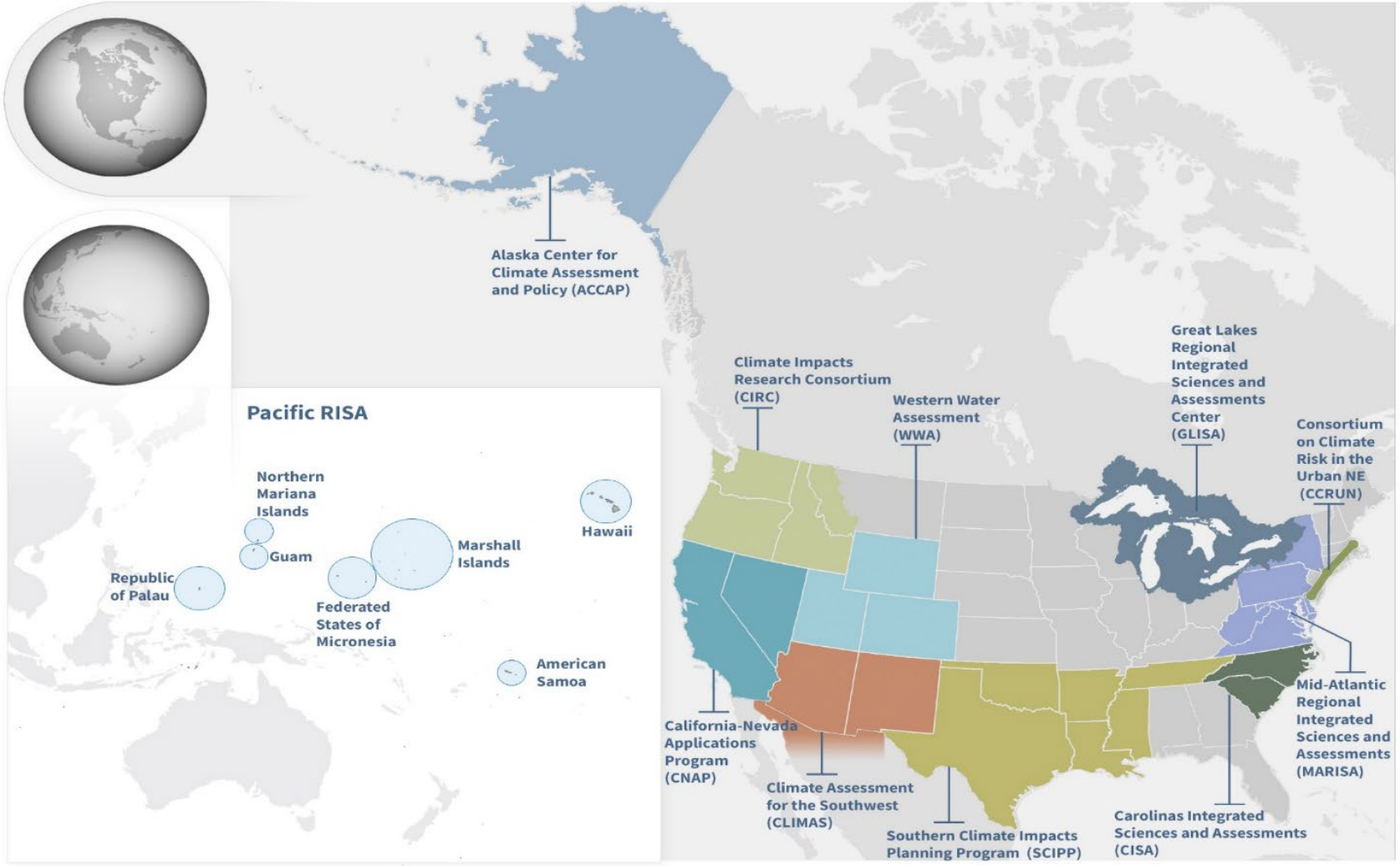
Climate Change in the Great Lakes

Photo: Dan Brown

NOAA Regional Integrated Sciences and Assessments (RISA)

Regional teams that help the nation to prepare for and adapt to climate variability and change



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Great Lakes Integrated Sciences & Assessments

GLISA

GREAT LAKES INTEGRATED SCIENCES + ASSESSMENTS

UNIVERSITY OF MICHIGAN

NOAA

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

U.S. DEPARTMENT OF COMMERCE

MICHIGAN STATE UNIVERSITY

GLISA's Approach

Research

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Integration
Collaboration
Extension

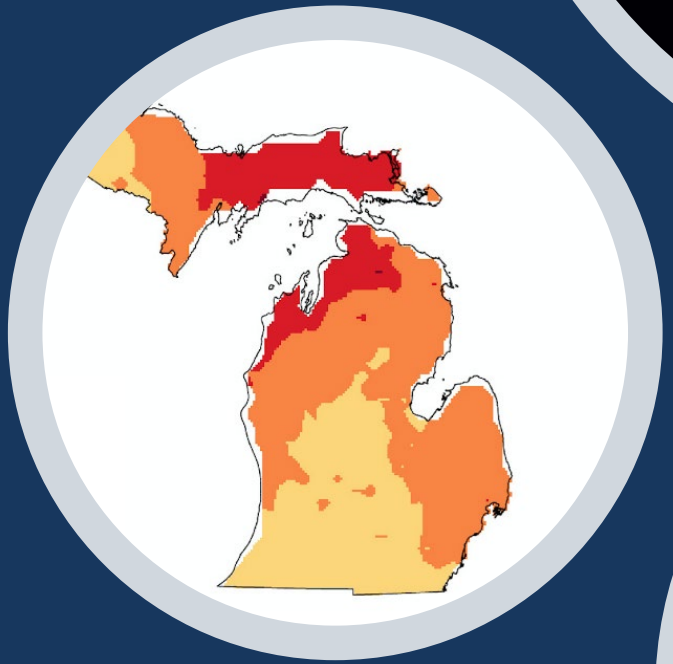
Service

- Interpret *existing* information and data for stakeholders
- Provide *locally* relevant climate synthesis:
  - What has happened?
  - What could happen?
  - What are the impacts?

Global | Regional | Local

- There are multiple ways of looking at climate change:
  - Global
  - Regional
  - Local

- Local factors can drastically alter the magnitude of climate change impacts, but can also be adapted to more readily.



