

# Flood Reduction Lessons Learned after Major Disasters: Mitigation Project Performance Post-Harvey and Irma

Karen Helbrecht, FEMA Headquarters  
Lawrence Frank, Atkins North America

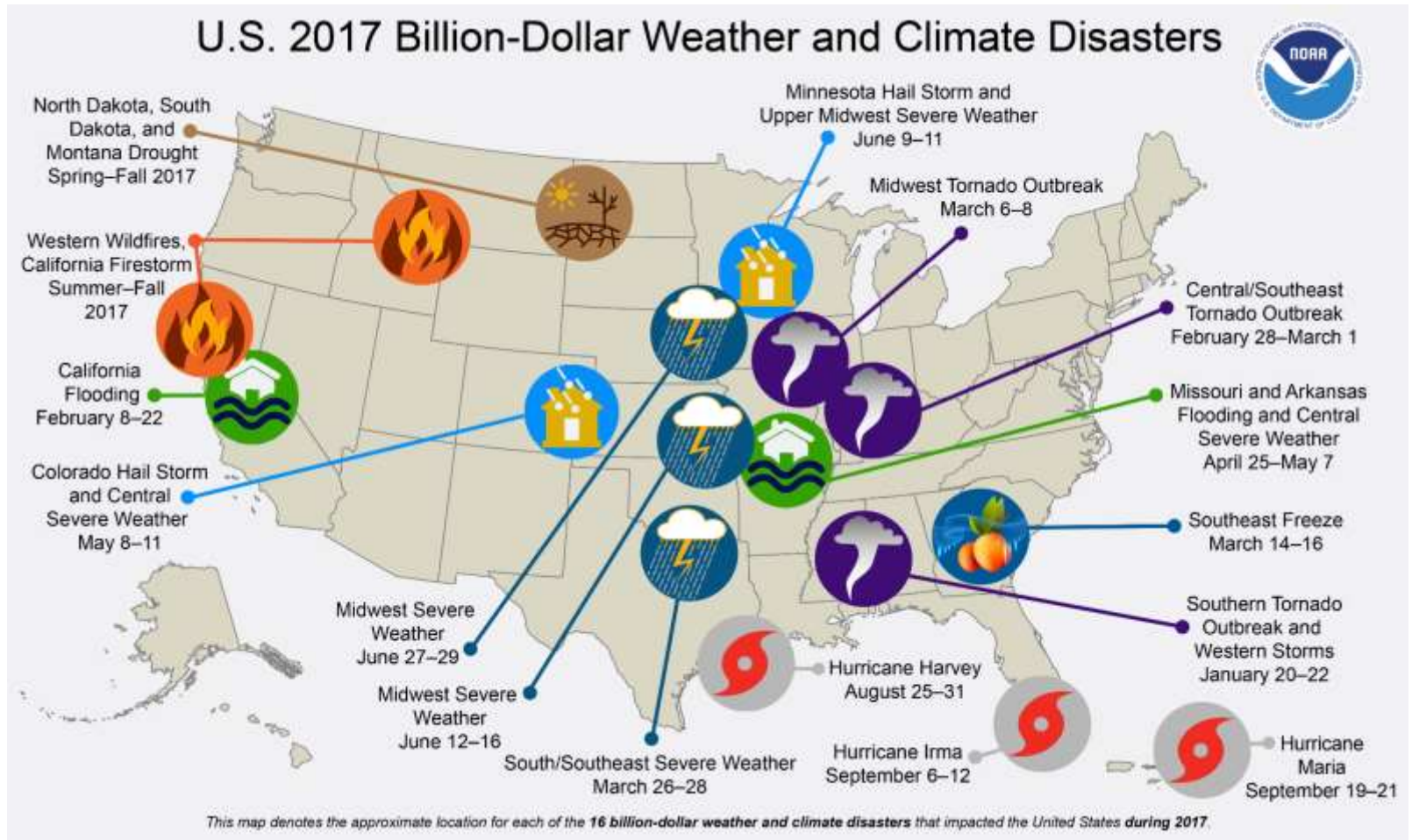


**FEMA**

June 20, 2018

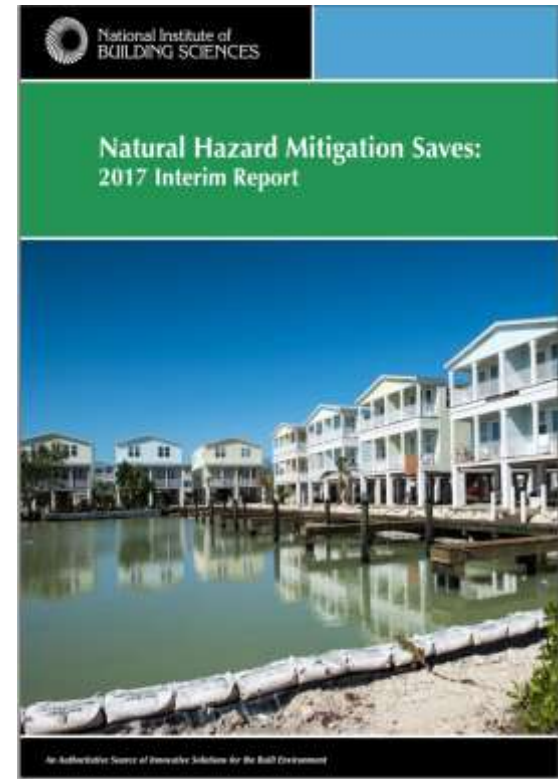
**ATKINS**

# What a year!



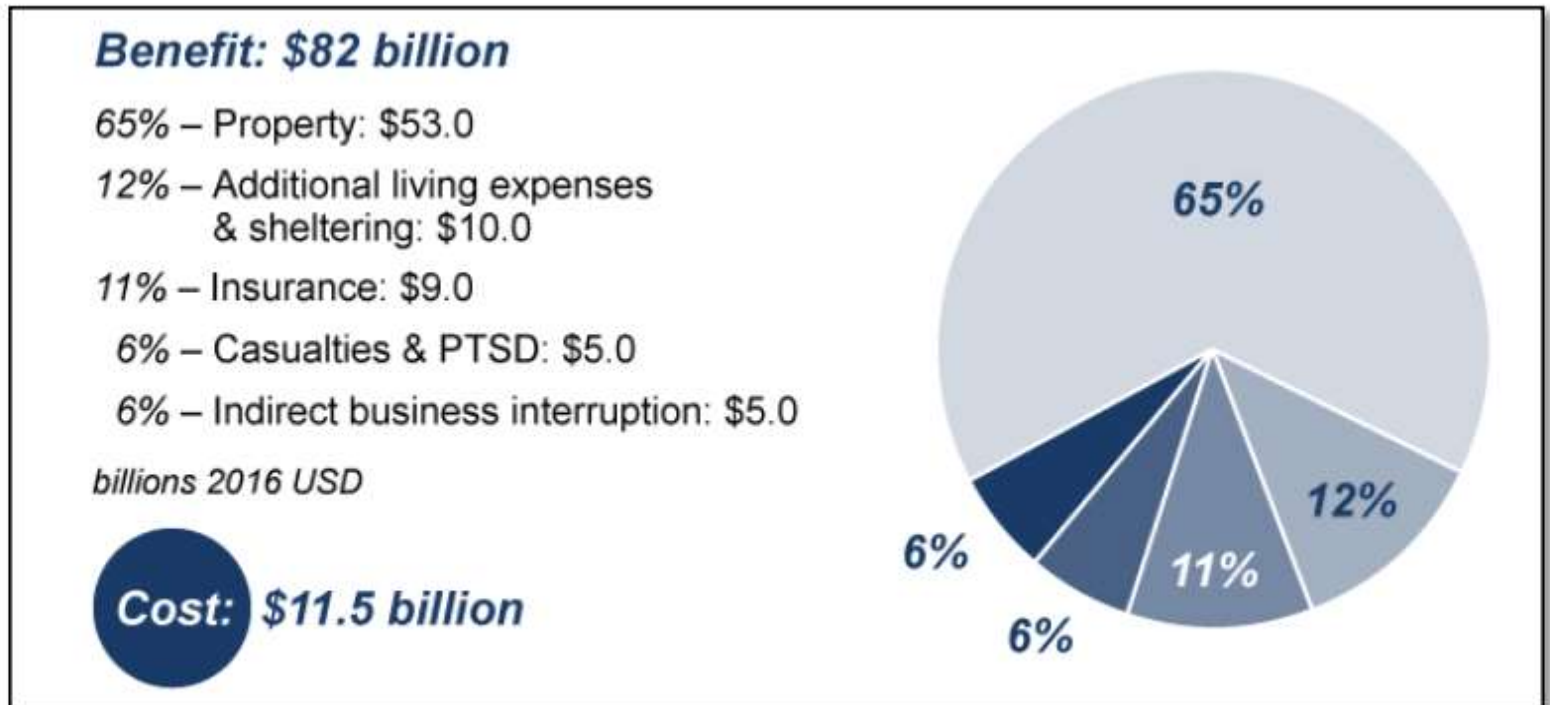
# Mitigation Saves 2.0

- The Institute's MMC updated and expand upon the *2005 Mitigation Saves* study on the value of mitigation
- **Federal grants:** Reviewed 23 years of federal mitigation grants provided by FEMA, the Economic Development Administration (EDA), and HUD
  - National benefit of \$6 for every \$1 invested
- **Beyond code requirements:** Cost/benefits of designing new construction to exceed select provisions in the 2015 IBC, the 2015 IRC, and implementation of the 2015 International Wildland-Urban Interface Code
  - National benefit of \$4 for every \$1 invested



