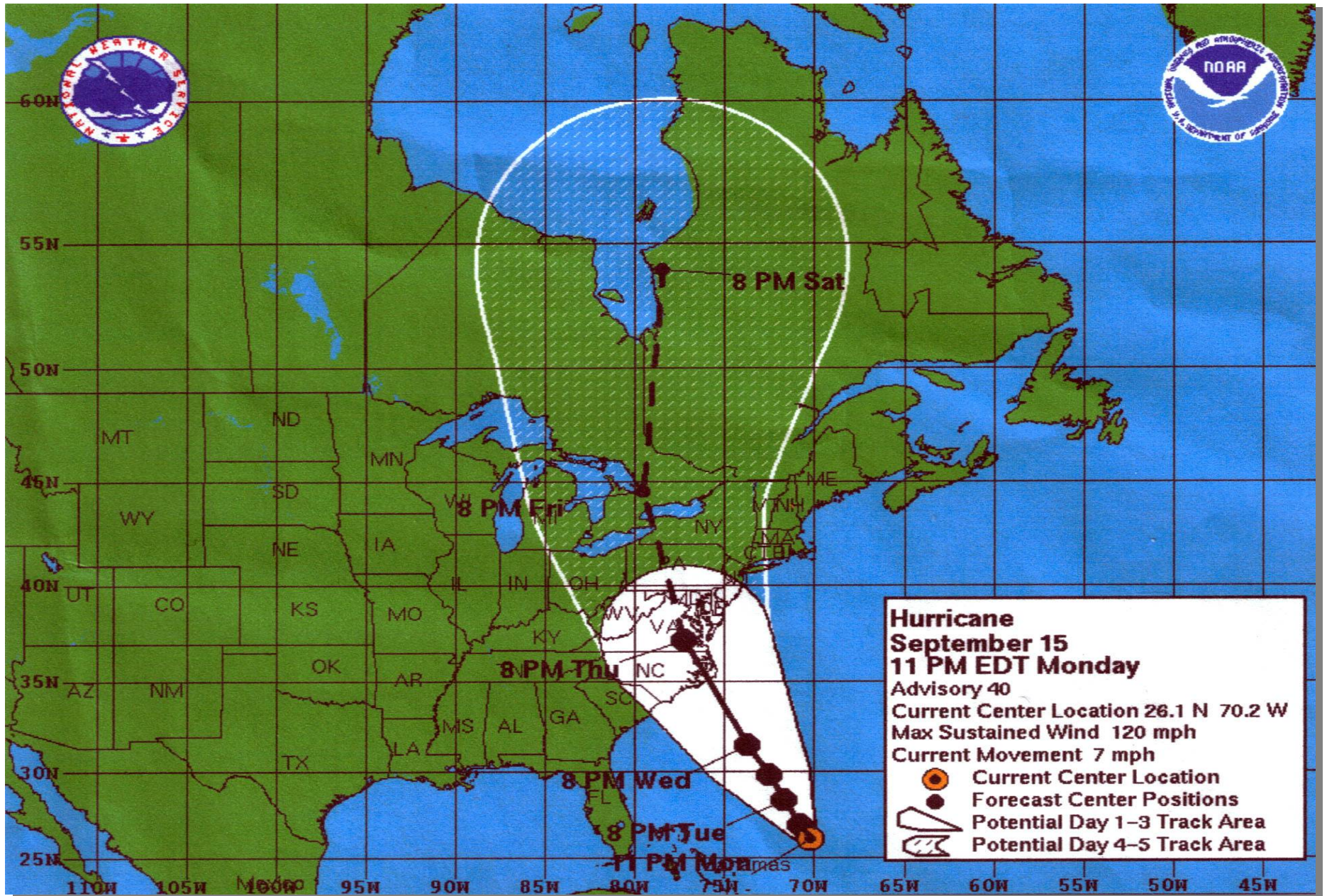
Example Interpretations

The two examples below typify some features of readings of the advisory maps that we would consider more and less accurate, or successful. In example 1, the participant is managing multiple considerations (space, time, direction, shaded areas, and probability) simultaneously. The participant is obviously consulting the keys to understand the meaning of the data. Projected change in movement of the storm over time and “forecasts,” forecasts possible,” and “percent changes” over time and relative to different areas are mentioned.

