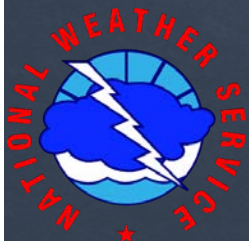


# Michael and Harvey

Communications Successes and Challenges

Tom Johnstone, MIC Tallahassee/NOAA Gulf  
Collaboration Team Member



## What We Will Cover Today

- Brief review of Hurricanes Michael and Harvey
- NWS IDSS review for both storms
- Shared challenges and lessons learned
- A look to the future

# Harvey Facts

- ❖ 1st category 4 hurricane to strike Texas since Carla 1961
- ❖ 1<sup>st</sup> major hurricane to hit U.S. since Wilma 2005 (12 years).
- ❖ Tropical depression to major hurricane in **36 hours!**
- ❖ 16<sup>th</sup> deepest U.S land-fall
- ❖ Zero direct landfall fatalities!

RANK	HURRICANE	YEAR	(at landfall)	Millibars	Inches
1	FL (Keys)	1935	5	892	26.35
2	CAMILLE (MS/SE LA/VA)	1969	5	909	26.84
3	KATRINA (SE LA, MS)	2005	3	920	27.17
4	ANDREW (SE FL/SE LA)	1992	5	922	27.23
5	TX (Indianola)	1886	4	925	27.31
6	FL (Keys)/S TX	1919	4	927	27.37
7	FL (Lake Okeechobee)	1928	4	929	27.43
8	DONNA (FL/Eastern U.S.)	1960	4	930	27.46
8	FL (Miami)/MS/AL/Pensacola	1926	4	930	27.46
10	CARLA (N & Central TX)	1961	4	931	27.49
11	S TX	1916	4	932	27.52
12	LA (Last Island)	1856	4	934	27.58
12	HUGO (SC)	1989	4	934	27.58
14	TX (Galveston)	1900	4	936	27.64
15	RITA (SW LA/N TX)	2005	3	937	27.67
16	GA/FL (Brunswick)	1898	4	938	27.70
16	HAZEL (SC/NC)	1954	4	938	27.70
18	SE FL/SE LA/MS	1947	4	940	27.76
18	TX (Galveston)	1915	4	940	27.76
20	N TX	1932	4	941	27.79

- ❖ Peak wind gust 145 mph measured near Rockport.
  - ❖ 151 mph at 15 meters
- ❖ Peak storm surge 12.5 feet Aransas Wildlife Refuge



# Messaging - Briefing One

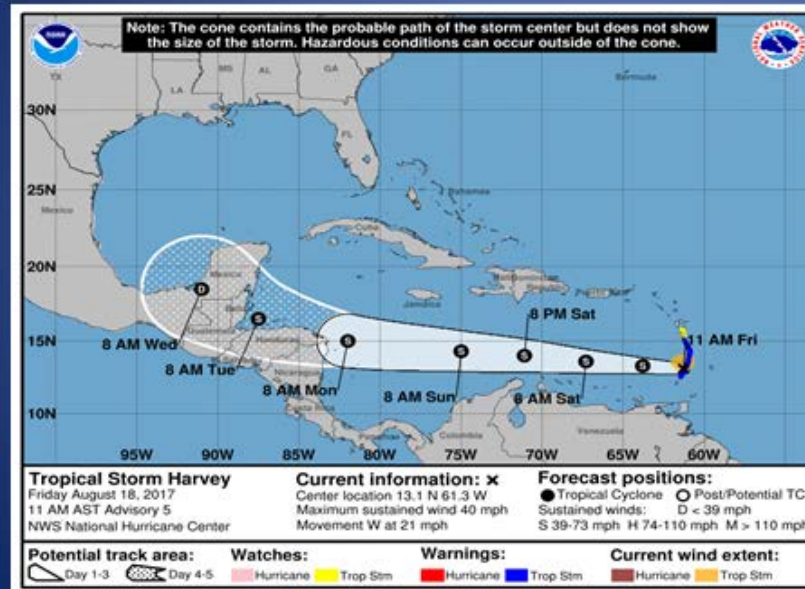
Issued Friday August 18, 2017



## Tropical Weather Update

### Tropical Storm Harvey

#### Impacts:



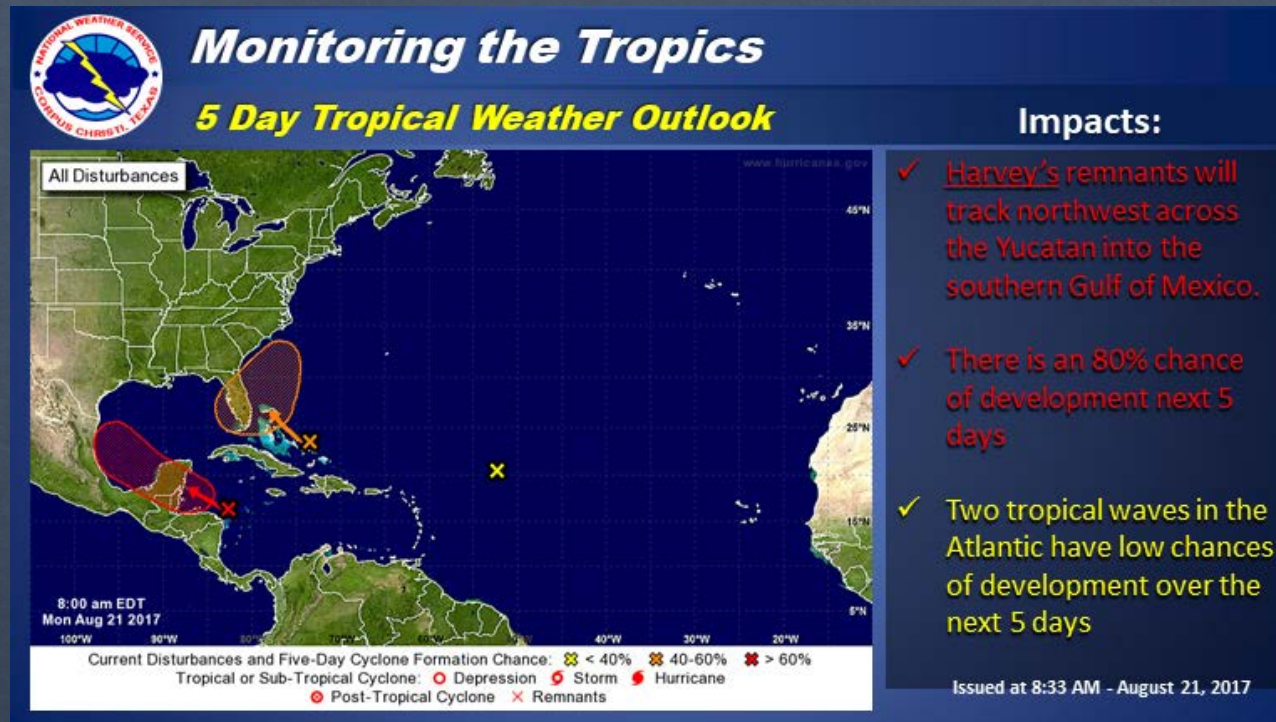
- As of 12 PM, Tropical Storm Harvey was located in the eastern Caribbean Sea.
- The system is expected to move west and could reach the Bay of Campeche early next week.
- Continue to monitor the latest advisories from the National Hurricane Center

Issued at 12:17 PM - August 18, 2017

Beyond the 5-day forecast, there remains considerable uncertainty on where the system may track. Continue to monitor the latest advisories from the National Hurricane Center.

