

Chapter 1

Introduction

On September 9th, 2002 a tropical wave moved off the coast of Africa. As the wave approached Trinidad and the northern coast of Venezuela the system became reclassified as a tropical depression. This depression then interacted with land and was downgraded to a tropical wave. When the wave encountered the warm waters of the Caribbean Sea it redeveloped and was again reclassified to tropical depression status on September 17th, 2002. Tropical Storm Isidore was named on September 18. Isidore very slowly meandered west-northwest across the Cayman Islands and developed into Hurricane Isidore on September 19. Slow moving Isidore would then pound western Cuba for more than 12 hours. Isidore then moved west and southwest toward the Yucatan Peninsula. Here, Isidore reached its maximum intensity with winds of 125 miles per hour, a category 3 hurricane. For the next 24 to 36 hours Isidore would track over northern Yucatan and weaken into a minimal tropical storm. Isidore moved once again over the water. As it spun over the Gulf of Mexico, circulation expanded once again. This time Isidore would not regain its intensity and made landfall at Grand Isle, Louisiana on September 26th with winds of 63 miles per hour. Isidore produced torrential rainfall amounts over the southeastern United States before moving north where it was absorbed into a frontal zone. Isidore would be responsible for 4 direct deaths in the United States. Overall cost estimates of the damage done in the United States were \$330 million. Hardest impacted was Louisiana. Unfortunately the hurricane season was not over for this area.

While Isidore was spinning its path, another tropical wave was moving over the Atlantic Ocean off the coast of Africa on September 16th. On September 21st the wave qualified for tropical depression status. As the system continued and crossed the Windward Islands on September 23rd, it was developing into tropical storm status. The storm then encountered vertical wind shear in the east-central Caribbean and weakened into an open tropical wave. September 27th the system re-acquired a low-level circulation and began slowly moving north around the north coast of Jamaica. The storm would inflict heavy rains on Jamaica for the next three days. Hurricane Lili developed on September 30th as the storm moved west-northwest over Cayman Brac and Little Cayman Islands. The hurricane moved over Cuba on October 1st with wind speeds as high as

104 miles per hour. While Hurricane Lili was centered in the north-central Gulf of Mexico, the storm intensified. Wind speeds would be estimated to be between 100 and 144 miles per hour, with gusts reaching over 155 miles per hour. Hurricane Lili was an extremely dangerous category 4 hurricane as it made its way northwest towards the Gulf coast of the United States. Then inexplicably during the final 13 hours before landfall in Louisiana, Lili weakened. Landfall occurred October 3rd in Vermilion Parish, Louisiana as a category 1 storm. Lili was the first hurricane to make landfall in the United States since Irene hit Florida in 1999. While Isidore was directly responsible for four deaths, Lili had no direct deaths. The estimate of the damage costs for Hurricane Lili was \$860 million. This made the combined dollar damage from the storms in excess of \$1 billion. Most of the damage occurred in Louisiana, and prompted President Bush to declare Louisiana eligible for federal assistance (FEMA 1437-DR-LA).

Tropical Storm Isidore and Hurricane Lili caused mass evacuations in Louisiana parishes both coastal and inland. Additional limited evacuations occurred in Texas, Alabama, and Mississippi. The Federal Emergency Management Agency (FEMA) and the U. S. Corps of Engineers (USACE) New Orleans District initiated a post-storm assessment for these two storms. The purpose of the assessment is to analyze the effectiveness of the products provided in hurricane evacuations studies; which products were most useful and which were least useful; and what improvements could be made to current methodologies and products to assist during the next evacuation event. FEMA, the USACE and the National Weather Service jointly fund these studies and their associated work products. The assessment is used to determine if the data and products are useful and accurate.

