

# Bringing People into the Flood Risk Management Equation - Understanding Social Vulnerability



**Mitch Paine,** King County, Washington



**Lori Peek,** Department of Sociology and Natural Hazards Center, University of Colorado Boulder

# Session Overview

- What is social vulnerability? Why does it matter and how do we measure it?
- Social vulnerability, risk perception, and floods
- A social vulnerability scenario and a call to action
- Resources



# What is social vulnerability?

- (1) Refers to the differential *susceptibility* of social groups or populations to potential losses from hazard events
- (1) Refers to *the lack of capacity* of people, organizations, and societies to withstand *adverse impacts from multiple stressors* to which they are exposed

**Which groups are most socially vulnerable?**

# Vulnerable Population Examples



Children



Persons with  
chronic illnesses



Older adults



Marginalized  
populations



Pregnant,  
postpartum, and  
lactating women



Persons with Limited  
English Proficiency



Persons with  
disabilities



Persons  
experiencing  
homelessness

# People are *not* inherently vulnerable



**Social vulnerability is about recognizing a gap between *resources*, *structural capacity*, and *exposure***



**Social vulnerability is about recognizing a gap between *resources*, *structural capacity*, and *exposure***





# Social vulnerability is about recognizing a gap between *resources*, *structural capacity*, and *exposure*

PEW


TOPICS PROJECTS FEATURES ABOUT GET INVOLVED SEARCH

## Nearly 4 Million Students Attend Schools in Flood-Risk Areas


New research maps affected counties, offers policy solutions

ARTICLE August 1, 2017 By Laura Lightbody Topics: U.S. Policy, Infrastructure & Land Conservation Projects: Flood-Prepared Communities Tags: Floods Read time: 5 min

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**AUTHORS**

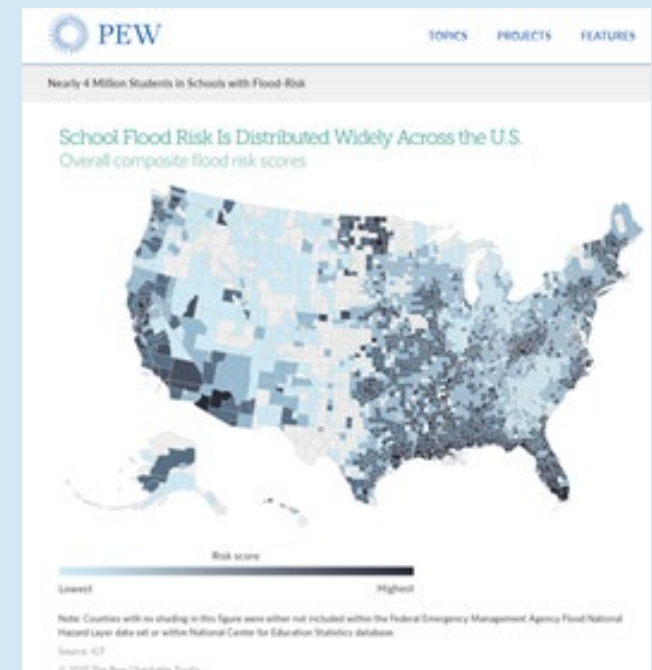
 Laura Lightbody  
Project Director  
Flood-Prepared Communities

**RELATED RESOURCES**

- Interactive: Schools in all 50 States Face Flood Challenges
- Chartbook: Flooding Threatens Public Schools Across the Country



Floods last year in West Virginia caused \$100-million in damage to regional schools, including the baseball field at Herbert Hoover High School in Clendenin.



# Why are some groups disproportionately vulnerable to death, injury, harm, suffering, and loss in a disaster?

## Vulnerable Population Examples



Children



Persons with chronic illnesses



Older adults



Marginalized populations



Pregnant, postpartum, and lactating women



Persons with Limited English Proficiency



Persons with disabilities



Persons experiencing homelessness

# Why are these groups disproportionately vulnerable?

- Fewer economic resources
- Fewer social networks / more socially isolated
- Less power and influence

## Vulnerable Population Examples



Children



Persons with chronic illnesses



Older adults



Marginalized populations



Pregnant, postpartum, and lactating women



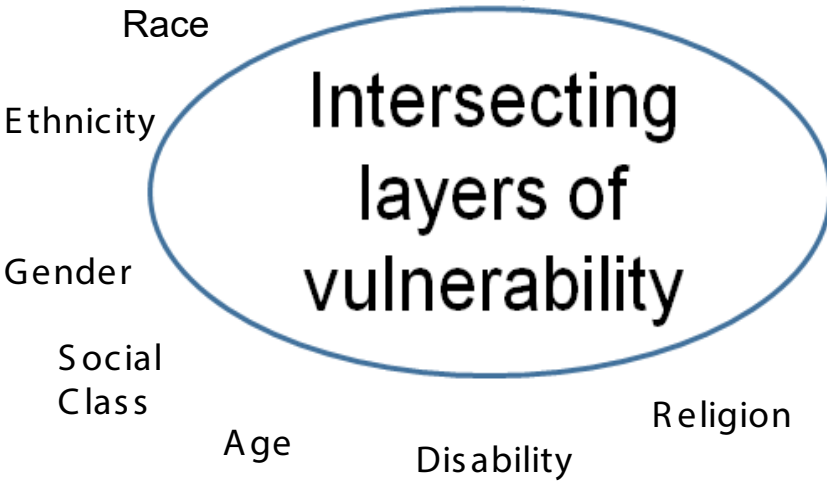
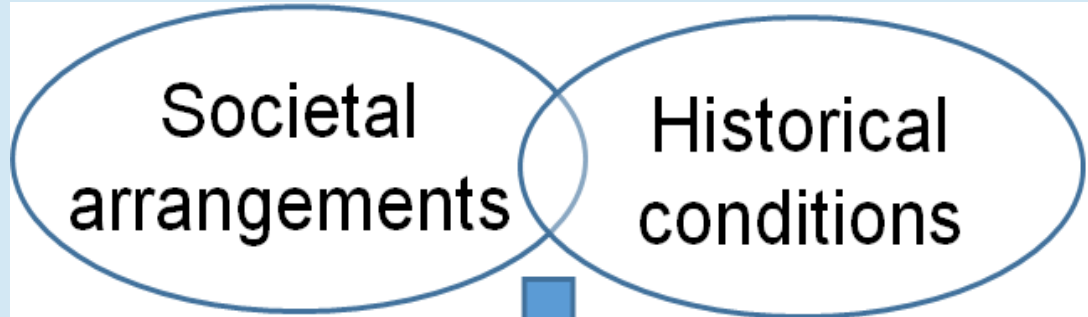
Persons with Limited English Proficiency



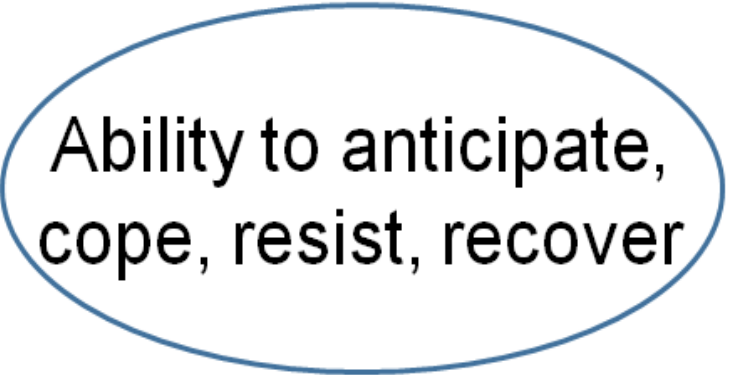
Persons with disabilities



Persons experiencing homelessness



**Social Vulnerability**



Converge. (2019). *Social Vulnerability and Disasters*. <https://converge-training.colorado.edu/courses/vulnerable-populations/>.



# 'Heat islands': racist housing policies in US linked to deadly heatwave exposure

Deadly 'heat islands' which have fewer green spaces and tree canopy linked to racist policies in urban neighborhoods, study finds

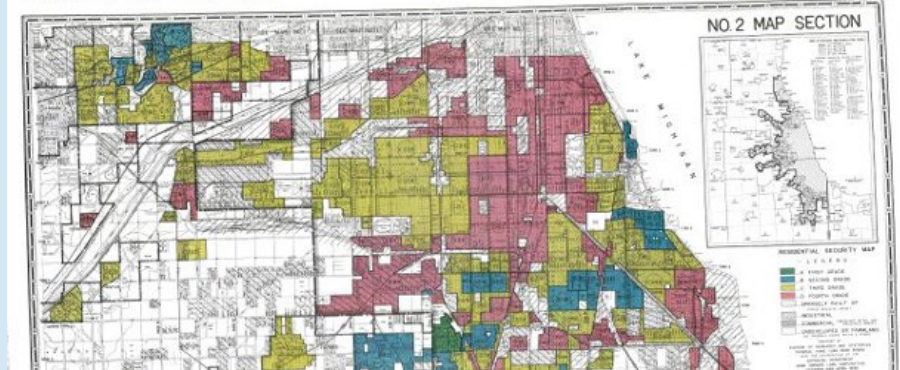
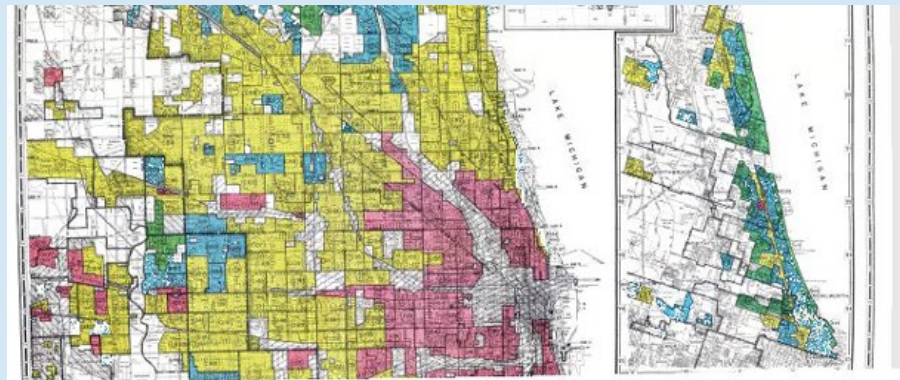


The picture shows a view of a street in an urban neighborhood. It is a view of a street in an urban neighborhood, showing a brick building, a bus stop shelter, and a tree.