# Mitigation Saves 2.0

## FLOOD MITIGATION GRANTS



**Figure 2-16.** Contribution to benefit from federally funded riverine flood grants.

# Texas

High Water Mark Comparison Between Tropical Storm Allison (6/9/01) and Hurricane Harvey (8/27/17) - estimated HWMs

| Location                            | Allison HWM | Harvey HWM |
|-------------------------------------|-------------|------------|
| Interstate 45 / Clear Creek         | 10.7        | 16.6       |
| Interstate 45 / Sims Bayou          | 20.5        | 22.1       |
| Rice Boulevard / Bray's Bayou       | 50.4        | 54.1       |
| N. Shepherd / White Oak Bayou       | 49.0        | 51.3       |
| NASA Road #1 / Armand Bayou         | 4.7         | 8.3        |
| Bay Area Boulevard / Horsepen Bayou | 14.6        | 15.7       |
| Spencer Highway / Big Island Slough | 18.5        | 17.3       |
| Astoria / Turkey Creek              | 29.0        | 32.2       |

Source: Harris County Flood Control District website; above 1988 NAVD; 2001 ADJ

# Texas

- **Harris County Flood Control District** (from website)
- ***Sims Bayou Federal Project with Local Stormwater Detention*** –70 properties sustained damage during Harvey as opposed to more than 6,570 being damaged
- ***Brays Bayou Project Bray Channel improvements and stormwater detention basins*** – 10,000 properties not damaged
- ***White Oak Bayou Flood Mitigation projects*** – reduced damages to an estimated 5,500 structures.
- ***Harris County buyouts*** - 2,076 homes acquired via HCFD's Flood Control District's home buyout program across Harris County would have flooded during Harvey.

# Texas Success Stories

## League City Elevations



A parking space and patio was created underneath the home as a result of the elevation project. Photo courtesy of Mary Sullivan



Mary Sullivan took a photo of the house from the rescue boat as they were leaving the property on the day of the flood.

