RURAL RESILIENCE FRAMEWORK

DISASTER ADAPTATION STRATEGIES FOR BUILDING RURAL RESILIENCE

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THANK YOU

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Note: The views and opinions expressed by the authors are their own and do not necessarily represent those of the LAF, listed contributors, or the technical advisors that supported this study. All inquiries relating to the content within this report should be directed to the authors, Travis Klondike and Andy Fox, via the email addresses provided above.

BACKGROUND INFORMATION

INTRODUCTION

Too often, rural communities attempting to recover from or prepare for natural hazards lack the local financial and technical capacity to adequately respond to the systemic and emerging threats of climate change. As a result, many small towns in rural America are collectively grouped into planning strategies that remove people from direct environmental risks, but also from the places and social systems required for their full community health. The intent of this document is to highlight the need for in-situ adaptation to climate change as a viable and necessary alternative for community rebuilding and redevelopment, particularly in the rural context. The document includes content that compares and contrasts standardized, national disaster relief policies against constructs of: i) buying power and geographic mobility patterns within climate-vulnerable populations; and ii) capacity gaps facing rural communities in the resilience-building context. Research findings illustrate the need for more inclusive, climate-responsive land planning solutions for rural communities and, as a result, informs a proposed Rural Resilience Framework (pages 55-98). This framework outlines actionable steps that landscape architects and other built environment professionals can use to support under-resourced, rural communities achieve their recovery and resilience goals.

Problem Statement. Providing research, planning, and design services to rural communities in the context of natural hazards and climate change is critical because there is an increasing body of studies and initiatives (with policy implications) that either ignore or fail to understand customary lifeways and lived experiences of rural people. Many contemporary theories suggest that displaced climate refugees will simply transplant to land-locked, environmentally "safe" cities as a mitigation response. Presumptions that climate migrants are able to move to either large, urban metropolises (Hauer, 2017) or to distant, hollowed-out "receiver cities" (e.g., PLACE Initiative, 2023) fail to recognize: i) the existing financial realities and associated federal disaster relief policies (FEMA, 2020) that hinder the ability of rural residents to move into urban markets; ii) data that argues against the mass migration of rural residents to distant locations, particularly out-of-state (U.S. Census Bureau, 2018); and iii) the long-term impacts of stripping away multi-generational social networks and place attachments that are associated with specific cities, towns, neighborhoods, and places of meaning (Fullilove and Wallace, 2011). The false dichotomy of staying or moving from places of meaning due to environmental risk is too generalized and lacks the nuance required to develop solutions that meaningfully respond to localized conditions and desires. With an increased acknowledgment of the climate change effects in rural places, a realignment of processes and procedures is needed to empower these communities to more fully participate in their own resilience planning.

> "Collectively, this multi-decade lack of specificity in rural responses to natural hazards has perpetuated an urban bias that is now an overly dominant voice in the national climate change arena."

Policy Context. Many of the disparities found within current top-down approaches to hazard mitigation are a result of the Disaster Mitigation Act (DMA) passed by Congress in 2000. The DMA requires local governments to develop a pre-disaster hazard mitigation plan (HMP) in order to qualify for federal aid should a disaster occur that overwhelms state and local capacity. HMP's are intended to identify at-risk properties and community assets, and to develop strategies to reduce a community's vulnerability to known and anticipated hazards. However, a six-year study of these plans (Berke, Lyles, and Smith, 2014) found that communities often fail to implement the strategies outlined in HMP's and that these plans are often developed to meet minimum federal requirements rather than serving as a means to comprehensively address hazard risk. While large metropolitan areas can use public funds to supplement HMP's with additional vulnerability assessments and small area plans for at-risk neighborhoods, these resources and outcomes are uncommon in rural communities. In the rural context, HMP's lack the same level of detail as their urban counterparts and, worse, the cost of professional services for completing HMP's often leads to neighboring rural counties pooling together funds for a single, multi-county HMP that further blurs both resolution and an understanding of fit for corresponding recommendations. Collectively, this multi-decade lack of specificity in rural responses to natural hazards has perpetuated an urban bias that is now an overly dominant voice in the national climate change arena.

Role of Landscape Architects. The research contained within this document underscores the importance of the expertise, skill sets, and processes possessed by landscape architects in supporting rural communities, and highlights the need for the field to take a stronger leadership role in developing, advocating, and advancing environmentally responsible and socially just mitigation and resilience solutions. The concluding Rural Resilience Framework seeks to situate conventional methods of landscape design and planning within contemporary, emerging, and non-traditional tools and techniques to galvanize local resilience-building initiatives in underserved, rural communities who are often unable to benefit from the profession's services. These services represent an emerging market for landscape architects and fill a critical gap in providing equitable responses to climate adaptation.

Photo: Travis Klendike (2016).

STATE OF NATURAL DISASTERS: PAST TO PRESENT

In the last 50 years there has been an exponential rise in the number of federally declared disaster events impacting the United States. For instance, the number of counties receiving a federal disaster declaration each year is presently 280% greater than the figures observed in the 1970's (Figure 1). Due to climate change and other socio-economic stressors, future projections forecast continued increases in the scale, frequency, and impacts of disasters.

The last decade, in particular, has seen this ramping-up effect take place. Between 2011 and 2021, 90% of counties in the U.S. experienced a federally declared disaster event (Chester and Lawton, 2022), which subsequently triggered the release of over $91 billion in financial assistance from the Federal Emergency Management Agency (FEMA) and the U.S. Department of Housing and Urban Development (HUD).

The primary use of these federal funds is intended to assist communities in post-disaster recovery and rebuilding efforts. However, it is increasingly recognized that a greater focus on proactively addressing climate change in communities is needed. In 2018, HUD began allocating funds from their Community Development Block Grant program specifically for mitigation purposes (CDBG-MIT), and in 2020 FEMA launched the Building Resilient Infrastructure and Communities (BRIC) program. Both of these programs seek to make strategic, cost-effective investments in communities to mitigate disaster risks and reduce futures losses.

While these programs, and others with similar aims, represent positive steps toward improving community resilience in the U.S., areas that are at higher risks of losses due to natural disasters continue to experience an immediate need for design and planning solutions to both acute and chronic socio-environmental challenges. Compounding these threats, many of these same communities face disproportionate challenges to apply for and receive funds through these programs based on factors including but not limited to location, racial composition, community wealth, population size, and historic marginalization and lack of investments. The scale of these issues highlights the need to better understand the spatial extent and geographic distribution of vulnerable areas across the country.

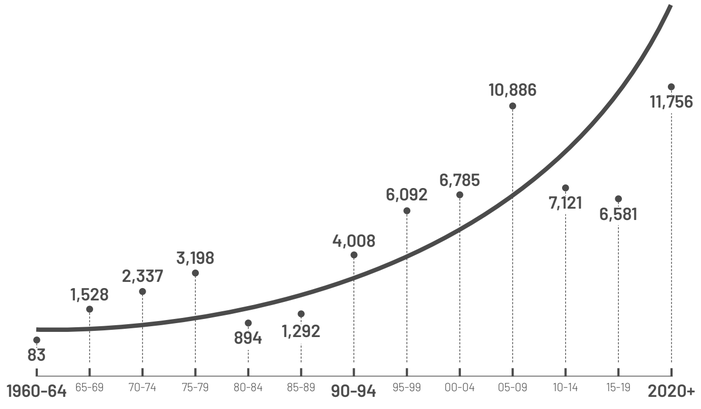
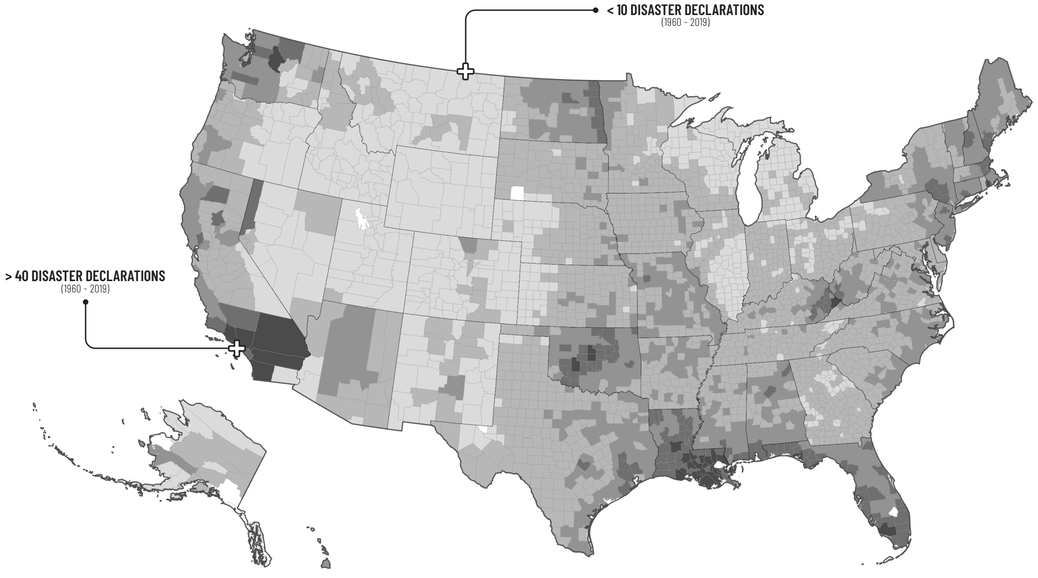
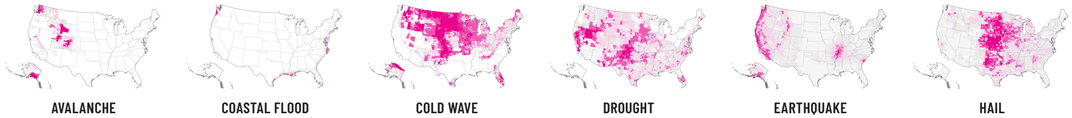


FIGURE 1. TOTAL NUMBER OF DISASTER DECLARATIONS FROM 1960 - PRESENT

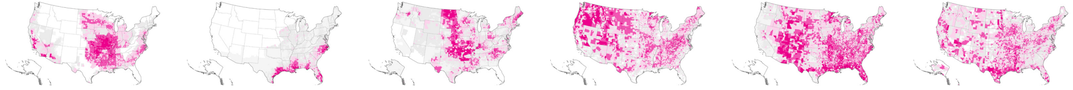
Since the 1970's, there has been a **280% rise in the number of counties receiving a federal disaster declaration each year** - and due to climate change and other socio-economic stressors - the scale, frequency, and impacts of disasters are projected to increase.



CUMULATIVE
TOTAL NUMBER OF DISASTER DECLARATIONS BY COUNTY FROM 1960 - 2019 (FEMA, 2022)



AVALANCHE | COASTAL FLOOD | COLD WAVE | DROUGHT | EARTHQUAKE | HAIL



HEAT WAVE | HURRICANE | ICE STORM | LANDSLIDE | LIGHTNING | RIVERINE FLOOD

STRONG WIND | TORNADO | TSUNAMI | VOLCANIC ACTIVITY | WILDFIRE | WINTER WEATHER

DISASTER HOT SPOTS: FUTURE PROJECTIONS

Census tracts with elevated ratings for "expected annual losses" (EAL) due to various types of natural disasters are categorized in FEMA's National Risk Index (NRI, 2022) and are illustrated in the 18 maps above. While various metrics and data points can be used to assess a community's vulnerability to hazards, EAL most directly addresses the financial implications of inaction in communities with elevated risks. In addition to data for each type of disaster, the NRI also includes cumulative EAL classifications (all disaster types) for each census tract in the U.S. where data is made available (n = 72,739):

+ **Very High** (n = 1,020)
+ **Relatively High** (n = 7,593)
+ **Relatively Moderate** (n = 18,453)
+ **Relatively Low** (n = 24,228)
+ **Very Low** (n = 21,429)
+ **No Expected Annual Losses** (n = 16)

The document uses the two highest EAL classifications ("very high" and "relatively high") to describe **'Disaster Hot Spots',** or census tracts with elevated economic risks due to natural hazards.

Collectively, these areas contain a **population of 45,263,494 people** (which is greater than the population of Canada), **30% of the total U.S. land area** (1,062,288 square miles), and a median population density or 873 people per square mile, which is approximately **2.5x more rural than the U.S. median** (2,182 people / square mile).

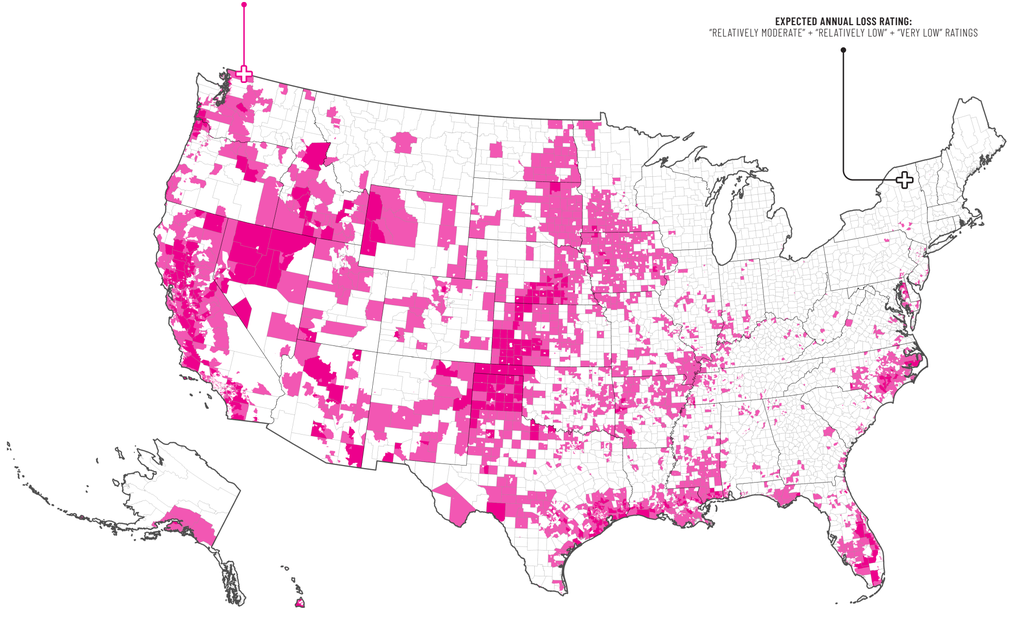
Given the wide range of geographies, cultures, and types of disasters facing communities across the U.S., one might assume that responses to natural hazards are highly nuanced to fit each population and place. Unfortunately, this is not the case due, in large part, to the standardization of recovery and preparedness programs. As a result, communities that are either recovering from or preparing for disasters (which are likely to be occurring simultaneously in 'Disaster Hot Spot' areas), are typically provided little technical assistance or are presented with a coarse overview of resilience-building options that may not adequately address the specific needs that are unique to each place. These resultant shortcomings underscore the need to tailor fit responses to better fit localized conditions, preferences, and capabilities.

45,263,494
PEOPLE
(~15% OF U.S. POPULATION)

30%
OF TOTAL U.S. LAND AREA
(1,062,288 SQUARE MILES)

2.5x
MORE RURAL THAN U.S. AVERAGE
(MEDIAN POPULATION DENSITY)

"DISASTER HOT SPOTS"



CUMULATIVE
CENSUS TRACTS WITH THE HIGHEST RATINGS OF "EXPECTED ANNUAL LOSSES" (FEMA NATIONAL RISK INDEX, 2022)

RESEARCH QUESTION #1 (A+B)

MIGRATION:

Moving away from the threat

Migration Patterns: Given the tendency for 'Disaster Hot Spots' to be located in more rural areas, are there distinguishable relocation preferences for people relocating from more rural areas compared to more urban areas?

Buying Power: Does the median home value of properties within 'Disaster Hot Spots' afford residents displaced by natural disasters the ability to relocate to nearby markets at a price point equivalent to their existing housing?

ADAPTATION:

Evolving with the threat

Community Capacity: Are there capacity gaps within 'Disaster Hot Spots' that make recovery, rebuilding, and long-term resilience building more challenging than Metropolitan Statistical Areas (MSA's) in the same region?

RESEARCH QUESTION #2

CHALLENGING TRADITIONAL RESPONSES: RESEARCH QUESTIONS

Planning approaches focused on **migration** and **adaptation** represent the two primary schools-of-thought that have dominated post-disaster hazard mitigation practices since the enactment of the Robert T. Stafford Disaster Relief and Emergency Assistance Act ("Stafford Act") in 1988, and subsequently, the Disaster Mitigation Act (DMA) in 2000. Collectively, these two acts outline the requirements and processes for municipalities to request and receive federal financial assistance after a natural disaster overwhelms local and state resources. As a result of these two policies, specific practices have been formed that generally align with either migration- or adaptation-focused principles.

Actions that prioritize **migration** principles generally attempt to move people, property, and infrastructure away from an environmental threat. One of the most common forms of this practice is the acquisition and subsequent demolition of at-risk or impacted properties (commonly referred to as "buyouts") with the aim of relocating people, families, and businesses to safer locations. Many federal and state assistance programs have long recognized these projects as being the most effective way of relinquishing threats and future damages to a property due to natural hazards.

Actions that prioritize **adaptation** principles focus on evolving with the environmental threat. For private property owners this may require modifications to buildings or property, such as elevating a house, to make them more resilient to future disasters. Similarly, public entities may undertake adaptive infrastructure improvements, such as elevating roads or constructing living shorelines, to safeguard community assets and resources. Federal and state programs are increasingly recognizing a broader range of these project types in significantly reducing the impacts of natural hazards.

Research Questions. Because the federal funding mechanisms that commonly support each of these practices are tied to local economic conditions (such as the fair market value of homes to be purchased for a buyout or municipal budget allowances to fund public infrastructure projects), this study presumes that: i) at-risk homeowners in rural areas will often lack the financial resources needed to migrate outside of their community; and ii) local units of government will either lack or will be unable to provide the technical capacity (e.g., personnel, financial resources, etc.) required to pursue and implement climate-adaptive projects. In response, demographic and geospatial analyses were conducted to investigate three guiding questions at the intersection of rural migration and adaptation principles:

As such, demographic and geospatial analyses were conducted to investigate three guiding questions at the intersection of rural migration and adaptation principles:

Migration Patterns:
Given the tendency for 'Disaster Hot Spots" to be located in areas that are more rural than the U.S. median, are there distinguishable relocation preferences for people relocating from more rural areas compared to those relocating from more urban areas?

Buying Power:
Does the median home value of properties within 'Disaster Hot Spots' afford residents who are displaced by natural disasters the ability to relocate to nearby markets (Metropolitan Statistical Areas (MSAs)) at a price point equivalent to their existing housing?

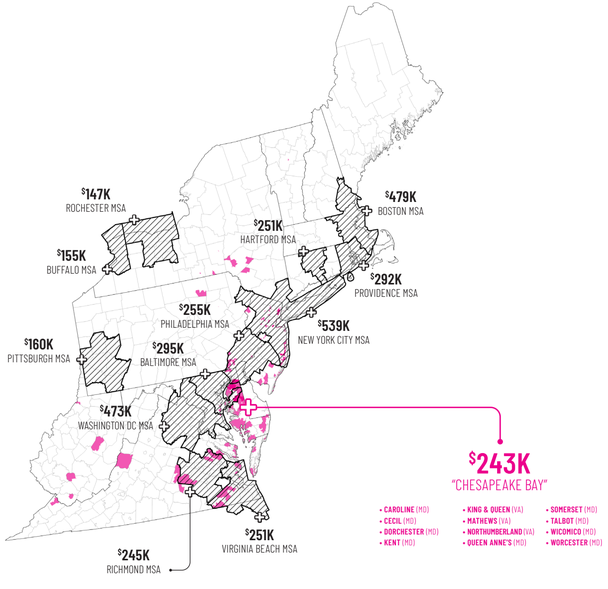
Community Capacity:
Are there capacity gaps within 'Disaster Hot Spots' that make recovery, rebuilding, and long-term resilience building more challenging than MSAs in the same region?

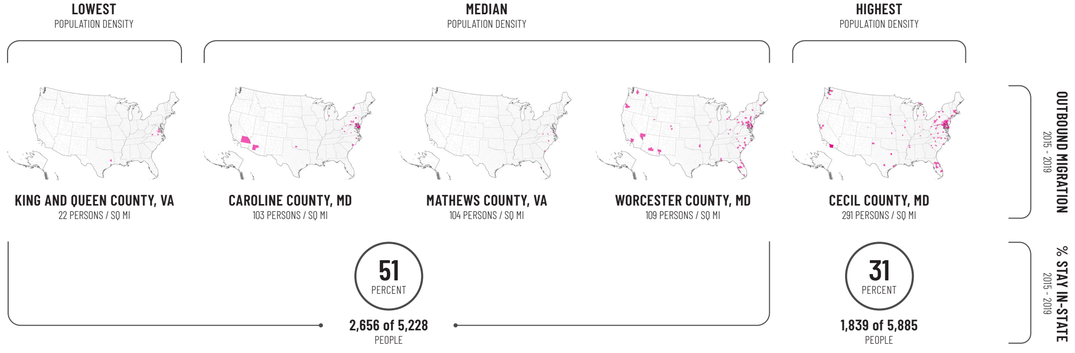
BUYING POWER + MIGRATION PATTERNS

DEFINITIONS + DATA LIMITATIONS

Buying Power. Figures for "median value of owner-occupied housing units," as listed by the U.S. Census Bureau at the time of data collection (Fall - Winter 2021), were used as the basis for determining Median Home Values (MHV) in the Buying Power analysis. To determine the MHV of each study area (e.g., Raleigh MSA or "Coastal Carolina"), weighted MHV figures for each county were assigned based on each county's total population (U.S. Census Bureau, 2021). Future releases of data from the U.S. Census Bureau are likely to contain different figures for MHV and population totals within each county, and consequently, may yield different MHV figures for each county if analyses are replicated.

Migration Patterns. Figures for "total outbound migration flows," as listed by the U.S. Census Bureau at the time of data collection (Fall - Winter 2021), were used as the basis for illustrating Outbound Migration patterns for sampled counties in each FEMA Region. For the purposes of this study and based on population density, five counties were assessed in each FEMA Region. Sampled areas in each FEMA Region include counties containing: i) the lowest population density (most "rural"); ii) the highest population density (least "rural"); and iii) the three median population densities. This sampling included a total of 40 counties as part of the analysis. While this was sufficient for illustrating, in general, geographic mobility patterns and in-state versus out-of-state migration tendencies, future analyses would benefit from the inclusion of additional counties in the sample group.





FEMA REGIONS I + II + III

States in FEMA Regions I, II, and III – which include Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia – host twelve (12) Metropolitan Statistical Areas (MSA) with populations exceeding 1,000,000 people, and one (1) cluster illustrated as a 'Disaster Hot Spot' based on Expected Annual Loss data derived from FEMA's National Risk Index (2022).

