

RURAL HOSPITAL EMERGENCY PREPAREDNESS: A CASE STUDY OF GLADES GENERAL HOSPITAL AND HURRICANE WILMA

GLADES GENERAL HOSPITAL

11/06/07

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APHA 135TH ANNUAL MEETING AND EXPO
NOVEMBER 3-7, 2007 WASHINGTON, DC



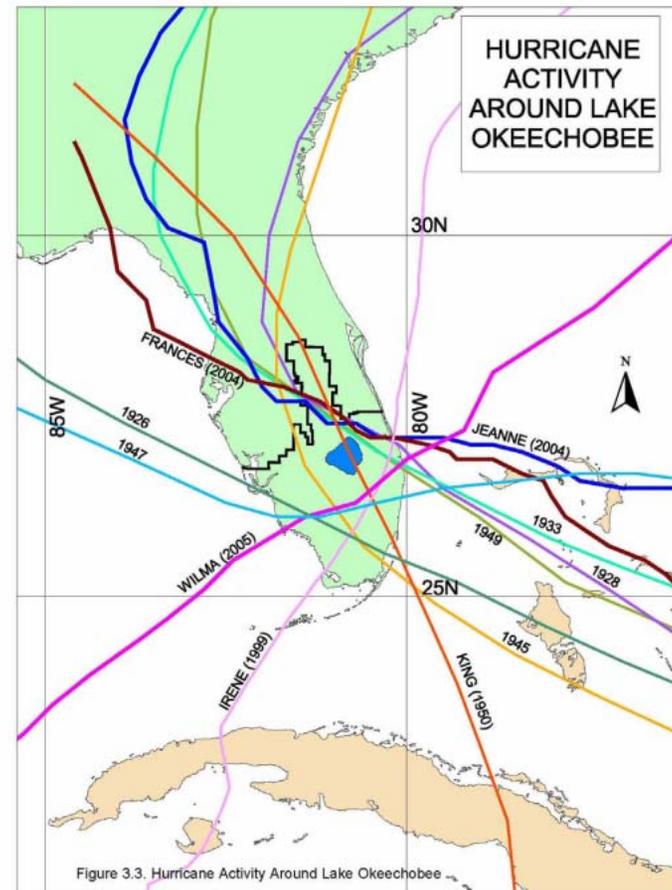
Glades General Hospital

- GGH is a 73 bed JCAHO accredited acute care hospital.
- It is located in Belle Glade, FL, an isolated agricultural community on Lake Okeechobee.
- The hospital was built in 1939 (the current “Memorial Wing”) and expanded in 1964.
- A replacement hospital is being built.



Natural Disaster Threats

Since 1926, there have been 22 hurricanes that have passed near Belle Glade and Lake Okeechobee.



Natural Disaster Threats

- GGH is approximately 3 miles from the shores of Lake Okeechobee and the base of the Herbert Hoover Dike.
- During a hurricane event, the effects on the dike including elevated water levels from rain, wind or storm surge, and waves can elevate water levels against the dike by as much as 15 feet which potentially could lead to failure of the dike.

