

# DYNAMIC COMMUNICATION OF WEATHER RISK: A USER-CENTERED DESIGN APPROACH

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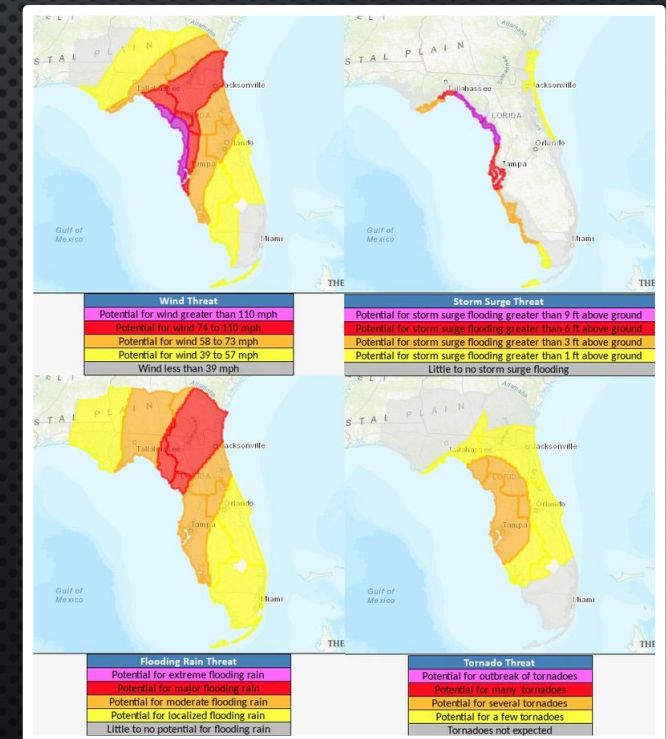
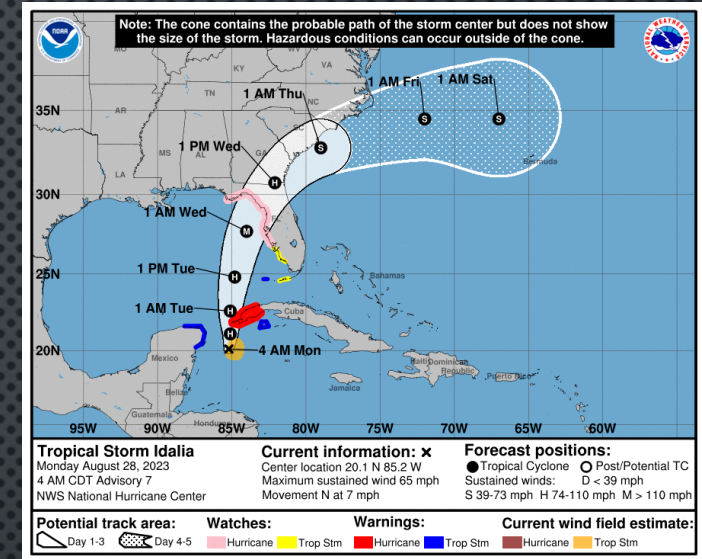
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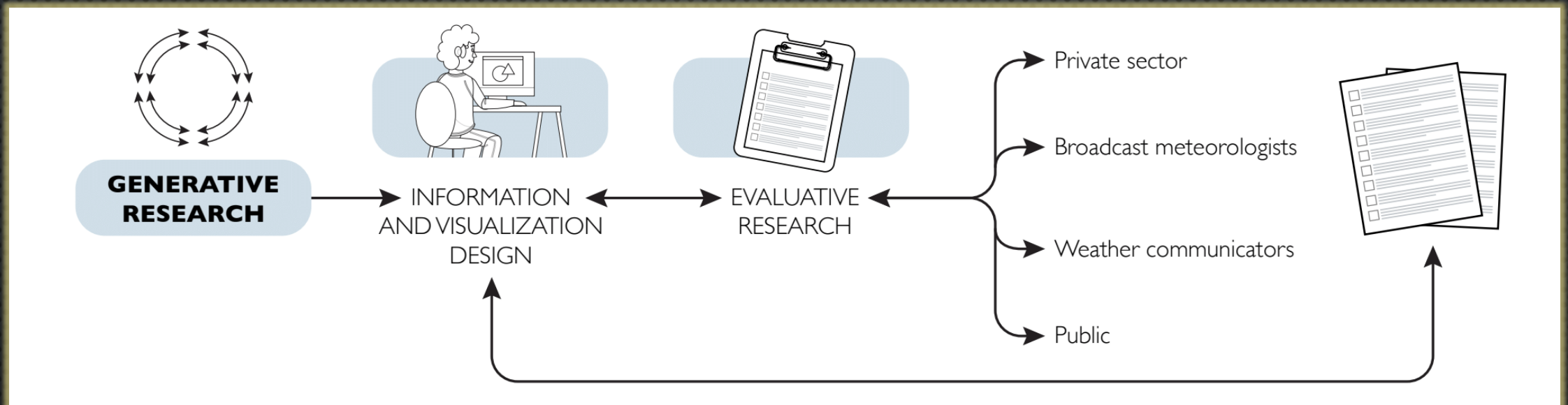
# MOTIVATION