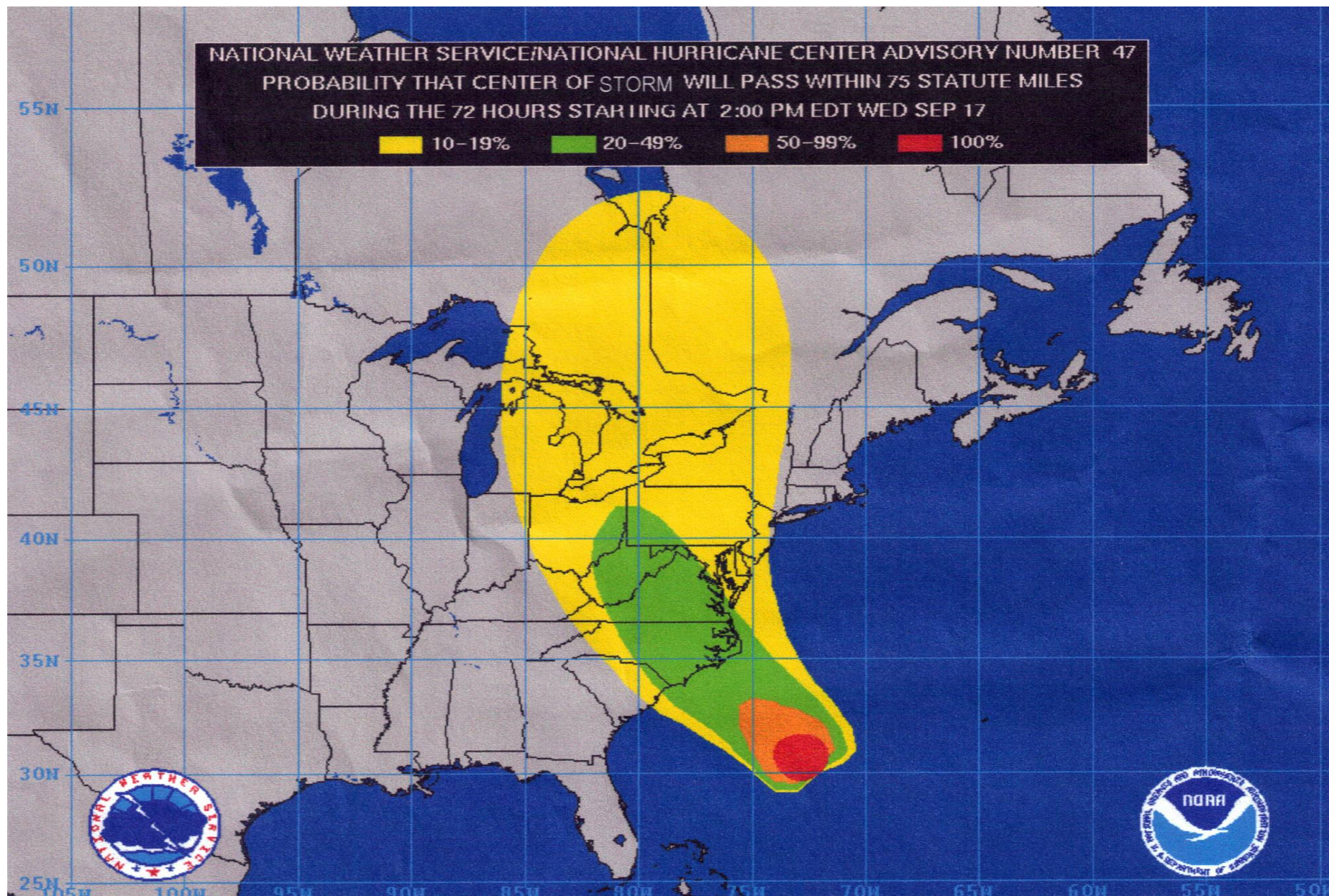
The participant in example 2 has more difficulty interpreting the information. For Map A, the line in the cone of uncertainty is interpreted as indicating the storm track, which “would have passed right over” a location. The comment about “not going north” indicates that the participant understands the direction of the storm in Map A; however, in discussing Map B, which has no line, the participant interprets that the storm has “gone offshore,” or east away from the coast. The assumption that the colored areas of the cone in Map B primarily indicate intensity is somewhat typical. Example 2 doesn’t refer at all to forecasts or potential change in the direction of the storm. Ideas about probability relate to differences in rain and wind in areas marked by different colors. No clear references to time are indicated.

1. More Accurate	2. Less Accurate
<p>[Viewing Map A] Well, [pause], okay, so the brown one is a current location, the black dots are the forecasts where they consider it will be positioning. Uh, the white area, I don’t know what you call that thing, is the potential in the [next few] days, uh huh, and then the other little skidded area, uh huh, would be the forecast possible for the fourth and fifth day after, you know. Ok?</p> <p>[About Map B] Umm, well, [inaudible] the center storm clouds [inaudible], so right down there, that’s the center of the storm. Yeah, the red. 100 percent. During the next [inaudible] hours starting at 2:30 pm, Wednesday, so that’s where it is right then. Orange is 50 to 99 percent chance it’s going to move in that direction. [inaudible] during the 72 hours starting at 2 o’clock, and green is [long pause, interviewee considers the aloud], a 100 percent chance it’s going to be there, a 50 to 90-some chance it’s going to be within 35 miles, and the green is like a 50 – up to 50 percent chance and this would be more like a 20 percent chance, up to that area. Did I get anything close?</p>	<p>[Viewing Map a] Well, I’m getting the hell out. <i>Okay. How close is that storm landing to where you live?*</i></p> <p>Right there, so it’s almost like um, I guess maybe the storm would have passed right over us.</p> <p><i>Okay, anything else that you can make out on that?</i></p> <p>Well yeah, not to go, not to go north. It’s, it’s best to get out of the range and go south. It’s going north. Northeast.</p> <p>[About Map B]</p> <p>That means it’s gone offshore.</p> <p><i>Okay. So, how do you know that it, based on that, that the storm’s going</i></p> <p>Well there’s the eye</p> <p><i>Okay. PAUSE.</i></p> <p>We’re at the most powerful.</p> <p><i>Okay. That’s uh, anything that the other colors tell you about?</i></p> <p>Well, um, tropical storm, yellow, and tropical storm green will probably be higher winds. Probably a little more rain. And the orange is probably still very strong winds, a lot of rain.</p>

*** Italicized text is the interviewer.*



Map A



Map B