# Texas Success Stories

## Creek Expansion Directs Flood Water to Detention Pond; Spares Homes



Lone Tree Creek Channel near StockBauer Drive after the 2005 expansion project.  
Photo by: Joyce Price/FEMA



A new park associated with the detention facility project that was completed in 2005.  
Photo: Joyce Price/FEMA



# Texas Success Stories

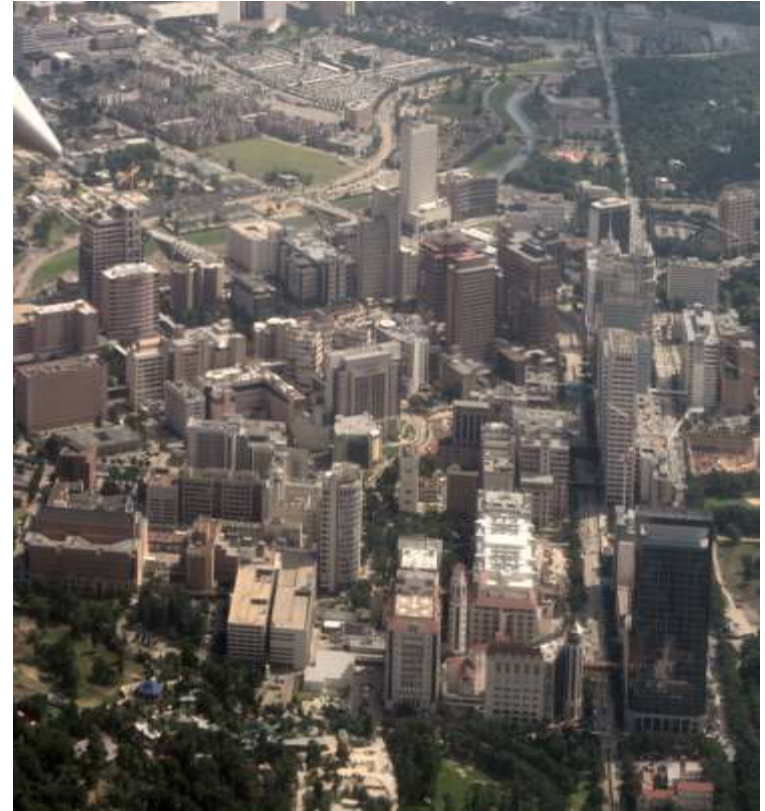
## **Sand Dune Restoration Protects Coastal Communities**



Work to restore sand dunes on the beaches of McFaddin National Wildlife Refuge helps protect nearby marshes from saltwater intrusion and other effects of major storms. Photo by U.S. Fish and Wildlife Service.

# Texas Medical Center After Harvey

- Five success factors made bracing the storm, and returning to business as usual afterward, possible:
  - Disaster infrastructure,
  - Resilient culture,
  - Technological developments enabling constant communication,
  - Operations and preparedness of staff,
  - Care coordination



# Texas Decisions Post-Harvey



Example of an elevated house

**In April 2018, the City Council in Houston, Texas approved a regulation requiring all new and redeveloped structures to be built two feet above the 500-year floodplain,\* replacing the former code of building one foot above the 100-year floodplain.**



# Texas Decisions Post-Harvey

**40%**  
damaged

This decision followed a recent Houston Public Works' report recounting that Hurricane Harvey damaged nearly 40% of homes in the 100-year floodplain despite them being built to code.