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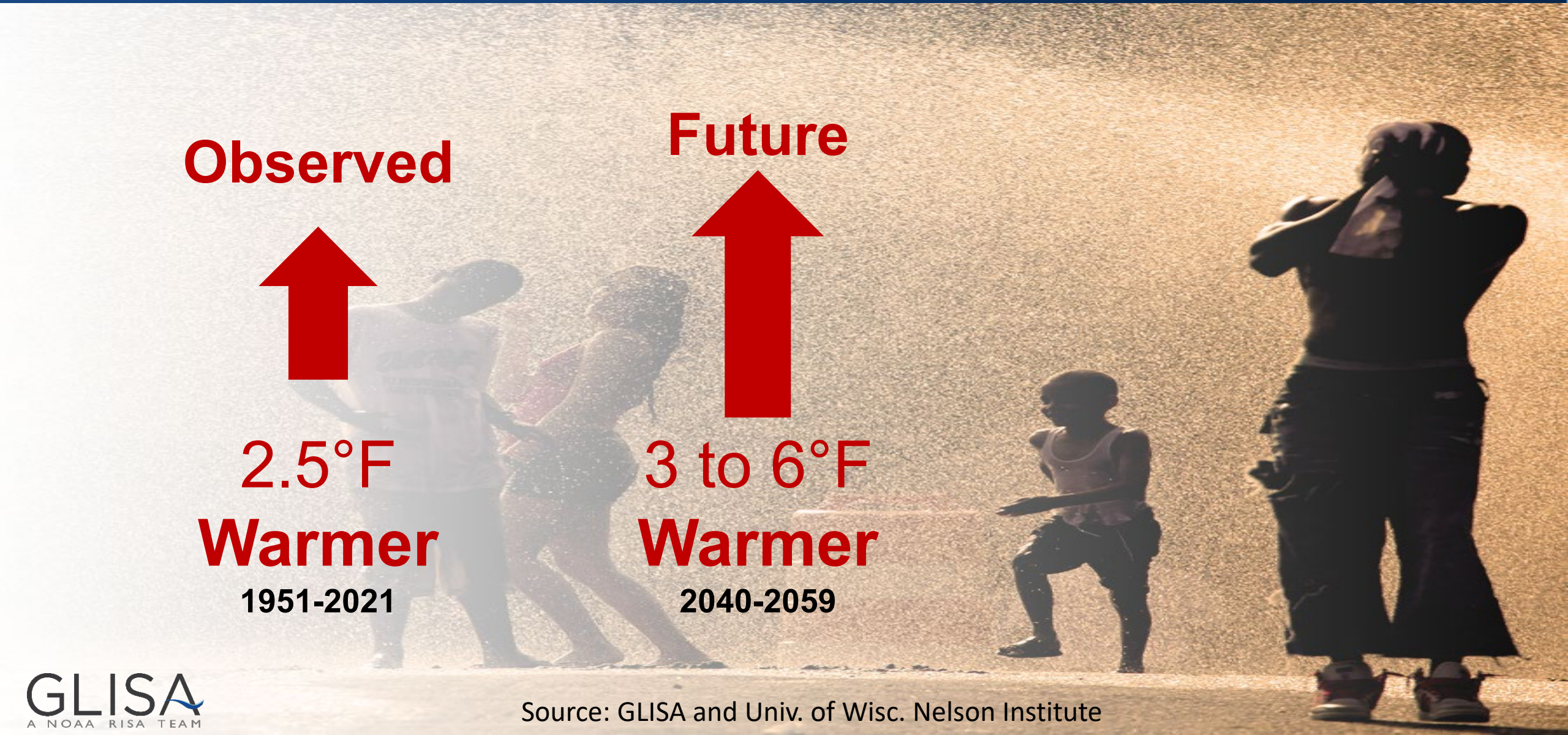
Global | Regional | Local

Photo credit: http://www.noaa.gov/resource-collections/great-lakes-eco-region

Rising Temperatures



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Source: GLISA and Univ. of Wisc. Nelson Institute

Winters are Warming Faster

2.5°F increase averaged over the entire **year**

3.9°F increase during **winter** **(December - February)**

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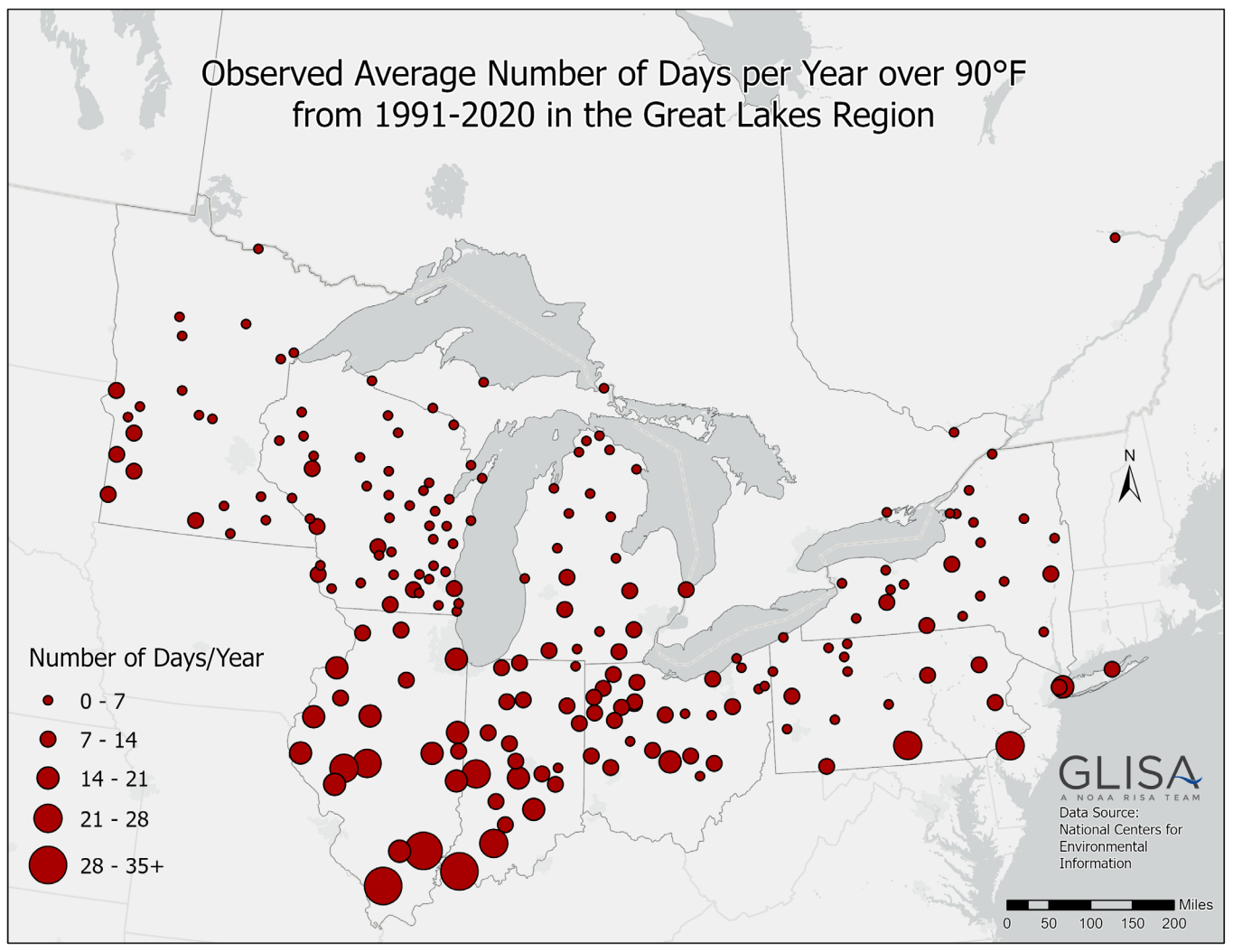
Source: GLISA & National Centers for Environmental Information

Photo: Dan Brown

Extreme Heat

Average Number of Days over 90°F in the Great Lakes region has increased by:

7.7 Days



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Source: National Centers for Environmental Information

Extreme Heat

By mid-century, models project the region could see:

90°F Days

9 to 37 more days per year

100°F Days

3 to 19 more days per year

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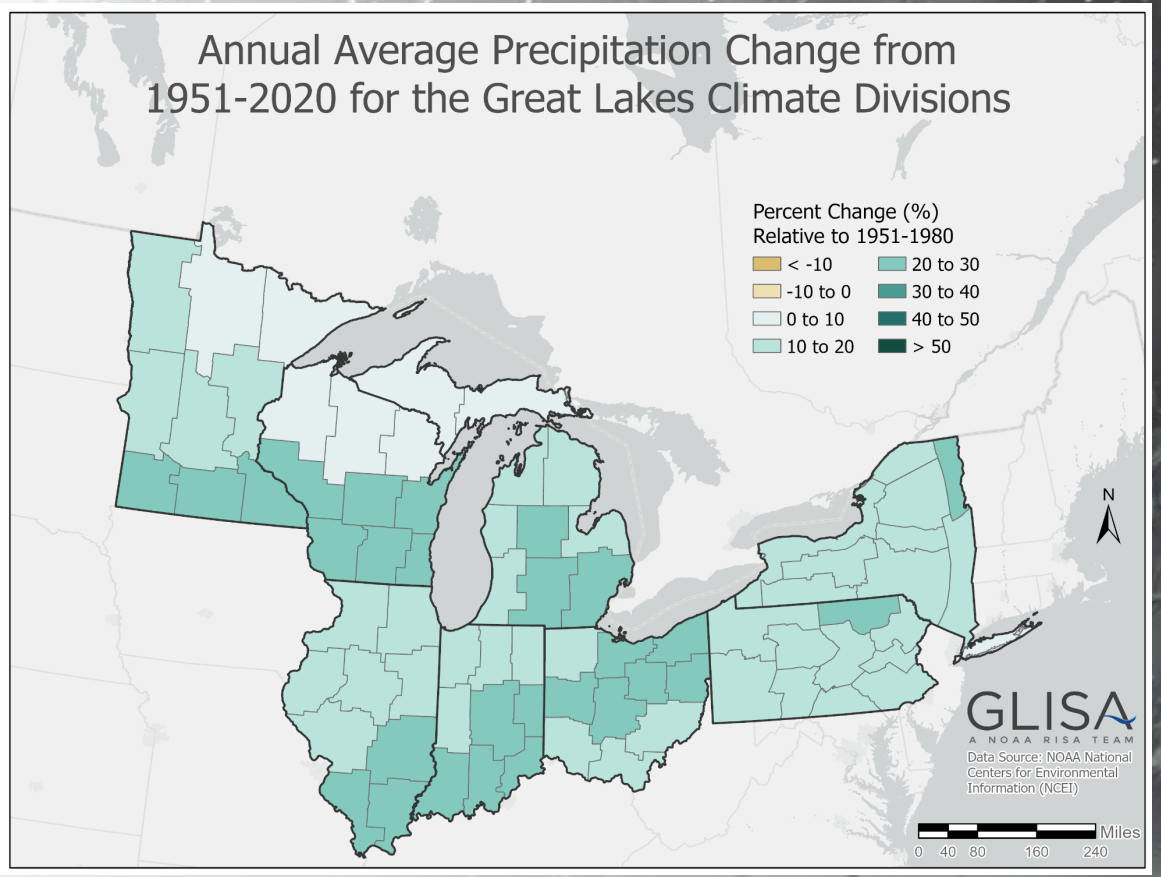
Source: GLISA and Univ. of Wisc. Nelson Institute

More Precipitation

Total annual precipitation in the Great Lakes region has increased by:

16%



Uneven changes across the Region

Percent change are calculated relative to the period of 1951-1980 historical reference period.

Source: National Centers for Environmental Information

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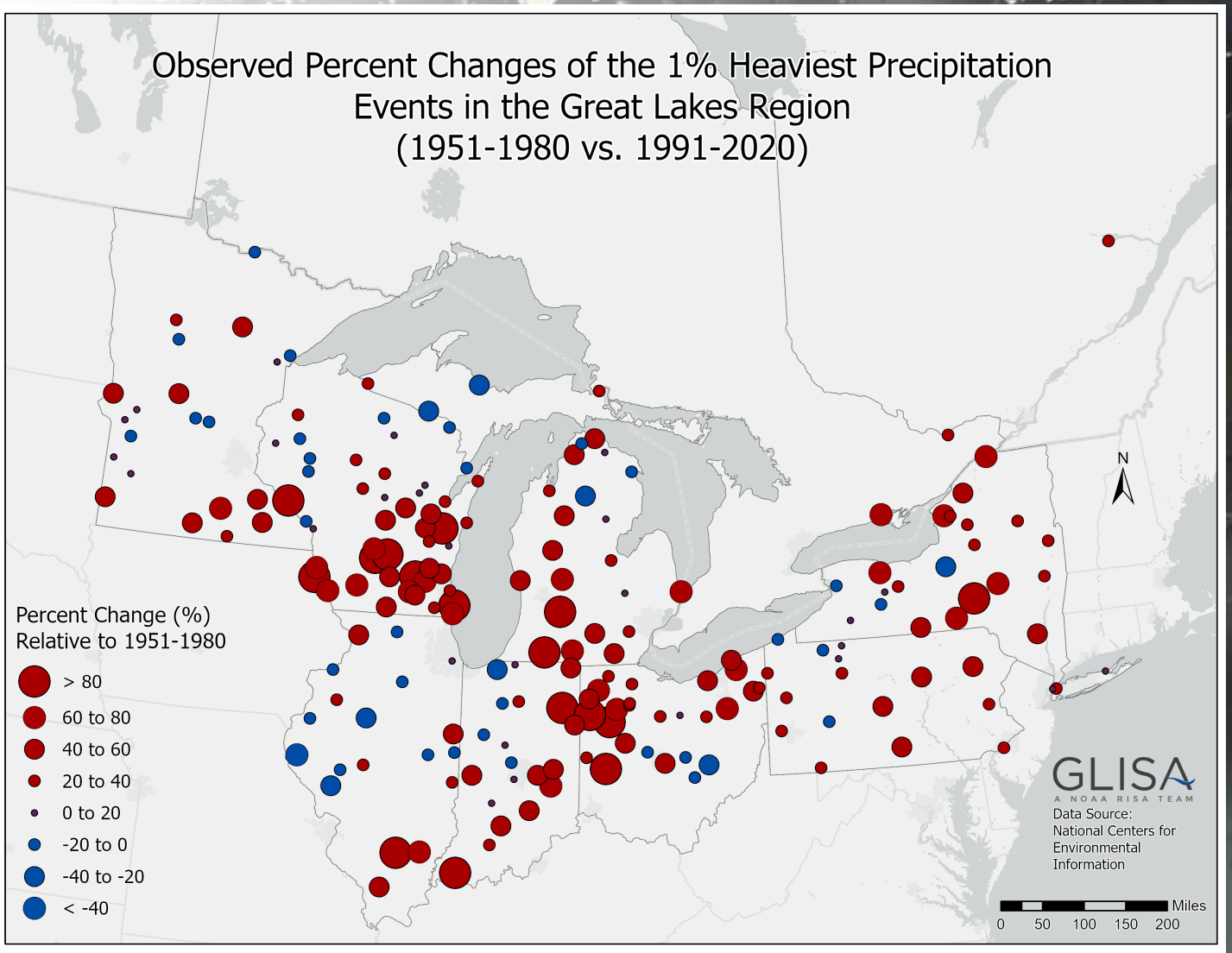
More Extreme Precipitation

1% Heaviest Precipitation Events:

37%

Nuisance flooding and minor damages are reported more frequently after these events



Source: National Centers for Environmental Information

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Extreme Precipitation

Mid-Century

Greater than 1-inch Precipitation Days:

0.4 to 1.5 days more per year

2040-2059

End of the Century

Greater than 1-inch Precipitation Days:

1.3 to 2.6 days more per year

2070-2099

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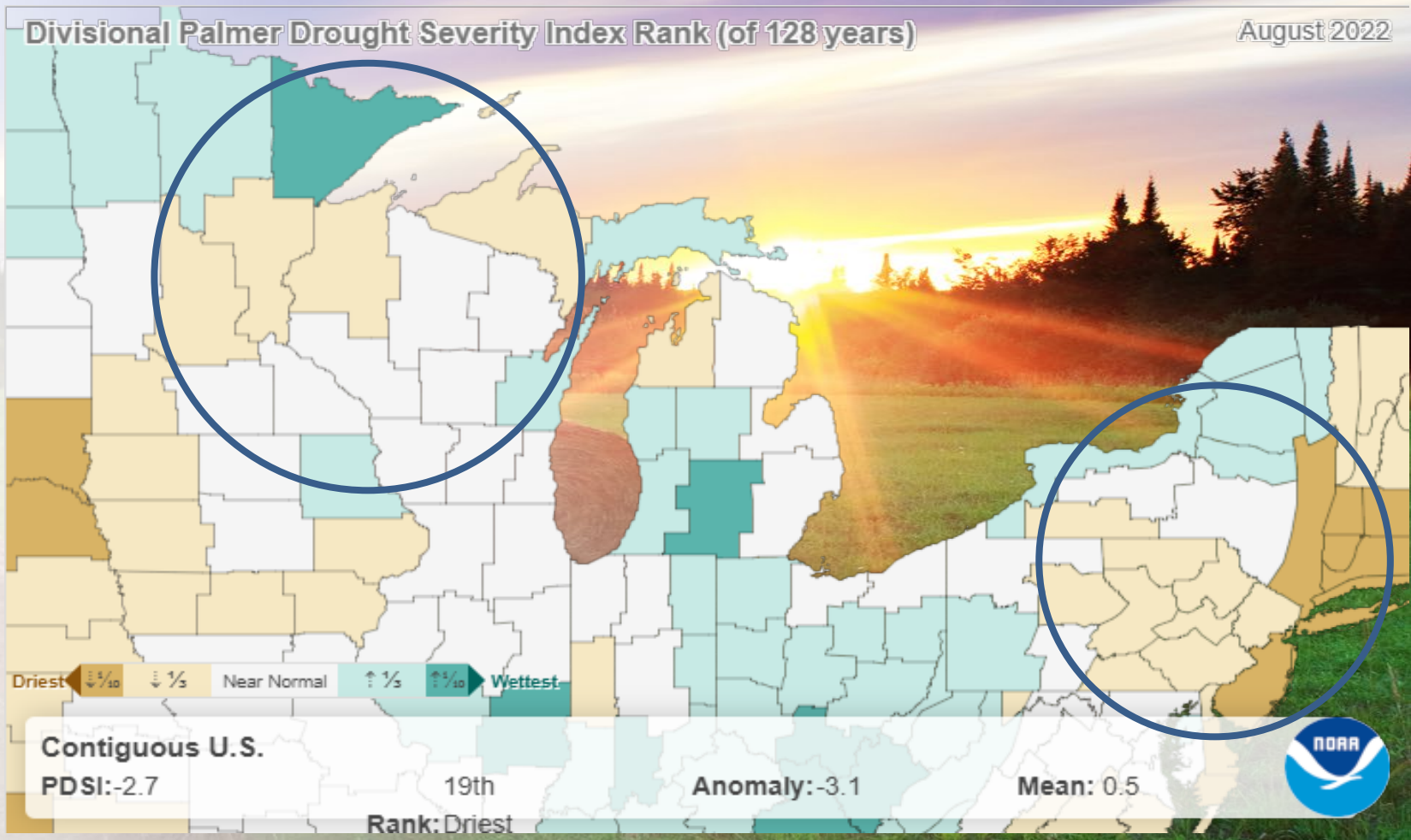
Source: GLISA, National Centers for Environmental Information, & U of Wisc. Nelson Institute

Drought

Observed

0.6 PDSI

1951-2021



Source: NOAA National Centers for Environmental Information

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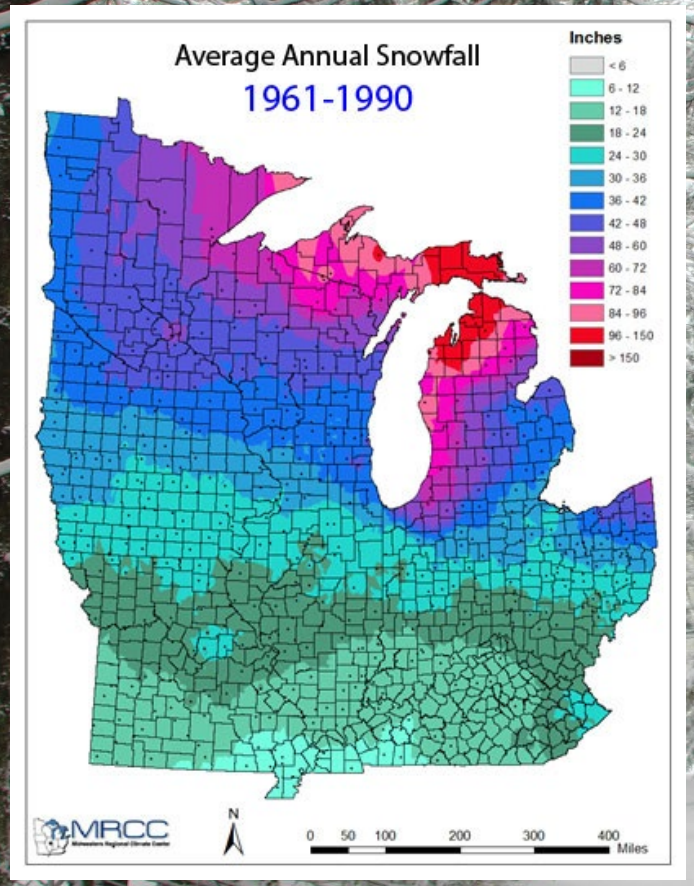
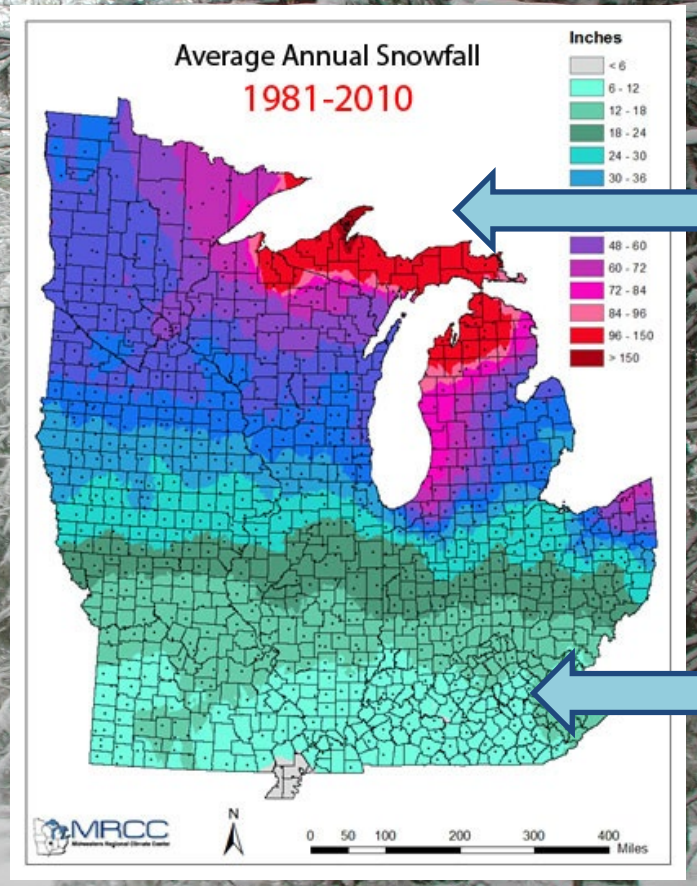
Change in Snowfall