- HURRICANE HAZARD COMMUNICATION IS CHALLENGING!
  - THE **TRACK FORECAST CONE** (OPERATIONAL SINCE 2002) IS CONFUSING TO MANY PEOPLE, INCLUDING SOME DECISION MAKERS... BUT IS VERY POPULAR AND WIDELY USED
    - PERCEPTION THAT OUTSIDE THE CONE IS SAFE
    - MANY PEOPLE DON'T KNOW THE DIFFERENCE BETWEEN WATCH/WARNING
  - **HURRICANE THREATS AND IMPACTS (HTI) GRAPHICS** (OPERATIONAL SINCE 2015) ARE INTUITIVE TO PEOPLE BUT HARD TO FIND AND NOT WIDELY USED
    - PROVIDES 4 THREAT LEVELS FOR 4 HURRICANE HAZARDS
    - REQUIRES NHC AND WPC FORECASTS THEN WFO COORDINATION... VERY HANDS-ON



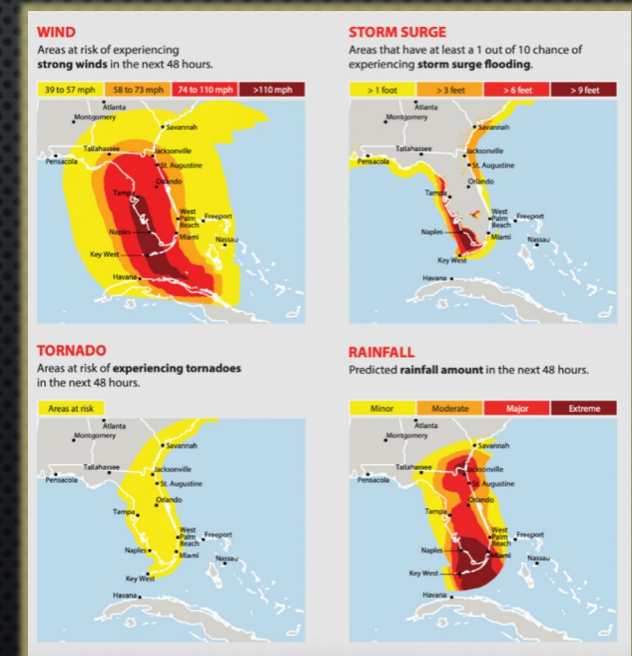
# GOAL & METHODOLOGY

- IDENTIFY DESIGN FEATURES THAT ARE EFFECTIVE ACROSS MULTIPLE HAZARDS AND IMPACTS OVER MULTIPLE FORECAST PERIODS.
  - EXPLORE THE IMPACT OF RISK ATTRIBUTES TO INFORM THE VISUALIZATION DESIGN OF A REDESIGNED HTI-LIKE GRAPHICAL PRODUCT



# DESIGN CHARRETTES

- 33 PARTICIPANTS IN LOCAL COMMUNITY ORGS.
- INTRODUCTIONS & STUDY PURPOSE
- UNDERSTANDING/REACTIONS TO HURRICANE IRMA HTI GRAPHIC
  - “WHAT DOES THIS FORECAST PRODUCT TELL YOU? WHAT DO YOU LIKE/DON'T LIKE?”
- DESIGN
  - “CREATE A NEW VISUAL(S) THAT CONTAINS AN INTEGRATED MAP, SEVERAL MAPS, TEXT, GRAPHICS AND/OR ANY COMBINATION OF ELEMENTS THAT HELPS COMMUNICATE ABOUT THE HURRICANE AND ASSOCIATED THREATS SO YOU CAN PREPARE.”
- SHARING & DISCUSSION