# Eclipse Day Briefing

Issued Monday August 21, 2017

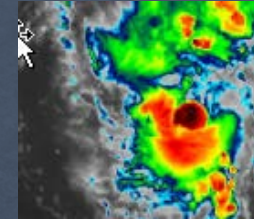


There remains considerable uncertainty on where the system may track. Continue to monitor the latest forecasts or advisories from the National Hurricane Center.

# Message Evolution

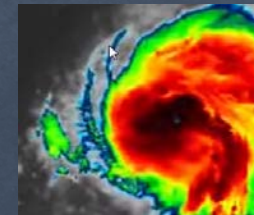
BULLETIN  
Tropical Depression Harvey Advisory Number 12  
NWS National Hurricane Center Miami FL AL092017  
1000 AM CDT Wed Aug 23 2017

...HARVEY REGENERATES INTO A TROPICAL DEPRESSION...  
...HURRICANE AND STORM SURGE WATCHES ISSUED FOR PORTIONS OF THE TEXAS COAST...



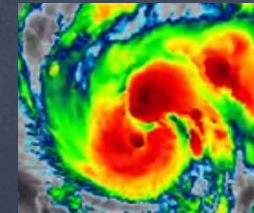
BULLETIN  
Tropical Storm Harvey Advisory Number 15  
NWS National Hurricane Center Miami FL AL092017  
400 AM CDT Thu Aug 24 2017

...HARVEY FORECAST TO STRENGTHEN IN THE GULF OF MEXICO...  
...HURRICANE WARNING ISSUED FROM PORT MANSFIELD TO MATAGORDA...



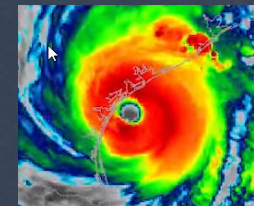
BULLETIN  
Tropical Storm Harvey Advisory Number 16  
NWS National Hurricane Center Miami FL AL092017  
1000 AM CDT Thu Aug 24 2017

...HARVEY QUICKLY STRENGTHENING AND FORECAST TO BE A MAJOR HURRICANE WHEN IT APPROACHES THE MIDDLE TEXAS COAST...  
...LIFE-THREATENING STORM SURGE AND FRESHWATER FLOODING EXPECTED...



...6 PM CDT POSITION AND INTENSITY UPDATE...  
...HARVEY BECOMES A CATEGORY FOUR HURRICANE...  
...SUSTAINED HURRICANE-FORCE WINDS SPREADING ONTO THE MIDDLE TEXAS COAST...

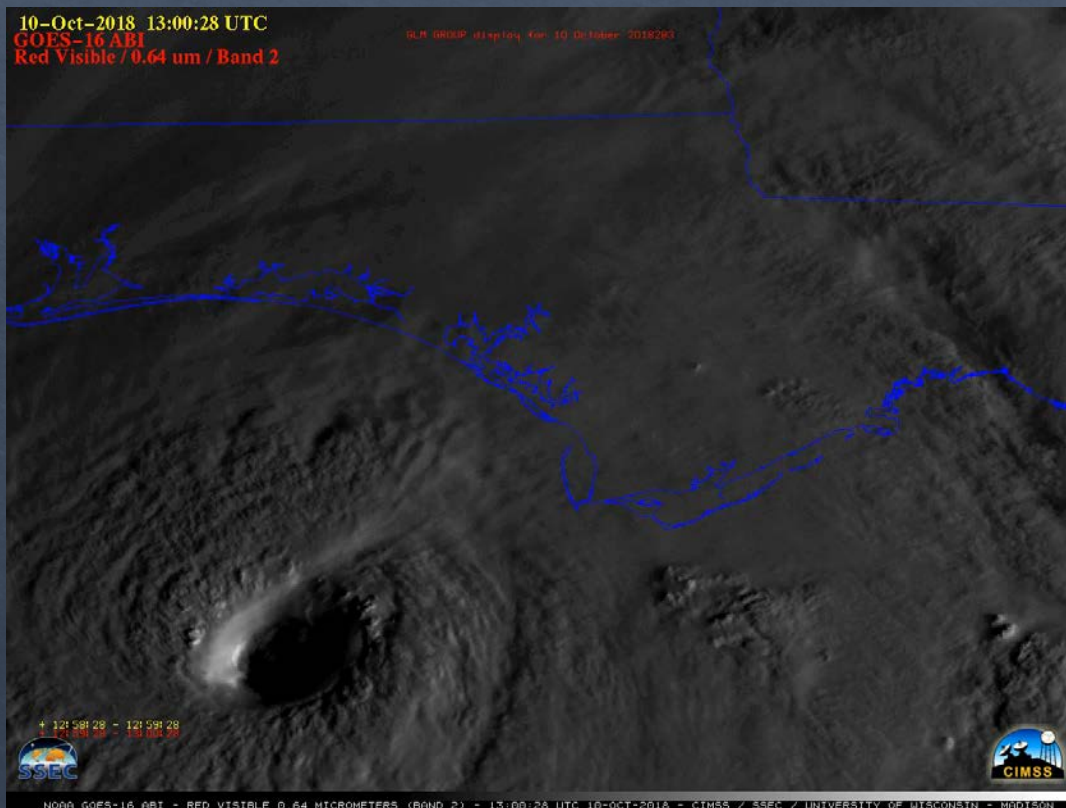
Air Force Reserve Reconnaissance aircraft data indicate that Harvey has become a category 4 hurricane with maximum sustained winds of 130 mph (215 km/h).



# NWS Corpus IDSS for Harvey

- Meteorologists deployed to Corpus and Victoria EOCs for the duration
- 40 email briefing packages sent
- Led 25 Webinars
- Participated in dozens of other calls
- 55 personal Core Partner briefings
- Over 500 text messages to core partners
- Nine individual EM briefings...
  - In the eye!!!