Snowfall has increased in lake-effect areas

Snowfall has remained stable or decreased throughout southern parts of the region

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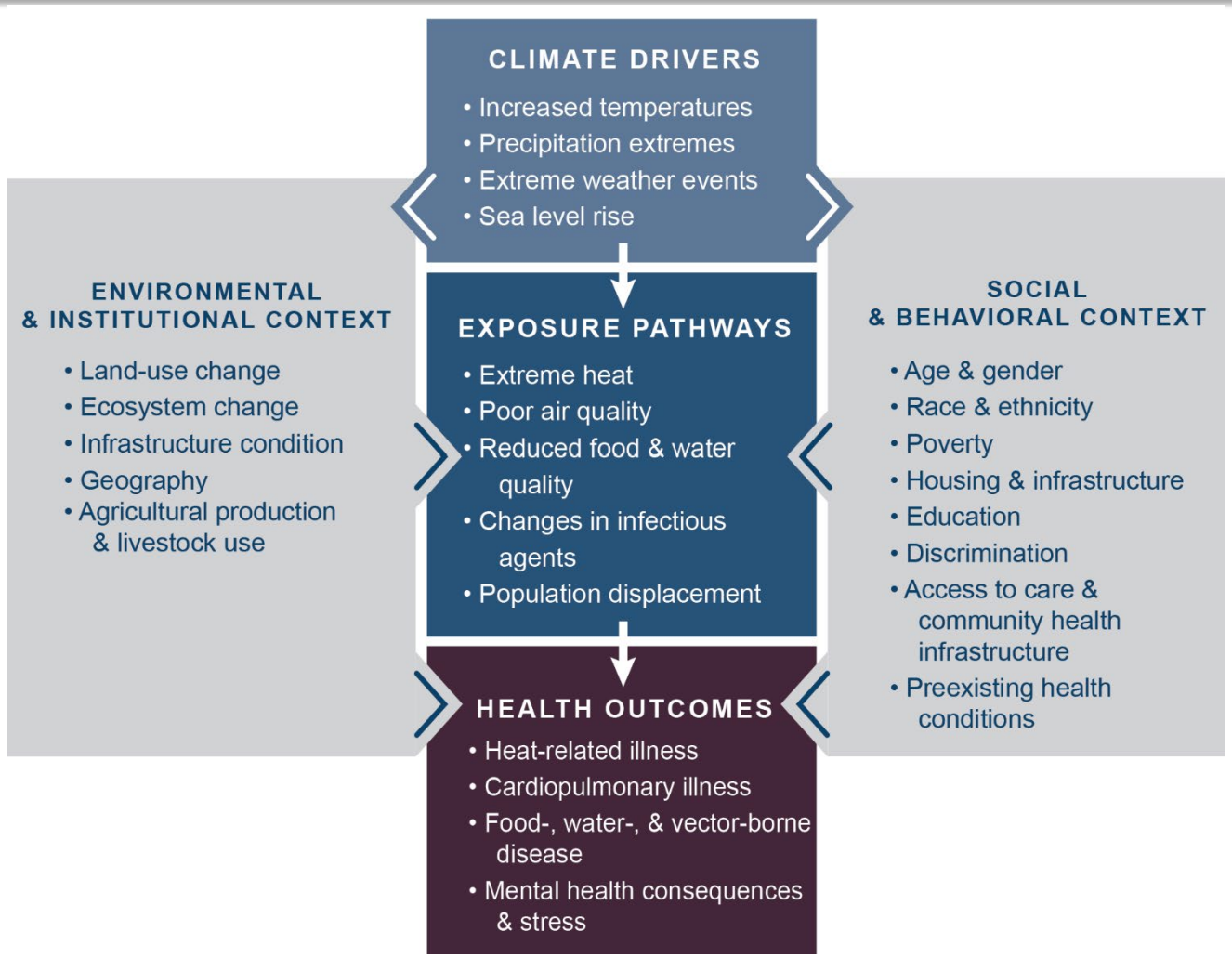
Photo: Kim Channell

Impacts

Photo: Dan Brown

Climate Change and Health



Source: USGCRP Climate Health Assessment *"1.5 Climate Change and Health"*

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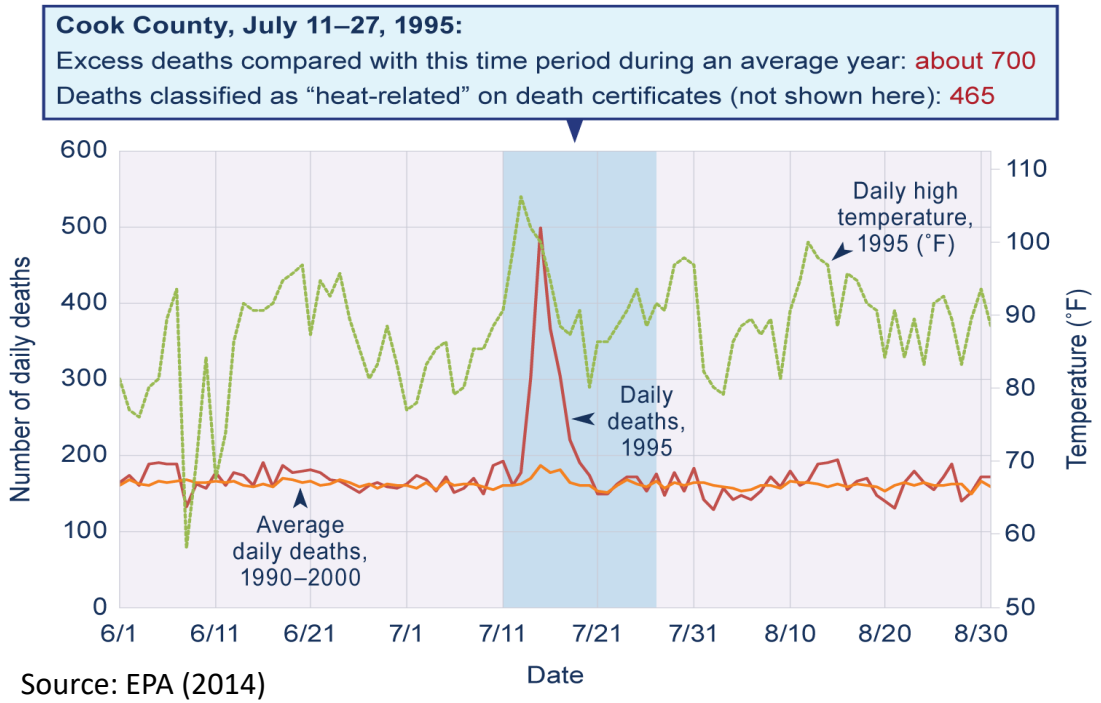
Heat-Related Impacts

- Health Outcomes
  - Hyperthermia
  - Illnesses
    - Cardiovascular
    - Respiratory
    - Renal
  - Mental Health
- Chicago Heat Wave of 1995
  - Excessive heat event extending from June 21 through August 10, 1995
  - Nearly 465 deaths were attributed to the extreme heat

Heat-Related Deaths During the 1995 Chicago Heat Wave



Source: EPA (2014)

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Source: USGCRP Climate Health Assessment Chapter 1 *"Temperature-Related Death and Illness"*

Stormwater Impacts

With increased extreme precipitation events, intense, flashy runoff amplify flooding risks.