Deadly urban heatwaves disproportionately affect underserved neighborhoods because of the legacy of racist housing policies which have denied African Americans home ownership and basic public services, a landmark new study has found.

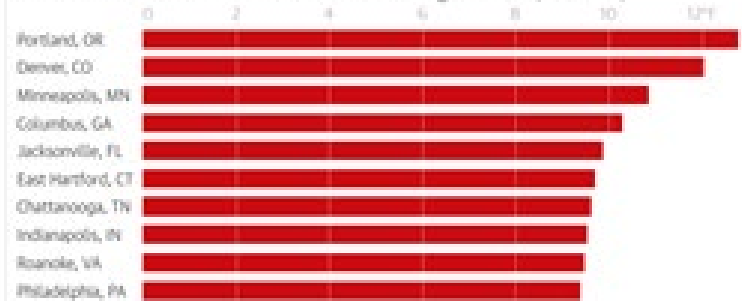
Extreme heat kills hundreds of people in the US every year - more than any other hazardous weather event, including hurricanes, tornadoes and flooding, according to the Centers for Disease Control. Heatwaves have been occurring more frequently since the mid-20th century, and are expected to become more common, more intense and longer lasting due to the climate crisis.

However, exposure to extreme heat is unequal: temperatures in different neighborhoods within the same city can vary by 20F. It is mostly lower-income households and communities of color who live in these urban 'heat



## A new study found that temperatures in formerly redlined and non-redlined neighborhoods within cities differ by up to 12.6°F

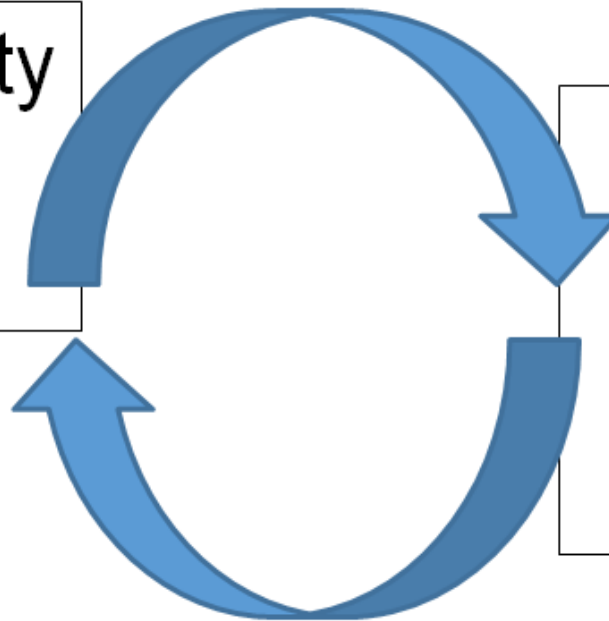
Heat differences between redline and non-redlined neighborhoods (Fahrenheit)



Guardian graphic | Researchers from the Science Museum of Virginia, Portland State University and Virginia Commonwealth University

# Vicious Cycle

Social Vulnerability  
and Economic  
Inequality



Adverse  
disaster  
outcomes

- Physical health
- Mental health



# What does a social vulnerability lens help us to see?



**Risk** = Hazard Exposure x Physical *and* Social Vulnerability / Capacity






	<b>Social Vulnerability</b>	<b>Physical Vulnerability</b>
<b>Focus</b>	Socioeconomic, political, and historical influences that contribute to hazard losses	Physical processes of the hazard
<b>Approach</b>	Studies social conditions to address the social and personal impact of the hazard	Uses technology, engineering, and science to address the hazard
<b>Perspective</b>	Community-based problem solving	Problem solving through scientific authority
<b>Goal</b>	Reduce social and economic inequality and injustice	Reduce physical damage

# Methodological Approaches

- Secondary Data Approaches: U.S. Census, SoVI, CDC Social Vulnerability Index

 MODULES RESOURCES LOG OUT

**EXAMPLE**  
|| Hazus & SoVI

Schmidtlein and colleagues conducted a study to examine the relationship between social vulnerability and estimated earthquake losses in Charleston, South Carolina.<sup>2</sup> Their multi-step analysis involved the use of both [FEMA's Hazus](#) software and the University of South Carolina's [Social Vulnerability Index \(SoVI®\)](#).<sup>2</sup>

Using the *Hazus* software, the researchers first predicted earthquake losses (amount of debris generated and direct economic costs) in Charleston. Then, the social vulnerability of the area was modeled using the *SoVI®*. Overall, their findings revealed significant relationships between social vulnerability and predicted earthquake losses, as areas with high levels of social vulnerability had higher predicted economic losses.<sup>1</sup>

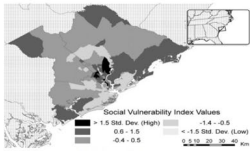
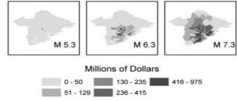
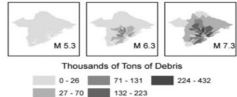


Fig. 6. Social Vulnerability Index Values for Charleston.

Source: Schmidtlein, Shafer, Berry, & Cutter, 2011

## CDC's Social Vulnerability Index (SVI)

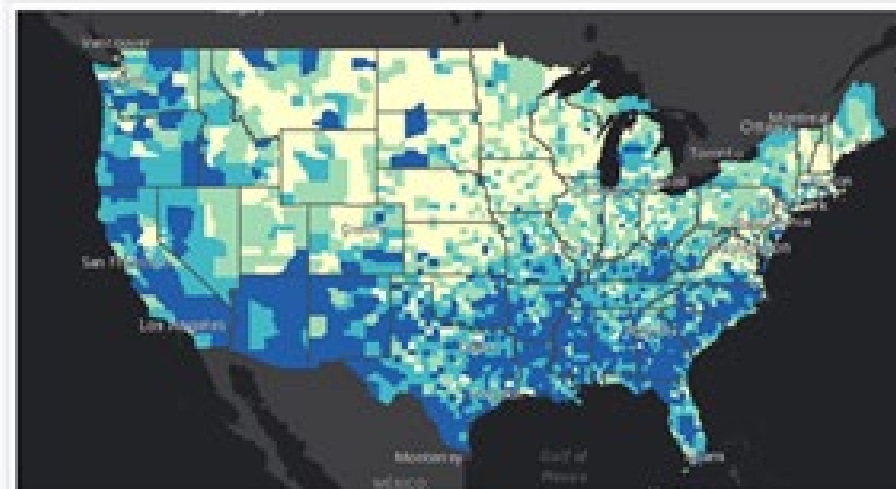


### What is the SVI?

Social vulnerability refers to the resilience of communities when confronted by external stresses on human health, stresses such as natural or human-caused disasters, or disease outbreaks. Reducing social vulnerability can decrease both human suffering and economic loss. CDC's Social Vulnerability Index uses 15 U.S. census variables at tract level to help local officials identify communities that may need support in preparing for hazards or recovering from disaster.

The Geospatial Research, Analysis, and Services Program (GRASP) created and maintains CDC's Social Vulnerability Index.

Contact the [SVI Coordinator](#) with comments or questions.

