

Hurricane Ian – After Landfall

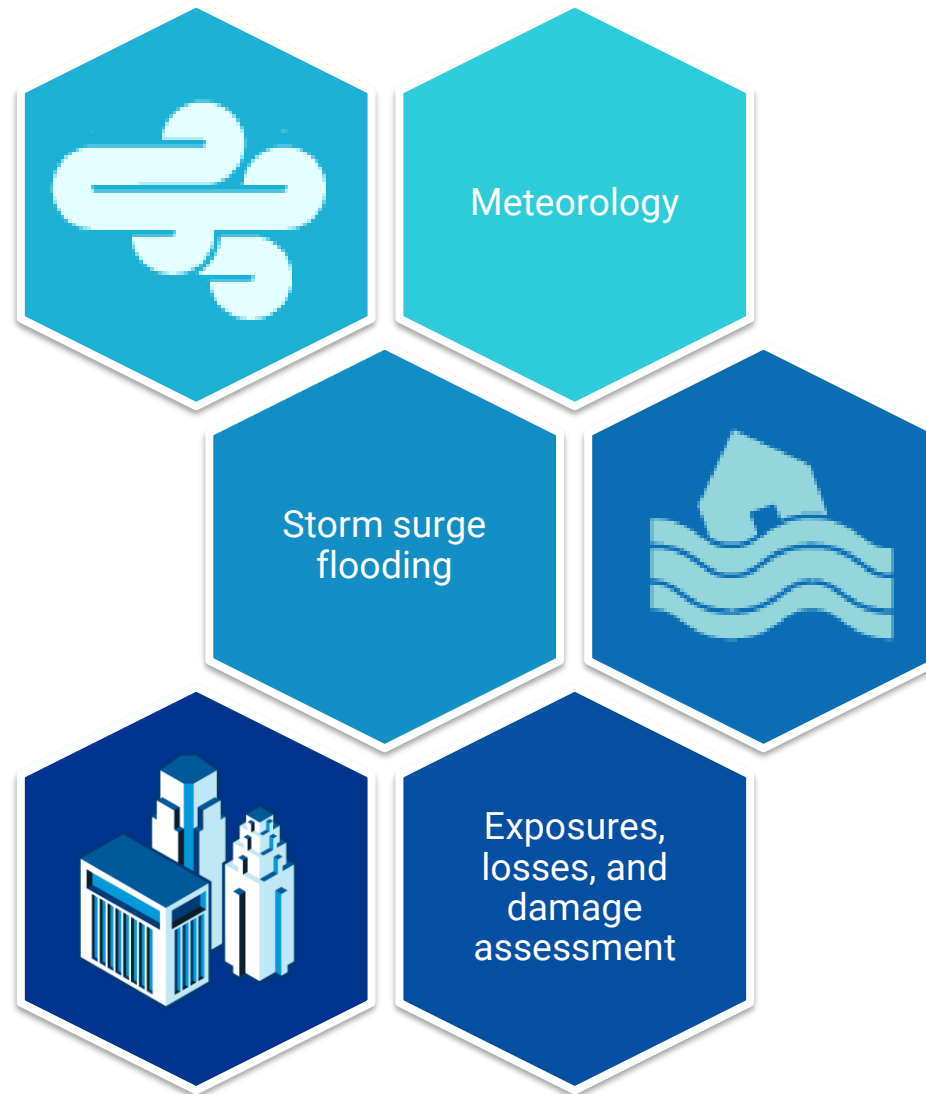
Extreme Event Solutions

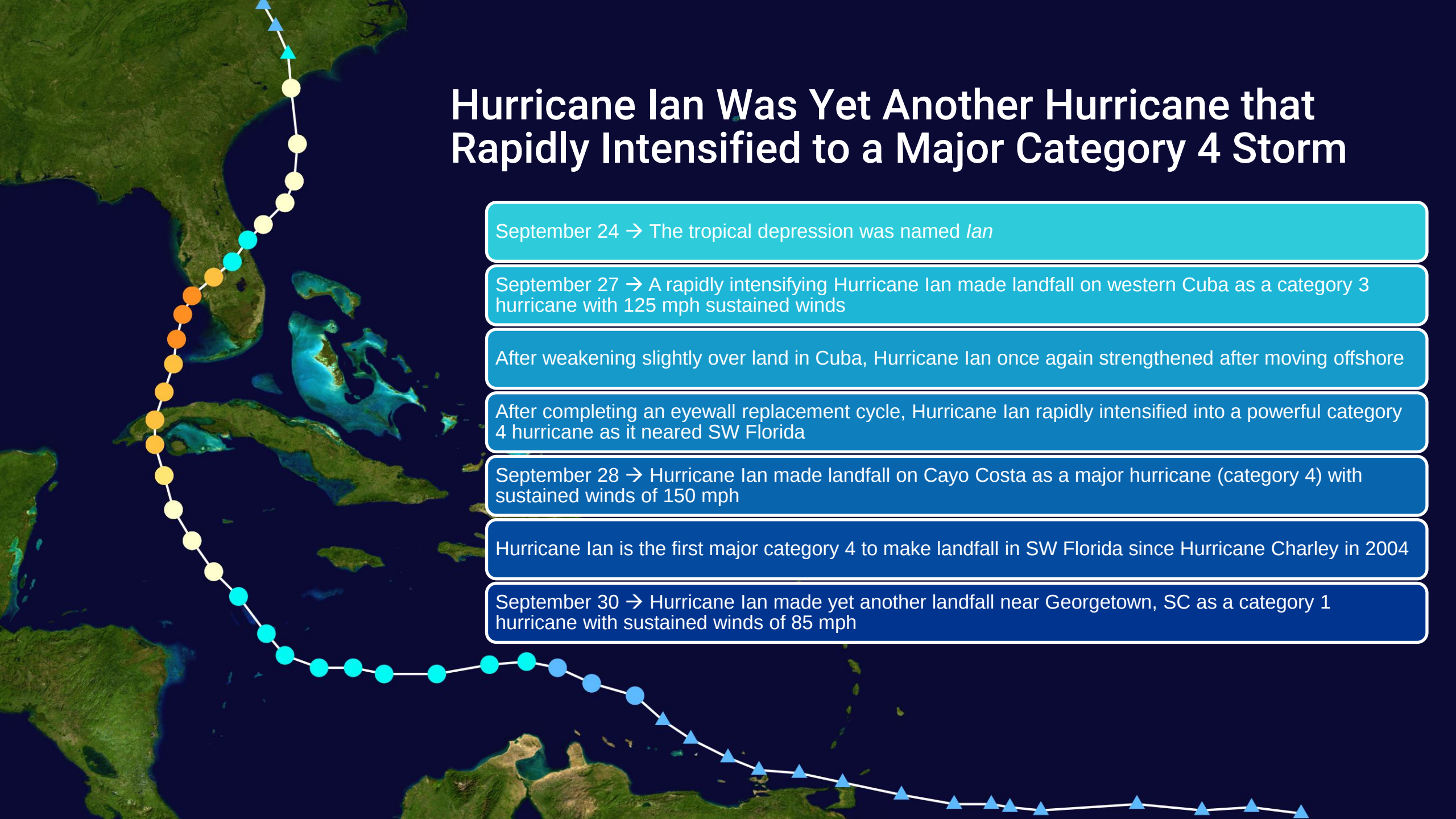
Eric Uhlhorn, Principal Scientist

**Richard Yablonsky, Principal Scientist,
Senior Manager**

Karthik Ramanathan, Vice President

Hurricane Ian Event Modeling



A map showing the path of Hurricane Ian. The path starts in the Caribbean, moves north through Cuba, then curves westward through the Gulf of Mexico, and finally heads north along the Atlantic coast of the United States. The path is marked with a series of colored dots and triangles: yellow and orange dots in the Caribbean, cyan dots in the Gulf of Mexico, and blue triangles along the US coast. The background is a satellite-style map of the region.

Hurricane Ian Was Yet Another Hurricane that Rapidly Intensified to a Major Category 4 Storm

September 24 → The tropical depression was named *Ian*

September 27 → A rapidly intensifying Hurricane Ian made landfall on western Cuba as a category 3 hurricane with 125 mph sustained winds

After weakening slightly over land in Cuba, Hurricane Ian once again strengthened after moving offshore

After completing an eyewall replacement cycle, Hurricane Ian rapidly intensified into a powerful category 4 hurricane as it neared SW Florida

September 28 → Hurricane Ian made landfall on Cayo Costa as a major hurricane (category 4) with sustained winds of 150 mph

Hurricane Ian is the first major category 4 to make landfall in SW Florida since Hurricane Charley in 2004

September 30 → Hurricane Ian made yet another landfall near Georgetown, SC as a category 1 hurricane with sustained winds of 85 mph

Meteorology

Hurricane Ian

Cayo Costa



Cape Coral

Fort Myers

Sanibel Island

Naples

Landfall at Cayo Costa, FL

Maximum Wind Speed: 150 mph

Minimum Central Pressure: 940 mb

Hurricane Ian's Evolution as It Approached Landfall

Emerges off north coast of Cuba and begins eyewall replacement cycle (ERC)

Max Winds = 125 mph
Central Pressure = 950 mb

ERC continues

Max Winds = 120 mph
Central Pressure = 949 mb

ERC complete, begin rapid intensification

Max Winds = 120 mph
Central Pressure = 953 mb

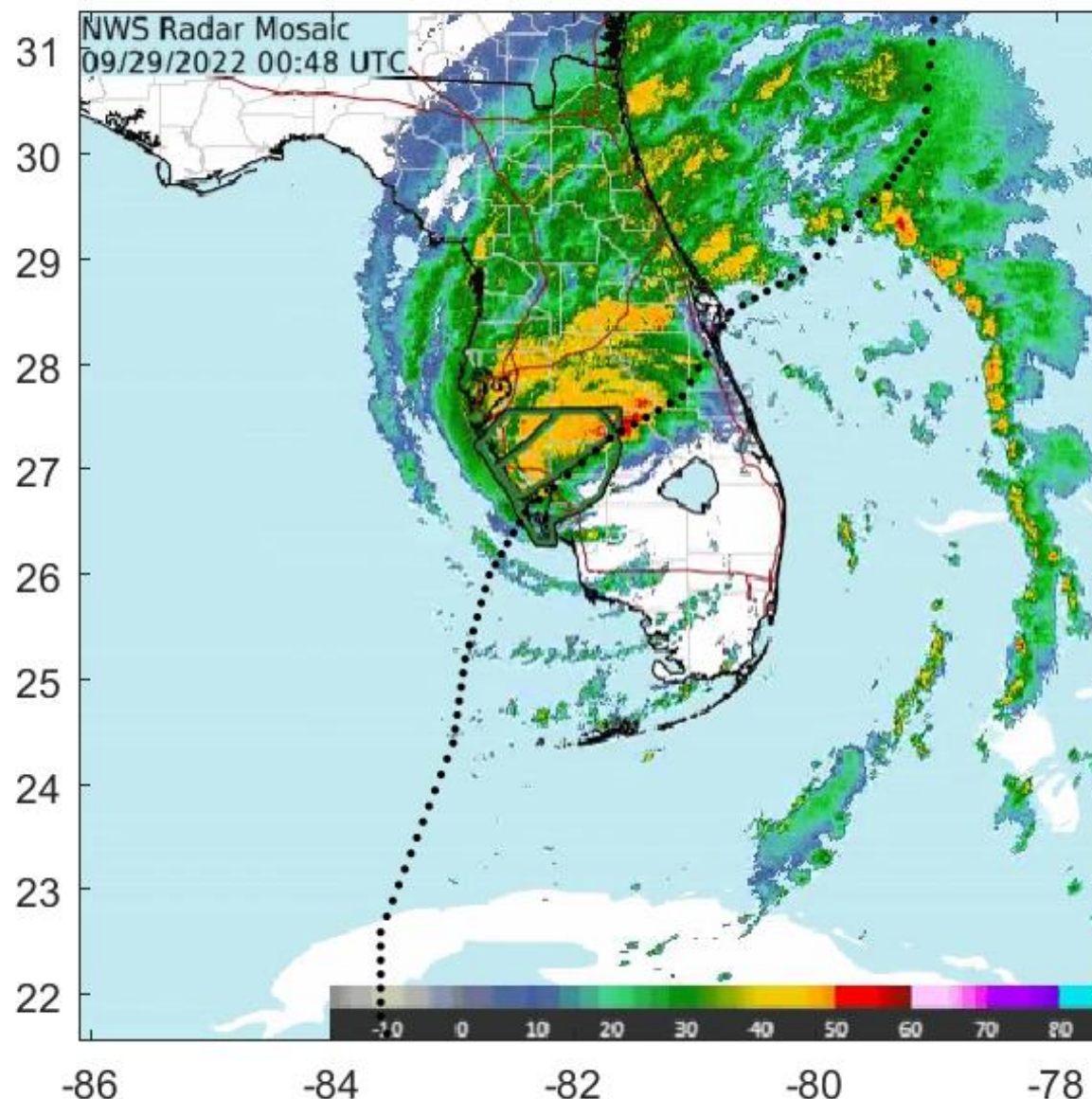
Peak intensity, but dry air intruding south and east

Max Winds = 155 mph
Central Pressure = 937 mb

Landfall at Cayo Costa with asymmetry shifting north of center due to wind shear

Max Winds = 150 mph
Central Pressure = 940 mb

Over Central Florida - flooding from prolonged rainfall



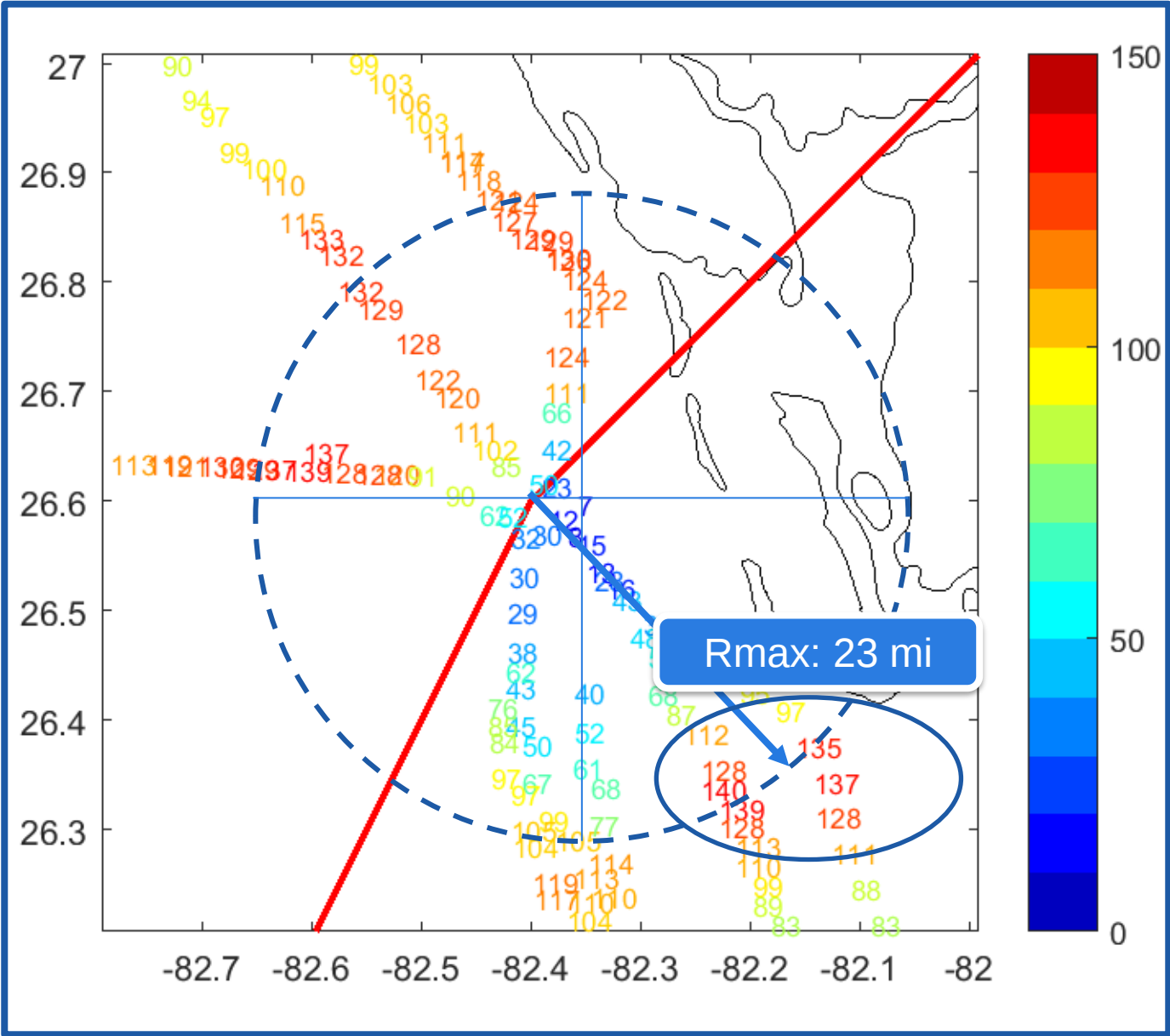
Radar images courtesy of Brian McNoldy, Univ. of Miami, Rosenstiel School

Winds Near Landfall

Aircraft-measured surface (10m) winds in mph just offshore of SW Florida

Maximum wind speeds of 135-140 mph south of Sanibel Island

Radius of maximum wind (Rmax) at landfall estimated to be 20-30 mi based on wind observations



Maximum 1-Minute Sustained Winds

Wind observations from National Weather Service, National Ocean Service, Uni. FL Mesonet, and WeatherFlow/FCMP