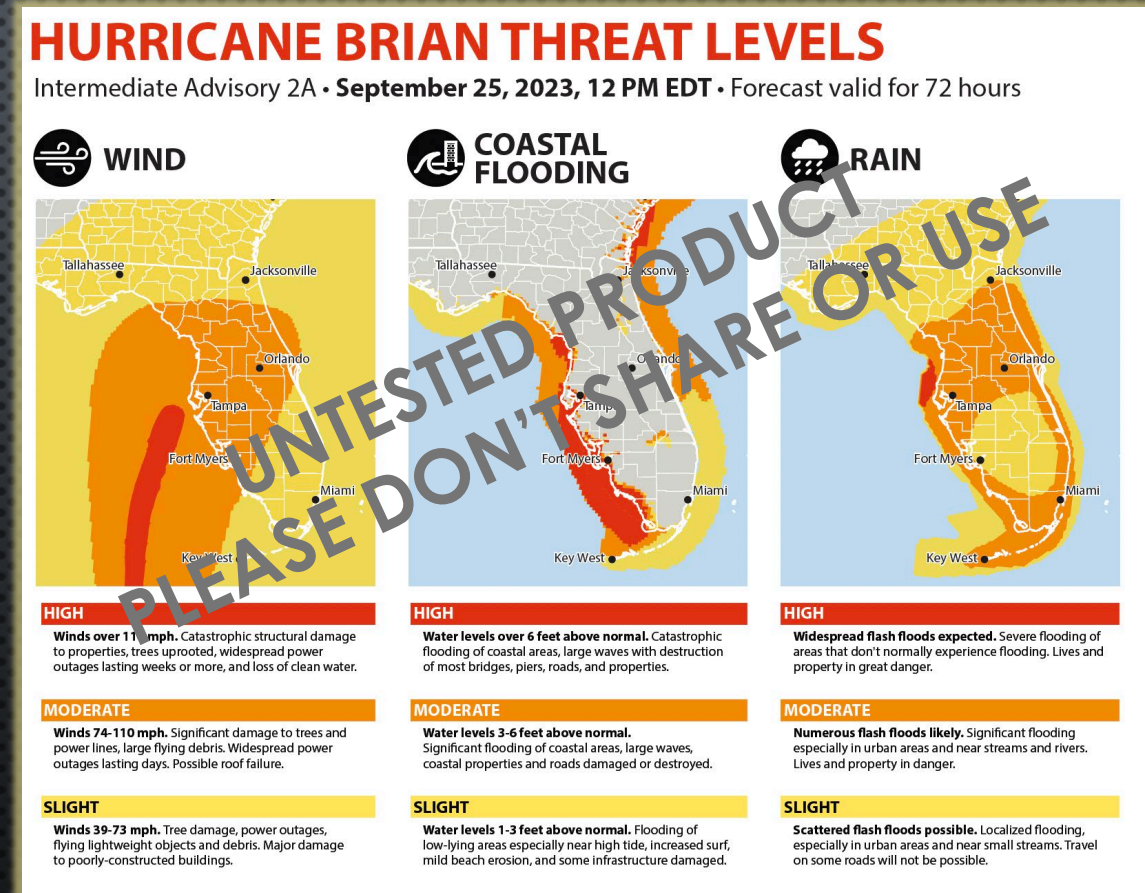


# IDEATION SESSIONS & PROTOTYPE DESIGN

- COLORS AND LABELS FOR THREAT LEVELS
- CLEAR INDICATION OF TIMING OF HAZARDS
- MODERNIZATION OF AESTHETICS
- ACCESSIBILITY AND LANGUAGE BARRIERS
- COMMUNICATING INLAND IMPACTS
- COMMUNICATING MULTIPLE THREATS
- RETHINK WATCHES AND WARNINGS
- TIMING OF ISSUANCE OF INFORMATION
- EXAMPLES OF IMPACTS FROM HAZARDS ON HOUSES, STREETS ETC.
- SUPPLEMENTING GRAPHICS WITH ICONS AND TEXTUAL INFORMATION
- INCORPORATING FORECAST UNCERTAINTY
- UTILIZING LONGER FORECASTS OF WIND, FLOODING RAIN, & SURGE (72 HOURS)