Ontario Spring 17' Flood

U.S. Army National Guard

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Stormwater Impacts

- Extreme precipitation events have been linked to increased levels of pathogens in (treated) drinking water supplies
  - Cited as the contributing factor for waterborne disease outbreak.
- Walkerton, Ontario, Canada (May 2000)
  - Heavy rains produced runoff containing E.coli and other bacterium into the main drinking water source
  - The event resulted in approximately 2,300 illnesses and 7 deaths
- Heavy rainfall events are important catalyst for such water disease outbreaks
  - Infrastructure, maintenance problems, and communication with health officials are key non-climate factors

Photo Credit: Dan Brown

Source: USGCRP Climate Health Assessment Chapter 6 *"Water-Related Illness"*

Algal Blooms and Water Quality

More/Stronger Storms

More Runoff from Agriculture

Greater Nutrient Loading

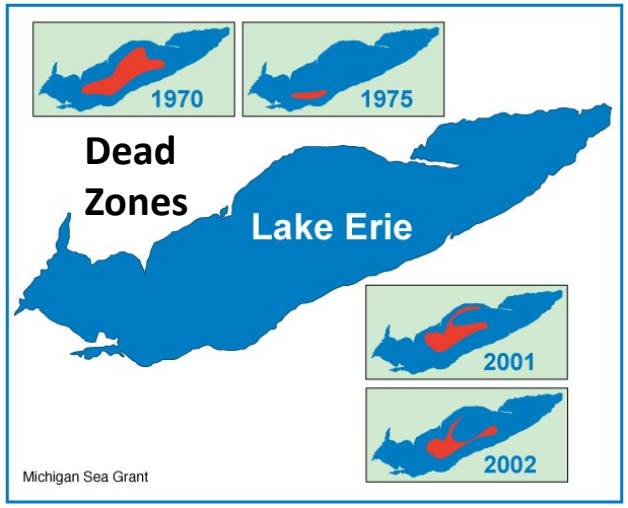
Warmer Lake Temperatures

Changed Lake Dynamics

Algal Blooms

Dead Zones

NOAA



MI SeaGrant

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Algal Blooms and Water Quality

- Health Outcomes:
  - Drinking water contamination
  - Toxins produced by harmful algal blooms
- Toledo Water Crisis
  - Microcystin was produced by blue-green algae during the 2014 algal bloom in Lake Erie
  - Residents were advised to not to use any tap water during the crisis to avoid exposure

Photo Credit: Alliance for the Great Lakes

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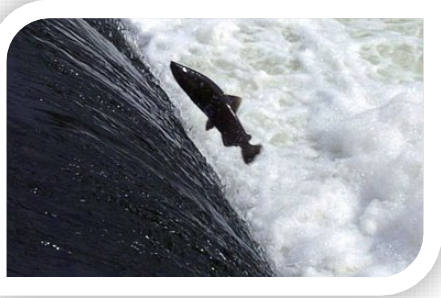
Source: USGCRP Climate Health Assessment Chapter 6 *"Water-Related Illness"*

Plants and Wildlife

- Forest ecosystems forced northward
  - Maple-Beech-Birch forest displaced
- Amplified stressors on biodiversity
  - Declining Coldwater fish populations, species migrating northward
- Agriculture
  - Longer growing season
  - Decreasing water availability, warm spells, spring freezes, flooding, and drought will limit crop yields



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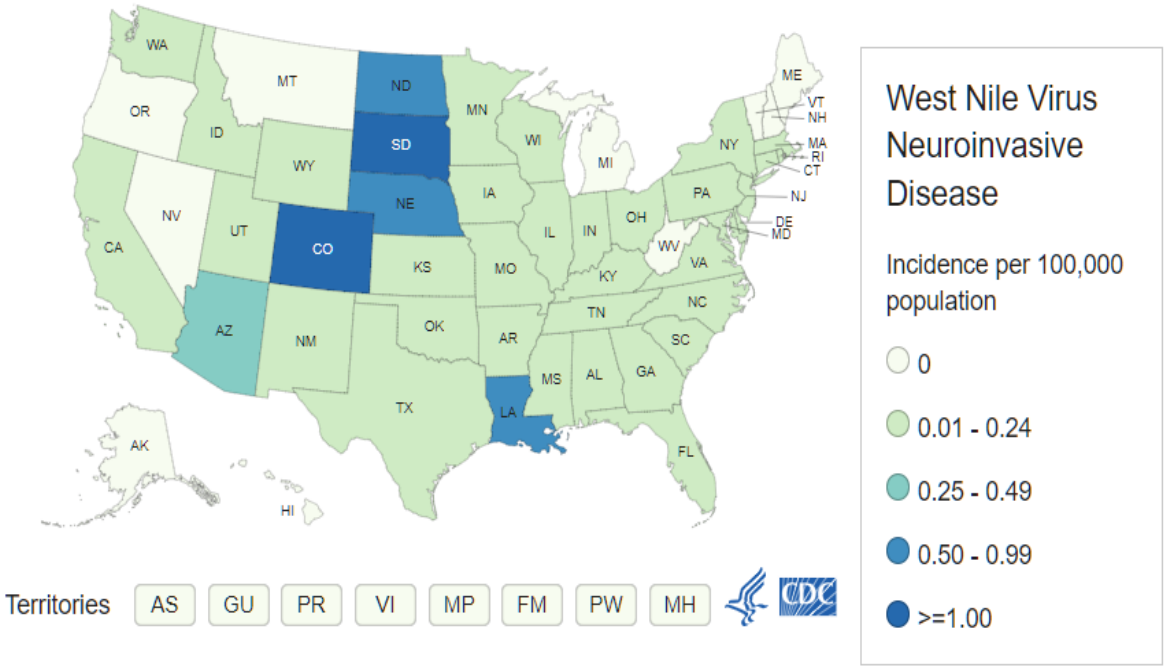
Vector-Borne Illnesses

- Warmer temperatures and heavy precipitation events have changed the geographic and seasonal distribution of vectors and vector-borne illnesses
  - Lyme disease
  - West Nile Virus
- Impacts to human health will be determined by communities' adaptative capacity
  - Vector control practices
  - Personal protective measures



Source: CDC (2022)

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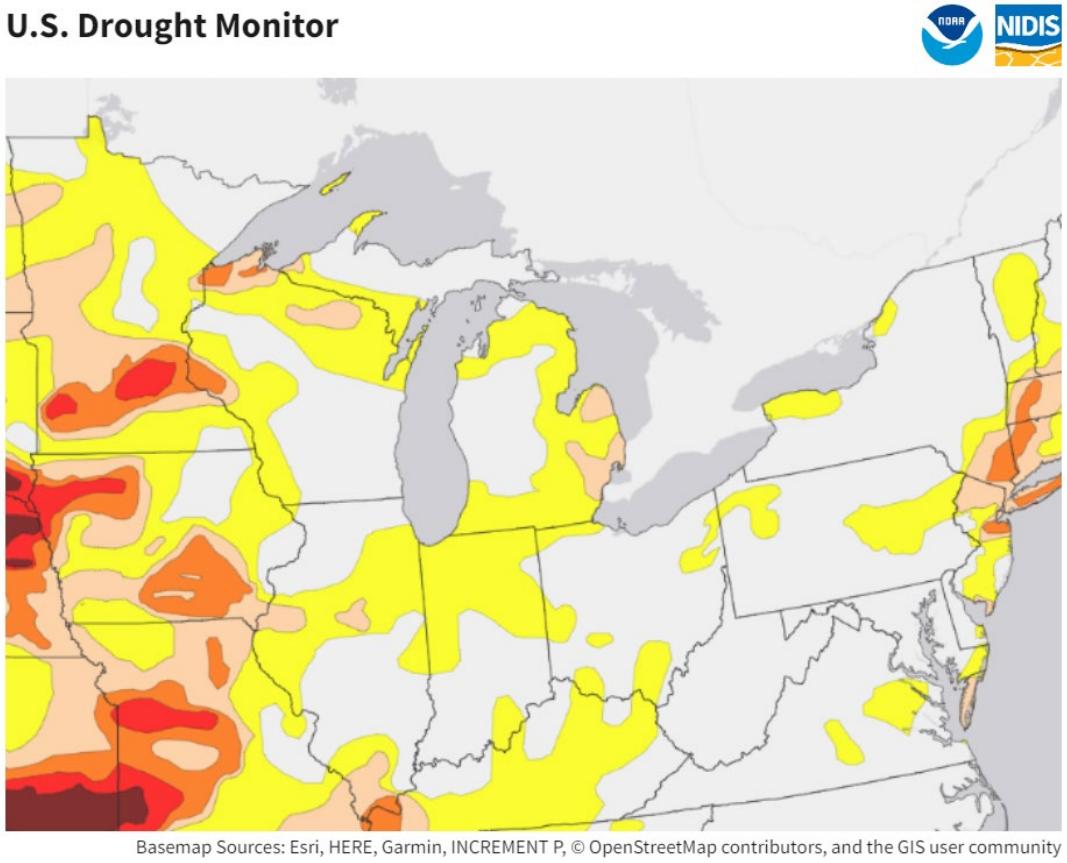
Source: USGCRP Climate Health Assessment Chapter 5 *"Vector-Borne Diseases"*