# Michael - One for the Record Books\*

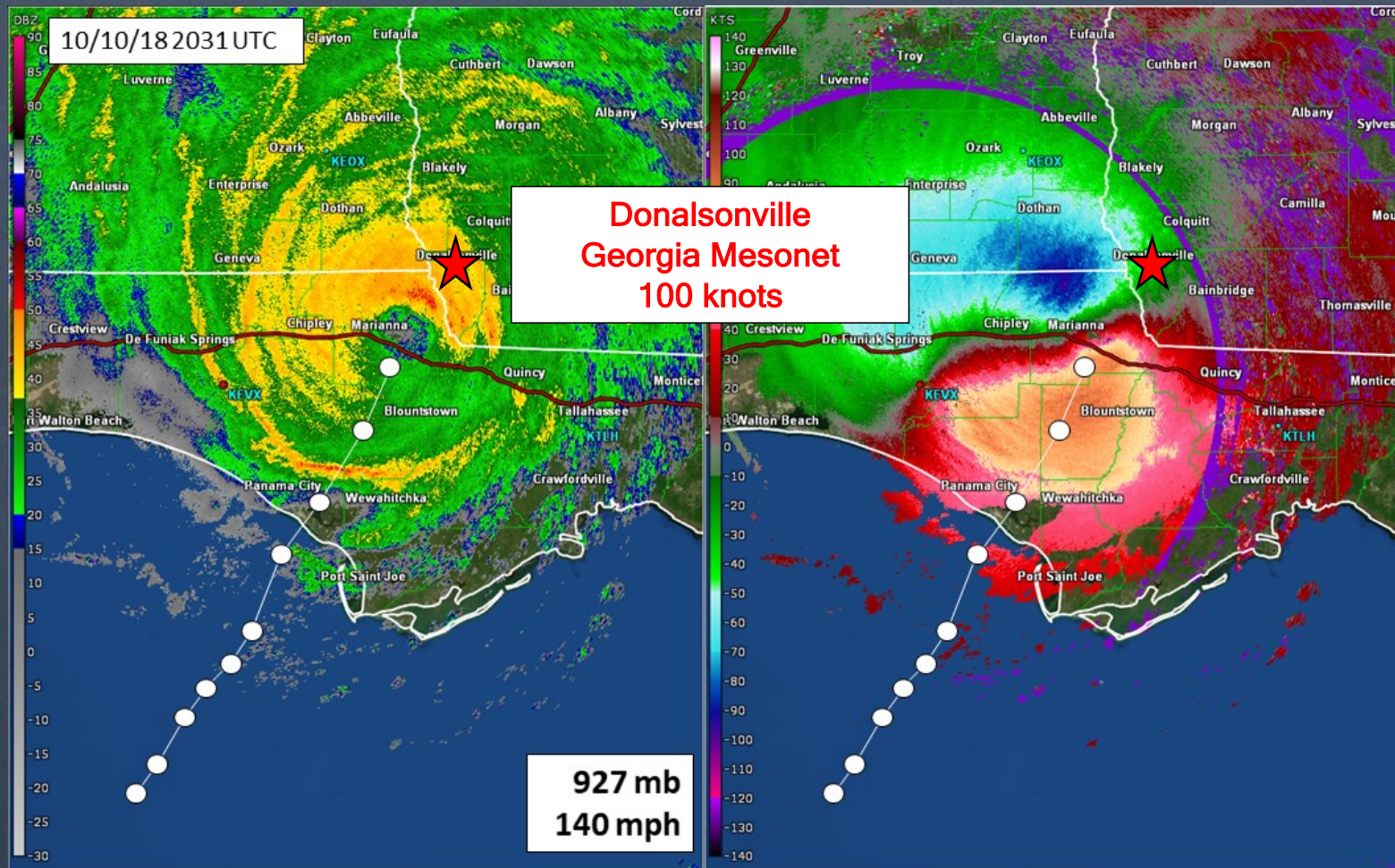


- 1<sup>st</sup> category 4 or 5 hurricane on record to make landfall in the Florida Panhandle
- Latest in season to make landfall as Cat-5
- First GA Major Hurricane since 1898
- 3<sup>rd</sup> strongest hurricane at U.S. landfall based on pressure (behind 1935 unnamed FL Keys hurricane and Camille 1969)
- 4<sup>th</sup> strongest hurricane at U.S. landfall based on wind (160 mph) behind the 1935 Keys, Camille (1969) and Andrew (1992)
- 46 mb drop in 24 hours before landfall - 9 mb drop in final three hours

\* Based on NHC Advisories and preliminary best track data.



# Peak Measured Gusts\*



\*No known site with complete wind data for storm core.

# Surge

Location	Preliminary Peak Storm Surge Inundation (AGL)
Mexico Beach to Indian Pass	9 to 14 feet
Indian Pass to Lanark Village	6 to 9 feet
Lanark Village to Ecofina State Park	9 to 11 feet
Ecofina State Park to Steinhatchee	6 to 8 feet
Steinhatchee to Suwanee River	4 to 6 feet

# Impacts

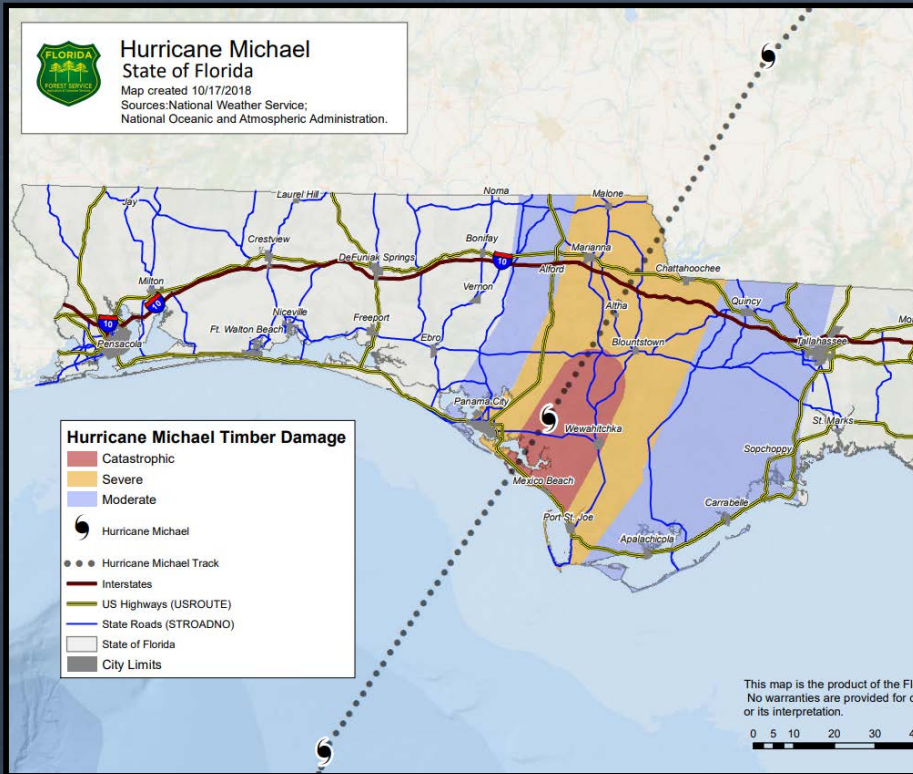


# Estimated Maximum Power Outages



# Timber Industry

Georgia - 2,368,226 acres of forestland was impacted by Hurricane Michael; estimated value of \$762,683,909



Florida - almost 3 million acres of forested land was damaged; costs estimate of \$1.29 billion