# GENERAL DESIGN FEATURES & UPDATES

- **COLOR SCHEME:** TRANSITIONED TO A SEQUENTIAL SCHEME, RANGING FROM YELLOW TO DARK RED.
- **GEOGRAPHIC REFERENCE:** ADDED MAJOR CITIES TO THE MAPS FOR BETTER ORIENTATION.
- **EXPLANATORY TEXT:** INTRODUCED TITLES AND SUBTITLES TO EACH MAP FOR CLARITY.
- **MODERN AESTHETICS:** UPDATED THE OVERALL LOOK AND FEEL OF THE GRAPHICS TO A MORE CONTEMPORARY STYLE.
- **EXCLUSION OF TORNADO HAZARD:** TORNADO HTI GRAPHIC WAS INTENTIONALLY LEFT OUT FROM THE DESIGN UPDATES.



# INTERVIEWS:

## EMERGENCY MANAGERS & BROADCAST METEOROLOGISTS

- GOAL: ELICIT PERSPECTIVES ON PROTOTYPE HTI GRAPHICS, INCLUDING LIKELY USES AND FEEDBACK ON AREAS FOR IMPROVEMENT
- SAMPLING: FOCUSED ON HURRICANE FORECAST & WARNING SYSTEM PROFESSIONALS IN HURRICANE-PRONE REGIONS, AT LOCAL AND STATE/REGIONAL LEVELS
- 20 INTERVIEWS TOTAL
  - 10 BROADCAST METEOROLOGISTS + 10 EMERGENCY MANAGERS
- APPROACH: SEMI-STRUCTURED ONLINE INTERVIEWS