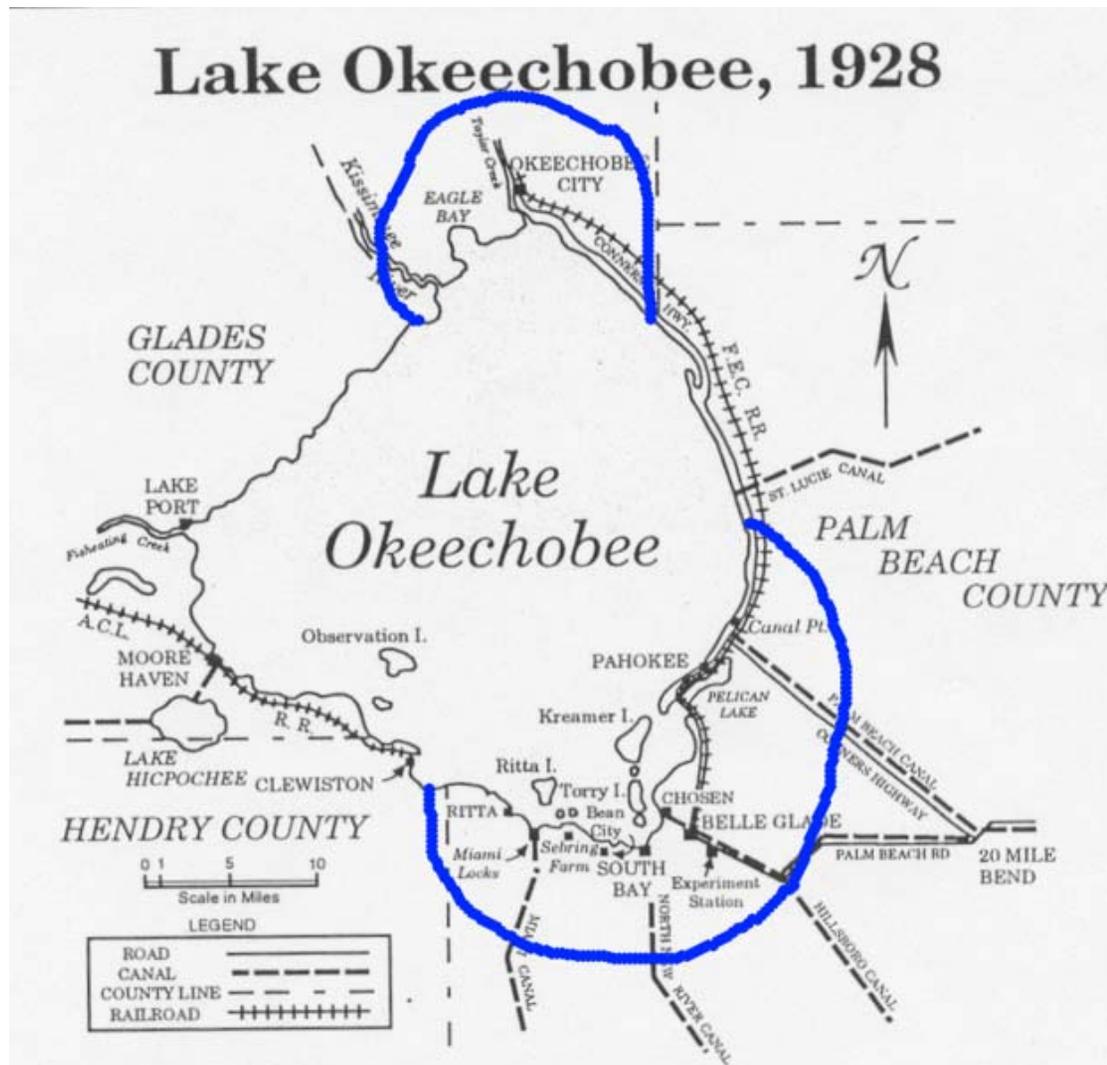


1928 Okeechobee Hurricane

- An intense, Category 5 hurricane made landfall in South Florida on 9/16/1928.
- The 6 foot bream around Lake Okeechobee was breached.
- Water spilled over the bream of the lake, flooding hundreds of square miles in depths up to 6 feet.
- An estimated 2,500 people died.



Extent of flooding around Lake Okeechobee after hurricane



Concerns in October 2005

- The flooding of New Orleans after Hurricane Katrina was a warning.
- Lake Okeechobee is surrounded by levees and dikes.
- As Hurricane Wilma approached, the Army Corps of Engineers gave assurance that the dikes would hold.



Facility Assessment

- The hospital had an engineering assessment done in the summer of 2005.
- The consultants felt the building was safe winds of 120 mph. However, they warned about water intrusion.
- They did not recommend use of the oldest part of the facility (“Memorial Wing”) during the hurricane.