Data was collected for each of the following technical areas:

- Hazards – High water mark data versus SLOSH model data; actual storm surge versus predicted; data concerning inland flooding, tornadoes, rainfall amounts
- Evacuation Decision Making – Evaluate usefulness of FEMA/USACE products in the decision-making process; determine when EOCs were activated and how long they were active; determine when and how evacuation orders were issued
- Transportation – Compare actual traffic accounts (when available) to study predictions; evaluate usefulness of the Evacuation Traffic Information System (ETIS) and the Evacuation Liaison Team (ELT)

in this event; assess effect of railroad traffic on evacuating vehicular traffic

- Sheltering – Data on shelter space actually available during Isidore and Lili compared to shelter estimates from FEMA/USACE studies
- Public Information – To what extent was public information released and was the message disseminated clearly and understood by the public

A behavioral component of the post storm assessment process is located in Appendix C. This data is collected via telephone surveys to randomly selected local residents to determine if and why they evacuated or did not evacuate, and then uses this data to compare to predicted behavioral parameters.

To answer these questions, study teams comprised of representatives from FEMA; the USACE and the contractor PBS&J visited with local and state officials throughout the directly impacted areas of Louisiana, Mississippi, Alabama, Florida, and Texas. PBS&J was retained to accompany the study team and document all relevant findings. Many local and state officials provided their observations. Local emergency management directors, law enforcement officers, and Red Cross personnel were involved in meetings held in each area that responded to both Tropical Storm Isidore and Hurricane Lili. Separate meetings were held to discuss study product usage with local media representatives. Appendix A lists those individuals who either attended meetings or provided input through telephone conversations. Discussion with local emergency management officials focused on study products and their use relative to the evacuation decision process, evacuation and clearance time, sheltering, and public information. Discussions with state officials centered on the role the state played in the evacuation process, including the use of study products in communicating with local officials. Media representatives were asked to focus on study related materials that they possessed and that were broadcast to the general public. They also addressed the types of materials and public information they could have used that had not been developed or delivered to them to date.

In addition to the meetings held with state and local officials, Hazards Management Group conducted and analyzed a residential behavioral sample survey for selected communities in Louisiana and Texas. Telephone interviews were conducted to ascertain actual evacuation

response in Isidore and Lili and to predict evacuation response parameters for the comprehensive hurricane evacuation restudy. The behavioral analysis focused on the actual percent of the affected population that evacuated during Isidore and Lili, when the evacuees left their residence, what sort of refuge evacuees used, where the refuge was located, and the number of vehicles used by evacuating households.

This report documents the findings of the study team and is organized by each category of hurricane evacuation study product. The report is chaptered to include each of the following:

- (2) Hazards/Vulnerability
- (3) Evacuation Decision Making Process
- (4) Transportation/Clearance Times
- (5) Public Shelter Issues
- (6) Public Information

Each chapter describes typical study components and products produced in comprehensive hurricane evacuation studies. The chapter then summarizes actual data related to Tropical Storm Isidore and Hurricane Lili and where relevant, compares it with study-produced data for a relevant storm scenario. Recommendations are then given for future study efforts concerning that study topic.

Finally, the FEMA Hurricane Liaison Team (HLT), with the National Weather Service again successfully coordinated video and audio conference calls with FEMA Headquarters, the FEMA Regional Operation Centers (ROCs) and the state emergency management agencies. In cooperation with the National Hurricane Center, FEMA arranged conference calls to discuss the latest advisories.

The NWS Southern Region supported deployment of NWS staff to the ROCs and state Emergency Operations Centers (EOCs). The Louisiana Office of Emergency Preparedness, Texas Division of Emergency Management, Mississippi Emergency Management Agency, Alabama Emergency Management and Florida Division of Emergency Management participated in those calls. The states in turn conducted their own conference calls with state and local government agencies to discuss the forecasts and consider appropriate response actions. Many

local government representatives interviewed for this report commended FEMA, NWS and state emergency management for the improved conference call systems that took place. The states also took advantage of our resources from universities including LSU at the EOC in Baton Rouge and the University of Texas at the state EOC in Austin.

The program utilized most frequently by local and state emergency managers for hurricane tracking and decision-making is HURREVAC. The figures 1-1 and 1-2 are screen captures taken from the HURREVAC program for Tropical Storm Isidore and Hurricane Lili.

