HAZARD REDUCTION & RECOVERY CENTER
TEXAS A&M UNIVERSITY

Assessing Resiliency

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What is resilience?

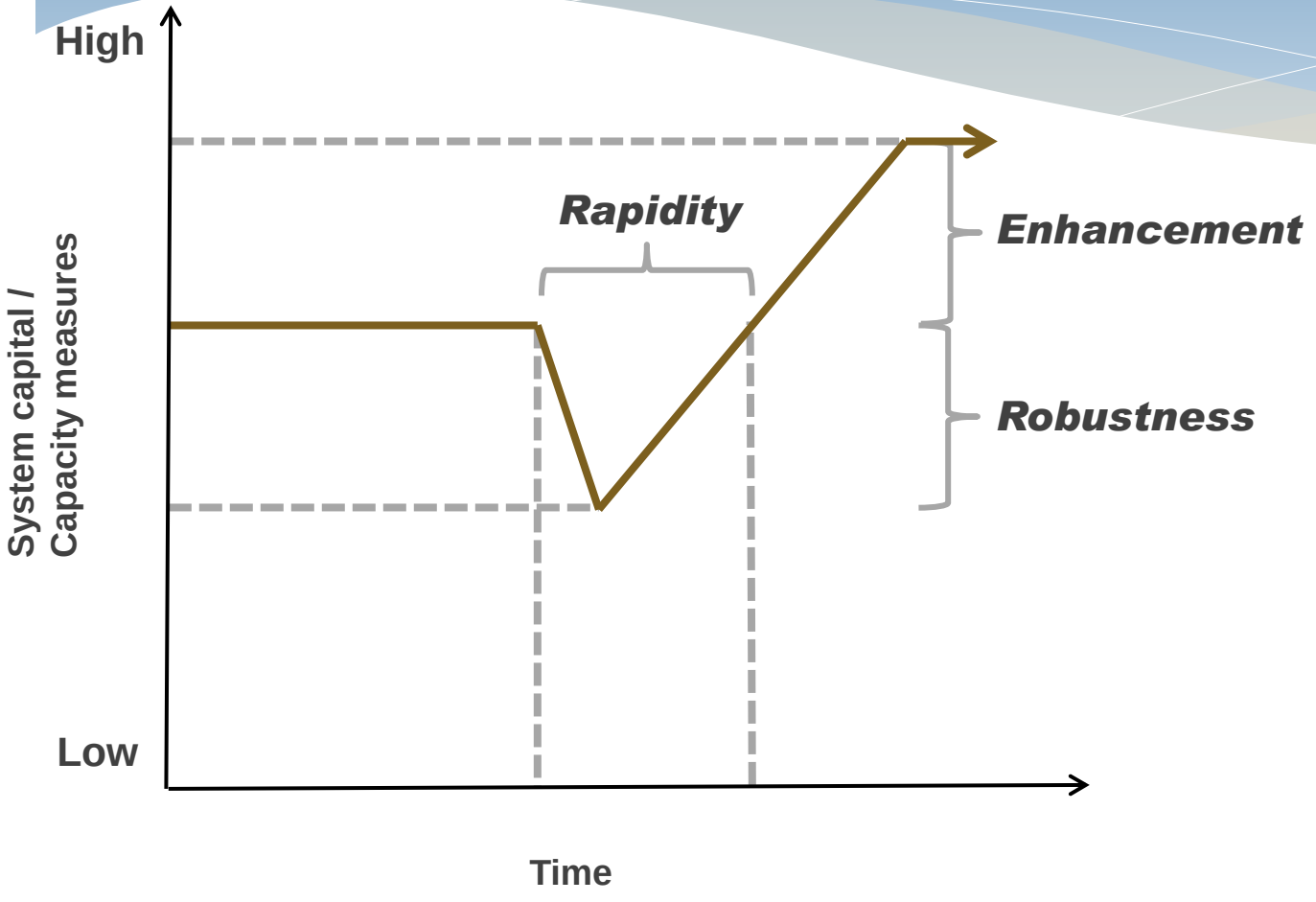
Resilience is the ability of a

community and the **bio-physical systems,**

upon which they depend, to:

* *resist* or absorb the impacts (deaths, damage, losses, etc.) of natural hazards,
* *rapidly* recover from those impacts, and
* reduce future vulnerabilities through *adaptive* strategies (Peacock et al. 2008 RAVON).

Three Dimensions of Resilience



Robustness captures the ability to withstand potential hazard impacts, which implies solid mitigation planning and implementation

Rapidity captures how quickly restoration or recovery levels are achieved, which clearly points to the importance of recovery planning & implementation

Enhancement captures the quality of recovery processes in terms of learning and adapting

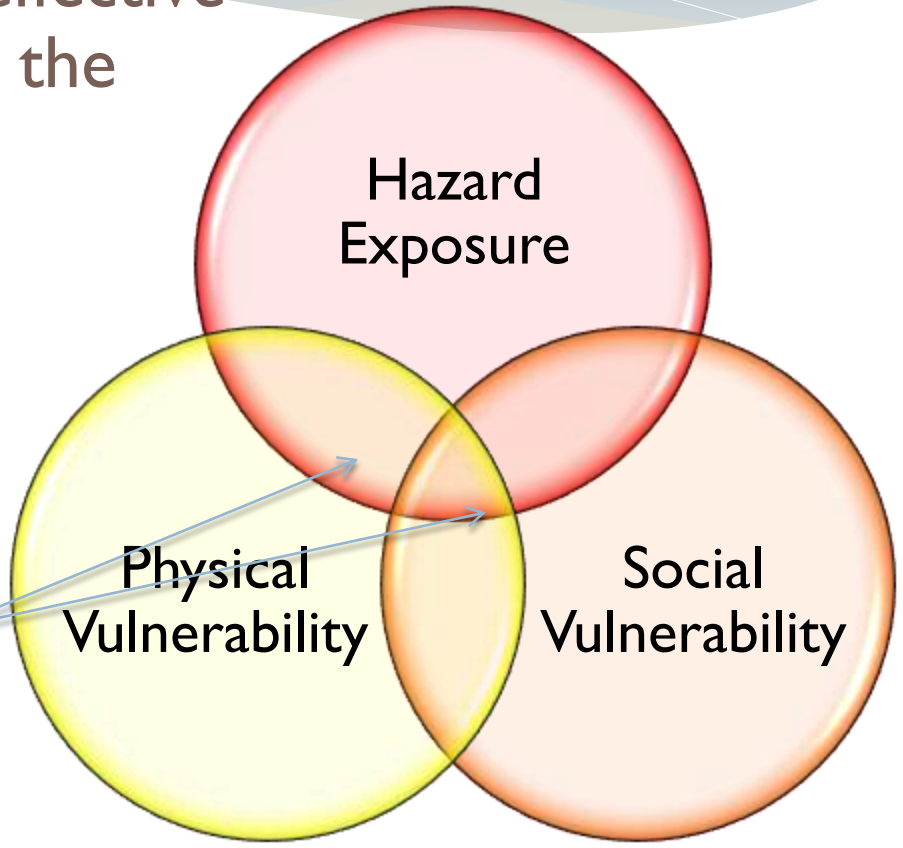
More Formalized Dimensions of Resilience