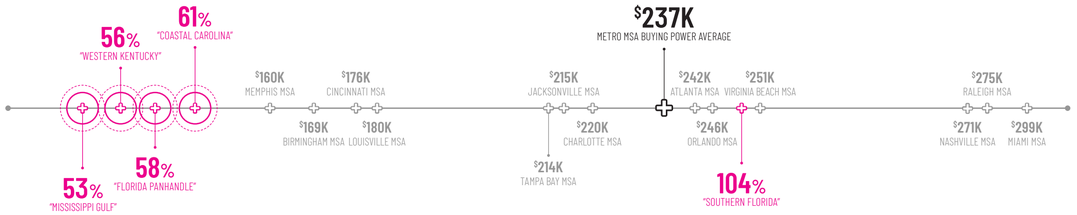
Geographically connected areas with the highest Expected Annual Loss ratings have been grouped using the following naming conventions to designate the 'Disaster Hot Spot': **Chesapeake Bay** (12 counties; 470,534 people). Comparing the median home values (U.S. Census Bureau, 2016-2020), of counties within this 'Disaster Hot Spot' against counties in the largest MSA's in FEMA Regions I, II, and III present the following findings:

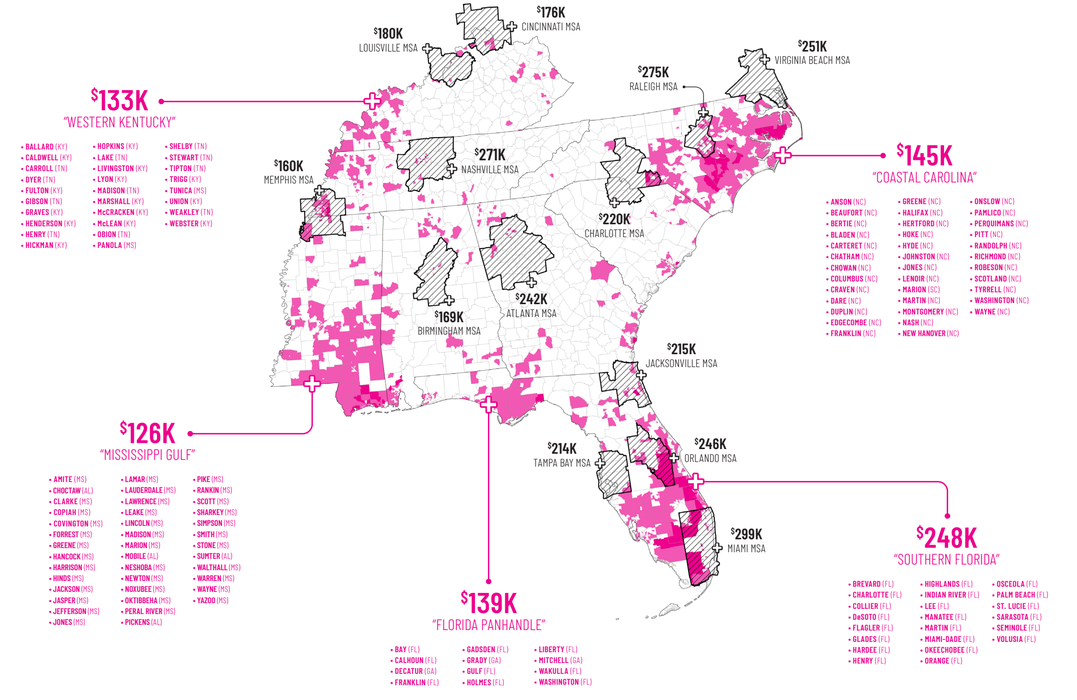
+ The single 'Disaster Hot Spot' included in this study area has a median home value that is less than the average median home value for MSA's in FEMA Regions I, II, and III ($407,491); and

+ There are **three (3) MSA's in FEMA Regions I, II, and III (n=12) that possess median home values less than the median home values observed in the Chesapeake Bay 'Disaster Hot Spot' area.**

Additional analysis of outbound migration patterns (U.S. Census Bureau, 2015-2019) within counties containing the lowest, median (3), and highest population densities in FEMA Regions I, II, and III illustrates that:

+ **People that migrate from more rural counties are more likely to relocate closer to their origination point, specifically within their origination state (51%), compared to people that migrate from more urban areas** (e.g., Cecil County, Maryland in the Philadelphia MSA; 31%).





- BALLARD (KY)
- CALDWELL (KY)
- CARROLL (TN)
- DYER (TN)
- FULTON (KY)
- GIBSON (TN)
- GRAVES (KY)
- HENDERSON (KY)
- HENRY (TN)
- HICKMAN (KY)
- HOPKINS (KY)
- LAKE (TN)
- LIVINGSTON (KY)
- LYON (KY)
- MADISON (TN)
- MARSHALL (KY)
- McCRACKEN (KY)
- McLEAN (KY)
- OBION (TN)
- PANOLA (MS)
- SHELBY (TN)
- STEWART (TN)
- TIPTON (TN)
- TRIGG (KY)
- TUNICA (MS)
- UNION (KY)
- WEAKLEY (TN)
- WEBSTER (KY)

- ANSON (NC)
- BEAUFORT (NC)
- BERTIE (NC)
- BLADEN (NC)
- CARTERET (NC)
- CHATHAM (NC)
- CHOWAN (NC)
- COLUMBUS (NC)
- CRAVEN (NC)
- DARE (NC)
- DUPLIN (NC)
- EDGECOMBE (NC)
- FRANKLIN (NC)
- GREENE (NC)
- HALIFAX (NC)
- HERTFORD (NC)
- HOKE (NC)
- HYDE (NC)
- JOHNSTON (NC)
- JONES (NC)
- LENOIR (NC)
- MARION (SC)
- MARTIN (NC)
- MONTGOMERY (NC)
- NASH (NC)
- NEW HANOVER (NC)
- ONSLOW (NC)
- PAMLICO (NC)
- PERQUIMANS (NC)
- PITT (NC)
- RANDOLPH (NC)
- RICHMOND (NC)
- ROBESON (NC)
- SCOTLAND (NC)
- TYRRELL (NC)
- WASHINGTON (NC)
- WAYNE (NC)

- AMITE (MS)
- CHOCTAW (AL)
- CLARKE (MS)
- COPIAH (MS)
- COVINGTON (MS)
- FORREST (MS)
- GREENE (MS)
- HANCOCK (MS)
- HARRISON (MS)
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- NESHOBA (MS)
- NEWTON (MS)
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- PERAL RIVER (MS)
- PICKENS (AL)
- PIKE (MS)
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- SCOTT (MS)
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- SMITH (MS)
- STONE (MS)
- SUMTER (AL)
- WALTHALL (MS)
- WARREN (MS)
- WAYNE (MS)
- YAZOO (MS)

- BAY (FL)
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- MARTIN (FL)
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- ORANGE (FL)
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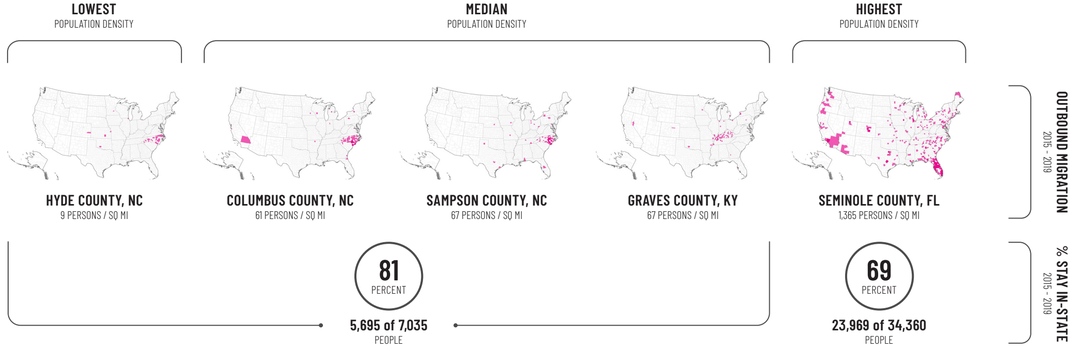


FEMA REGION IV

States in FEMA Region IV – which include Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee – host thirteen (13) Metropolitan Statistical Areas (MSA) with populations exceeding 1,000,000 people, and five (5) clusters of 'Disaster Hot Spots' based on Expected Annual Loss data derived from FEMA's National Risk Index (2022).

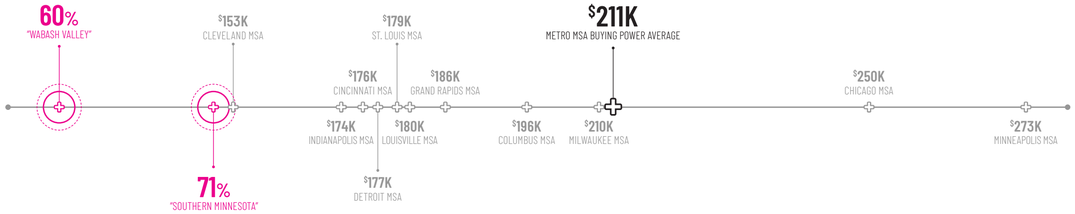
Geographically connected areas with the highest Expected Annual Loss ratings have been grouped using the following naming conventions to designate 'Disaster Hot Spots': **Coastal Carolina** (37 counties; 2,694,325 people), **Florida Panhandle** (12 counties; 417,953 people), **Mississippi Gulf** (40 counties; 2,218,462 people), **Southern Florida** (22 counties; 9,405,660 people), and **Western Kentucky** (28 counties; 1,312,134 people). Comparing the median home values (U.S. Census Bureau, 2016-2020), of counties within these 'Disaster Hot Spot' areas against counties in the largest MSA's in FEMA Region IV present the following findings:

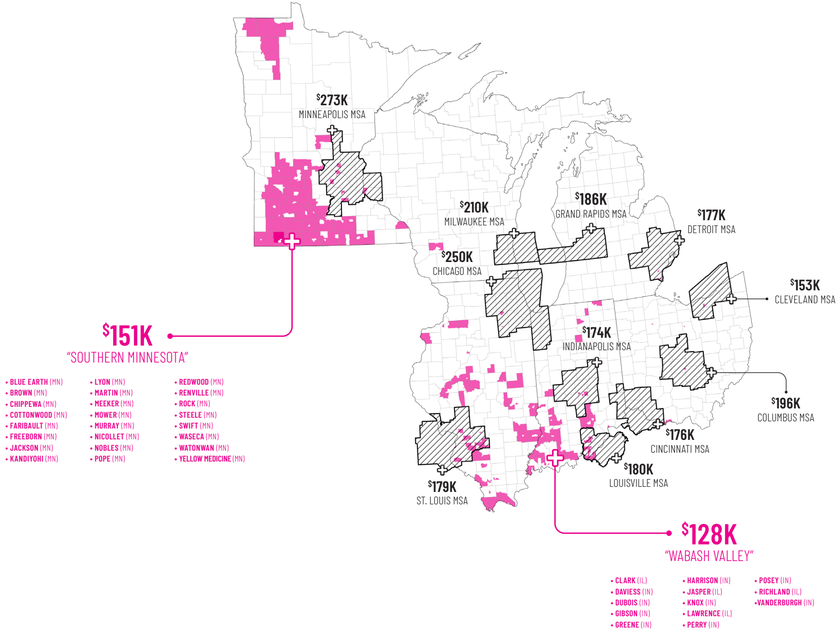
+ Four of the five of the 'Disaster Hot Spots' (80%) have median home values that are less than the average median home value for MSA's in FEMA Region IV ($237,340); and

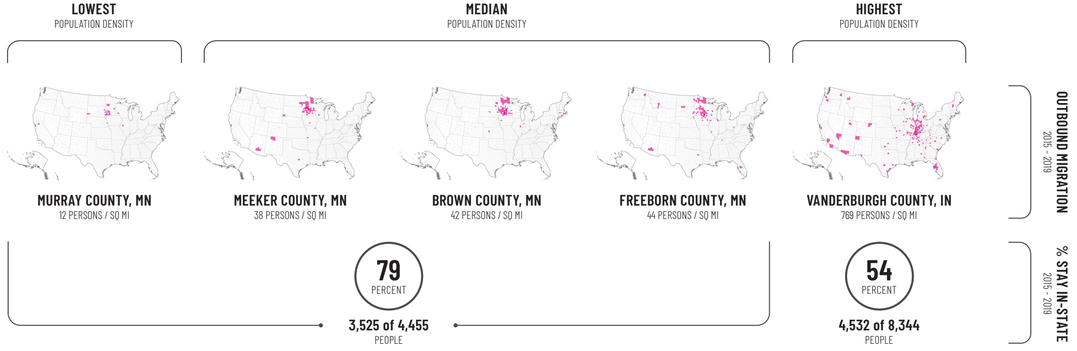
+ These same **four (4) 'Disaster Hot Spots' possess median home values that are less than all MSA median home values in FEMA Region IV** (n=13).

Additional analysis of outbound migration patterns (U.S. Census Bureau, 2015-2019) within counties containing the lowest, median (3), and highest population densities in FEMA Region IV illustrates that:

+ **People that migrate from more rural counties are more likely to relocate closer to their origination point, specifically within their origination state (81%), compared to people that migrate from more urban areas** (e.g., Seminole County, Florida in the Orlando MSA; 69%).







FEMA REGION V

States in FEMA Region V – which include Indiana, Illinois, Michigan, Minnesota, Ohio, and Wisconsin – host eleven (11) Metropolitan Statistical Areas (MSA) with populations exceeding 1,000,000 people, and two (2) clusters of 'Disaster Hot Spots' based on Expected Annual Loss data derived from FEMA's National Risk Index (2022).

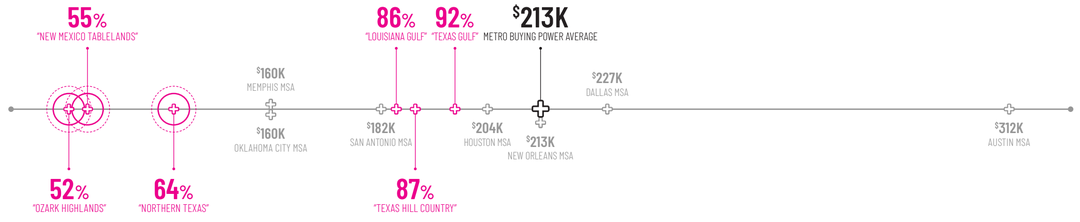
Geographically connected areas with the highest Expected Annual Loss ratings have been grouped using the following naming conventions to designate 'Disaster Hot Spots': **Southern Minnesota** (24 counties; 523,952 people), and **Wabash Valley** (13 counties; 502,059 people). Comparing the median home values (U.S. Census Bureau, 2016-2020), of counties within these 'Disaster Hot Spot' areas against counties in the largest MSA's in FEMA Region V present the following findings:

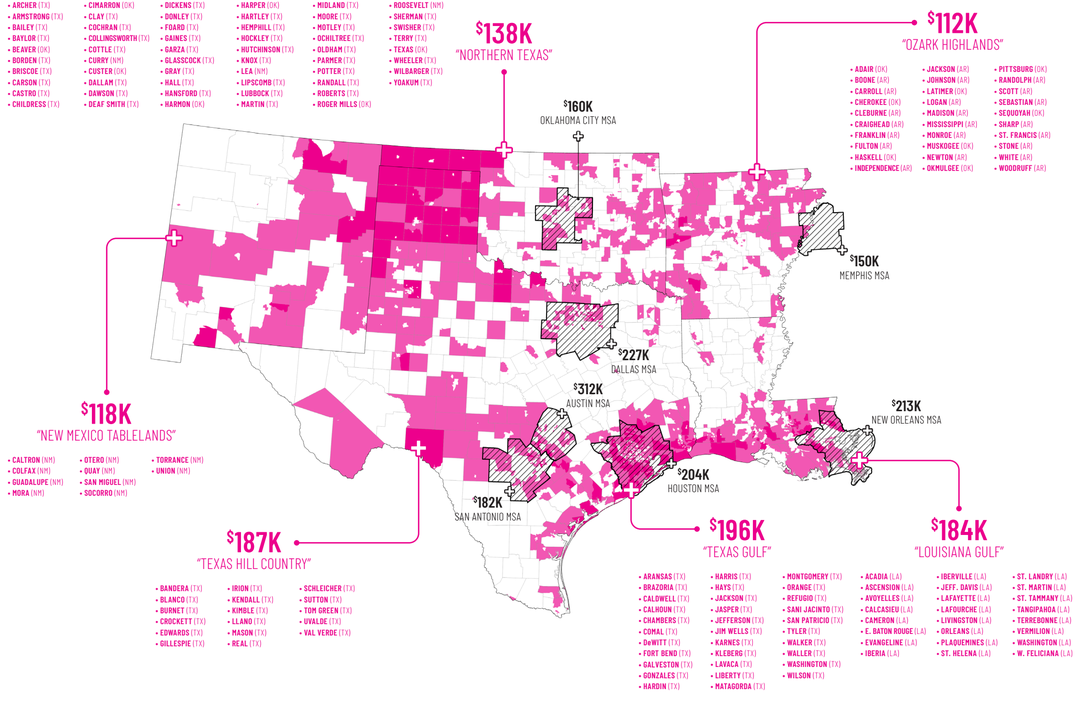
+ Both of the 'Disaster Hot Spots' (100%) have median home values that are less than the average median home value for MSA's in FEMA Region V ($211,075); and

+ These same **two (2) 'Disaster Hot Spots' possess median home values that are less than all MSA median home values in FEMA Region V** (n=11).

Additional analysis of outbound migration patterns (U.S. Census Bureau, 2015-2019) within counties containing the lowest, median (3), and highest population densities in FEMA Region V illustrates that:

+ **People that migrate from more rural counties are more likely to relocate closer to their origination point, specifically within their origination state (79%), compared to people that migrate from more urban areas** (e.g., Vanderburgh County, Indiana; 54%).





- ARCHER (TX)
- ARMSTRONG (TX)
- BAILEY (TX)
- BAYLOR (TX)
- BEAVER (OK)
- BORDEN (TX)
- BRISCOE (TX)
- CARSON (TX)
- CASTRO (TX)
- CHILDRESS (TX)
- CIMARRON (OK)
- CLAY (TX)
- COCHRAN (TX)
- COLLINGSWORTH (TX)
- COTTLE (TX)
- CURRY (NM)
- CUSTER (OK)
- DALLAM (TX)
- DAWSON (TX)
- DEAF SMITH (TX)
- DICKENS (TX)
- DONLEY (TX)
- FOARD (TX)
- GAINES (TX)
- GARZA (TX)
- GLASSCOCK (TX)
- GRAY (TX)
- HALL (TX)
- HANSFORD (TX)
- HARMON (OK)
- HARPER (OK)
- HARTLEY (TX)
- HEMPHILL (TX)
- HOCKLEY (TX)
- HUTCHINSON (TX)
- KNOX (TX)
- LEA (NM)
- LIPSCOMB (TX)
- LUBBOCK (TX)
- MARTIN (TX)
- MIDLAND (TX)
- MOORE (TX)
- MOTLEY (TX)
- OCHILTREE (TX)
- OLDHAM (TX)
- PARMER (TX)
- POTTER (TX)
- RANDALL (TX)
- ROBERTS (TX)
- ROGER MILLS (OK)
- ROOSEVELT (NM)
- SHERMAN (TX)
- SWISHER (TX)
- TERRY (TX)
- TEXAS (OK)
- WHEELER (TX)
- WILBARGER (TX)
- YOAKUM (TX)

- ADAIR (OK)
- BOONE (AR)
- CARROLL (AR)
- CHEROKEE (OK)
- CLEBURNE (AR)
- CRAIGHEAD (AR)
- FRANKLIN (AR)
- FULTON (AR)
- HASKELL (OK)
- INDEPENDENCE (AR)
- JACKSON (AR)
- JOHNSON (AR)
- LATIMER (OK)
- LOGAN (AR)
- MADISON (AR)
- MISSISSIPPI (AR)
- MONROE (AR)
- MUSKOGEE (OK)
- NEWTON (AR)
- OKMULGEE (OK)
- PITTSBURG (OK)
- RANDOLPH (AR)
- SCOTT (AR)
- SEBASTIAN (AR)
- SEQUOYAH (OK)
- SHARP (AR)
- ST. FRANCIS (AR)
- STONE (AR)
- WHITE (AR)
- WOODRUFF (AR)

- CALTRON (NM)
- COLFAX (NM)
- GUADALUPE (NM)
- MORA (NM)
- OTERO (NM)
- QUAY (NM)
- SAN MIGUEL (NM)
- SOCORRO (NM)
- TORRANCE (NM)
- UNION (NM)

- BANDERA (TX)
- BLANCO (TX)
- BURNET (TX)
- CROCKETT (TX)
- EDWARDS (TX)
- GILLESPIE (TX)
- IRION (TX)
- KENDALL (TX)
- KIMBLE (TX)
- LLANO (TX)
- MASON (TX)
- REAL (TX)
- SCHLEICHER (TX)
- SUTTON (TX)
- TOM GREEN (TX)
- UVALDE (TX)
- VAL VERDE (TX)

- ARANSAS (TX)
- BRAZORIA (TX)
- CALDWELL (TX)
- CALHOUN (TX)
- CHAMBERS (TX)
- COMAL (TX)
- DeWITT (TX)
- FORT BEND (TX)
- GALVESTON (TX)
- GONZALES (TX)
- HARDIN (TX)
- HARRIS (TX)
- HAYS (TX)
- JACKSON (TX)
- JASPER (TX)
- JEFFERSON (TX)
- JIM WELLS (TX)
- KARNES (TX)
- KLEBERG (TX)
- LAVACA (TX)
- LIBERTY (TX)
- MATAGORDA (TX)
- MONTGOMERY (TX)
- ORANGE (TX)
- REFUGIO (TX)
- SANI JACINTO (TX)
- SAN PATRICIO (TX)
- TYLER (TX)
- WALKER (TX)
- WALLER (TX)
- WASHINGTON (TX)
- WILSON (TX)

- ACADIA (LA)
- ASCENSION (LA)
- AVOYELLES (LA)
- CALCASIEU (LA)
- CAMERON (LA)
- E. BATON ROUGE (LA)
- EVANGELINE (LA)
- IBERIA (LA)
- IBERVILLE (LA)
- JEFF. DAVIS (LA)
- LAFAYETTE (LA)
- LAFOURCHE (LA)
- LIVINGSTON (LA)
- ORLEANS (LA)
- PLAQUEMINES (LA)
- ST. HELENA (LA)
- ST. LANDRY (LA)
- ST. MARTIN (LA)
- ST. TAMMANY (LA)
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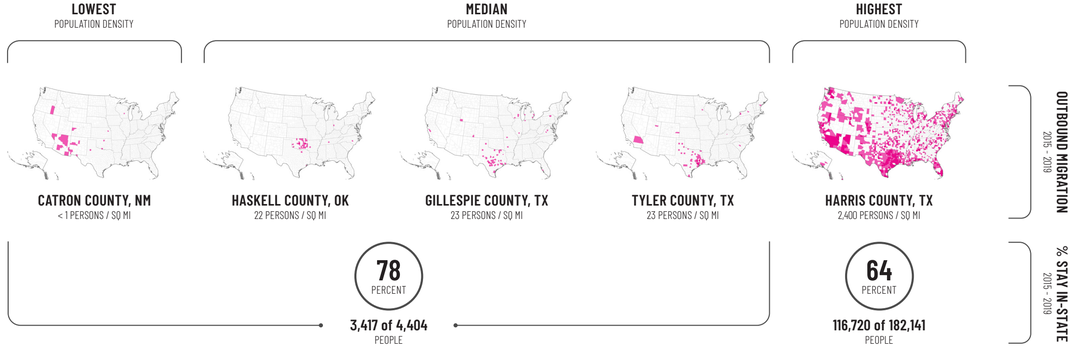
- VERMILION (LA)
- WASHINGTON (LA)
- W. FELICIANA (LA)



FEMA REGION VI

States in FEMA Region V – Arkansas, Louisiana, New Mexico, Oklahoma, and Texas – host seven (7) Metropolitan Statistical Areas (MSA) with populations exceeding 1,000,000 people, and six (6) clusters of 'Disaster Hot Spots' based on Expected Annual Loss data derived from FEMA's National Risk Index (2022).

