



Climate & Health Tools for Tribal and Frontline Communities

CSTE 2019 Climate and Respiratory Health Summit
May 8, 2019



**TRIBAL CLIMATE
HEALTH PROJECT**



PROSPER
Building Thriving Communities
SUSTAINABLY

Thank you for the invitation

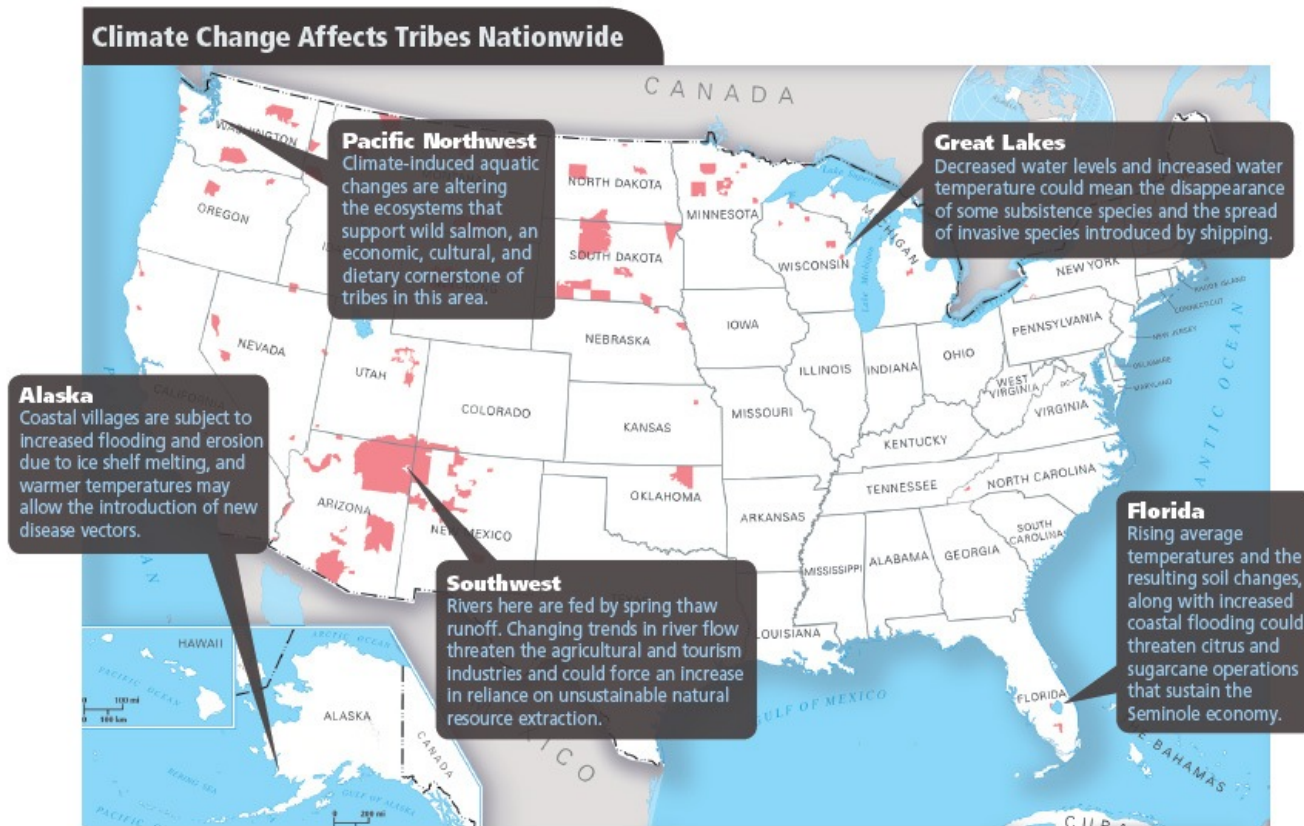
Purpose:

An interactive discussion with public health and epidemiology professionals to build tribal capacity and readiness to assess, address, implement, and evaluate climate and health vulnerabilities

- Climate change and tribal health basics
- Tools and frameworks to help tribes
- Gaps, needs, and recommendations



Climate changes lives differently in different places



Tribal lands are indicated in pink. Sources: map—www.nationalatlas.gov; climate change effect predictions—Hanna JM. 2007. Native communities and climate change: protecting tribal resources as part of national climate policy. Boulder, CO: Natural Resources Law Center / NWF. 2007. Overview of recent research: effects of global warming on the Great Lakes [fact sheet]. Ann Arbor, MI: National Wildlife Federation.

