Utilizing GIS to Identify and Mobilize Interdisciplinary Disaster Reconnaissance Research Teams: The SSEER and ISEEER Platforms

NSF-EAGER Award #1745611

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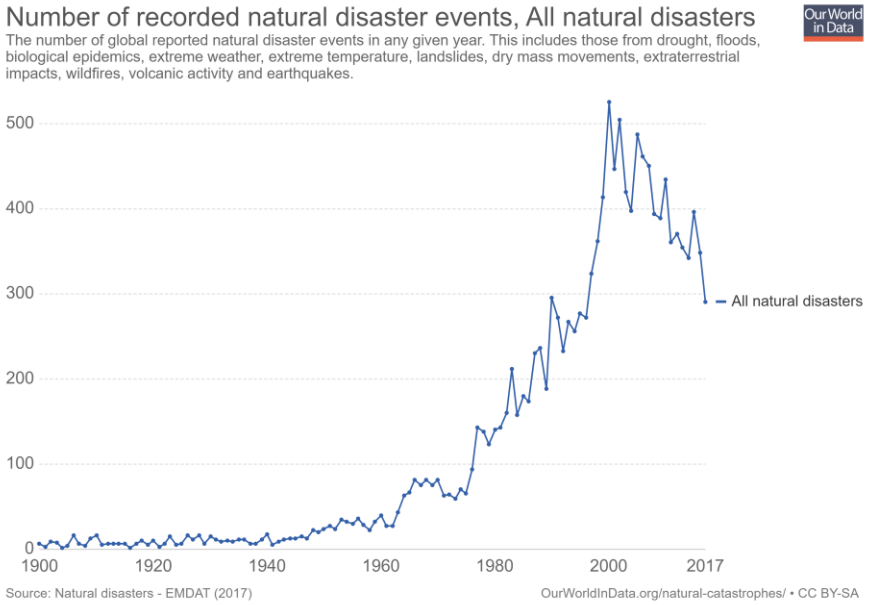
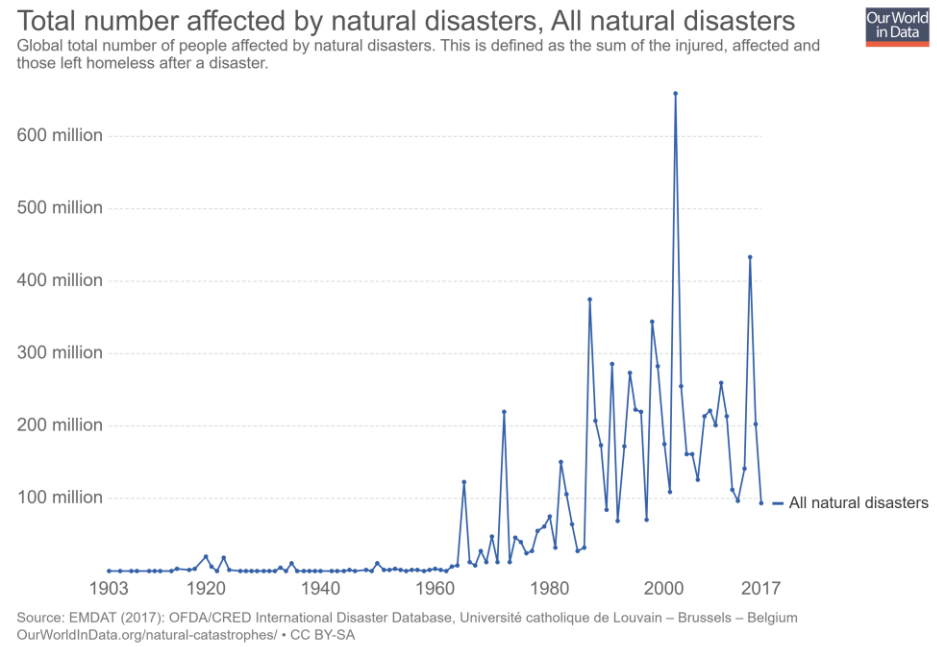
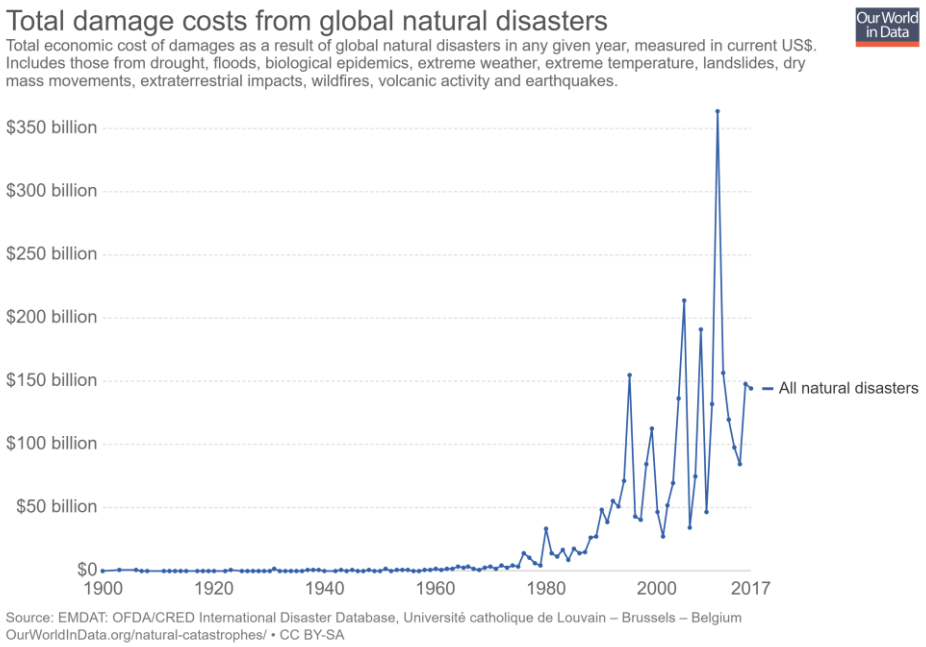
ESRI Southwest User Conference
April 11, 2018 Broomfield, CO

We envision a just and equitable world where knowledge is applied to ensure that humans live in harmony with nature.

