

# Potential Flooding from ARkStorm

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## BIOGRAPHICAL SKETCH

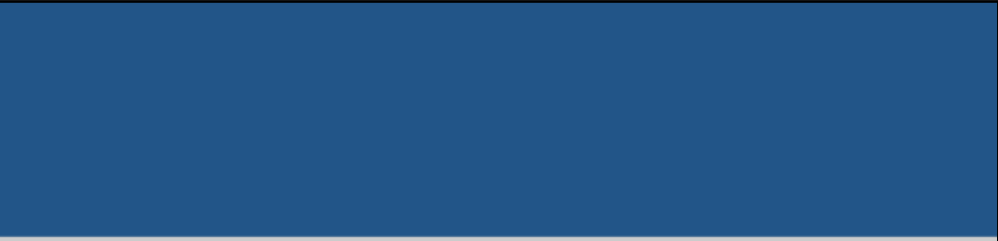
For over five years, Kathy, a licensed Professional Engineer (P.E.) in the state of California and a Certified Floodplain Manager (CFM), has served as Engineer/Program Specialist for the Map Modernization (Map Mod) Program both in Region IX and as an employee of the Regional Management Center (RMC) with Baker, Corp. As Regional Engineer with FEMA Region IX, Kathy oversees development and preparation of FEMA flood mapping products.

She has earned a master's degree in Chemical Engineering from the University of VA – Charlottesville and a bachelor's degree in Civil Engineering from the University of NE – Lincoln. Ms. Schaefer is recognized as a leader in FEMA's Map Mod implementation and program delivery.

## ABSTRACT

A state-of-the-art meteorological model was created by the ARkStorm atmospheric team to estimate pressures, wind speeds, temperatures, and precipitation time series in nested grid with resolution up to 2 km. The wind speed time series are being used directly for ARkStorm damage modeling, but it was impractical to input the precipitation time series into a statewide hydrological and hydraulic model to produce flood maps. Instead, ARkStorm is using FEMA's digital Flood Insurance Rate Maps, and the associated National Flood Hazard Layer, as a representation of areas vulnerable to flooding under the ARkStorm scenario.

As a part of the Map Modernization Program, FEMA created a seamless, digital National Flood Hazard Layer. Building on the success of Map Modernization, FEMA is transitioning to a new program entitled RiskMAP. Risk MAP's vision is to collaborate with State, local, tribal entities to deliver quality flood hazard data that increases public awareness and leads to mitigation actions that reduce risks to life and property. An overview of how the seamless National Flood Hazard Layer was used to support the goals of both Risk MAP and ARkStorm, in this innovative pilot project, will be presented.



**FEMA**

**California Extreme Precipitation  
Symposium**



**FEMA**

- **Federal Emergency Management Agency (FEMA)**
  - Kathy Schaefer,  
FEMA Region IX Engineer

# Denial

Flood Map  
Modernization

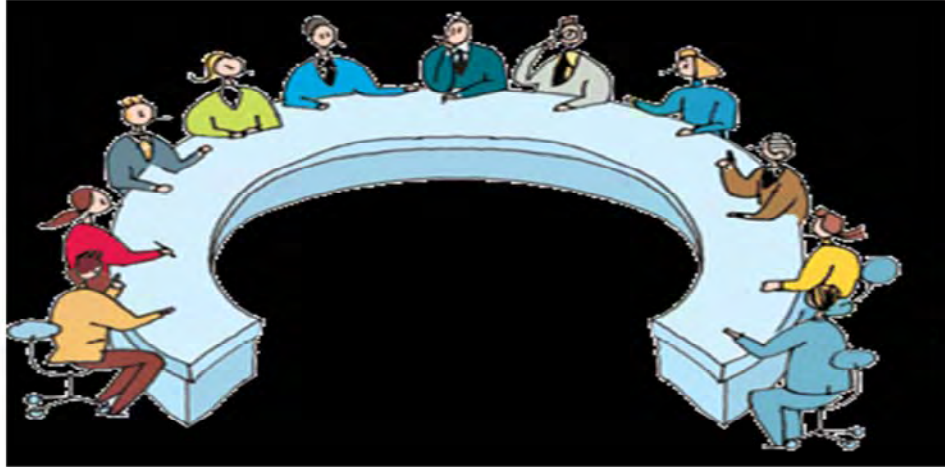


FEMA Map Changes follow the five stages of grief.

Stage 1 – My house has never flooded. Our levees are safe.