* Nature or quality of recovery implies learning/adaptation such that we see…
  * Improvements in mitigation status
    * Enhancing robustness
    * Reducing future loss potential
    * Reducing future failure probabilities
  * Reduction of pre-existing vulnerabilities
    * Reduced hazard exposure and risk
    * Reduced social vulnerabilities
  * Sustainable Disaster Recovery: improvements in the triple bottom line…
    * Enhanced economic sustainability
    * Enhanced ecological sustainability
    * Enhanced social sustainability

Assessing Resilience

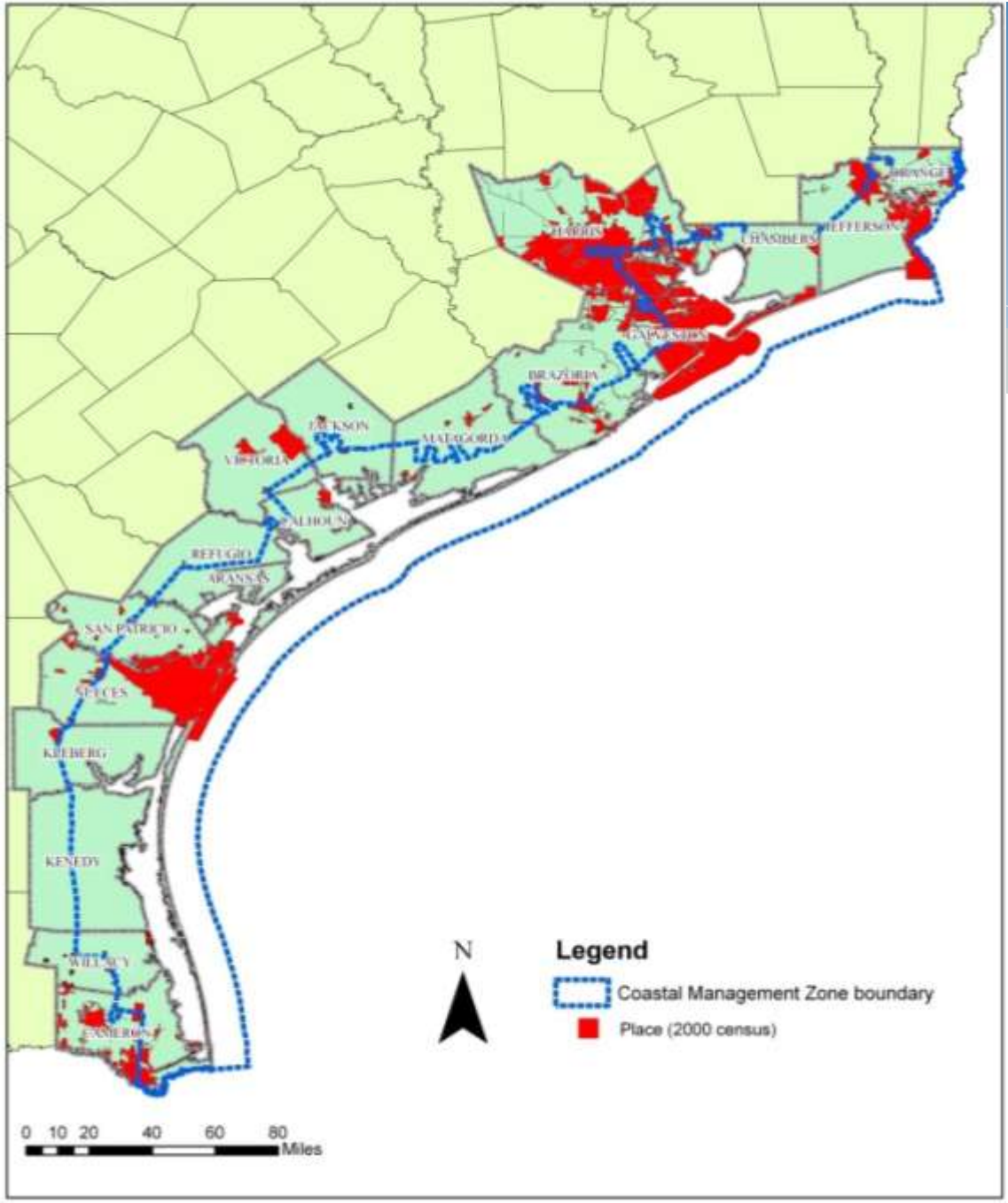
* Critical elements in guiding effective resiliency planning should be the convergence of these three:
  * Hazard exposure
  * Physical vulnerability
  * Social Vulnerability

The overlap represent hotspots that are prime targets for resiliency planning issues whether considering mitigation, recovery, or other planning activities.