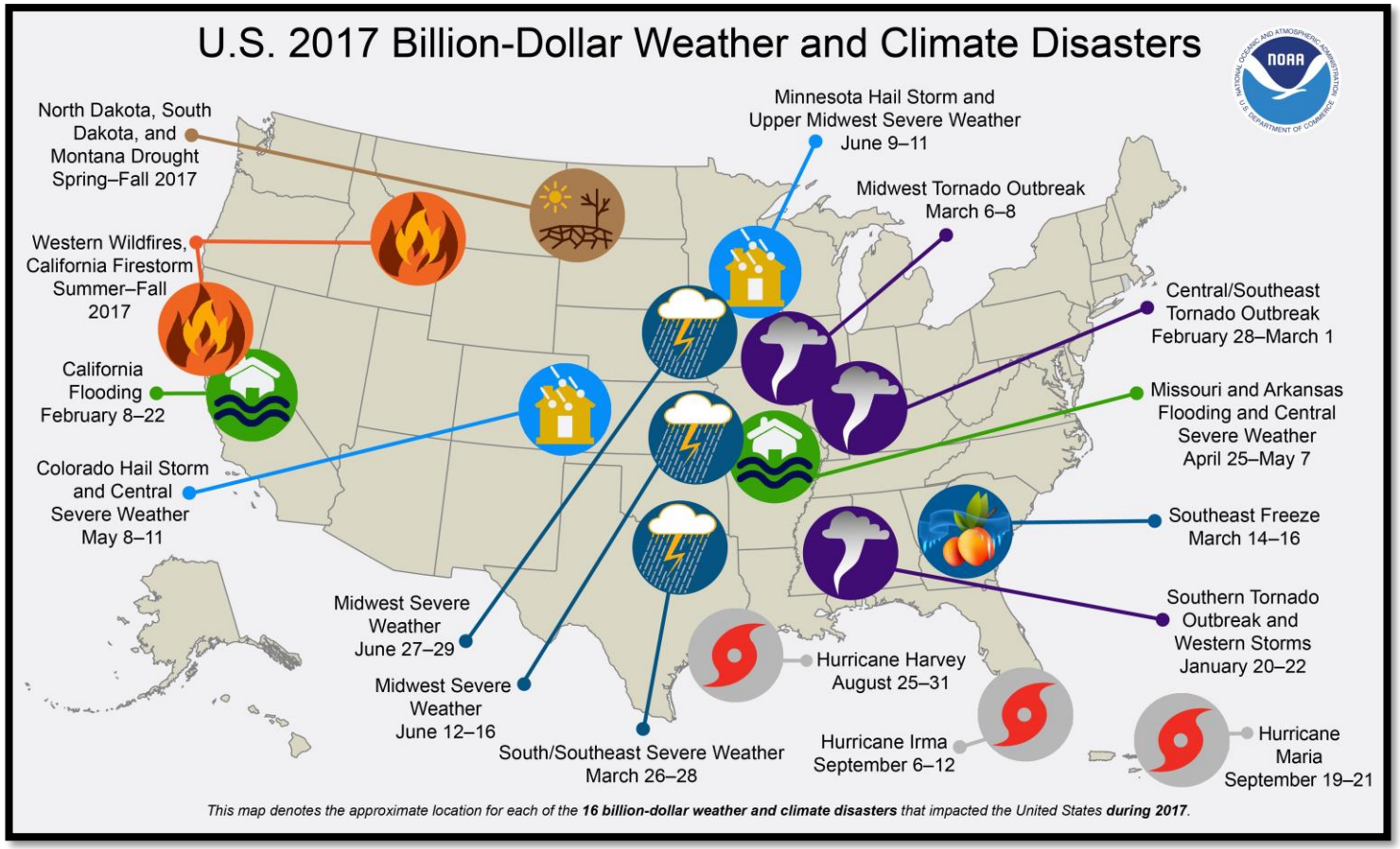
Increasing Numbers of Disasters, People Affected by Disasters, and Economic Losses Due to Disasters







The Increasing Economic Footprint of Disasters in the U.S.



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Increasing Potential for Future Natural Disasters on an Epic Scale

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The Importance of Rapid Hazards and Disaster Reconnaissance Research

- Provides insights into linkages between cause and effects of disasters.
- Enables collection of perishable data available only for a short time immediately after a disaster.
- Social scientists collect data related to disaster orgs while they are on the scene.
- Engineers collect data regarding infrastructure failure, building collapse, etc. before clean up, rebuilding, etc. removes evidence.
- Physical scientists collect geophysical data that may be obscured by weather, clean up, etc.

- Data that can help prevent future catastrophes, mitigate their impacts, or aid recovery may only be available for a **short time**!

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Challenges to the Advancement of Disaster Reconnaissance Research

1. Lack of Identification and Coordination of Researchers
2. Inadequate Guiding Research Frameworks and Insufficient Catalog of Research Approaches
3. Over-Emphasis on Large-Scale, Sudden-Onset Extreme Events
4. Cross-Sectional Data Collection, Time Scale Deviations, and Lack of Replication
5. Lack of Pre-Event Interdisciplinary Integration in Rapid Reconnaissance Teams
6. No Widely Established Mechanism among our Community for Sharing Research Findings to Promote Meaningful Change

The Challenges of Forming Hazards and Disaster Reconnaissance Research Teams

- Race against the clock (Prepare budget, obtain funding, obtain permissions, form teams, make travel arrangements…) to arrive and gather data.
- Research occurs in fluid, high intensity circumstances (ongoing threats to safety due infrastructure instability, health concerns, emotional states of affected populations, etc.).
- Challenges of fulfilling funding agency requirements; people need to find members from disciplines they may not normally interact with.

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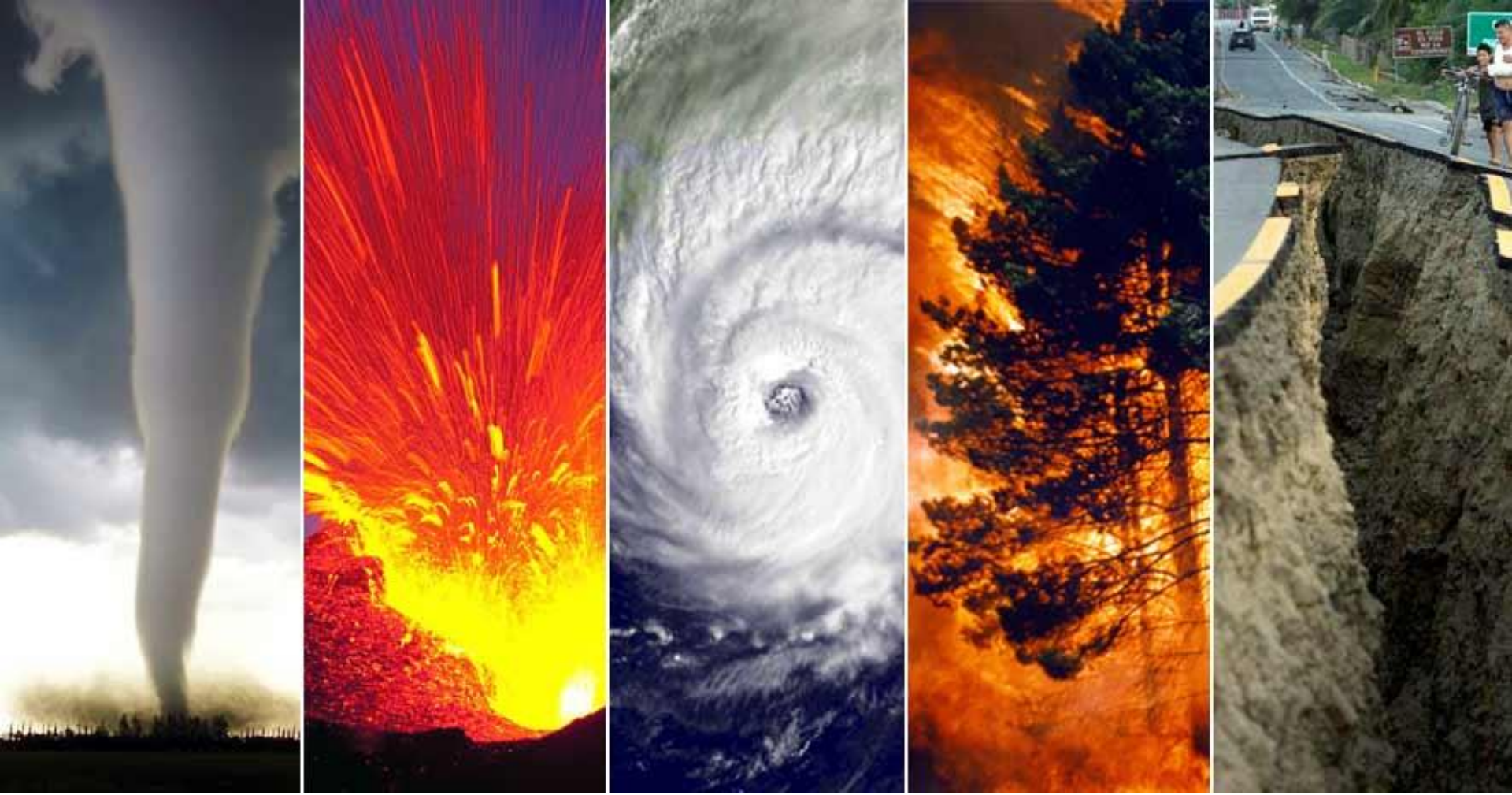

