Studies in Visual Interpretation of Complex Forecast Information

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Background

Misinterpretations of the "Cone of Uncertainty" in Florida during the 2004 Hurricane Season ~ May 2007 BAMS

By Kenneth Broad, Anthony Leiserowitz, Jessica Weinkle, and Marissa Steketee

- The current cone of uncertainty, however, while explicitly providing information about uncertainty, does so using graphic elements that seem paradoxically to lead many to perceive lower risk … **The skinny black line and the outlines of the cone itself apparently led many to overestimate the certainty of the projected track;** therefore, if they did not live within the vicinity of the track line, or alternatively lived just outside the boundaries of the cone, they incorrectly concluded that they were not at risk. Ironically, a graphic intended to convey uncertainty may have had the opposite effect, at least with some members of the public.

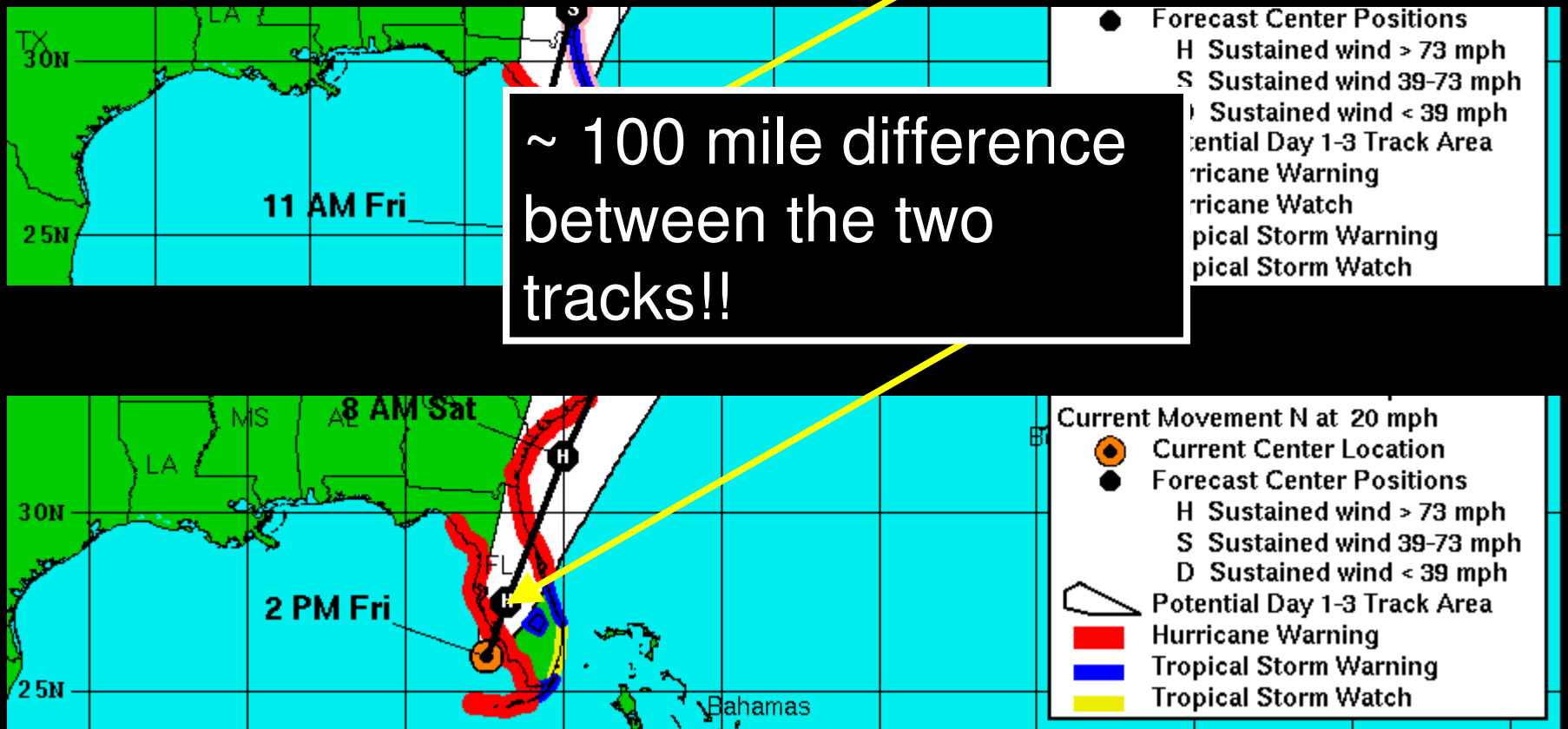
Background

According to a U.S. Army Corp of Engineer's report from the 2004 Hurricane Season:

- Some EMA's may have focused too much on the forecast track and not adequately considered the error cone or Hurricane watches and warnings. Behavioral analyses reveal that citizens indicated watches and warnings are a major factor in their decision to evacuate. However, nearly half of the respondents cannot define what NOAA Hurricane Watches and Warnings mean. Behavioral analyses indicate that evacuation participation rates are higher in communities that issue "Mandatory" warning orders.

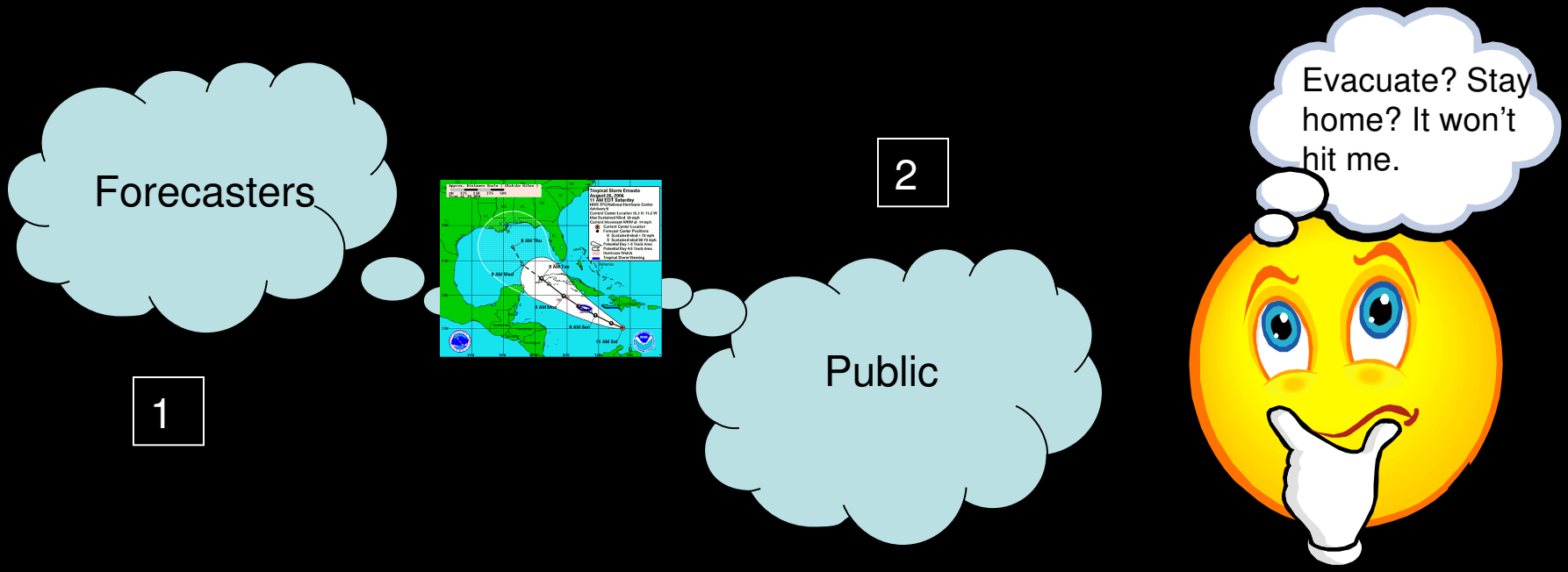
Why the cone?

- It's a commonly used graphic to communicate the track of a hurricane.
- It increases ratings!! (It's not going away!)
- Hurricane Charley … In 2004, the cone caused much confusion!