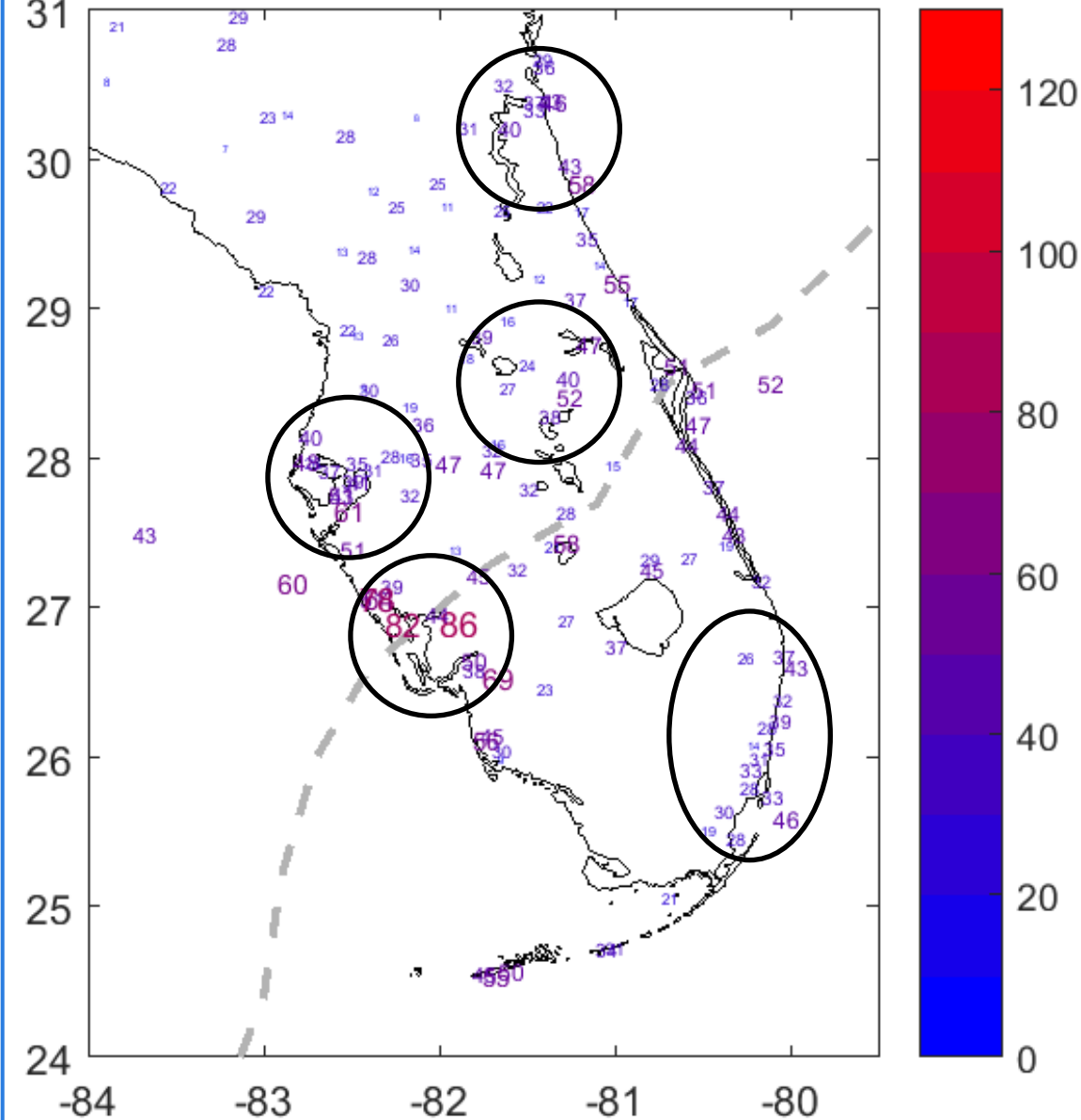
Most stations near landfall location failed, making validation challenging

Highest winds in Tampa Bay area: 60-65 mph

Orlando area: 50-55 mph

Jacksonville: 40-45 mph

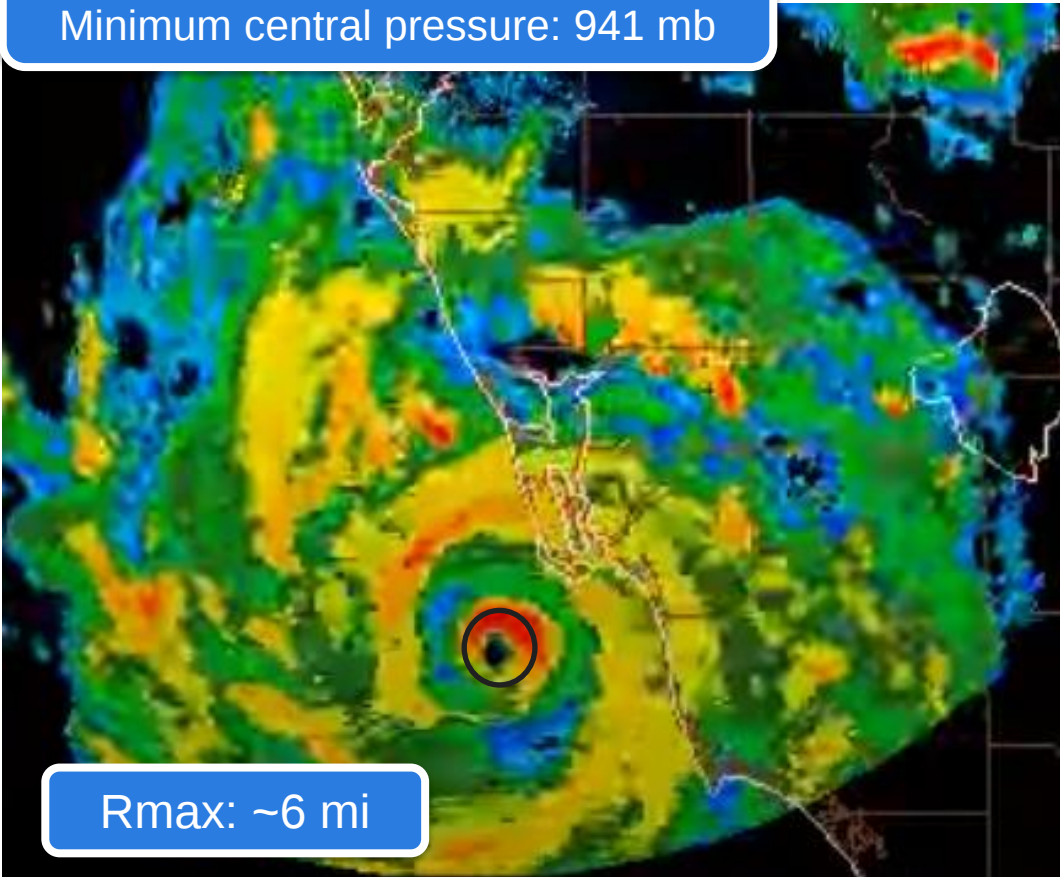
Southern Florida: <40 mph



Comparison with Hurricane Charley (2004)

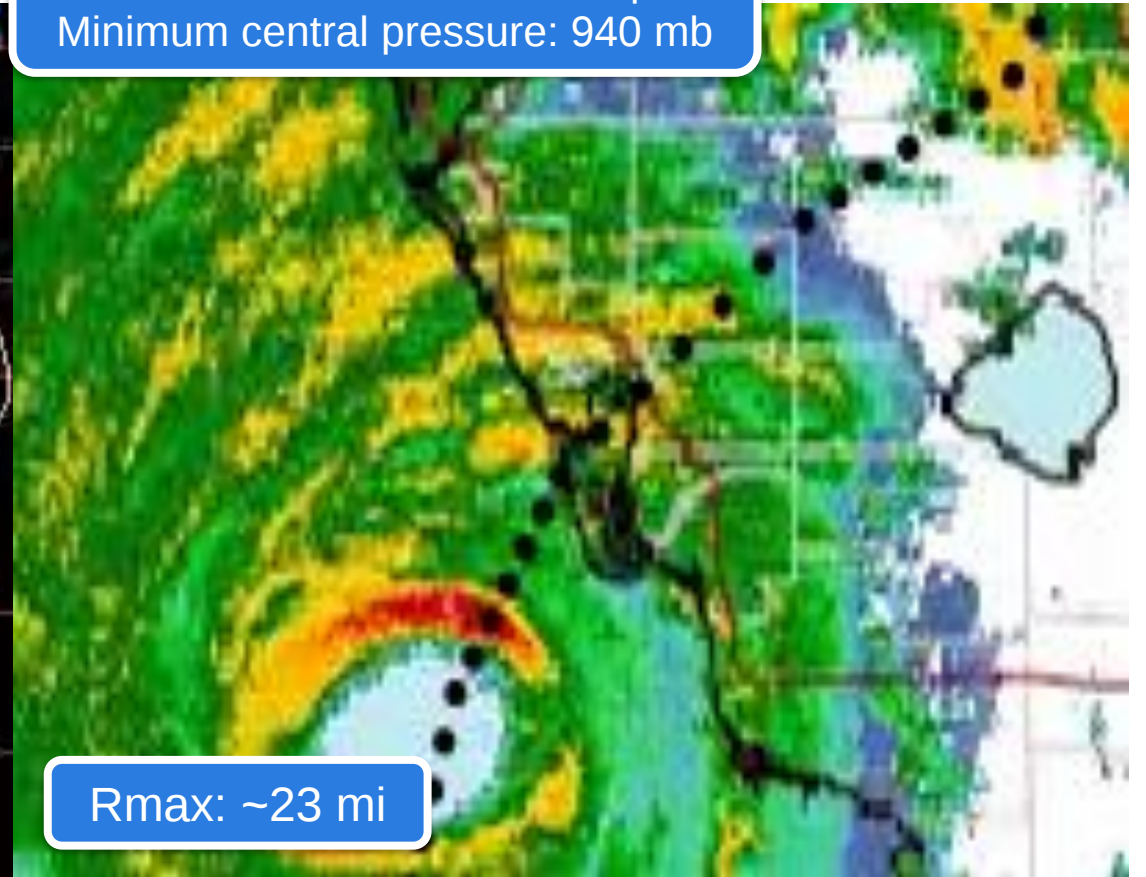
Both Charley and Ian made landfall in Southwest Florida as Category 4 hurricanes, but...the similarities end there.

Max winds at landfall: 150 mph
Minimum central pressure: 941 mb



Rmax: ~6 mi

Max winds at landfall: 150 mph
Minimum central pressure: 940 mb



Rmax: ~23 mi

Storm Surge Flooding

Hurricane Ian in Florida from a Storm Surge Perspective

Ian generated devastating storm surge in southwest Florida from greater Fort Myers to Naples

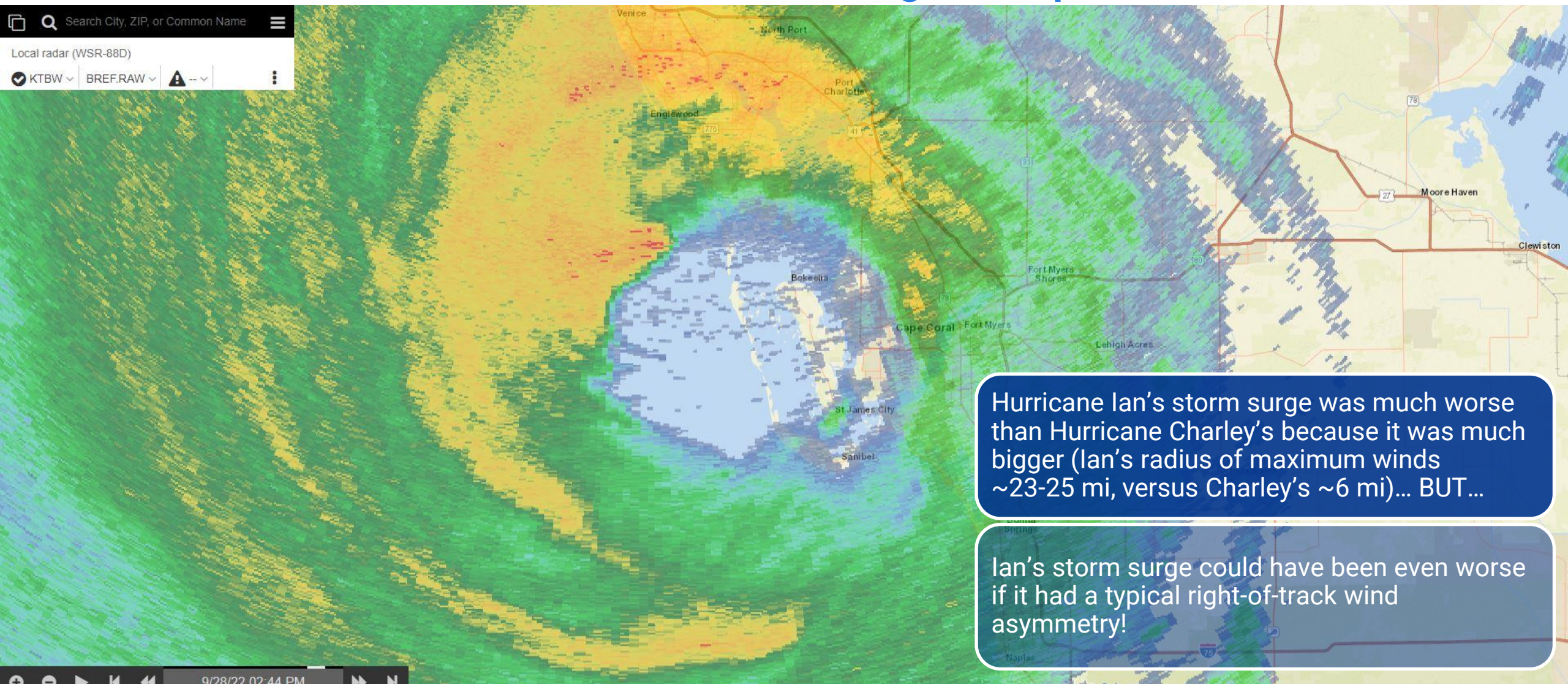
Bridges to inundated Sanibel Island and Pine Island (in greater Fort Myers) were destroyed

Much less severe storm surge occurred in northeast Florida, including areas like New Smyrna Beach/Port Orange and St. Augustine

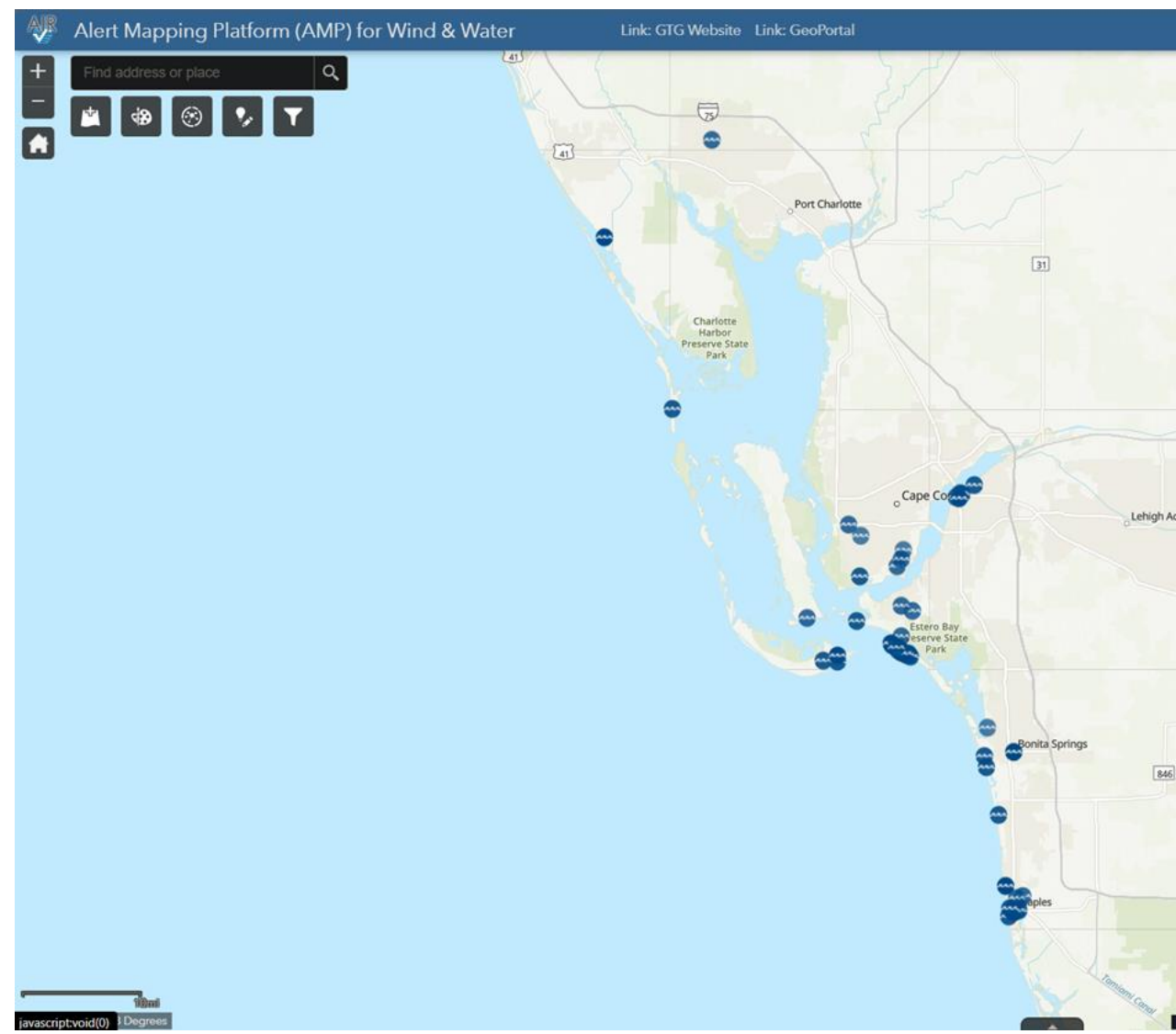
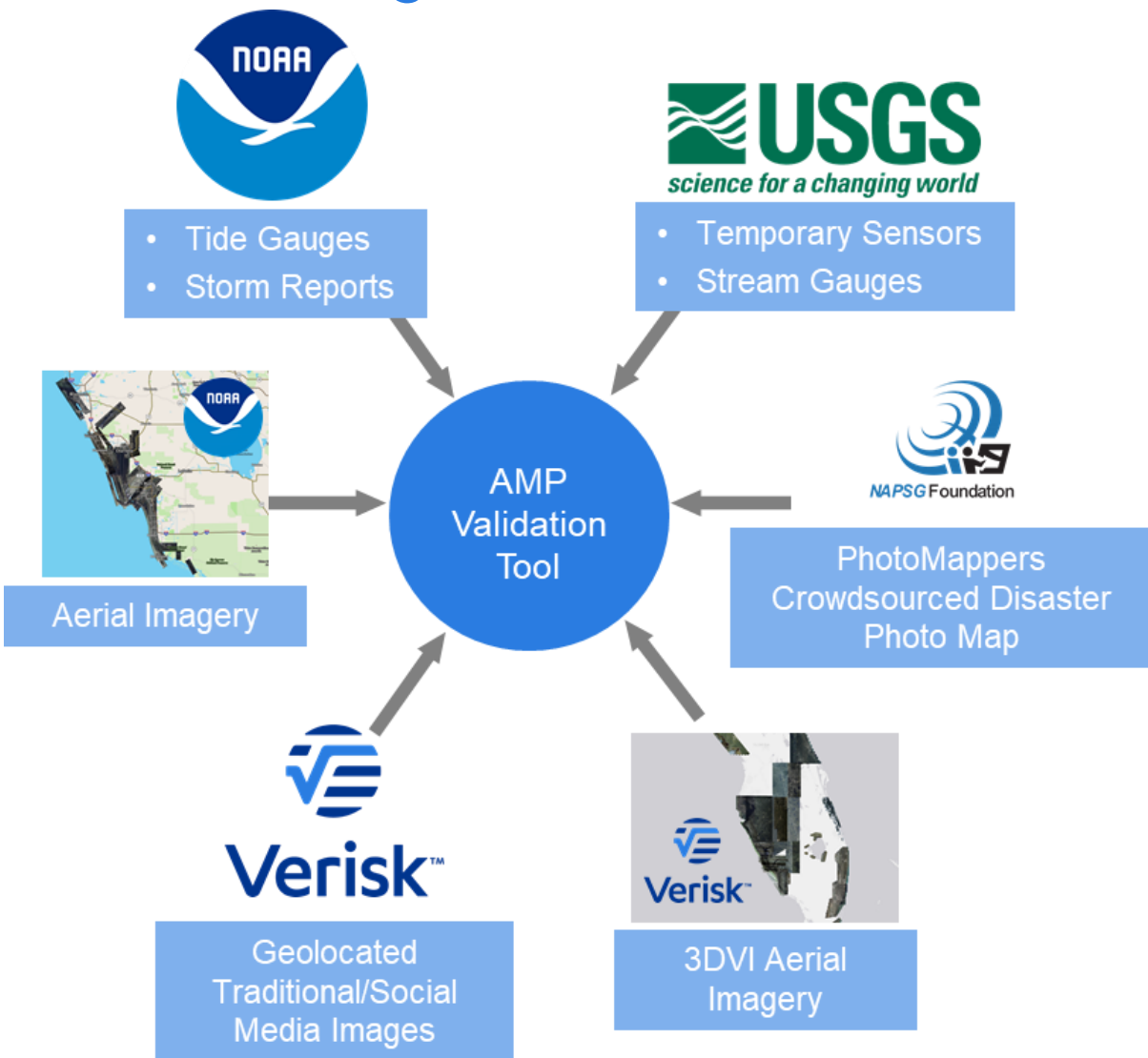
Overall, our modeled water depths compare well with reported flooding, particularly in Fort Myers Beach (> 10 ft) and Downtown Naples