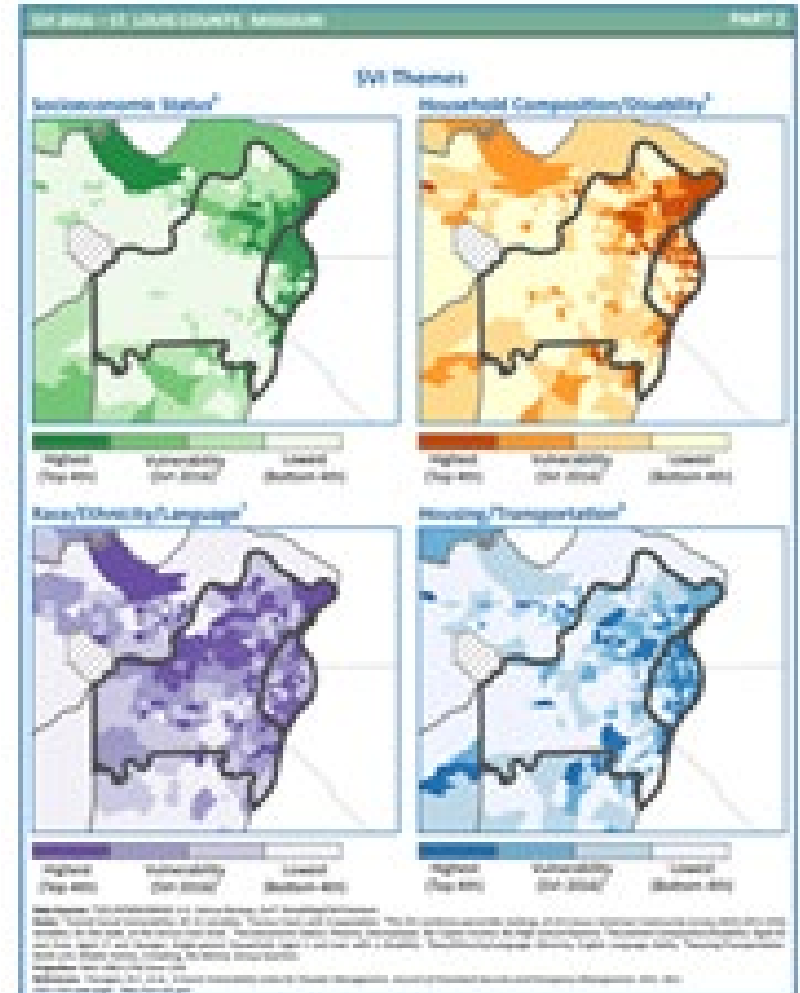
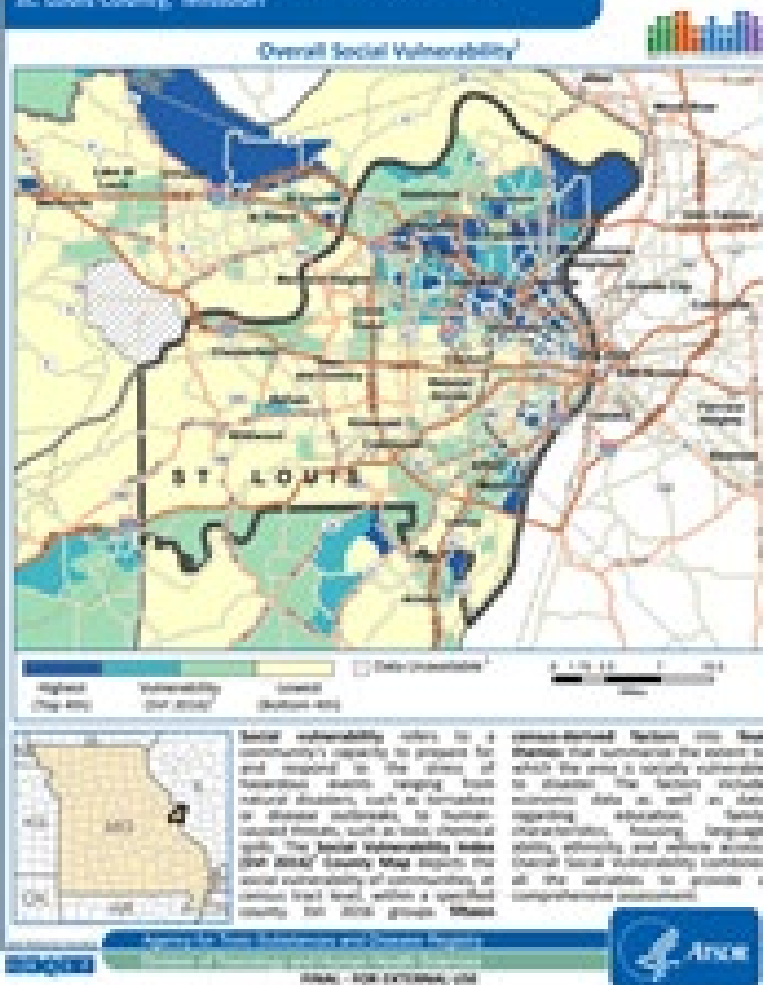


SVI Interactive Map

## CDC's Social Vulnerability Index 2016

St. Louis County, Missouri

Sheet 1



# Methodological Approaches

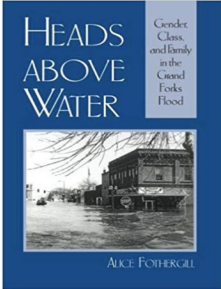
- **Secondary Data**  
Approaches: U.S. Census, SoVI, CDC Social Vulnerability Index
- **Qualitative:** interviews, focus groups, observations, photovoice, content analysis

CONVERGE can also empower disenfranchised populations by providing them with a voice to share their unique disaster experiences. <sup>1</sup> MODULES

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EXAMPLE  
|| Ethnography

*Heads Above Water: Gender, Class, and Family in the Grand Forks Flood* is an *ethnographic* book that tells the stories of women and their families who survived the Grand Forks, North Dakota Flood of 1997. Their stories highlight the upheaval of women and families, the emotional and physical trauma of the floods, and experiences with loss, vulnerability, and violation. <sup>2</sup> Fothergill conducted *in-depth interviews* with local women to explore how gender, class, race, sexual orientation, and disability impact disaster recovery. Through the experiences of these women, she explores the challenges women face in the disaster context, including the stigma of needing and receiving assistance, stressful family relationships, domestic violence, and economic insecurity. <sup>2</sup>



Source: Fothergill, 2004


# Methodological Approaches

- **Secondary Data**  
Approaches: U.S. Census, SoVI, CDC Social Vulnerability Index
- **Qualitative:** interviews, focus groups, observations, photovoice, content analysis
- **Quantitative:** random, probability based sampling techniques, surveys

CONVERGE

MODULES RESOURCES

EXAMPLE  
|| Longitudinal Survey Research




*The Gulf Long Term Follow-Up Study* is a *longitudinal* examination of the long-term health impacts of the Deepwater Horizon oil spill. The study collected *telephone survey* data from adult participants who helped with the oil spill clean up, or who took trainings, signed up to work, or were sent to the Gulf to help with the disaster. A subset of participants additionally received *questionnaires* on physical and

# Methodological Approaches

- **Secondary Data**  
Approaches: U.S. Census, SoVI, CDC Social Vulnerability Index
- **Qualitative:** interviews, focus groups, observations, photovoice, content analysis
- **Quantitative:** random, probability based sampling techniques, surveys
- **Mixed Methods Approaches**

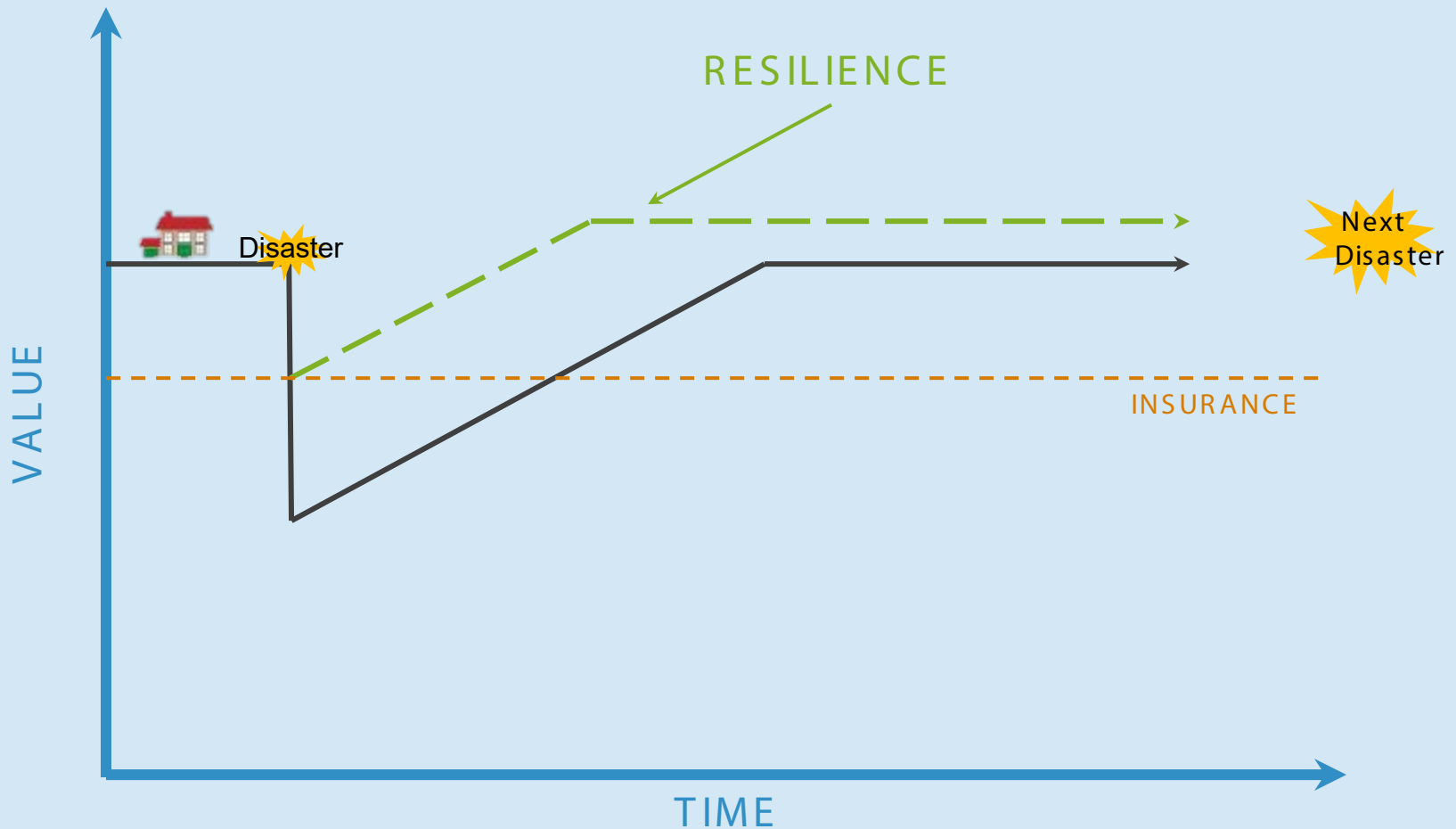
CONVERGE  
MODULES

EXAMPLE  
|| Mixed Methods



In their study of race, class, and capital among Hurricane Katrina evacuees, Barnshaw and Trainor used mixed methods research to examine how social inequalities that existed prior to the hurricane influenced

# What is “flood resilience?”





# Flooding

An aerial photograph showing a residential area that has been severely flooded. The water is murky and has reached the roofs of several houses. In the foreground, a large, rusted metal structure, possibly a collapsed roof or a piece of machinery, is partially submerged. The background shows a wide expanse of water and distant hills under a cloudy sky.