Drought & Health

- Health Outcomes:
  - Reduced water quality and quantity
  - Respiratory impacts related to reduce air quality
  - Increased recreational risks
  - Compromised food and nutrition

- Risks
  - Depends on localized variables
    - Built environment
    - Local demand for water
  - Can contribute to other climate events
    - Heat wave intensification



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Source: USGCRP Climate Health Assessment Chapter 4 *"Extreme Events"*

Air Quality

- Changing weather conditions can affect the number of air pollutants found in an area
  - Ground-level ozone (O_3)
  - Particulate Matter ($PM_{2.5}$)
- Health Outcomes
  - Chronic and acute respiratory effects
    - Lung cancer
    - Chronic Obstructive Pulmonary Disease (COPD)
    - Asthma
  - Cardiovascular disease
- Populations at Risk
  - Youth and young people
  - Immunocompromised people
  - Elderly
  - Minority adults and children

Air Quality Index	Protect Your Health
Good (0-50)	No health impacts are expected when air quality is in this range.
Moderate (51-100)	Unusually sensitive people should consider limiting prolonged outdoor exertion.
Unhealthy for Sensitive Groups (101-150)	The following groups should limit prolonged outdoor exertion: • People with lung disease, such as asthma • Children and older adults • People who are active outdoors
Unhealthy (151-200)	The following groups should avoid prolonged outdoor exertion: • People with lung disease, such as asthma • Children and older adults • People who are active outdoors Everyone else should limit prolonged outdoor exertion.
Very Unhealthy (201-300)	The following groups should avoid all outdoor exertion: • People with lung disease, such as asthma • Children and older adults • People who are active outdoors Everyone else should limit outdoor exertion.

Source: EPA AIRNOW

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Source: USGCRP Climate Health Assessment Chapter 3 *"Air Quality Impacts"*

Summary

- **Extreme temperature and precipitation are major concerns for the region.**
  - Model projections suggest more instances of heavy precipitation events and days over 90°F in the region.
- **Many of these changes will impact human health for many populations in the region.**
  - Heat-related Impacts
  - Water-borne and Vector-borne Illnesses
  - Drought
  - Air Quality
- **Communities and public health organizations can lead the effort in addressing the various health impacts affecting vulnerable populations.**
  - Advisories and documentations
  - Data and tools mapping exposures
  - Best practices guidance

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Thank You

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Photo: Kim Channell

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Leading with Equity: Community-Based Law and Policy Strategies to Address Extreme Heat

Presented at the 2022 Public Health Law Climate Change and Health Equity Summit by April Shaw, PhD, JD, Senior Staff Attorney, Network for Public Health Law – Northern Region Office, October 12, 2022

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Law and Policy Pathways to Community Centered Extreme Heat Solutions

Heat is the number one cause of weather-related death in the U.S., but not all communities are impacted the same. Historically redlined communities have experienced higher heat exposure through urban heat islands. Heat exposure contributes to heat illness, respiratory problems, and heat stroke and impacts the Social Determinants of Health. Outdoor workers paid low-incomes and Latino/a workers are especially vulnerable to poor health due to non-working days and lost income. As jurisdictions search for solutions to extreme heat, such as creating green energy and infrastructure communities are seeking a just transition to ensure equitable benefits flow to these and other frontline communities. Law and policy play an essential role in supporting community-centered processes and solutions to reducing the negative health impacts of extreme heat.

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Barriers to community engagement:

1. **Community is defined without input**
2. **Solutions originate outside the community**
3. **Public participation isn't intentional, meaningful, or engaged**
   - Not designed to result in substantive or procedural change reflecting voices heard
4. **Processes are inaccessible – language, time, place**
5. **Agencies have not done the work to build trust**
   - History of exclusion and/or solutions that harm communities
6. **Failure to be intersectional and cross-collaborative**
7. **Need for fair and transparent processes for resolving competing goals or values**
   - E.g., Which projects? What to prioritize? What is the role of community (consultation or partnership)? Who gets to speak for the community? Competing community priorities? Competing community/organization priorities?

The Network for Public Health Law

Law and Policy Pathways to Community Centered Extreme Heat Solutions

Heat is the number one cause of weather-related death in the U.S., but not all communities are impacted the same. Historically redlined communities have experienced higher heat exposure through urban heat islands. Heat exposure contributes to heat illness, respiratory problems, and heat stroke and impacts the Social Determinants of Health. Outdoor workers paid low-incomes and Latino/a workers are especially vulnerable to poor health due to non-working days and lost income. As jurisdictions search for solutions to extreme heat, such as creating green energy and infrastructure communities are seeking a just transition to ensure equitable benefits flow to these and other frontline communities. Law and policy play an essential role in supporting community-centered processes and solutions to reducing the negative health impacts of extreme heat.

Create Accessible Cooling Centers

Enhance inclusive and multigenerational programming at city-run cooling centers to increase their use

Utilize geographic information system tools with community needs assessments to strategically locate cooling centers in areas most vulnerable to extreme heat exposure

Provide free transportation to and from cooling centers to address access barriers

Increase community knowledge concerning what cooling centers are and who they serve

Improve cooling center signage to increase their accessibility

Support Green Infrastructure

Integrate green infrastructure into routine streetscape upgrades

Create an Urban Forest Fund to support new greening projects in communities with a low percentage of tree covers and high concentrations of impervious surfaces

Develop an Urban Forest Management Plan for private and public property with sustainable funding

Establish landscape ordinances which set minimum tree standards and require the planting of trees in energy conservation zones

Increase tree covers in formerly redlined neighborhoods

Engage in Community Planning

Develop a Community Benefits Agreement to prevent displacement of vulnerable residents via climate gentrification

Enact policies so impacted communities can shape heat mapping initiative priorities

Use the spectrum of community engagement to ownership tool to measure local government's level of community engagement

Culturally adapt the CDC's Building Resilience Against Climate Effect framework using value-driven data for traditionally excluded groups

Adopt a cultural safety emergency planning model

Add climate & community engagement goals to declarations of racism as a public health crisis

Protect Workers

Provide culturally inclusive written and oral communications about safety during high/extreme heat days