Sources: Georgia Forestry Commission/Florida Department of Agriculture

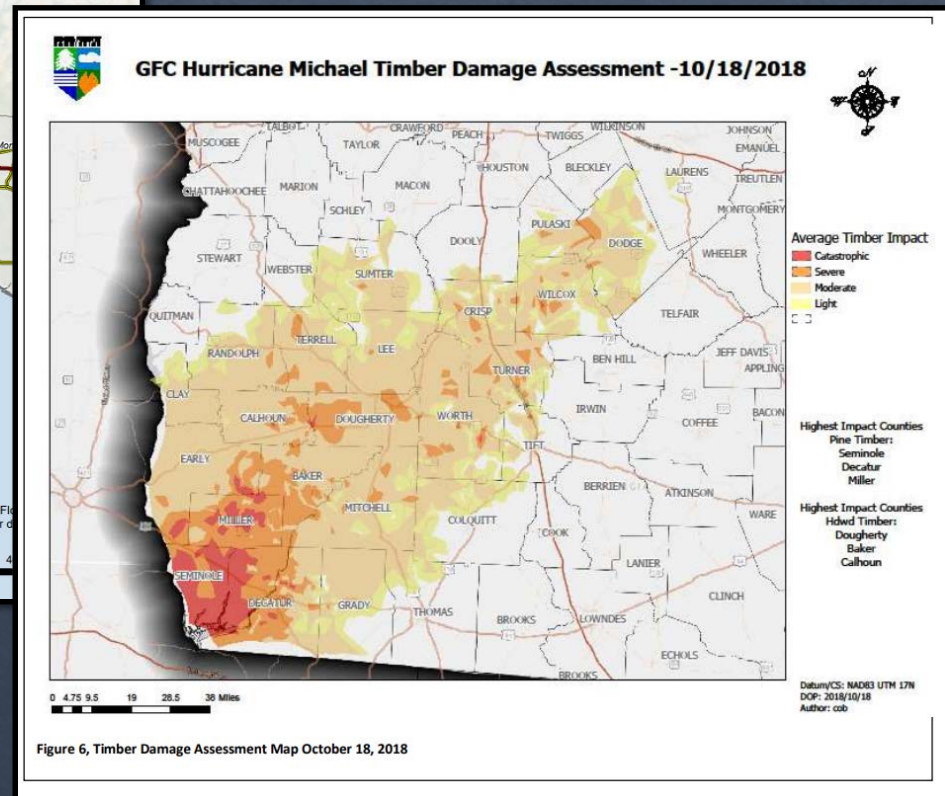


Figure 6, Timber Damage Assessment Map October 18, 2018

# Other Agriculture

- Florida

- Cotton: \$50 million
- Cattle: \$43 million
- Peanuts: \$23 million
- Poultry and eggs: \$10 million
- Pecans: \$4 million
- Other ag: \$33 million

- Georgia

- Cotton: \$550-600 million
- Pecans: \$560 million
- Vegetables: \$480 million
- Poultry: \$28 million
- Peanuts: \$10-20 million
- Other ag: \$28 million



# Mexico Beach, Florida



Source: NOAA/National Geodetic Survey

# Panama City, Florida



Source: National Weather Service



# Lynn Haven, Florida (Panama City Area)



Source: Google



Source: National Weather Service

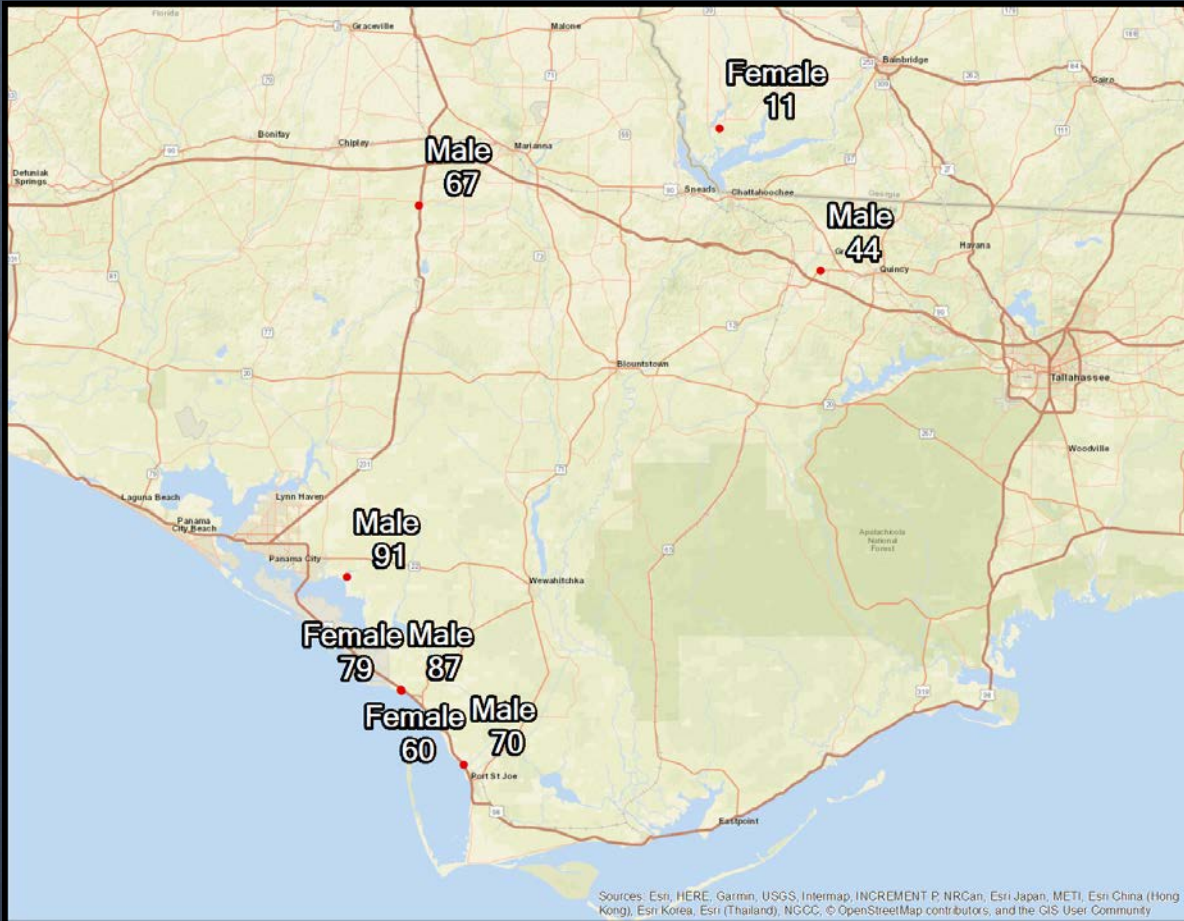
# Marianna, Florida

- 56 miles inland from landfall point



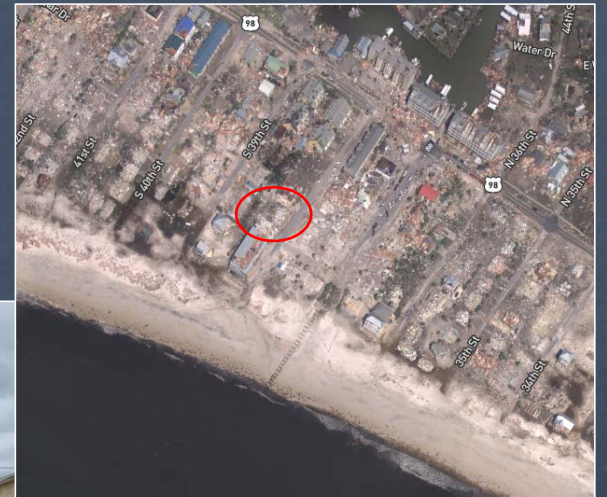
Source: National Weather Service

# Fatalities



- 8 Direct Fatalities Locally
  - 16 nationwide
- 3 Wind Related
- 5 Surge Related
- 5 Male
- 3 Female

# Agnes Vicari, 79 – Bay County



Found in Mexico Beach, moved by storm surge

# Agnes Vicari's Conversation With Her Niece

TALLAHASSEE — In the final hours before Hurricane Michael crumbled her Mexico Beach home around her, Agnes Vicari was on the phone with her niece with a promise.