Flooding Risk

- As the hurricane approached, the Army Corps of Engineers was asked about the risk of flooding. The thought was the hospital would be evacuated if the risk was high.
- The risk was deemed low due to
 - The lake had a low water level.
 - The storm was relatively dry.
 - The storm was expected to move through quickly, further reducing the total rainfall.

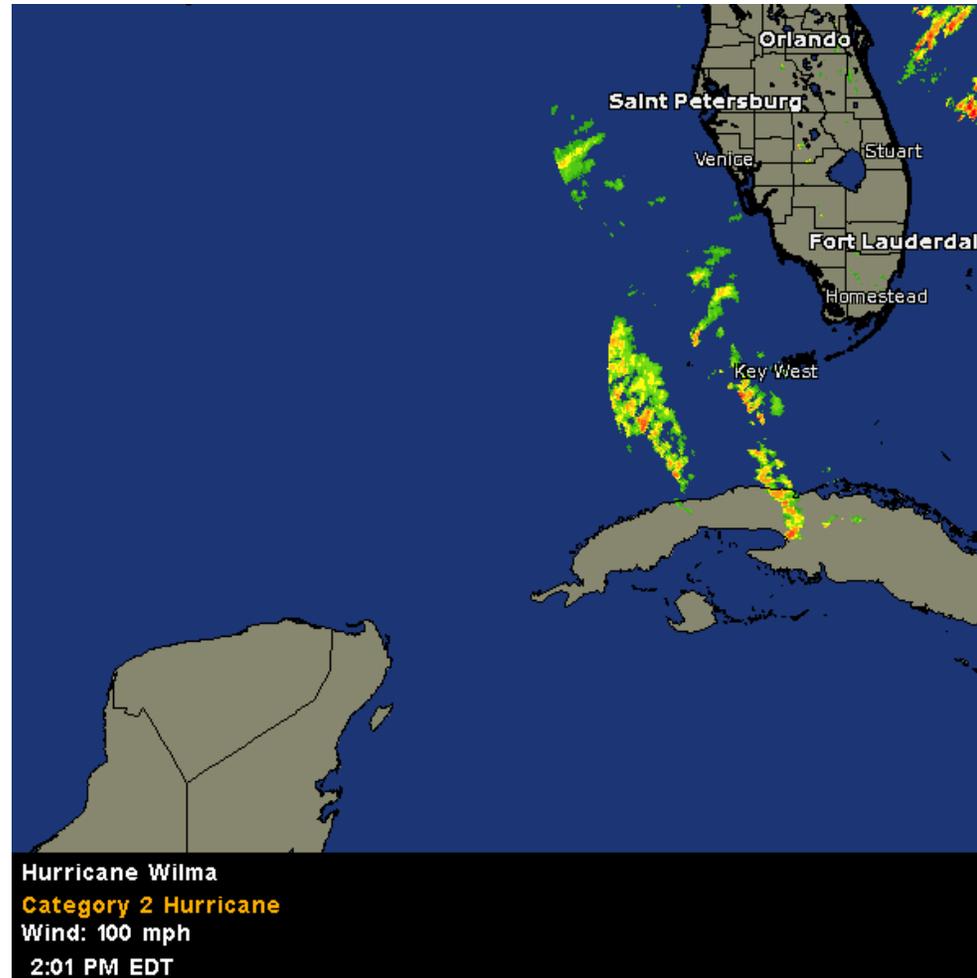


Hurricane Wilma

- Hurricane Wilma struck the southwest coast of Florida on 10/24/2005.
- The storm was a Category 3 hurricane when it struck.
- The south end of Lake Okeechobee reported sustained winds of 103 mph and gusts of up to 112 mph.
- The eye of the hurricane passed over the hospital.