# Negotiation

Flood Map  
Modernization



Step 3 – Can't we delay the map? Can't we change the boundary?

# Negotiation

Flood Map  
Modernization



Sometimes the negotiation looks like this.

# Negotiation

Flood Map  
Modernization



Sometimes, from the perspective of the locals, the negotiation process looks like this.

# Depression

Flood Map  
Modernization



Step 4 – How do we live with his for the long time.

# Acceptance

Flood Map  
Modernization



Step 5– Ultimately we get to the is what it is step.

# Why is this process so painful? So confrontational?



Why is this process so confrontational?

The key to answering this question can be found in the hard wiring of our brains.

# Risk Brain Defect

Flood Map  
Modernization

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As human beings, we have a brain defect when it comes to understanding risk.

# Risk Brain Defect

Flood Map  
Modernization

## Odds of Winning

Match	Prize	Odds
○○○○○ + 	JACKPOT	1:1,359,288
○○○○○	\$5,000	1:90,619
○○○○ + 	\$500	1:10,456
○○○○	\$20	1:697
○○○ + 	\$5	1:418
○○○	\$2	1:28
	\$1	1:8

Overall odds of winning are approximately 1:6



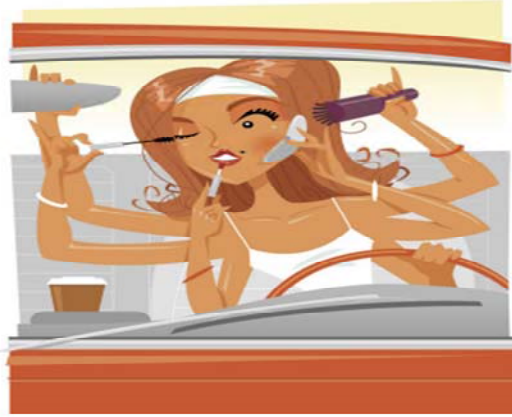
First we are hard wired to believe that if something good is going to happen, it will happen to me. If something bad is going to happen, it will happen to you. It is the brain defect that allows us to believe that if we purchase a lotto ticket, *we* will be the million to one winner.

In terms of flood maps it becomes:

“Your house may flood, but mine will not.”

# Risk Homeostasis

Flood Map  
Modernization



Secondly, if we are exposed to a risk every day, we eventually fail to see it as a risk.

# Risk Homeostasis

Flood Map  
Modernization



If we drive over this road every day, it is unimaginable that the levee below it could fail and that a major flood event could occur.

## Status Quo Bias

Flood Map  
Modernization



We also suffer from a status quo bias. If I get you to sign up for a free magazine subscription, I know you won't cancel when the bill comes due, because you have a status quo bias. Hundreds of studies confirm that humans suffer from status quo bias – inertia. A new map forces home owners to purchase flood insurance. It forces them to have to overcome the do nothing alternative.

# Tragedy of the Commons

Flood Map  
Modernization



In addition to brain defects, we have economics working against us. Just as it is economically advantageous for every sheep herder, sharing a common pasture, to graze as many sheep as possible, even to the point of overgrazing, it is economically advantageous for a community to ignore its flood risk and rely on federal disaster dollars. We recently explored the concept of tying effective proactive mitigation measures to a community's bond rating. What we found is that bond holders liked flood events because it brought federal disaster dollars into the community.

The flood disaster that wiped out downtown Nashville two months ago caused an estimated \$1.9 billion in damages. Did your community experience the loss? You may not have even known Nashville flooded.

Yet at the same time, if new maps increase the size of the Special Flood Hazard Area and increase the number of homes that are required to purchase high risk flood insurance, it takes tangible dollars from the community.

# Superman will save us

Flood Map  
Modernization



We think if something bad happens, superman will be there to save us. But he won't.

# How can we overcome these brain defects?

## With Nudges

Flood Map  
Modernization



We can start early with nudges.

How much should you worry about your flood risk? How much care should you take in minimizing your flood risk?

In answering this type of question, most people use what is called the availability heuristic. They assess the likelihood of risks by asking how readily examples come to mind. If people can easily think of relevant examples, they are far more likely to be frightened and concerned than if they cannot.

This is why, as a FEMA engineer, I am such a huge fan of the ArkStorm Project.