- Causes long-term damage to home/property
  - Reduces wealth
- Poses health risks
- Lasts for many days
- Difficult bureaucracy of flood insurance
- Bias to ignore risk
- Complicated hazard to understand
- Misconceptions of insurance coverage vs disaster relief

# Fundamental Question

**Who lives in floodplains?**



# Indicators of Social Vulnerability

## ➤ Demographic characteristics

- Age, race/ethnicity, family structure, gender, language proficiency

## ➤ Socioeconomic status

- Income, wealth, education, occupation

## ➤ Land tenure

- Owners, renters

## ➤ Health

- Access, stress, disease, mortality, sanitation

## ➤ Neighborhood characteristics

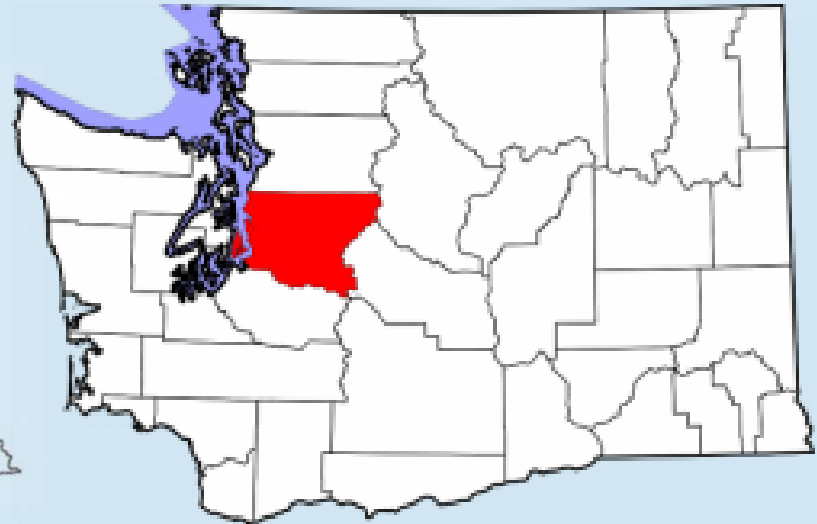
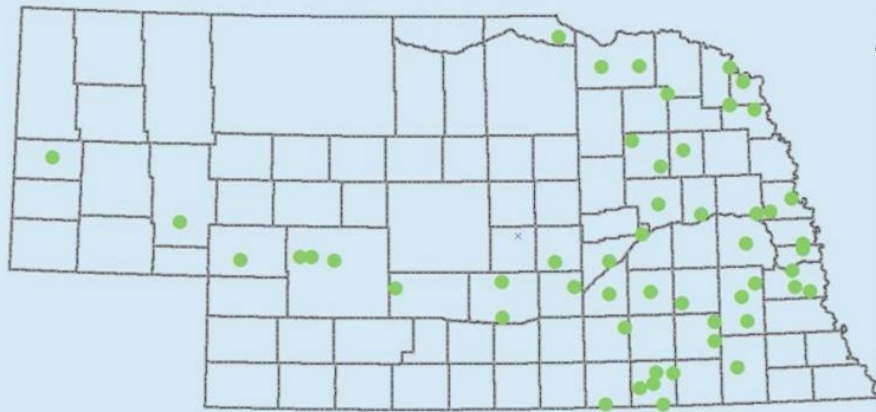
- Transportation, population density, housing, resource dependency

## ➤ Risk perception

- Awareness, prior experience, knowledge of flood protection, risk denial/acceptance, trust in officials

# Two Case Studies

- Tried to answer this question in Nebraska & King County, Washington



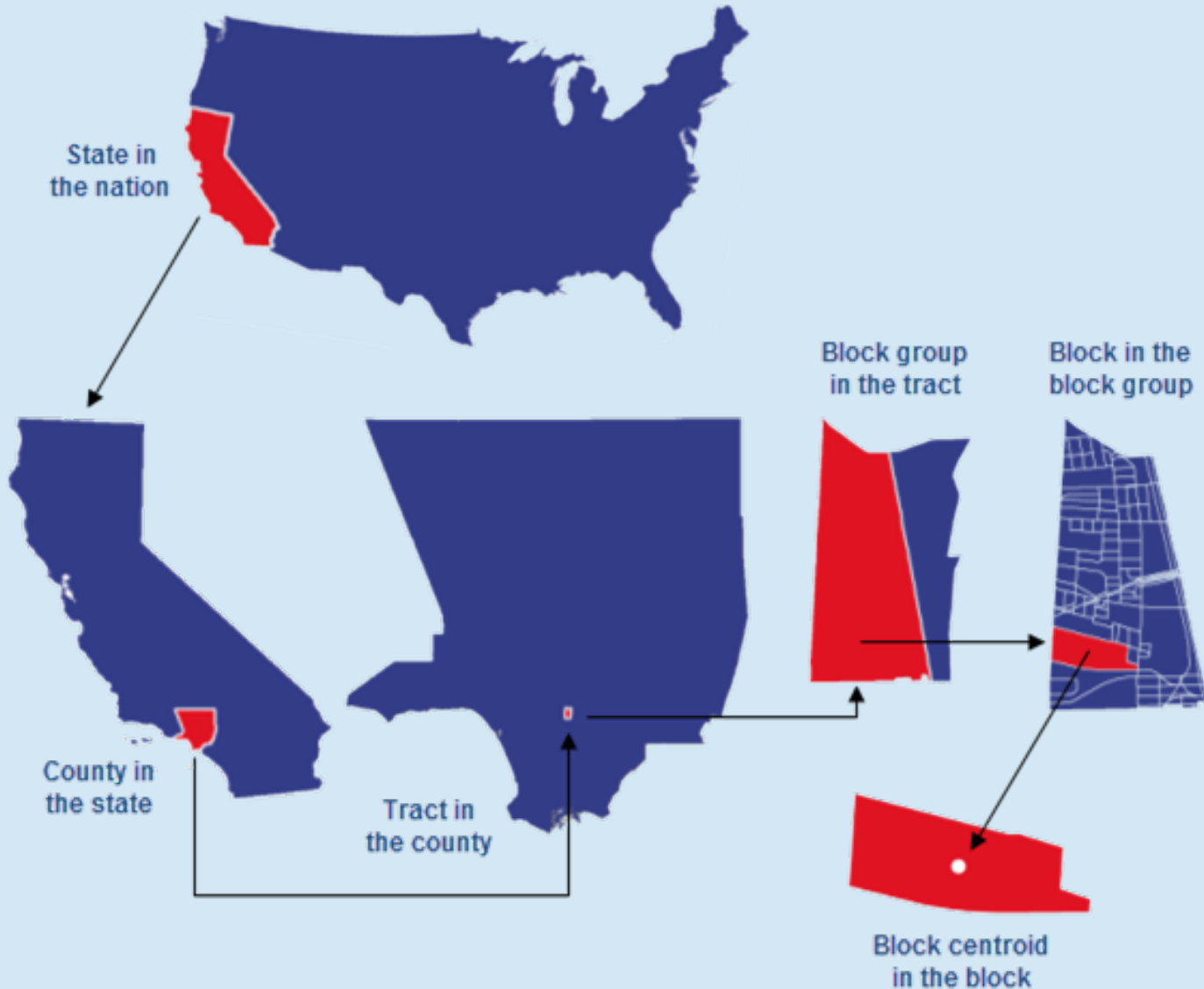
# Data Focus

- What available data can we use to help us answer the question?
  - Census?
  - Local data?
- What flood risk factors should we include?
- What conclusions can be drawn based on an imperfect set of data?