Some uncertainty remains regarding overall inundation extent, particularly in non-coastal areas of Fort Myers, Cape Coral, and Naples; our modeled event set covers that range of uncertainty

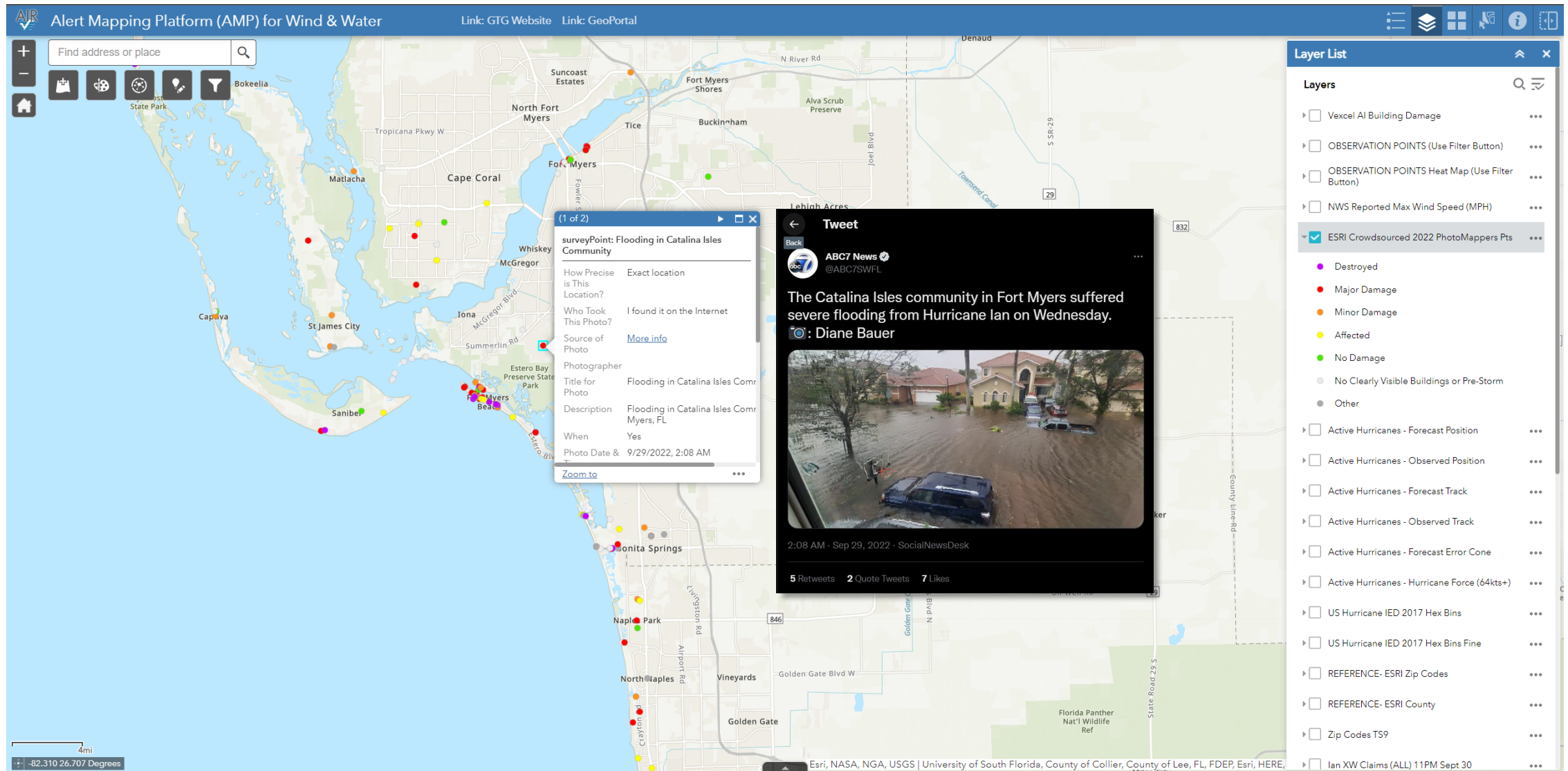
Hurricane Ian in Florida from a Storm Surge Perspective



Storm Surge Data Sources Available as of Oct. 1, 2022

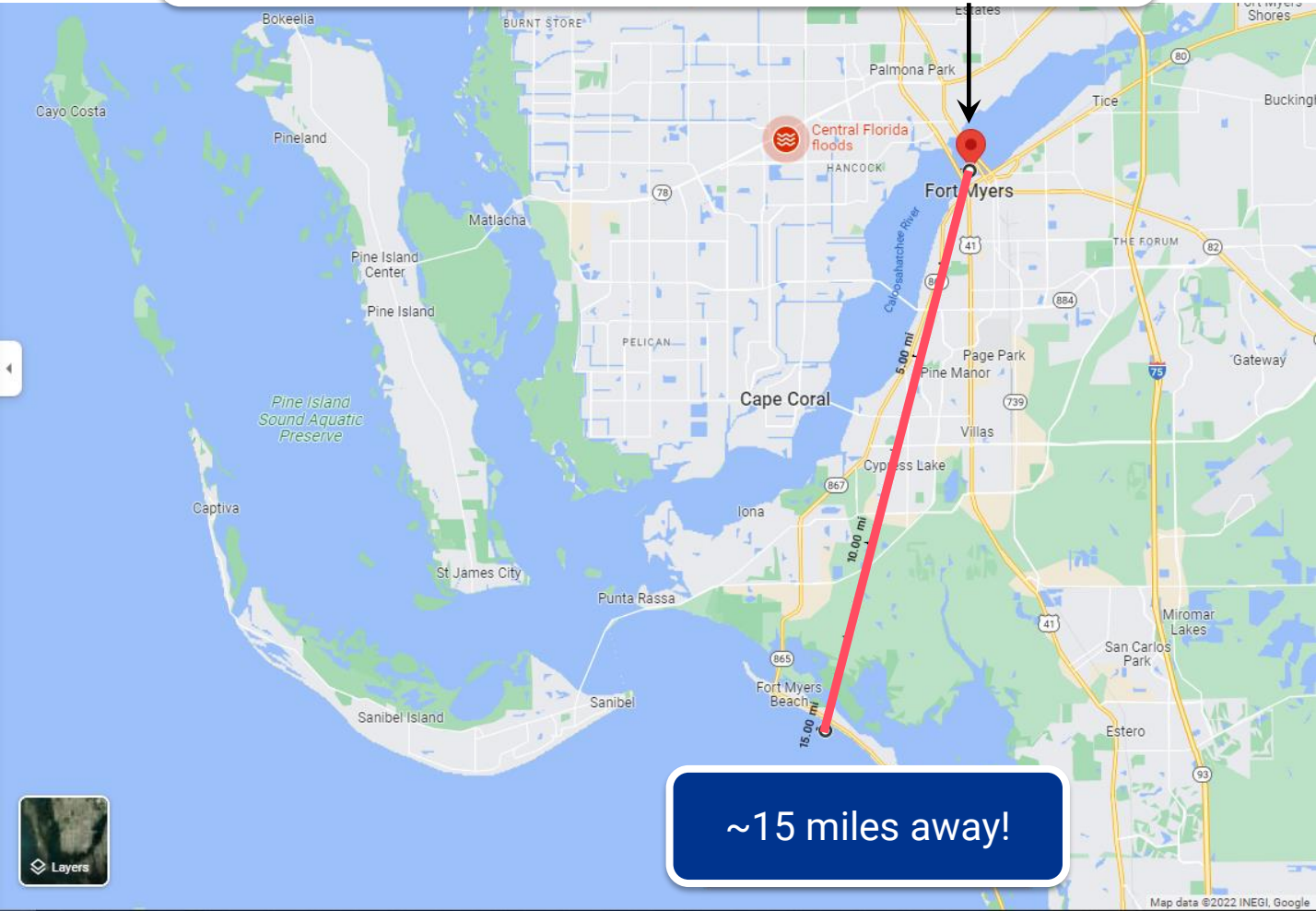


Storm Surge Data Sources Available as of Oct. 1, 2022

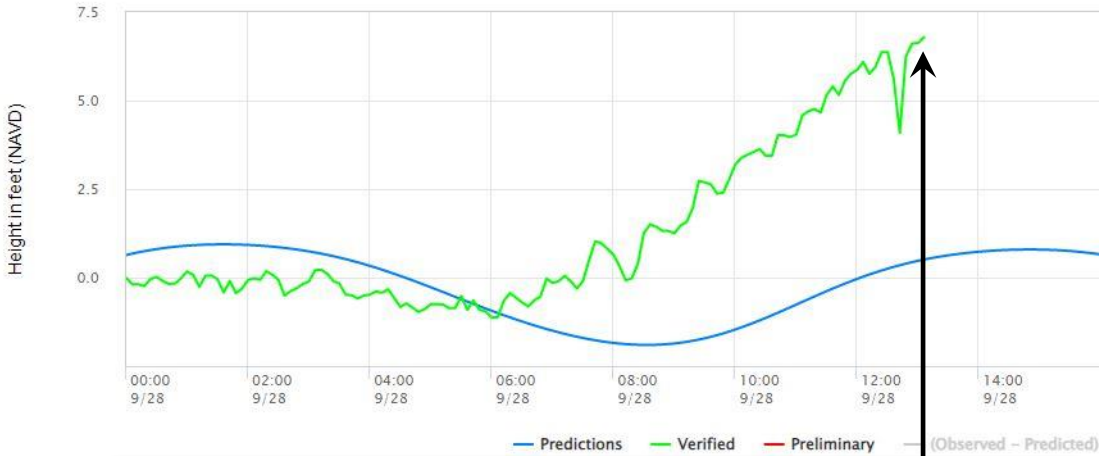


NOAA Tide Gauges at Fort Myers and Naples

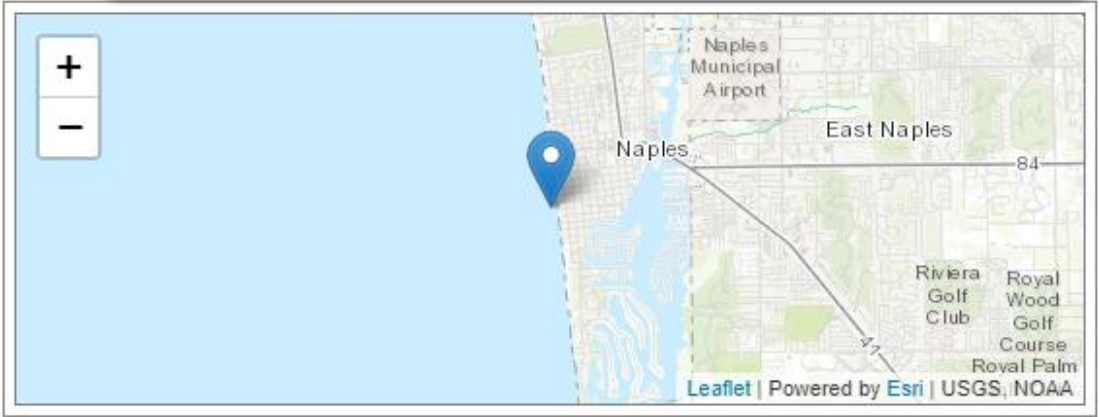
NOAA tide gauge at Fort Myers is not representative of the water levels on Fort Myers Beach



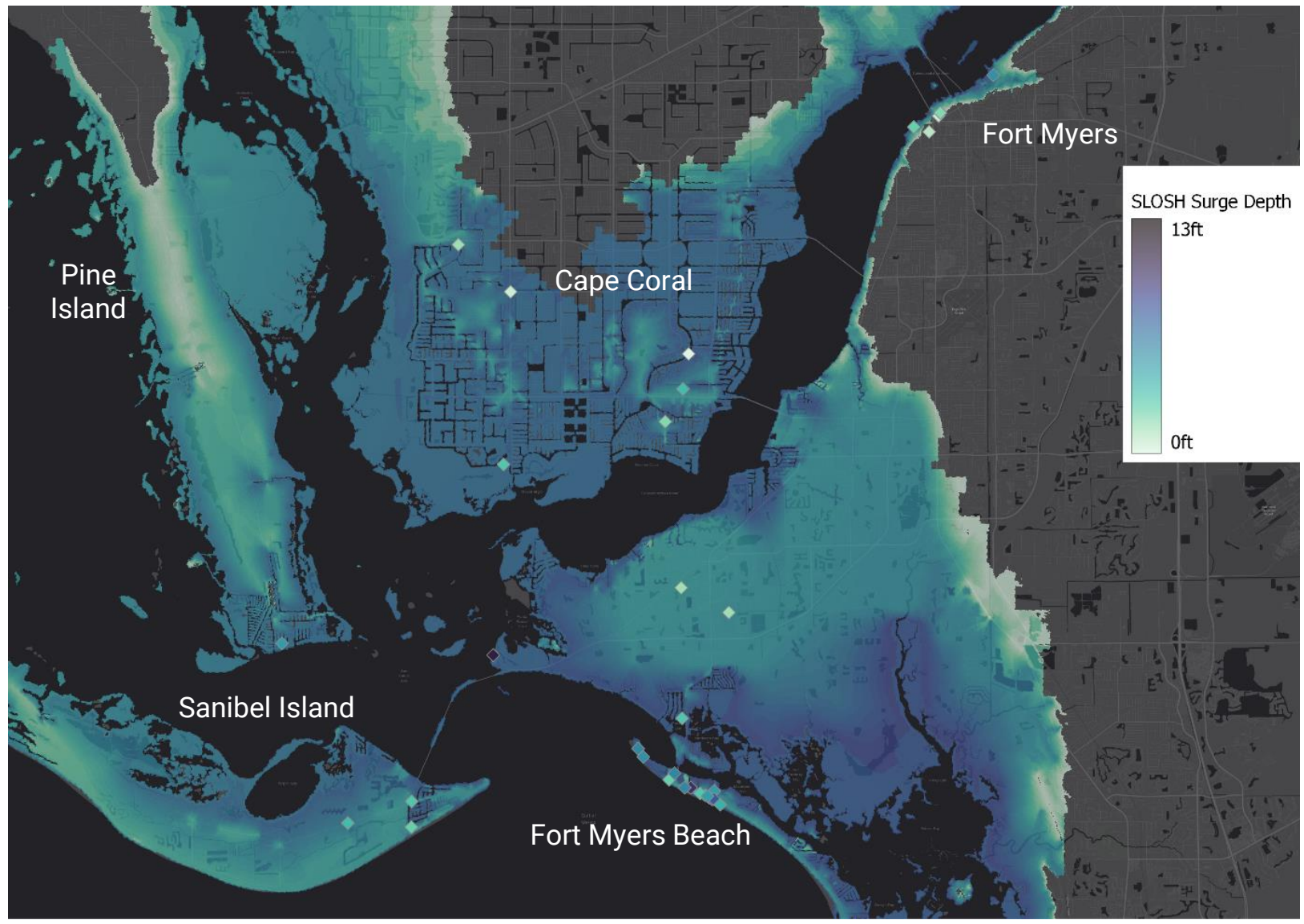
NOAA/NOS/CO-OPS
Observed Water Levels at 8725110, Naples, Gulf of Mexico FL
From 2022/09/28 00:00 LST/LDT to 2022/09/28 23:59 LST/LDT



NOAA tide gauge at Naples failed during the storm at 1:06 PM EDT on 9/28/2022, so it did not capture the maximum water level due to Ian's storm surge