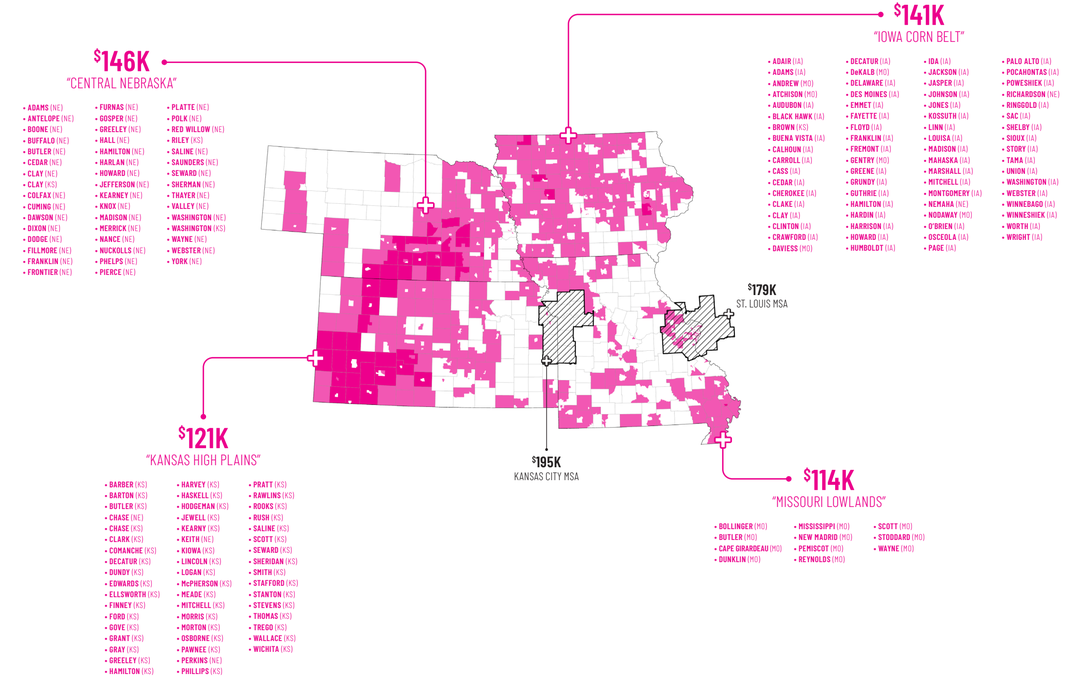
Geographically connected areas with the highest Expected Annual Loss ratings have been grouped using the following naming conventions to designate 'Disaster Hot Spots': **New Mexico Tablelands** (10 counties; 168,072 people), **Northern Texas** (58 counties; 1,188,577 people), **Ozark Highlands** (30 counties; 988,423 people), **Louisiana Gulf** (24 counties; 3,002,625 people), **Texas Gulf** (32 counties; 7,172,552 people), and **Texas Hill Country** (17 counties; 363,625 people). Comparing the median home values (U.S. Census Bureau, 2016-2020), of counties within these 'Disaster Hot Spot' areas against counties in the largest MSA's in FEMA Region VI present the following findings:

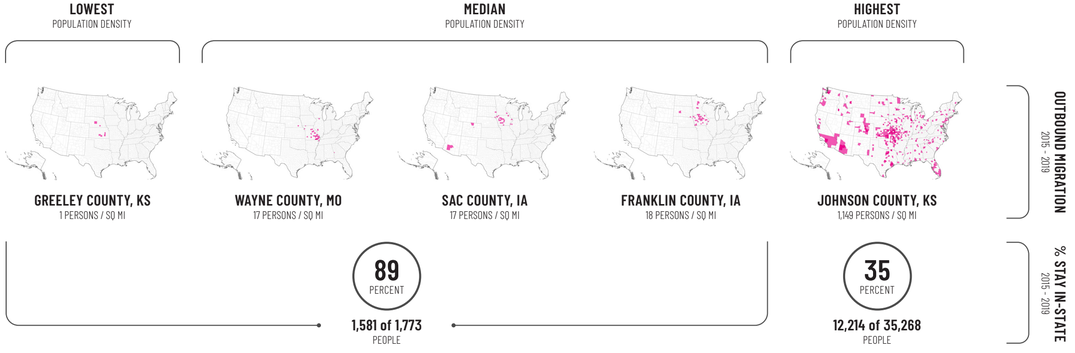
+ All six of the 'Disaster Hot Spots' (100%) have median home values that are less than the average median home value for MSA's in FEMA Region VI ($213,700); and

+ Out of six, **three (3) 'Disaster Hot Spots' possess median home values that are less than all MSA median home values in FEMA Region VI** (n=11).

Additional analysis of outbound migration patterns (U.S. Census Bureau, 2015-2019) within counties containing the lowest, median (3), and highest population densities in FEMA Region VI illustrates that:

+ **People that migrate from more rural counties are more likely to relocate closer to their origination point, specifically within their origination state (78%), compared to people that migrate from more urban areas** (e.g., Harris County, Texas in the Houston MSA; 64%).





FEMA REGION VII

States in FEMA Region VII – Iowa, Kansas, Missouri, and Nebraska – host two (2) Metropolitan Statistical Areas (MSA) with populations exceeding 1,000,000 people, and four (4) clusters of 'Disaster Hot Spots' based on Expected Annual Loss data derived from FEMA's National Risk Index (2022).

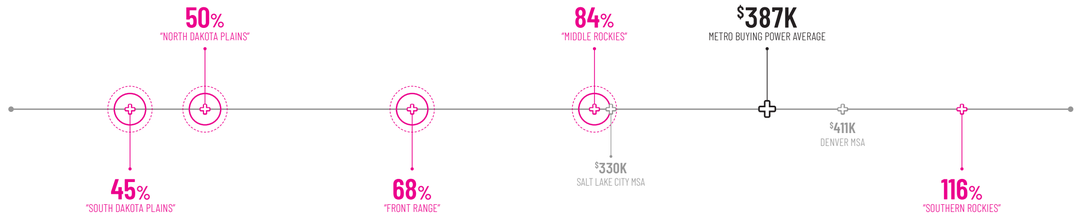
Geographically connected areas with the highest Expected Annual Loss ratings have been grouped using the following naming conventions to designate 'Disaster Hot Spots': **Central Nebraska** (47 counties; 634,926 people), **Iowa Corn Belt** (71 counties; 1,628,396 people), **Kansas High Plains** (52 counties; 494,786 people), and **Missouri Lowlands** (11 counties; 303,770 people). Comparing the median home values (U.S. Census Bureau, 2016-2020), of counties within these 'Disaster Hot Spot' areas against counties in the largest MSA's in FEMA Region VII present the following findings:

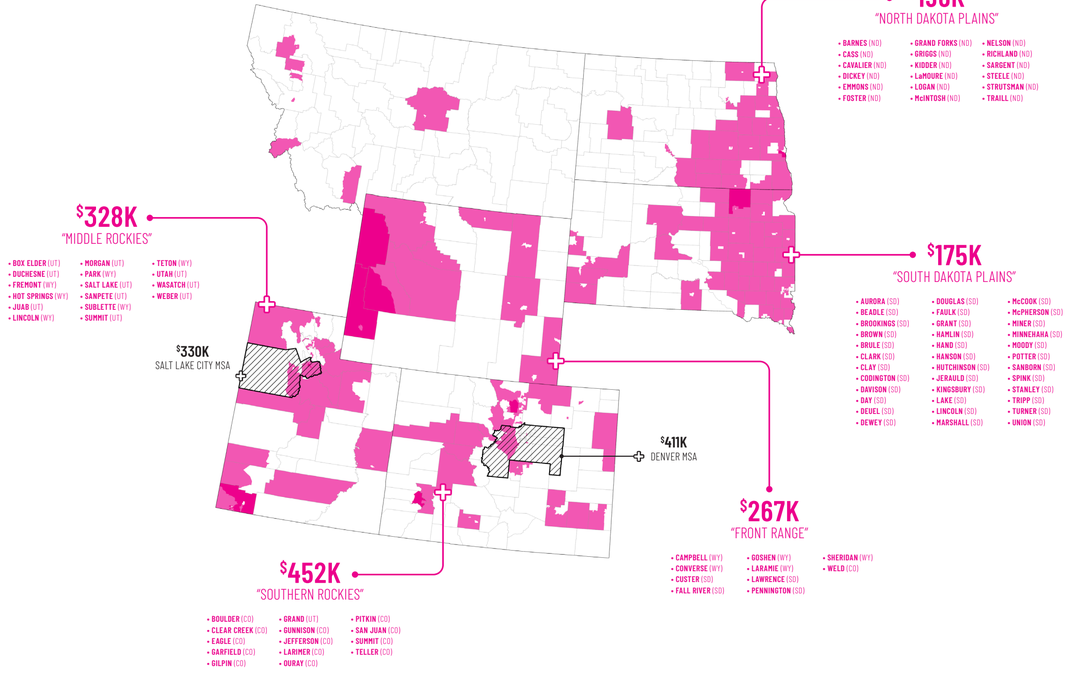
+ All four of the 'Disaster Hot Spots' (100%) have median home values that are less than the average median home value for MSA's in FEMA Region VII ($186,662); and

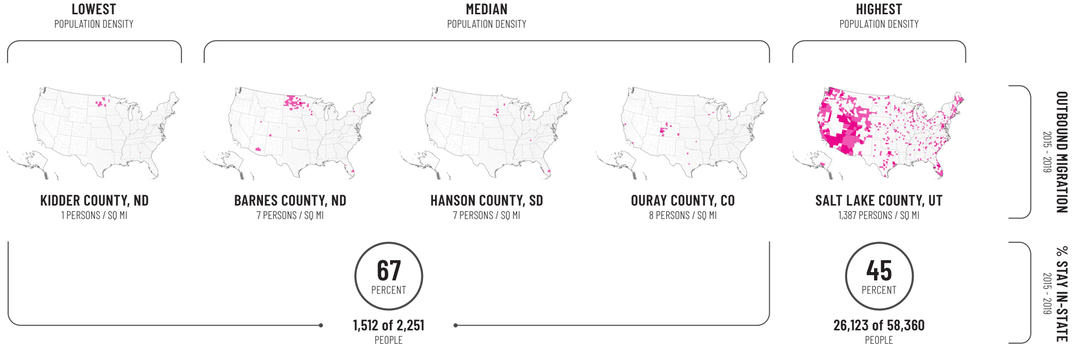
+ **All four (4) 'Disaster Hot Spots' possess median home values that are less than all MSA median home values in FEMA Region VII** (n=2).

Additional analysis of outbound migration patterns (U.S. Census Bureau, 2015-2019) within counties containing the lowest, median (3), and highest population densities in FEMA Region VII illustrates that:

+ **People that migrate from more rural counties are more likely to relocate closer to their origination point, specifically within their origination state (89%), compared to people that migrate from more urban areas** (e.g., Johnson County, Kansas in the Kansas City MSA; 35%).







FEMA REGION VIII

States in FEMA Region VIII – which include Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming – host two (2) Metropolitan Statistical Areas (MSA) with populations exceeding 1,000,000 people, and five (5) clusters of 'Disaster Hot Spots' based on Expected Annual Loss data derived from FEMA's National Risk Index (2022).

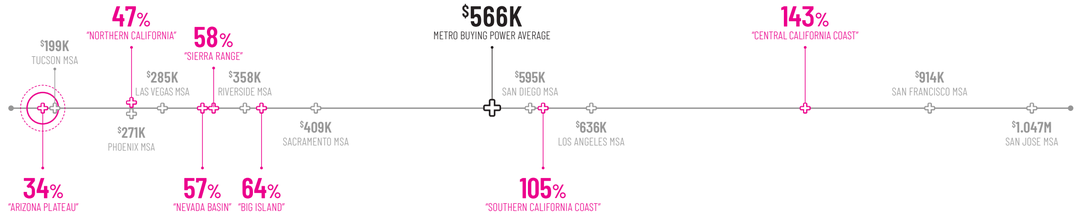
Geographically connected areas with the highest Expected Annual Loss ratings have been grouped using the following naming conventions to designate 'Disaster Hot Spots': **Front Range** (10 counties; 587,249 people), **Middle Rockies** (16 counties; 2,076,215 people), **North Dakota Plains** (18 counties; 312,415 people), **South Dakota Plains** (36 counties; 503,028 people), and **Southern Rockies** (14 counties; 1,350,031 people). Comparing the median home values (U.S. Census Bureau, 2016-2020), of counties within these 'Disaster Hot Spot' areas against counties in the largest MSA's in FEMA Region VIII present the following findings:

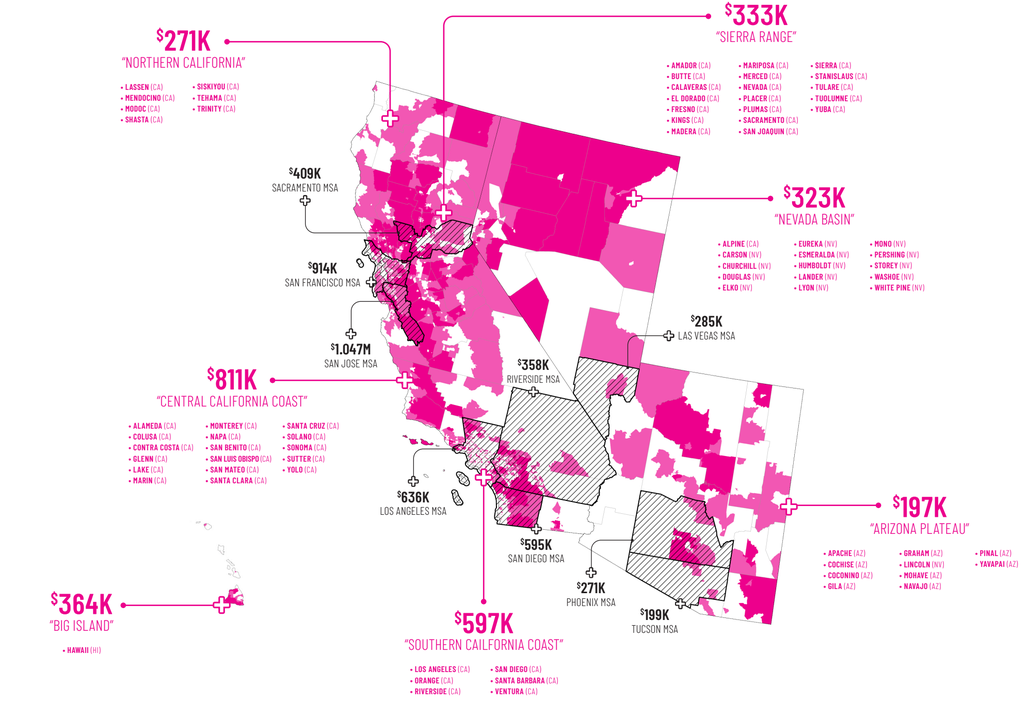
+ Four of the five of the 'Disaster Hot Spots' (80%) have median home values that are less than the average median home value for MSA's in FEMA Region VIII ($387,089); and

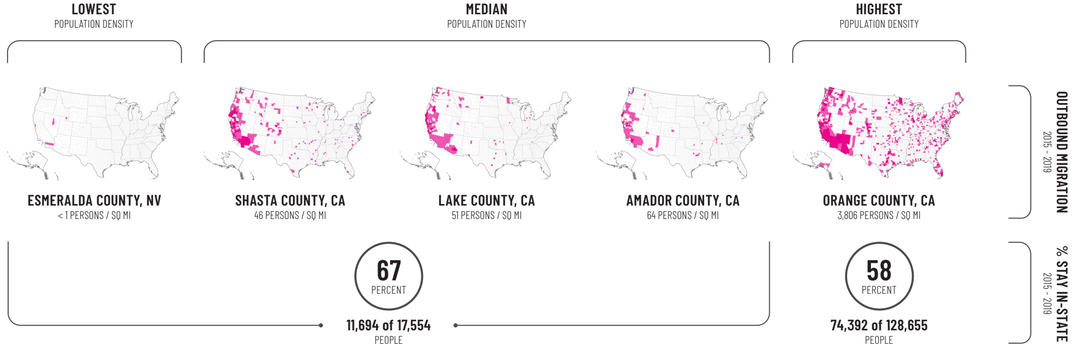
+ These same **four (4) 'Disaster Hot Spots' possess median home values that are less than all MSA median home values in FEMA Region VIII** (n=2).

Additional analysis of outbound migration patterns (U.S. Census Bureau, 2015-2019) within counties containing the lowest, median (3), and highest population densities in FEMA Region VIII illustrates that:

+ **People that migrate from more rural counties are more likely to relocate closer to their origination point, specifically within their origination state (67%), compared to people that migrate from more urban areas** (e.g., Salt Lake County, Utah, in the Salt Lake City MSA; 45%).







FEMA REGION IX

States in FEMA Region IX – which include Arizona, California, Hawaii, and Nevada – host nine (9) Metropolitan Statistical Areas (MSA) with populations exceeding 1,000,000 people, and seven (7) clusters of 'Disaster Hot Spots' based on Expected Annual Loss data derived from FEMA's National Risk Index (2022).

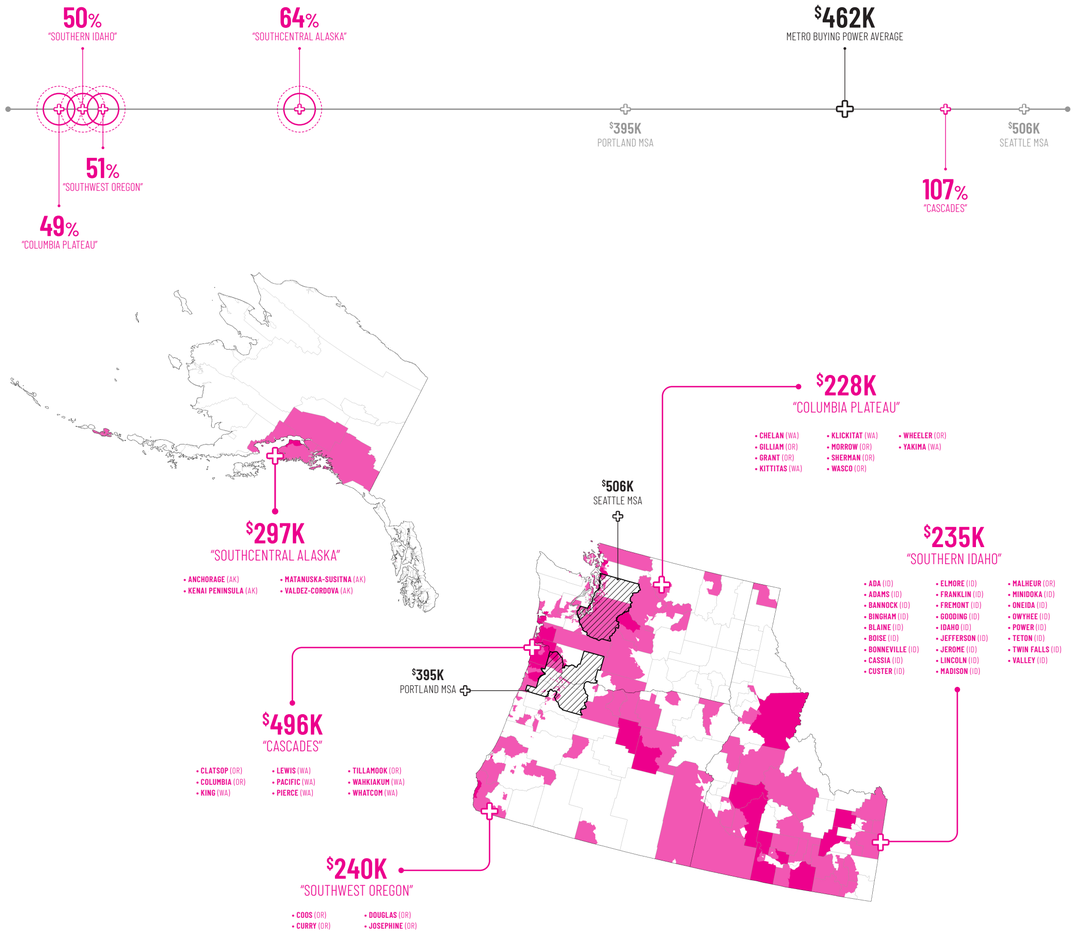
Geographically connected areas with the highest Expected Annual Loss ratings have been grouped using the following naming conventions to designate 'Disaster Hot Spots': **Arizona Plateau** (10 counties; 1,327,885 people), **Big Island** (1 county; 185,079 people), **Central California Coast** (17 counties: 7,757,641 people), **Nevada Basin** (15 counties; 710,596 people), **Northern California** (7 counties; 431,794 people), **Sierra Range** (19 counties; 5,651,757 people), and **Southern California Coast** (6 counties; 19,361,004 people). Comparing the median home values (U.S. Census Bureau, 2016-2020), of counties within these 'Disaster Hot Spot' areas against counties in the largest MSA's in FEMA Region IX present the following findings:

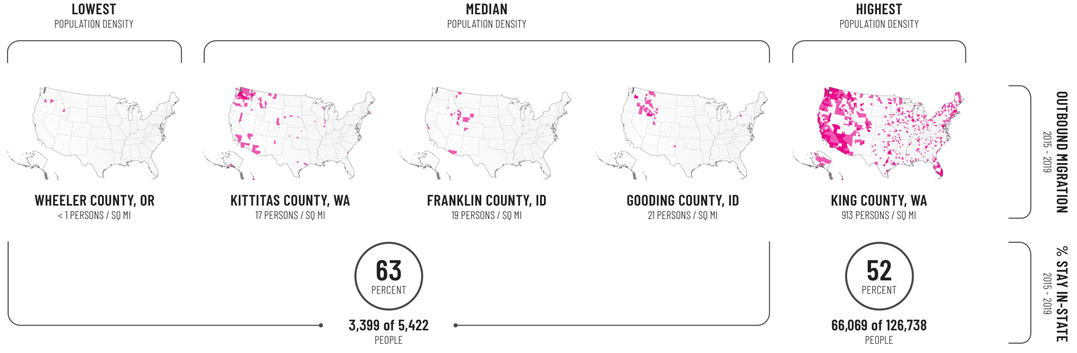
+ Five of the seven of the 'Disaster Hot Spots' (71%) have median home values that are less than the average median home value for MSA's in FEMA Region IX ($566,941); and

+ Out of seven, **one (1) 'Disaster Hot Spot' possesses a median home value that is less than all MSA median home values in FEMA Region IX** (n=9).

Additional analysis of outbound migration patterns (U.S. Census Bureau, 2015-2019) within counties containing the lowest, median (3), and highest population densities in FEMA Region IX illustrates that:

+ **People that migrate from more rural counties are more likely to relocate closer to their origination point, specifically within their origination state (67%), compared to people that migrate from more urban areas** (e.g., Orange County, California in the Los Angeles MSA; 58%).





FEMA REGION X

States in FEMA Region X – which include Alaska, Idaho, Oregon, and Washington – host two (2) Metropolitan Statistical Areas (MSA) with populations exceeding 1,000,000 people, and five (5) clusters of 'Disaster Hot Spots' based on Expected Annual Loss data derived from FEMA's National Risk Index (2022).

Geographically connected areas with the highest Expected Annual Loss ratings have been grouped using the following naming conventions to designate 'Disaster Hot Spots': **Cascades** (9 counties; 3,139,607 people), **Columbia Plateau** (10 counties; 425,825 people), **Southcentral Alaska** (4 counties; 445,857 people); **Southern Idaho** (26 counties; 1,033073 people), and **Southwest Oregon** (4 counties; 275,787 people). Comparing the median home values (U.S. Census Bureau, 2016-2020), of counties within these 'Disaster Hot Spot' areas against counties in the largest MSA's in FEMA Region X present the following findings:

+ Four of the five of the 'Disaster Hot Spots' (80%) have median home values that are less than the average median home value for MSA's in FEMA Region X ($462,815); and

+ These same **four (4) 'Disaster Hot Spots' possess median home values that are less than all MSA median home values in FEMA Region X** (n=2).

Additional analysis of outbound migration patterns (U.S. Census Bureau, 2015-2019) within counties containing the lowest, median (3), and highest population densities in FEMA Region X illustrates that:

+ **People that migrate from more rural counties are more likely to relocate closer to their origination point, specifically within their origination state (63%), compared to people that migrate from more urban areas** (e.g., King County, Washington in the Seattle MSA; 52%).

BUYING POWER: SUMMARY + FINDINGS

Of the 35 'Disaster Hot Spots' assessed nationwide, 22 (62.8%) have Median Home Values (MHV) below **all** Metropolitan Statistical Areas (MSAs with 1M+ population) within their same FEMA Region. Additionally, only 5 of the 'Disaster Hot Spots' assessed nationwide (14.2%) have Median Home Values that are equal to or above the weighted average for MSAs within their same FEMA Region ("Southern Florida," "Southern Rockies," "Southern California Coast," "Central California Coast," and "Cascades").

These findings suggest that, in general, individuals displaced by a natural disaster within the remaining 30 'Disaster Hot Spots' (85.7%) are likely to face significant financial barriers that are not typically covered in federal and state relocation programs if presented with migration-focused strategies for hazard mitigation.

Furthermore, it is important to note that these figures represent county-level figures within each 'Disaster Hot Spot' and Metropolitan Statistical Area (MSA). Within each county are areas that: i) are more vulnerable to losses from natural hazards and climate change; and ii) have lower property values than associated countywide figures due to location, population demographics, environmental conditions, etc. In many cases, these two forces are working together to create even more drastic "buying power" figures than what is shown in the provided data tables. For instance, there are many rural and minority communities throughout the Southeast U.S. (FEMA Regions IV and VI) that live within the floodplains of large riverine systems. In these cases, the Median Home Value of these properties are likely to be significantly lower than countywide statistics which, in addition to raising alarming equity concerns, further excludes these populations from participating in the most common forms of mitigation assistance programs.