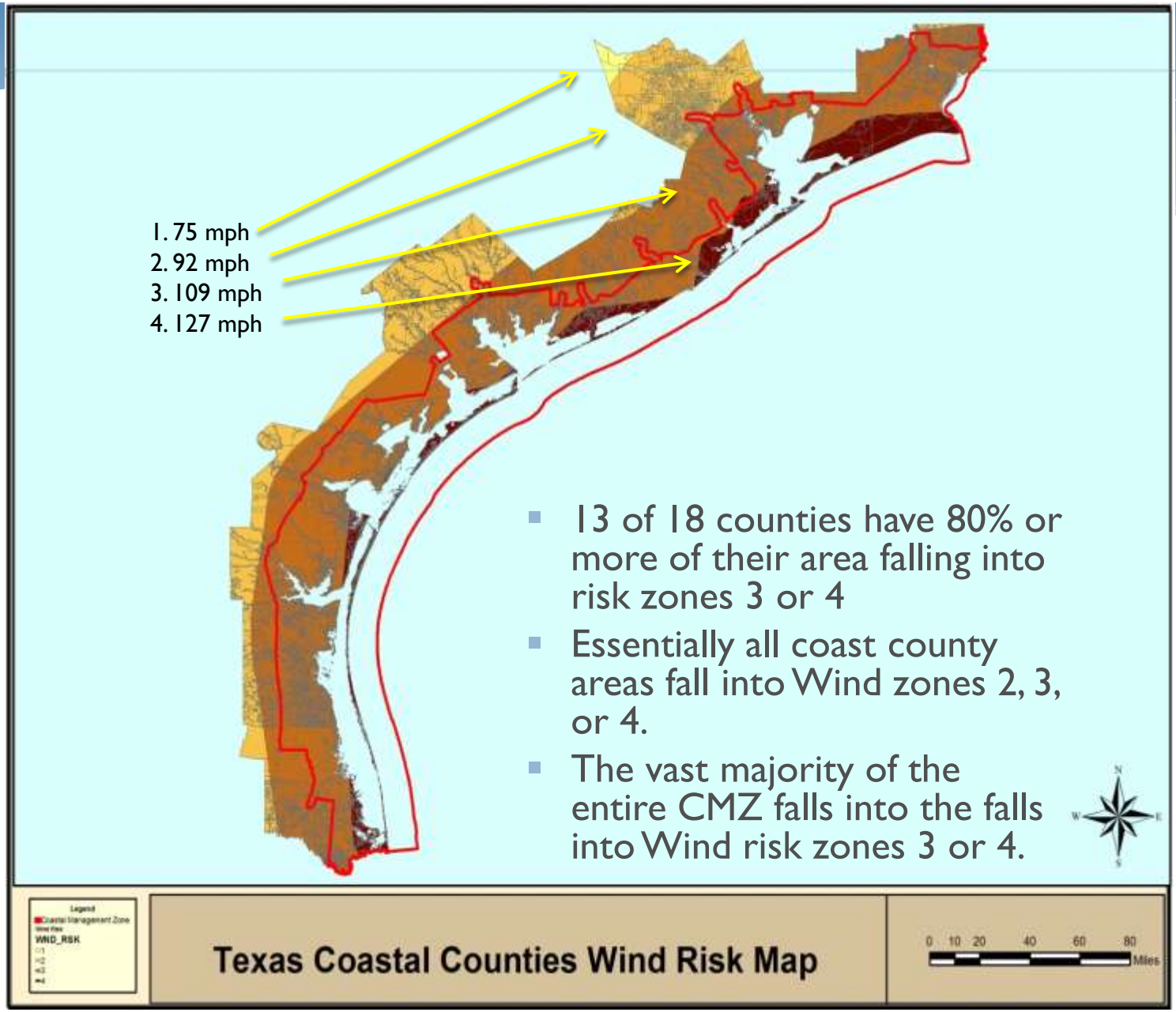
Hazard Exposure and Identification

* Geographical areas can be affected by disaster impact, in part, because of their exposure to hazard agents
  * Flood, Wind, Surge, Earthquake, urban/rural fringe
  * Technological or man-made hazards
* Identification of the potential hazards in a location, the likelihood of exposure, and some assessment of probability of impact
  * Hurricane risk zones (slosh models and wind fields)
  * Flood zones (Flood insurance Rate Maps –FIRM)
  * Coastal erosion/accretion
  * Hazardous sites
  * Wildfire
  * Drought

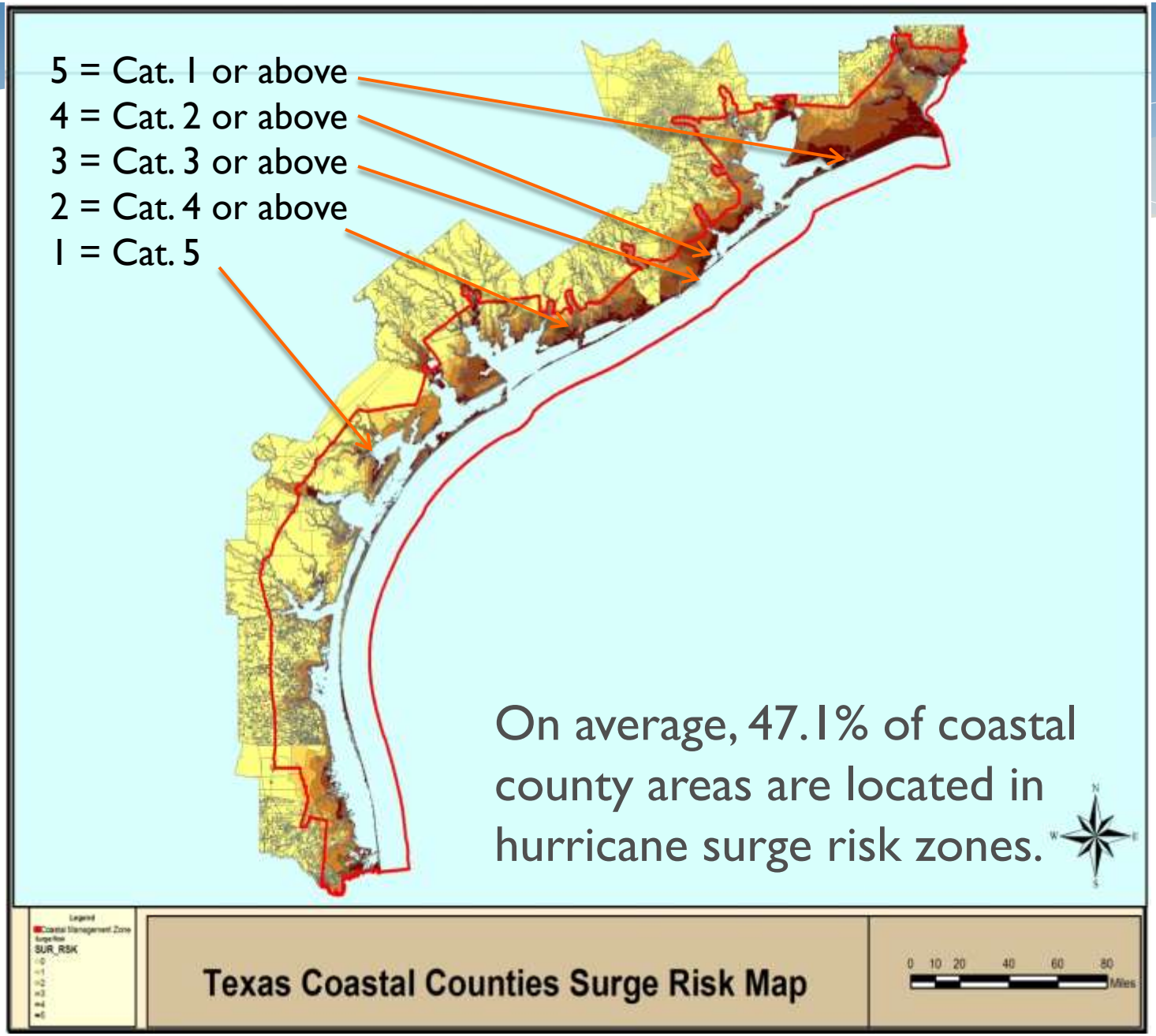


Texas Coastal Counties & Coastal Hazards

* The Texas Coast:
  * 18 coastal counties
  * 228 coastal municipalities
  * 39,546 sq. kilometers
  * 47.6% of this area is located in our Coastal Management Zone (CMZ)