"I made a mistake. I won't make a mistake again," she told Joanne Garone Behnke the morning the storm hit. Vicari, 79, who lived in a small one-story home just yards from the Gulf of Mexico, promised she'd evacuate the next time a storm came, that she'd see them soon to celebrate Behnke's husband retiring.

"Aunt Aggie, you can still go to a shelter," Behnke begged.

"There are no shelters in Mexico Beach," Vicari said, before the call ended.

When Hurricane Michael began to churn into the Gulf two weeks ago, her family begged her to leave. Her pilot nephew called the day before the storm. Her granddaughter, who evacuated north to Wewahitchka, asked her to do the same. Even a police officer stopped by. She chuckled at them, Behnke remembered.

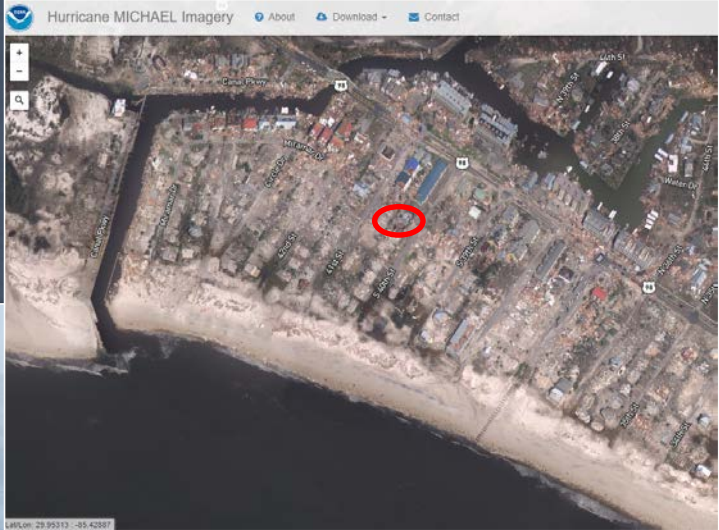
"She was still struggling with the concept of getting in her car and going somewhere," she said. "She's an old-time Italian, kept her money in her house, very stubborn."

Her somewhat reclusive aunt might also have not wanted to go to a shelter, she added, "probably afraid of leaving her home where she had her sense of security."

The Wednesday the storm hit, Behnke called Vicari around 11 a.m. Vicari worried about the storm, which had strengthened to a Category 4 overnight. But as it approached, she sounded hopeful she would see her family soon.

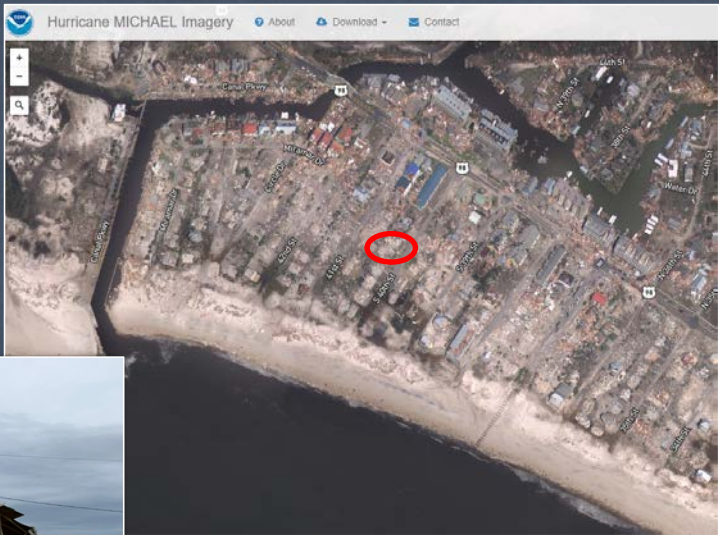
"My aunt didn't want to die," Behnke added. "She didn't think she was going to die."