"Of the 35 'Disaster Hot Spots' assessed nationwide, 22 (**62.8%**) have median home values below all Metropolitan Statistical Areas (MSA's with 1M+ population) within their same FEMA Region."

FEMA REGIONS I + II + III

MHV ($1,000)	DISASTER HOT SPOT OR 1M+ POP. MSA	% MSA WT. AVG.
147	Rochester, NY	36%
155	Buffalo, NY	38%
160	Pittsburgh, PA	39%
243	"Chesapeake Bay"	59%
245	Richmond, VA	60%
251	Hartford, CT	61%
251	Virginia Beach, VA	61%
255	Philadelphia, PA	62%
292	Providence, RI	71%
295	Baltimore, MD	72%
407	**1M+ Pop. MSA Weighted Average**	
473	Washington D.C.	116%
479	Boston, MA	117%
539	New York City, NY	132%

FEMA REGION IV

MHV ($1,000)	DISASTER HOT SPOT OR 1M+ POP. MSA	% MSA WT. AVG.
126	"Mississippi Gulf"	53%
133	"Western Kentucky"	56%
139	"Florida Panhandle"	58%
145	"Coastal Carolina"	61%
↑	**No MSA Relocation Options**	
160	Memphis, TN	67%
169	Birmingham, AL	71%
176	Cincinnati, OH	74%
180	Louisville, KY	75%
214	Tampa Bay, FL	90%
215	Jacksonville, FL	90%
220	Charlotte, NC	92%
237	**1M+ Pop. MSA Weighted Average**	
242	Atlanta, GA	102%
246	Orlando, FL	103%
248	"Southern Florida"	104%
251	Virginia Beach, VA	105%
271	Nashville, TN	121%
275	Raleigh, NC	116%
299	Miami, FL	126%

FEMA REGION V

MHV ($1,000)	DISASTER HOT SPOT OR 1M+ POP. MSA	% MSA WT. AVG.
128	"Wabash Valley"	60%
151	"Southern Minnesota"	71%
↑	**No MSA Relocation Options**	
153	Cleveland, OH	72%
174	Indianapolis, IN	82%
176	Cincinnati, OH	83%
177	Detroit, MI	83%
179	St. Louis, MO	84%
180	Louisville, KY	85%
186	Grand Rapids, MI	88%
196	Columbus, OH	92%
210	Milwaukee, WI	99%
211	**1M+ Pop. MSA Weighted Average**	
250	Chicago, IL	118%
273	Minneapolis, MN	129%

FEMA REGION VI

MHV ($1,000)	DISASTER HOT SPOT OR 1M+ POP. MSA	% MSA WT. AVG.
112	"Ozark Highlands"	52%
118	"New Mexico Tablelands"	55%
138	"Northern Texas"	64%
↑	**No MSA Relocation Options**	
160	Memphis, TN	75%
160	Oklahoma City, OK	75%
182	San Antonio, TX	85%
184	"Louisiana Gulf"	86%
187	"Texas Hill Country"	87%
196	"Texas Gulf"	92%
204	Houston, TX	95%
213	**1M+ Pop. MSA Weighted Average**	
213	New Orleans, LA	100%
227	Dallas, TX	106%
312	Austin, TX	146%

FEMA REGION VII

MHV ($1,000)	DISASTER HOT SPOT OR 1M+ POP. MSA	% MSA WT. AVG.
114	"Missouri Lowlands"	61%
121	"Kansas High Plains"	65%
141	"Iowa Corn Belt"	75%
146	"Central Nebraska"	78%
↑	**No MSA Relocation Options**	
179	St. Louis, MO	96%
186	**1M+ Pop. MSA Weighted Average**	
195	Kansas City, MO	104%

FEMA REGION VIII

MHV ($1,000)	DISASTER HOT SPOT OR 1M+ POP. MSA	% MSA WT. AVG.
175	"South Dakota Plains"	45%
196	"North Dakota Plains"	50%
267	"Front Range"	68%
328	"Middle Rockies"	84%
↑	**No MSA Relocation Options**	
330	Salt Lake City, UT	85%
387	**1M+ Pop. MSA Weighted Average**	
411	Denver, CO	106%
452	"Southern Rockies"	116%

FEMA REGION IX

MHV ($1,000)	DISASTER HOT SPOT OR 1M+ POP. MSA	% MSA WT. AVG.
197	"Arizona Plateau"	34%
↑	**No MSA Relocation Options**	
199	Tucson, AZ	35%
271	"Northern California"	47%
271	Phoenix, AZ	47%
285	Las Vegas, NV	50%
323	"Nevada Basin"	57%
333	"Sierra Range"	58%
358	Riverside, CA	63%
364	"Big Island"	64%
409	Sacramento, CA	72%
566	**1M+ Pop. MSA Weighted Average**	
595	San Diego, CA	105%
597	"Southern Cali. Coast"	105%
636	Los Angeles, CA	112%
811	"Central Cali. Coast"	143%
914	San Francisco, CA	161%
1,047	San Jose, CA	184%

FEMA REGION X

MHV ($1,000)	DISASTER HOT SPOT OR 1M+ POP. MSA	% MSA WT. AVG.
228	"Columbia Plateau"	49%
235	"Southern Idaho"	50%
240	"Southwest Oregon"	51%
297	"Southcentral Alaska"	64%
↑	**No MSA Relocation Options**	
395	Portland, OR	85%
462	**1M+ Pop. MSA Weighted Average**	
496	"Cascades"	107%
506	Seattle, WA	109%

MIGRATION PATTERNS: SUMMARY + FINDINGS

People within 'Disaster Hot Spots' that move from counties with the lowest and median population densities (n=32) are more likely to remain in-state (70%) than people that move from counties with the highest population densities (n=8; 56%).

This in-state migration tendency for people leaving more rural counties is variable across the U.S. (a 12% difference from the sampled urban county in FEMA Region IV, and a 54% difference from the sampled urban county in FEMA Region VII), however, this pattern is observed across the U.S. in every FEMA Region.

While an individual's ability to move further away from their origination point can be partially influenced by their relative "buying power" (which is typically higher within more urban areas, see "Buying Power" summary), there are many other **choice factors** that may contribute to the closer migration distances stemming from populations leaving rural counties, including social cohesion, access to natural resources, and/or place attachment.

Whether influenced by some **limiting factor** (such as "buying power") or by a series of choice factors, there is a significant and sizable tendency for rural out-migrants to remain closer to home when moving outside of their community. Given the rural tilt to 'Disaster Hot Spots' nationwide, these results – though somewhat limited in scope for the purposes of this study – challenge presumptions that climate-migrants would be willing, as a matter of choice, to move to more expensive urban markets or to distant "receiver" cities.

"... [people] that move from counties with the lowest and median population densities (n=32) are more likely to remain in-state (**70%**) than people that move from counties with the highest population densities (n=8; **56%**)."

FEMA REGIONS I + II + III

# OUT MIGRANTS	DISASTER HOT SPOT SAMPLE COUNTY	% IN STATE
	Lowest Pop. Density	
592	King & Queen County, VA	
	Median Pop. Density	**51%**
1,838	Caroline County, MD	
475	Mathews County, VA	
2,323	Worcester County, MD	
	Highest Pop. Density	
5,885	Cecil County, MD	**31%**

+ 20 PERCENT

In-State Migration Tendency for Sampled Rural Counties

FEMA REGION IV

# OUT MIGRANTS	DISASTER HOT SPOT SAMPLE COUNTY	% IN STATE
	Lowest Pop. Density	
292	Hyde County, NC	
	Median Pop. Density	**81%**
3,110	Columbus County, NC	
2,418	Sampson County, NC	
1,215	Graves County, KY	
	Highest Pop. Density	
34,630	Seminole County, FL	**69%**

+ 12 PERCENT

In-State Migration Tendency for Sampled Rural Counties

FEMA REGION V

# OUT MIGRANTS	DISASTER HOT SPOT SAMPLE COUNTY	% IN STATE
	Lowest Pop. Density	
455	Murray County, MN	
	Median Pop. Density	**79%**
1,329	Meeker County, MN	
1,288	Brown County, MN	
1,383	Freeborn County, MN	
	Highest Pop. Density	
8,344	Vanderburgh County, IN	**54%**

+ 25 PERCENT

In-State Migration Tendency for Sampled Rural Counties

FEMA REGION VI

# OUT MIGRANTS	DISASTER HOT SPOT SAMPLE COUNTY	% IN STATE
	Lowest Pop. Density	
299	Catron County, NM	
	Median Pop. Density	**78%**
895	Haskell County, OK	
1,460	Gillespie County, TX	
1,750	Tyler County, TX	
	Highest Pop. Density	
182,141	Harris County, TX	**64%**

+ 14 PERCENT

In-State Migration Tendency for Sampled Rural Counties

FEMA REGION VII

# OUT MIGRANTS	DISASTER HOT SPOT SAMPLE COUNTY	% IN STATE
	Lowest Pop. Density	
43	Greeley County, KS	
	Median Pop. Density	**89%**
820	Wayne County, MO	
521	Sac County, IA	
389	Franklin County, IA	
	Highest Pop. Density	
35,268	Johnson County, KS	**35%**

+ 54 PERCENT

In-State Migration Tendency for Sampled Rural Counties

FEMA REGION VIII

# OUT MIGRANTS	DISASTER HOT SPOT SAMPLE COUNTY	% IN STATE
	Lowest Pop. Density	
146	Kidder County, ND	
	Median Pop. Density	**67%**
902	Barnes County, ND	
515	Hanson County, SD	
688	Ouray County, CO	
	Highest Pop. Density	
58,360	Salt Lake County, UT	**45%**

+ 22 PERCENT

In-State Migration Tendency for Sampled Rural Counties

FEMA REGION IX

# OUT MIGRANTS	DISASTER HOT SPOT SAMPLE COUNTY	% IN STATE
	Lowest Pop. Density	
77	Esmeralda County, NV	
	Median Pop. Density	**67%**
9,848	Shasta County, CA	
4,627	Lake County, CA	
3,002	Amador County, CA	
	Highest Pop. Density	
128,655	Orange County, CA	**58%**

+ 19 PERCENT

In-State Migration Tendency for Sampled Rural Counties

FEMA REGION X

# OUT MIGRANTS	DISASTER HOT SPOT SAMPLE COUNTY	% IN STATE
	Lowest Pop. Density	
48	Wheeler County, OR	
	Median Pop. Density	**63%**
3,327	Kittitas County, WA	
640	Franklin County, ID	
1,407	Gooding County, ID	
	Highest Pop. Density	
126,738	King County, WA	**52%**

+ 21 PERCENT

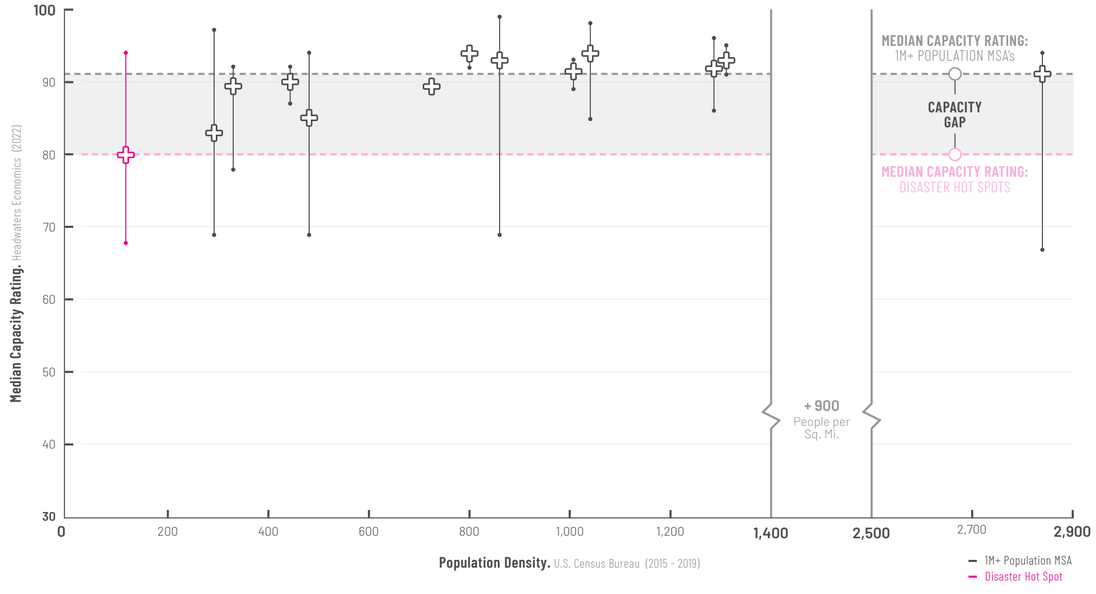
In-State Migration Tendency for Sampled Rural Counties

COMMUNITY CAPACITY

DEFINITIONS + DATA LIMITATIONS

Community Capacity. Figures from the "Rural Capacity Index," created by Headwaters Economics, at the time of data collection (Winter 2021 - Spring 2022) were used to illustrate the minimum, maximum, and median 'Capacity' values for each study area (e.g., Raleigh MSA or "Coastal Carolina"). Headwaters Economics defines "capacity" as the "staffing, resources, and expertise to apply for funding, fulfill onerous reporting requirements, and design, build, and maintain infrastructure projects over the long term." The Rural Capacity Index uses a scale of 0 (low capacity) to 100 (high capacity) to assign capacity values (county-level values for this study) based on ten variables related to **government staffing, community education, and engagement and socioeconomic trends.**

These ten variables include: i) "core" versus "non-core" metropolitan classification (Centers for Diseases Control and Prevention, 2013); ii) presence of a head of planning or zoning (Power Almanac, 2021); iii) presence of a college or university (National Center for Education Statistics, 2020); iv) percentage of adults with a Bachelor's degree or higher (U.S. Census Bureau, 2020); v) percentage of families above poverty level (U.S. Census Bureau, 2020); vi) percentage of households with broadband service (U.S. Census Bureau, 2020); vii) percentage of population with health insurance (U.S. Census Bureau, 2020); viii) voter turnout (Atlas of U.S. Presidential Elections, 2020); ix) income stability score (Bureau of Economic Analysis, 2021); and x) population change (U.S. Census Bureau, 2021).



FEMA REGIONS I + II + III

The median capacity rating (Headwaters Economics, 2022) for counties within the 'Disaster Hot Spot' is: **Chesapeake Bay: 80** (min=68; max=94).

+ **The median capacity rating of all counties within the single 'Disaster Hot Spot' in FEMA Regions I, II, and III is: 80** (n=12), and

+ **The median capacity rating of all counties within the largest MSA's in FEMA Regions I, II, and III is: 91** (n=130).

When these figures are illustrated on a scatter plot and compared against the overall population density (total population divided by total area), the following patterns are present:

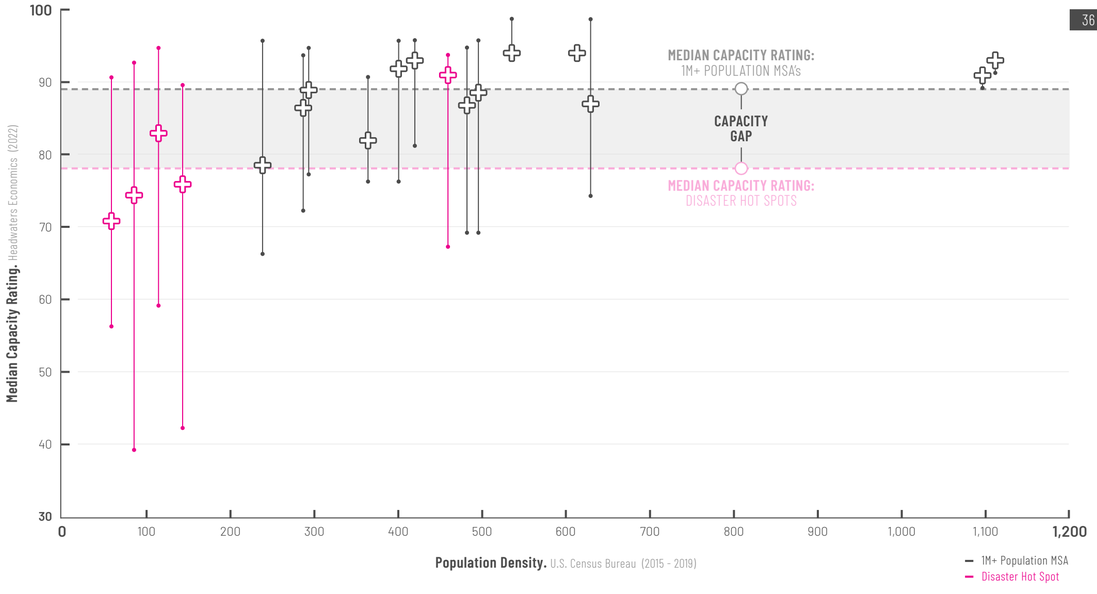
+ A correlation associates **lower (and more variable) ratings of community capacity to areas with lower (more rural) population densities,**

+ The single (1) 'Disaster Hot Spot' (100%) has a population density that is more rural than all MSAs in FEMA Regions I, II, and III, and

+ **The single (1) 'Disaster Hot Spot' (100%) has a median capacity rating that is less than the median MSA capacity rating (91) in FEMA Regions I, II, and III.**

80 OUT OF 100
DISASTER HOT SPOTS

91 OUT OF 100
1M+ POPULATION MSA's



FEMA REGION IV

The median capacity ratings (Headwaters Economics, 2022) for counties within each of the designated 'Disaster Hot Spots' are: **Florida Panhandle: 71** (min=56; max=91), **Mississippi Gulf: 74** (min=39; max=93), **Western Kentucky: 76** (min=42; max=90), **Coastal Carolina: 83** (min=61; max=95), and **Southern Florida: 91** (min=67; max=94). Collectively:

+ **The median capacity rating of all counties within 'Disaster Hot Spots' in FEMA Region IV is: 78** (n=144), and

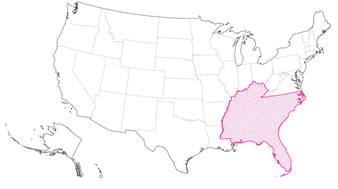
+ **The median capacity rating of all counties within the largest MSA's in FEMA Region IV is: 89** (n=128).

When these figures are illustrated on a scatter plot and compared against the overall population density (total population divided by total area), the following patterns are present:

+ A correlation associates **lower (and more variable) ratings of community capacity to areas with lower (more rural) population densities,**

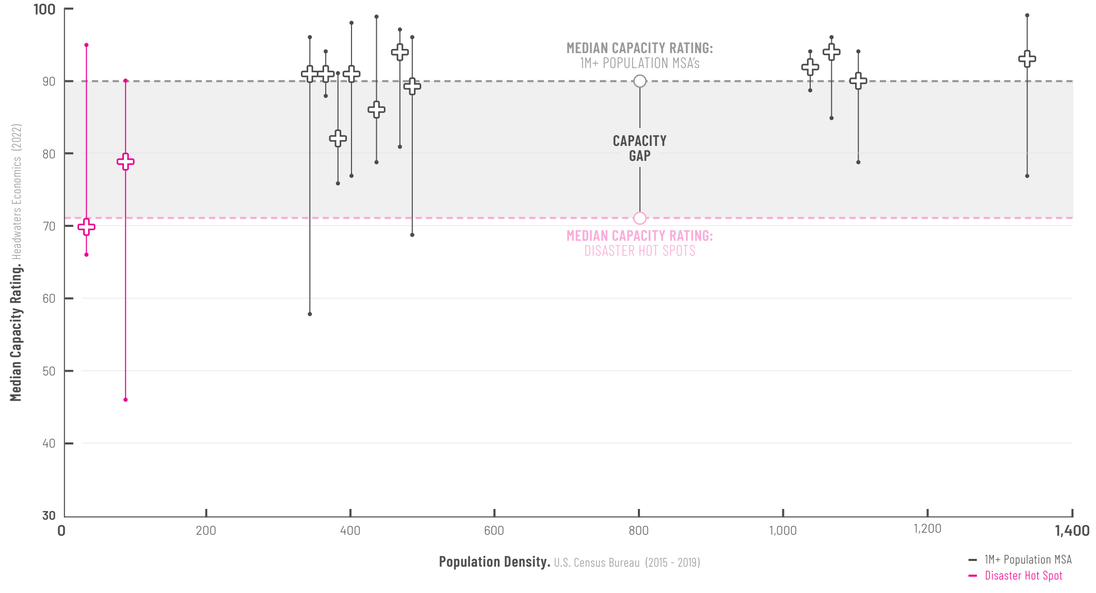
+ Four (4) of the five (5) 'Disaster Hot Spots' (80%) have population densities that are more rural than all MSAs in FEMA Region IV, and

+ The same **four (4) 'Disaster Hot Spots' (80%) have median capacity ratings that are less than the median MSA capacity rating (89) in FEMA Region IV.**



78 OUT OF 100
DISASTER HOT SPOTS

89 OUT OF 100
1M+ POPULATION MSA's



FEMA REGION V

The median capacity ratings (Headwaters Economics, 2022) for counties within each of the designated 'Disaster Hot Spots' are: **Southern Minnesota: 70** (min=66; max=95), and **Wabash Valley: 79** (min=46; max=90). Collectively:

+ The median capacity rating of all counties within 'Disaster Hot Spots' in FEMA Region V is: 71 (n=137), and

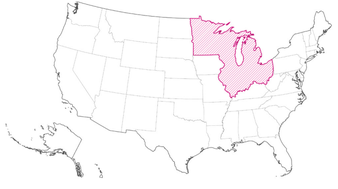
+ The median capacity rating of all counties within the largest MSA's in FEMA Region V is: 90 (n=110).

When these figures are illustrated on a scatter plot and compared against the overall population density (total population divided by total area), the following patterns are present:

+ A correlation associates l**ower (and more variable) ratings of community capacity to areas with lower (more rural) population densities,**

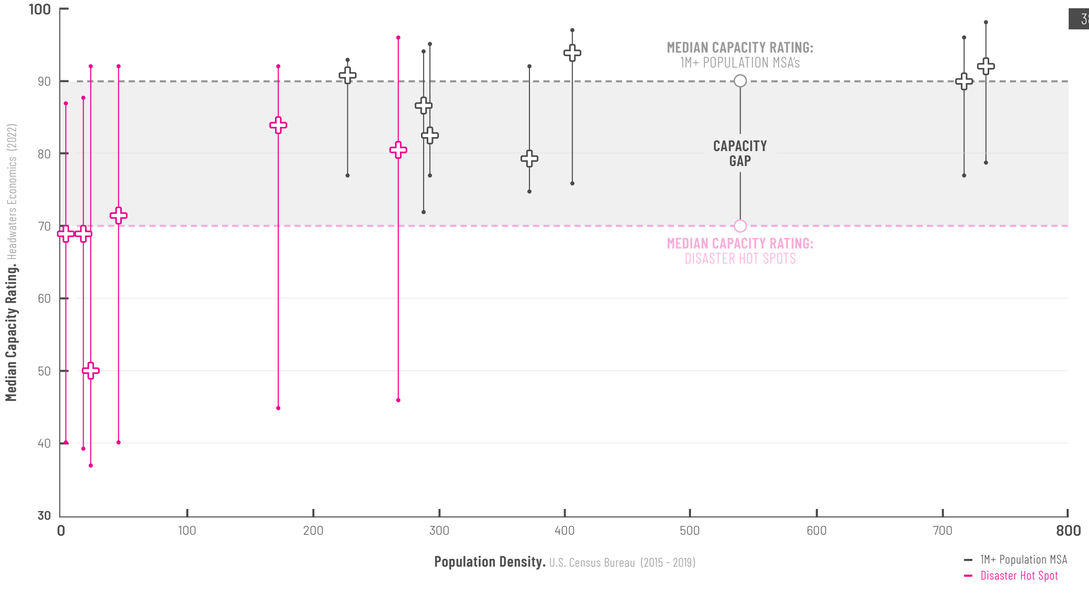
+ Both of the two (2) 'Disaster Hot Spots' (100%) have population densities that are more rural than all MSAs in FEMA Region V, and

+ Both of the **two (2) 'Disaster Hot Spots' (100%) have median capacity ratings that are less than the median MSA capacity rating (90) in FEMA Region V.**



71 OUT OF 100
DISASTER HOT SPOTS

90 OUT OF 100
1M+ POPULATION MSA'S



FEMA REGION VI

The median capacity ratings (Headwaters Economics, 2022) for counties within each of the designated 'Disaster Hot Spots' are: **Northern Texas: 50** (min=37; max=92), **New Mexico Tablelands: 69** (min=40; max=87), **Texas Hill Country: 69** (min=39; max=88), **Ozark Highlands: 71** (min=40, max=92), **Texas Gulf: 80** (min=46, max=96), and **Louisiana Gulf: 84** (min=45, max=92). Collectively:

+ The median capacity rating of all counties within 'Disaster Hot Spots' in FEMA Region VI is: 70 (n=173), and

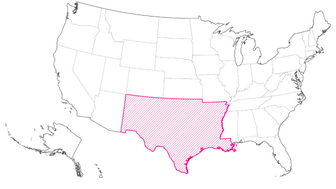
+ The median capacity rating of all counties within the largest MSA's in FEMA Region VI is: 90 (n=55).