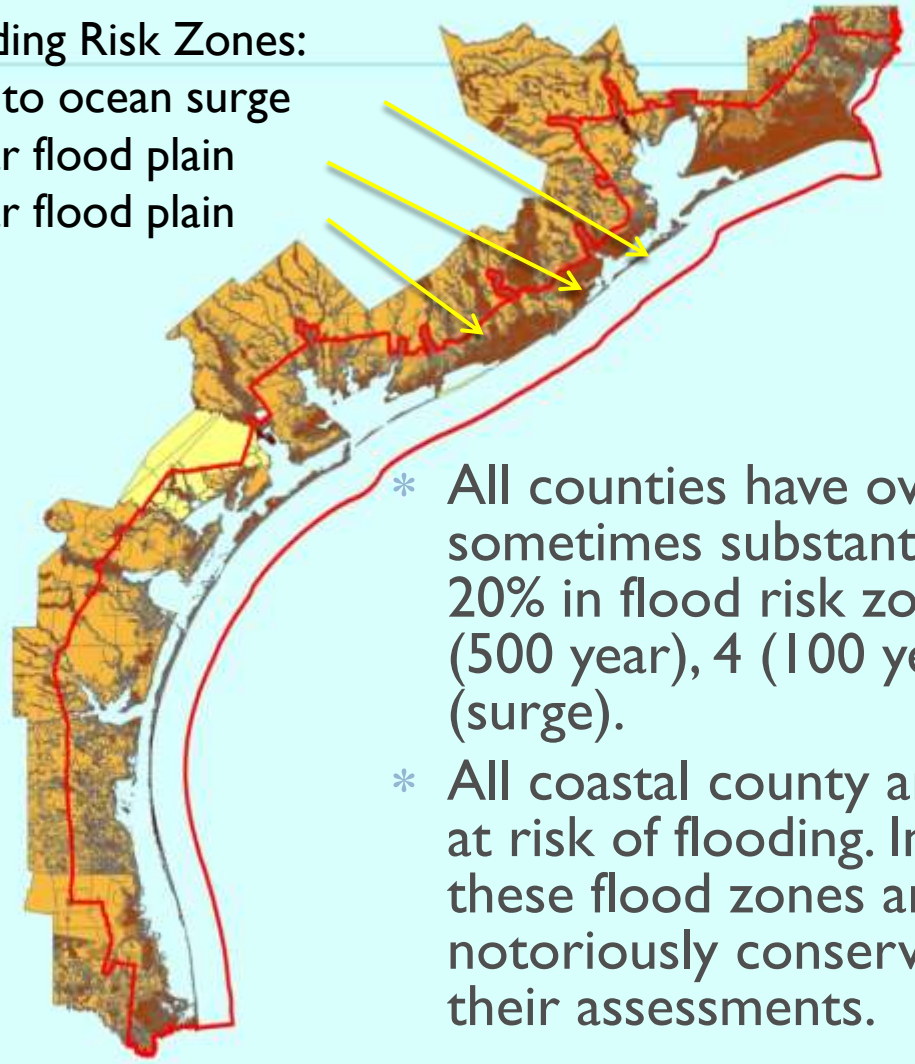


* A more complete discussion of Texas coastal county hazard exposure can be found in the following report -- Status and Trends of Coastal Hazard Exposure and Mitigation Policies for the Texas Coast: The Mitigation Policy Mosaic of Coastal Texas by Walter Gillis Peacock, Jung Eun Kang, Yi-Sz Lin, Himanshu Grover, Rahmawati Husein, and Gabriel R. Burns. 2009. Hazard Reduction and Recovery Center.



* see: Status and Trends of Coastal Hazard Exposure and Mitigation Policies for the Texas Coast: The Mitigation Policy Mosaic of Coastal Texas by W.G.Peacock, J.E.Kang, Y.S. Lin, H. Grover, R.Husein, and G.R. Burns. 2009. Hazard Reduction and Recovery Center.

Major Flooding Risk Zones:
5 = subject to ocean surge
4 = 100 year flood plain
3 = 500 year flood plain



- All counties have over, sometimes substantially over, 20% in flood risk zones 3 (500 year), 4 (100 year) or 5 (surge).
- All coastal county areas are at risk of flooding. Indeed, these flood zones are notoriously conservative in their assessments.

* see: Status and Trends of Coastal Hazard Exposure and Mitigation Policies for the Texas Coast: The Mitigation Policy Mosaic of Coastal Texas by W.G.Peacock, J.E.Kang, Y.S. Lin, H. Grover, R.Husein, and G.R. Burns. 2009. Hazard Reduction and Recovery Center.

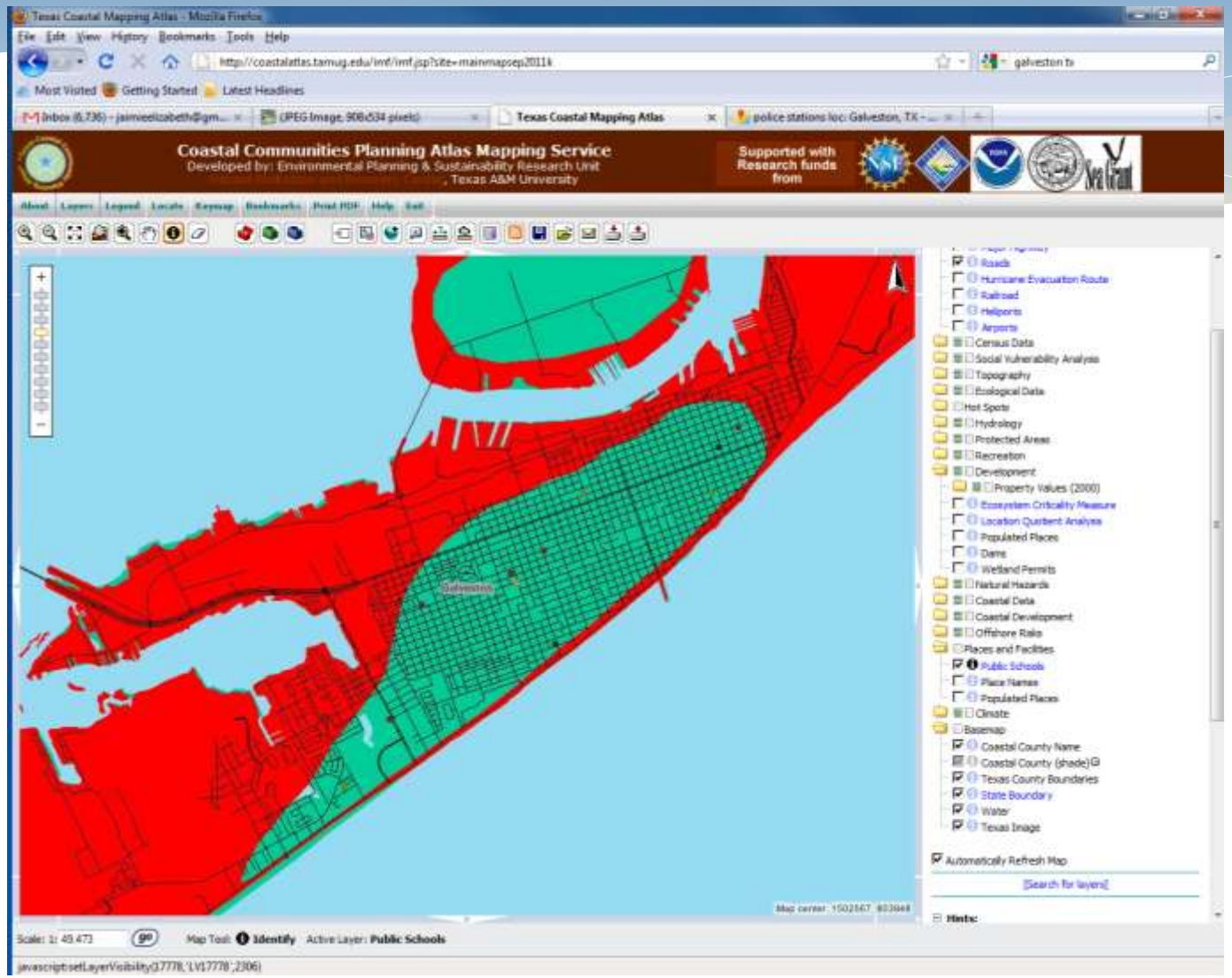
Physical Vulnerability

- Susceptibility to physical damage and loss based on exposure and:
  - Building methods, materials, and codes
  - Infrastructure
    - Vulnerabilities due to location and other characteristics
    - Can these be enhanced??
  - Natural environment – eco-services
    - Will these be compromised by the development?
    - Can these be preserved or restored to increase system services?
- Forms:
  - Vulnerability assessment = The likely damage given the nature of the quality of construction
  - Risk Analysis: = Includes probability assessments of damage