# Donald Vonderhaar, 87 - Bay County



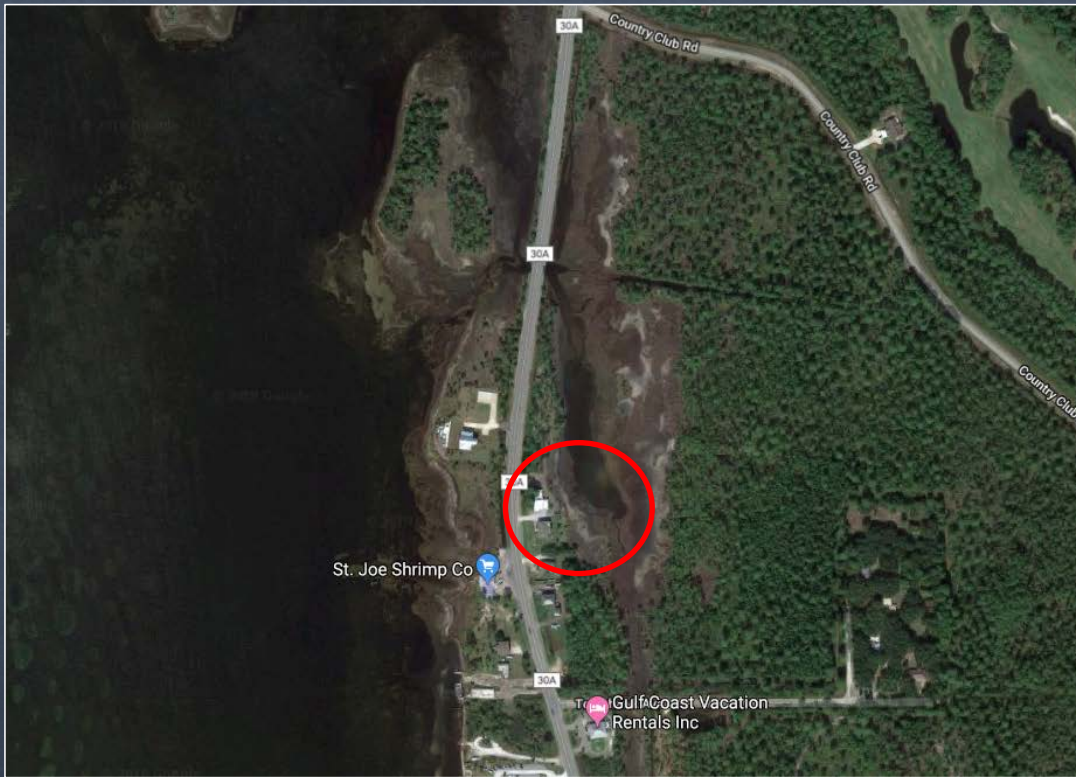
Swept away by house during the storm

# Sandra Lucas Detrick, 60 – Bay County



Found in Mexico Beach rubble, moved by storm surge

# William McConnell, 70 – Gulf County



MATIAS J. OCNER/Miami Herald

Found in Cape San Blas debris - was fleeing in truck

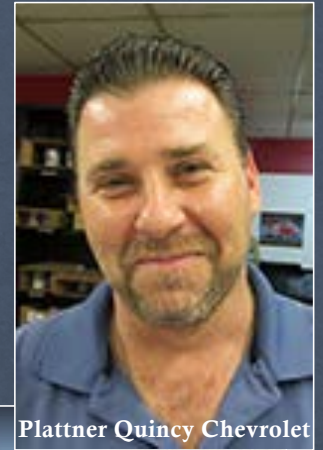


# John Gombos, 67 – Jackson County



Tree collapsed on mobile home, roof collapsed onto decedent

# Steve Sweet, 44 – Gadsden County



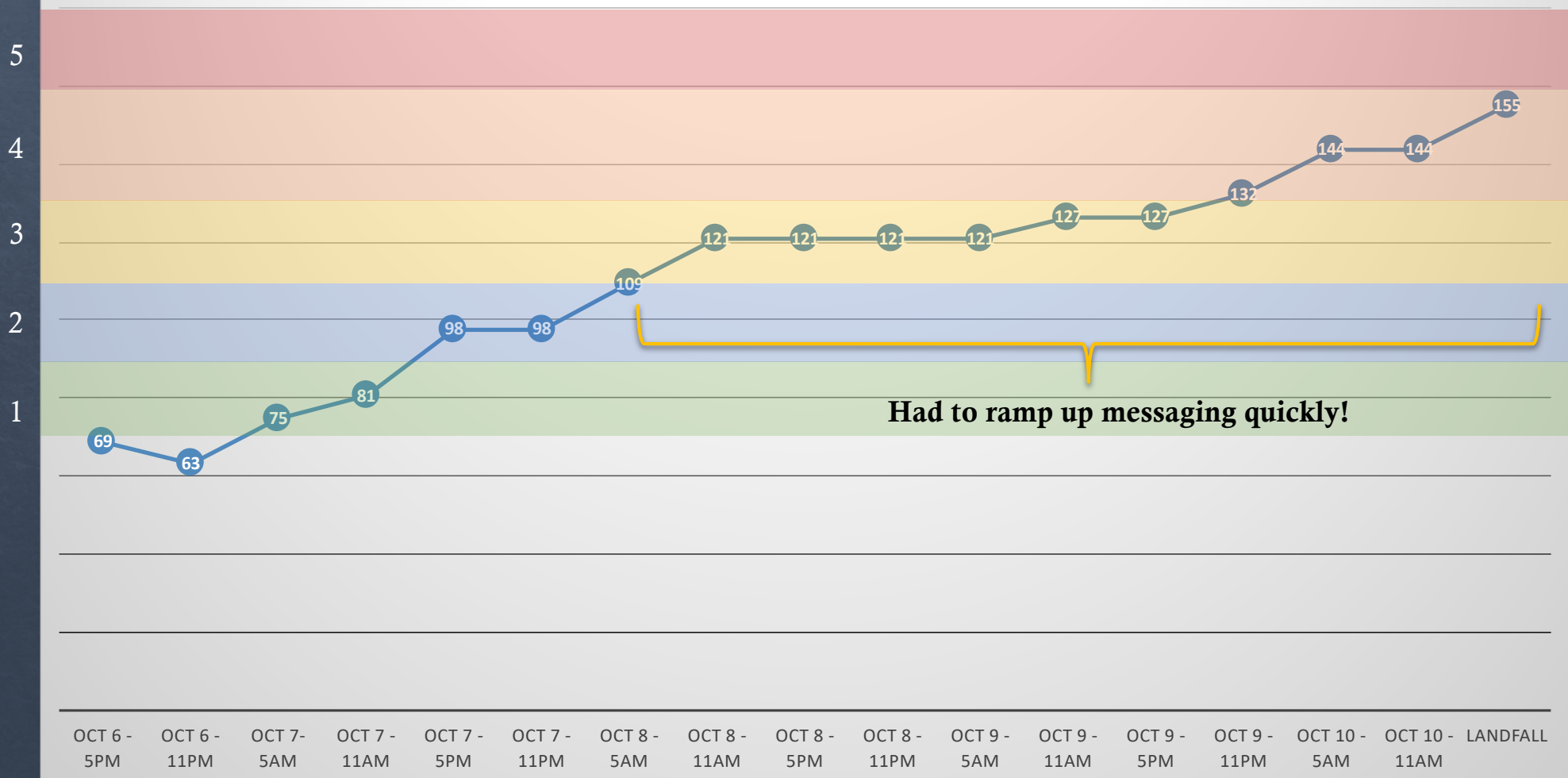
Plattner Quincy Chevrolet



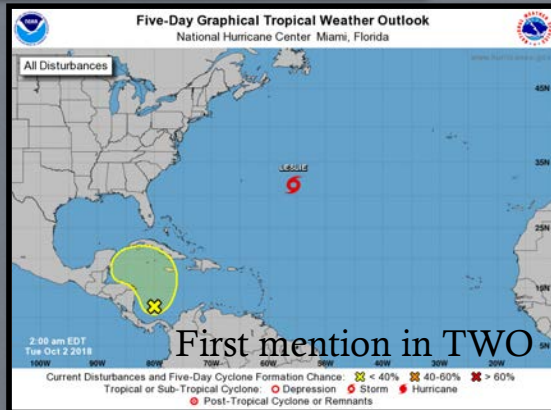
Due to trauma following a tree falling on a home

# Local WFO Response and Communication

### Forecast Max Wind Speed (mph)



**October 2, 2018 2AM EDT**  
 First mention of potential for Michael in 5 day TWO



**October 5, 2018 2:51PM EDT**  
 First email to partners

**Tropical Outlook (NHC)**  
 Weather Forecast Office Tallahassee  
 Latest Information As Of: 2 PM EDT October 5, 2018  
 Issued October 5, 2018 2:13 PM ET

**Things to Know For the Tri-State Area**

- Area of tropical activity has a **70% chance of development in the next 5 days**
- There is **low confidence** for future track and intensity
- Regardless of development, this system will **increase rain chances** for the FL Big Bend and Panhandle towards the middle of next week
- Continue to monitor this system through the holiday weekend

Visit [hurricanes.gov](http://hurricanes.gov) and [floridadisaster.org](http://floridadisaster.org) for preparedness information

NWSTallahassee weather.gov/tallahassee

**October 6, 2018 4PM EDT**  
 Potential Tropical Cyclone Fourteen



TS expected



October 7, 2018 11:30AM EDT  
Pow-Wow with MIC

October 7, 2018 2PM EDT  
Becomes TS Michael



Hurricane expected

October 7, 2018 2:30PM EDT  
First webinar for partners

**Situation Overview**  
Tropical Storm Michael

Tallahassee WEATHER FORECAST OFFICE

- Michael has maximum sustained winds of 40 mph.
- No watches or warnings

Map showing the storm's position and forecast track.

