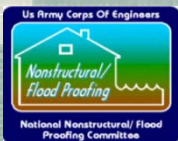


# Big Weather – How Will Hurricane Harvey & Maria & Irma Redefine Our Approach to Flooding

## Current Trends in Nonstructural Flood Risk Adaptive Measures

**Randall L. Behm P.E., CFM**  
Chair, National Nonstructural Committee  
US Army Corps of Engineers

October 2017



US Army Corps of Engineers  
**BUILDING STRONG®**



## Consequences Associated with Flooding

- Loss of Life
- Property Damage (Structure and Content)
- Emergency Response Costs
- Business Losses (Customers)
- Health (Medical)
- Compounded Disasters (Flood, Fire, Hazardous Material)



Grand Forks, ND

# Is this the new Normal?

Property Damages of \$10.2 Billion Annually from 1985-2016

(Hurricane Harvey??? Hurricane Irma???)



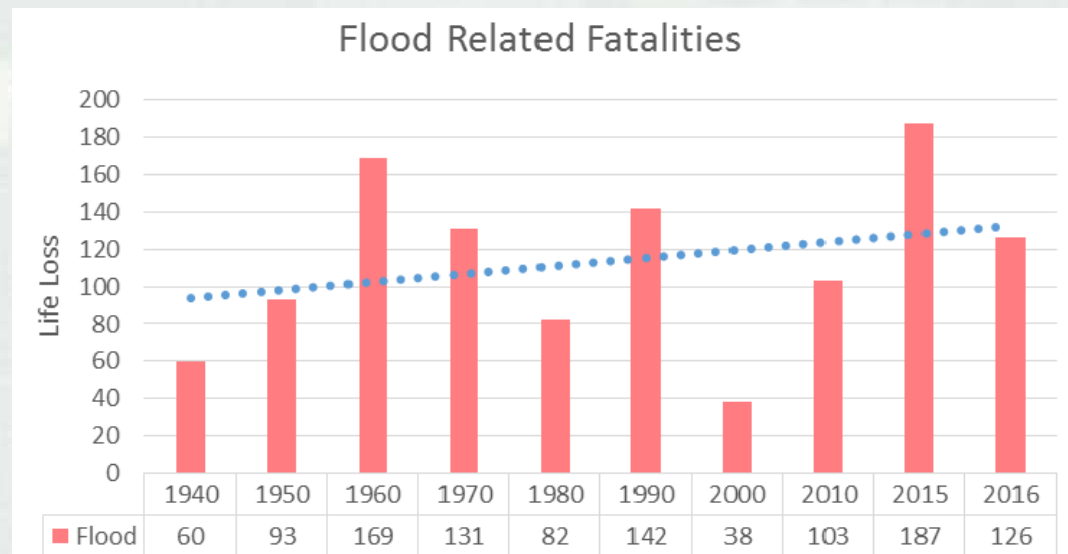
Hurricane Sandy



Hurricane Harvey



Louisiana Flooding



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# Nonstructural Flood Risk Adaptive Measures

Nonstructural Flood Risk Adaptive Measures reduce flood risk by modifying the physical features of buildings that are vulnerable to flooding or by modifying the behavior of people living in or near floodplains. In general, these measures do not modify the natural characteristics of floods (stage, velocity, duration) nor do they induce development in a floodplain that is inconsistent with reducing flood risk.

$$\text{Flood Risk} = f [(\text{Probability of Flooding}) \times (\text{Consequences})]$$

The **Probability of Flooding** is the frequency/occurrence of flooding in a particular location. Reduce the frequency of flooding (levee or dam) and flood risk is reduced.

**Consequences** are the potential damages and life loss associated with flooding. The structures (critical, residential, commercial, public, and industrial) and infrastructure (highways, roads, rail, utilities) make up the potentially damageable assets. Reduce the consequences and flood risk is reduced.

Note: If critical facilities become inoperable due to flooding, the area of impact extends beyond the area of flooding (hospitals, fire and rescue, utilities).



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# Nonstructural Flood Risk Adaptive Measures

The most common physical flood proofing measures implemented for flood damage reduction are considered to be:

Acquisition

Relocation

Elevation

Dry Flood Proofing

Wet Flood Proofing

Basement Removal/Utility Addition

Nonphysical flood proofing measures for life loss reduction are :

Floodplain Mapping

Building Codes

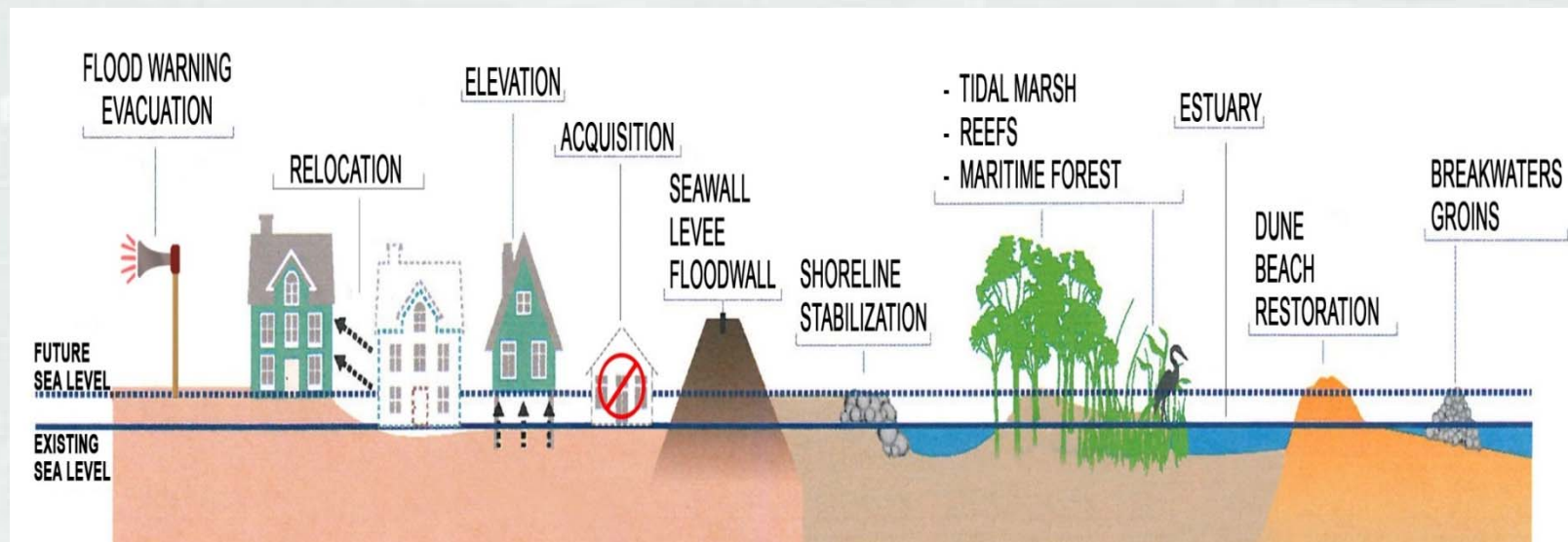
Flood Insurance

Zoning

Evacuation Plans

Flood Warning

Emergency Preparedness Plans



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**Thank You**



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