When these figures are illustrated on a scatter plot and compared against the overall population density (total population divided by total area), the following patterns are present:

+ A correlation associates **lower (and more variable) ratings of community capacity to areas with lower (more rural) population densities,**

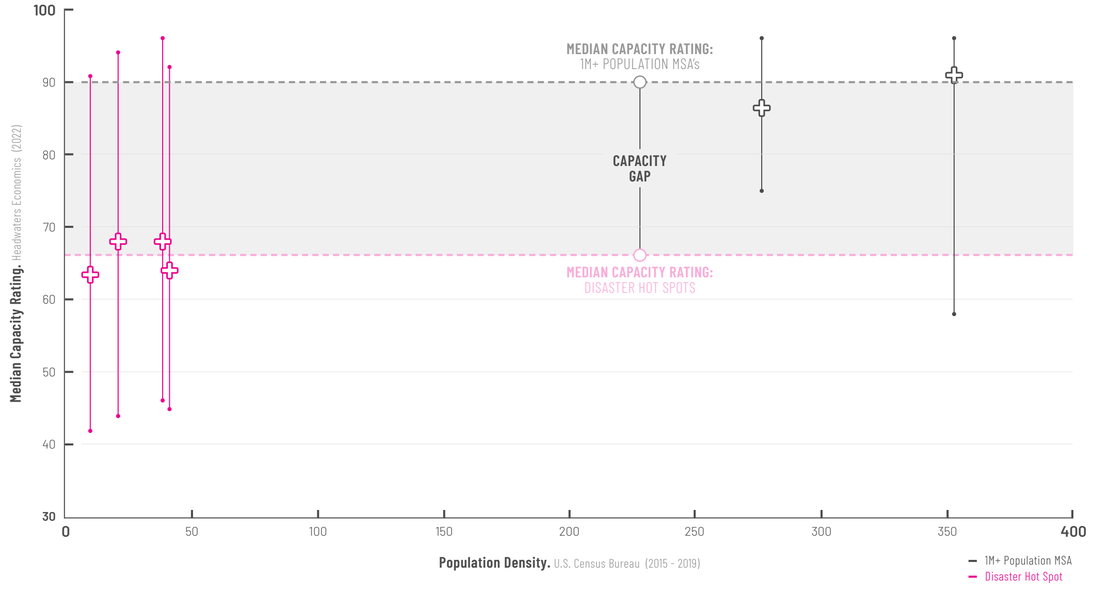
+ Five (5) of the six (6) 'Disaster Hot Spots' (83%) have population densities that are more rural than all MSAs in FEMA Region VI, and

+ All six (6) 'Disaster Hot Spots' (100%) have median capacity ratings that are less than the median MSA capacity rating (90) in FEMA Region VI.



70 OUT OF 100
DISASTER HOT SPOTS

90 OUT OF 100
1M+ POPULATION MSA'S



FEMA REGION VII

The median capacity ratings (Headwaters Economics, 2022) for counties within each of the designated 'Disaster Hot Spots' are: **Kansas High Plains: 63** (min=42; max=91), **Missouri Lowlands: 64** (min=45, max=92), **Central Nebraska: 68** (min=44, max=94), and **Iowa Corn Belt: 68** (min=46, max=96). Collectively:

+ **The median capacity rating of all counties within 'Disaster Hot Spots' in FEMA Region VII is: 67** (n=186), and

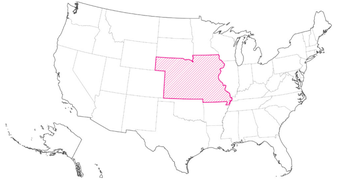
+ **The median capacity rating of all counties within the largest MSA's in FEMA Region VII is: 90** (n=29).

When these figures are illustrated on a scatter plot and compared against the overall population density (total population divided by total area), the following patterns are present:

+ A correlation associates **lower (and more variable) ratings of community capacity to areas with lower (more rural) population densities,**

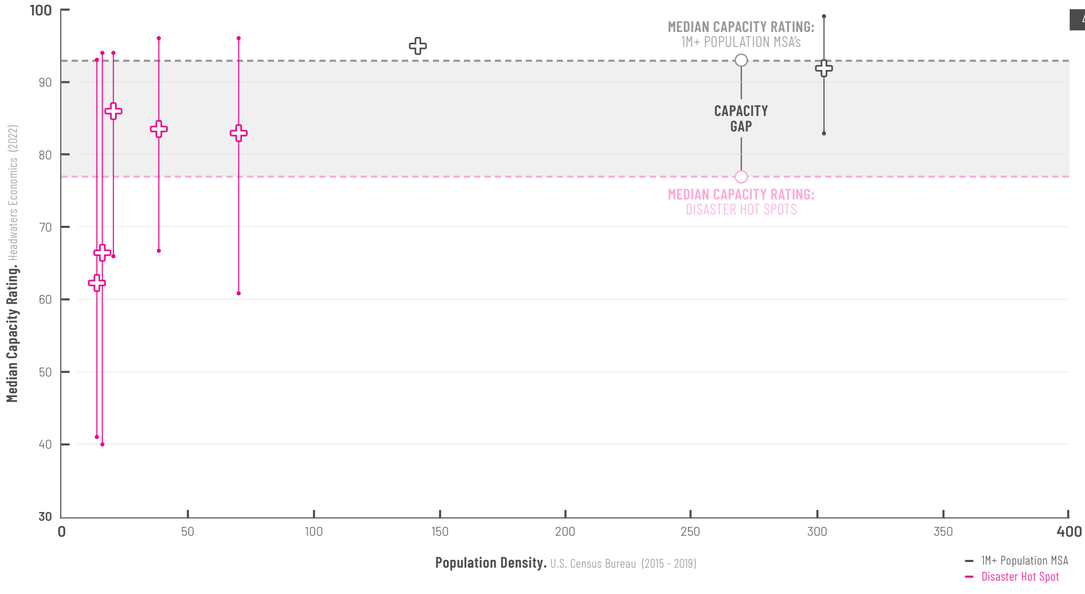
+ All four (4) 'Disaster Hot Spots' (100%) have population densities that are more rural than all MSAs in FEMA Region VII, and

+ **All four (4) 'Disaster Hot Spots' (100%) have median capacity ratings that are less than the median MSA capacity rating (90) in FEMA Region VII.**



67 OUT OF 100
DISASTER HOT SPOTS

90 OUT OF 100
1M+ POPULATION MSA'S



FEMA REGION VIII

The median capacity ratings (Headwaters Economics, 2022) for counties within each of the designated 'Disaster Hot Spots' are: **North Dakota Plains: 62** (min=41; max=93), **South Dakota Plains: 66** (min=40, max=94), **Southern Rockies: 83** (min=61, max=96), **Middle Rockies: 83** (min=67, max=96), and **Front Range: 86** (min=66, max=94). Collectively:

+ **The median capacity rating of all counties within 'Disaster Hot Spots' in FEMA Region VIII is: 77** (n=94), and

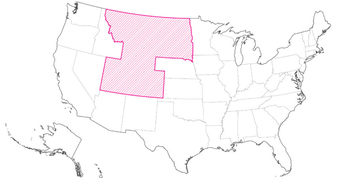
+ **The median capacity rating of all counties within the largest MSA's in FEMA Region VIII is: 93** (n=12).

When these figures are illustrated on a scatter plot and compared against the overall population density (total population divided by total area), the following patterns are present:

+ A correlation associates **lower (and more variable) ratings of community capacity to areas with lower (more rural) population densities,**

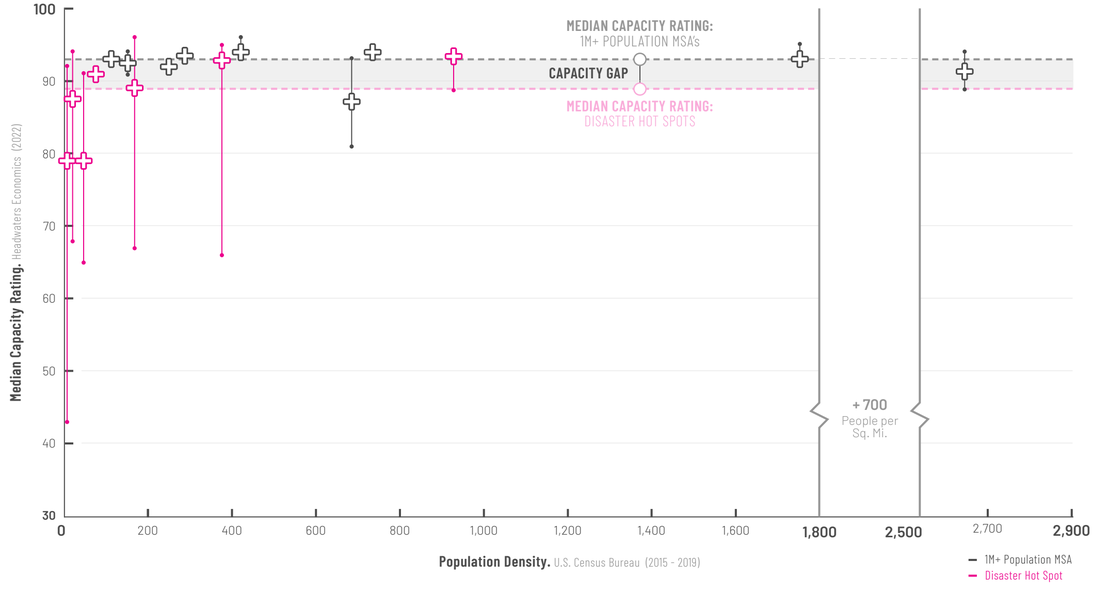
+ All five (5) 'Disaster Hot Spots' (100%) have population densities that are more rural than all MSAs in FEMA Region VIII, and

+ **All five (5) 'Disaster Hot Spots' (100%) have median capacity ratings that are less than the median MSA capacity rating (93) in FEMA Region VIII.**



77 OUT OF 100
DISASTER HOT SPOTS

93 OUT OF 100
1M+ POPULATION MSA'S



FEMA REGION IX

The median capacity ratings (Headwaters Economics, 2022) for counties within each of the designated 'Disaster Hot Spots' are: **Nevada Basin: 79** (min=43; max=92), **Northern California: 79** (min=65, max=91), **Arizona Plateau: 87** (min=68, max=94), **Sierra Range: 89** (min=67, max=96), **Big Island: 91** (min=91, max=91), **Central California Coast: 93** (min=66, max=95), and **Southern California Coast: 93** (min=89, max=94). Collectively:

+ **The median capacity rating of all counties within 'Disaster Hot Spots' in FEMA Region IX is: 89** (n=75), and

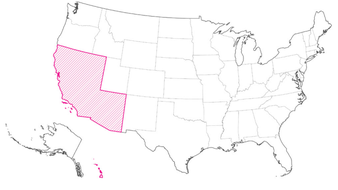
+ **The median capacity rating of all counties within the largest MSA's in FEMA Region IX is: 93** (n=20).

When these figures are illustrated on a scatter plot and compared against the overall population density (total population divided by total area), the following patterns are present:

+ A correlation associates **lower (and more variable) ratings of community capacity to areas with lower (more rural) population densities,**

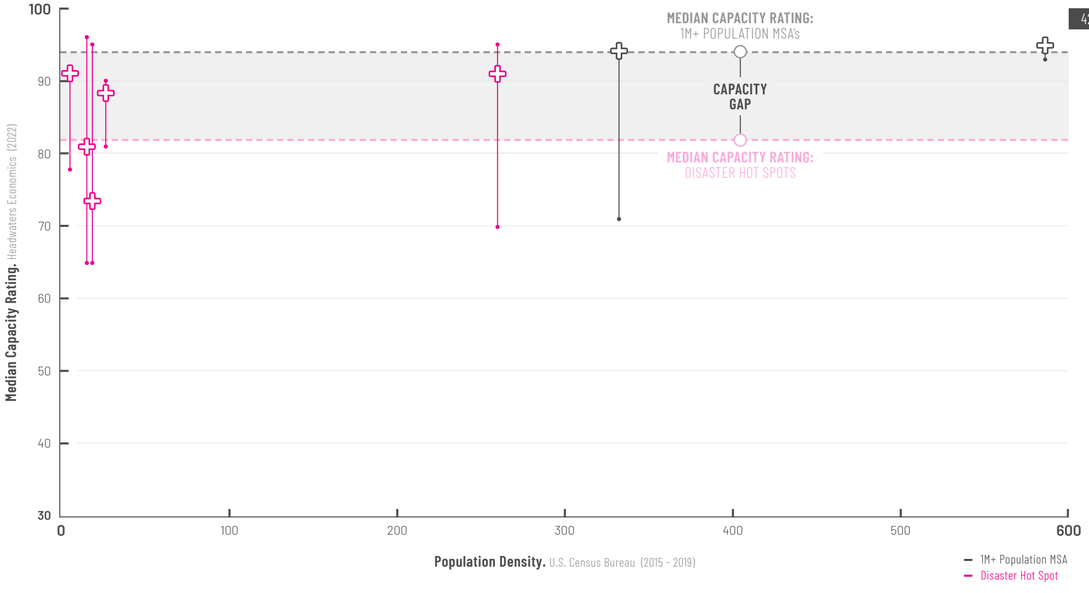
+ Four (4) of the seven (7) 'Disaster Hot Spots' (57%) have population densities that are more rural than all MSAs in FEMA Region IX, and

+ **Five (5) of the seven (7) 'Disaster Hot Spots' (71%) have median capacity ratings that are less than the median MSA capacity rating (93) in FEMA Region IX.**



89 OUT OF 100 — **DISASTER HOT SPOTS**

93 OUT OF 100 — **1M+ POPULATION MSA'S**



FEMA REGION X

The median capacity ratings (Headwaters Economics, 2022) for counties within each of the designated 'Disaster Hot Spots' are: **Columbia Plateau: 73** (min=65; max=95), **Southern Idaho: 81** (min=65, max=96), **Southwest Oregon: 88** (min=81, max=90), **Southcentral Alaska: 91** (min=78, max=92), and C**ascades: 91** (min=70, max=95). Collectively:

+ **The median capacity rating of all counties within 'Disaster Hot Spots' in FEMA Region X is: 82** (n=53), and

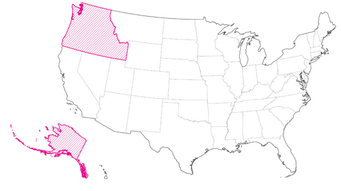
+ **The median capacity rating of all counties within the largest MSA's in FEMA Region X is: 94** (n=10).

When these figures are illustrated on a scatter plot and compared against the overall population density (total population divided by total area), the following patterns are present:

+ A correlation associates **lower (and more variable) ratings of community capacity to areas with lower (more rural) population densities,**

+ All five (5) 'Disaster Hot Spots' (100%) have population densities that are more rural than all MSAs in FEMA Region X, and

+ **All five (5) 'Disaster Hot Spots' (100%) have median capacity ratings that are less than the median MSA capacity rating (94) in FEMA Region X.**



82 OUT OF 100 — **DISASTER HOT SPOTS**

94 OUT OF 100 — **1M+ POPULATION MSA'S**

COMMUNITY CAPACITY: SUMMARY + FINDINGS

Of the 35 'Disaster Hot Spots' assessed nationwide, 27 (77.1%) have median capacity ratings below **all** Metropolitan Statistical Areas (MSA's with 1M+ population) within their same FEMA Region.

Additionally, only 3 of the 'Disaster Hot Spots' assessed nationwide (8.5%) have median capacity ratings that are equal to or above the median for MSAs within their same FEMA Region ("Southern Florida," "Central California Coast," and "Southern California Coast"). These findings suggest that, in general, local units of government within the remaining 32 'Disaster Hot Spots' (91.4%) are likely to face significant financial and/or technical barriers, compared to their nearby urban counterparts, when attempting to implement resilience-building measures within their communities.

While the median 'Disaster Hot Spot' capacity rating in comparison to the median MSA capacity rating within each FEMA Region yielded a "capacity gap" for 'Disaster Hot Spots' in every FEMA Region, the size of the capacity gap was somewhat variable across the U.S. (a 4-point difference in FEMA Region IX, and a 23-point difference in FEMA Region VII on a 100-point scale).

These findings collectively illustrate that designers and planners should expect that municipalities located within 'Disaster Hot Spot' areas are more likely to have additional financial challenges and technical constraints in need of consideration, especially compared to urban areas, as they relate to all aspects of developing recommendations and implementing projects.

"Of the 35 'Disaster Hot Spots' assessed nationwide, 27 (**77.1%**) have median capacity ratings below all Metropolitan Statistical Areas (MSA's with 1M+ population) within their same FEMA Region."

FEMA REGIONS I + II + III

CAPACITY RATING	DISASTER HOT SPOT OR 1M+ POP. MSA	POP. DENSITY
80	"Chesapeake Bay"	121
80	**Disaster Hot Spot Median**	
83	Richmond, VA	292
85	Virginia Beach, VA	481
89	Rochester, NY	330
89	Buffalo, NY	725
90	Pittsburgh, PA	446
91	**1M+ Population MSA Median**	
91	New York City, NY	2,826
91	Providence, RI	1,008
92	Philadelphia, PA	1,296
93	Boston, MA	533
93	Washington D.C.	860
94	Hartford, CT	800
94	Baltimore, MD	1,041

FEMA REGION IV

CAPACITY RATING	DISASTER HOT SPOT OR 1M+ POP. MSA	POP. DENSITY
71	"Florida Panhandle"	59
74	"Mississippi Gulf"	85
76	"Western Kentucky"	142
78	**Disaster Hot Spot Median**	
78	Birmingham, AL	236
82	Louisville, KY	371
83	"Coastal Carolina"	113
86	Virginia Beach, VA	484
86	Memphis, TN	287
87	Atlanta, GA	628
89	**1M+ Population MSA Median**	
89	Nashville, TN	289
89	Cincinnati, OH	490
91	"Southern Florida"	460
91	Miami, FL	1,097
92	Charlotte, NC	400
93	Jacksonville, FL	420
93	Tampa Bay, FL	1,106
94	Raleigh, NC	533
94	Orlando, FL	613

FEMA REGION V

CAPACITY RATING	DISASTER HOT SPOT OR 1M+ POP. MSA	POP. DENSITY
70	"Southern Minnesota"	32
71	**Disaster Hot Spot Median**	
79	"Wabash Valley"	89
82	Louisville, KY	371
86	Indianapolis, IN	438
89	Cincinnati, OH	490
90	**1M+ Population MSA Median**	
90	Detroit, MI	1,104
91	St. Louis, MO	354
91	Grand Rapids, MI	369
91	Columbus, OH	396
92	Cleveland, OH	1,039
93	Chicago, IL	1,338
94	Minneapolis, MN	472
94	Milwaukee, WI	1,069

FEMA REGION VI

CAPACITY RATING	DISASTER HOT SPOT OR 1M+ POP. MSA	POP. DENSITY
50	"Northern Texas"	18
69	"New Mexico Tablelands"	3
69	"Texas Hill Country"	15
70	**Disaster Hot Spot Median**	
71	"Ozark Highlands"	46
79	New Orleans, LA	371
80	"Texas Gulf"	267
82	San Antonio, TX	292
84	"Louisiana Gulf"	171
86	Memphis, TN	287
90	**1M+ Population MSA Median**	
90	Houston, TX	716
91	Oklahoma City, OK	227
92	Dallas, TX	734
94	Austin, TX	406

FEMA REGION VII

CAPACITY RATING	DISASTER HOT SPOT OR 1M+ POP. MSA	POP. DENSITY
63	"Kansas High Plains"	10
64	"Missouri Lowlands"	44
67	**Disaster Hot Spot Median**	
68	"Central Nebraska"	21
68	"Iowa Corn Belt"	39
86	Kansas City, MO	276
90	**1M+ Population MSA Median**	
91	St. Louis, MO	354

FEMA REGION VIII

CAPACITY RATING	DISASTER HOT SPOT OR 1M+ POP. MSA	POP. DENSITY
62	"North Dakota Plains"	14
66	"South Dakota Plains"	16
77	**Disaster Hot Spot Median**	
83	"Southern Rockies"	70
83	"Middle Rockies"	39
86	"Front Range"	21
92	Denver, CO	304
93	**1M+ Population MSA Median**	
95	Salt Lake City, UT	141

FEMA REGION IX

CAPACITY RATING	DISASTER HOT SPOT OR 1M+ POP. MSA	POP. DENSITY
79	"Nevada Basin"	9
79	"Northern California"	15
87	"Arizona Plateau"	14
87	San Jose, CA	685
89	**Disaster Hot Spot Median**	
89	"Sierra Range"	160
91	"Big Island"	45
91	Los Angeles, CA	2,645
92	Riverside, CA	154
92	Las Vegas, NV	247
93	**1M+ Population MSA Median**	
93	Tucson, AZ	106
93	"Central Cali. Coast"	376
93	San Francisco, CA	1,754
93	Phoenix, AZ	287
93	"Southern Cali. Coast"	928
94	Sacramento, CA	421
94	San Diego, CA	735

FEMA REGION X

CAPACITY RATING	DISASTER HOT SPOT OR 1M+ POP. MSA	POP. DENSITY
73	"Columbia Plateau"	17
81	"Southern Idaho"	15
82	**Disaster Hot Spot Median**	
88	"Southwest Oregon"	27
91	"Southcentral Alaska"	5
91	"Cascades"	259
94	**1M+ Population MSA Median**	
94	Portland, OR	332
95	Seattle, WA	585

A TIME FOR ACTION

(MICRO) MIGRATION

Moving away from the threat

Reframed Approach: Rather than whole-cloth migration out of a community, focus on strategies that support relocation options for the most climate-vulnerable populations to safer locations within the community.

REFRAMING TRADITIONAL HAZARD MITIGATION RESPONSES

Geospatial analyses reinforce that implementing traditional hazard mitigation responses are challenging, if not impossible, for rural communities and their residents. As the assessment reveals, property owners are unlikely to have enough equity in their property to migrate into more urban or suburban areas, and smaller municipalities typically lack the internal capacity to operationalize scale-appropriate adaptation projects.

Reframing mitigation practices to prioritize "retreating locally" and "adapting in-place" represent viable resilience-building measures for rural and/or underserved communities. However, **without the infusion of external monies and/or personnel to analyze, design, plan, and manage the nuances of this approach, rural communities are likely to be left with fewer and potentially less effective mitigation opportunities** when compared to their urban counterparts.

In order to appropriately serve rural populations, designers and planners need to establish ways of working with communities that address the realities of resident buying power, the significance of place attachments, and the funding challenges faced by small, local governments to pay for professional services. In response, reframed approaches to migration and adaptation principles include:

(Micro) Migration:

Reframed Approach: Rather than whole-cloth migration out of a community, focus on strategies that support relocation options for the most climate-vulnerable populations to safer locations **within** the community. This approach recognizes:

+ The financial challenges faced by individual homeowners when deciding to participate in traditional acquisition / relocation programs (household buying power);
+ The catastrophic effect that large-scale migration would have on smaller communities as a result of lost tax base, reduced consumer demand and labor supply to support small businesses and industry; and
+ The isolation and erosion of social networks that are important for whole-community health and cohesion.

Because migration-focused issues facing every community area are unique, it is imperative that consultants use analysis, planning, and engagement strategies that are highly granular, contextually appropriate, and in support of values determined by community stakeholders.