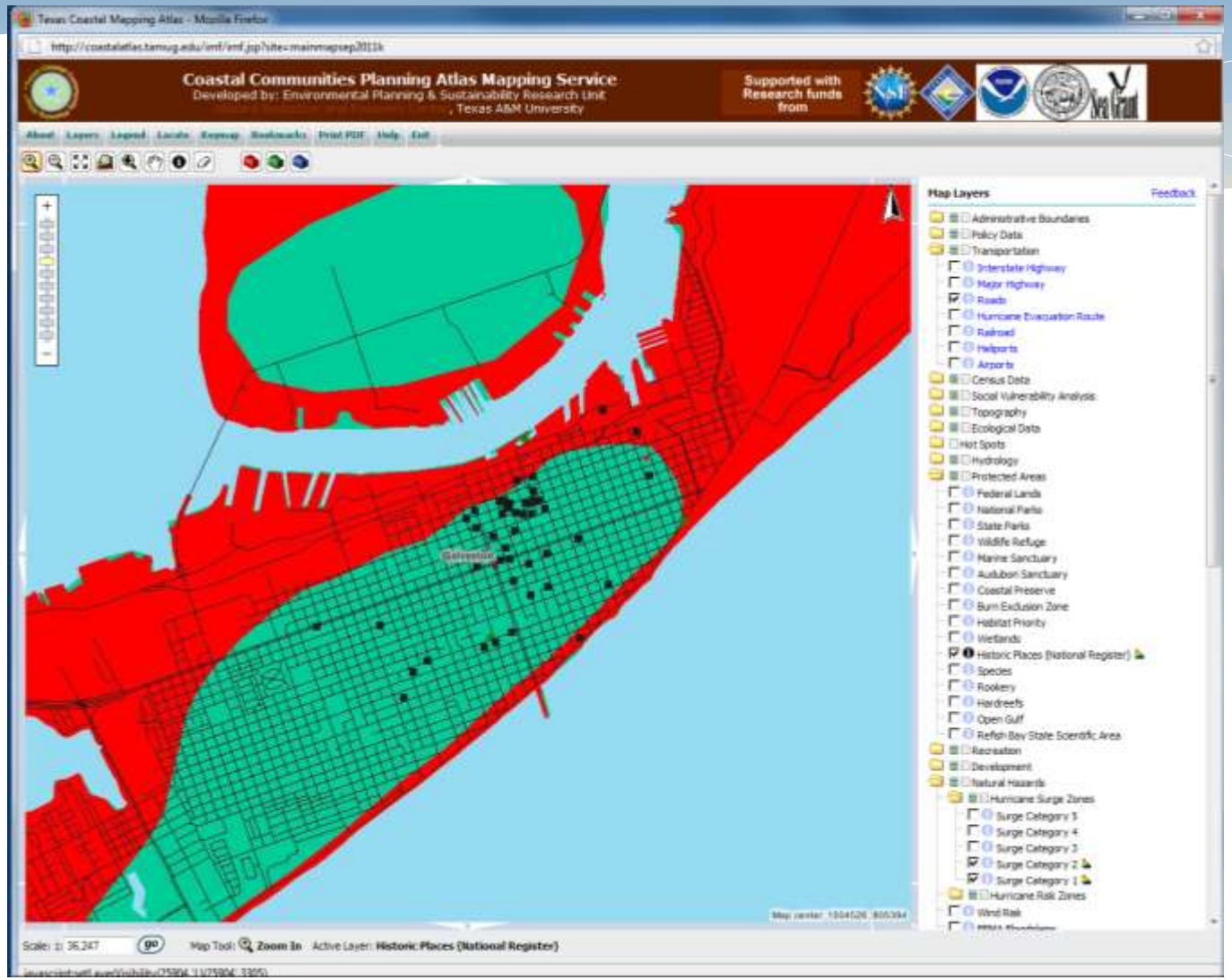
Physical vulnerabilities

* From: coastalatlas.tamu.edu

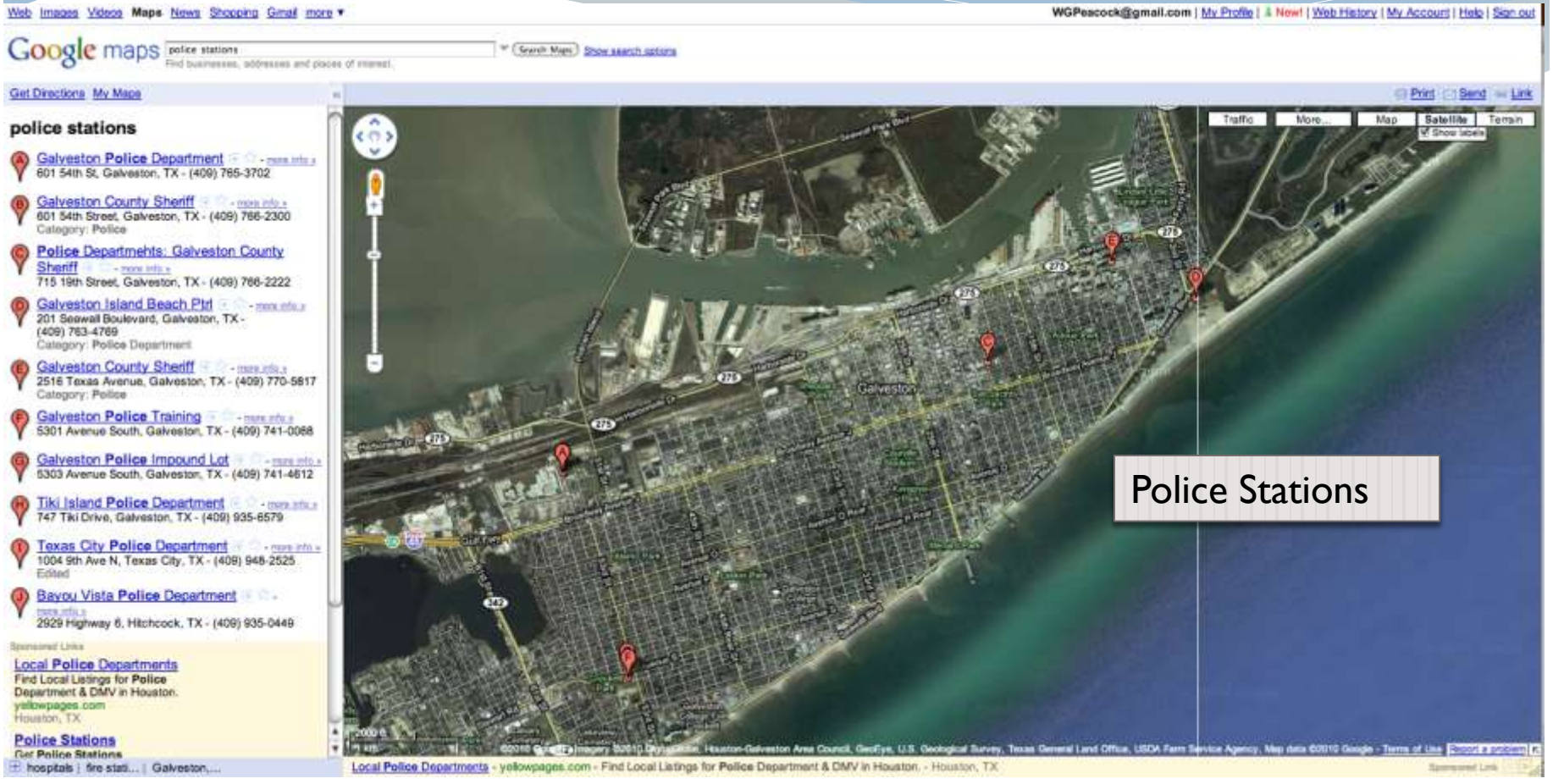
Public Schools



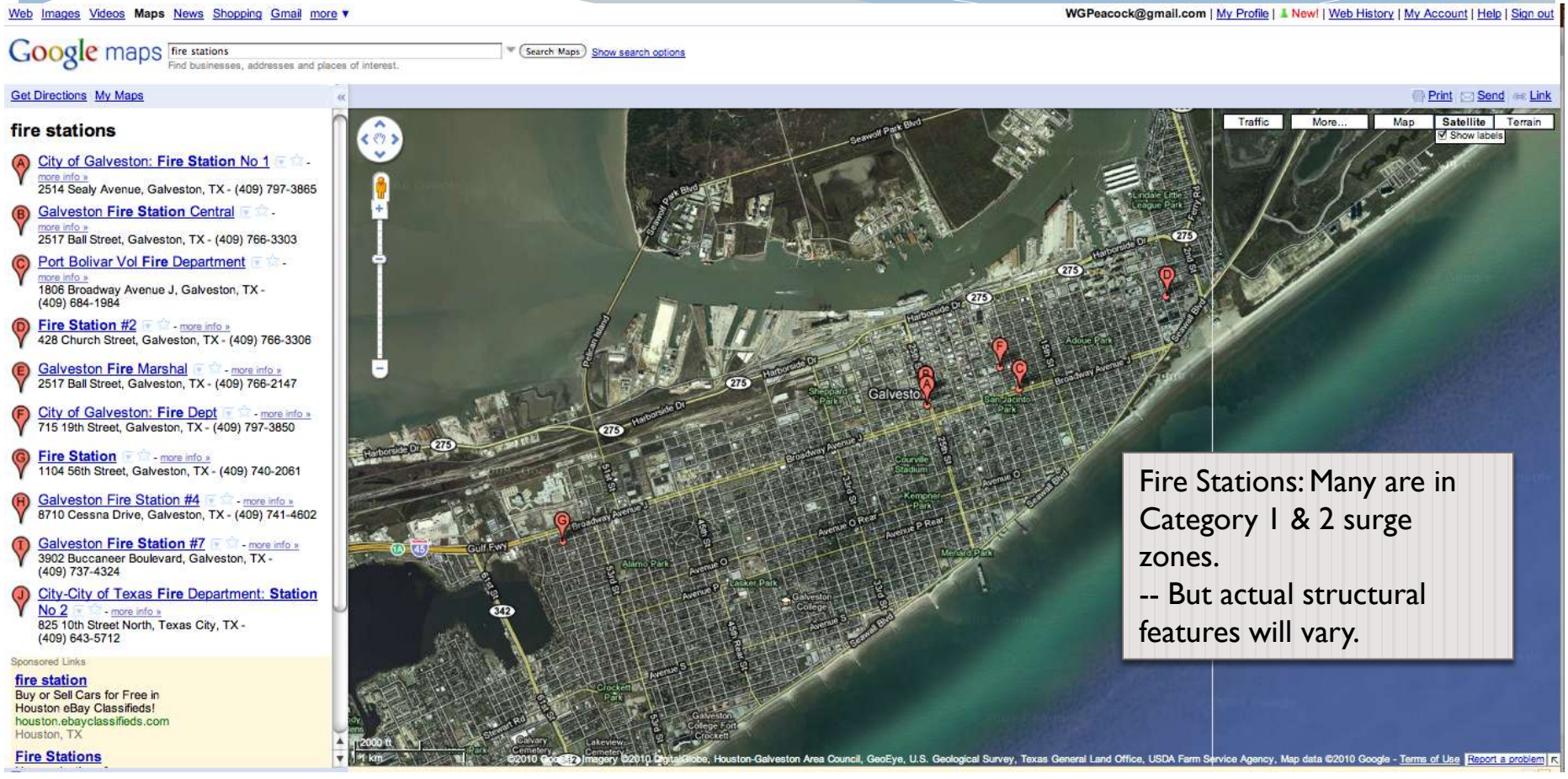
Historic Places



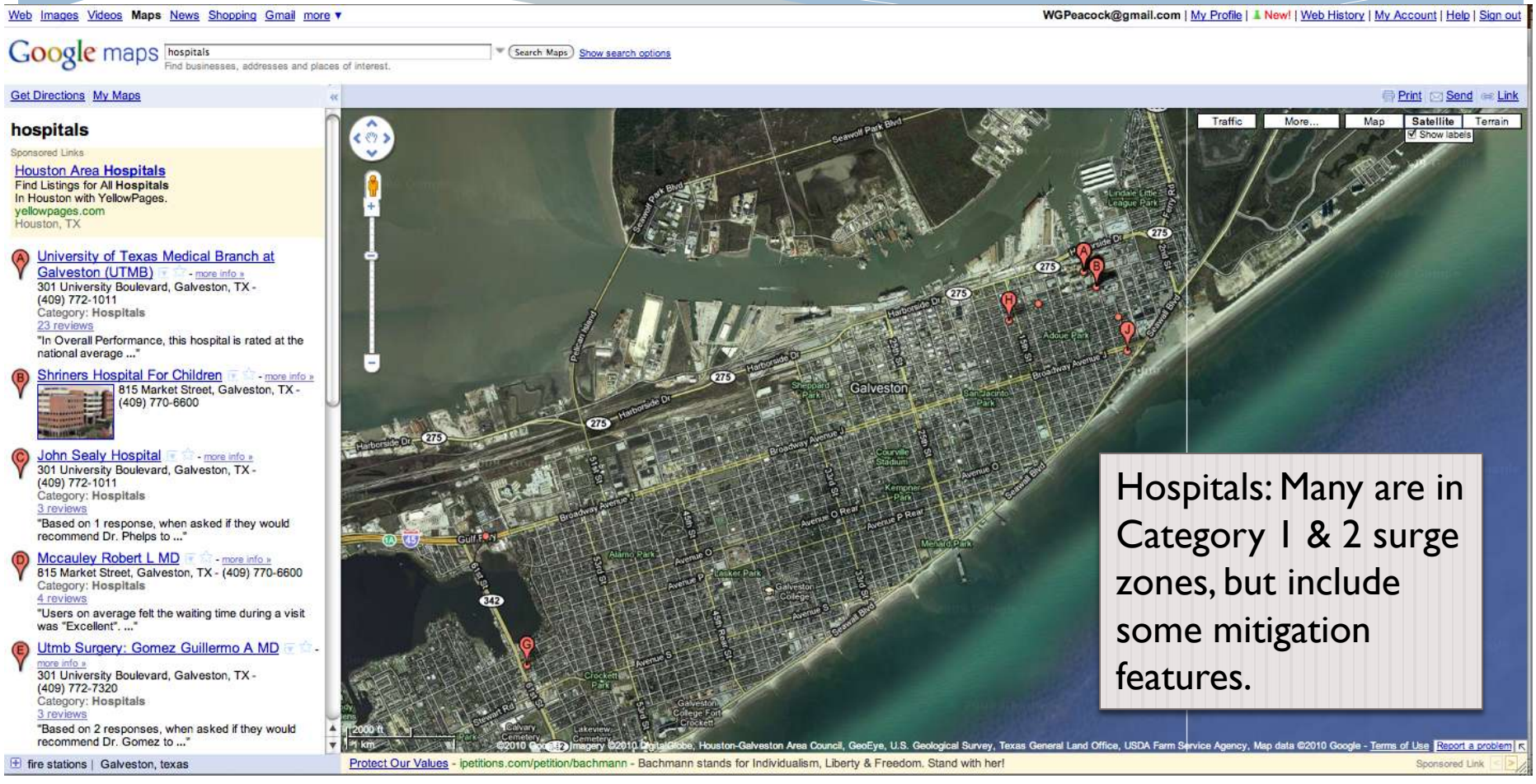
Police stations



Fire stations



Hospitals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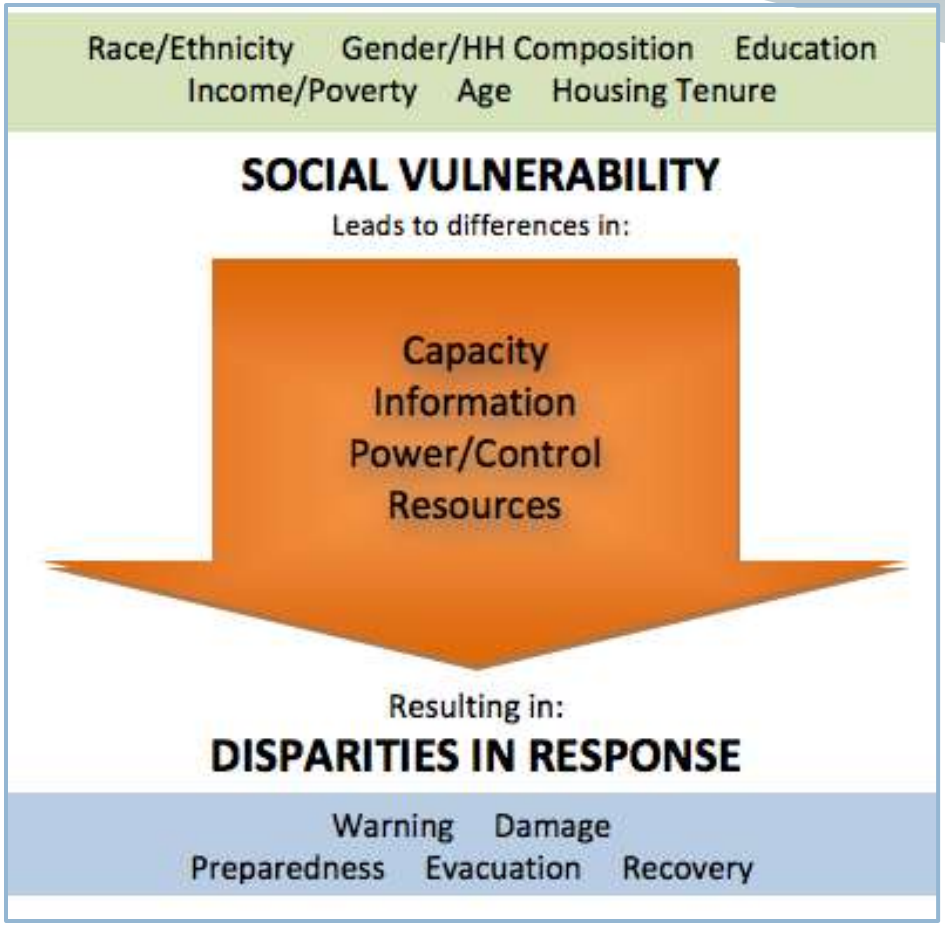
Find Listings for All Hospitals
In Houston with YellowPages.
yellowpages.com
Houston, TX
A University of Texas Medical Branch at Galveston (UTMB) - more info »
301 University Boulevard, Galveston, TX - (409) 772-1011