A New Approach to Organize Rapid Reconnaissance Research is Needed

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How can we collaborate even more effectively as social scientists and in interdisciplinary teams to conduct disaster research?

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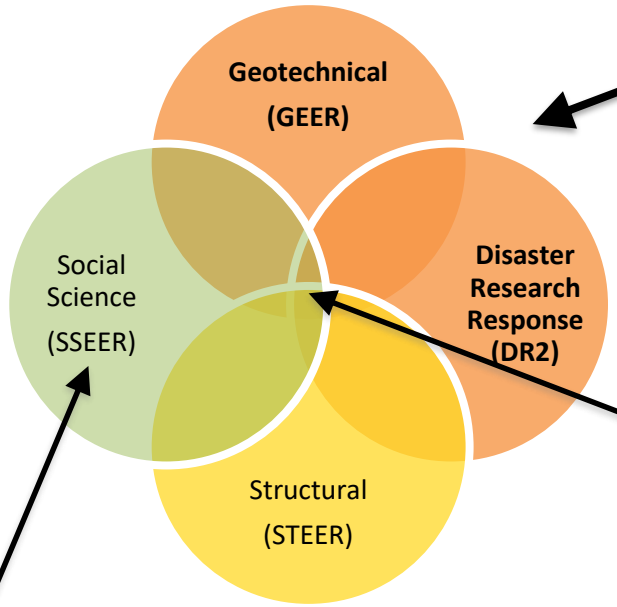
Project Purpose

To establish the Social Science Extreme Events Reconnaissance (SSEER) and Interdisciplinary Science and Engineering Extreme Events Reconnaissance (ISEEER) platforms and networks to facilitate research coordination efforts for all hazards.



SSEER and ISEEER will be integrated with existing disaster research coordination platforms

ISEEER
INTERDISCIPLINARY
SCIENCE & ENGINEERING
EXTREME EVENTS
RECONNAISSANCE

SSEER
SOCIAL SCIENCE
EXTREME EVENTS
RECONNAISSANCE

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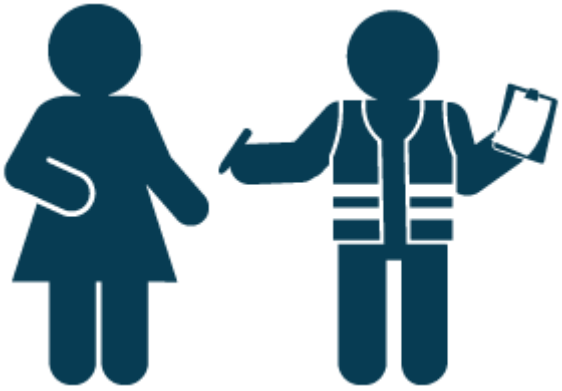
Vision

For hazards and disaster researchers to be prepared to carry out extreme events reconnaissance research that is *coordinated*, *comprehensive*, *coherent*, *ethical*, and *scientifically rigorous*.



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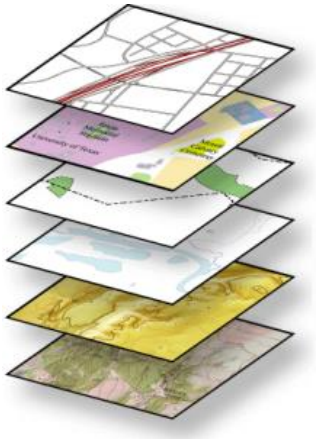
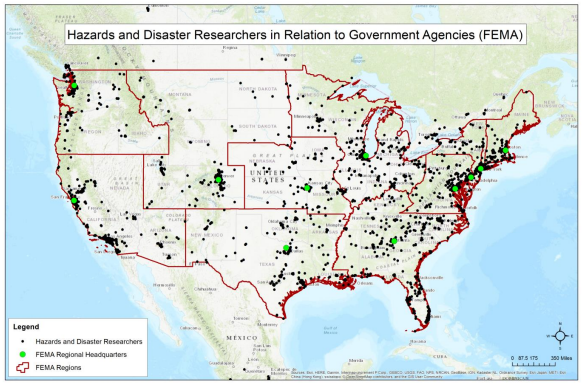
Using GIS as a Tool to Coordinate the Formation of Hazards and Disasters Research Teams

1. Lack of Identification and Coordination of Researchers

5. Lack of Pre-Event Interdisciplinary Integration in Rapid Reconnaissance Teams





How can we use GIS to address these challenges?

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1. Lack of Identification and Coordination of Researchers