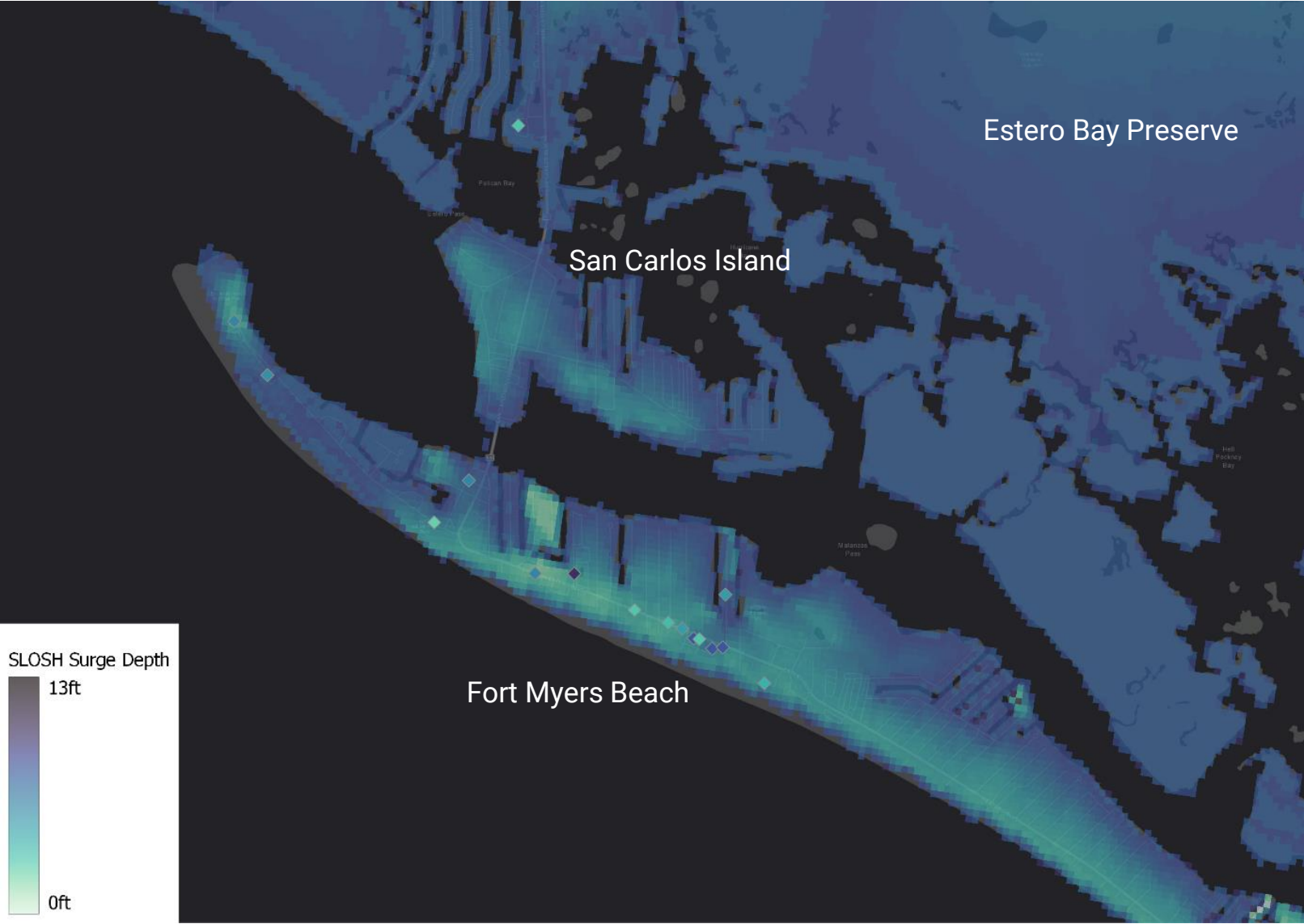
Greater Fort Myers



Darker color =
Higher storm surge

Diamonds indicate observations

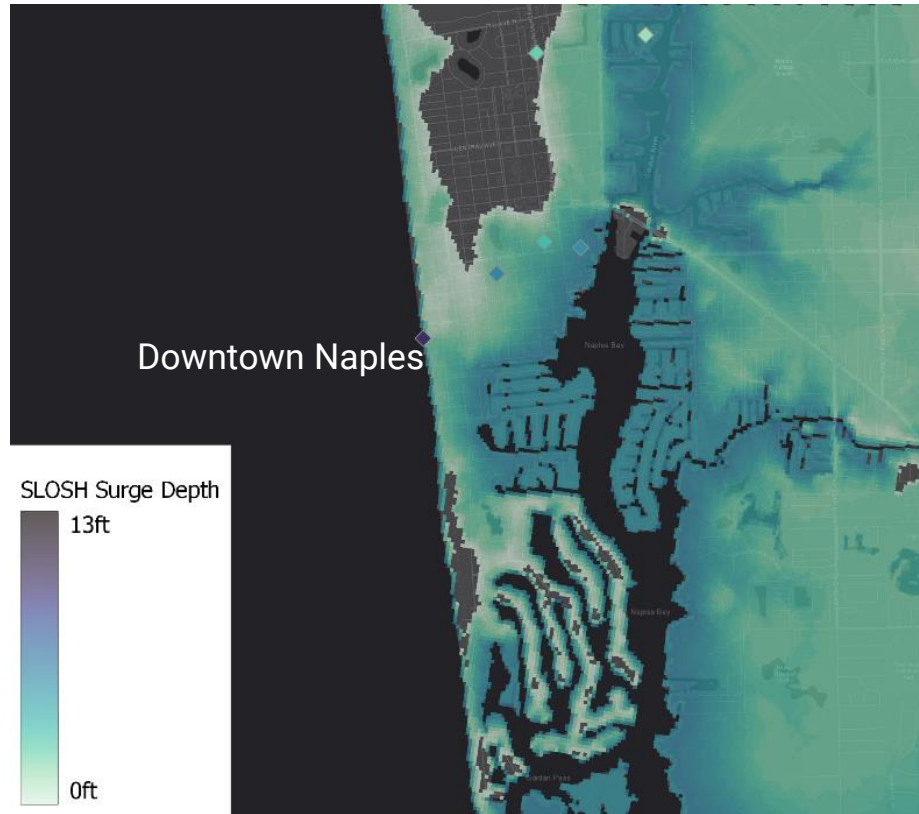
Fort Myers Beach



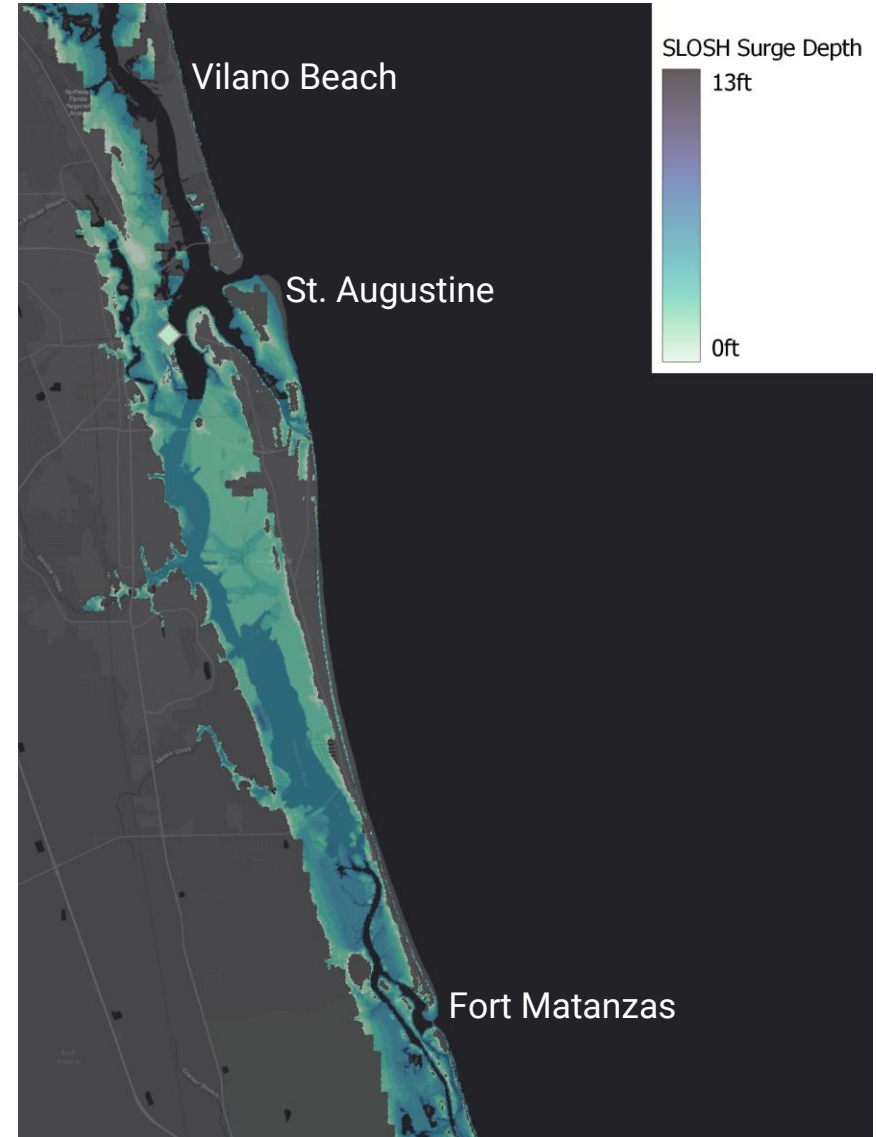
Darker color =
Higher storm surge

Diamonds indicate observations

Naples (FL West Coast) and St. Augustine (FL East Coast)

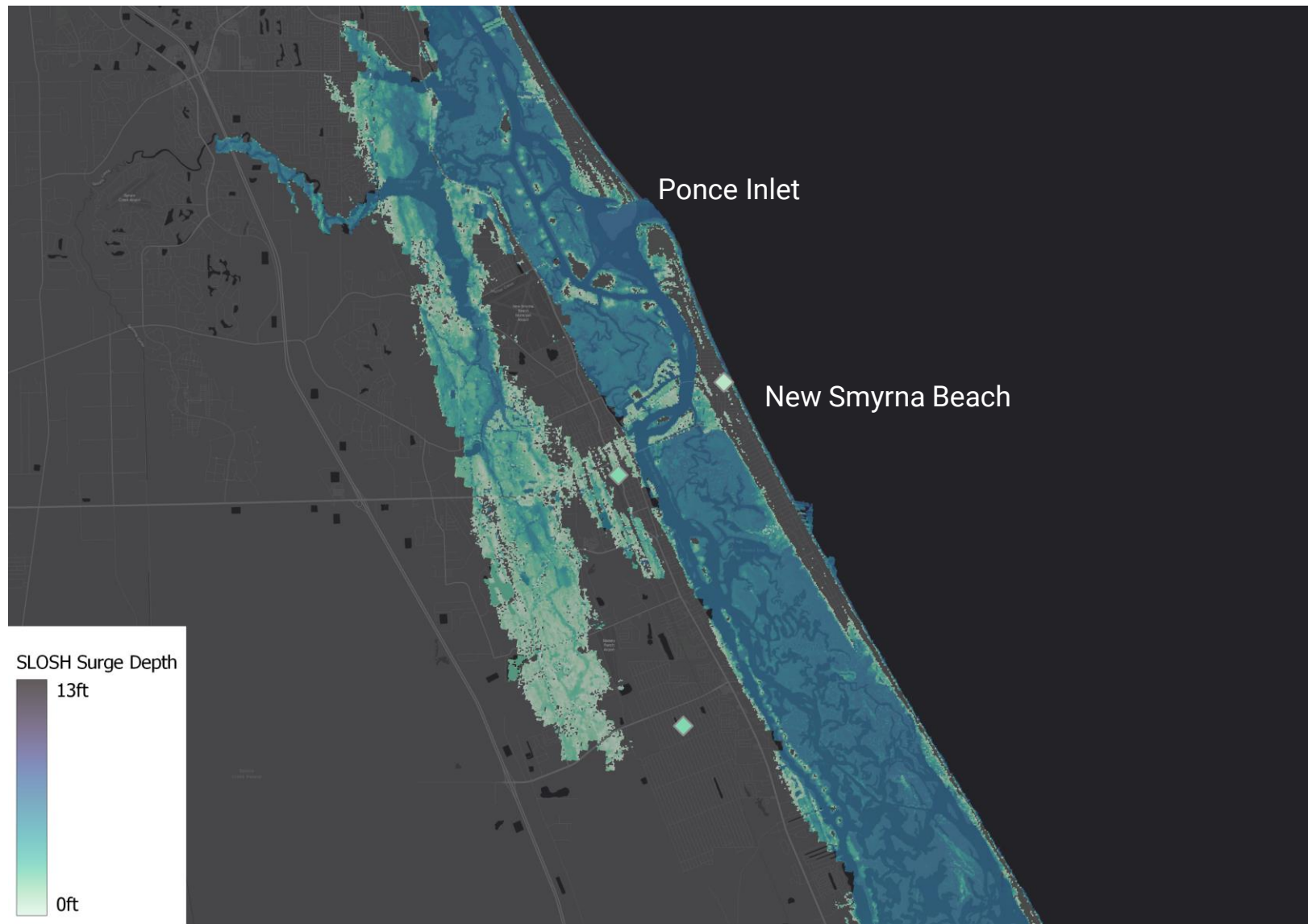


Darker color =
Higher storm surge



Diamonds indicate observations

New Smyrna Beach (FL East Coast)



Darker color =
Higher storm surge

Diamonds indicate observations

Industry Loss Estimates for Hurricane Ian

The Real Time Event Timeline

September 28, 2022

- Hurricane Ian makes landfall in Florida
Verisk begins custom event modeling

October 3, 2022

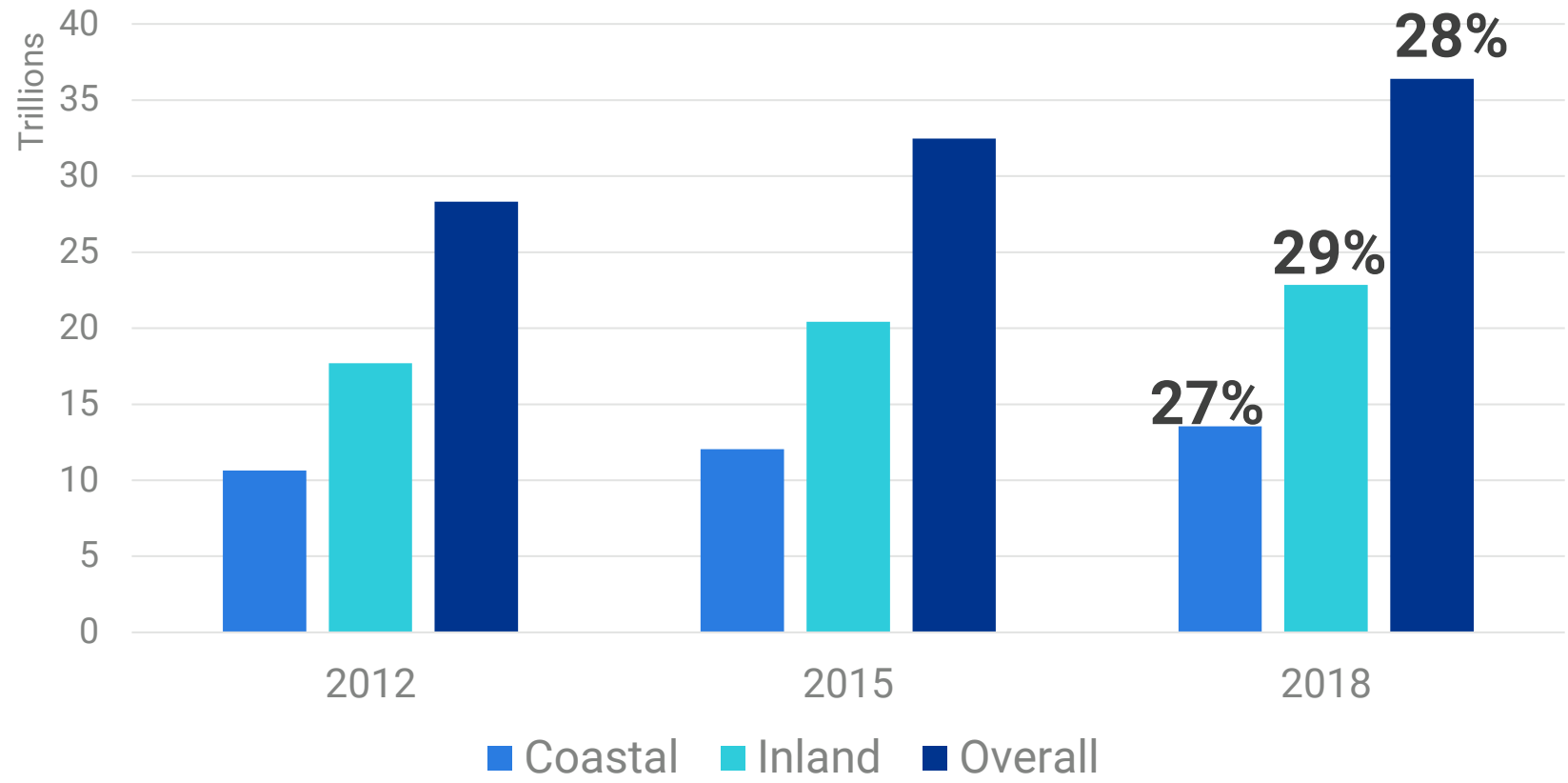
- Verisk EES issues loss estimates

Post October 3

- Damage surveys, data analyses and further insights

Coastline at Risk

Growth in Inland and Coastal Counties Exposures across All U.S. Coastal States



According to the latest U.S. census, more than 50 million people live in a county on the coast of the Atlantic Ocean or the Gulf of Mexico

Exposure at Risk



CNN

US

Crime + Justice

Energy + Environment

Extreme Weather

Space + Science

Population is ‘exploding’ in the region hit hardest by Hurricane Ian

By [Ella Nilsen](#), CNN

Published 7:25 AM EDT, Tue October 4, 2022



(CNN) — Hurricane Ian last week slammed into one of the fastest-growing areas of the country, putting hundreds of thousands of people in harm's way — many of whom had never experienced a hurricane.

Florida has added nearly 3 million people since 2010. And the Fort Myers area, which was ravaged by Ian's deadly storm surge, was recently named the sixth fastest-growing city in the country by the US Census Bureau. The population in the Fort Myers-Cape Coral metro area was around 444,000 in 2000, according to Census Bureau data. By 2021 it had ballooned to more than 787,000.



RELATED ARTICLE

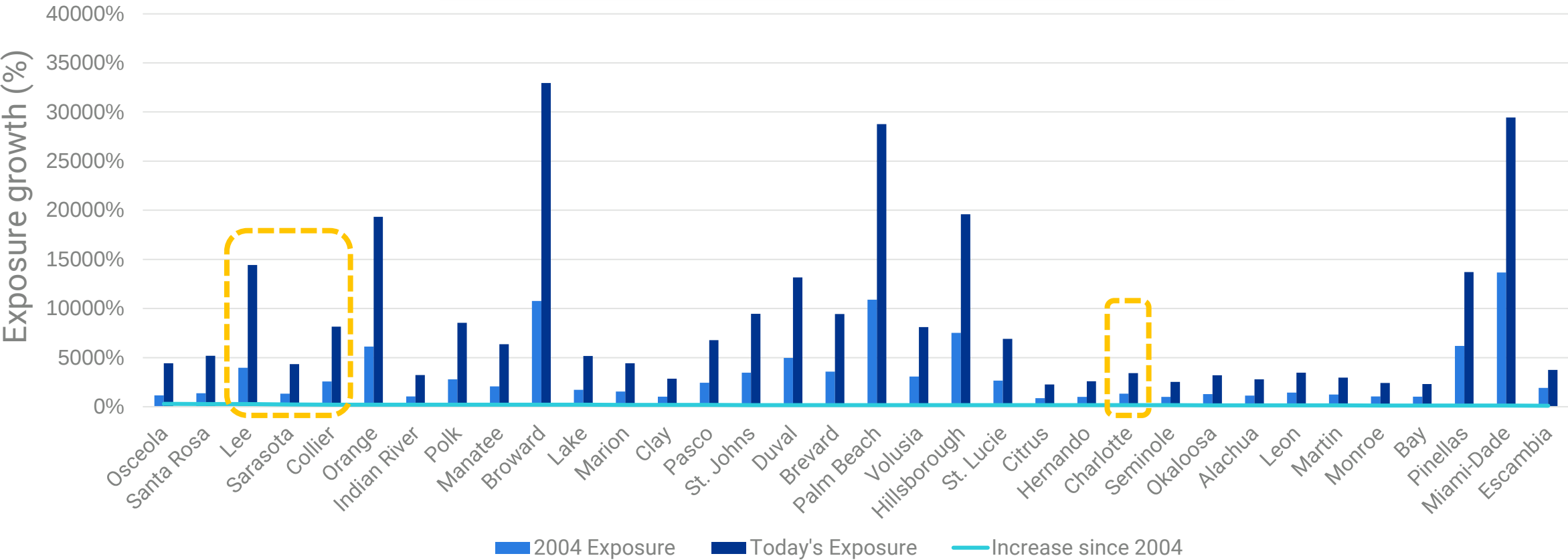
Politics of rebuilding intensify as Florida's devastation is laid bare

Southwest Florida's population has “exploded in part because it's the cheapest part of the state to live,” according to Jesse Keenan, a professor of sustainable real estate at Tulane University's School of Architecture, who told CNN that “there has been a huge amount of growth in the past several decades.”