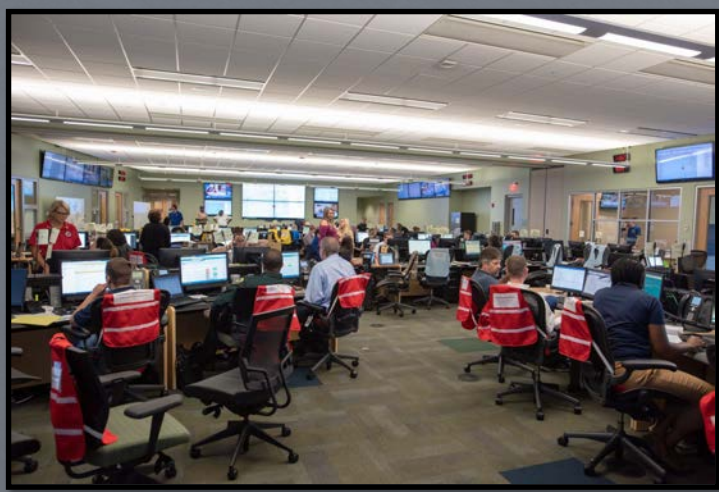
NWS National Hurricane Center

Tropical Storm Michael - Adv. 4A Sunday October 07, 2018 02 PM ET  
Center location: 19.2 N 86.9 W Max Sustained Winds: 40 mph. Minimum P.S.W. 39 mph  
Wind Surface Wind Field  
Valid for 5 days ending 08 AM ET+05  
Consultation Probability of Tropical Storm Status

NOTE: Do not focus on the exact track. Impacts the area enclosed by the cone.

**October 8, 2018 5:16 AM EDT**  
Watches issued for CWA

**October 8, 2018 Afternoon**  
Decision made to deploy forecasters to three EOCs



Hurricane expected

Major hurricane expected

**October 8, 2018 11AM EDT**  
Becomes Hurricane Michael

**US National Weather Service Tallahassee Florida**  
Published by Joe Gempak [?] · October 8 at 12:18 PM · 🌐

🚨 11AM UPDATE KEY MESSAGES.

1. #Michael now forecast to be a MAJOR hurricane at landfall.
2. Life-threatening storm surge along the FL Panhandle and Big Bend.
3. Tropical Storm Force winds arrive as early as Tues Eve.
4. Widespread Heavy Rain.

#FLwx #GAwx #ALwx #HurricaneMichael

PLEASE FOLLOW US ON TWITTER ([www.twitter.com/NWSTallahassee](http://www.twitter.com/NWSTallahassee)) FOR MORE RAPID UPDATES OF CURRENT INFORMATION.

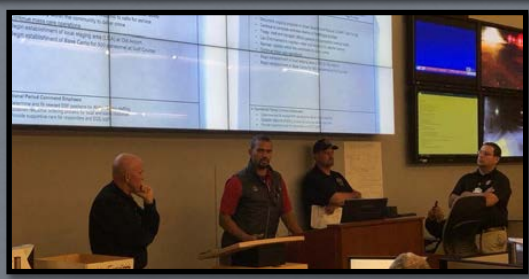


- Hurricane and Tropical Storm Watches have been issued for much of the area.
- Life threatening storm surge possible along the coast

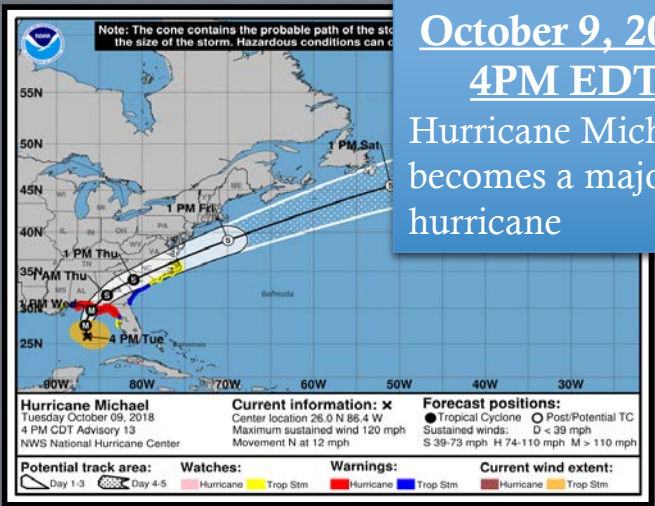
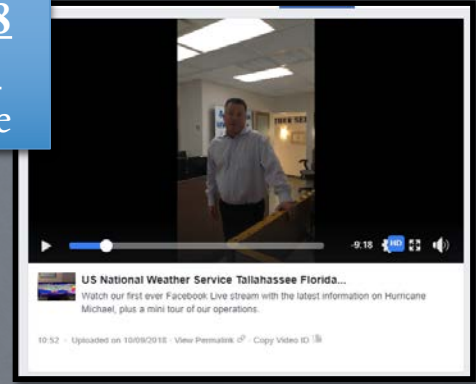
**October 8, 2018 5:42 PM EDT**  
Warnings issued for CWA



**October 9, 2018 Morning**  
Forecasters arrive at respective EOCs

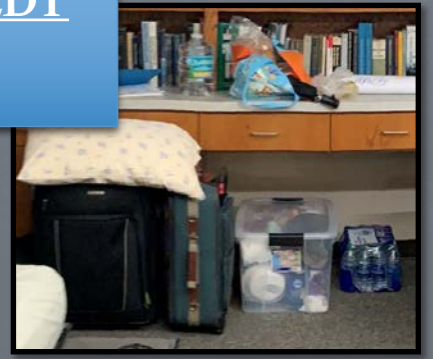


**October 9, 2018  
12:55PM EDT**  
First Facebook Live



Major hurricane expected

**October 9, 2018 7PM EDT**  
Midnight shift arrives for the duration of the event



**October 9, 2018 Evening**  
~250 people left in Mexico Beach

**October 9, 2018 10:15PM EDT**  
"Pull out all the stops"

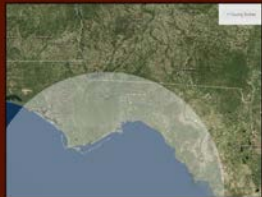


# Messaging Avenues and Severity

Pre-Event

**Unprecedented Event Unfolding** Weather Forecast Office Tallahassee  
Issued October 10, 2018 1:06 AM ET

We searched the historical database for category 4 hurricanes that have made landfall in the Florida Panhandle and Big Bend. This map says it all – it's **BLANK** – this situation has NEVER happened before.



This is your **LAST** chance to get to a safe place and the time for that is closing. This storm will bring deadly surge to the Florida anything we have seen before. If you risk your life or that of your family.

NWS Tallahassee @NWSTallahassee

## Social Media

**NWS Tallahassee** @NWSTallahassee

5AM EDT update: This is as **SERIOUS** as it gets. Major #HurricaneMichael has continued to intensify over the Gulf of Mexico. We want everyone to know this is an **EXTREMELY** dangerous storm and unfortunately the time for preparation is ending!