ADAPTATION (PREMIUMS)

Evolving with the threat

Reframed Approach: Address the historical lack of access to technical resources for rural communities through investments in adaptation-focused planning processes designed to overcome existing capacity gaps.

Adaptation (Premiums):

Reframed Approach: Address the historical lack of access to technical resources for rural communities through investments in adaptation-focused planning processes designed to overcome existing capacity gaps. Examples of the challenges commonly encountered in low-capacity and underserved rural communities include but are not limited to:

+ Systemic under-funding of public projects due to small populations, inclusion of historically-marginalized populations, and/or geographic isolation;
+ Reduced availability of and access to data; and
+ Limited precedent work to inform lessons learned from similar contexts.

As a result of these obstacles, service providers are likely to experience greater start-up expenses because the costs associated with getting resources into less-served and more remote places may, at first, require additional investments of time, personnel, and financial support. Given these challenges, providing meaningful levels of service to rural populations will, in many cases:

+ Require a greater per capita cost than comparable planning efforts in more urban or suburban settings; and
+ Be financially unattainable for local units of government.

Landscape architects and other built environment professionals have a critical role to play in supporting rural communities to prepare for and recover from disasters. This responsibility begins with first understanding limitations in local capacity, then working together with community leaders to address the various gaps in municipal revenues, personnel, and precedent resources in order to ultimately develop and implement resilience-building projects.

With this aim, three "pre-requisites" concerning: **fit, time, and money** are provided on the pages that follow as a primer for the Rural Resilience Framework.

PRE-REQ 01: FIT

Commit to filling service gaps. Holistic solutions require scales of focus that have historically been absent in rural communities.

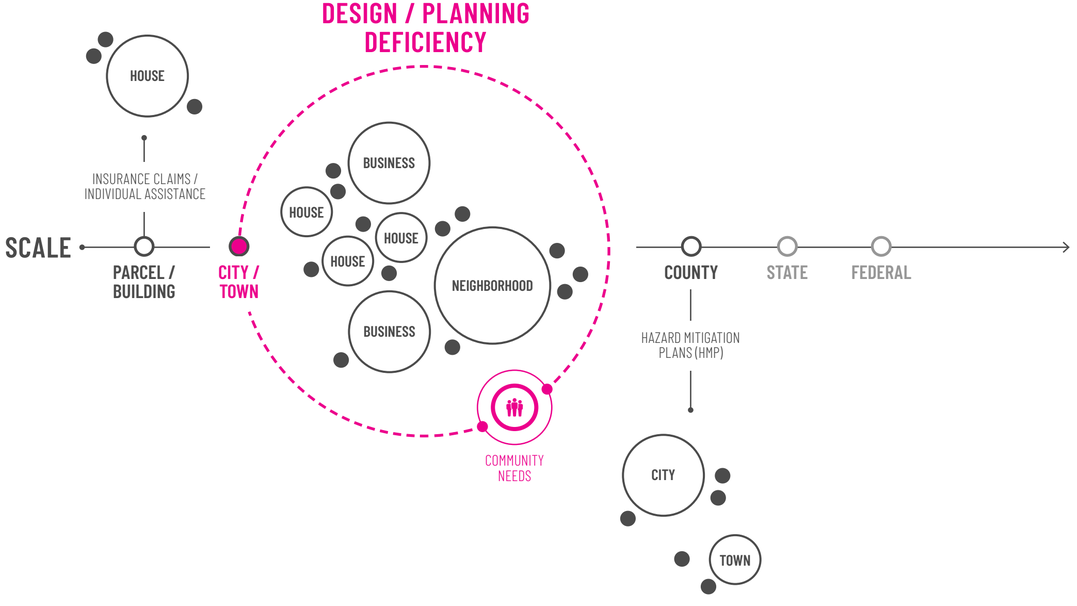
The most commonplace design and planning services associated with hazard mitigation projects tend to focus on either **small-scale mitigation actions** (e.g., single parcels or buildings) or **large-scale vulnerability assessments** (e.g., county-level Hazard Mitigation Plans).

Although lot-specific mitigation actions can be effective, and planning efforts at regional scales can address broader systems, patterns, and trends (e.g., watersheds, transportation corridors, etc.), **these practices fail to capture the details of neighborhood-scale concerns that are needed in order to arrive at actionable, community-focused projects and recommendations.**

Furthermore, when a disaster strikes, these traditional scales of service can unintentionally perpetuate reactive cycles of decision-making within a community due to significant uncertainties regarding rebuilding and recovery efforts. Scale-appropriate plans can empower community leaders to:

+ Take actions post-disaster that have been vetted for fit and appropriateness separate from the immediate trauma surrounding a natural disaster; and
+ Take actions pre-disaster that consider holistic views of community preparedness.

Designers and planners are well-situated to fill these service gaps. However, providing these services requires a willingness to assemble personnel, resources, and products that have traditionally been considered atypical scales of focus in the hazard mitigation policy landscape.



PRE-REQ 02: TIME

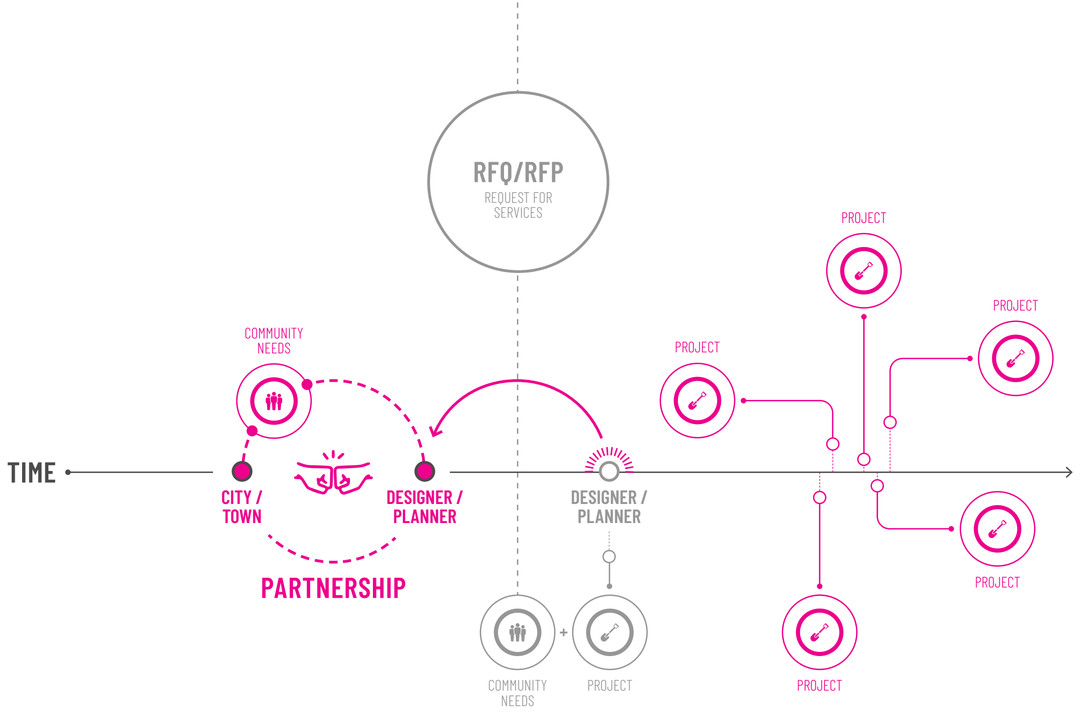
Move up the timeline of engagement to allow for the co-definition of issues, opportunities, and potential solutions.

Waiting until the release of a Request for Qualifications (RFQ) or Request for Proposals (RFP) to engage with communities is predicated on a fee-for-service model that confines design consultants to pre-defined scopes of work, time on task, and funding levels. Given these parameters, outcomes of relationships between a community and service-provider are often transactional and focused on a single, predetermined deliverable or project. These traditional service relationships also assume that communities have:

+ The funds to procure professional services;
+ Performed due diligence to define, evaluate, and understand underlying causes (versus symptoms) of issues;
+ Undertaken a capital projects prioritization process; and
+ Organized projects and partnerships to attract and fully leverage external funding opportunities.

When working in under-resourced communities, these assumptions are problematic. In particular, small and rural communities often lack the tax base and municipal revenues required to develop capital improvement projects that address long-term resilience, which includes funding for professional design services. Furthermore, the fees required to deliver quality design services at the granular level needed to move small towns from broad strategies into implementation are likely sparse, if not absent altogether.

To address these shortcomings, a process that augments the traditional design services model to more holistically address rural resilience is needed. Shifting the engagement timeline to include a 'pre-project' phase offers a critical first step. **Pre-project client engagement creates opportunities for non-transactional relationship building, enables the co-definition of community issues and opportunities, and creates a space for service providers to better understand local conditions relative to potential scopes of work.**



PRE-REQ 03: MONEY

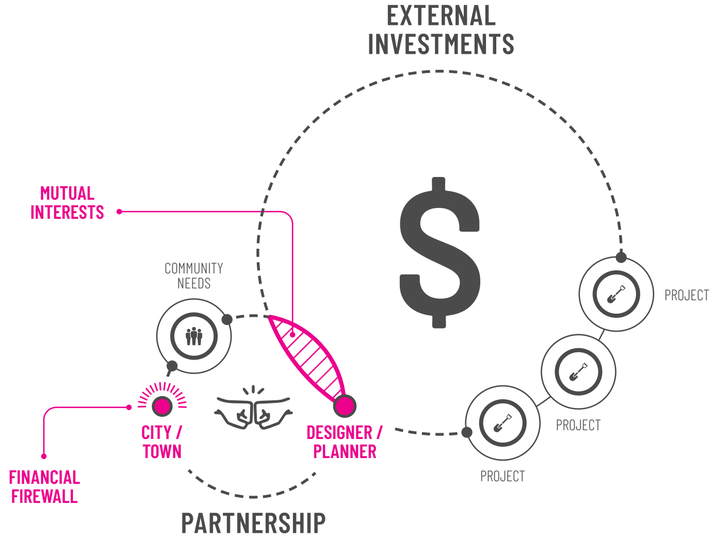
Establish financial firewalls that protect community resources by playing an active role in identifying and securing external sources of project financing.

Shifting the source of project funding away from the host community and toward external financiers, such as governmental and non-governmental grantors, requires time and resources from designers / planners to serve as a dealmaker. While this aspect of pre-project development is typically outside the scope of industry norms, there are a wide range of benefits for all parties involved.

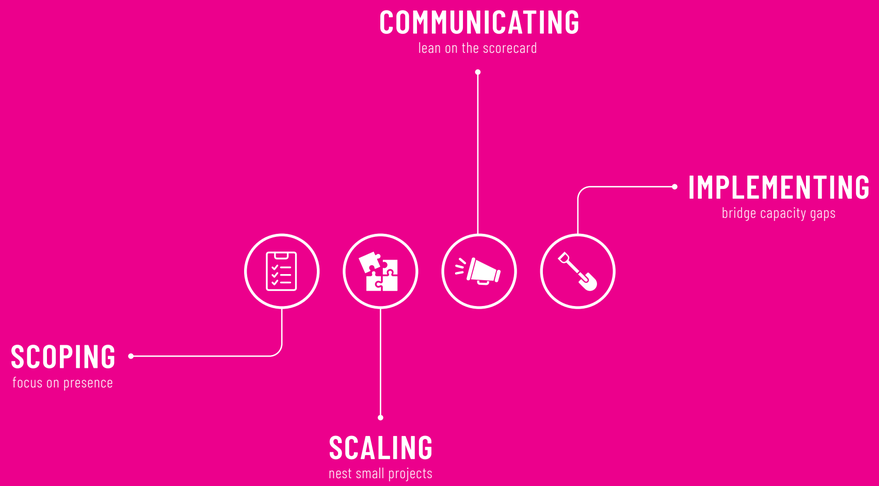
+ City / Town: When external financing is secured beyond what a municipality might otherwise be able to pay a designer or planner, local resources are protected while also supporting a more substantive and holistic level of service in the community.

+ Designer / Planner: Involvement of an external financier can substantially enhance the community / service provider relationship to the benefit of the community. No longer is the municipality responsible for administering and managing local monies toward a design or planning effort, nor is the designer or planner responsible for delivering a myopic product or service as a result of budget constraints. This change in power dynamics allows for a greater degree of open-mindedness and collaboration between the community and service provider.

+ External Financier: An investment in a proven, established partnership between a community **AND** designer / planner is more likely to result in a desired outcome, as opposed to investing in either the community **OR** the designer / planner as a standalone entity.



RURAL RESILIENCE FRAMEWORK



In response to the call for increasing rural resilience, the following section describes four planning and design strategies: **scoping, scaling, communicating, and implementing.** Working in concert with one another, these four strategies comprise a Rural Resilience Framework to support practitioners when engaging with smaller, rural communities that are recovering from or preparing for natural disasters.

PLAN FOR PRESENCE

SCOPING

When under-resourced communities procure design and planning services, the process is often governed by conditions of small fees, narrow scopes, and limited timelines. However, when working with communities through a process that is guided by a commitment to long-term resilience building, the relationship between city / town and designer / planner is best nurtured if longer timelines and broader scopes of work (and yes, larger fees) are supported and prioritized according to the long-term interests of the community.

Finding creative avenues to financially support and commit personnel to **longitudinal investments in rural communities lays the groundwork for more meaningful responses to community needs, realizing more buildable projects, and ultimately, yielding more tangible outcomes.**

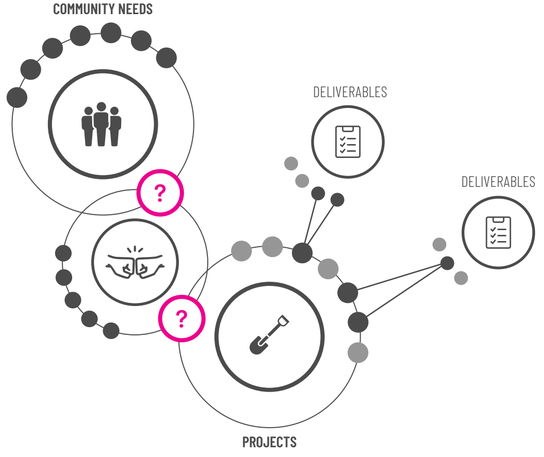
Photo: Madalyn Baldwin (2022)

BIG PICTURE

Establish scope terms that allow for flexibility in effort and personnel. Community needs and project deliverables may not be known at the onset.

When developing relationships with communities in a "pre-RFQ/RFP" time horizon, the menu of potential solutions is likely unclear because the precipitating issues and opportunities for response have not yet been fully vetted, understood, or leveraged. While these earlier forms of engagement can enable the co-definition of future scopes of work, the beginning of a relationship presents many "unknowns" that can have drastic impacts on subsequent levels of effort and personnel required to best support community needs, including determination and alignment of respective designer / planner capabilities.

Which locations have unmet needs? What types of interventions should be assessed? What are potential pathways to project funding? Answers to these questions, among others, are likely to emerge **during** a planning and design process, not before. Establishing scope terms that are intentionally flexible creates an advantageous position where people, skill sets, and effort loads can evolve to meet new conditions and opportunities should they arise.

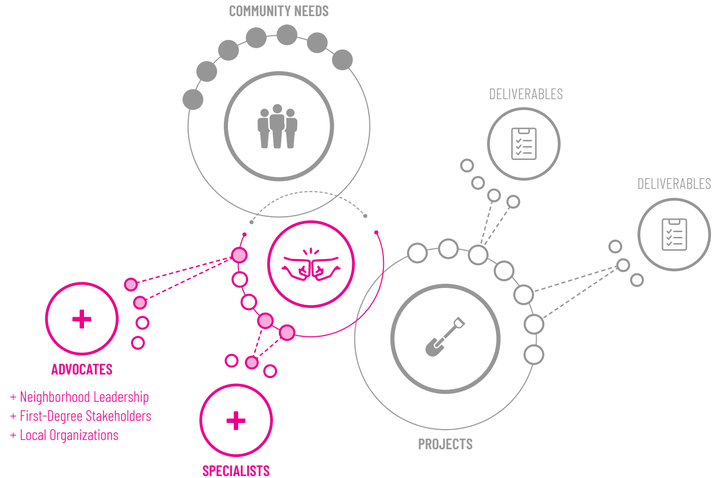


ACTION 01

Build a project team that includes advocates and specialists. Both are needed to demonstrate the fit, efficacy, and compliance of proposed interventions.

Designers and planners are not the sole proprietors of good ideas. Explicitly recognizing that local knowledge is equal to, and often more important than, design / planning expertise equalizes the power dynamic between local stakeholders and service providers from outside a community. Prioritizing community expertise enables local champions ("advocates") to serve in leadership roles that guide and advance a community's participation in a project. Similarly, acknowledging that technical expertise ("specialists") are typically better positioned to speak to the specifics and efficacy of proposed projects can empower designers and planners to tap into underutilized strengths of the professions, synthesize various viewpoints, and orchestrate holistic solutions.

These approaches collectively place designers and planners in the "middle", which better positions them to translate a diverse set of perspectives, fully leverage group contributions toward a unified effort, and disseminate the effectiveness of proposed interventions to a wide range of audiences.

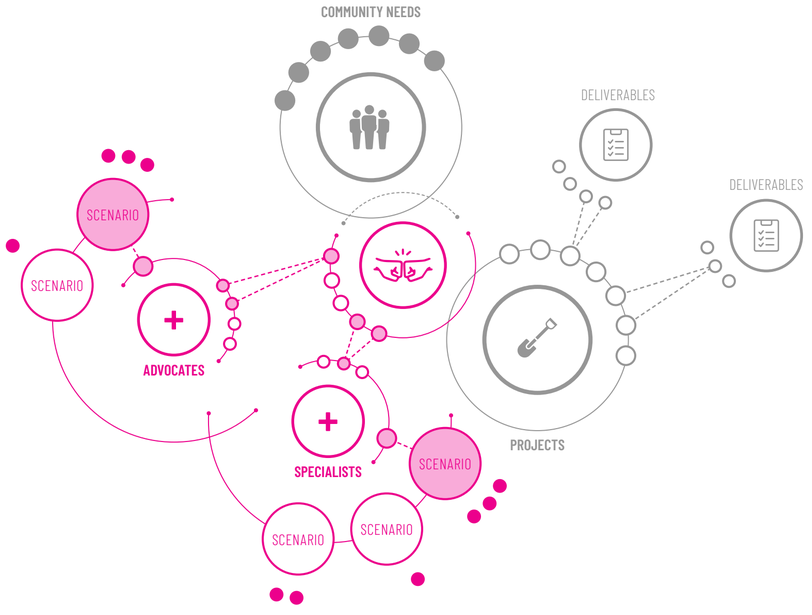


ACTION 02

Iteration is key. Craft a process that prioritizes scenario planning as a way of building consensus within the project team and across stakeholder groups.

There will always be more than one solution to a problem. Devoting time toward the creation and assessment of multiple responses to a problem provides the necessary room for specialists to analyze the merits of each scenario, while also inviting community advocates and stakeholder groups to understand and respond to trade-offs between various future conditions that may impact them.

As a designer or planner engaged in this effort, it is important to: i) maintain an open mind relative to how specific recommendations from others could inform, guide, and fit under the larger umbrella of proposed plans; and ii) allocate enough time and fee to thoughtfully generate multiple plans (at least schematically) with enough detail and differentiation to elicit informed responses from stakeholders.

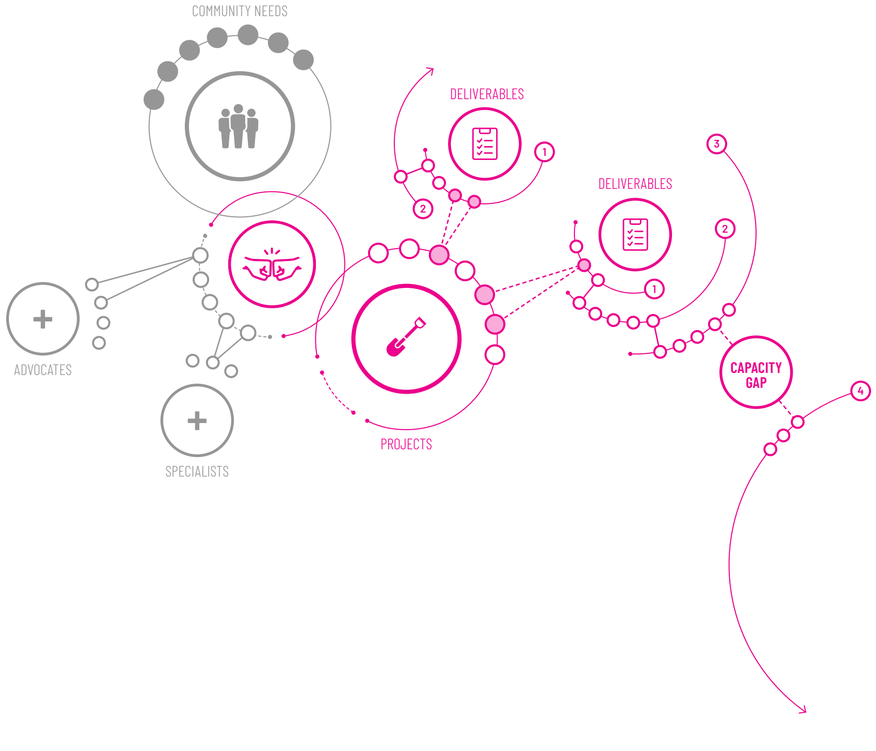


ACTION 03

Plan for “loose ends” as a necessary part of the process. Extracting services too early can perpetuate capacity gaps and kill momentum.

There are many points where community recovery projects may seem finite or work complete. These perceptions are limited and can be destructive to the long life-cycle of rural resilience projects. Due to a reliance on external investments and the traditionally long recovery timelines that follow a natural disaster, the continuum of recovery and resilience planning processes requires a continuity of service that extends far beyond the initial completion of a plan.

Committing to the long arc of recovery enables project partners to revisit variables and adjust proposed components as conditions become clearer, circumstances change, and/or resources materialize. Project timelines may shift, local priorities may evolve, and certain funding mechanisms may require specific elements of projects to be altered. This fluidity emphasizes the importance of service providers remaining tightly connected with communities throughout the planning, design, and financial procurement processes. Adjustments and modifications to plans should be expected when assuming these roles, and the designers / planners who are responsible for creating community plans are the best-suited parties to make adjustments while remaining consistent with the overall intent of the original, community-adopted plan narrative.



NEST SMALLER PROJECTS

SCALING

In low-capacity communities, proposing a singular "moonshot" project not only sets unrealistic expectations, but also places unnecessary pressure on pre-construction conditions (funding, property ownership, permitting, etc.) to perfectly align in order to implement a large-scale project.

Conversely, **an approach that nests smaller projects within a larger, holistic vision offers opportunities for more diverse, financially nimble, and "shovel-ready" projects to independently move forward more quickly.** In doing so, this approach provides the time necessary for larger, potentially slower projects to materialize while also maintaining expectations for and evidence of progress being made within the community.

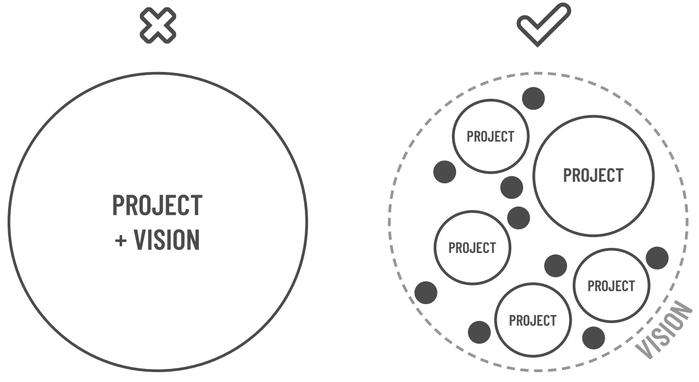
Photo: Travis Kiondike (2021)

BIG PICTURE

Aggregate smaller projects. Big ideas that don't consider the reality of bite-sized chunks can quickly stagnate into a plan that "sits on a shelf."

Plans are merely schematic concepts if they lack the specificity needed to clearly understand project requirements at the site scale. While planning is extremely useful for long-term visioning, plans that rely on individual champions or organizations outside of the original project team to figure out the details and oversee the implementation of built projects create an illusion that any single idea, grant, or proposal is by itself actionable and capable of mitigating a host of complex problems.