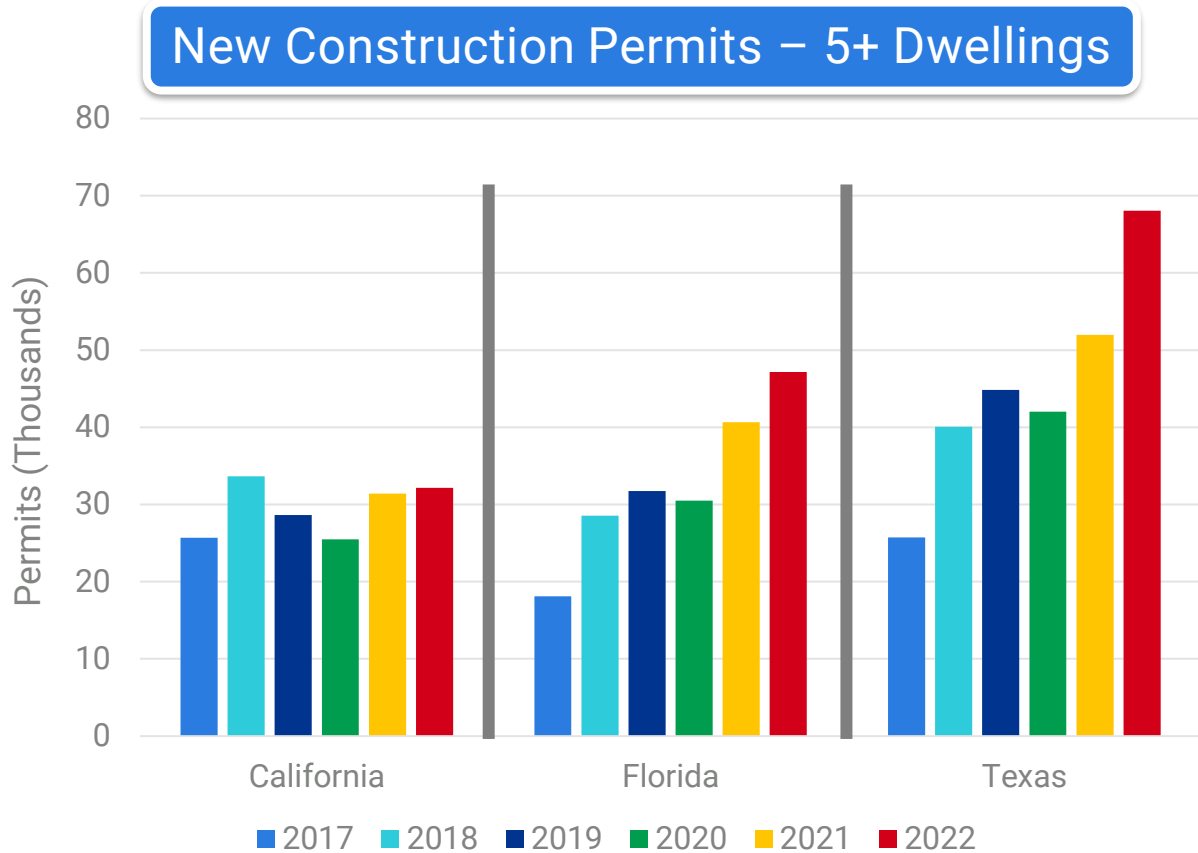
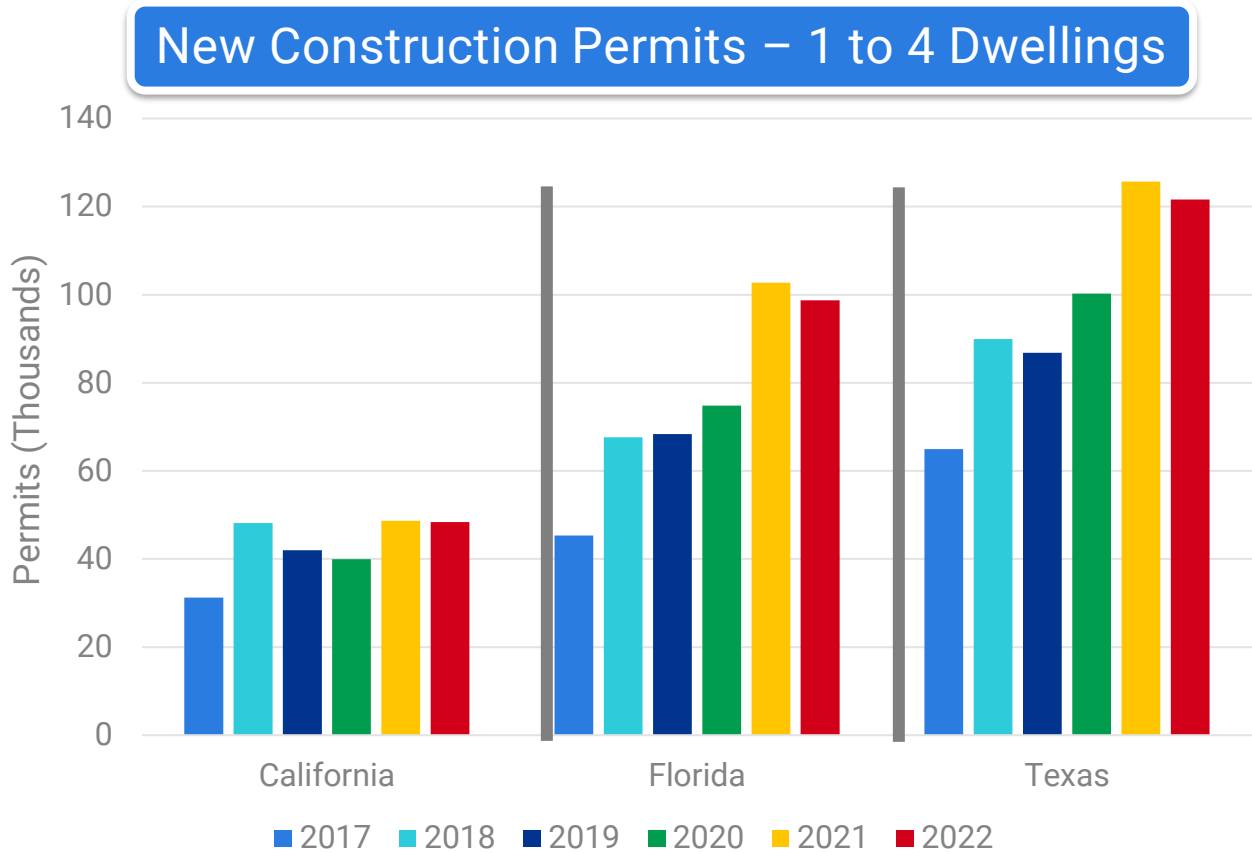
Significant Growth in Exposure in Southwest Florida Since Hurricane Charley (2004)

Exposure Growth By County Since 2004



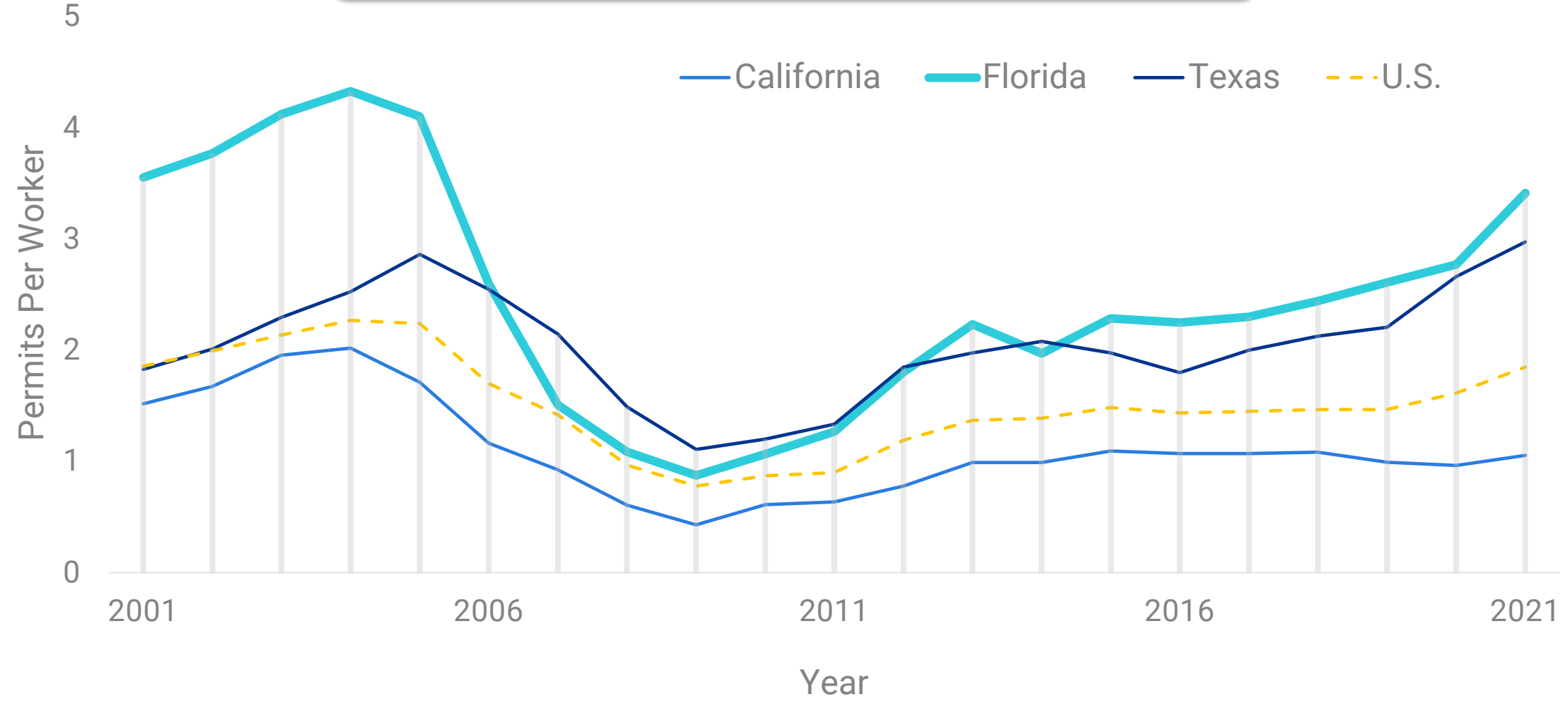
Counties hardest hit by Hurricane Ian

Over the Last 5 Years, Construction Permits Have Continued to Increase



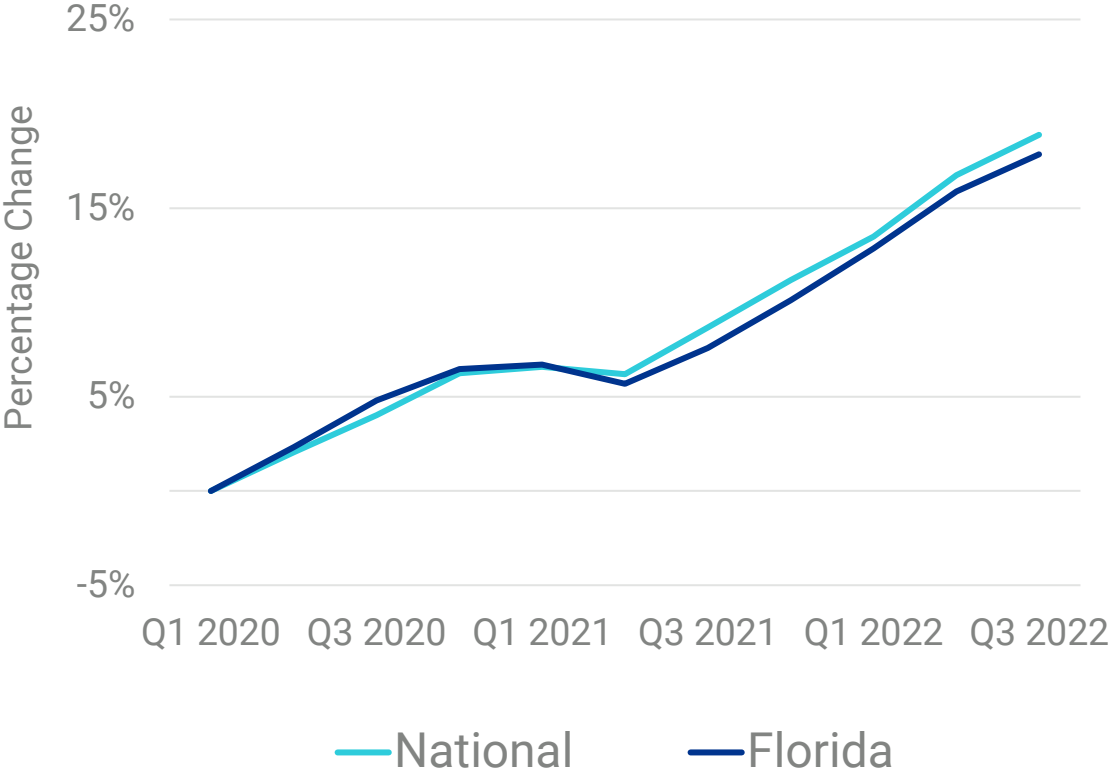
Demand for Construction Workers Also Continues to Increase

Permits Per Worker for New Construction and Repairs

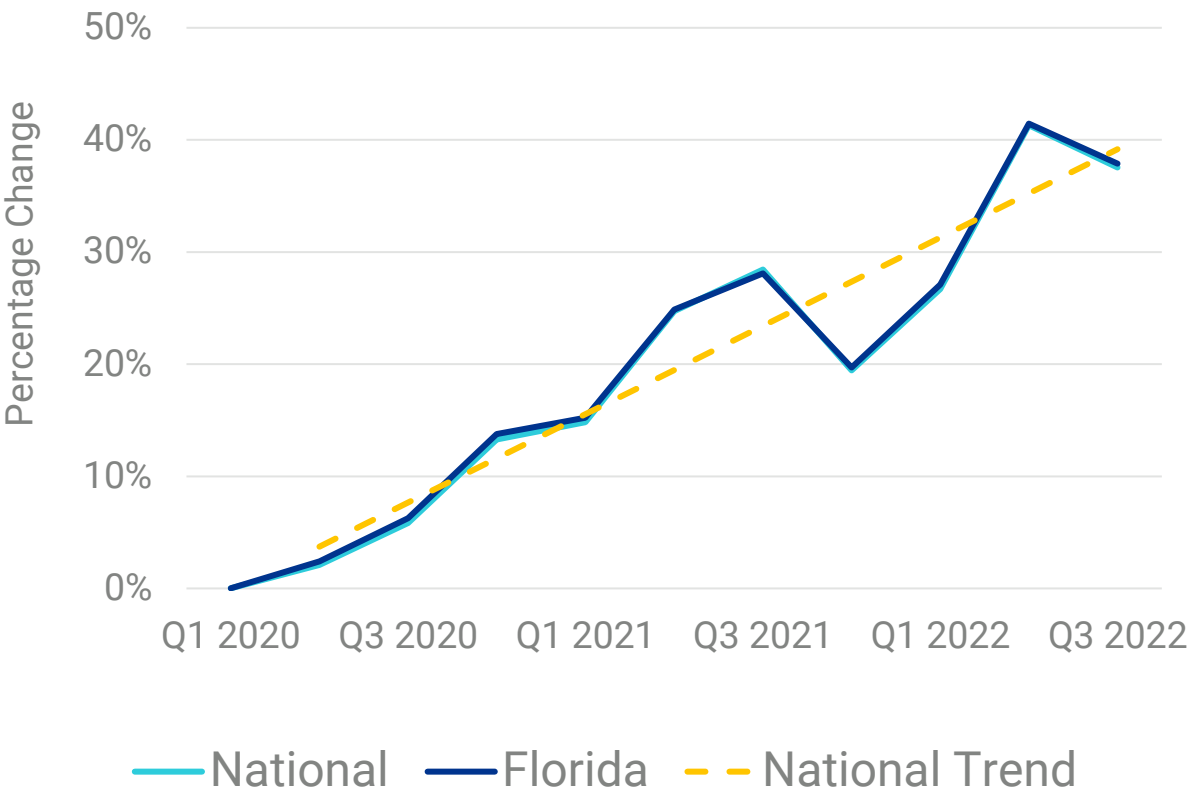


Industry Exposure – Indexing to Current Value

Construction Labor – Q1 2020 Baseline



Construction Material – Q1 2020 Baseline



Extremely Detailed Insights from Verisk's Property Estimation Solutions

Insurance
Product Finder
Insights
Product Login

MATERIAL AND LABOR PRICING DATA

Pricing Updates

Home / Insurance / Products / Pricing Data Services / Pricing Updates

Monthly Pricing Update
Latest Quarterly Bulletin
Archived

Verisk's Pricing Data

LEHI, Utah — October 1, 2022 — The October 2022 price list updates for more than 460 regions in the United States and Canada are now available for download.

Pricing research for the October 2022 publication shows that average costs for labor and materials in the United States in claims and remodeling showed some decreases as well as some increases in key pricing components. Since October 2021, the 30-yr. Laminated Shingle Labor and Material report showed the largest increase of 12.76 percent in the United States and 14.67 percent in Canada. The Common Lumber Material report showed the least movement with an increase of 6.28 percent in the United States and a 1.55 percent decrease in Canada.

Pricing News — 2022 - October

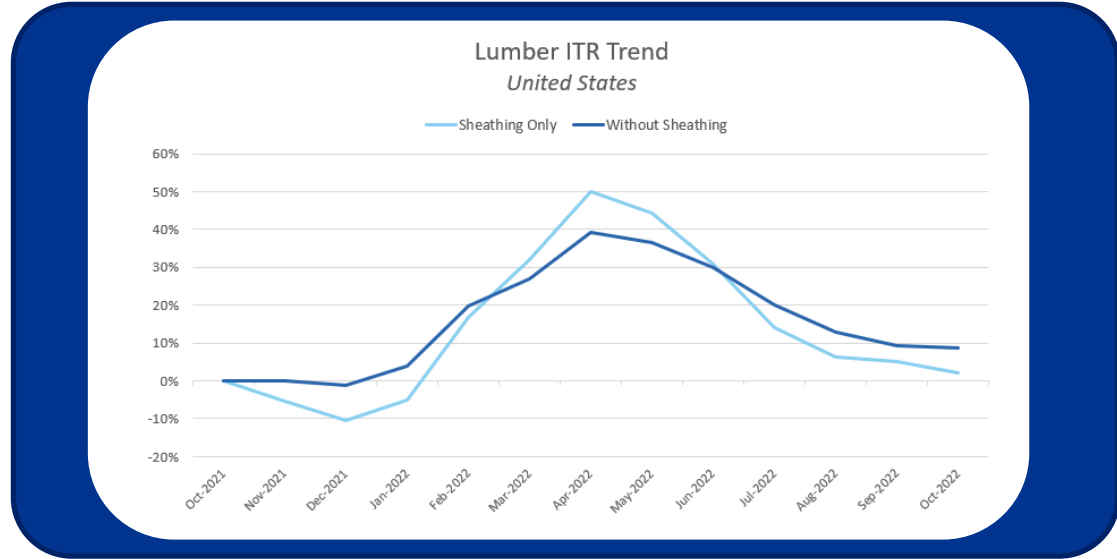
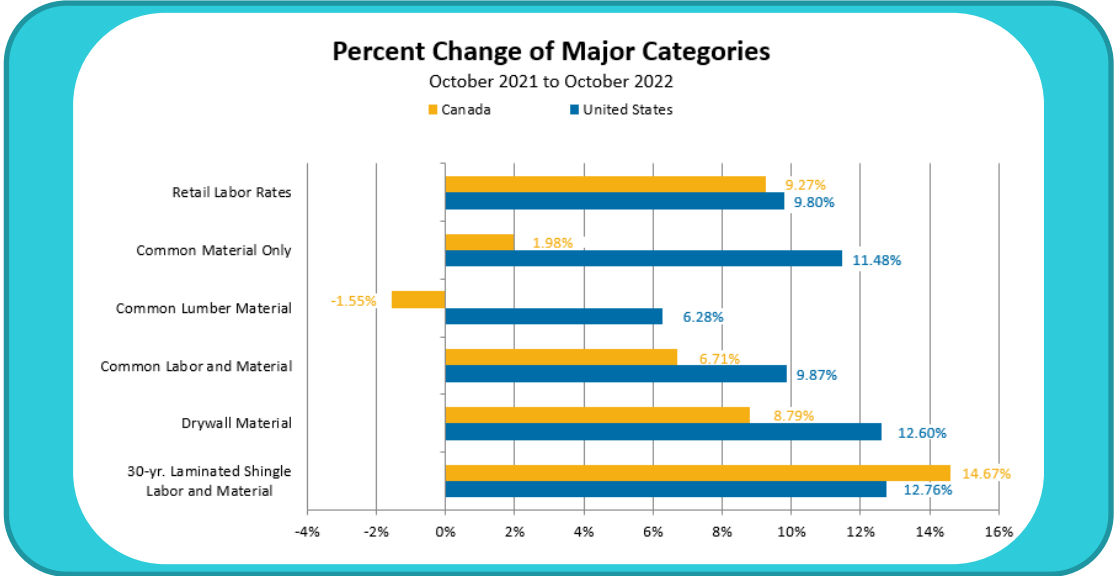
Hurricane Ian update

The October price lists are inclusive of pricing updates for the areas impacted by Hurricane Ian, which made landfall in Florida on September 28th, 2022 and again in South Carolina on September 30th, 2022. Customers can view the [Industry Trend Reports](#) for additional information.