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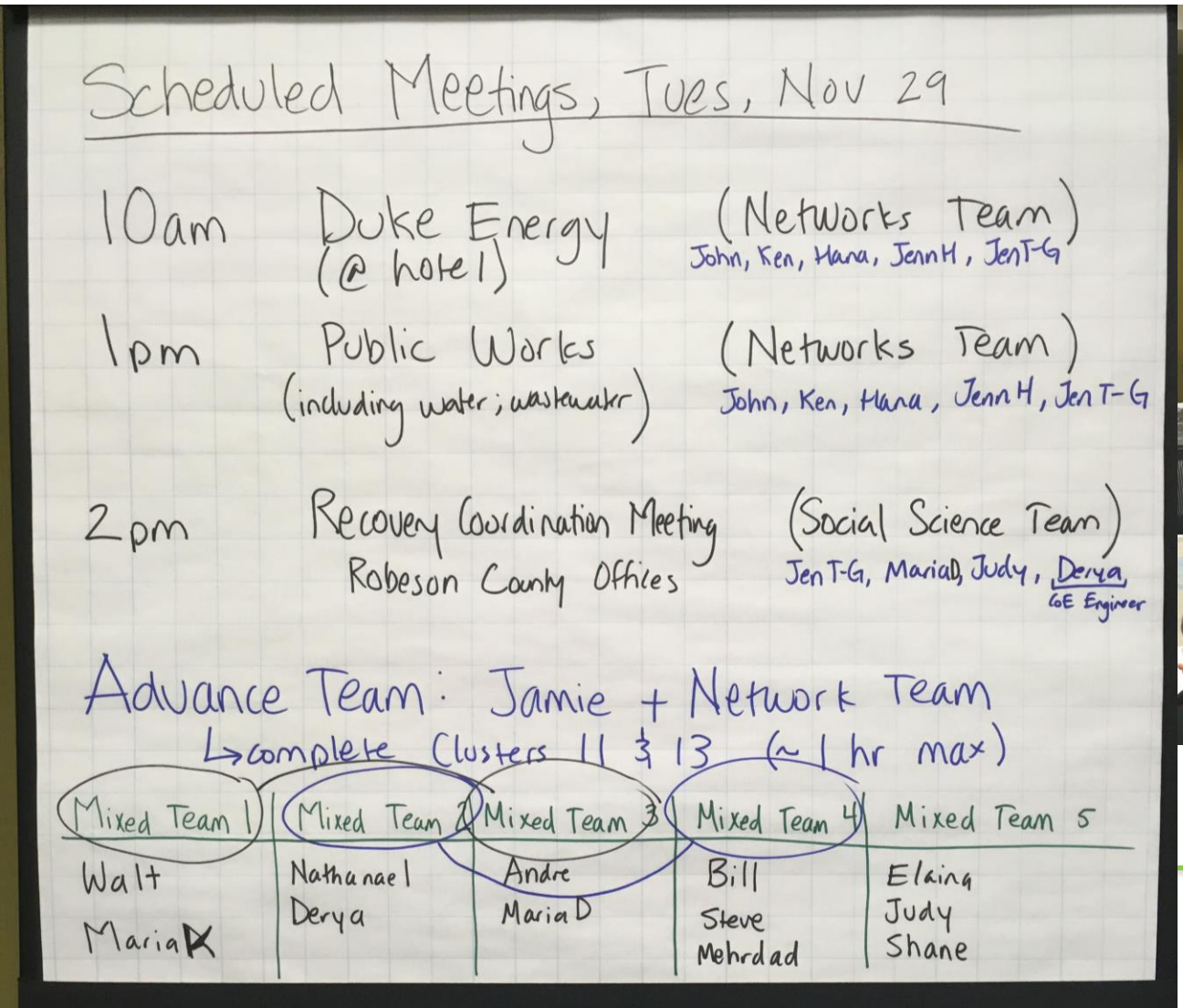
1. Lack of Identification and Coordination of Researchers

- Difficult to find researchers with site specific experience (knowledge of local conditions, culture, etc.)
- Potential negative impacts to affected communities and emergency response operations (best suited researchers unable to participate)
- Same small group of well-known researchers asked to participate in recon teams (overwhelmed with requests)
- Difficult for young, up and coming researchers to obtain experience, build skills, make contacts, etc.

5. Lack of Interdisciplinary Integration in Rapid Reconnaissance Teams



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5. Lack of Interdisciplinary Integration in Rapid Reconnaissance Teams

- Challenges facing all interdisciplinary collaboration compounded by time constraints of rapid reconnaissance studies
- Difficult to find team members from other disciplines (Anyone here a Sociologist?)
- Lack of a multi disciplinary database of rapid reconnaissance researchers that can be easily searched

SSEER SOCIAL SCIENCE EXTREME EVENTS RECONNAISSANCE

ISEEER INTERDISCIPLINARY SCIENCE & ENGINEERING EXTREME EVENTS RECONNAISSANCE

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Using GIS as a Tool to Coordinate Research Efforts *Before* Hazards and Disasters Occur

How can we use GIS to organize research efforts associated with the Preparation Phase of Disaster Management?

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Identifying Hazards and Disaster Researchers

1) Natural Hazards Center database of 4,000+ hazards and disaster researchers

2) North American Network of Hazards and Disaster Centers

3) Annual Natural Hazards Workshop (500 hazards and disaster specialists)

- Contact experts from these sources to determine if they are interested in participating.

- Gather information regarding (disciplinary background, expertise, phases of disaster studied, experience with reconnaissance research, etc.).

- Obtain IRB and other approvals that may be required beyond the existing IRB

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Examples of Research Coordination Networks (RCNs)

- RCNs have proliferated in recent years.
- Some are general and apply to a wide variety of individuals (LinkedIn, VIVO, etc.)
- Many are highly specialized, designed to organize researchers from very specific research domains.
- Academic funding agencies (NSF, NIH, etc.) are aggressively promoting the RCN model.

How can we improve RCNs with GIS?

LinkedIn

VIVO
connect • share • discover

MHRN Mental Health Research Network

TERN
LTERN
Long Term Ecological Research Network

BWR Hub
Boiling Water Reactor Research Network

RARE CLINICAL DISEASES RESEARCH NETWORK
Initiative of the National Center for Advancing Translational Sciences (NCATS)

PECARN
Pediatric Emergency Care Applied Research Network

OMPRN
Ontario Molecular Pathology Research Network

Collaborative Research Networks

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Science of Team Science (SciTS)

- Examines the processes by which scientific teams *organize, communicate,* and *conduct research*
- *Micro-level processes and macro-level conditions*
- Helps to understand how teams collaborate to achieve scientific breakthroughs that would *not be attainable* through either individual efforts or a sequence of additive contributions
- Provides insights into the best practices for forming research teams

How can we enhance the SSEER and ISEEER platforms by merging the best practices of SciTS for team formation with GIS tools?