Hurricane Wilma Track







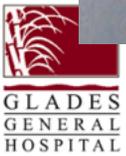










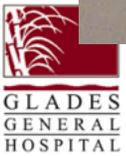




- REBECCA ABU, M.D. PEDIATRICS 992-2316
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Damages and Consequences

- Power failure including main back-up generator
- Water utility failure
- Water intrusion
- Roof damage to main building
- Destruction of two portables
- Evacuation of 22 patients (4 on ventilators) by air and ground
- Interruption of business for 4 days
- Emergency room remained open



Costs

Debris Removal	\$ 30,000
Staffing	\$ 28,000
Repairs	\$ 464,000
Business Interruption	\$ 160,000
Evacuation costs	\$ 38,000
TOTAL	\$ 720,000

\$44 million Annual Budget



Insurance and FEMA payments

- The insurance payments were \$146,307. This covered damage to roofs and destruction of portables.
- There were many exclusions to the insurance policy.
- The FEMA payments totaled \$72,000. This covered debris removal, evacuation costs and damaged to uninsured property.



Herbert Hoover Dike and Public Safety

- Soon after the events of Hurricanes Wilma and Katrina, Palm Beach County Emergency Management began to develop a plan in the event the Dike surrounding Lake Okeechobee breached.
- The plan addressed both hurricane and non-hurricane events and identified evacuation and recovery procedures



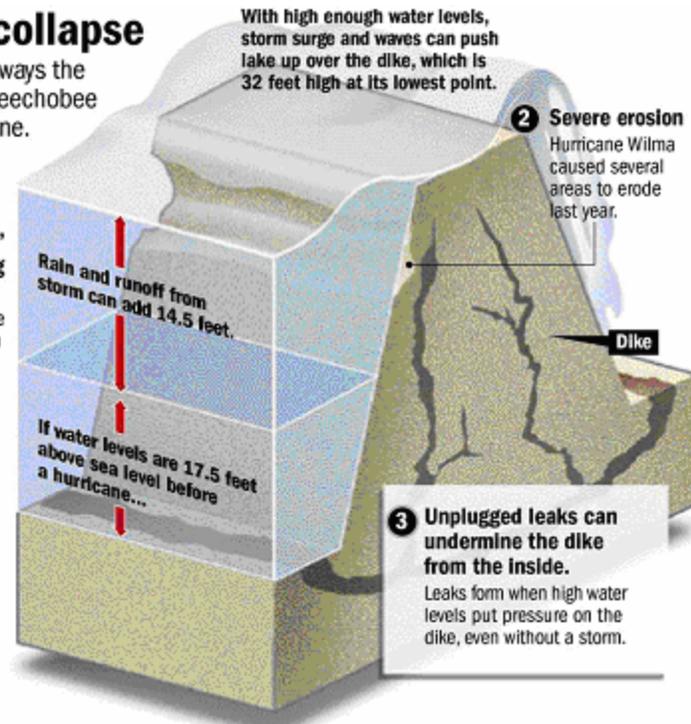
Dike Failure

The Dike is at risk of failure from internal erosion and from overtopping during a Tropical Storm or Hurricane

How the dike could collapse

Engineers have identified numerous ways the Herbert Hoover Dike around Lake Okeechobee could fail – with or without a hurricane. A severe storm could make three of these nightmare scenarios come true.