Research Questions

- **What is the objective of the cone of uncertainty?**
- **How should the public respond to the graphic? Are there intended behavioral responses**
- **How do these objectives correspond with the visual?**



Methods

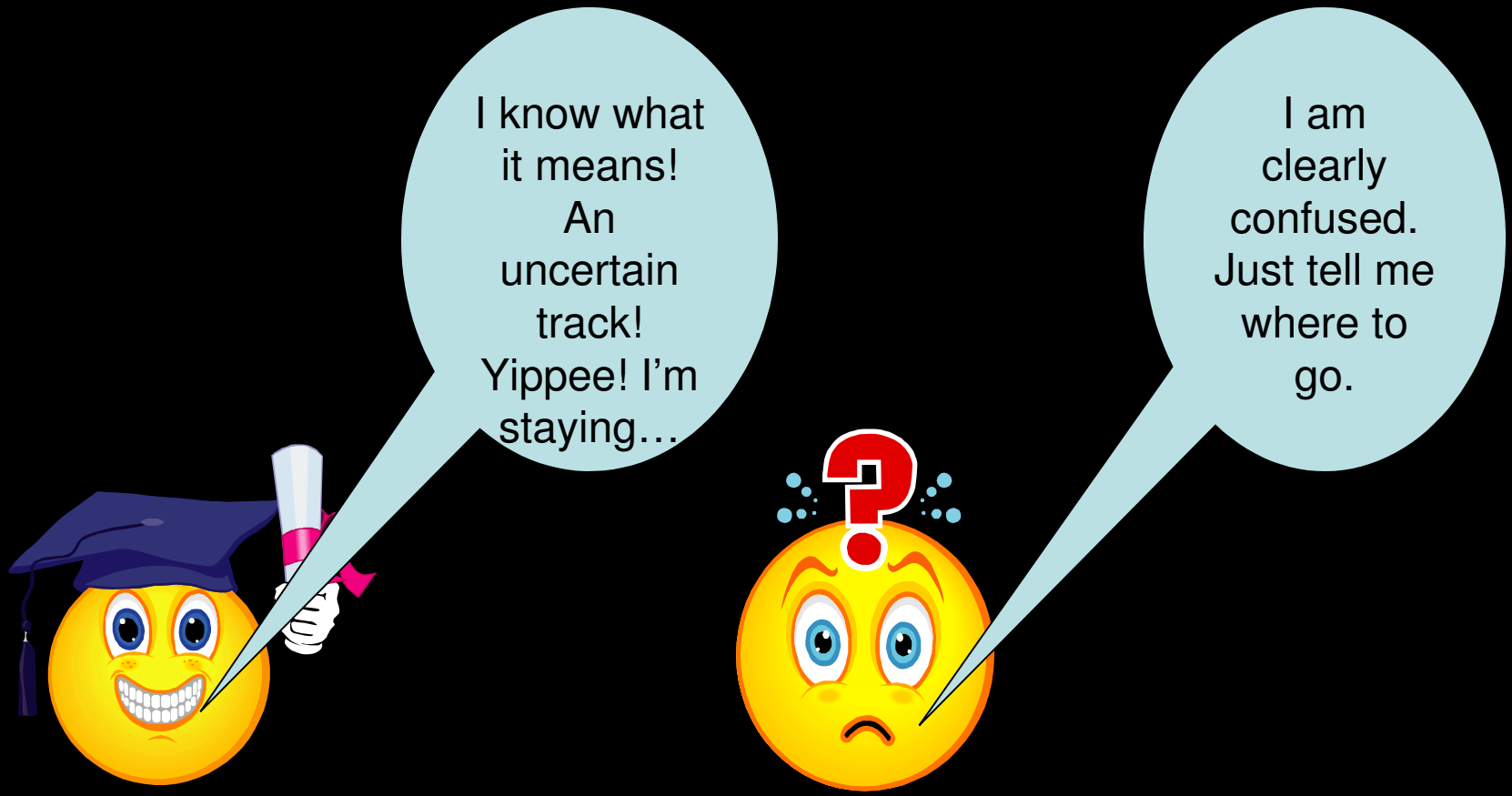
Methods

- Grounded Theory (Glaser & Strauss, 1967; Strauss & Corbin, 1990)
- 19 In-depth Interviews
  - 4 National Weather Service employees
  - 1 Director of the National Center for Environmental Prediction
  - 5 National Hurricane Center (NHC) employees, including one previous director
  - 1 FEMA meteorologist
  - 4 Broadcast meteorologists (Fl and Washington, DC)
  - 4 Private Sector employees
- Average interview length ~ 1 hour 15 minutes

Message Objectives

- **Scientific Uncertainty**
  - "Bottom line the answer to your question is whether we'll be able to give the public an idea of the **uncertainty** to provide the real detailed information, well how to use it to decision makers at the local and state level to help them with their tough calls."
- **Risk (Impacts)**
  - "If you were close enough to that track … then know you should **expect damage** within 50 miles of landfall."
- **Confidence (certainty)**
  - "It [the cone] represents where we expect the center of circulation to be, within the next so many days, and we have timelines on there every 12 hours. It **represents the certainty** of where we expect the center of circulation to be, only the circulation, not the impacts."