Tribal examples:

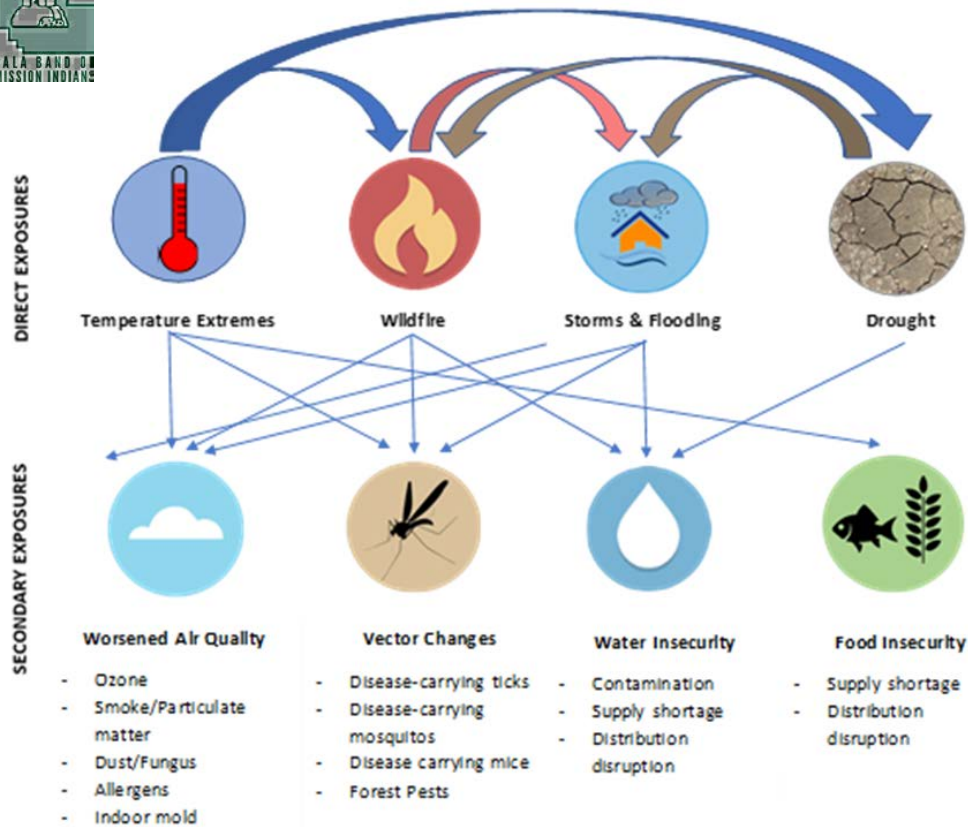
- ***Pacific Northwest and Great Lakes tribes***: fish, food, and forests
- ***Navajo***: heat and water insecurity
- ***Mojave***: shrinking river (spirituality)
- ***Seminole Tribe of Florida***: hurricanes and sea-level rise
- ***Alaska coastal tribes***: thawing, erosion and hunting
- ***Lakota (South Dakota)***: Bomb cyclone and flooding
- ***California tribes***: drought, wildfire, heat

Climate changes lives differently in different places

Tribal example: Pala Band of Mission Indians



Pala's Climate Change-Driven Exposures Are Interrelated



What Climate Change Means for Tribes & Indigenous Peoples

Tribes are both uniquely and disproportionately vulnerable and uniquely resilient

“Climate change threatens Indigenous peoples’ livelihoods and economies, including agriculture, hunting and gathering, fishing, forestry, energy, recreation, and tourism enterprises. Indigenous peoples’ economies rely on, but face institutional barriers to, their self-determined management of water, land, other natural resources, and infrastructure that will be impacted increasingly by changes in climate.”

Key Finding, Fourth National Climate Assessment

“In our every deliberation, we must consider the impact of our decisions on the next seven generations.”

Iroquois Maxim (1700-1800)



DESPITE THIS TREMENDOUS RESPECT FOR THE ENVIRONMENT, TRIBES NOW FIND THIS BALANCE AND HARMONY IS SLIPPING AWAY DUE TO CLIMATE CHANGE.