Planning approaches that address the pragmatics of implementation effectively: i) offer enough granularity to communicate intent across a range of scales, groups, and outcomes; and ii) include an appropriate partitioning of projects to understand the feasibility of individual actions. Doing so relieves the pressure of a singular plan to act as a silver bullet and, instead, sets the expectation that a combination of smaller, incremental interventions can coalesce over time and space to form a community-scale solution.



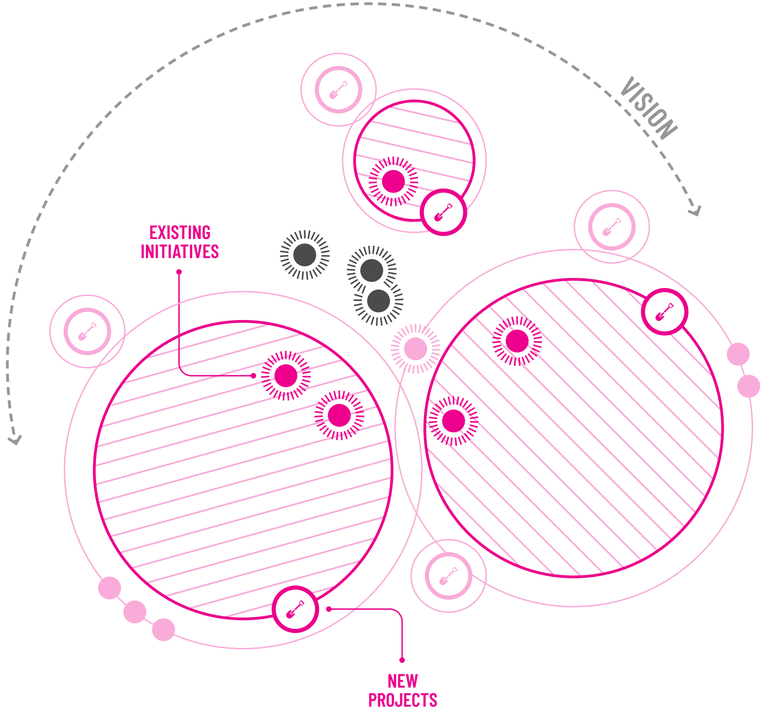
ACTION 01

Find ways to highlight, lift up, or integrate existing community efforts and/or capabilities within the suite of new projects being proposed.

Designers and planners are not the sole proprietors of good ideas. Oftentimes there are histories of community efforts or initiatives that precede the involvement of a service provider. These not only serve as a statement of existing community values, but also point to local sources of time, energy, and funding, even if modest, that can "snowball" into a more holistic project.

However, in the event that a natural disaster heavily impacts a community, pre-disaster initiatives and priorities may stall or shift based on the new conditions. In this case, it is important for designers and planners to gain an understanding of why certain efforts were pursued pre-disaster, and how post-disaster conditions have altered previously planned courses of action.

Collectively, these steps require an approach to design and planning that is distinctly **with** a community, rather than **at** a community. This is achieved through processes that prioritize trust-building and build recommendations that intentionally blend "old" ideas with "new" ones.

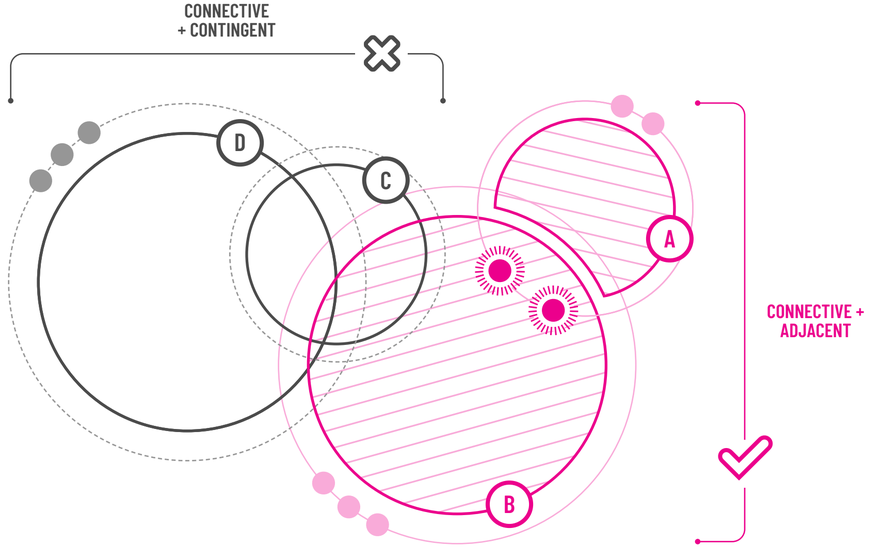


ACTION 02

Be mindful of contingencies across projects. Too many propositions reliant on preceding actions narrows the margin of error for implementation.

While two **adjacent** projects can often leverage the momentum from one onto the other, a project that is **contingent** on another action greatly reduces project autonomy and flexibility. For example, if the removal of Road 'A' is only possible if a parallel Road 'B' is widened, then the funding, feasibility, and construction schedule of the Road 'B' widening project must all be accounted for prior to proceeding with any aspect of the demolition and removal of Road 'A'.

While contingencies are unavoidable in certain circumstances, advanced efforts to reduce the number and scale of contingencies allows projects to move forward independent of actions that may reside outside the realm of internal control. Designers, planners, and community leaders can proactively close these gaps by transparently communicating the "shovel-readiness" of various projects, time constraints of connected grant programs, and critical path items that are required to realize each phase of a plan.

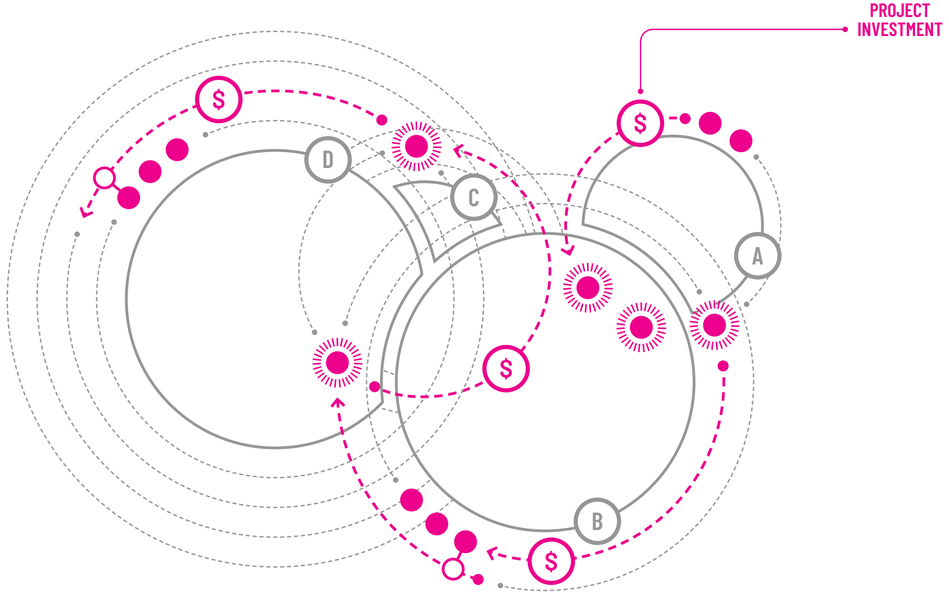


ACTION 03

Apply a “link-and-leverage” mindset for phasing the implementation of proposed projects.

Laying out the order of operations required to see each phase of a plan through to construction helps community stakeholders (residents / business owners), leadership (staff / elected officials), and potential grantors get on the same page regarding the expected timing of implementation. As such, designers and planners play a critical role in identifying projects that can act as a catalyst for others, as well as the overall **orchestration of cascading interventions** needed to sustain the progress of implementation post-planning.

This strategy requires the creation of plans and supporting materials that are simultaneously specific and elastic. The combination of these characteristics provides the detail(s) needed to maintain consistency with the overall project intent and direction, while providing the flexibility to adjust to unknown future conditions.



LEAN ON THE SCORECARD

COMMUNICATING

Many small, rural communities face financial challenges that make the implementation of resilience-building projects cost prohibitive. In these cases, externally funded grant programs offer a critical lifeline to support projects that may not otherwise receive enough local funding.

If this reliance on grants is recognized during the earliest stages of pre-project engagement, **communication approaches can be shaped, molded, and catered to specifically align community needs with the requirements and scoring metrics of relevant grant programs.** When done well, these strategies help to proactively position communities to become more competitive in the grant programs that are necessary to implement projects at scale.

Photo: Marybeth Campeau (2022).

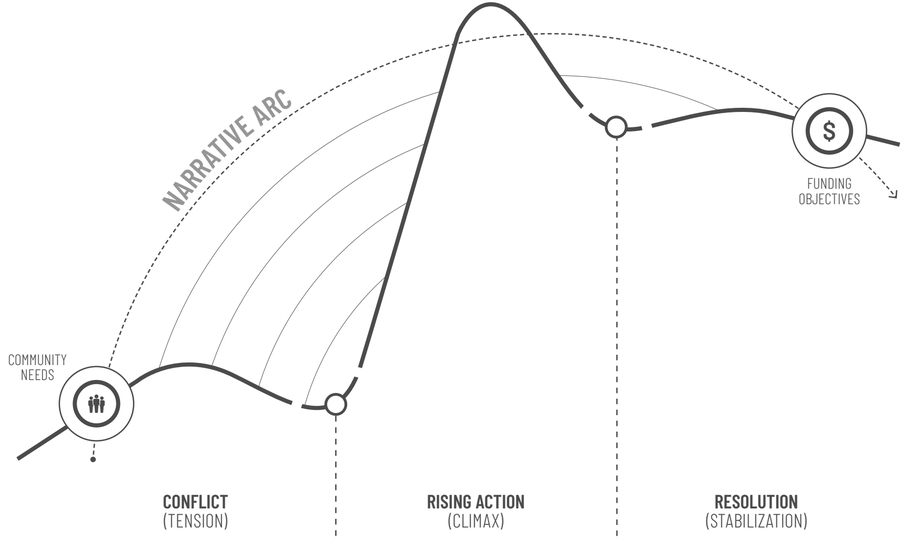
BIG PICTURE

Develop a narrative that specifically links community needs with the funding objectives of external grant programs.

Proposed resilience interventions must communicate to potential grantors the reasons why they are sound investments. Key components include:

+ Robust, community-informed inventories and analyses of environmental, social, and community-specific issues and opportunities;
+ A design and planning process that is conducive to determining appropriate solutions; and
+ An awareness of existing grant programs and associated funding priorities.

Unifying these variables into a cohesive project narrative requires a willingness from the designers, planners, and community leaders to match-make and adapt proposed solutions to be more competitive in a grant review process. While this may result in slight modifications from the "ideal" solution, using this approach ultimately enables more opportunities for communities to secure the financial and/or technical resources needed to take actions forward.



ACTION 01

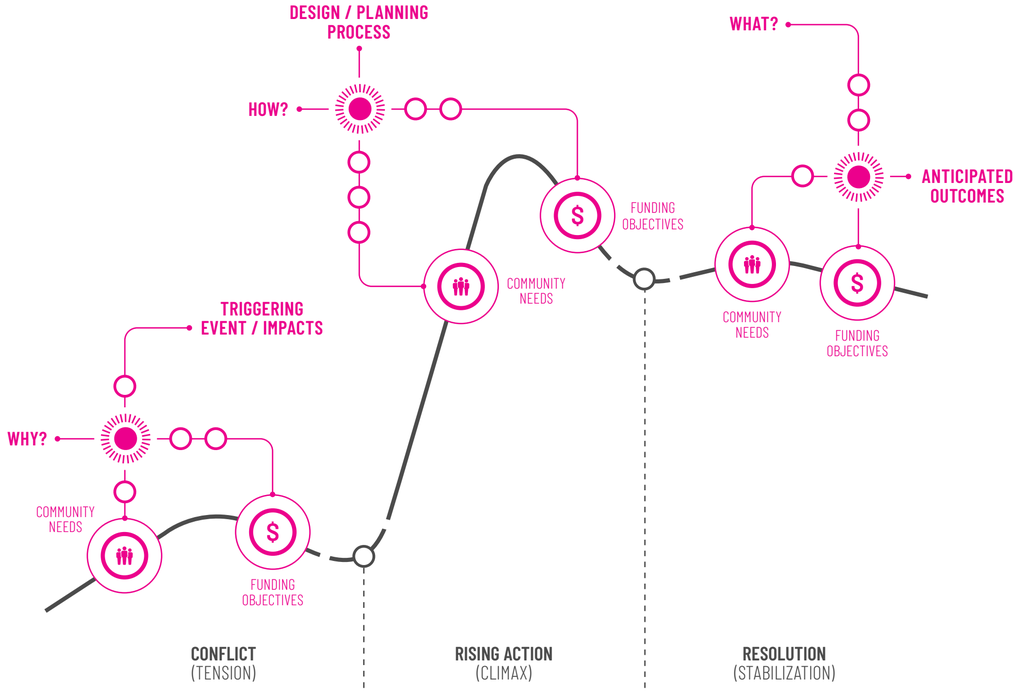
Invite project stakeholders to shape their own narrative with the terms of the overall funding strategy clearly understood.

Planning and design processes that do not incorporate a funding strategy from the onset:

+ Run the risk of proposing "blue-sky" interventions that may not be financially or administratively feasible for local municipalities to self-fund or staff; or
+ Are misaligned with grant programs that may be required for project financing.

Communicating the funding strategy to project stakeholders invites them to contribute to the development of proposed solutions in a way that expedites alignment of community preferences with grant-suitable project types. This strategy also offers a view into the realities of municipal finances.

Articulating funding issues, opportunities, and strategies early, and often, in engagement processes also allows time for stakeholders to understand and buy into the proposed approach and sets expectations for what to expect in future engagement activities (e.g., data being presented, programming recommendations, grant information, etc). These methods seek to both enable local voices to be heard throughout the formation of projects and facilitate conversations that directly focus on the financial, staffing, and oversight realities incumbent to grant-funded projects.

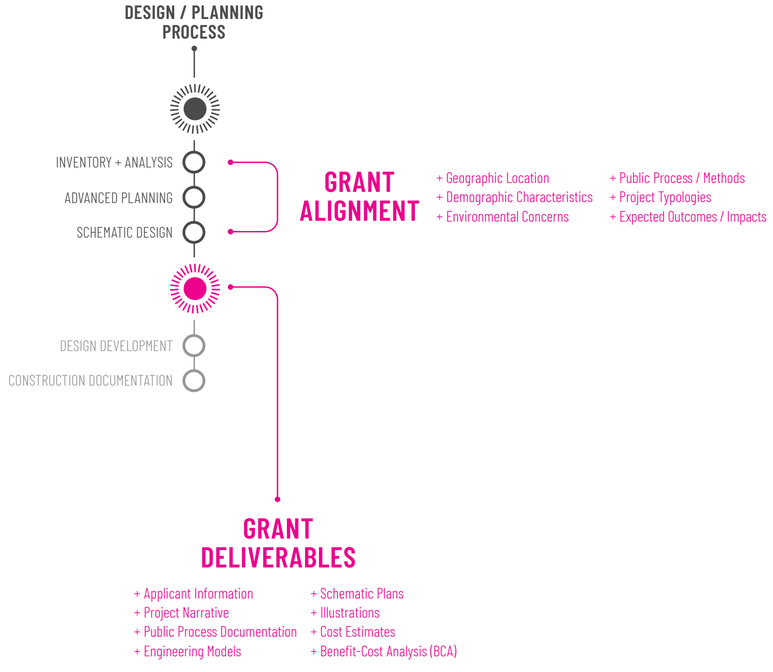


ACTION 02

Embed "copy-and-pasteable" grant application material within the set of design and planning deliverables.

Many small and/or under-resourced communities have limited staff resources available to supply the necessary components of grant applications (e.g., a volunteer mayor as the only elected official). While many grant programs require some form of locally derived match, the majority of required materials can be generated by service providers who are external to local leadership and staff. Embedding "copy-and-pasteable" application material into the scope of work enhances the quality of the proposal, and lessens the overall burden, both for designers/planners and municipal officials, in the long-run.

Defining and delineating tasks that reduce the amount of material generated by community partners allows them more time to review provided materials provided, ask informed questions, and offer revisions without needing to serve as the lead author(s). Once all materials have been compiled to submit a grant application, it is helpful for the designer/planner to work through the act of submitting an application through the lens of the local representative tasked with completing the application. Completing a dry run prior to actual submission helps reduce the amount of unknowns that may emerge when the local representative inputs the application materials and ensures that the time needed to submit is efficient and accurate.



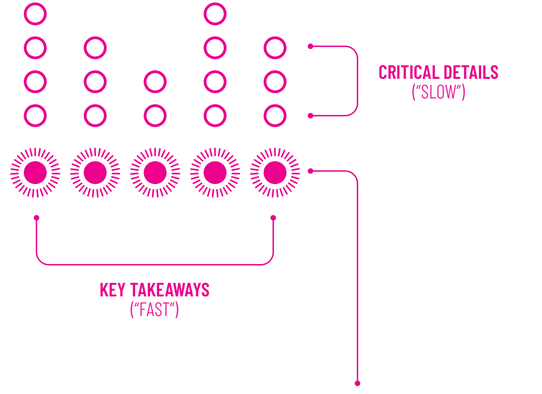
ACTION 03

Assemble deliverables to be digestible at both “fast” and “slow” speeds of consumption. Audiences have different needs, interests, and attention spans.

Once the target audience transitions from community stakeholders to potential grantors, collateral materials created by designers/planners need to accommodate a wide range of detail and attention spans to best advocate for project needs. While some grant programs (typically more local) may only require a high-level overview of project goals, other grant programs (typically federal) may require acute levels of specificity into expected outcomes, data to support claims, and robust documentation packages.

Given this variability, the best practice is to deliver a single set of documentation to community leadership that can be understood by audiences at both “fast” and “slow” speeds of consumption.

This can require significant time and thought devoted to the hierarchy of text, graphics, maps, and language being provided so that the overall project messaging remains consistent, while simultaneously offering more detail to be assessed by those who may require, or are interested in, additional specificity.



BRIDGE CAPACITY GAPS

IMPLEMENTING

Low-capacity communities are unlikely to have the internal staff necessary to adequately shepherd projects through permitting, construction, and into long-term maintenance. **Designers and planners who are actively engaged with a community can offer services and skill sets to temporarily bridge these capacity deficits through roles akin to temporary municipal staff.**

While it is crucial to understand and plan for local capacity limitations that may impact long-term project sustainability, it is also important to recognize that there are likely short-term personnel missing from local governments to advocate for high-quality design standards, comply with associated grant requirements, and to manage multiple projects that may be moving in parallel. Temporary infusions of skilled design and planning expertise within the fabric of community leadership can lead to a more sound and robust delivery of proposed projects.

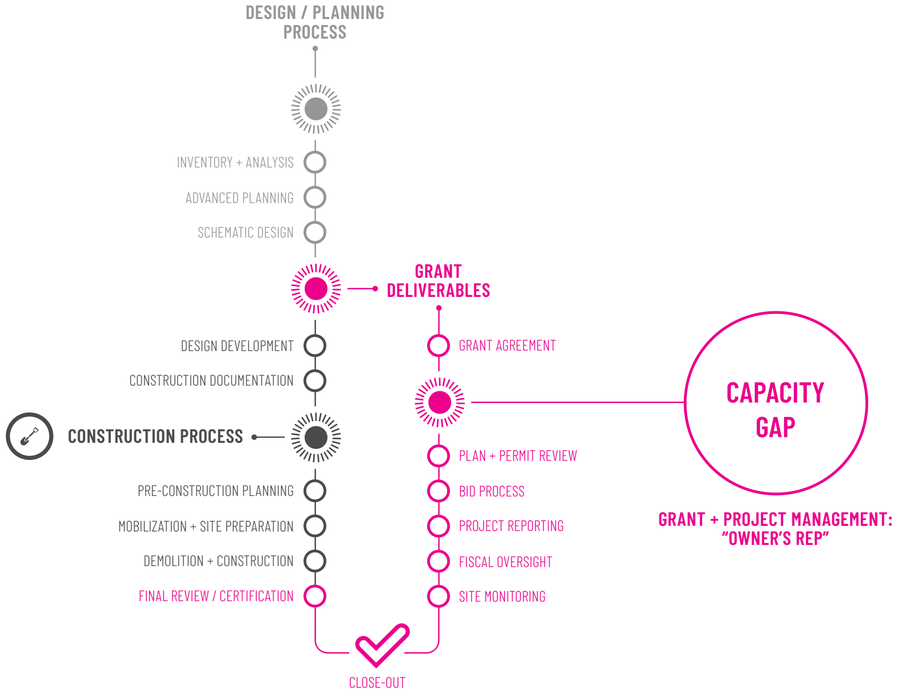
Photo: PBS North Carolina (2021).

BIG PICTURE

Adopt an owner's rep mindset to help local governments manage projects and associated grants through construction.

Taking proposed projects from a plan through implementation is more like a marathon than a sprint. A primary value generated by longitudinal community engagement is that the process enables service providers to fully advocate on behalf of the community through the role of an owner's representative ("owner's rep") when collaborating with other consultants/disciplines on subsequent phases of work or advocating with funders, regulators, and/or future partners.

Framing roles such as these invites others to supplement projects in ways that may not be feasible for designers/ planners, while also adding to local capacity for procuring services, reconciling budgets, reviewing plans, and helping administer influxes of project capital that may be in excess to what a local government typically manages.



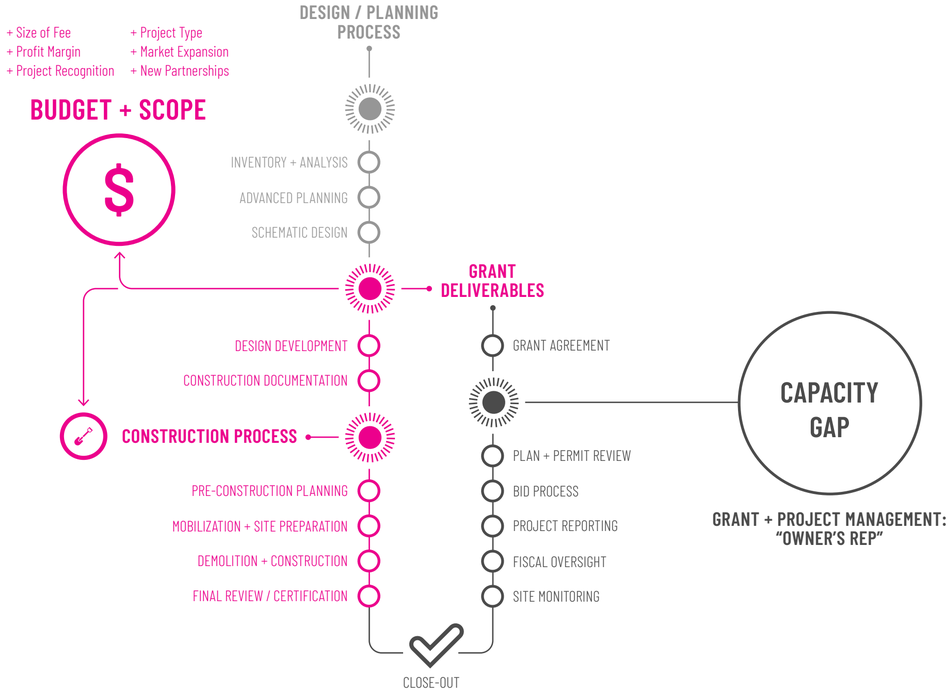
ACTION 01

Create attractive conditions for bringing high-quality services to small communities. Pitching projects and negotiating terms are forms of advocacy.

Geographic remoteness and/or a lack of financial resources often hinder the ability of small communities to engage with service providers who are capable of providing robust scopes of work or who may have fee schedules in excess of the lowest bid.

Long histories of inaccessibility to service providers leave many counties, cities, and towns generally unaware of the consultants who can support their needs and, similarly, consultants and other resource providers may be unaware of the needs of small jurisdictions that could benefit from their services.

While community voices can best articulate localized (first-hand) needs, designers and planners engaged with these communities can take an active role in "pitching" projects to potential service and/or resource providers. This is a critical step in aligning implementation needs with qualified individuals, groups, and organizations who reside outside of the community.