Understanding vs. Behavior
What do scientists really want?



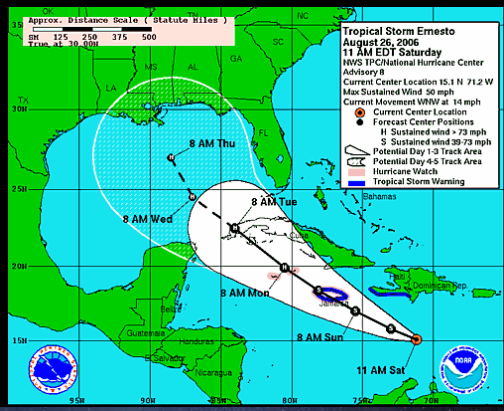
Behavioral Objectives

- Beginning of Hurricane Season..... Prepare now!
- Formation..... Keep Listening
- 5-day Cone..... Prepare for a possible hurricane
- ..... Start listening to your emergency managers (EMs)/local decision makers
- 3-day Cone..... Begin to Implement Hurricane plan/Listen to EMs
- Hurricane/Tropical Storm Watch..... Listen to EMs/Implement Your Plan!
- Hurricane/Tropical Storm Warning..... Implement Your Plan!!

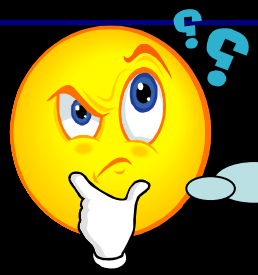
Message Objectives vs. Visual Design

Recall: • Scientific Uncertainty • Risks/Impacts •

• Confidence • Listen to Emergency Managers



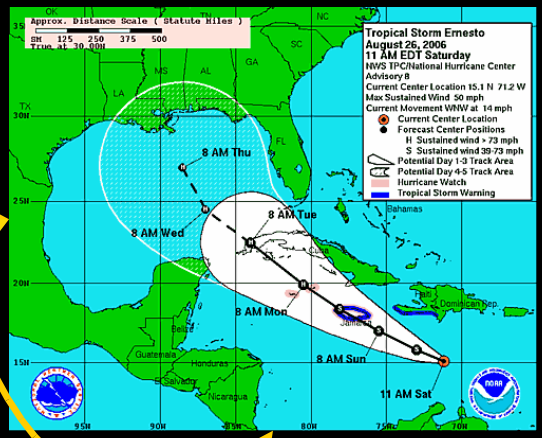
Sometimes people don't understand What we intended them to understand



This storm is definitely hitting N.O. (Said by an undergrad research participant)

This storm will be HUGE once it arrives in N. O. (said by a Cornell grad student)

This graphic makes me want to sing! (Said by my Uncle Richie)



Low Visual Validity

Thinking Outside the Box

This is ONLY an example!!

The science is not accurate!

This has not been tested!

Thank you for listening!