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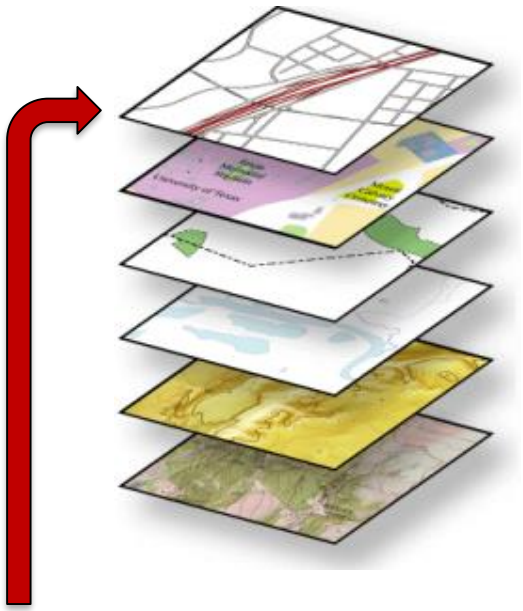
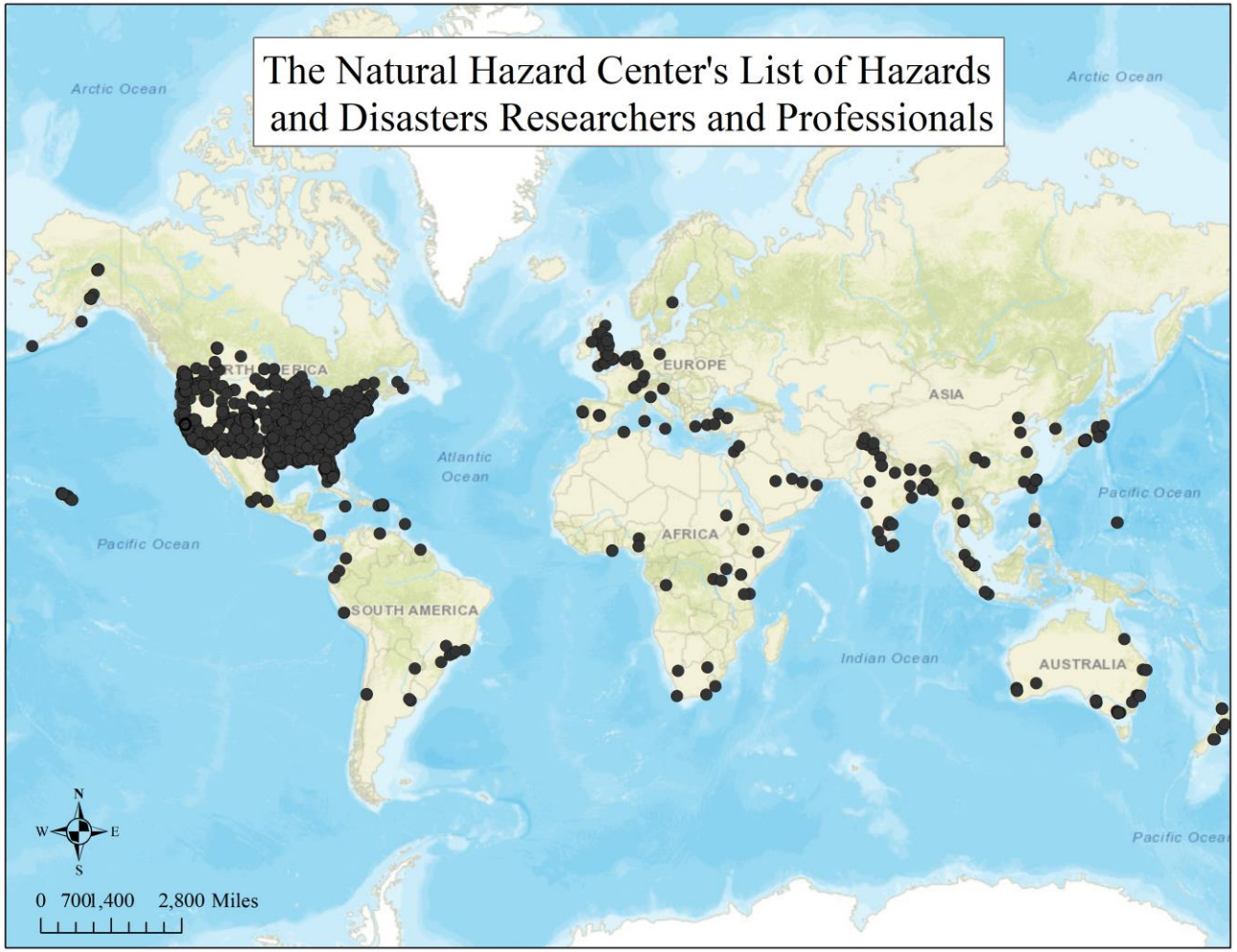
Layer 1 – Hazards and Disaster Researchers



Natural Hazards Center Database of > 4,000 Hazards and Disaster Researchers



Where are the hazards and disaster researchers located? What are their areas of expertise?

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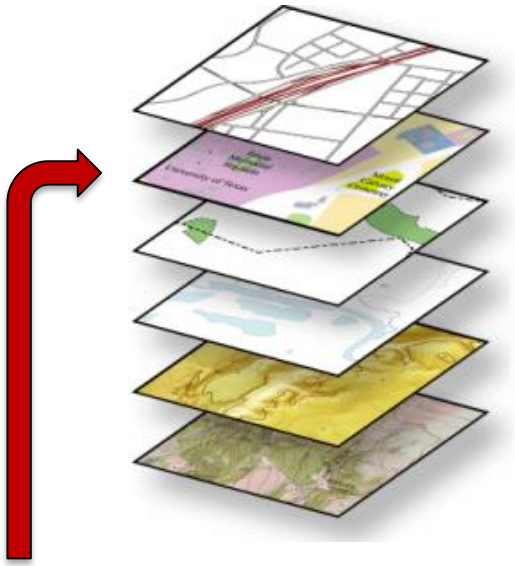
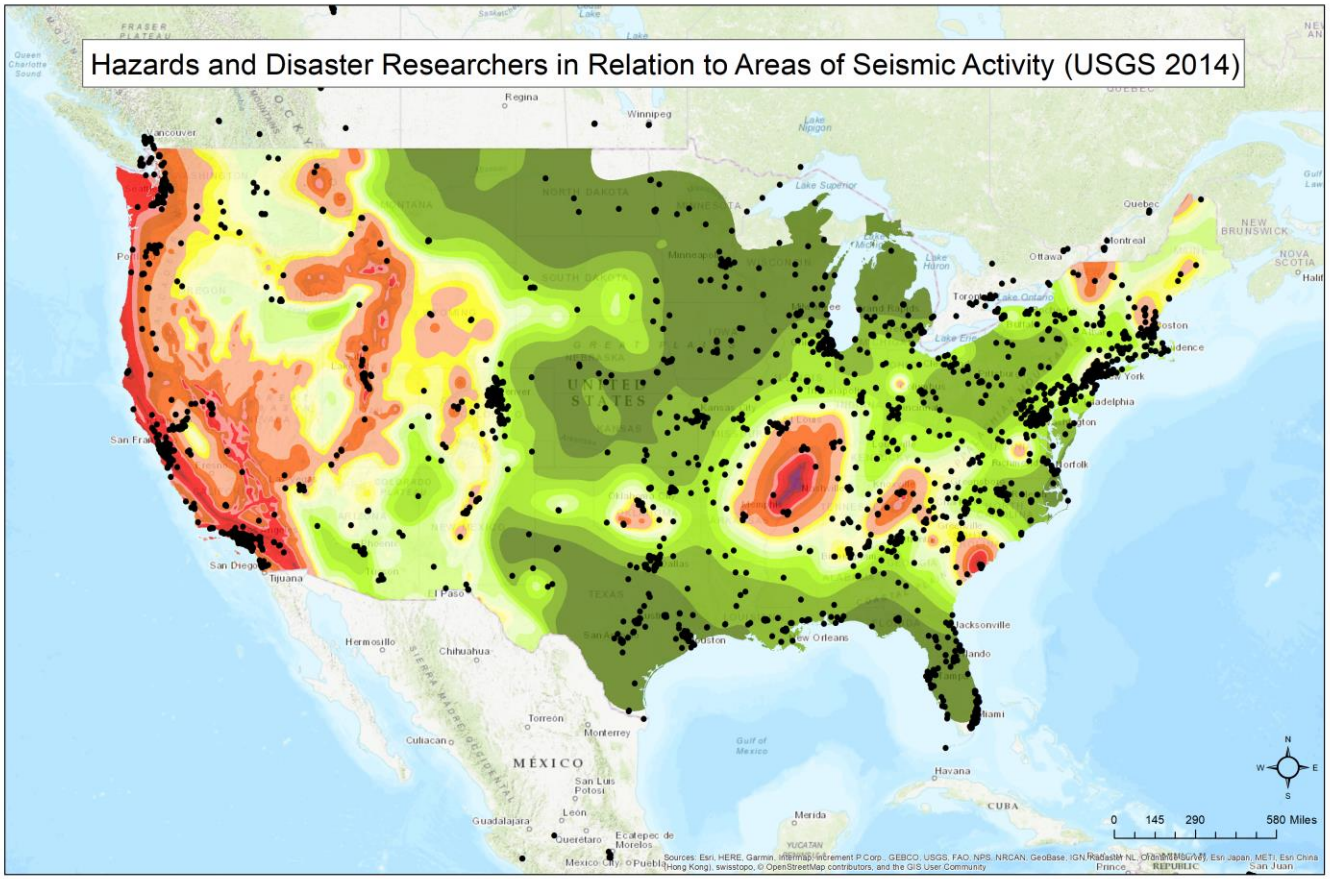
Layer 2 – Hazards and Disaster Areas of Risk



Natural Hazards and Disasters
Areas of Occurrence and Risk



What is the spatial relationship between hazards and disaster researchers and zones of risk for different types of hazards? Not just earthquakes, could be flood zones, tornado allies, etc.