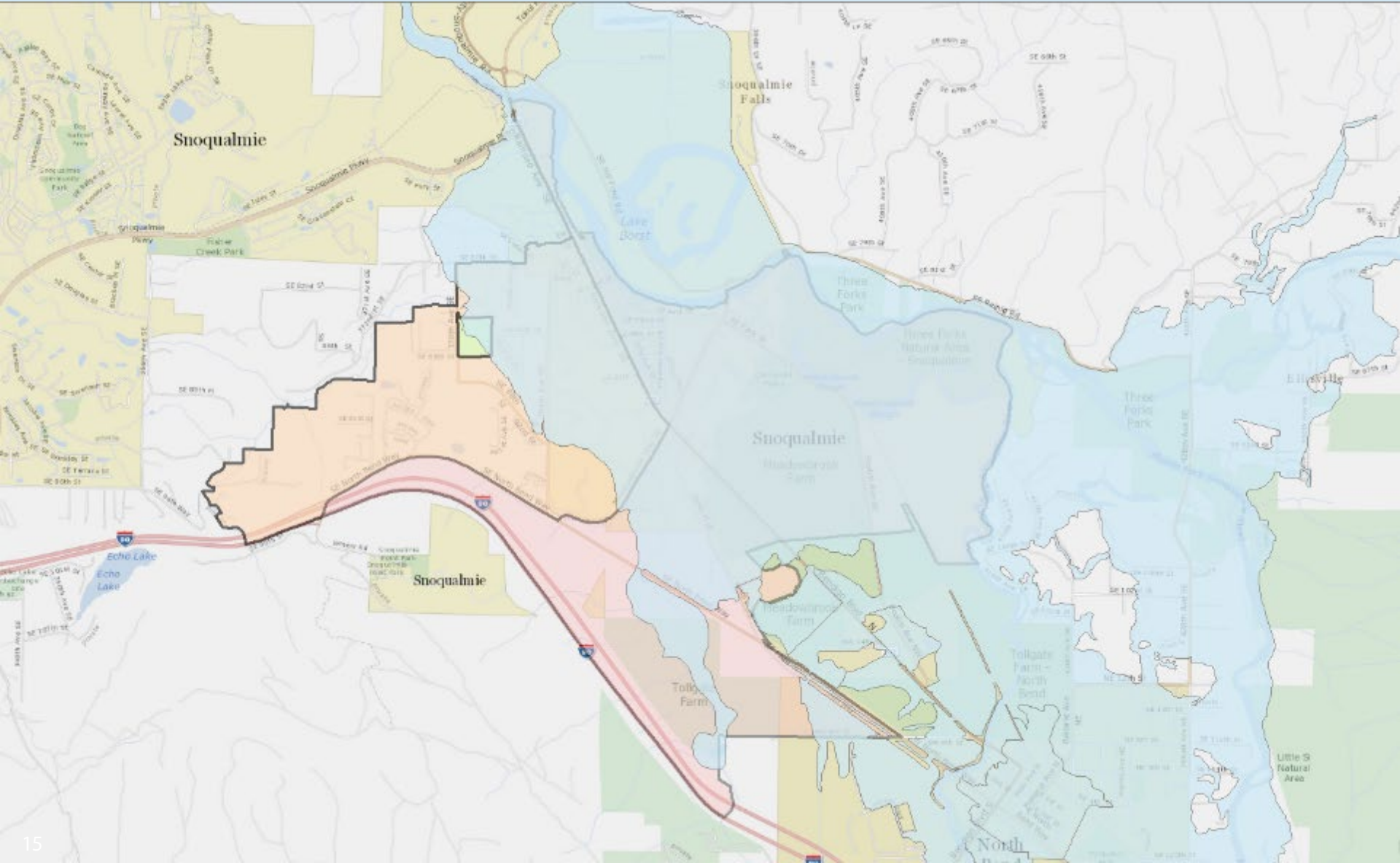
# Data

- U.S. Census– Conducted every 10 years, counts everyone
  - **Housing:** occupancy status, tenure
  - **Household structure:** size, type
  - **Demographics:** race/ethnicity, gender, age
- American Community Survey – Conducted annually, statistical sample of households
  - Income
  - Home value
  - Languages spoken
  - Commute time