Implement state laws to protect outdoor workers from heat illness mandating access to shade, water, and training

Provide benefits including health care and paid leave for missed workdays due to extreme temperatures

Enact national heat standards to protect workers at risk for heat illness

Establish task forces to engage with at-risk workers to determine barriers to working safely (e.g., immigration status, income needs, pregnancy)

Enact Equitable Energy Strategies

Use a community-centered energy justice scorecard

Adopt community solar programs like Illinois Solar for All requiring community input

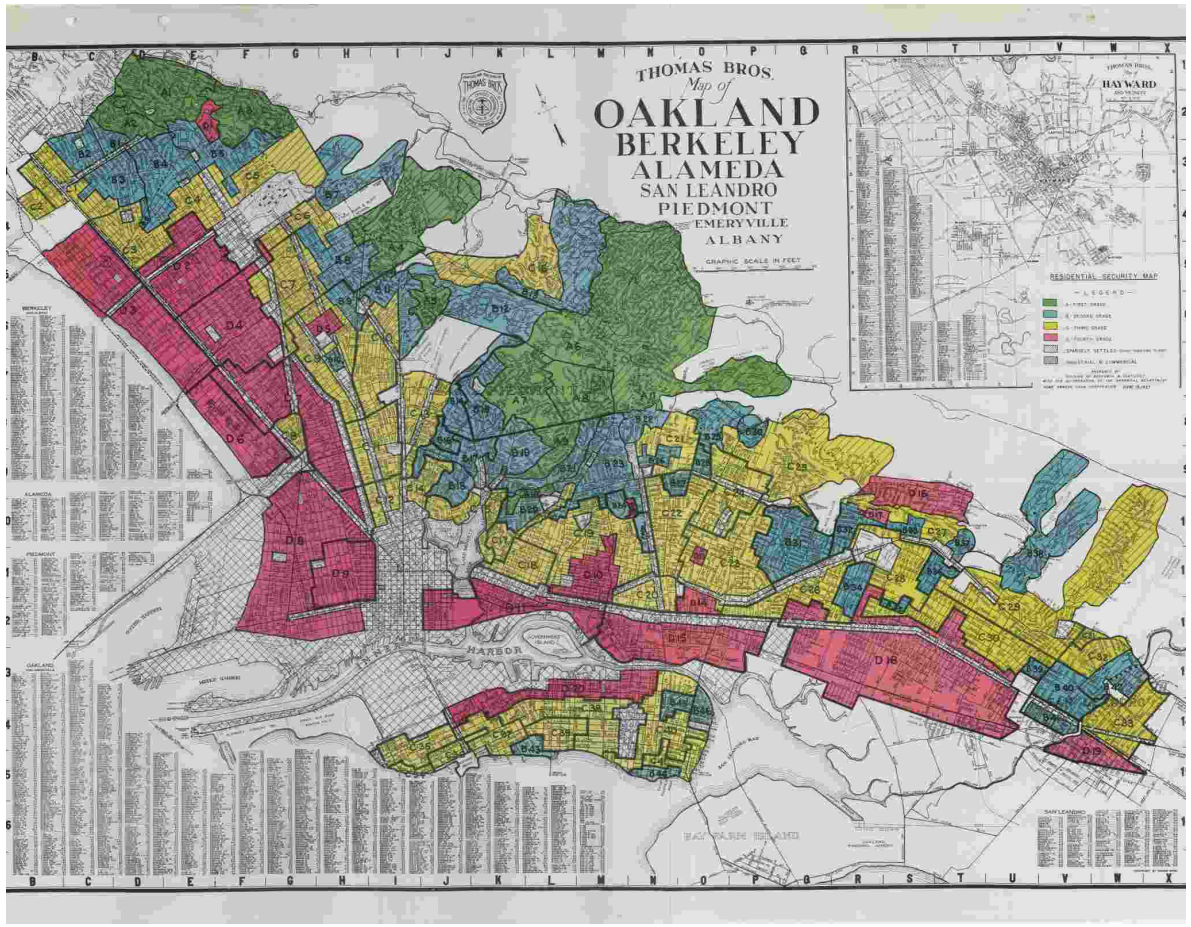
Create energy assistance programs that cap fees at a percentage of a person's income and make eligibility / participation easy (e.g., opt-out not opt-in)

Establish a clean energy fund centered on energy, green infrastructure, and job training needs of frontline communities

Require that spending on renewable and energy efficiency programs benefit underserved communities

Support Green Infrastructure & Engage in Community Planning

Heat Mitigation Requires Intersectional Community-Based Solutions



Redlining
- Impervious surfaces
- Disinvestment

Resources for recovery
- Based on property value
- Climate gentrification

Adopt a Cultural Safety Model in Emergency Planning

Cultural Safety & Communications:

- **What are the cultural barriers (whose culture is being served)?**
- **Where are communications being shared?**
- **How are messages being communicated?**
  - Multiple languages
  - Cultural framing
  - Written & oral
  - Plain language
  - Non-verbal communications
  - Information on culturally specific concerns
  - Not relying on children/family members to be interpreters

Engage in Community Planning: A Tool for Measuring Community Engagement

THE SPECTRUM OF COMMUNITY ENGAGEMENT TO OWNERSHIP

STANCE TOWARDS COMMUNITY	0 IGNORE	1 INFORM	2 CONSULT	3 INVOLVE	4 COLLABORATE	5 DEFER TO
IMPACT	**Marginalization**	**Placation**	**Tokenization**	**Voice**	**Delegated Power**	**Community Ownership**
COMMUNITY ENGAGEMENT GOALS	Deny access to decision-making processes	Provide the community with relevant information	Gather input from the community	Ensure community needs and assets are integrated into process & inform planning	Ensure community capacity to play a leadership role in implementation of decisions	Foster democratic participation and equity through community-driven decision-making; Bridge divide between community & governance
MESSAGE TO COMMUNITY	***Your voice, needs & interests do not matter***	***We will keep you informed***	***We care what you think***	***You are making us think, (and therefore act) differently about the issue***	***Your leadership and expertise are critical to how we address the issue***	***It's time to unlock collective power and capacity for transformative solutions***
ACTIVITIES	Closed door meeting Misinformation Systematic	Fact sheets Open Houses Presentations Billboards Videos	Public Comment Focus Groups Community Forums Surveys	Community organizing & advocacy House meetings Interactive workshops Polling Community forums	MOU's with Community-based organizations Community organizing Citizen advisory committees Open Planning Forums with Citizen Polling	Community-driven planning Consensus building Participatory action research Participatory budgeting Cooperatives
RESOURCE ALLOCATION RATIOS	**100%** Systems Admin	**70-90%** Systems Admin **10-30%** Promotions and Publicity	**60-80%** Systems Admin **20-40%** Consultation Activities	**50-60%** Systems Admin **40-50%** Community Involvement	**20-50%** Systems Admin **50-70%** Community Partners	**80-100%** Community partners and community-driven processes ideally generate new value and resources that can be invested in solutions

The Spectrum of Community Engagement to Ownership, Facilitating Power available at https://movementstrategy.org/wp-content/uploads/2021/08/The-Spectrum-of-Community-Engagement-to-Ownership.pdf.

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Thank you to Mosalewa Ani, Program Coordinator, The Network for Public Health Law, National Office, and Masters of Public Health Candidate at the George Washington University – Milken Institute School of Public Health (2023) & Jade Colclasure, Legal Intern, The Network for Public Health Law, Northern Region Office, J.D. Candidate, University of Arizona James E. Rogers College of Law (2024) for their research assistance.

Questions contact April Shaw at ashaw@networkforphl.org

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