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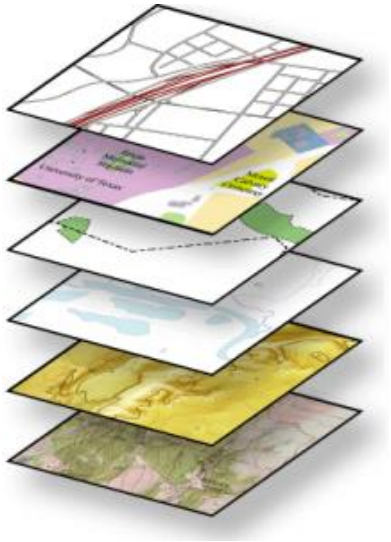
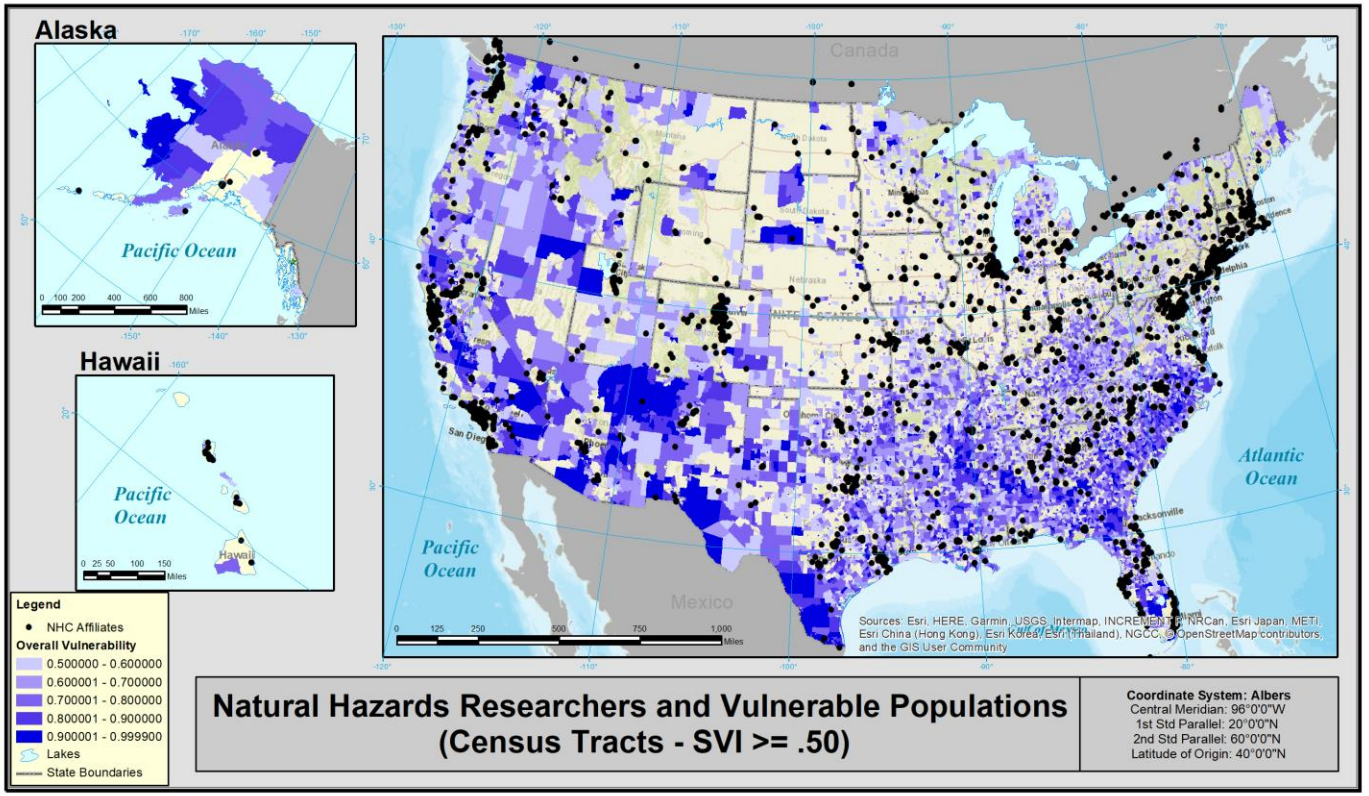
Layer 3 – CDC Social Vulnerability Index



Location of Vulnerable Populations at Risk from Hazards and Disasters



Where are hazards and disaster researchers in relation to the most vulnerable populations?