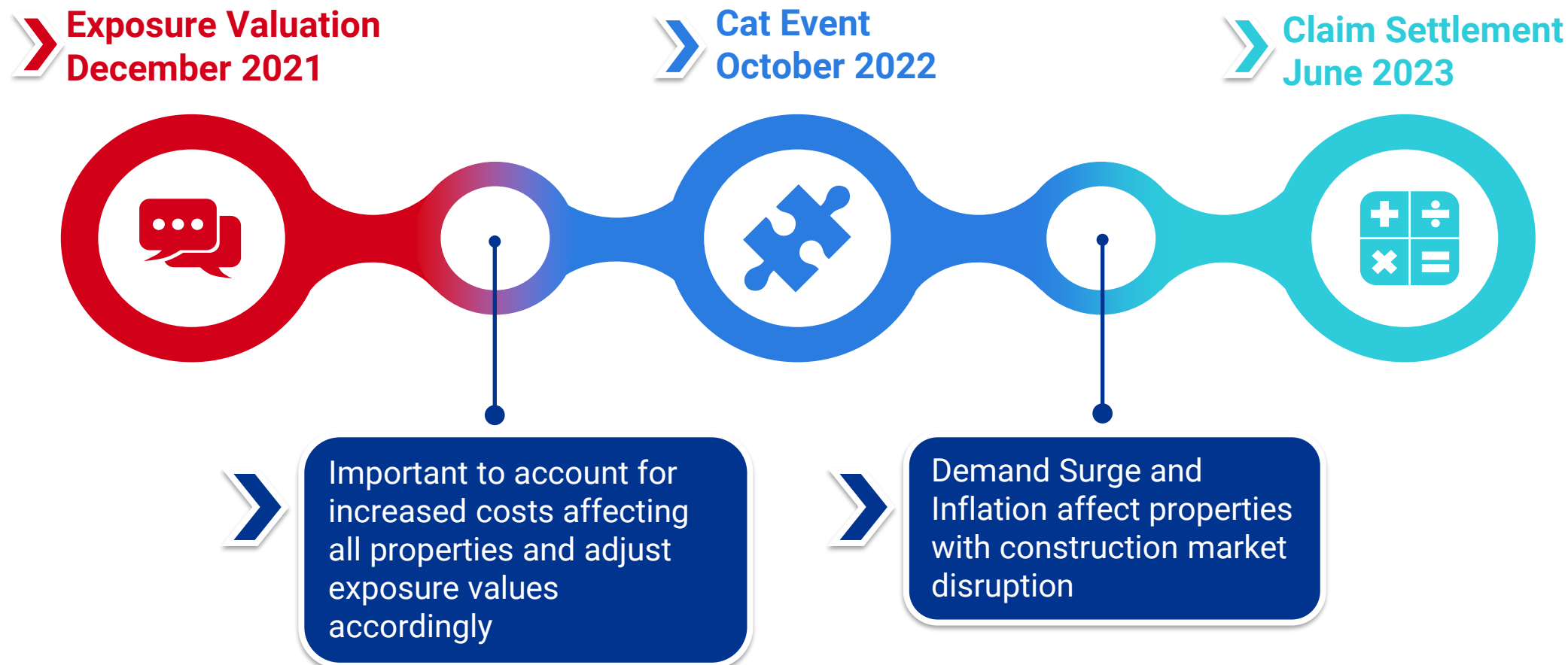
October Pricelist

Since our September 2022 publication, the Common Lumber Material report showed a decrease of 1.43 percent in the United States and 4.85 percent in Canada. The Drywall Material report showed the largest increase of 1.41 percent in the United States while the 30-yr. Laminated Shingle Labor and Material report showed the largest increase of 1.83 percent in Canada. Construction costs continue to be impacted by supply and demand, distribution, inflation, etc. It also remains a tight labor market, and companies are competing to hire and keep quality employees.

Pricing Updates | Verisk



Accurate Representation of the Replacement Values Is Extremely Important in Today's Environment



Industry Loss Estimates for Hurricane Ian

As of October 3, 2022

\$42 - \$57
USD Billion

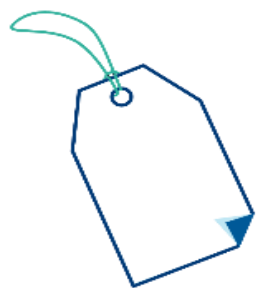
The industry loss estimate includes estimated wind, storm surge, and inland flood losses resulting from Ian's landfalls in both Florida and South Carolina

The industry loss estimate excludes certain elements, such as losses to the NFIP and any potential impacts of litigation or social inflation, and loss adjustment expenses

Loss estimates exclude: losses to inland marine, ocean-going marine cargo and hull, and pleasure boats, storm surge leakage, losses paid on wind-only policies due to government intervention, losses to uninsured properties, losses to infrastructure, losses from extra-contractual obligations, losses from hazardous waste cleanup, vandalism or civil commotion, whether directly or indirectly caused by the event, losses resulting from the compromise of existing defenses (e.g., natural and man-made levees), other non-modeled losses, including those resulting from tornadoes spawned by the storm, losses for U.S. offshore assets, and non-U.S. property

Several Sources of Loss Inflation Post-Event

Economic Demand Surge



- Construction market disruption
- Post-event cost inflation

Moral Hazard



- Social inflation or fraud
- Litigation

Government Intervention



- Reconstruction to code
- Extension of coverage

Infrastructure Damage



- Supply chain disruption
- Transportation systems

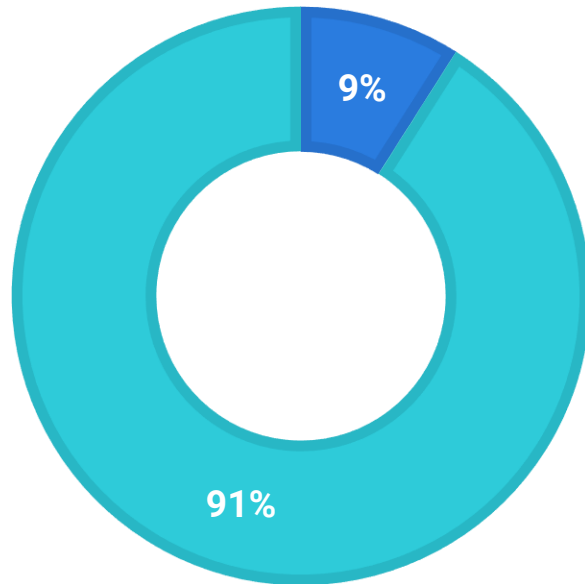
Loss Adjustment



- Large volume of claims
- Distinguishing non-covered perils

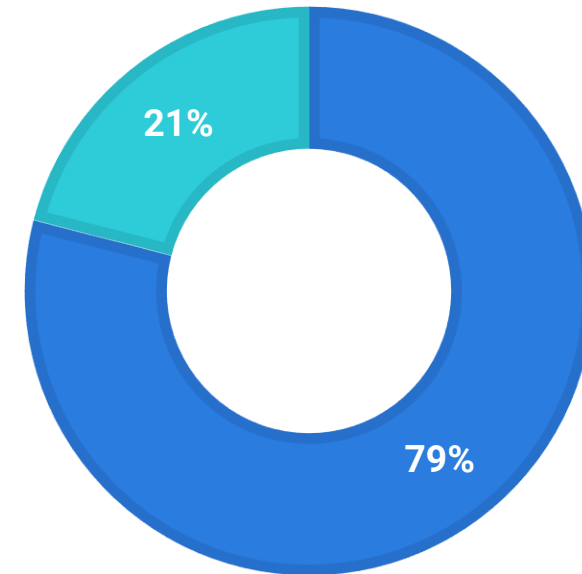
Social Inflation – by the Numbers

Homeowners Claims



■ Florida ■ Rest of U.S.

Homeowners Insurance Lawsuits



■ Florida ■ Rest of U.S.

Florida has the highest number of homeowners' insurance-related lawsuits, despite having less than 10% of claims nationwide by count

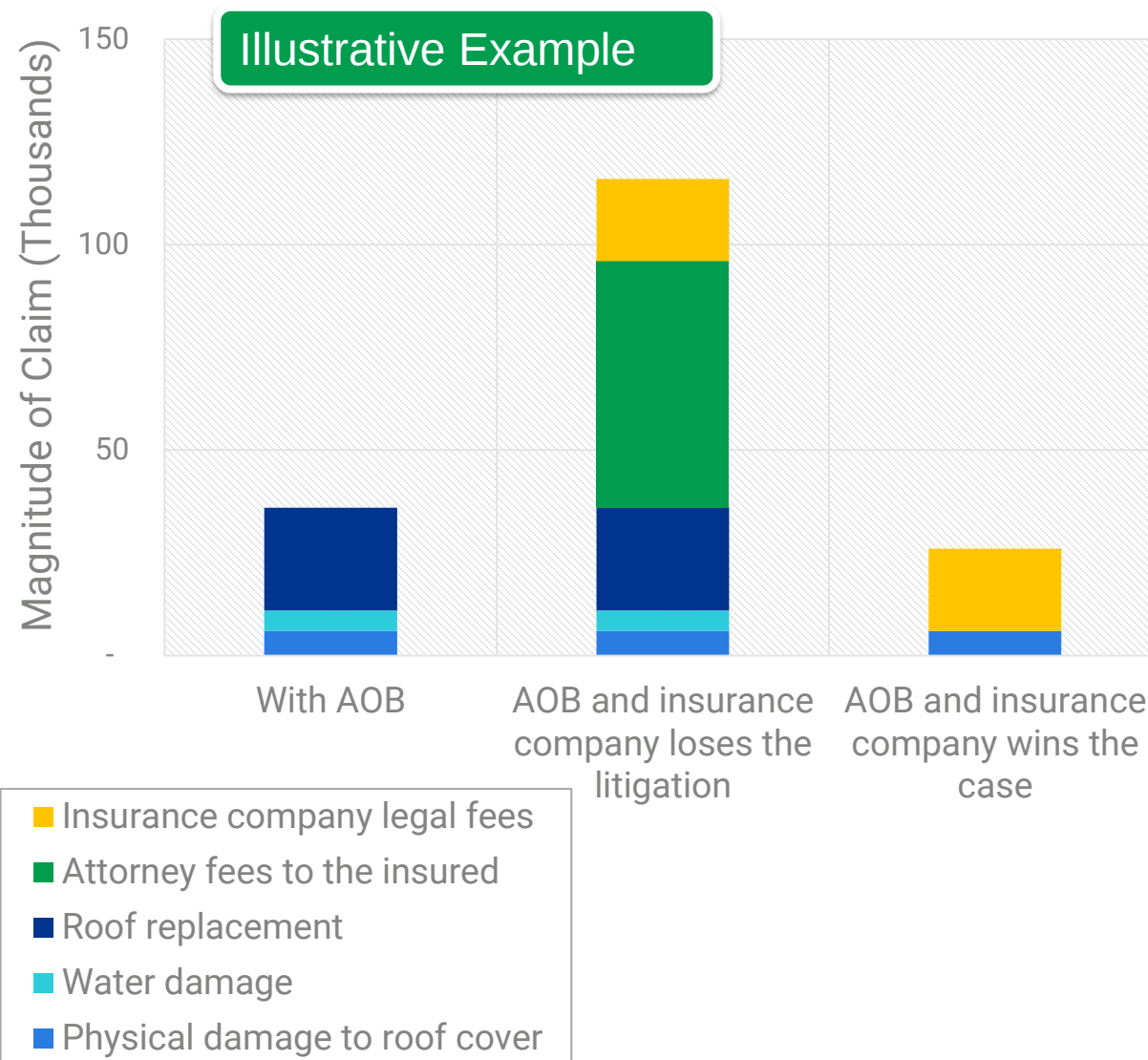
Crisis Post-Hurricane Irma (2017) Is Driven by Several Factors

Laws Stoke Litigation to a Great Extent

A 2017 Florida Supreme Court (Joyce v. Federated National Insurance Company) decision allows courts to award plaintiffs' attorneys 2-2.5 times their hourly billing rate when courts rule in favor of policyholders

These "contingency fee multipliers" can result in attorneys receiving several hundred thousand dollars for a simple lawsuit

Will the 2019 AOB Reforms and 2022 Property Insurance Reforms help curb social inflation?

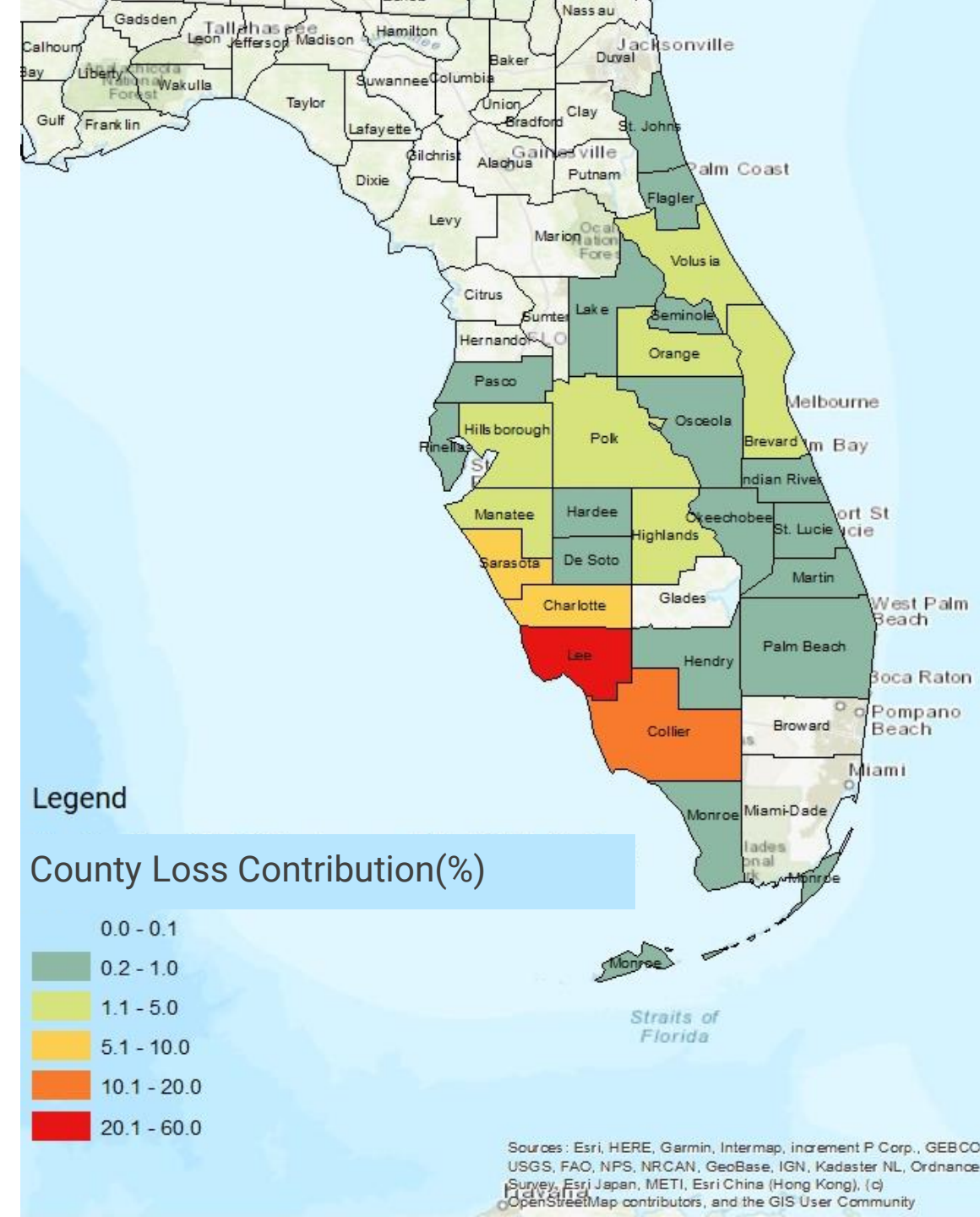


More than 80% of Losses Are from the Hardest Hit Counties in Southwest Florida

Counties on the east coast of Florida account for approximately 5% of the losses

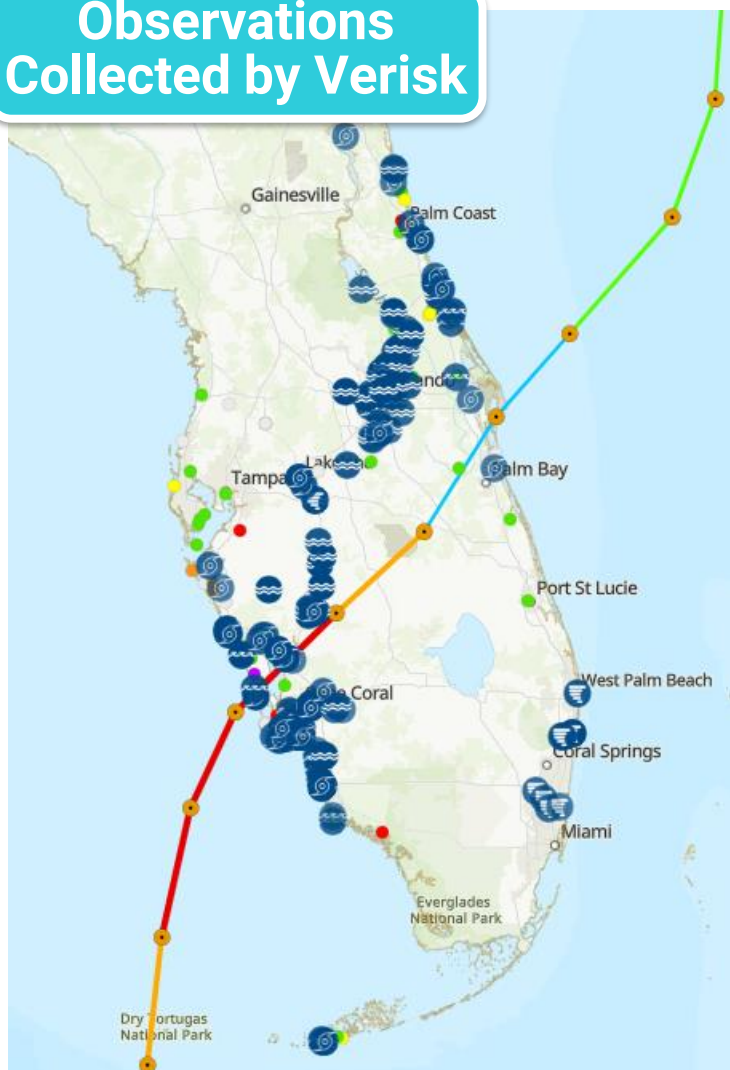
Other counties account for approximately 10-12% of the losses