# INTERVIEWS:

## EMERGENCY MANAGERS & BROADCAST METEOROLOGISTS

### 8 OVERALL DESIGN / IMPROVEMENTS

3 HAZARDS

1 COLORS

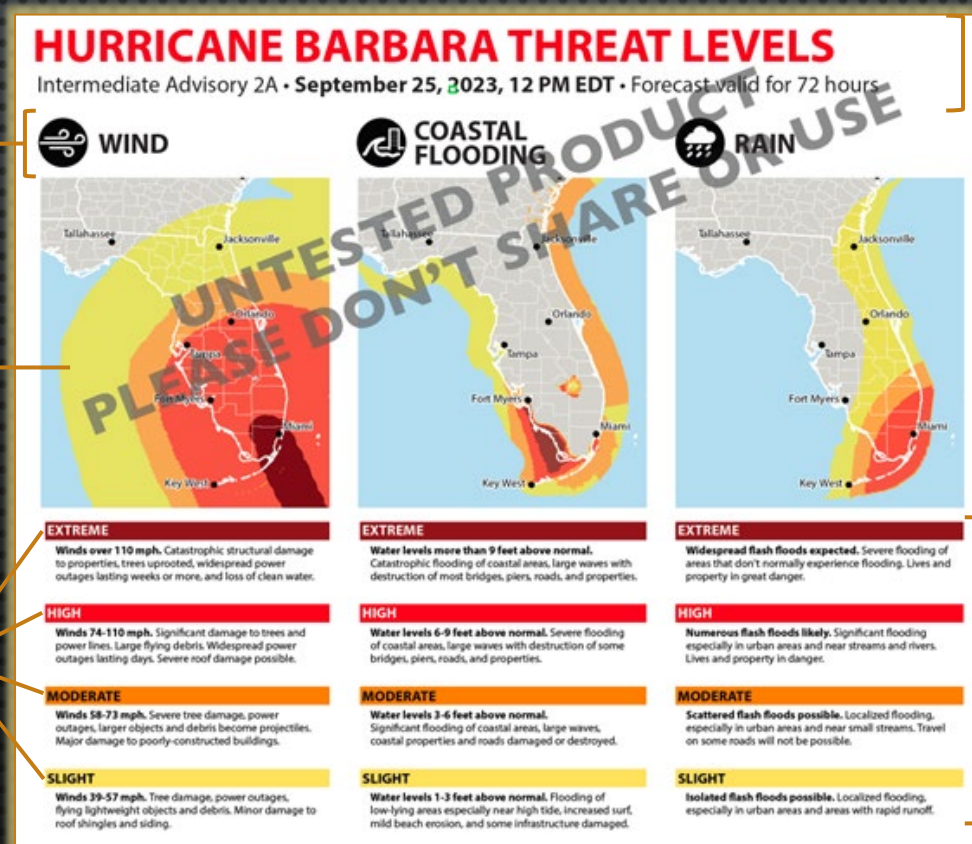
2 THREAT LEVELS

4 TITLE AND HEADER

6 ADDING TIMING

7 ADDING LOCAL INFO

5 LEGEND / DESCRIPTORS





# INTERVIEWS:

## EMERGENCY MANAGERS & BROADCAST METEOROLOGISTS

- OVERALL, THE INTERVIEWEES RECOGNIZE AND APPRECIATE THE IMPACT OF THE IMPROVED DESIGN