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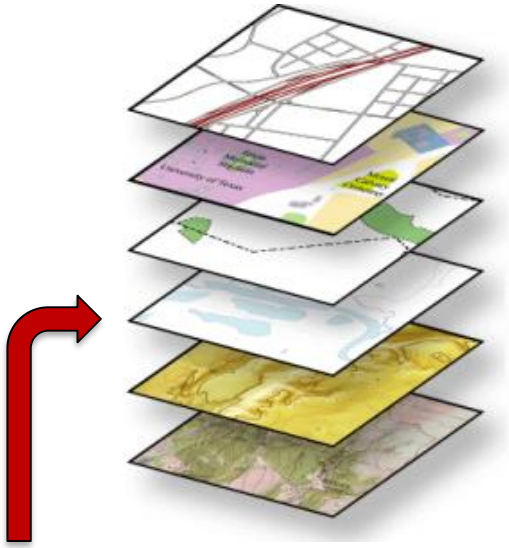
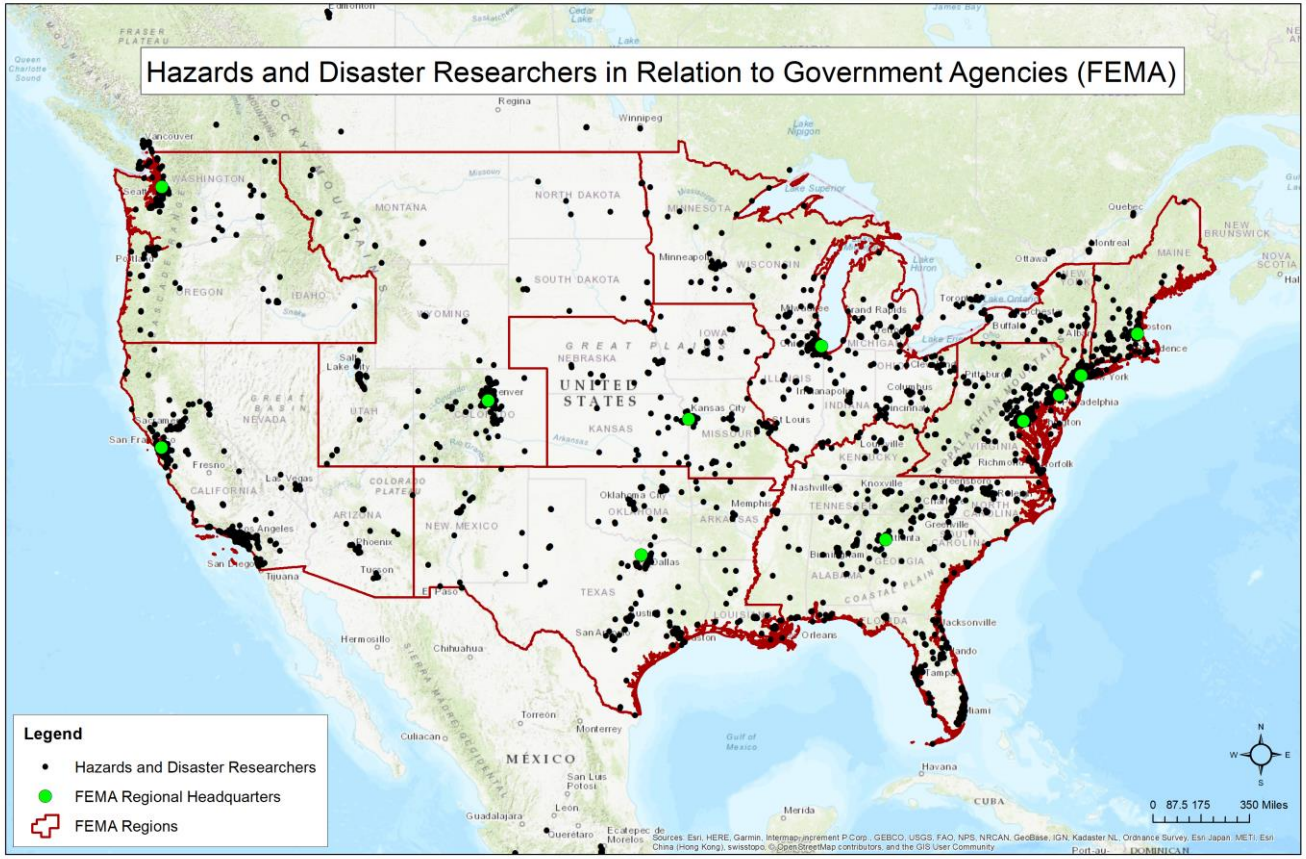
Layer 4 – Spatial Location of Partners and Hazard Management Jurisdictions



Location of Partner Agencies and Jurisdictions



How do hazards and disaster researchers cluster in relation to agencies and their jurisdictions?

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Using GIS as a Tool to Coordinate Research Efforts *During and After* Hazards and Disasters Occur

How can we use GIS to facilitate the formation of hazards and disaster reconnaissance teams during and after events occur?

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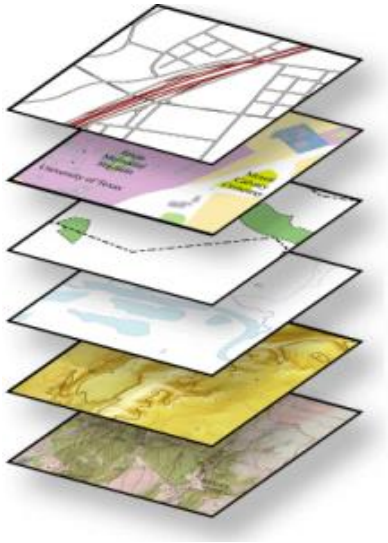
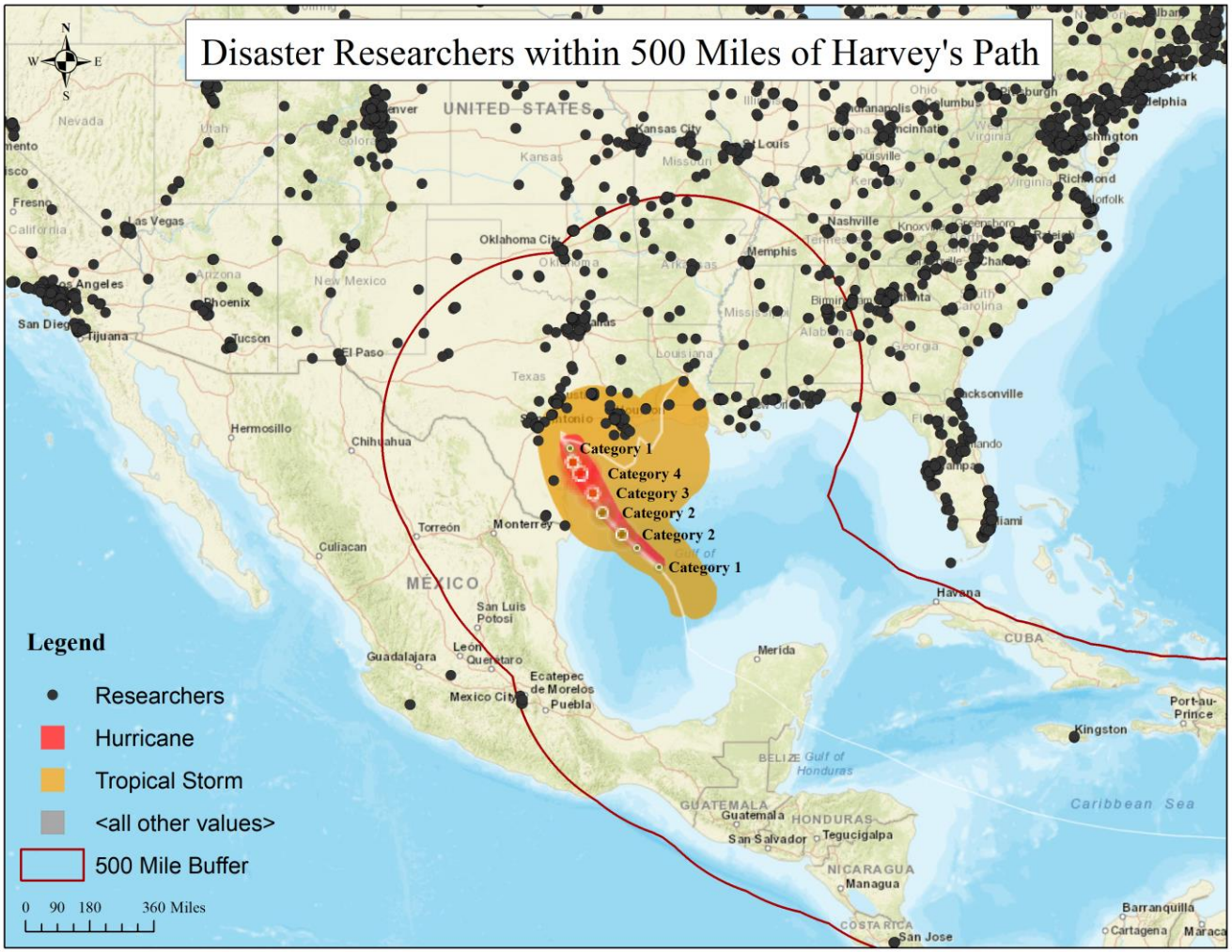
Layer 5 – Spatial Location of Specific Disasters as they Unfold



Location of Specific Disasters



What is the spatial distribution of hazards and disaster researchers in relation to specific disaster events?