What Climate Change Means for Tribes & Indigenous Peoples

Federal laws, treaty rights, sovereignty and self-determination

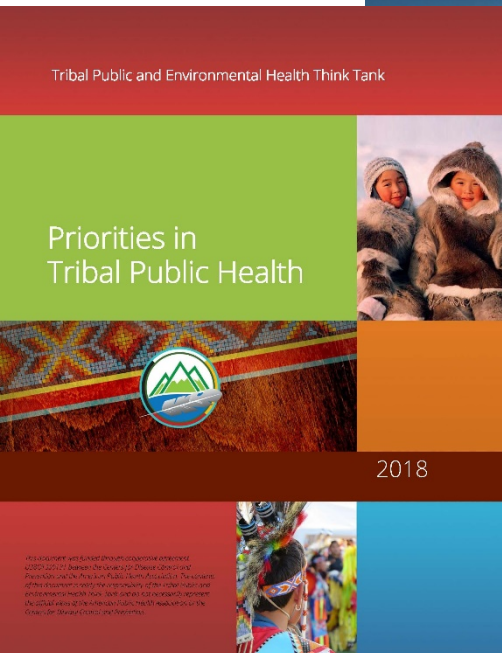
- Displacement, relocation, resettlement
- Institutional barriers to adaptation
- Engagement, consultation, and consent



What Climate Change Means for Tribes & Indigenous Peoples

Unique climate-driven health challenges and compounding stressors

- Each tribal community is unique
- Climate change exacerbates disproportionate health outcomes
- Water and food insecurity
- Loss of ecological health can mean loss of livelihoods
- Relocating may mean loss of culture, community, and rights
- Arctic warming
- Underfunded public health services



What is Health?

Western and tribal communities often define health differently

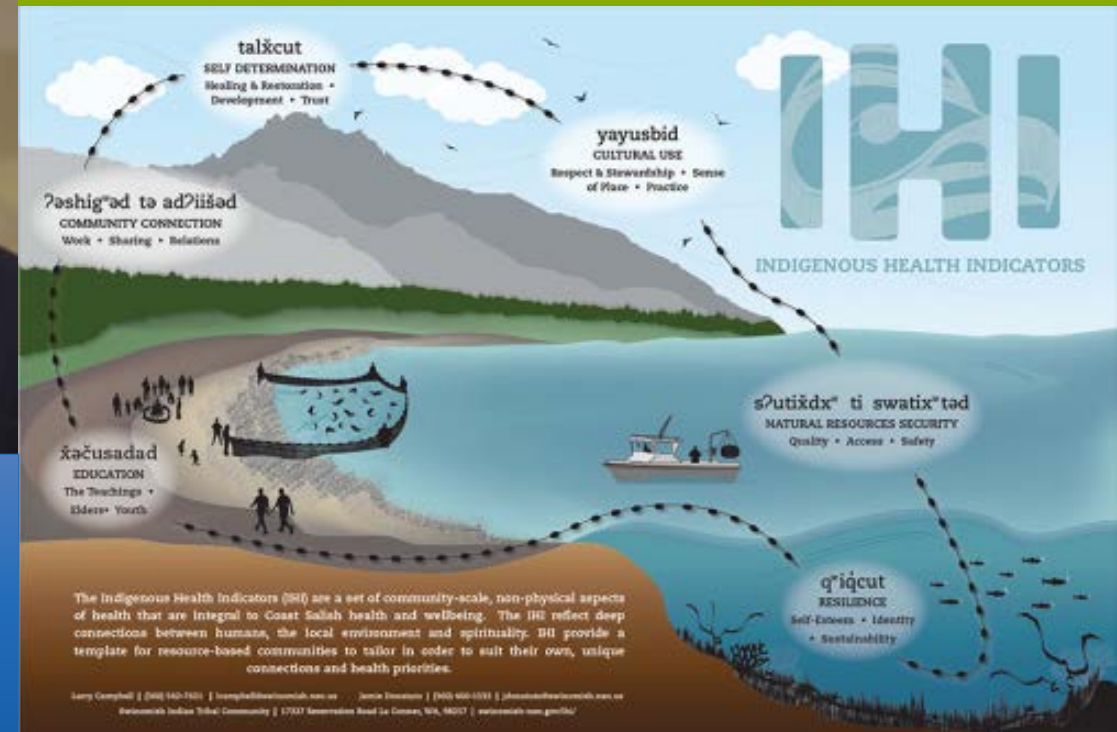


“Mission: By providing whole-person health services in medical care, preventative wellness programs, rural community infrastructure development and statewide solutions, we are able to protect and perpetuate our Alaska Native culture and traditions”

Alaska Native Tribal Health Consortium

“Nobody can be in good health if he does not have all the time fresh air, sunshine and good water.”