accessible  
modern  
very simple  
clean  
not cluttered  
well-organized  
digestible  
more complete  
easier to understand  
easy to read  
more consumer friendly  
clear  
easy on eyes  
less "sciency"  
more uniform

# INTERVIEWS:

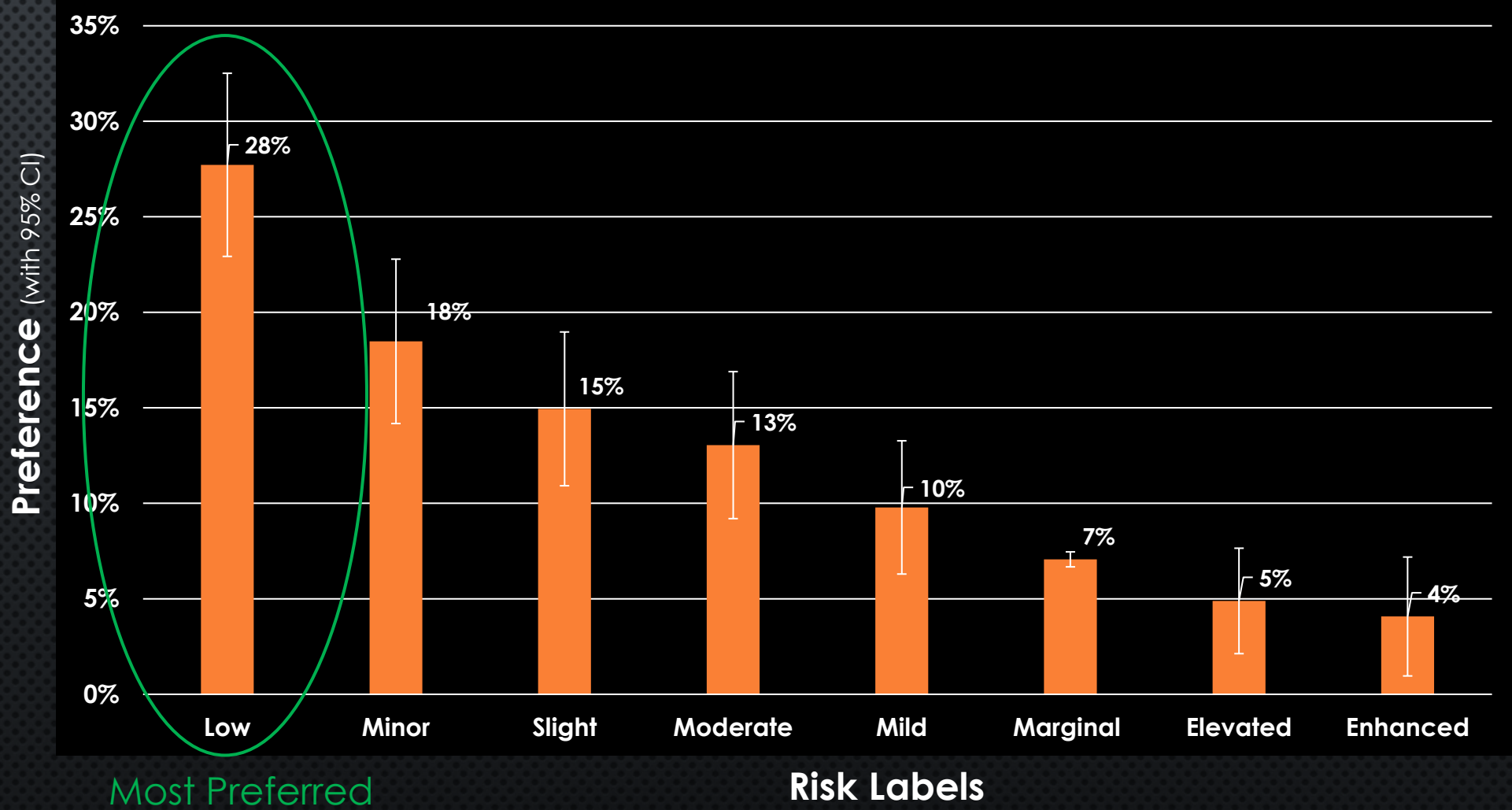
## EMERGENCY MANAGERS & BROADCAST METEOROLOGISTS