# Geography of Census Data



# Floodplain Overlay



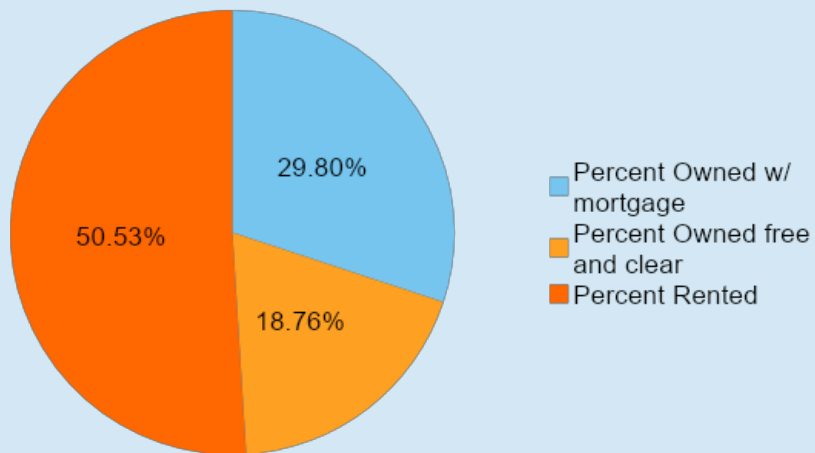


# Census Block 1028

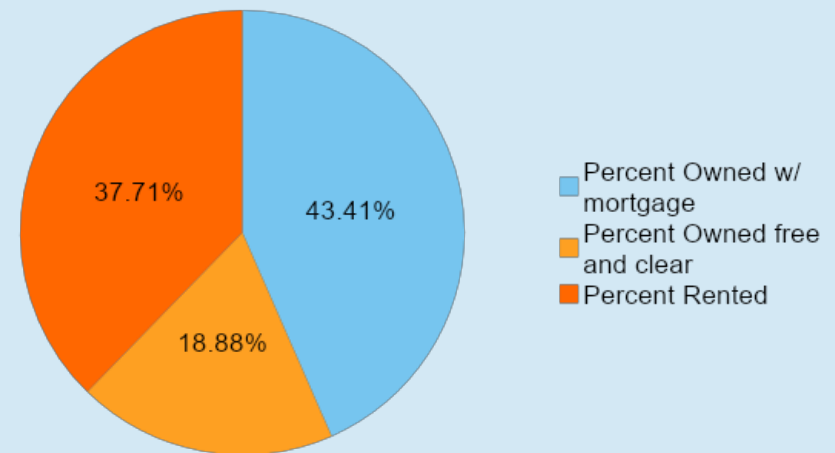


# Housing - Tenure (Nebraska)

## Floodplain

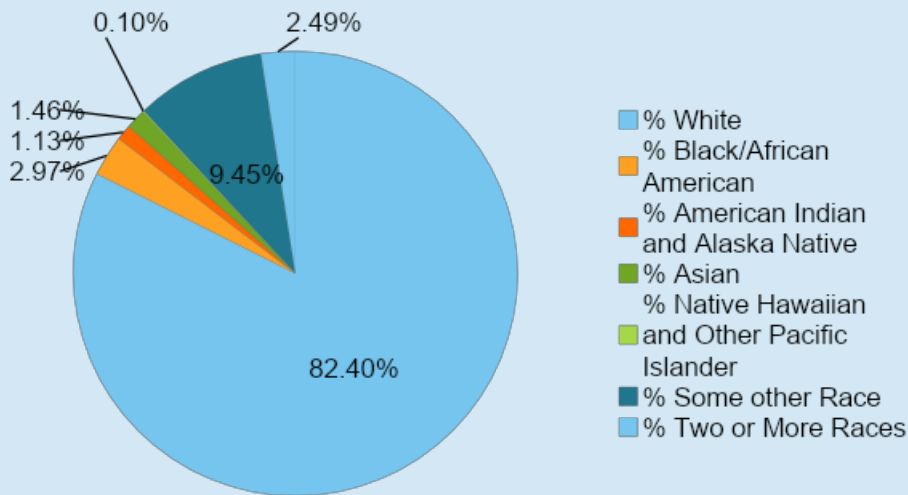


## Not Floodplain

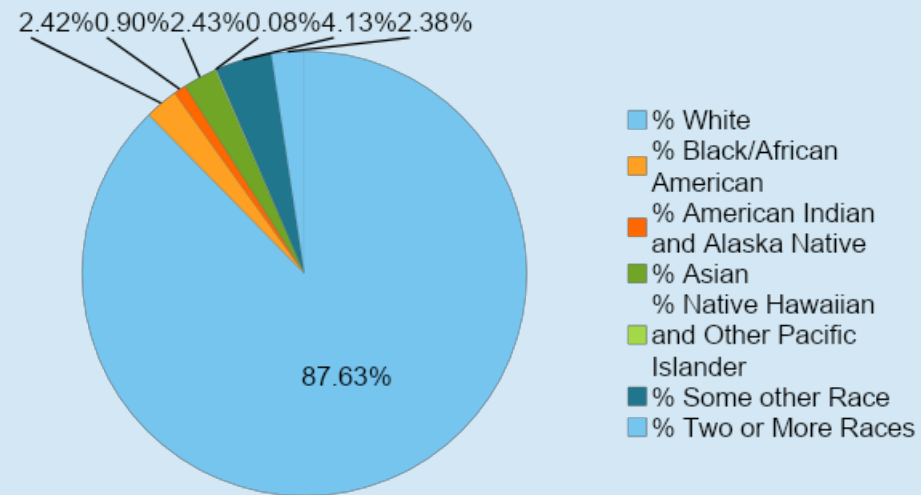


# Demographics – Race/Ethnicity (Nebraska)

## Floodplain

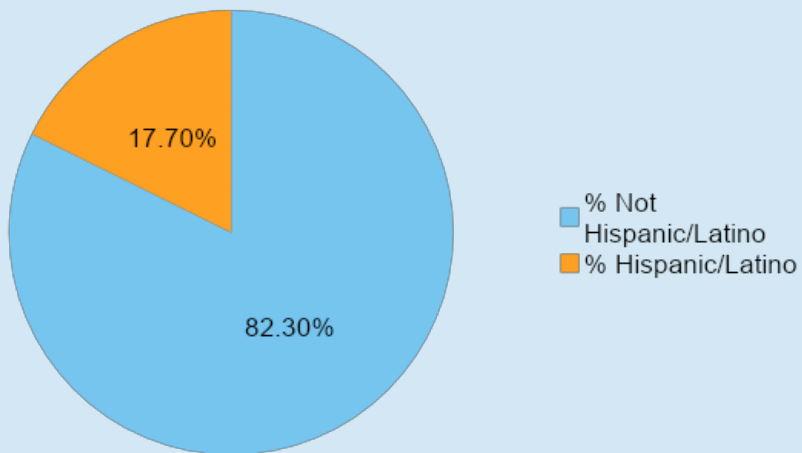


## Not Floodplain

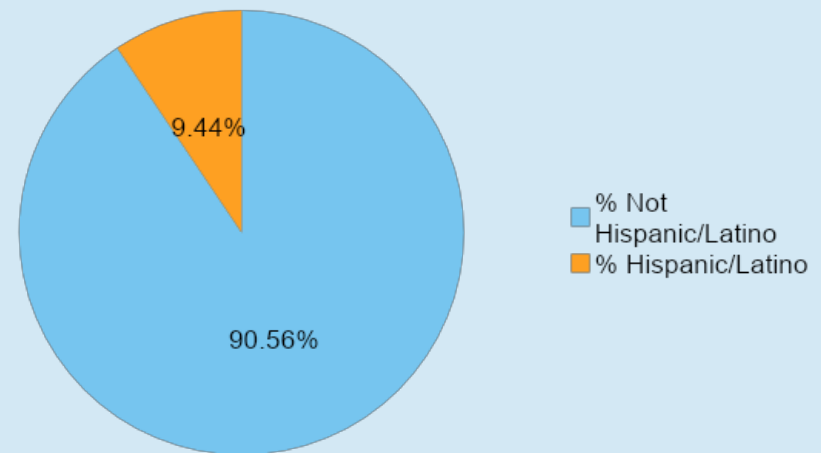


# Demographics – Hispanic/Latino (Nebraska)

Floodplain



Not Floodplain



# Lincoln Results

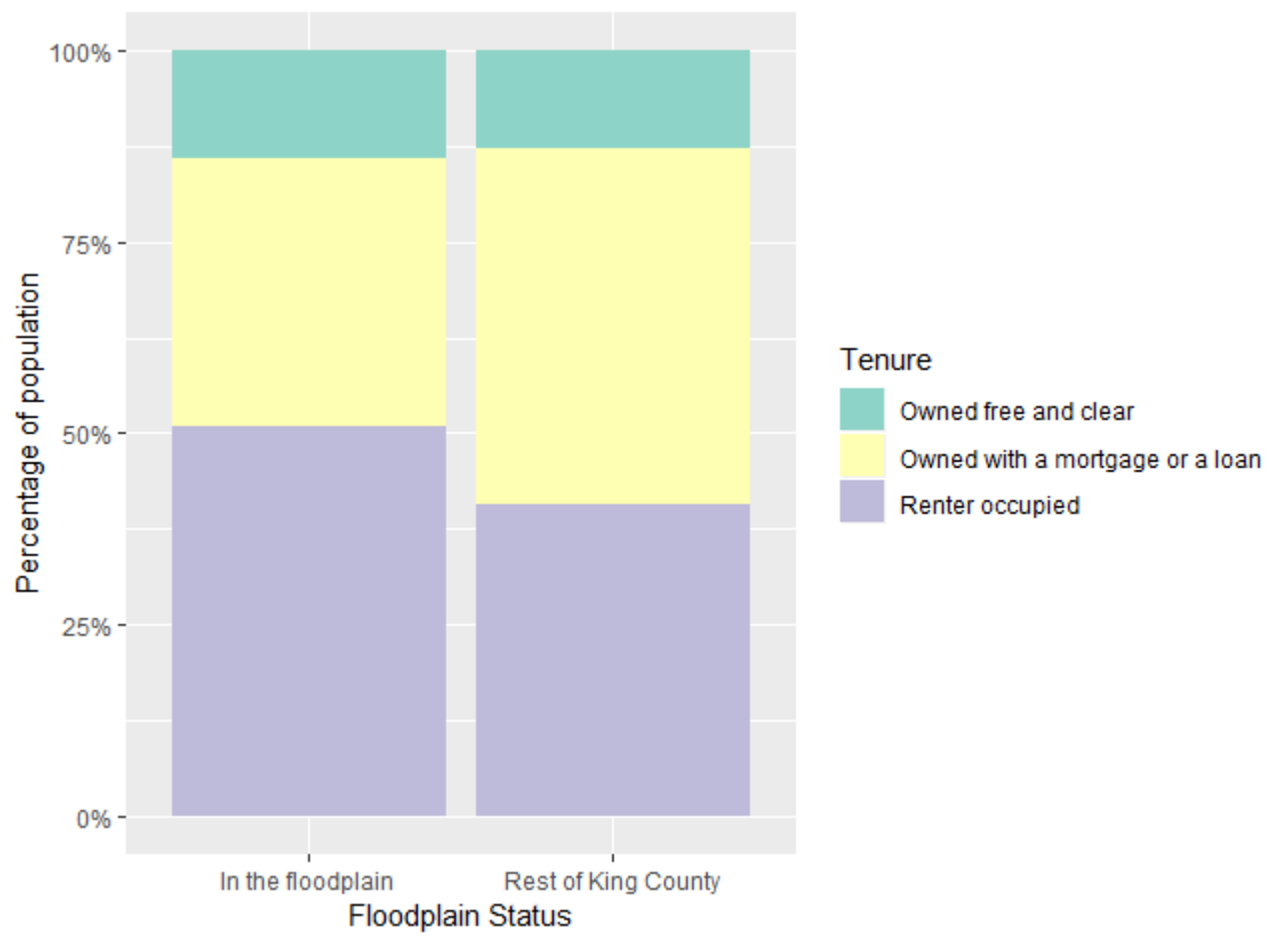
## ➤ Significant factors:

- 16,000 people live in floodplains
- 68% rent in floodplains, 40% in community
- Double the percentage of African American and American Indian/Alaska Native in floodplain
- 12% Hispanic/Latino in floodplain, 6% in community
- 55% nonfamily households in floodplain, 40% in community

# Renters in Floodplains

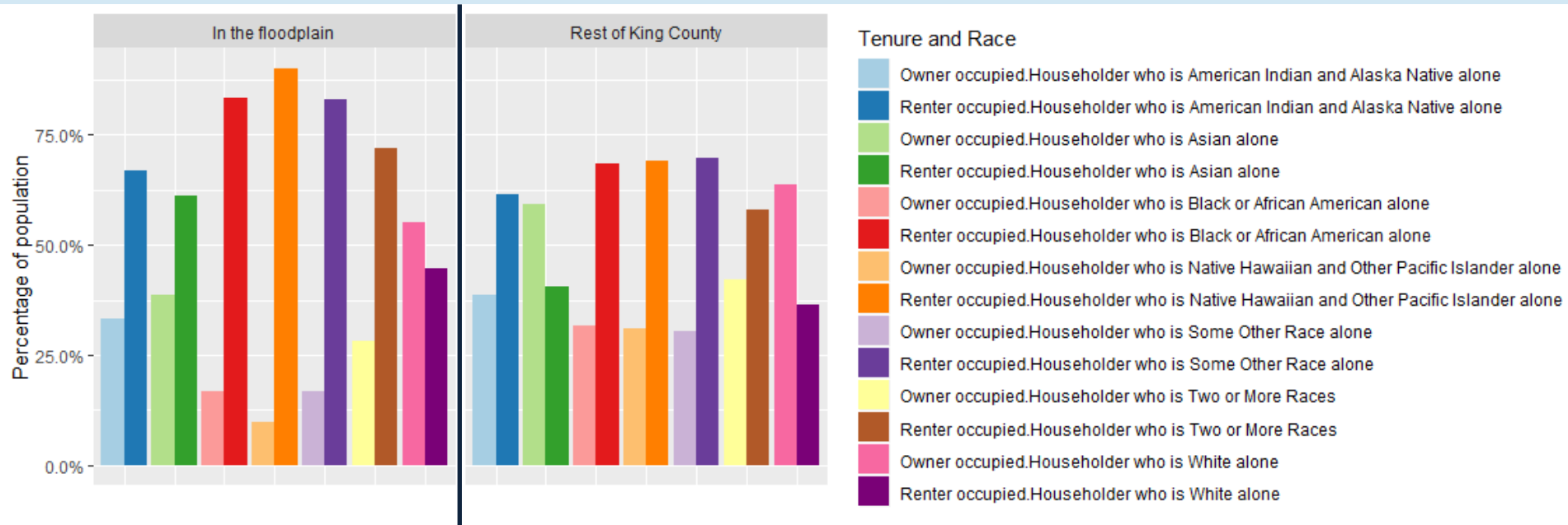
- Renters insurance does not cover flood damage
- Renters very unlikely to know about flood risk
- More likely to be lower income, minority, more vulnerable to impacts from flooding
  
- Nearly 20,000 renters live in floodplains in the communities analyzed
- Data from FEMA suggests fewer than 40 contents-only coverage purchased in Nebraska