# Denial

Flood Map  
Modernization



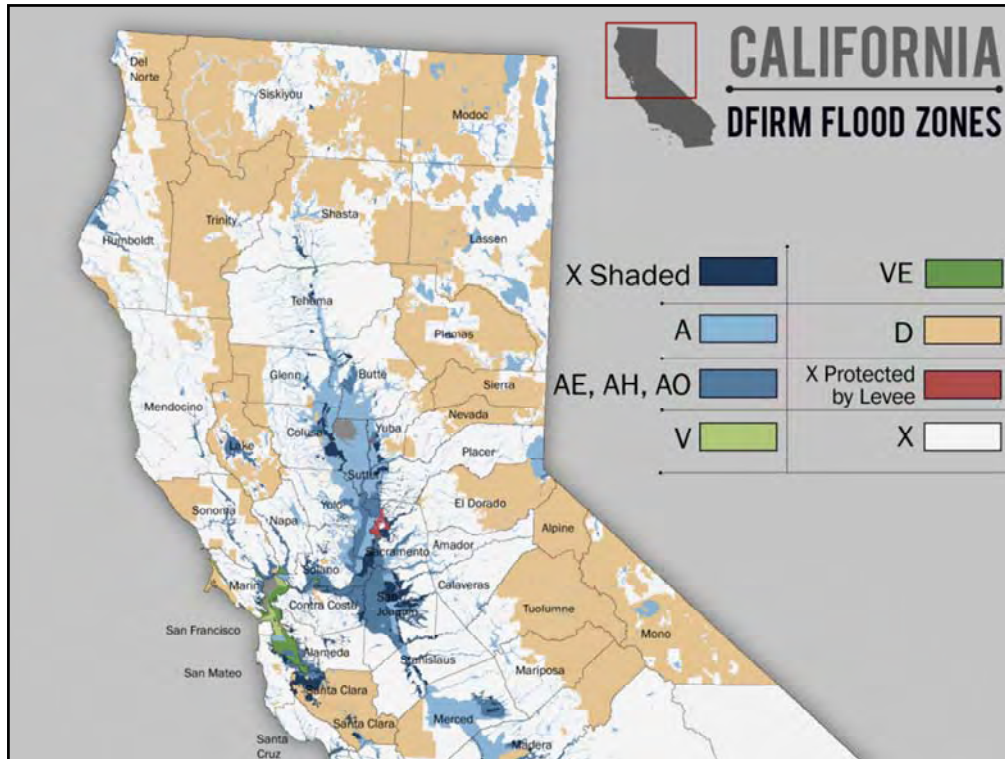
I believe that when the public truly believes that the “Risk is Real” then when FEMA produces a new map, they will move quickly past denial.

## Go Angry Early

Flood Map  
Modernization



Stage 2 – How dare you map me into a high flood hazard area.