**84%**  
saved

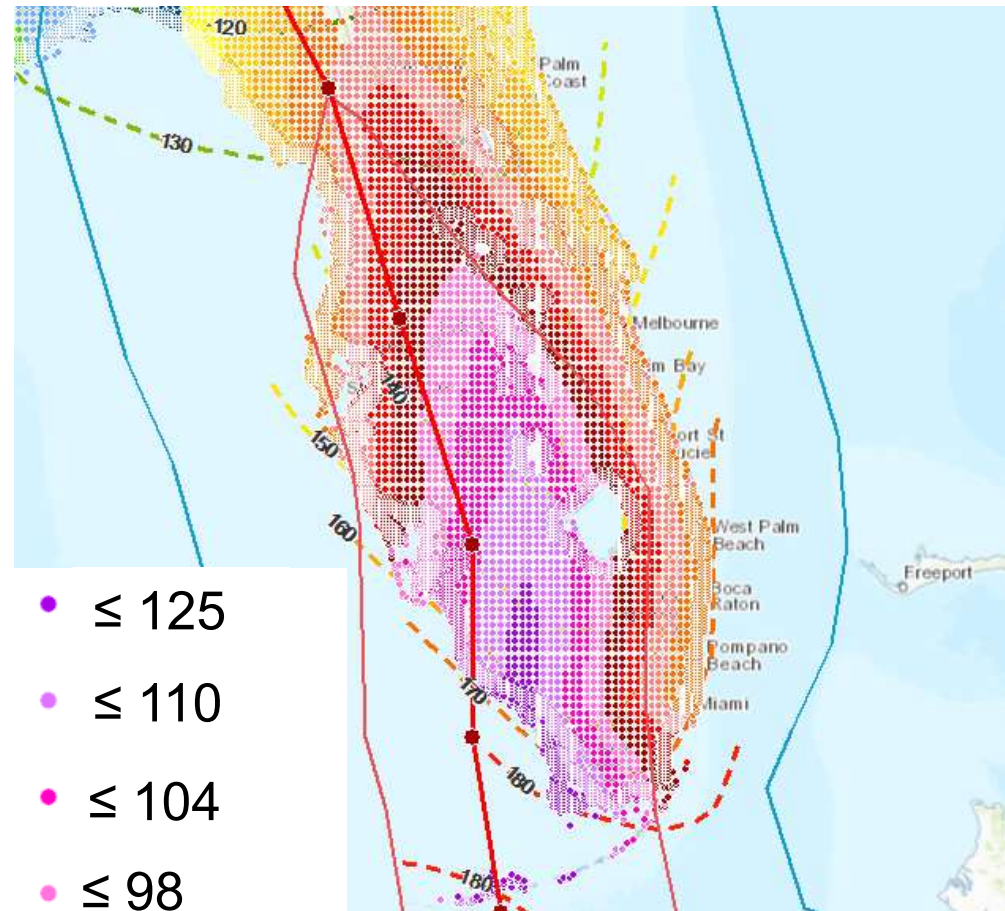
The report estimates that 84% of those homes would have been spared if the recently implemented building code had been in place.

expected savings  
**\$50K**  
per house

By increasing code standards, each newly developed or redeveloped home has the potential to save upwards of \$50,000 in rebuilding costs and prevent significant health impacts caused by potential flooding.

# Florida - Irma

- Eye in Keys (≈MM 19.5) Sunday Sep 10 at 9AM EDT (130 mph-Cat 4, 928mb, NNW at 8 mph)
- Eye just east of Marco Island Sunday Sep 10 at 3:30PM EDT (115 mph-Cat 3, 940mb, N at 12mph)
- Reduced to Tropical Depression Monday Sep 11 at 11 PM EDT over Columbus, GA



- ≤ 125
- ≤ 110
- ≤ 104
- ≤ 98
- ≤ 93
- ≤ 88

# Florida Loss Avoidance Study

## Oakland Park Stormwater Project



**The wetland area, inhabited by native plants, helps with flood control by temporarily storing and slowly releasing storm water. *Photo by: Bonnie Hanchett***

# Florida Loss Avoidance Study

## Hallandale Beach Drainage Project



**Pump station withdraws storm water from culvert and discharges to wells. Photo courtesy of Florida Division of Emergency Management**

# Florida Loss Avoidance Study

## Protecting Historic Resources



**The high-impact glass canopy/skylight covering Vizcaya's Courtyard protects its culturally and historically significant collections. *Photo by: Bonnie Hanchett***



# Florida Loss Avoidance Study

**The Sloth is Safe!!** –  
protecting Daytona  
Beach's Museum of Arts  
and Sciences



**The remains of the pre-historic giant sloth, MOAS' famous exhibit, is no longer threatened by flood because of the elevation/reconstruction project. Photo by: Bonnie Hanchett/FEMA**