Figure 1-1 - HURREVAC - Tropical Storm Isidore

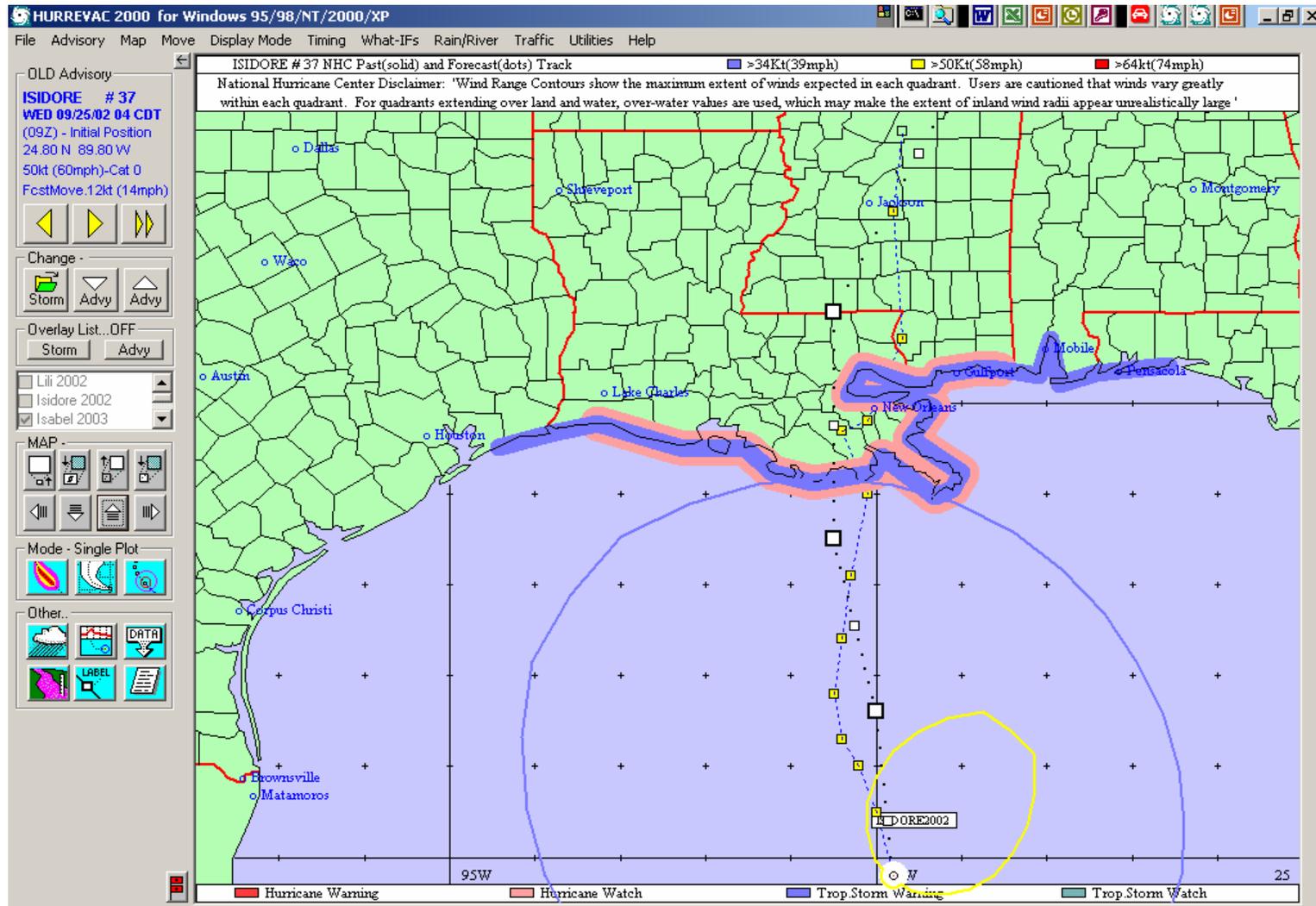


Figure 1-2 - HURREVAC – Hurricane Lili