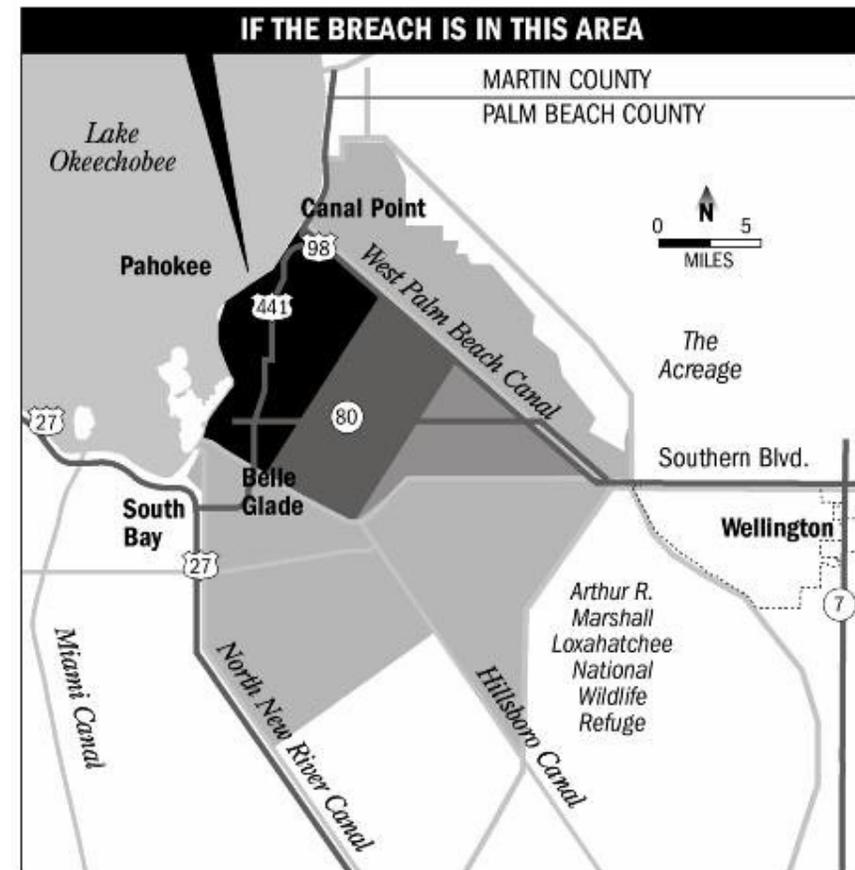
- 1 Water can 'overtop' the dike, collapsing it from the top.**
In a hurricane with more than 30 inches of rain and 100 mph winds.



Evacuation Timeline

Depending on the size of the breach, the hospital could have less than 1 day to evacuate

How fast land would flood



County Hurricane Evacuation Plans

Decision-making matrix:

- A “low” risk level would likely not warrant a mandatory evacuation order.
- A “moderate” risk level will require consideration of additional risk factors in order to determine if a mandatory evacuation order is required.
- A “high” risk level will likely warrant a mandatory evacuation order assuming that all other factors reinforce this decision.

Threat/Risk	
Low	
Moderate	
High	



Storm Category	Lake Level					
	12'	12' – 15'	15' – 18'	18' – 20'	20' – 22'	> 22'
T.S.	L	L	L	M	H	H
1	L	L	L	M	H	H
2	L	L	M	M	H	H
3	L	M	M	H	H	H
4	L	M	M	H	H	H
5	L	M	H	H	H	H

Lessons Learned

- Replacement hospital being designed with impact resistant windows, enhanced exterior hardening, and first floor build-up above estimated flood levels
- Insurance / FEMA / Business Interruption – know your policies – they do not pay as much as you might expect



Lessons Learned

- Maintain redundant communication methods – landline and satellite phones failed
- 800MHz radio was the only line of communications during and immediately after the storm



Lessons Learned

- Pre-Communicate expectations with County or Jurisdiction – forced to close hospital due to lack of power and water, however, county required ER to remain open
- Understand county evacuation procedures – hospital not included – but residents (staff and family) required to leave area



Lessons Learned

- Transfer agreements with distant hospitals
 - unable to use ground transport following storm, forced to rely on helicopter transport that took patients all over the state
- Now have an agreement with a hospital outside our region to accept evacuated patients



Lessons Learned

- Regional coordination with other hospitals, EMS, Health Department, and Law Enforcement proved valuable post storm – particularly helping to transport patients when hospital was evacuated