- BEST PRACTICES IN RISK VISUALIZATION DESIGN GENERALLY YIELD POSITIVE RESULTS, BUT IMPORTANT **CONTEXTUAL KNOWLEDGE** NEEDS TO BE TAKEN INTO ACCOUNT AS WELL
  - GEOGRAPHIC, PLACE-BASED KNOWLEDGE
  - KNOWLEDGE OF THEIR CONSTITUENTS AND WHAT THEY NEED / UNDERSTAND
  - HIGHLIGHTS THE IMPORTANCE OF INCORPORATING USER FEEDBACK AS PART OF VISUALIZATION DEVELOPMENT
- **NO ONE GRAPHIC CAN ACCOMPLISH ALL COMMUNICATION GOALS** – DIVERSE PORTFOLIO OF VISUALIZATIONS NEEDED FOR DIFFERENT PURPOSES, DIFFERENT AUDIENCES
  - TENSIONS BETWEEN NEEDS AMONG KEY STAKEHOLDERS, AS WELL AS WITH THE PUBLIC
  - **BUILDING IN FLEXIBILITY WHILE MAINTAINING CONSISTENCY**

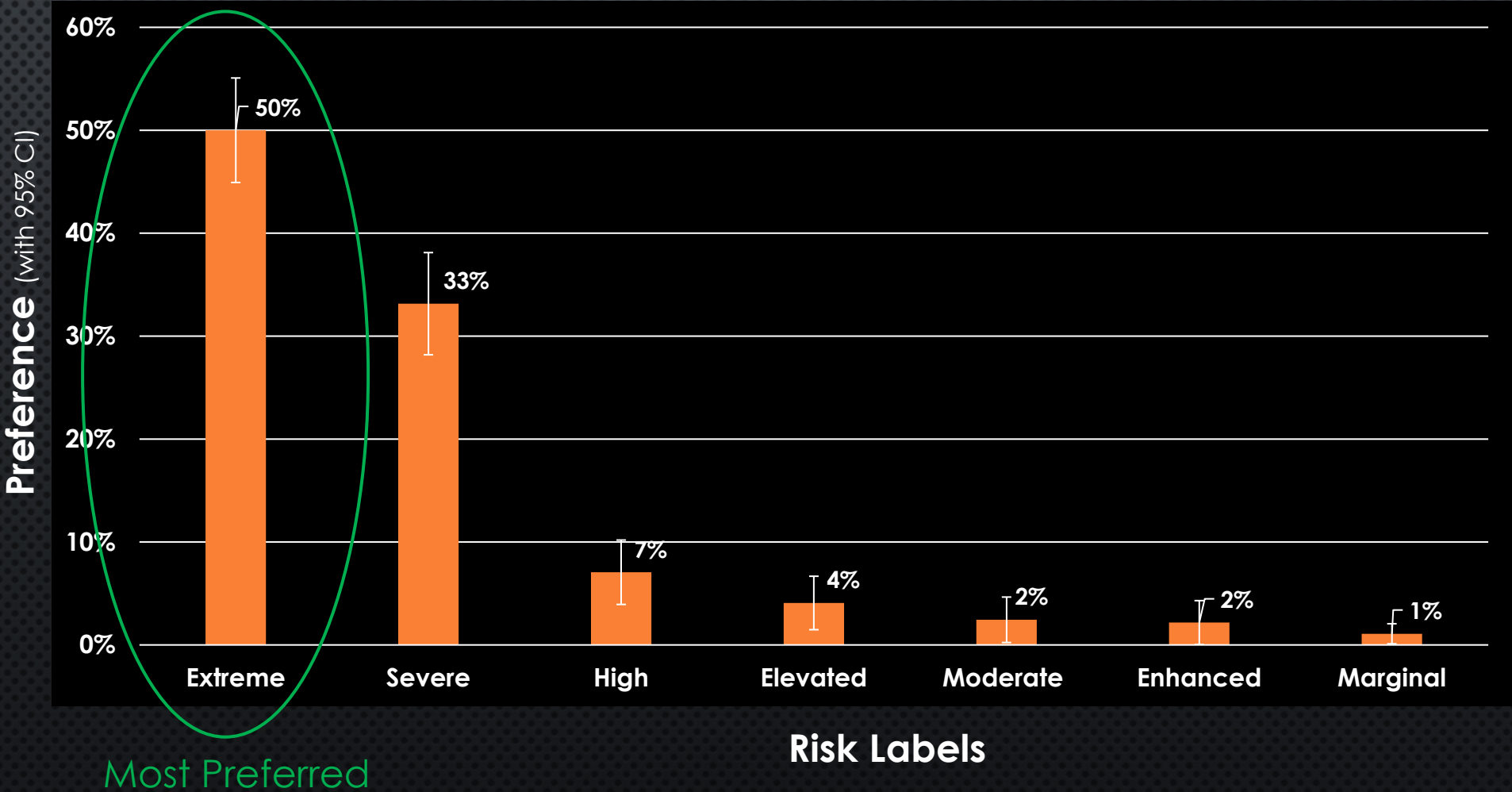
# EVALUATIVE RESEARCH: PUBLIC

- EXPLORATORY STUDIES: EXPLORE THE IMPACT OF THE FOLLOWING ATTRIBUTES TO INFORM THE VISUALIZATION DESIGN OF A NEW WEATHER RISK GRAPHICAL PRODUCT
  - ES1: THREAT LEVEL COLORS AND LABELS (368 PARTICIPANTS IN FL, 1/2 COASTAL, 1/2 INLAND)
  - ES2: WIND ARRIVAL TIMES
  - ES3: COMBINED THREAT INFORMATION PRESENTATION (TEXTUAL VS. ICONIC)
- MAIN EXPERIMENT: EVALUATE IMPACT OF WEATHER RISK VISUALIZATION DESIGN (NEW, EXISTING) ON COMPREHENSION, RISK PERCEPTION, AND BEHAVIORAL INTENT.
- EXPERIMENTS CONDUCTED REMOTELY & ASYNCHRONOUSLY