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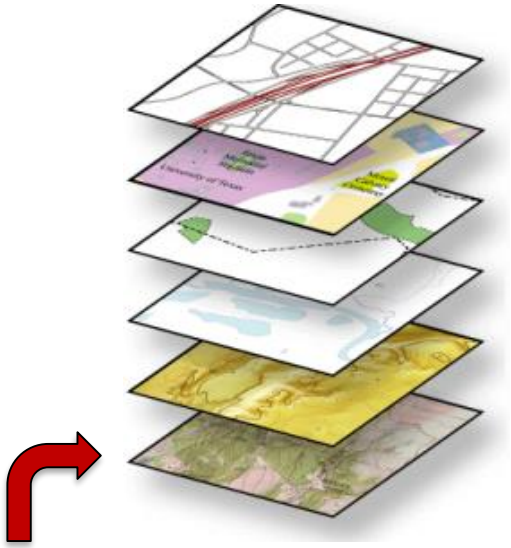
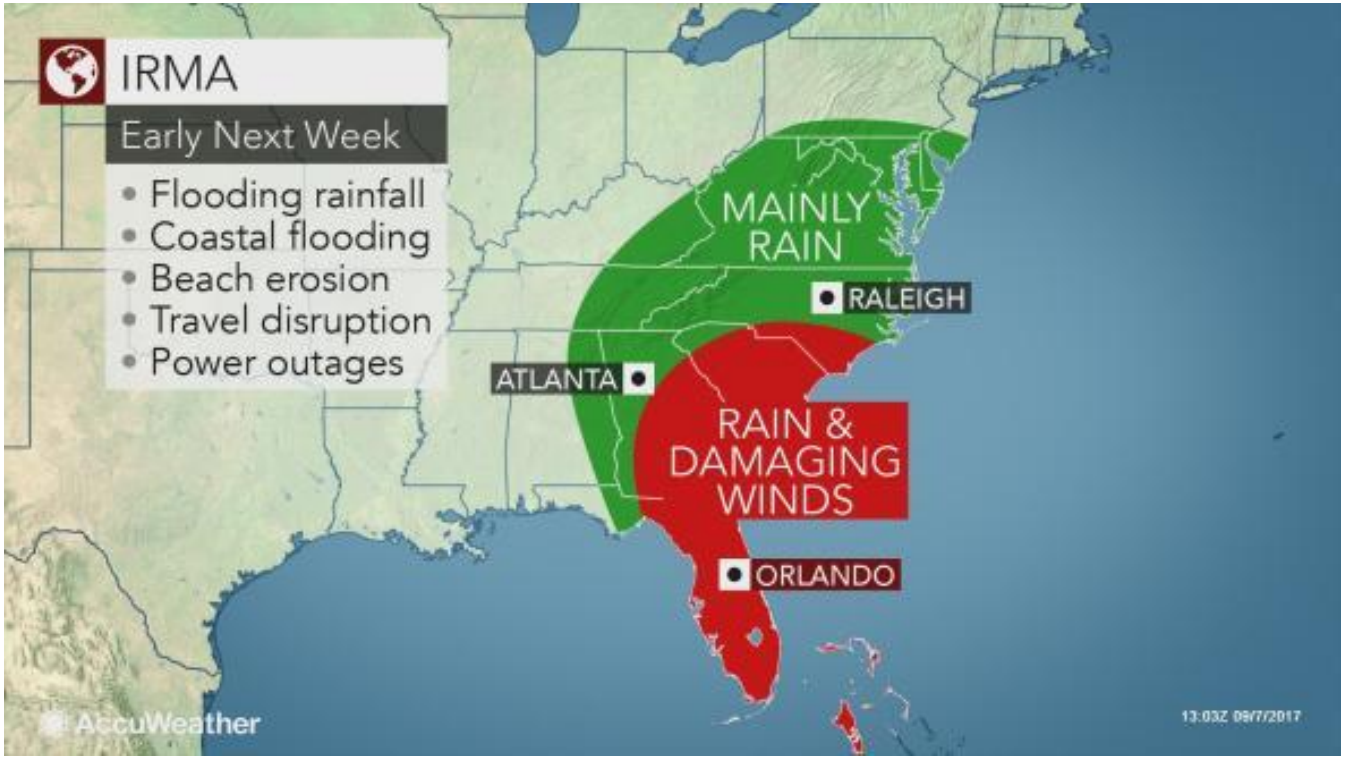
Layer 6 – Real Time Layer of Weather Conditions (AccuWeather)



Up-to-date weather conditions



How can we incorporate real time information into these platforms? Extreme weather events can change locations rapidly (projected path vs actual path).

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Questions Moving Forward

-What other layers do we need?

-How else can we use the layers together?

-How do we provide the most useful tools for researchers?

-How can these platforms be used in conjunction with existing tools, apps, etc. developed for similar purposes?

-Will these tools work best as a website portal, phone apps, etc.?

-Will researchers consent to being mapped? How can this be done without negative unforeseen outcomes? Should researcher locations be degraded slightly to protect identities if so, how will this affect the usefulness of the portal?

-How can these data layers be made to work in real time to account for the time constraints facing rapid reconnaissance researchers?

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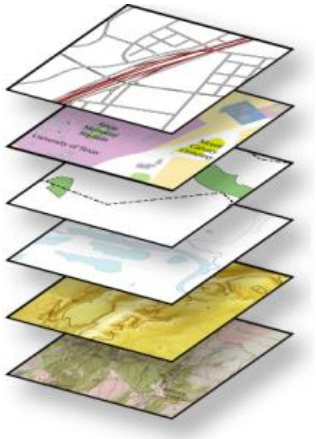
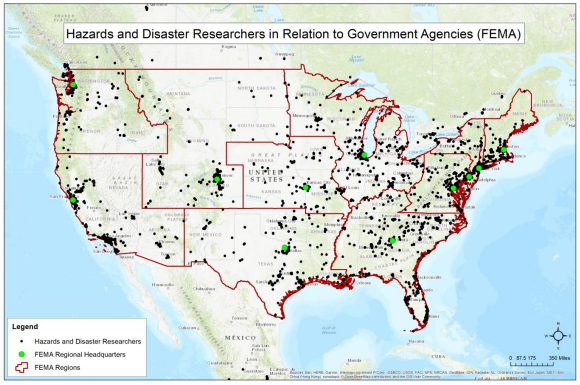
Thank You!

How can we collaborate even more effectively as social scientists and in interdisciplinary teams to conduct disaster research?





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GIS Data Sources

CDC / Social Vulnerability Index – https://svi.cdc.gov/SVIDataToolsDownload.html

USGS / Seismic Activity Zones – https://earthquake.usgs.gov/hazards/hazmaps/

FEMA Regions – https://gis.fema.gov/DataFeeds.html

ESRI Online (Harvey Path) – https://www.nhc.noaa.gov/gis/archive_forecast_results.php?id=al09&year=2017&name=Hurricane%20HARVEY

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