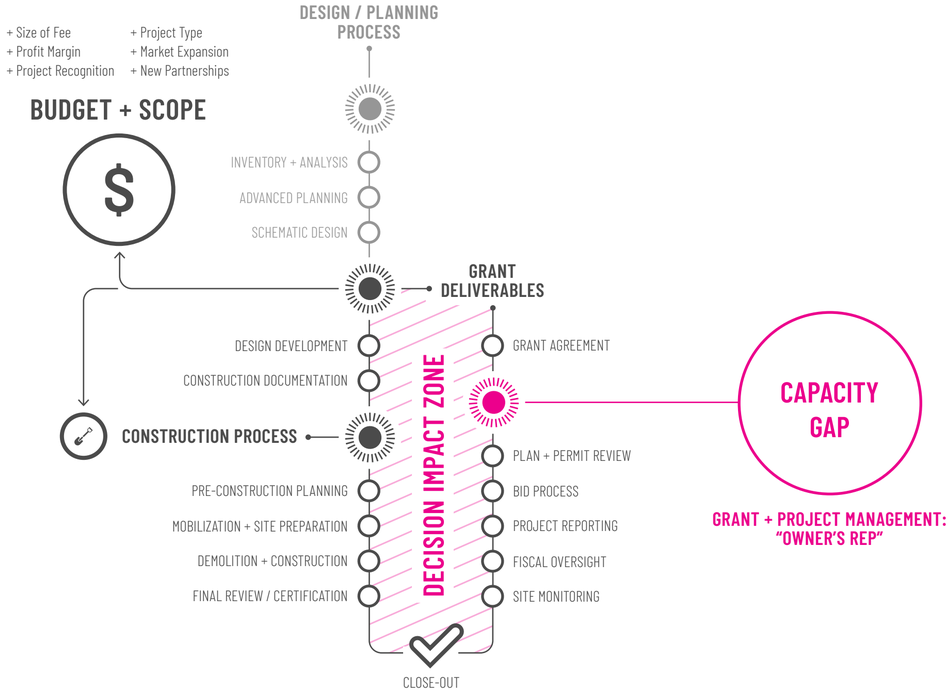


ACTION 02

Be diligent in tracking the relationship between micro-scale decisions and macro-scale impacts.

As projects are transitioning from final design and permitting to the beginning phases of construction, it is important for the appointed owner's representative to consistently connect smaller scale decisions with broader scales of intent.

Multiple projects, including respective funding mechanisms, are likely to occur simultaneously, therefore understanding the potential ripple effects across projects that may deviate from original plans, no matter how slight, cannot be understated. In some cases, the anticipated outcomes connected to a successful grant agreement are tied to quantifiable metrics (e.g., number of trees planted, amount of impervious surface removed, etc.), so the inevitable push-and-pull of details that happens during the construction of projects needs to be mindful of these higher-level impacts.



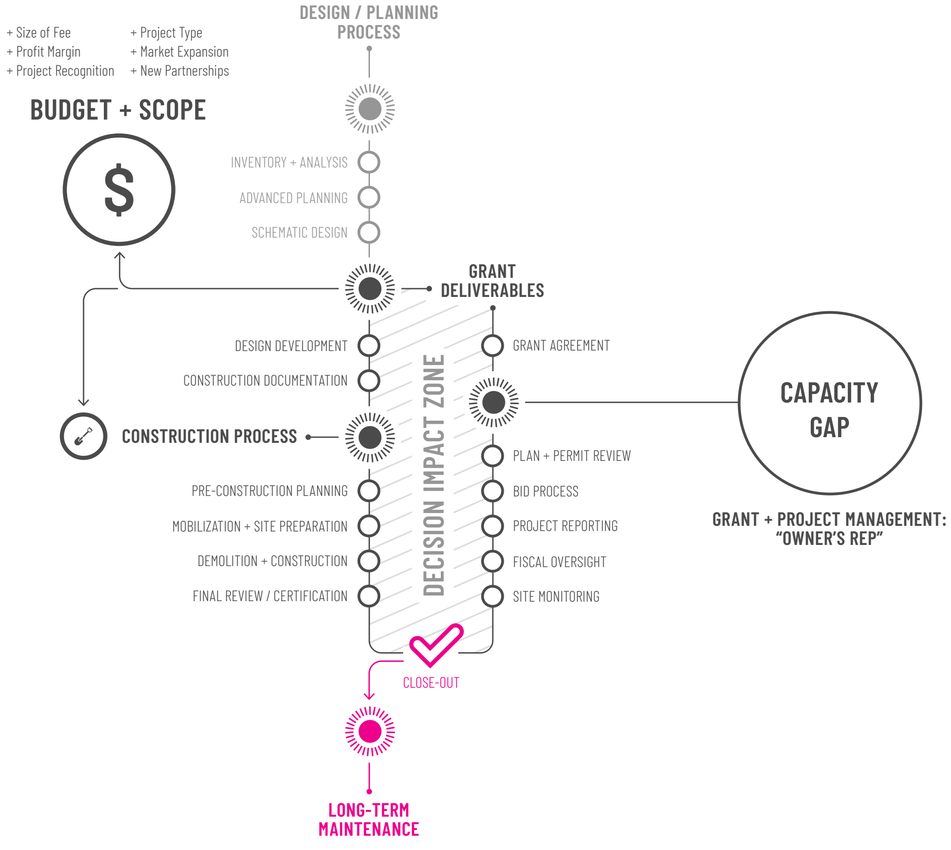
ACTION 03

Orchestrate a clean hand-off by determining the path of least resistance for long-term maintenance and management.

Consideration of post-implementation realities connected to life-cycle costs and investments in long-term maintenance of implemented projects needs to be carefully considered throughout planning, design, and construction processes.

While many grant programs provide resources to help support the financing of initial project construction, there are fewer external opportunities tied to long-term management. Communicating a post-implementation exit strategy, for both external infusions of capital and of design / planning personnel, as early as possible is important for everyone's capacity concerns, and promotes a healthy rapport between proposed projects and the staff and/or elected officials that are tasked with making long-term maintenance decisions.

Ultimately, for many small or under-resourced communities, this is likely to mean ultra-low cost of maintenance schema that are able to simultaneously deliver resilience-building results at a discounted rate of long-term costs.



CASE STUDIES

CASE STUDY: WHITEVILLE, NORTH CAROLINA

SCOPING

Background. In recent years, the City of Whiteville, North Carolina (population: 4,577) has seen an uptick in significant, citywide damage from floodwaters due to hurricanes and heavy rainfall events. Several neighborhood and commercial areas are now exposed to floods on a more frequent basis than what has previously been observed.

Working in collaboration with both the City of Whiteville and the North Carolina Office of Recovery and Resiliency (NCORR), a project team capable of delivering a broad, yet specific, scope of work to best fit community needs in the most impacted areas was assembled. These efforts cumulatively led to the creation of multiple grant applications (totaling over $5.1M; currently in review) during the initial stages of analysis and planning engagement, and have provided critical pathways for individuals, the city, and partner state agencies to each play a role in improving community resilience.

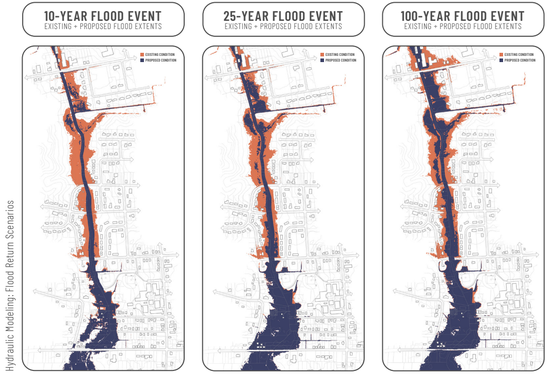
Planning for Presence. Funding from NCORR supported analysis and planning efforts, which allowed for the creation of scope terms that enabled the project team to work with the City of Whiteville for an extended, 16-month period of time that preceded the need to obtain follow-on grants resulting from planning recommendations. This length of time, combined with the associated resources needed to support significant time-on-task, provided the foundation for a more meaningful relationship with city officials. The time required to form these relationships would have been difficult, and financially impractical, if only relying on internal (city-derived) forms of project funding.

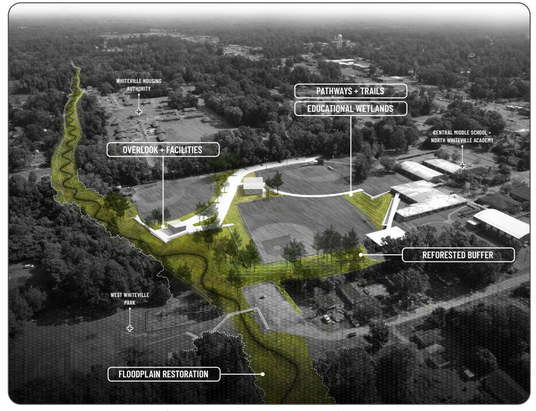
Additional, and critical, specifications of the scope terms included: the inclusion of specialists determined by the project team (hydraulic modelers and cost estimators), specialists determined by community partners (intentionally specified as "to-be-determined" until project types were identified), and a group of advocates ("technical advisory committee") that meet with the core project team throughout the duration of the 16-month engagement.

Together, this team prioritized scenario planning as a way of testing the efficacy of potential interventions (e.g., hydraulic models of three different alternative future conditions for a stream restoration project), and as a way of assessing the fit and appropriateness of proposed solutions within the neighboring residential areas. By "planning for presence," the project team was able to:

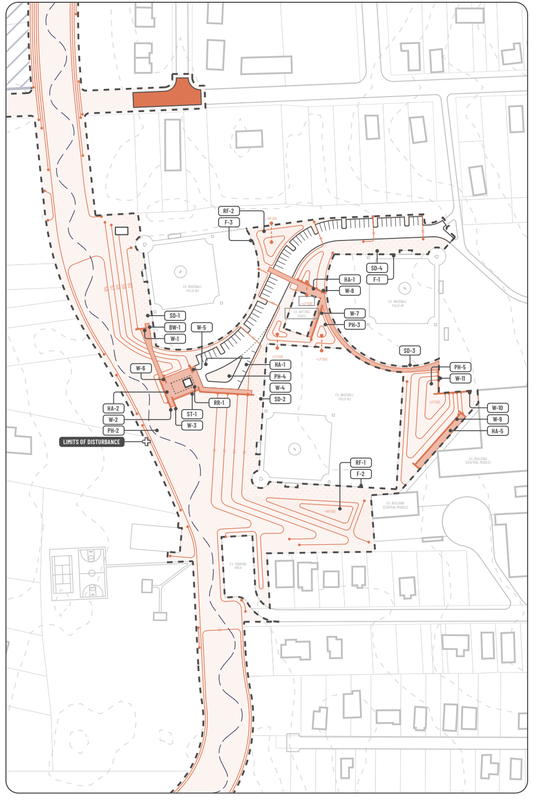
+ Invest time into developing iterative design scenarios;
+ Adequately account for stakeholder feedback loops as part of the planning and design process;
+ Assemble a bespoke project team to build a compelling case for project funding; and
+ Anticipate and incorporate projected "loose ends" into the original scope of work agreement.

Hydraulic Modeling: Flood Return Scenarios





Aerial Rendering: Central Middle School (Mollie's Branch Stream Restoration Project)



Schematic Design: Central Middle School Enlargement Area.

CASE STUDY: LUMBERTON, NORTH CAROLINA

SCALING

Background. In less than a 23-month timeframe, the City of Lumberton, North Carolina (population: 21,040) was tragically hit by two devastating floods resulting from Hurricane Matthew (2016) and Hurricane Florence (2018). The scale and close succession of these two events damaged property throughout the city, some concentrations of which were either left vacant or were approved for acquisition via federally funded 'buyout' programs.

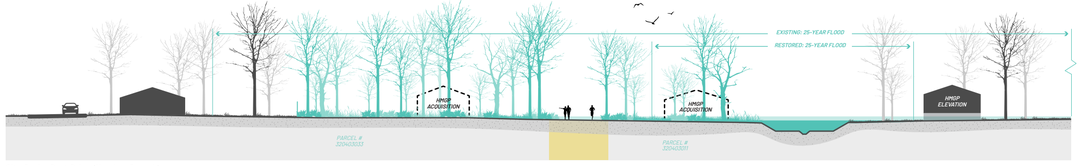
Working together after both Hurricane Matthew and Hurricane Florence, the City of Lumberton and the project team engaged in efforts that sought to transform these vacant lots into places for water storage, habitat, and parks and recreation resources. Stitched together under the "Lumberton Loop" vision, the partnership has yielded over $2.9M in external grants and matching resources, to-date, in support of implementation efforts (and was leveraged as part of a separate $2.9M grant application, currently in review).

Nesting Smaller Projects. At over 8.5-miles long, the scale of the "Lumberton Loop" represents a large endeavor for a city the size of Lumberton. Because many of the proposed projects focused on repurposing properties that are being acquired through federally funded "buyout" programs, and because portions of the Loop overlapped with planned improvements to Interstate-95 (being led by the NC Department of Transportation), there were many uncertainties regarding the timing of when properties would come under city ownership and when associated roadway improvements would take place.

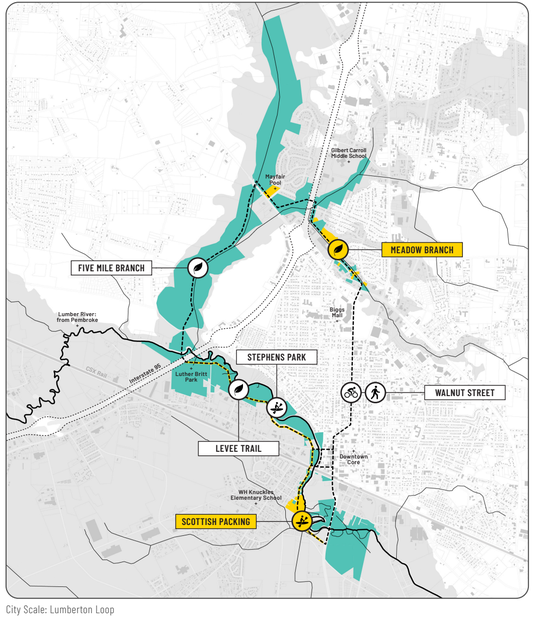
Together, these conditions necessitated that the project team consider ways to break up the plan into smaller "sub-projects" within the broader vision. The "Lumberton Loop" was then broken up into four components: Meadow Branch, Five Mile Branch, Scottish Packing, and Walnut Street. Each component is designed to operate independent of one another in terms of ownership rights, funding, permitting, and installation, however when taken together, aggregate to realize the entirety of the Loop.

Within each of the four component areas, more detailed schematic designs were generated to better communicate specific planning needs to specialists on the design team (e.g., hydraulic modelers), various governmental agencies (e.g., FEMA), and to local stakeholders. This "nesting" of different scales allowed for minor adjustments to be made at finer levels of resolution (site-, neighborhood-, and community-scale), while maintaining the intent of citywide planning recommendations. Collectively, the decision to divide the Loop into four component areas:

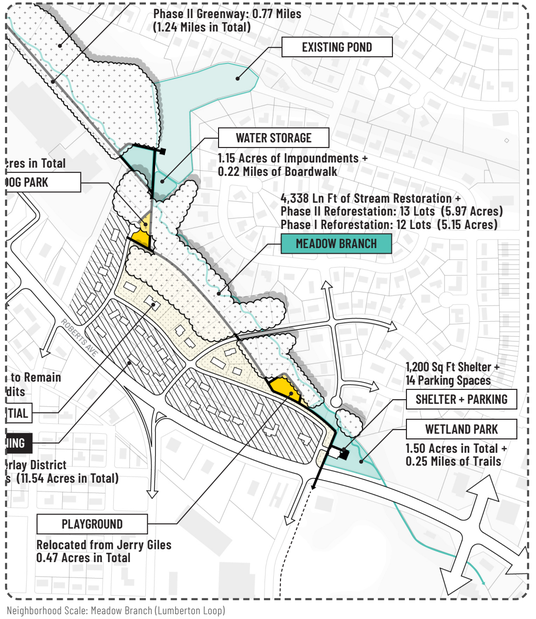
+ Proved extremely effective in fundraising efforts, as early wins in one location (grant awards and matching personnel / equipment commitments from the city) were used as leverage for subsequent, connected projects along the Loop;
+ Allowed more "shovel-ready" projects to move forward and build momentum until secondary and tertiary components of the Loop were ready for more concerted fundraising efforts; and
+ Reduced contingencies across project areas, so that (inevitable) delays within one component of the Loop could remain isolated without negatively impacting other project timelines.



Site Scale: Best Drive (Meadow Branch)



City Scale: Lumberton Loop



Neighborhood Scale: Meadow Branch (Lumberton Loop)

CASE STUDY: POLLOCKSVILLE, NORTH CAROLINA

COMMUNICATING

Background. The Town of Pollocksville, North Carolina (population: 216) is in the midst of a multi-year flood recovery process resulting from Hurricane Florence (2018). The rainfall and subsequent flooding generated by Florence was equivalent to a 1,000-year storm event, and far exceeded the extent of mapped floodplains in Pollocksville. Dozens of homes and nearly two-thirds of the town's commercial properties were damaged by the floodwaters.

Prior to Hurricane Florence, both the Town of Pollocksville and the State of North Carolina were beginning to make investments in the town's Riverfront Park and within its commercial corridor along Main Street. Post-Florence planning efforts aimed to reinvigorate these previous initiatives by embedding them within and alongside a new slate of resilience-building projects that, collectively, would further propel Pollocksville's recovery and rebuilding efforts. External grants and matching resources from nine different entities have raised over $2.0M to support implementation of the proposed projects in Pollocksville.

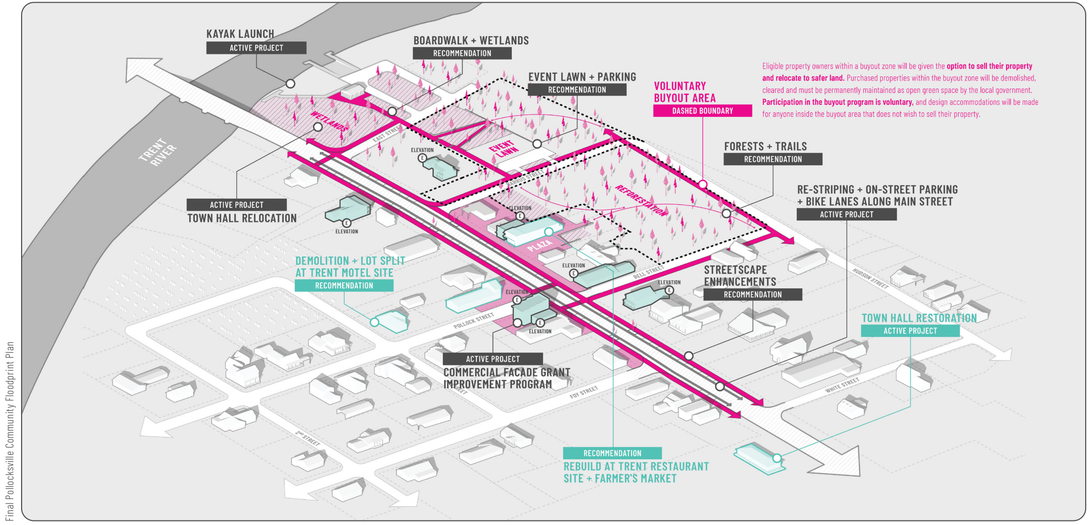
Leaning on the Scorecard. The municipal budgets available for capital expenditures in the Town of Pollocksville, and more broadly Jones County, are not sufficient in lump-sum amounts to self-fund projects of scale, and are far less per capita than other rural counties in North Carolina. These factors, in addition to extremely limited local staff availability to apply for and manage grants, leave few viable options for raising the funds necessary to implement resilience-building projects. With a good understanding of these conditions and having built strong consensus around a set of potential projects, the project team developed an overall communication strategy to intentionally embed grant application materials into the technical report developed for the town.

During public engagement events, participants were asked to identify areas important to local identity, voice community needs and list opportunities that deserved closer consideration, and vote on programmatic alternatives presented to improve the community's resilience. These steps invited the community to actively contribute to both content creation and the editorial process of determining and communicating planning recommendations. Ultimately, this process formed the basis by which types of areas to analyze, projects to test, and grant programs to target were identified.

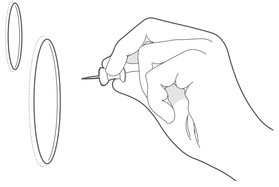
Identifying relevant grant programs early in the planning and design process afforded the project team the time necessary to fine-tune, tweak, and finalize project proposals so that they maximized alignments between community needs and the scoring metrics of external funders.

Upon completion of the final technical report, grant program material had been documented and generated across a year-long process (as opposed to viewing grant applications as being purely a post-planning exercise) and, in some cases, had already been submitted to grant programs for review. In total, the proactive measures taken to intentionally generate grant application material within the planning process:

+ Shortened the timeline for submitting grant applications relative to typical planning procedures;
+ Lengthened the amount of time to create comprehensive and robust supporting documentation; and
+ Reduced the dependency on local staff or elected officials to craft and/or modify planning recommendations to fit grant application requirements.



Final Pollocksville Community Floodprint Plan



Stakeholders who engaged in the Feb 2021 public engagement event were asked to place up to four (4) push pins in the programmatic recommendations they would like to see further investment and planning support. Top "vote-getters" were combined into a single, unified plan (see "Pollocksville Floodprint" plan, provided above).

Photos: Public Engagement Event (February 2021)

CASE STUDY: PRINCEVILLE, NORTH CAROLINA

IMPLEMENTING

Background. The Town of Princeville, North Carolina (population: 1,648) is undergoing a multi-year, and what has become a multi-generational, post-flood recovery process overseen by state and federal agencies. While current rebuilding efforts are a result of Hurricane Matthew (2016), the town has been impacted by devastating floods eight times since its historic charter in 1885.

Starting shortly after Hurricane Matthew, the project team and a host of collaborators have engaged with Town officials in multiple, small-scale planning and implementation efforts that, in whole, deploy land use strategies that reduce nuisance flood risk, increase environmental awareness, and enhance long-term ecological function within historically flood-prone areas. To date, planning-specific efforts have generated over $522K in implementation grants (and was leveraged as part of a separate $10.9M grant award).

Bridging Capacity Gaps. Without internal staff dedicated to managing construction-related projects and associated grant agreements, many small town governments, like Princeville, must either include additional project management costs within grant applications (in order to then hire external consultants for these purposes), or attempt to deliver these services through use of limited discretionary budgets or through elected officials who may not have the necessary time or appropriate training to do so effectively.

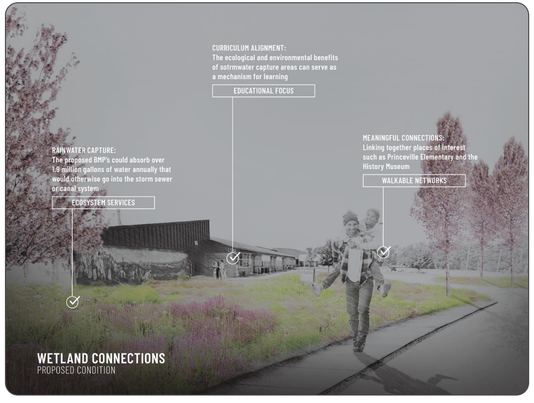
In working with elected officials from Princeville, the same project team responsible for the development of a town-adopted planning document was able to serve as an owner's representative ("owner's rep") for the implementation of various grant-funded construction projects. With this arrangement:

+ No additional monies were requested from the town;
+ The time demands on staff / elected officials was greatly reduced; and
+ The same individuals responsible for the creation of the reference plan were able to track the relationship between micro-scale decisions (e.g., plant spacing) and macro-scale impacts (e.g., grant agreement specifications).

Lastly, the trust that had been established between the project team and town staff / elected officials throughout the planning, design, and implementation process allowed for well-informed decisions to be made regarding the long-term maintenance of the projects. First-hand conversations with staff from the town's Public Works Department, coordination with construction crews, and regular updates to elected officials allowed the project team to regularly position town needs at the center of decision-making processes during construction, and into final hand-off.

Rendering: Existing Conditions (Princeville Elementary School Rain Gardens)

Rendering: Proposed Conditions (Princeville Elementary School Rain Gardens)



Photos: Princeville Elementary School Rain Gardens

CITATIONS + RESOURCES

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