# Preliminary Results – Tenure (King County)



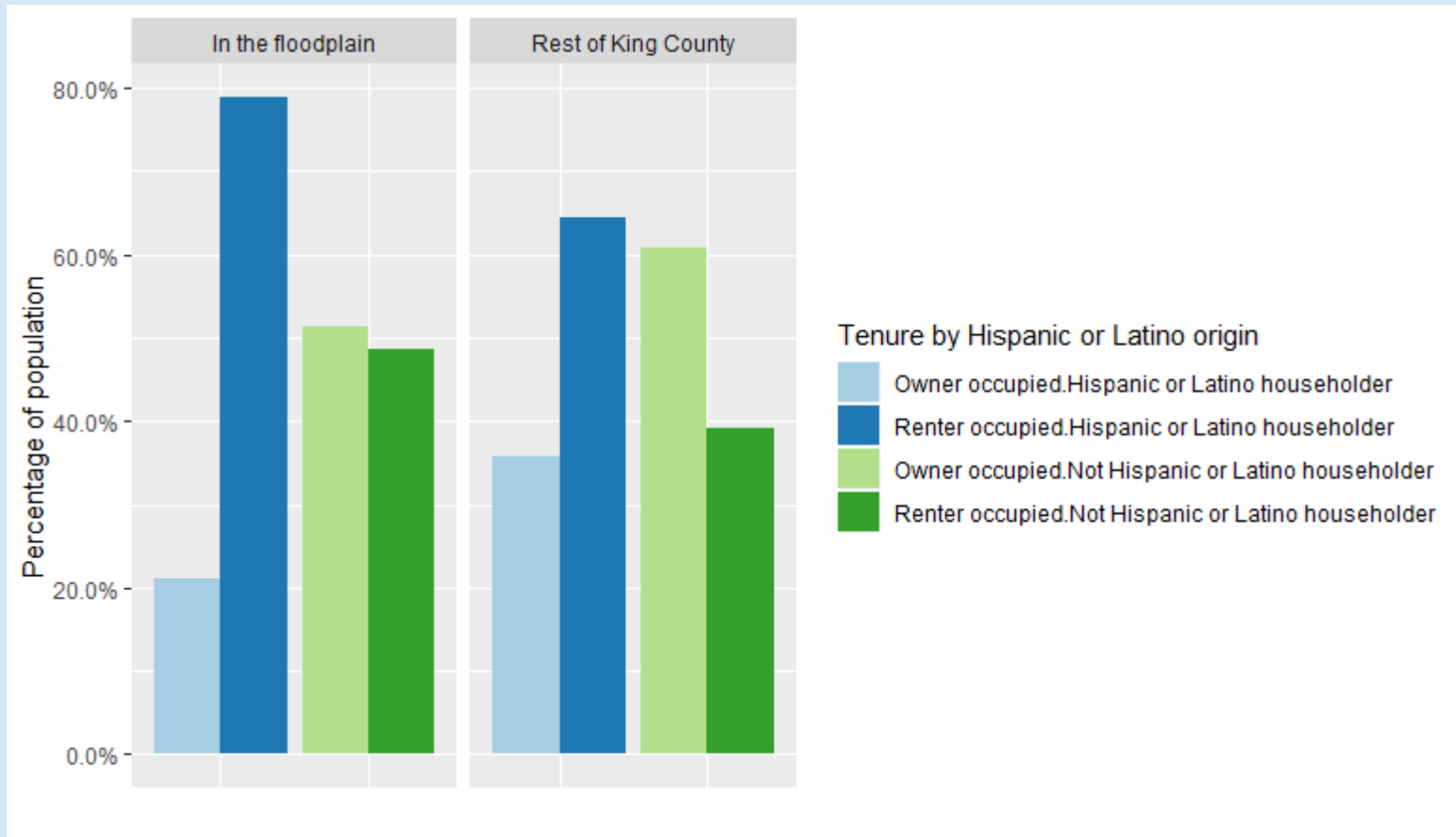
- Tenure in floodplain
- Owned FC: 1,978
  - Owned w/M: 4,864
  - Rented: 7,077

# Preliminary Results – Tenure by Race (King County)





# Preliminary Results – Tenure by Hispanic (King County)



# Preliminary Conclusions

- Much higher percentage of **renters** in the floodplain
- Differences among demographic, housing factors between watersheds
- Vast majority of those identifying as Hispanic/Latino in the floodplain **rent**

# Scenario

Imagine YOUR house is flooded with 6 feet of floodwater for 2 days.



# Scenario

- Where would you go for those 2 days?
- Do you have flood insurance (or would you if you lived in a floodplain)?
- Would you have known about the impending flooding?
- What would your family member/roommates know?

# Scenario - Revised

- You're a single parent with your flooded house & you work 2 jobs (neither of which are flood-related)
- Do you think you would know about the impending flooding?
- What if you couldn't get off work in time to move your stuff to a friend's/family member's or upstairs?
- What if all of your belongings on the lower floor got flooded?

# Scenario - Revised, Again

- Now imagine that you don't speak English, that you're a refugee from Sudan with a history of prior trauma.
- How would you know that floodplains even are a thing we talk about?
- If you did get a brochure from your local government, could you even read it? What if you didn't trust the "government"?
- Would you even know there was a "floodplain administrator" in your city/town?
- Would you even call them?

# MARKA UU DAAD/FATAHAAD DHACO...

Noqo qof diyaar ah! Ka hel faahfaahin ku saabsan daadka/fatahaada barta [kingcounty.gov/floodservices](http://kingcounty.gov/floodservices)

## KA HOR

### 1 Ogow khatartaada ee Daadka/Fatahaada.

Haddii lagu soo diray warbixintan, gurigaaga ama hantidaada waxay ku taalaa gudaha ama meel ku dhow dhulka-hooseeya ee daadka/fatahaada ku imaan kara. Ka baro wax dheeraad ah barta internet-ka ee [kingcounty.gov/floodmaps](http://kingcounty.gov/floodmaps) ama wac 206-477-4727.

### 2 libso caymiska daadka/fatahaada.

Caymiska mulkiilayaasha-guri ee caadiga ah ma daboolayo khasaraha uu sababay daadka/fatahaada, waxaana jiri kara muddo 30 maalmood oo sugitaan ah siyaasada caymiska daadka/fatahaada ee cusub.

Ka baro wax dheeraad ah barta internet-ka ee [floodsmart.gov](http://floodsmart.gov) ama wac 800-427-4661.

### 3 Ilaali naftaada iyo qoyskaaga.

- Cusboonaysii qorshooyinka xaaladaha degdega ah ee qoyskaaga, beertaada, ama ganacsigaaga oo dooro meel lagu kulmo haddii ay xubnaha qoysku kala lumaan.
- Ogow dhowr wado oo ka imaanaya gurigaaga ama ganacsigaaga ee aadaya dhul meel sare ah.
- Isticmaal jawaanada cilda si aad u ilaaliso gurigaaga ama hantidaada (ka fiiri kharidada gudaha kutaalo goobaha qaybinta ee lacag la'aanta ah).
- Dooro saaxiib ama qaraabo ka baxsan gobolka si aad u wacdo macluumaad bixin daraadeed haddii khadadka maxaliga ahi ay mashquulsan yihiin.
- Isku duwo xirmo ah gargaarka degdega ah (eeg hoos).
- Kala hadal deriskaaga u diyaarsanaanta daadka/fatahaada, khibradahii hore, iyo kaalmo walba oo gaar ah oo adiga ama ayaga u baahan karaan.

### 4 Ka ilaali hantidaada iyo xayawaanka gurigaaga khatarta daadka/fatahaada.

- Ogow sida aad iyo goorta aad u dhaqaajin lahayd gawaarida, qalabyada, xoolaha, ama xayawaanka guryaha dhul meel sare ah.
- Ku kaydi alaabada muhiimka ah iyo kilmikooyinka guryaha meel ka sareeya heerka daadadka/fatahaada.
- Ku xir oo u dhuuji si amaan ah taangiyada gaaska iyo weelasha shidaalka ee kale.
- Ku rakib tuubooyinka biyaha bixiya meesha bulaacada sarta si looga hortago biyaha daadka/fatahaada oo ku aruraya tuubada bixisa bulaacada.
- Ka ilaali biyo mareenka wadooyinka, godadka duufaanka, iyo albaabbada tubada weyn ee biyaha caleemaha iyo qashinka. Tallaabooyinkani waxay ilaaliyaan hantidaada waxayna ku hayaan webiyada iyo durdurrada inay nadiif noqdaan.

## ISDIIWAANGELIN KU SAABSAN DIGNIINTA

Booqo barta [kingcounty.gov/flood](http://kingcounty.gov/flood) si aad isku qorto helida digniinta nidaamyo wabi ee kala duwan ee gudaha Degmada King.

## INTA LAGU JIRO

### 1 Ha ku lugeynin, ku soconin, ha ku wadin gaariga aagaga fataahaada/daadka. Dib u laabo. Biyaha yaysan ku qaadin.

### 2 Haddii gaarigaaga uu ku xirmo/xayirmo aaga fatahday/daadka leh, ka bax gaariga sida ugu dhaqsaha badan ee suurtoogalka ah. Gadaal ugu soco wadada aad ku timid si aad u gaarto meel badbaado ah.

### 3 Wac Xarunta Digniinta Fatahaada/Daadka ee Degmada King si aad u hesho macluumaadka xaaladaha fatahaada/daadka iyo sadaalinta.

### 4 U diyaar garow ogeysiinta guuritaan ah ee ka imaanaya maamulada. Haddii lagaagala taliyo inaad guurto, sidaas samey isla markiiba. Raac wadooyinka guuritaanka ee lagu taliyay, iyadoo lagayaabo wadooyinka gaaban inay xirmaan karaan.

### 5 Haddii aysan suurtoogalku aheyn inaad si badbaado ah uga tagto gurigaaga ama dhismaha/sarta sababtuna tahay biyaha oo si degdeg ah ku kordhaya, wac 911 si lagu caawiyo. Kadib na u dhaqaaq dhul/dabaqa sare ama saqafka guriga. Qaado dhar diliran, biyaha aysan ka dusayn, toosh, mobaylka/taalefanka gacanta, iyo raadiyaha gacanta.