Flying Hawk (Chief) 1854 – 1931, Oglala Lakota



What is Health?

Tribal Climate Health Project defines health more broadly than the absence of medical disease:

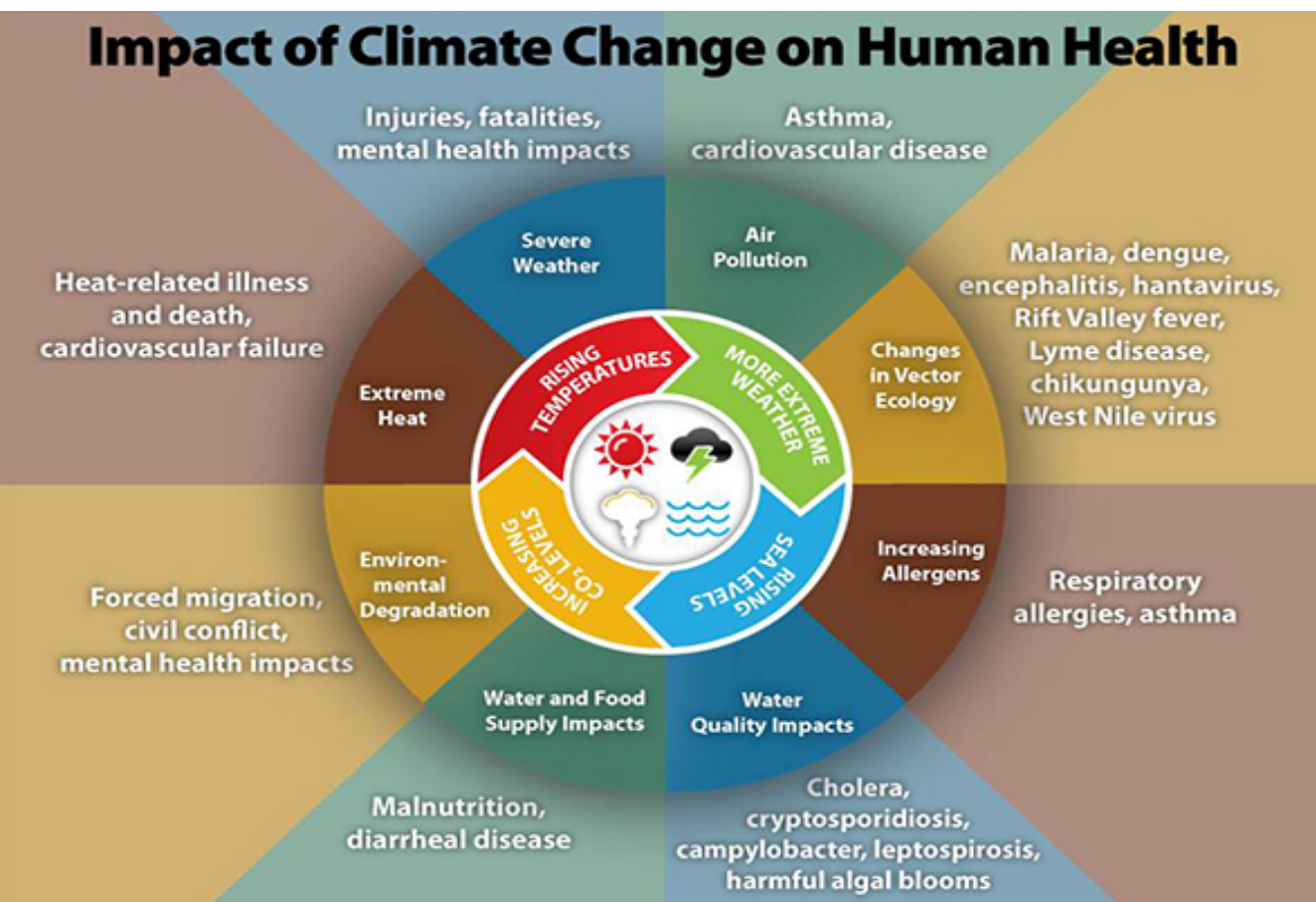
- Human health
- Spiritual and cultural health
- Socio-economic health

“Indigenous health is based on **interconnected** social and ecological systems that are being disrupted by a changing climate. As these changes continue, the health of individuals and communities will be uniquely challenged by climate impacts to lands, waters, foods, and other plant and animal species. These impacts threaten sites, practices, and relationships with cultural, spiritual, or ceremonial importance that are foundational to Indigenous peoples’ cultural heritages, identities, and physical and mental health.”