Wind contribution is between 38 to 51 Billion USD and storm surge (excluding NFIP) is between 3 to 5.5 Billion USD with precipitation induced flooding contributing less than 1 Billion USD

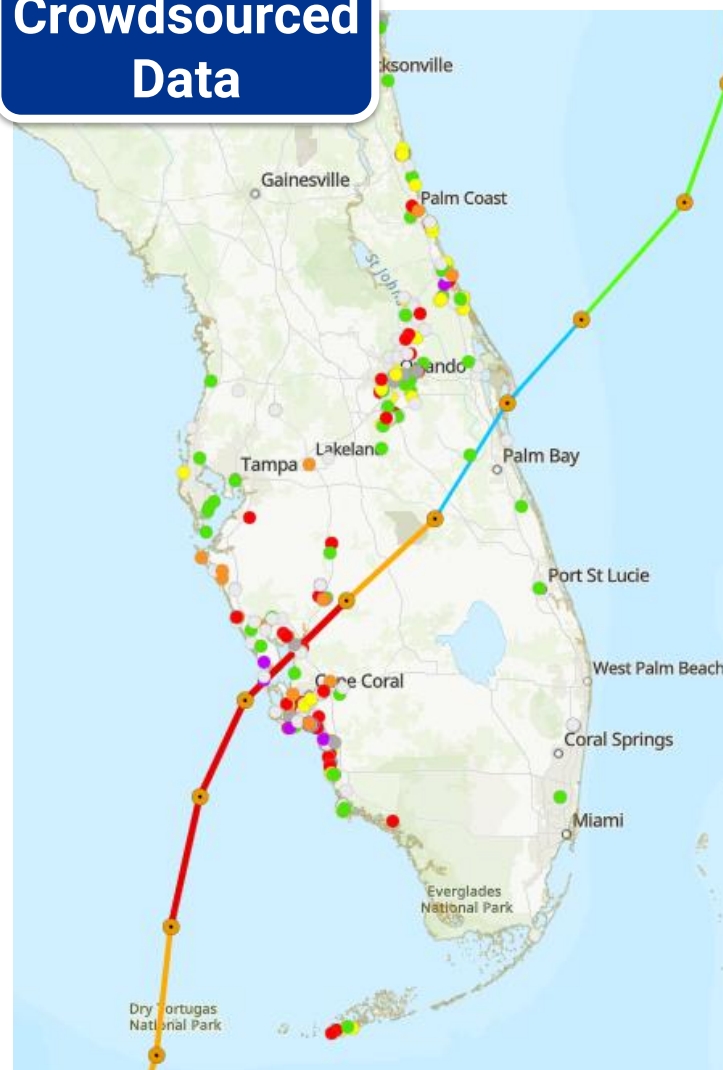


A Variety of Data Sources Are Used to Validate the Industry Loss Estimates in Near Real Time

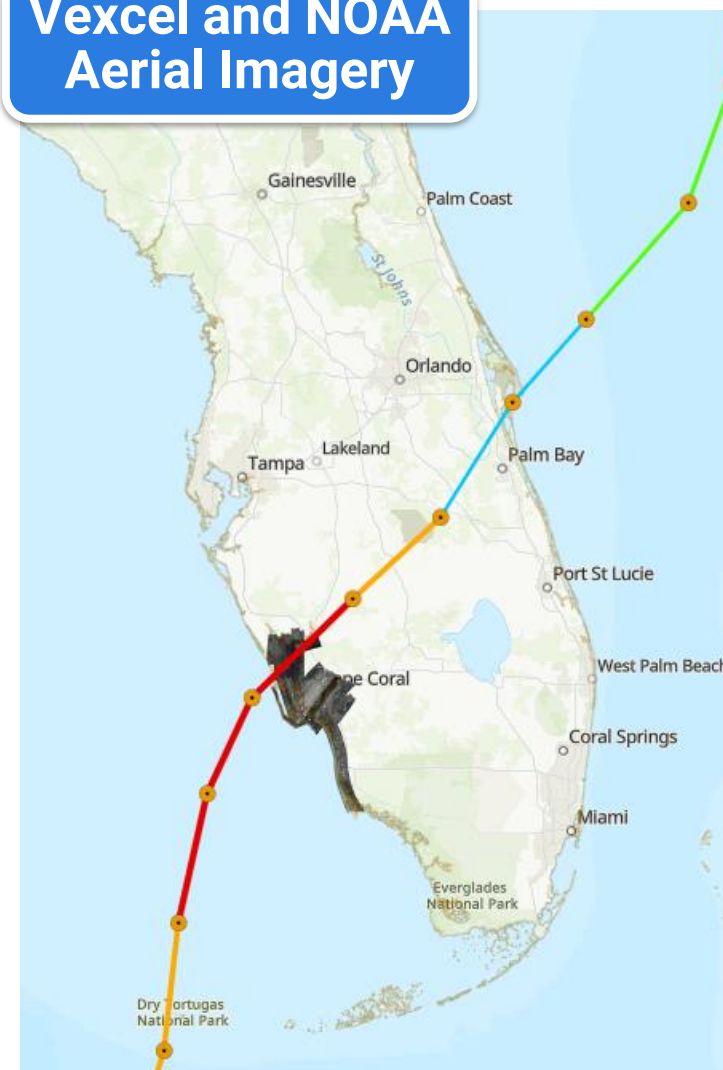
**Observations
Collected by Verisk**



**Crowdsourced
Data**



**Vexcel and NOAA
Aerial Imagery**



Damage Observations Collected by Verisk in Near Real Time

Fort Myers Beach - Wind and Surge Damage



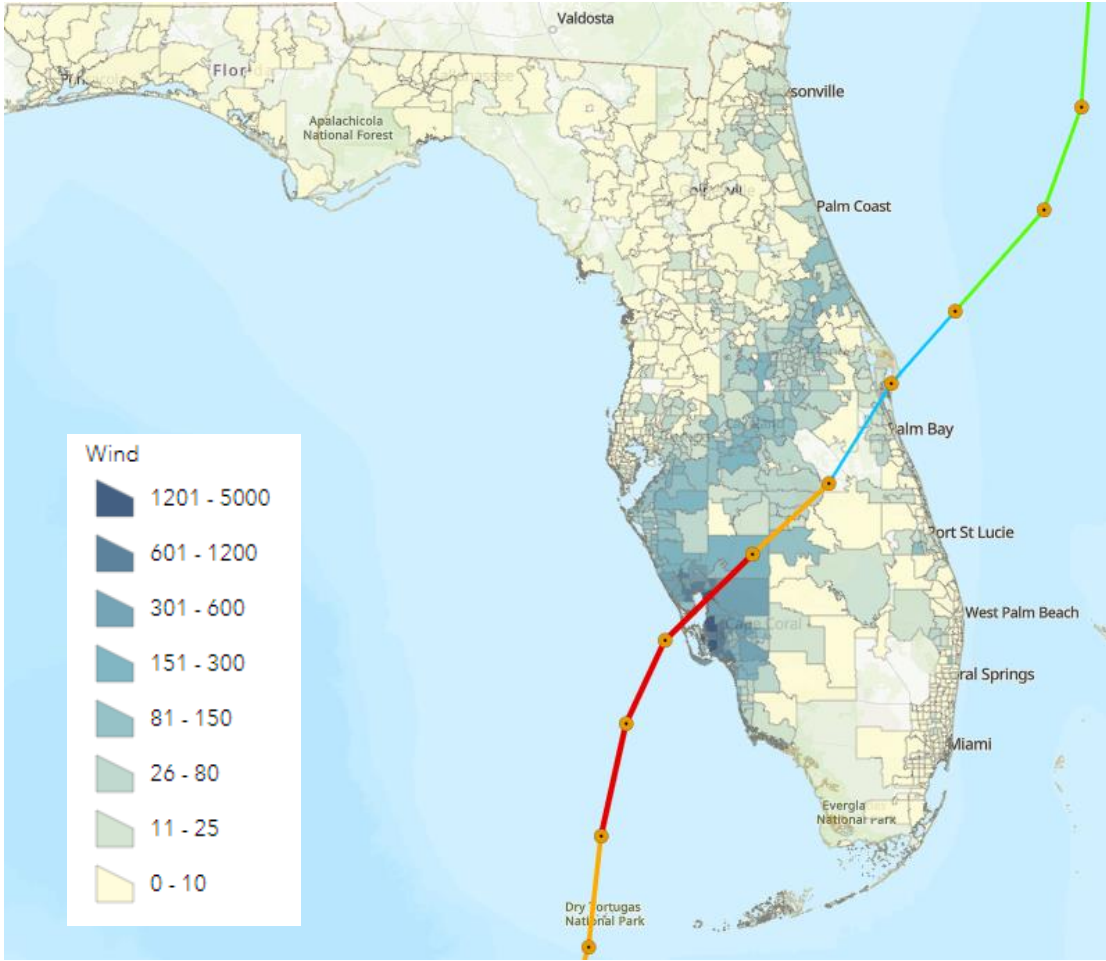
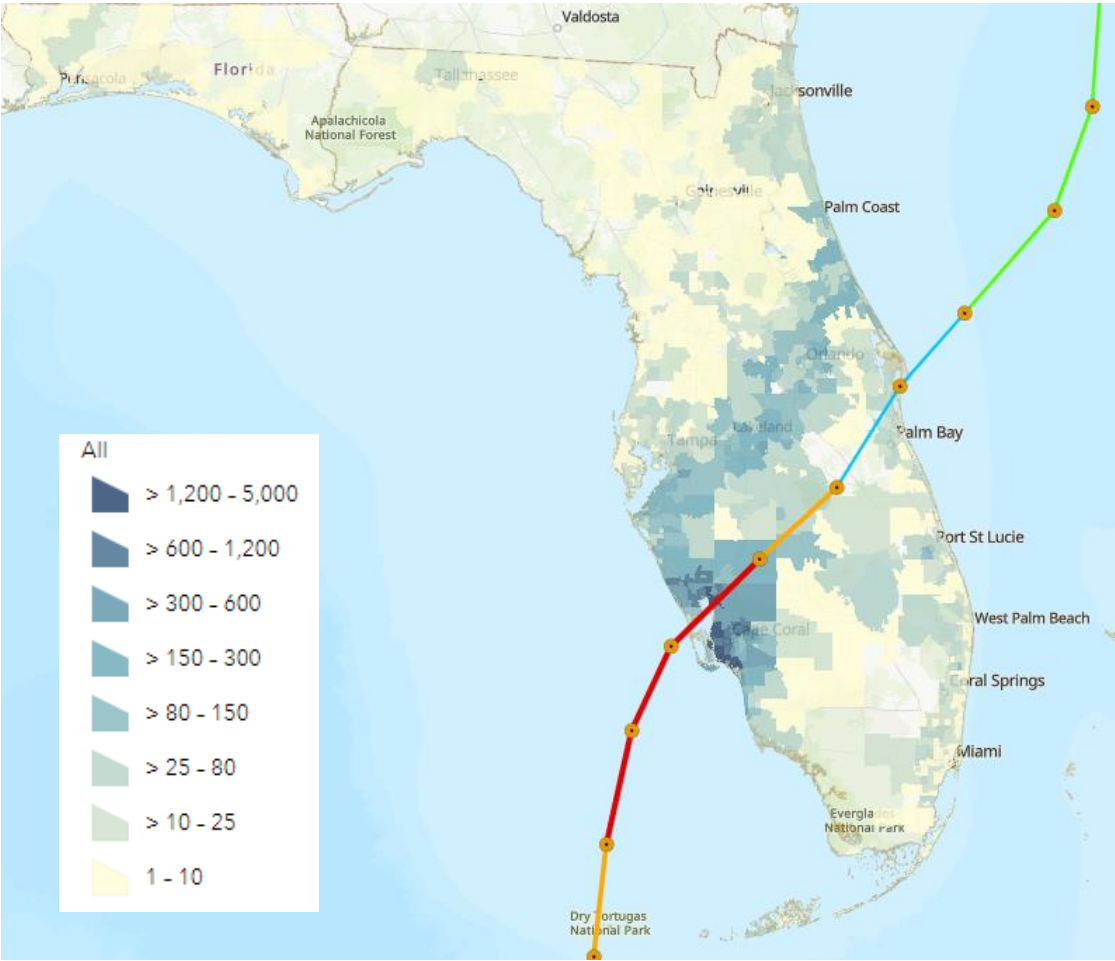
Vexcel and NOAA Aerial Imagery



Near Real Time Feed of Verisk Claims

Data as of 9/30/2022 End of the Day

ZIP Code-Level Claim Counts by Cause of Loss – Verisk Claims as of 9/30/2022 End of the Day



The Real Time Event Timeline

September 28, 2022

- Hurricane Ian makes landfall in Florida
Verisk begins custom event modeling

October 3, 2022

- Verisk EES issues loss estimates

Post October 3

- Damage surveys, data analyses and further insights

Hurricane Ian Damage Survey

Let's Start with Some Good News...

Residential and commercial buildings built to modern building codes performed very well

Widespread prevalence of opening protection systems

Residential homes with standing seam metal roofs performed exceptionally well

Roof top solar panels showed remarkable performance with very few instances of damage

High-rise condominium building in Fort Myers, FL

Performance of Roof Covers

Asphalt shingle roofs did not perform well, relatively



Among all residential roof covers, asphalt shingles exhibited poor performance

Performance of Roof Covers

Older clay tile roofs did not perform as well as their newer counterparts



Observations from Claims Ride-Along

Even minor shingle loss can result in total roof cover replacement

- Aesthetic matching requirements
- FBC compliant requirements for repairs
- If more than 2 sections of a roof needed repair, whole roof cover would be replaced
- If ridge tiles or shingles are damaged, it may not be necessary to replace the whole roof cover as these are easily accessible and matching is not too difficult



Evaluation of Newer Buildings Helped Confirm that Building Codes Are Being Followed

There was some observed failure to the roof covering in many instances, even though this was below a design-level event. Most new roofs performed as expected.



Single family home being constructed in Cape Coral, FL

Source: Verisk

Buildings Well Designed for Wind and Elevated for Surge Showed Almost No Damage

Single family home in Bonita
Springs, FL

Source: Verisk



Older Buildings Saw Significant Structural Damage to the Building Envelope

Source: Verisk



Significant damage to gable end frame in a condo community in Fort Myers, FL

Source: Verisk

Older Buildings Saw Significant Structural Damage to the Building Envelope

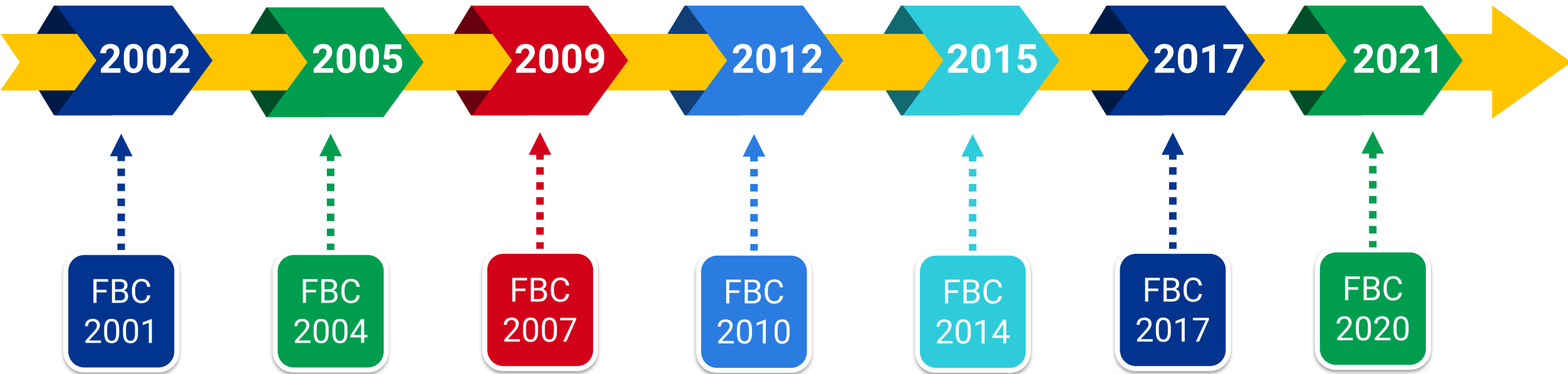
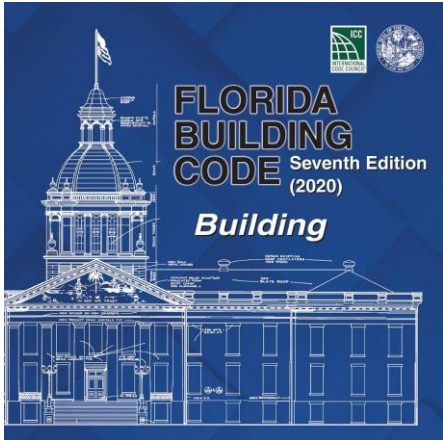


Significant damage to gable end frame in a condo community close to Fort Myers Beach, FL