### 6 Marka fatahaada/daadka uu shaki ka jirin in uu dhacayo, laakin kaliya haddii uu wakhtiga ogolaado:

- Xer khadkaaga gaaska ee assaasiga ah
- Ka dami dhammaan korontada dhismahaaga/sartaada furaha korontada ee assaasiga ah. Ha taaban waxii qalab koronta ah illaa haddii ay taalo aag/meel qalalan ama aad ku taagan tahay qayb alwaax/qori qalalan adigoo xiran kabaha hoos caaga ka ah iyo gacangashi caag ah.
- Diiwaangeli tirakoobka daadka/fatahaada sida wakhtiga, akhriska qalabka cabirida, iyo sare u qaadida daadka ee maxaliga si loo isticmaalo mustaqbalka si loo fahmo daadka/fatahaada xaafaddaada. Ku dar Wixii aragtida gaarka ah ee gurigaaga ama ganacsigaaga.

## MA U BAAHAN TAHAY CAAWIN?

Wac 206-477-4727 haddii aad u baahan tahay caawinta raadinta guri, aad u baahan tahay in la xaqiijyo gurigaaga inuu ku yaalo dhulka-hooseeya ee daadka/fatahaada ku imaan kara, ama aad rabto macluumaad dheeraad ah ee ku saabsan shahaadada kor u qaadida guri.

# How can we all do better?

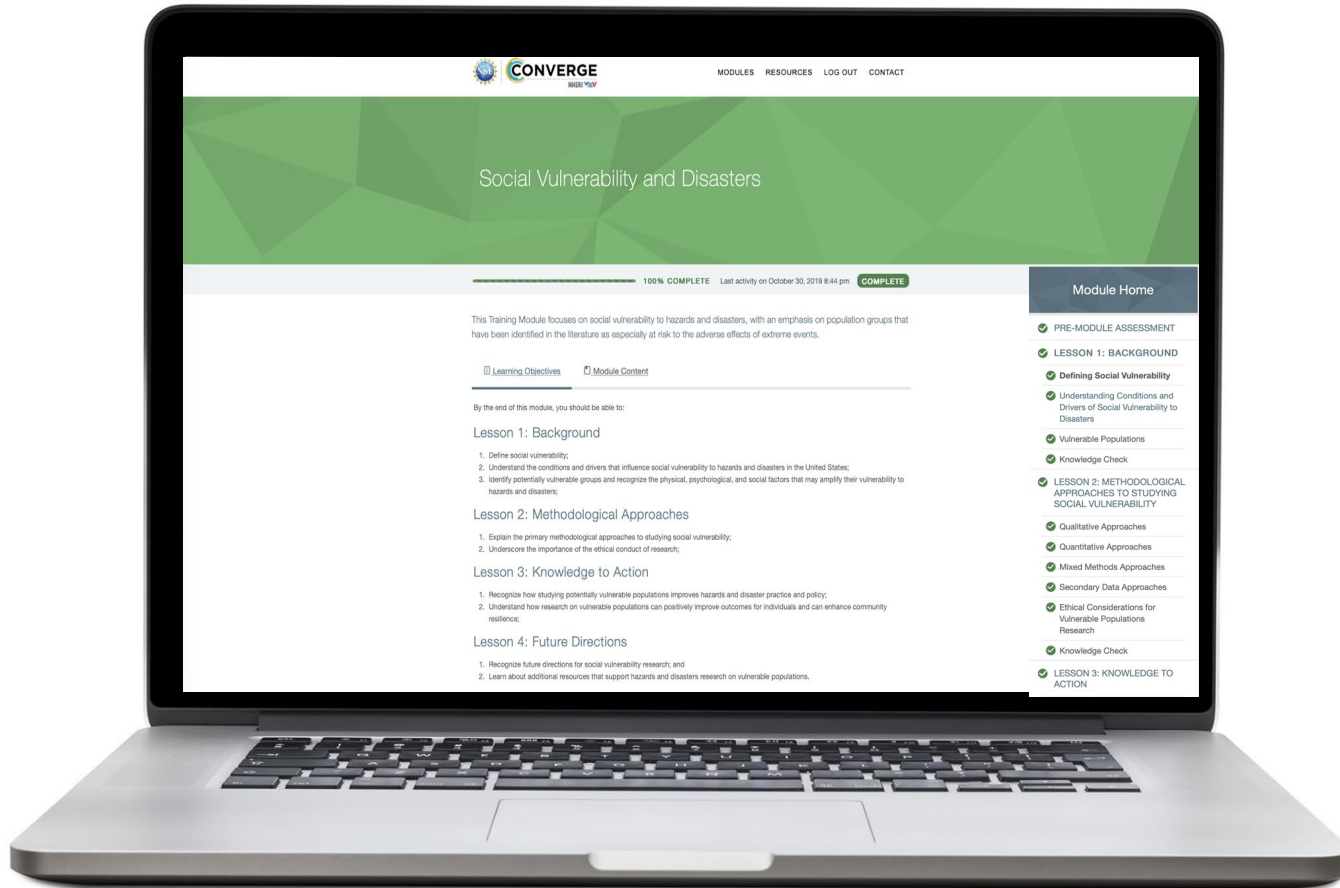
- Shift your focus in the planning stages
- Ask yourself and your project team these kind of questions
- What changes could you make to address equity/social justice?
- Take a step back further - are we investing in the right places? Can projects be prioritized to help lower income areas first?
- What data are we using? Can we incorporate equity/social justice data into the core of the project/plan?
- What academic, government, private sector partners do you need to do the work you need to do?



# Resources

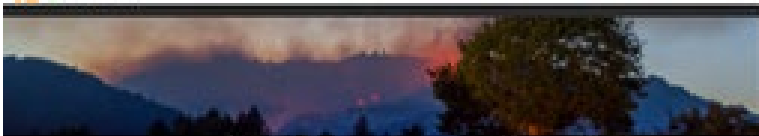


# CONVERGE Training Modules



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### Research Counts

Highlighted counts are those that are most relevant to the current research agenda. For more information on any of these counts, please visit the corresponding research count page.

**Research Counts**  
 By: [Author Name]

This research count highlights the importance of understanding the role of natural hazards in the development of resilient communities. It also discusses the importance of understanding the role of natural hazards in the development of resilient communities.

**January is a 'Quiet' Month for Wildfires in California**  
 By: [Author Name]

Wildfire activity in the United States tends to change seasonally, with the highest number of wildfires occurring in the western United States during the summer months. This is due to the combination of high temperatures and low humidity, which create ideal conditions for wildfires.

**Disaster Justice for All: The Road to a More Equitable and Just Recovery Lane**  
 By: [Author Name]

Disaster recovery is a long and complex process that involves many stakeholders. It is important to ensure that all communities, regardless of their socioeconomic status, have access to the resources and support they need to recover from a disaster.

**A Flood of Positive Winter Seismicity Cells for Multi and Transient Primary Approaches**  
 By: [Author Name]

Winter seismicity in the western United States is characterized by a high number of small earthquakes. This is due to the combination of high temperatures and low humidity, which create ideal conditions for earthquakes.

**Examining Through Florida Shows the Pitfalls of Post-Tracking Emergency Power Legislation**  
 By: [Author Name]

Emergency power legislation is a critical component of disaster preparedness. However, it is important to ensure that such legislation is based on sound science and does not create unnecessary burdens on communities.

**Was There? Why Missouri's New Locations Should Act Before the Next Earthquake**  
 By: [Author Name]

Missouri is a state with a high population density and a high number of earthquakes. It is important to ensure that all communities, regardless of their socioeconomic status, have access to the resources and support they need to recover from a disaster.



### Making Mitigation Work



#### Webinar Series

The Natural Hazards Center, in partnership with the Federal Emergency Management Agency, is pleased to announce this new webinar series, Making Mitigation Work. These free one-hour webinars feature innovative speakers and highlight recent progress in mitigation policy, practice, and research.

**Tuesday, March 10, 2020 | 1:00 to 2:00 p.m. Eastern**  
**All Along the Beach Front: Building Resilience from the 2017 Earthquake Mitigation Plans**  
 Speaker: [Speaker Name], Chief, Division of Emergency Management, San Francisco, Federal Emergency Management Agency

**Tuesday, April 14, 2020 | 1:00 to 2:00 p.m. Eastern**  
**The Quiet Majority: Understanding Communities to Make Mitigation Work**  
 Speaker: [Speaker Name], Bureau of Land Management, Forest Service, University of Colorado Boulder

Please save the dates and times for the additional upcoming Making Mitigation Work webinars and [view past webinar recordings here](#).

**Tuesday, May 12, 2020 | 1:00 to 2:00 p.m. Eastern**

**Tuesday, June 9, 2020 | 1:00 to 2:00 p.m. Eastern**

### Puerto Rico Landslide Hazard Mitigation Project



Descarga por otros idiomas de forma en español  
 Download Landslide Guide in English



#### What is the Challenge?

Other hurricanes have hit Puerto Rico in 2017, it is expected more than 70,000 inhabitants across the island, which already had high population density, will be affected by the hurricanes. The hurricanes have caused significant damage to the island's infrastructure and economy. It is important to ensure that all communities, regardless of their socioeconomic status, have access to the resources and support they need to recover from a disaster.



NATURAL HAZARDS CENTER

**DRAFT**

PRINCIPLES OF RISK COMMUNICATION

Implications for Understanding and Reducing Social Vulnerability Across the Disaster Lifecycle

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# Thank You!