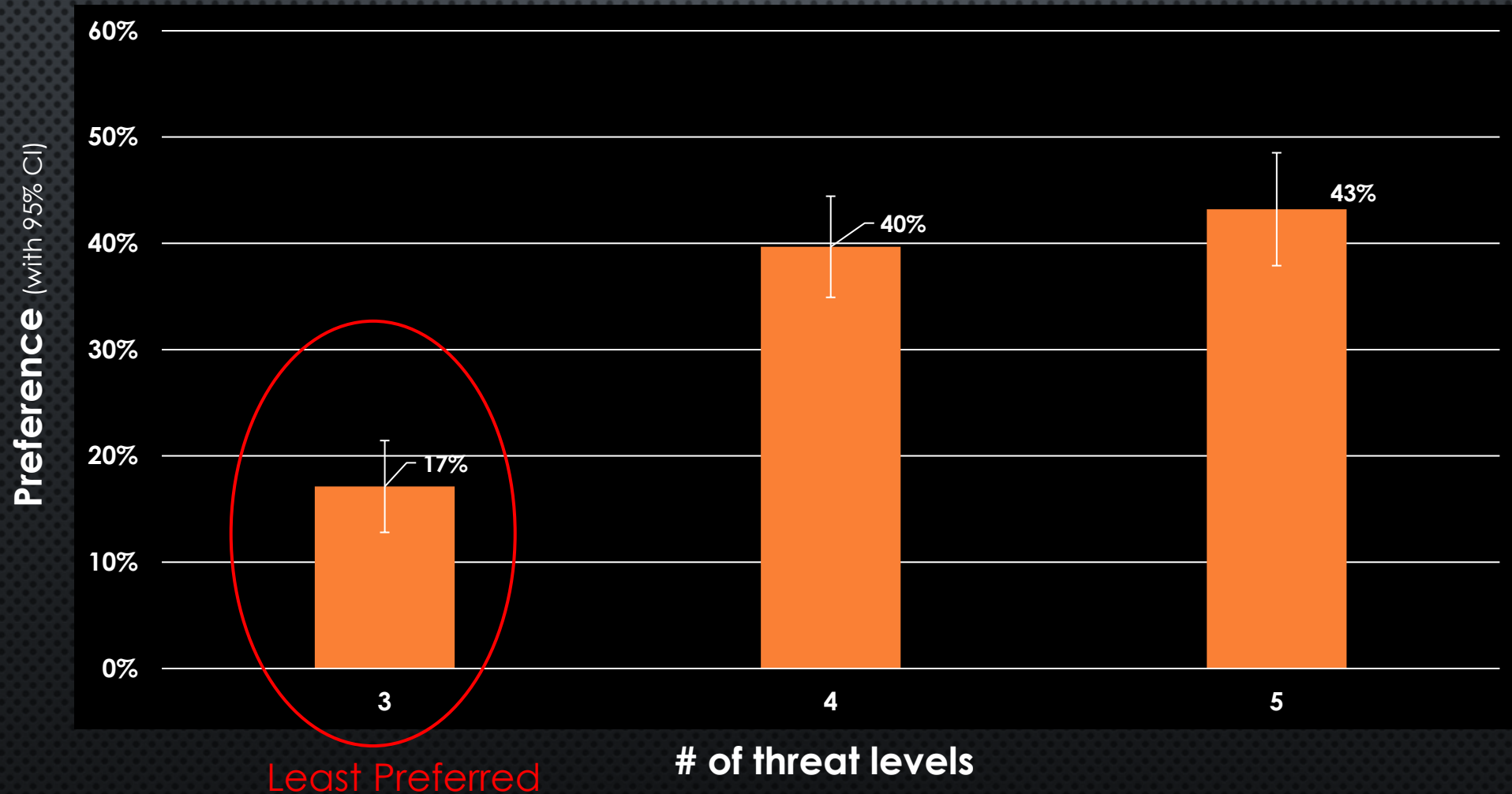
# EXPLORATORY STUDY 1: LOWEST THREAT LABEL



# EXPLORATORY STUDY 1: HIGHEST THREAT LABEL



# EXPLORATORY STUDY 1: NUMBER OF LEVELS



# EXPLORATORY STUDY 1: KEY FINDINGS

- RISK PERCEPTION
  - INFLUENCED BY BOTH THE NUMBER OF RISK CATEGORIES AND THE RISK LABELS. THIS AREA NEEDS FURTHER EXPLORATION
- PREPARATORY ACTIONS
  - DECISIONS ARE BASED ON STORM CHARACTERISTICS, NOT DESIGN
- THREAT LEVEL LABELS:
  - PARTICIPANTS PREFERRED “LOW” FOR THE LOWEST THREAT LEVEL BUT DESIRED MORE GRANULARITY FOR LEVELS.
  - PARTICIPANTS PREFERRED “EXTREME” FOR THE HIGHEST THREAT LEVEL

# NEXT STEPS

- EXPLORATORY STUDY 2: SURVEY COMPLETE, ANALYSIS IN PROGRESS
  - TIME OF ARRIVAL CONTOURS ON OR OFF WIND HTI MAP
- EXPLORATORY STUDY 3: THIS SUMMER
  - INCLUSION OF ICONS
- MAIN EXPERIMENT: THIS FALL
  - UTILIZE INFORMATION GATHERED FROM ES 1-3 AND FROM EM/BM INTERVIEWS TO GUIDE FINAL DESIGN
  - EVALUATE AGAINST MOST-SIMILAR EXISTING PRODUCTS

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