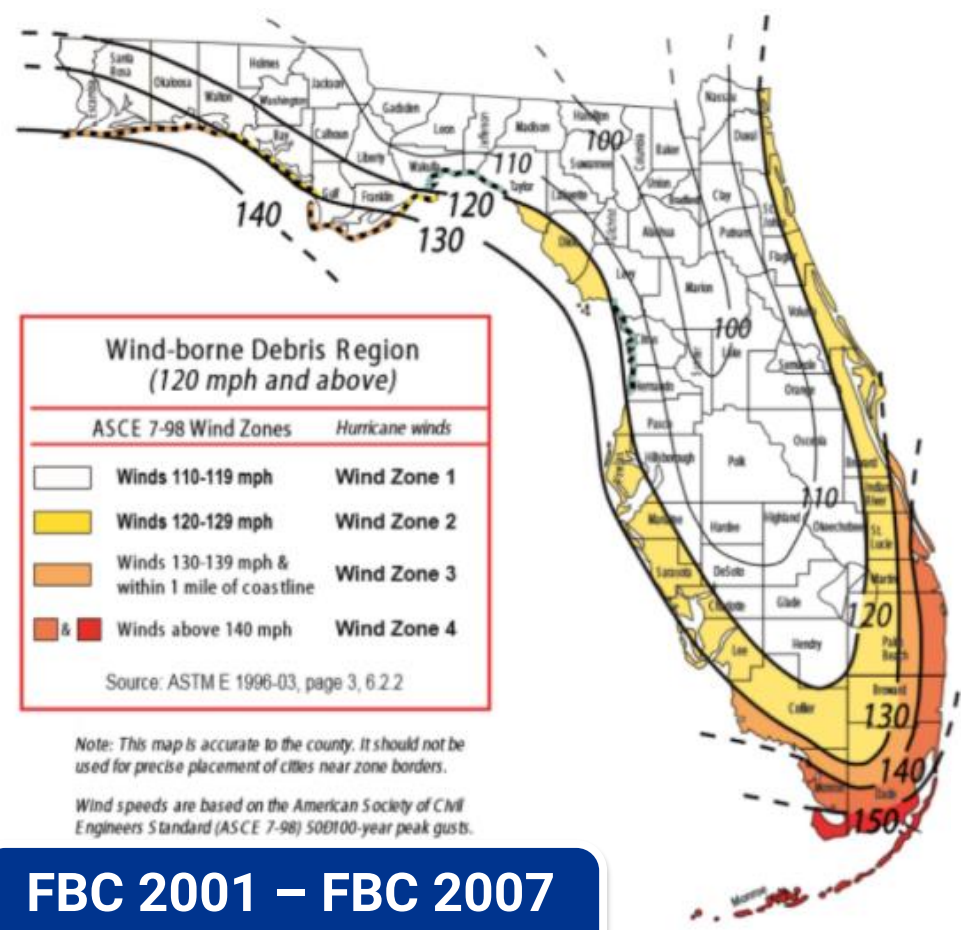
Evolution of the Florida Building Code (FBC)

Design Wind
Speed Maps

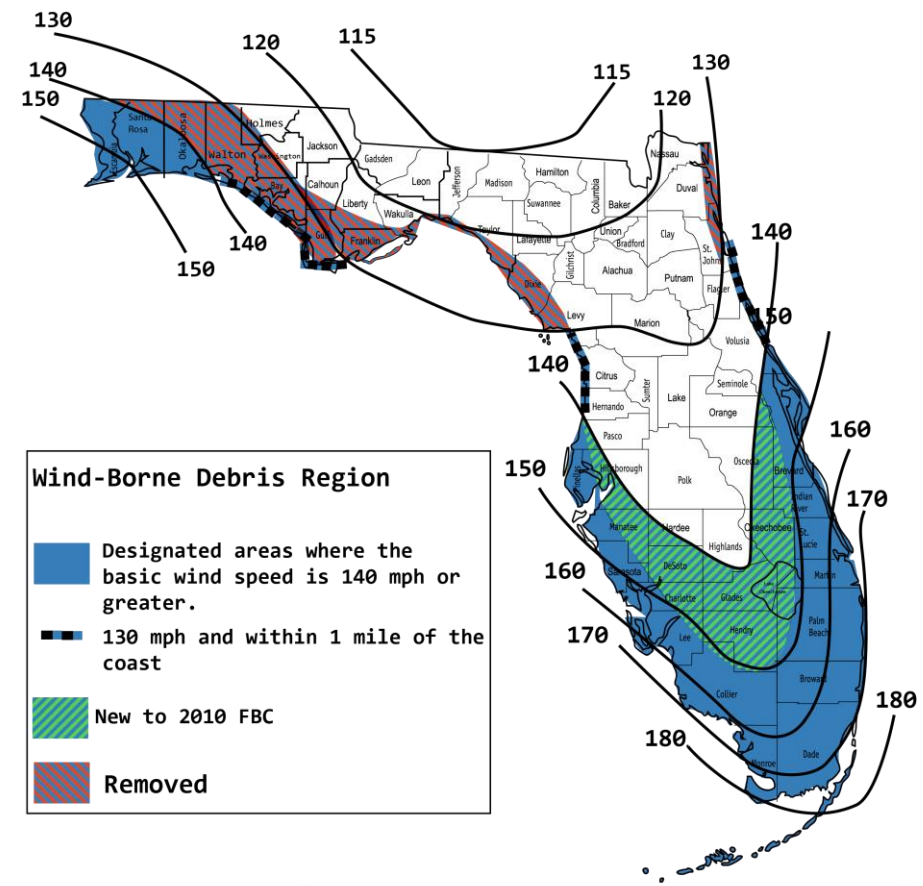
Wind-Borne
Debris Region
(WBDR)



Wind Speeds on Land from Hurricane Ian Were Below the Design Standards



**FBC 2001 – FBC 2007
(2002 – 2011)**



**FBC 2010 – FBC 2020
(Post 2011)**

TABLE 1609.3.1
WIND SPEED CONVERSIONS^{a, b, c}

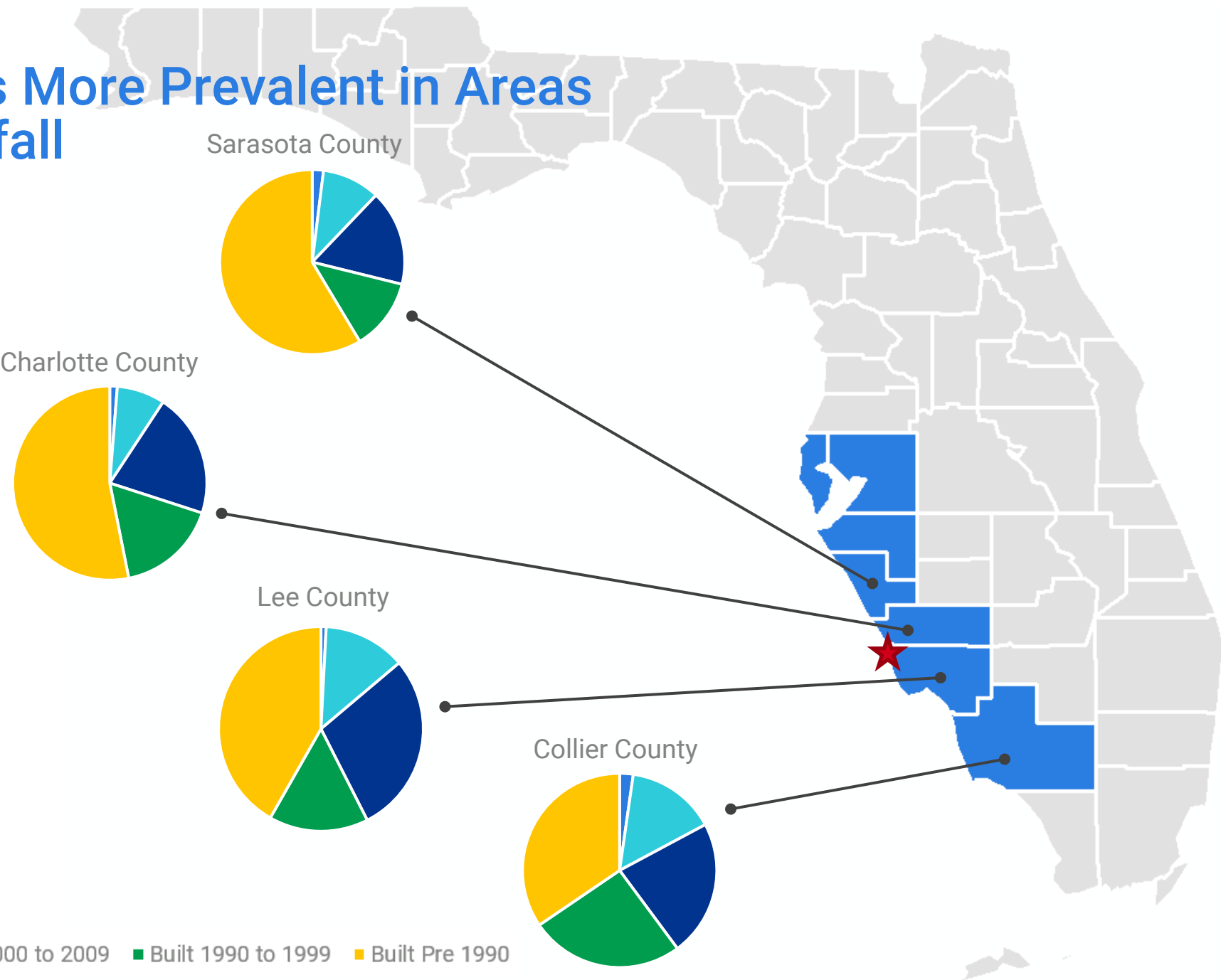
V_{ult}	100	110	120	130	140	150	160	170	180	190	200
V_{asd}	78	85	93	101	108	116	124	132	139	147	155

For SI: 1 mile per hour = 0.44 m/s.

- a. Linear interpolation is permitted.
- b. V_{asd} = nominal design wind speed applicable to methods specified in Exceptions 1 through 5 of Section 1609.1.1.
- c. V_{ult} = ultimate design wind speeds determined from Figure 1609.3(1), 1609.3(2) or 1609.3(3).

Newer Construction Is More Prevalent in Areas Surrounding the Landfall

Year Built Breakdowns by County



In Southwest Florida, the Majority of Roofs Were Built in the Era of the Florida Building Codes

Roof Year Built Breakdowns by County



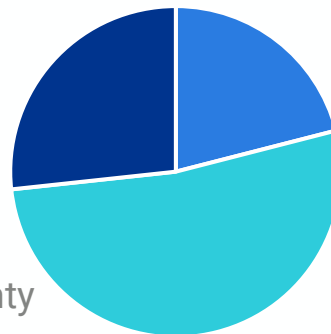
Landfall

■ 2001 and Older

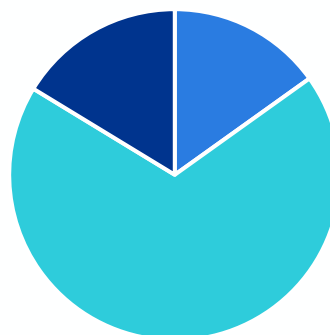
■ 2002-2011

■ 2012 and Newer

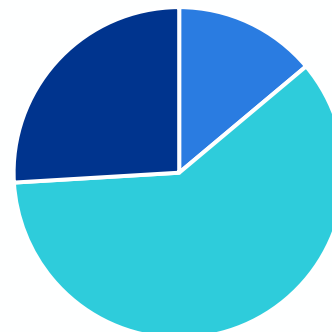
Sarasota County



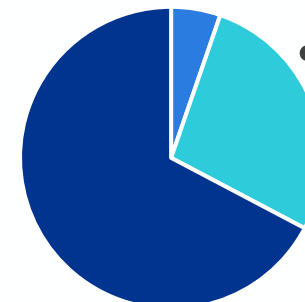
Charlotte County



Lee County



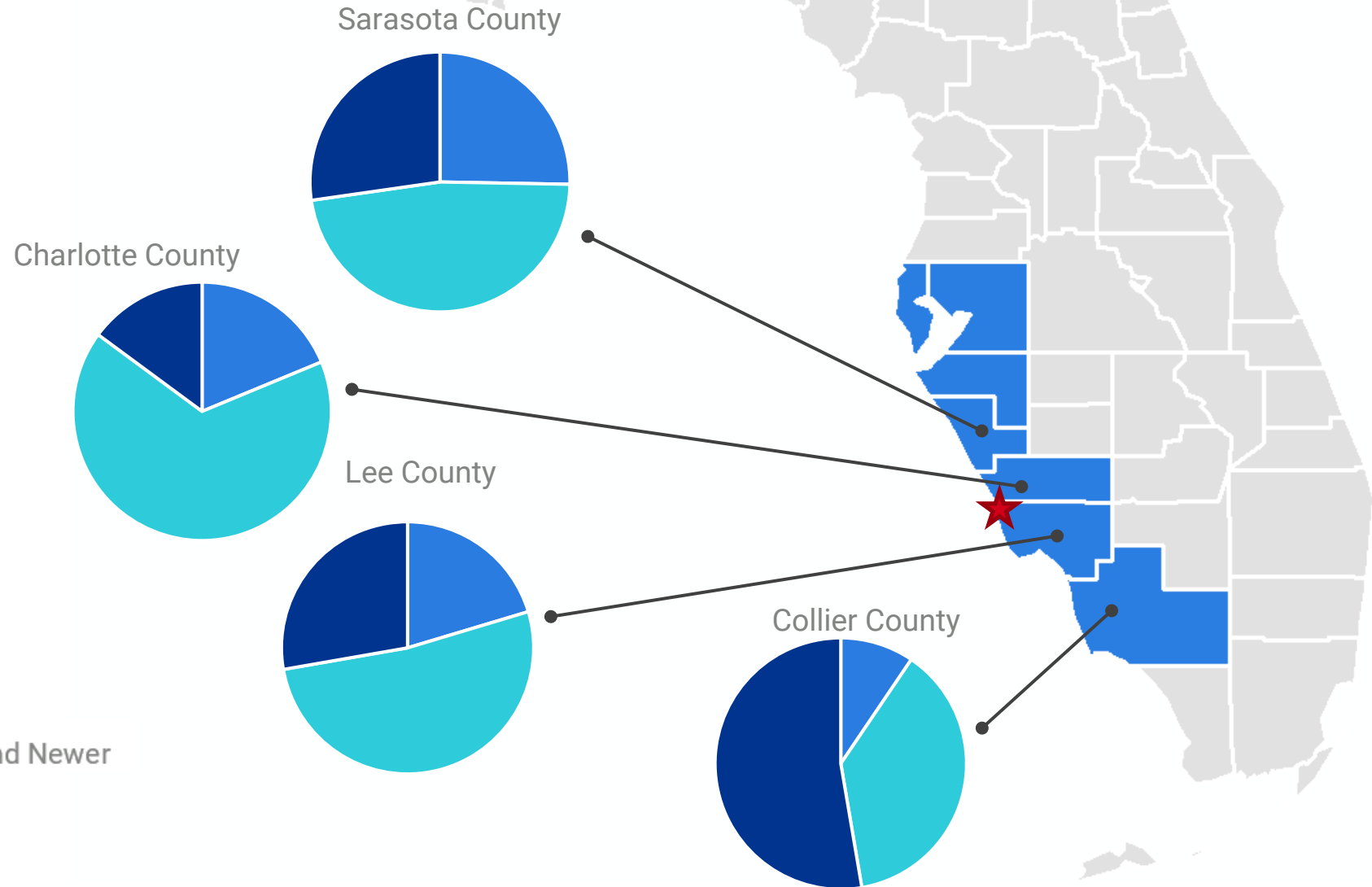
Collier County



In Southwest Florida, the Majority of Roofs on Older Structures Were Built in the Last 20 Years

Roof Year Built
Breakdowns by County
for Structures Built
Before 2000

★ Landfall
■ 2001 and Older ■ 2002-2011 ■ 2012 and Newer



Damage to Screened Enclosures

Early reconnaissance indicated significant damage to screened pool enclosures and appurtenant structures

Other common appurtenant structure damage included carports, boat shed/docks sheds



Screened enclosure damage, Cape Coral, FL

Source: Verisk



Significant Damage Due to Storm Surge in Coastal Areas



Significant surge damage to residential homes in Bonita Springs, FL

Widespread prevalence of slab foundations without much elevation to the buildings



Between 5-7 feet surge high water marks in areas close to the bay



High Value Homes Claims Could Be High

Relatively good wind performance compared to single family homes

- Predominantly clay tile roofs - metal roofs were less common, and asphalt shingle roof covering was rare
- Primary damage to roof cover
- Repair for clay tile roof cover can lead to high losses
- Garage door failures were rare based on observations in the Cape Coral area



Source: Verisk

High value home with clay tile roof damage in Cape Coral, FL

Rooftop Solar Panels Showed Remarkable Performance

Very little evidence of damage to rooftop solar panels



Damage to rooftop solar panel attachment fixed on standing seam metal roof, Port Charlotte, FL

Source: Verisk

Manufactured Homes Saw Significant Damage

Damage was very heavy and typically homogenous in nature



Damage to roofs, wall siding, and breached envelope lead to eventual collapse



Significant damage to attached structures, including carports, further exacerbate damage to the connected home



Presence of significantly deteriorated tie downs

Manufactured Homes Saw Significant Damage

Widespread presence of opening protection and fully tied down anchorage



Good construction practices in
manufactured home park in Fort Myers, FL

Performance of Commercial Buildings

Wide variety of performance across various occupancy types



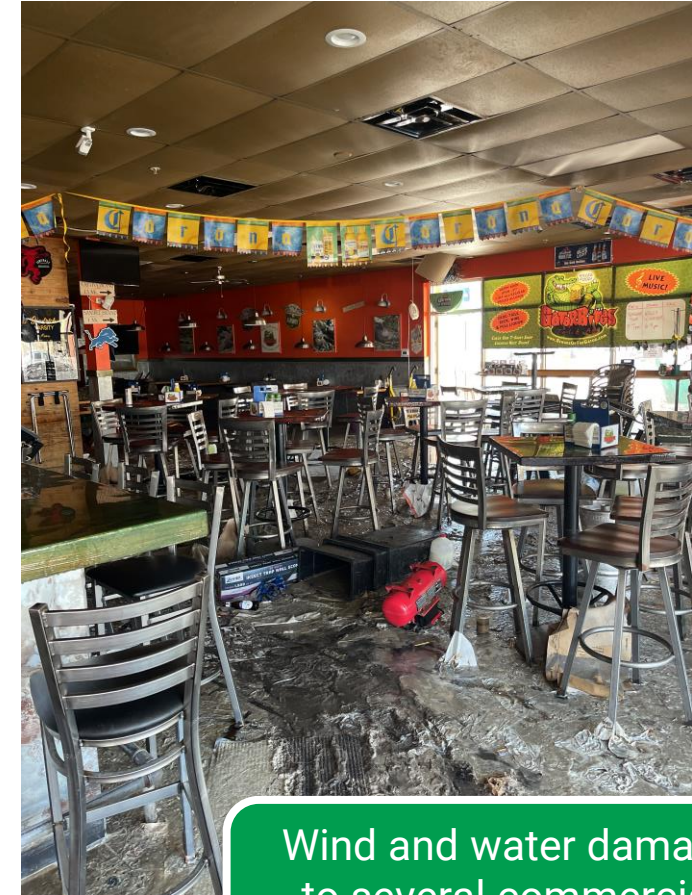
Surge damage to coastal properties in Vanderbilt Beach, FL



Wind damage to soffits, flashing in a high-end hotel in Cape Coral, FL



Major structural roof damage to buildings in a golf course in Fort Myers, FL



Wind and water damage to several commercial plazas in Fort Myers, FL

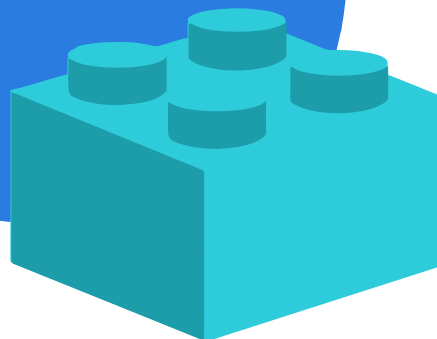
Automobiles Saw Significant Damage from Hurricane Ian's Storm Surge



Where Do We Go from Here?

Review Field Information

- Damage surveys with other agencies
- Claims ride along



Claims Studies

- Verisk claims
- Insurance industry claims
- PCS



Webinar:

2022 U.S. Hurricane Season Review

Tuesday, December 13, 2022
11:00am – 12:00pm ET

Jeff Strong, PhD, Scientist
Tim Johnson, PhD, Senior Engineer

Registration Opening Soon