5:16 AM - Oct 10, 2018

919 713 people are talking about this



Facebook Live

**LIVE** HURRICANE MICHAEL ALERT

80 mph  
1 ft surge  
22.2°N 83.2°W

NEXT HUR ADVISORY AT 8PM EDT/7PM CST

**FL: STATE OF EMERGENCY IN 35 COUNTIES**

ATHENS TONIGHT	7PM	8PM	9PM	10PM	11PM	12AM
	0%	15%	15%	15%	15%	5%

Via Skype Tallahassee, Florida 4:20 AM ET

**BREAKING NEWS** MICHAEL NOW MOVING ON TO THE CAROLINAS

Bringing tropical storm-force winds and flooding rains

TROPICAL STORM MICHAEL ADV 0

200

Skype Interviews

**EMERGENCY ALERTS** now

**Emergency Alert**  
LIFE THREATENING STORM EVACUATE ZONES A B C AND LOW LYING AREAS AND MOBILE HOMES NOW

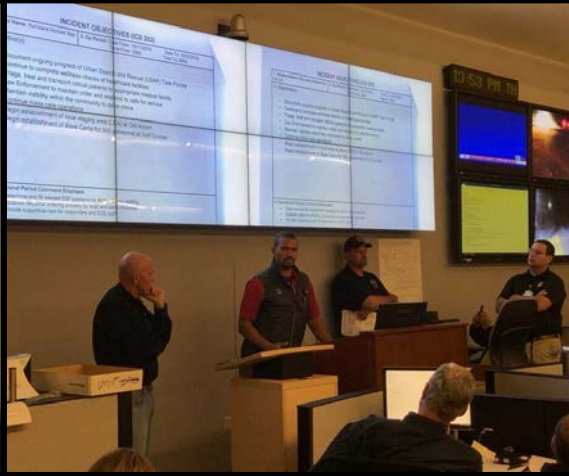
Wireless Emergency Alerts

# Deployed Meteorologists

Pre-Event



**Leon County**

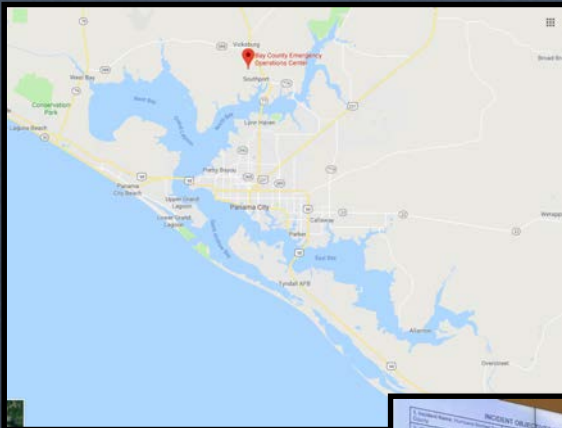


**Bay County**

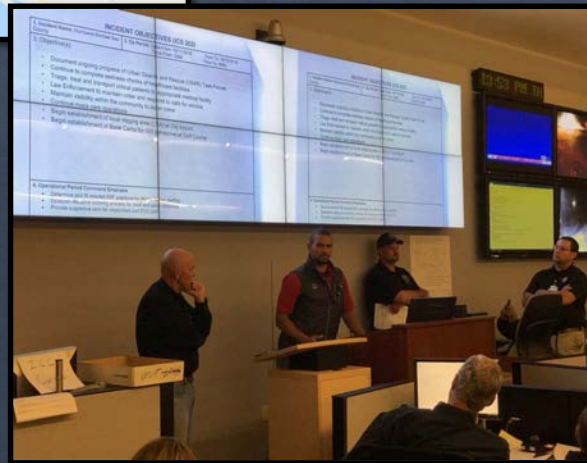
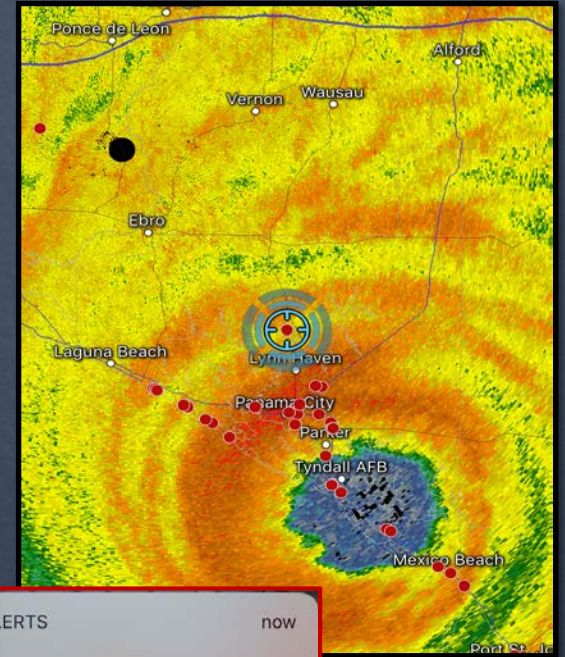


**Florida State University**

# Bay County Deployment



Communicator between Bay County and Leon County due to loss of comms

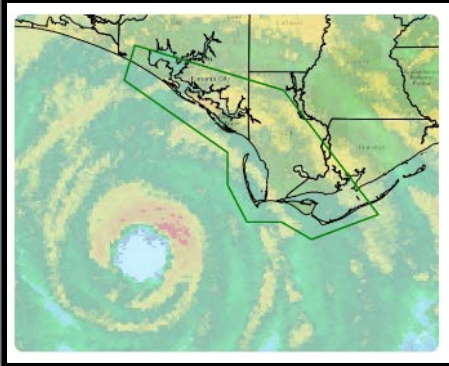


Provided briefings to partners that centered around logistical decisions



Helped to craft hard hitting messages

October 10, 2018 11:11AM EDT  
First Extreme Wind Warning issued



October 10, 2018 Morning  
50 people left in Mexico Beach

October 10, 2018 1:30PM EDT  
Hurricane Michael makes landfall - winds of 155 mph



Major hurricane expected

October 10, 2018 1:30PM EDT  
NWS Tallahassee comms fail and operations are passed to NWS Jacksonville

TO: All Southern Region Offices

FROM: WFO Jacksonville

SUBJECT: Service Backup

WFO Jacksonville has initiated full service backup for WFO Tallahassee.

# Lessons Learned – Looking Ahead

## Michael/Harvey - Similar Challenges

- Accelerated timeline associated with rapid intensification
- Staff lockdown
- Communications
  - No Hurricane Hotline for either storm
  - Lost Internet/Awips in Michael
  - No HAMS for either event
- Post hurricane surveys
  - 2000+ data points surveyed in Michael
  - Lack of coastal survey experience
  - EF Scale does not work for hurricanes
- Lack of reliable real time wind information

# Lessons Learned/Applied

- Prepare for one category stronger
- All hands on deck/12 hour shifts
- “Survive the aftermath” Mike Brennan
- IT expertise and Management on duty 24/7
- ET and facility personnel here throughout
- Backup internet critical – FSU and hot spots
- 10 hotel rooms reserved
- Internal coordination document and DSS schedule

## More Lessons Learned/Applied

- One person dedicated to supporting deployees
- Use DAT to coordinate internal and partner surveys
- Coastal survey support from NOAA and HCFCD
- Late season tropical training
- COOP and service backup???



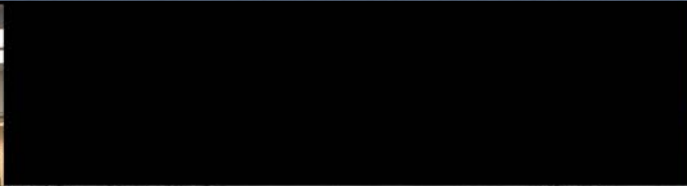
# Next Time?

- Redundant operational internet
- Time of departure graphics
- Robust/reliable observing equipment
- Tropical messaging training for inland WFOs
- Two person deployments to EOCs for tropical ops
- Apply Dr. Myers' post-Michael social science findings

# Team Effort

Challenges





**Thank You!**  
**Tom Johnstone**  
**[Thomas.Johnstone@noaa.gov](mailto:Thomas.Johnstone@noaa.gov)**