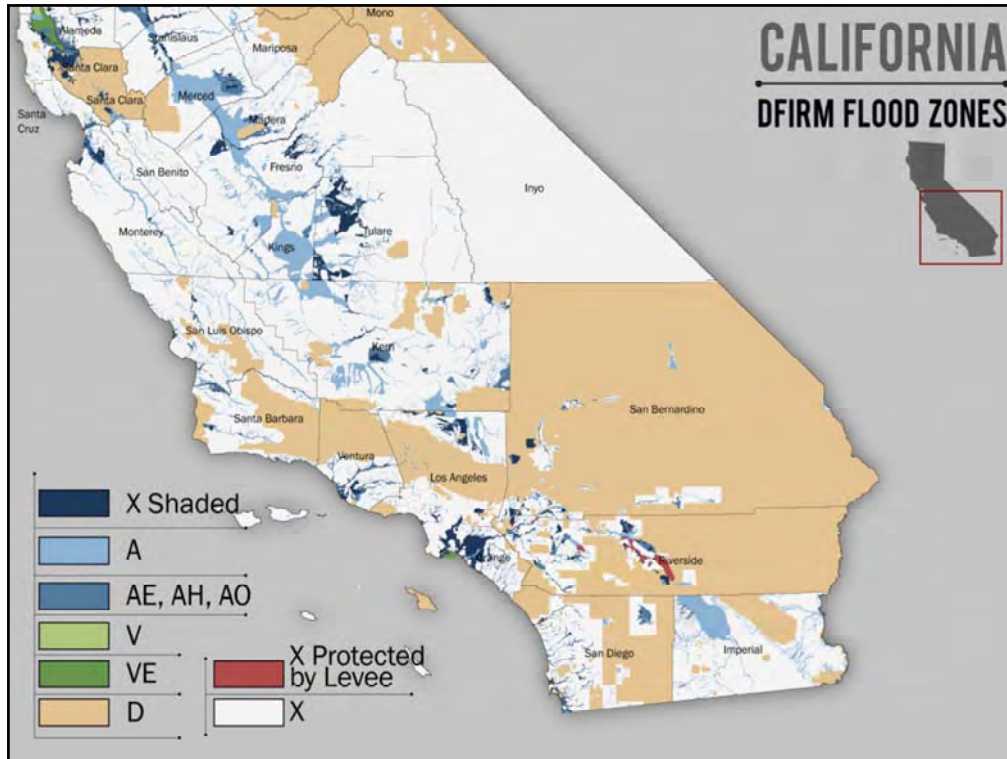


Thanks to the efforts of MapMod, we now have a seamless flood hazard layer. We can use tools like Google Earth to see the full extent of the potential flood hazard areas.

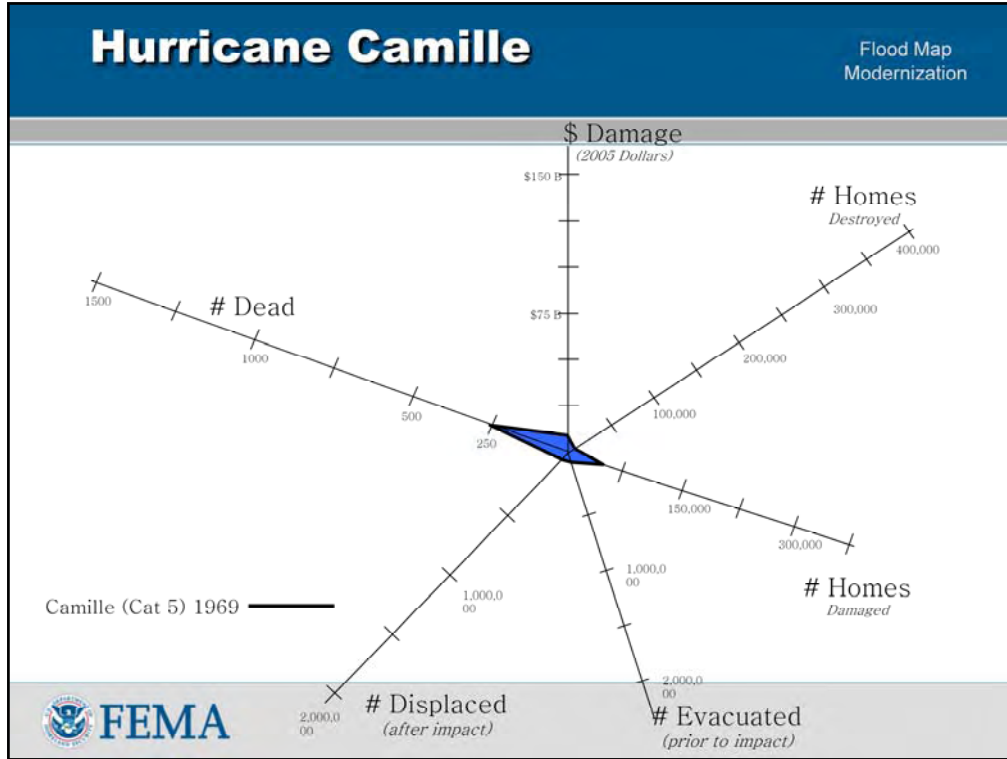
This information was used to help build the ARKstorm Scenario.

There was a lot of internal debate about how extensive the flooding could actually be. Healthy debate that I hope continues.

Discussion of how this was used to create the ARK Storm Scenario will be presented here.