Category: Hospitals
23 reviews
"In Overall Performance, this hospital is rated at the national average ..."
B Shriners Hospital For Children - more info »
815 Market Street, Galveston, TX - (409) 770-6600
C John Sealy Hospital - more info »
301 University Boulevard, Galveston, TX - (409) 772-1011
Category: Hospitals
3 reviews
"Based on 1 response, when asked if they would recommend Dr. Phelps to ..."
D Mccauley Robert L MD - more info »
815 Market Street, Galveston, TX - (409) 770-6600
Category: Hospitals
4 reviews
"Users on average felt the waiting time during a visit was "Excellent". ..."
E Utmb Surgery: Gomez Guillermo A MD - more info »
301 University Boulevard, Galveston, TX - (409) 772-7320
Category: Hospitals
3 reviews
"Based on 2 responses, when asked if they would recommend Dr. Gomez to ..."
fire stations | Galveston, texas
Traffic More... Map Satellite Terrain
Show labels
Galveston
Seawolf Park Blvd
Harborside Dr
Broadway Avenue
Seawall Blvd
Avenue O
Avenue P
Avenue S
Stewart Rd
Protect Our Values - ipetitions.com/petition/bachmann - Bachmann stands for Individualism, Liberty & Freedom. Stand with her!
Sponsored Link
Hospitals: Many are in Category 1 & 2 surge zones, but include some mitigation features.