# Florida Loss Avoidance Study

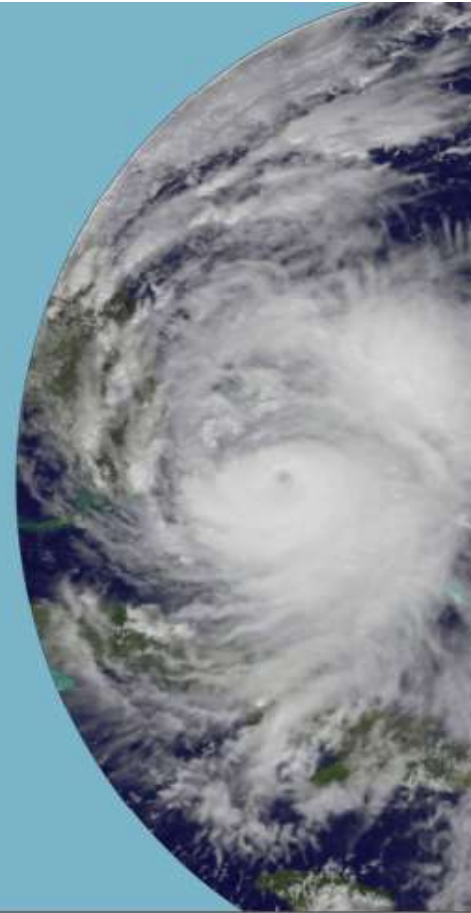
## Loss Avoidance Assessment

## Hurricane Matthew (DR-4283)

April 2017

Florida Division of Emergency Management  
2555 Shumard Oak Boulevard  
Tallahassee, FL 32399-2100  
<http://www.floridadisaster.org>

Rick Scott, Governor  
Bryan Koon, Director  
Miles Anderson, State Hazard Mitigation Officer



# Actions for Floodplain Administrations

Comprised of six actions to guide floodplain administrators during recovery and help their communities be more resilient:

- Communicate with Elected Officials and Administrators
- Assessing Disaster Needs and How to Request Assistance (EMAC & SMAA)
- Capturing High Water Marks
- Make Substantial Damage Determinations
- Understand NFIP Claims and Increased Cost of Compliance
- Identify Post-Disaster Mitigation Funding Assistance



# Actions for Floodplain Administrations

- Based on the questions and technical assistance the State repeatedly provided to FPAs during hurricanes the year before
- Action-oriented – each “chapter” is an action in a time sequence
- Our goal with the Toolkit is to update it and disseminate it electronically at the beginning of each hurricane season so that the live links in the manual can be accessed.
- Toolkit provide needed information at each step

## KEY MESSAGES:

|   |  |
|---|--|
| 1 | Elected officials and community managers should understand the need for accessing and inspecting properties that have been identified as “destroyed” or having “major damage” to document whether the buildings were substantially damaged. Explain what “Substantial Damage” means and the requirements for substantially damaged structures to be brought into compliance. Use Florida Floodplain Management Quick Guide, BASF Fact Sheet and FEMA guidance documents. |
| 2 | Property owners in flood zones must be advised of the need to inspect damaged buildings (sample letter follows). Communities must make preliminary substantial damage determinations using the Substantial Damage Estimator program or a similar structured approach to assess and record damage.  |
| 3 | Property owners must be reminded that permits are required to make repairs, especially following determinations of substantial damage.<br><br>**Note: Communities may elect to waive permit fees, but must not waive requirements to obtain permits and comply with the Florida Building Code.   |
| 4 | Property owners must be informed when a preliminary determination of substantial damages is made and what it means to bring substantially damaged buildings into compliance with the requirements in local flood damage prevention ordinances and the Florida Building Code. Templates for letters and notices to property owners follow.  |

# Discussion & Questions?

## Thank You!

Karen Helbrecht  
Grants Implementation Branch Chief  
karen.helbrecht@fema.dhs.gov

Lawrence Frank, Atkins North America  
Land Planning Technical Practice Lead  
lawrence.frank@atkinsglobal.com