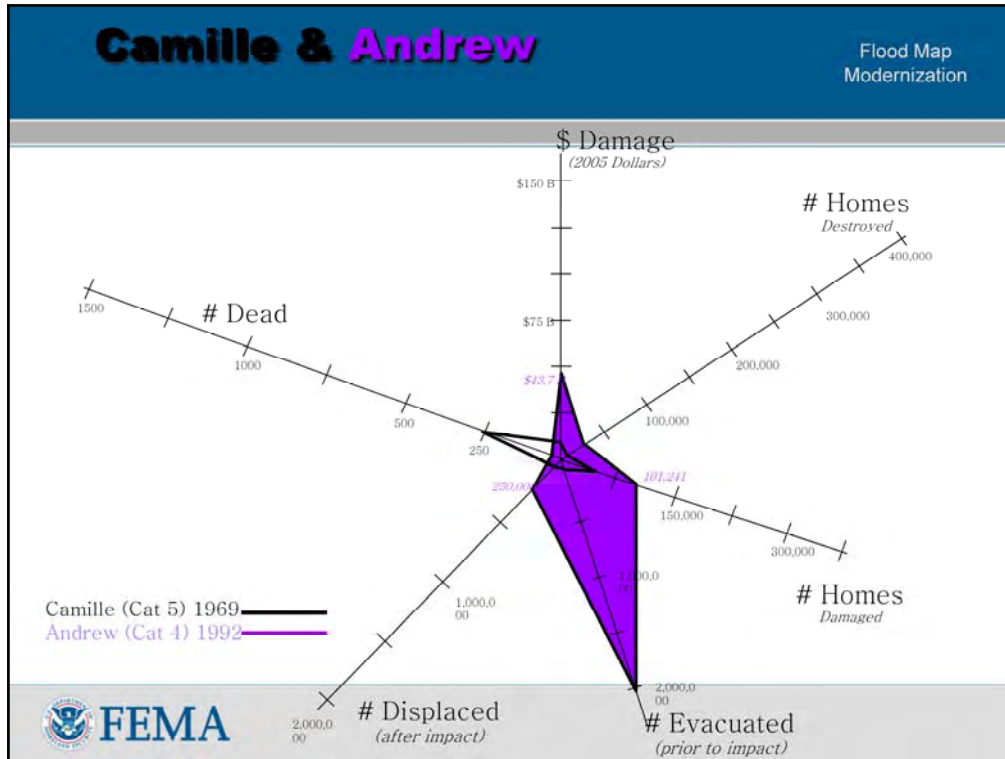






My Thanks To Jim Joseph the Director of The Pennsylvania Emergency Management Agency For These DOD Slides.

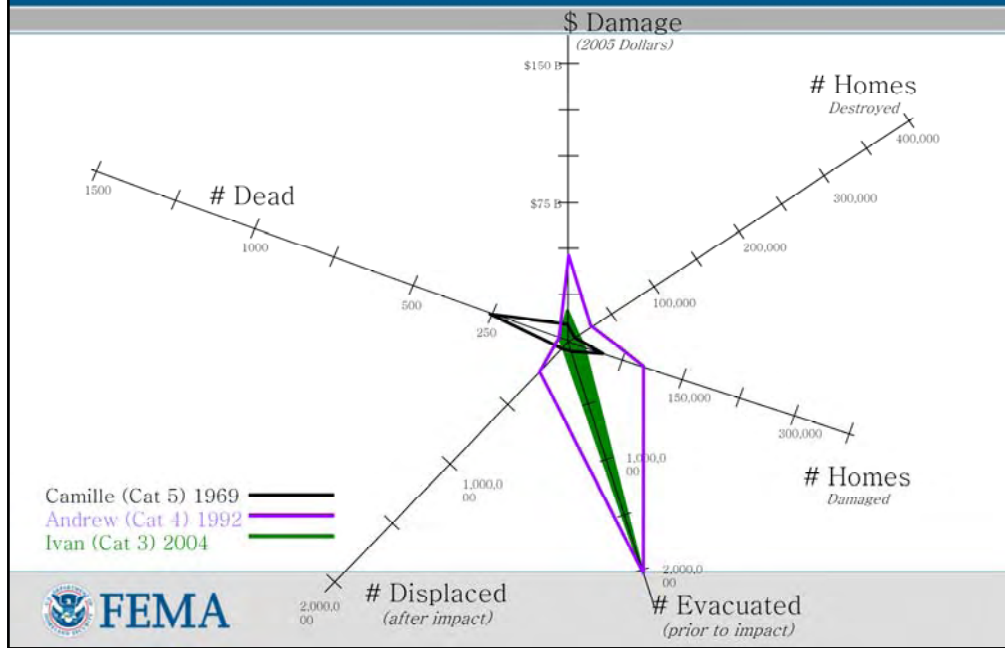
Camille was a horrible and devastating storm



Andrew devastated Dade County—at least the poorest and most vulnerable lower 1/3 of the county