Social vulnerability



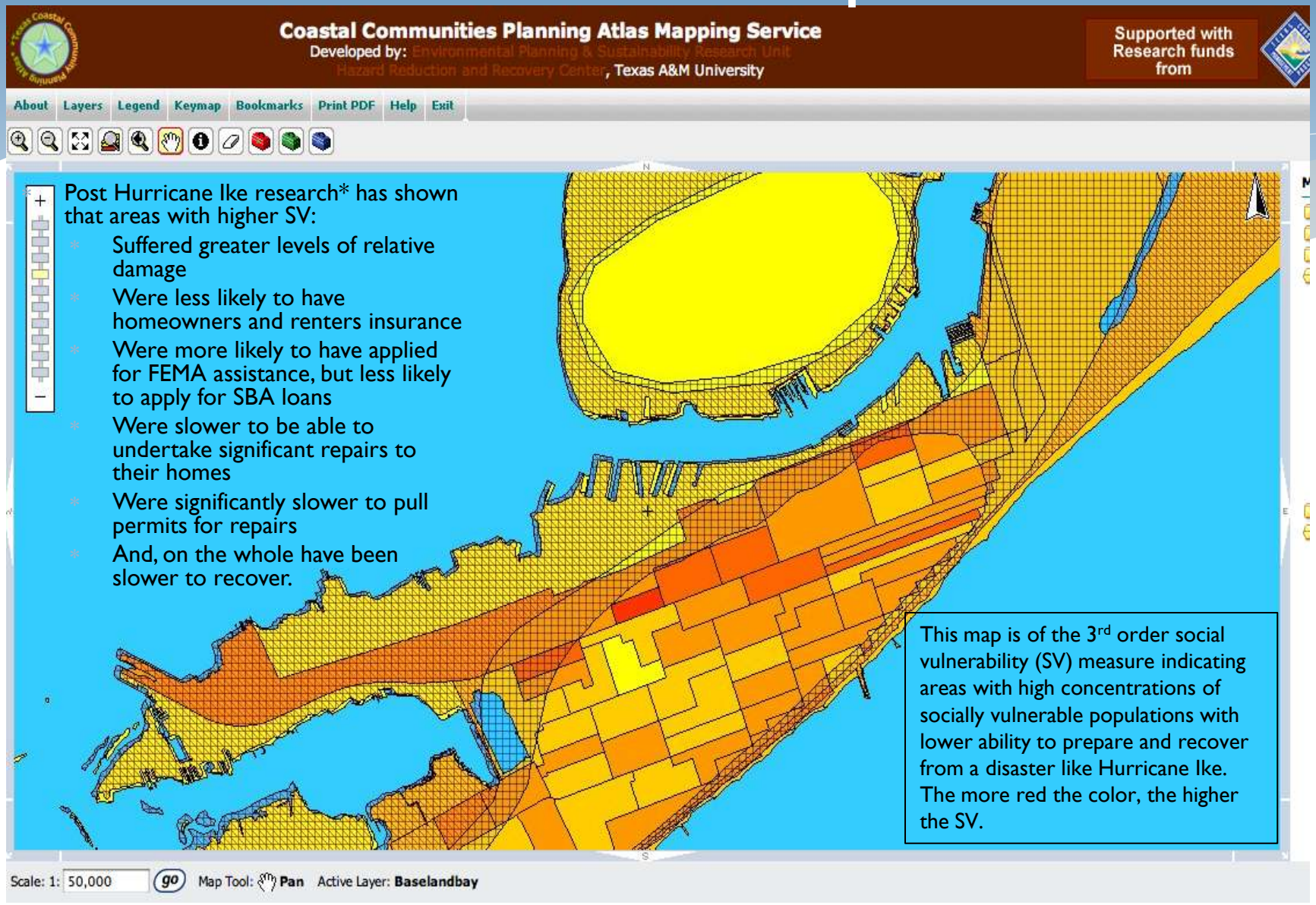
* Much like physical vulnerability, except focused on social units
* Focus is on social factors and processes that generate vulnerability in terms of a person's or group's capacity to anticipate, cope with, resist and recover from the impact of a natural hazard
  * These factors include:
    * Race/ethnicity, gender, education, poverty, age, and housing tenure
* Social vulnerability will rarely be uniformly distributed among the individuals, groups, or various populations comprising social systems
  * As a consequence we can develop mapping tools to identify areas with higher concentrations of socially vulnerable populations

Levels of Social Vulnerability Analysis

Base Social Vulnerability Indicators (percentages)	2nd Order	3rd Order
1. Single parent households with children/Total Households 2. Population 5 or below/Total Population	Child care Needs	Socially Vulnerable Hotspot
3. Population 65 or above/Total Population 4. Population 65 or above & below poverty/Pop. 65 or above	Elder Care Needs	
5. Workers using public transportation/Civilian pop. 16+ and employed 6. Occupied housing units without a vehicle/Occupied housing units (HUs)	Transportation needs	
7. Occupied Housing units/Total housing units 8. Persons in renter occupied housing units/Total occupied housing units 9. Non-white population/Total population 10. Population in group quarters/Total population 11. Housing units built 20 years ago/Total housing Units 12. Mobile Homes/Total housing units 13. Persons in poverty/Total population	Temporary Shelter and housing recovery needs	
14. Occupied housing units without a telephone/Total occupied HU 15. Population above 25 with less than high school/Total pop above 25 16. Population 16+ in labor force and unemployed/Pop in Labor force 16+ 17. Population above 5 that speak English not well or not at all/Pop > 5	Civic Capacity needs	

The entire set can be combined to capture hyper-vulnerability, or identify hotspots.

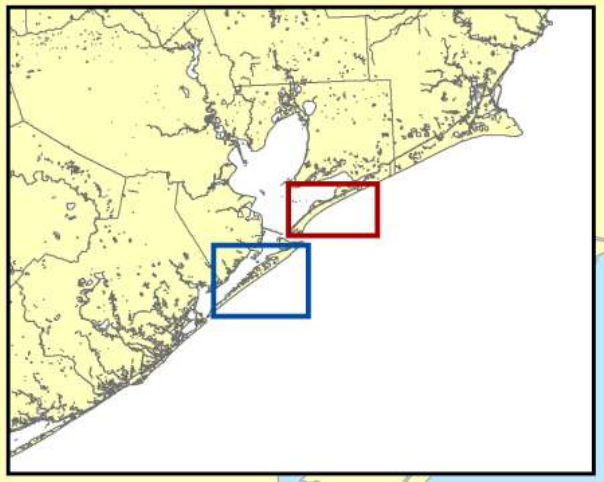
SV and hazard exposure



*For a more complete discussion of these data, analysis and findings see:
Van Zandt et al forthcoming, Peacock et al. forthcoming; Highfield et al. 2011, and Peacock et al 2011.

Putting the pieces together: Hazard Exposure, Physical vulnerability, and Social Vulnerability…Hurricane Ike

- Hazard Exposure: Structure's exposure to potential hazards
  - Wind, surge, and flooding
- Physical vulnerabilities: Structure's physical characteristics
  - Elevation, building codes, etc.
- Social vulnerabilities: social and economic factors that may shape disaster impact
  - Housing quality, maintenance, mitigation issues
  - Neighborhood characteristics



Legend

Damage Index

- 4 - 5
- 6 - 7
- 8 - 11
- 12 - 16
- 17 - 20
- Seawall
- County Boundary

N

0 5 Miles

0 5 Miles

In summary

* The physical and social impacts of disasters are results of the exposure to hazards, the physical vulnerabilities, and the social vulnerabilities present in a community

* That vulnerability analysis should be based on assessments