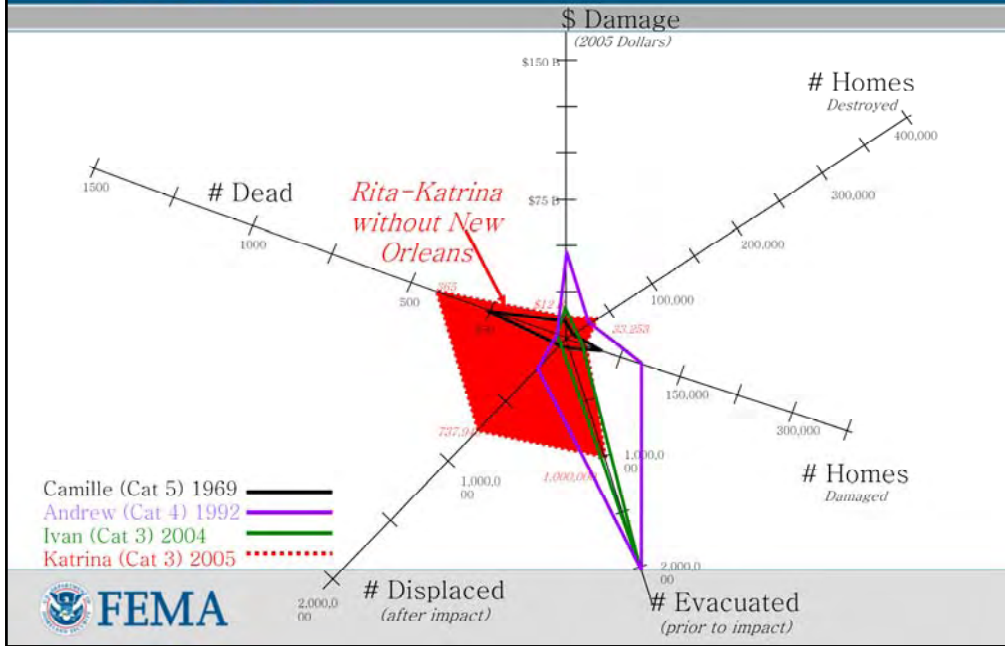
# Gamille, Andrew and Ivan

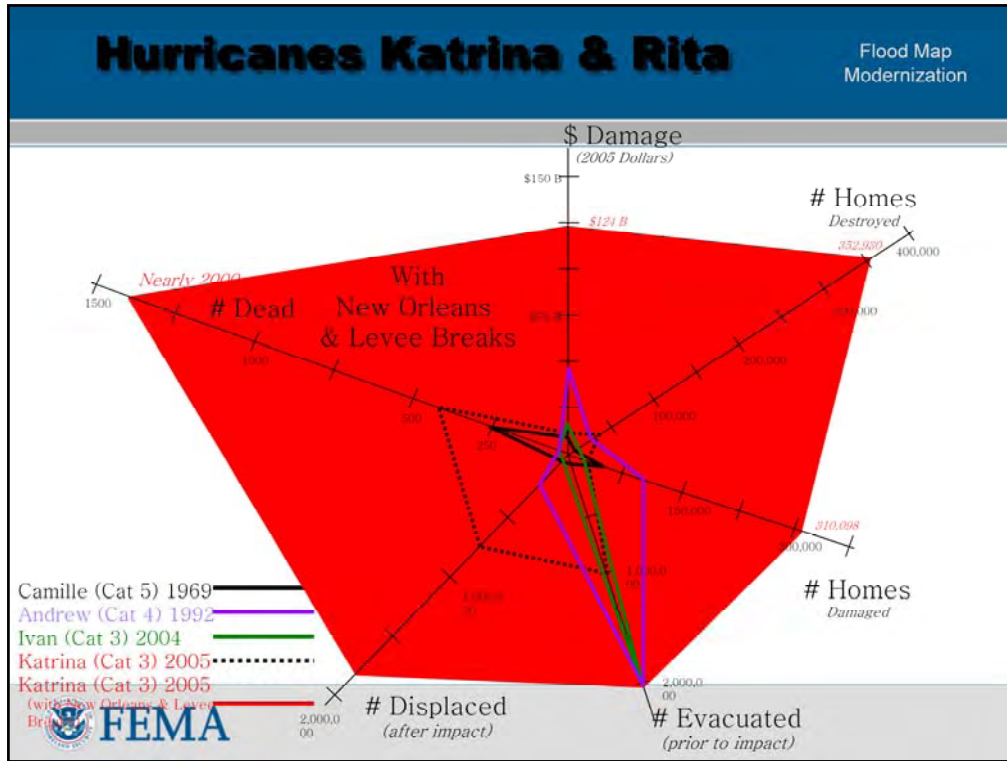
Flood Map  
Modernization



# Katrina & Rita w/o New Orleans

Flood Map  
Modernization





So what happened in New Orleans?

**“You cannot prepare for a catastrophe by  
planning for a disaster.” Unknown**





**FEMA**