Key Finding, Fourth National Climate Assessment

Climate Change and Human Health

Climate change is increasing the number of people at greater risk of human health threats such as **illness, injury, death, trauma and other mental and psychosocial consequences**



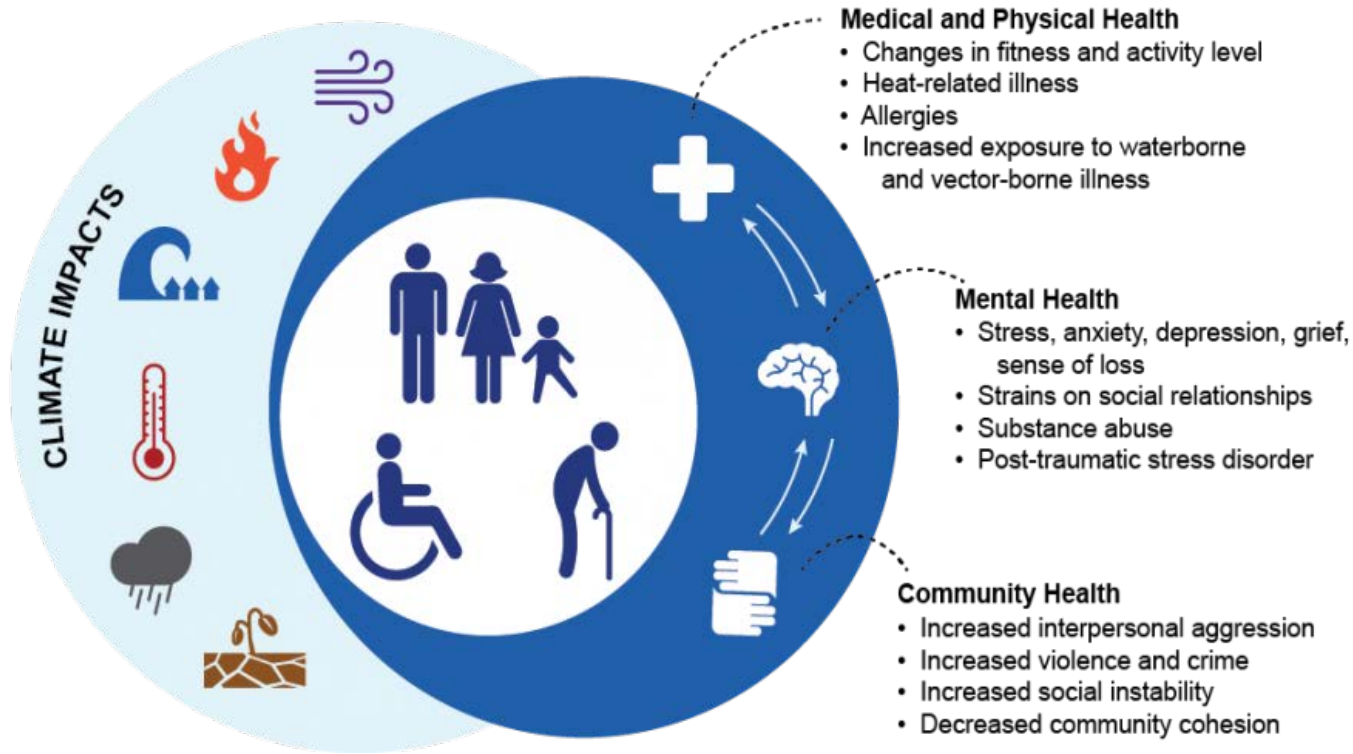
USGCRP Climate and Health Assessment Key Findings

- Increased exposure to extreme events and coastal flooding will effect health
- Disruptions to essential infrastructure can limit access to healthcare and emergency response services

“Our environment was rich in the wealth of natural resources, providing all our needs, allowing us to live healthy happy lives!”

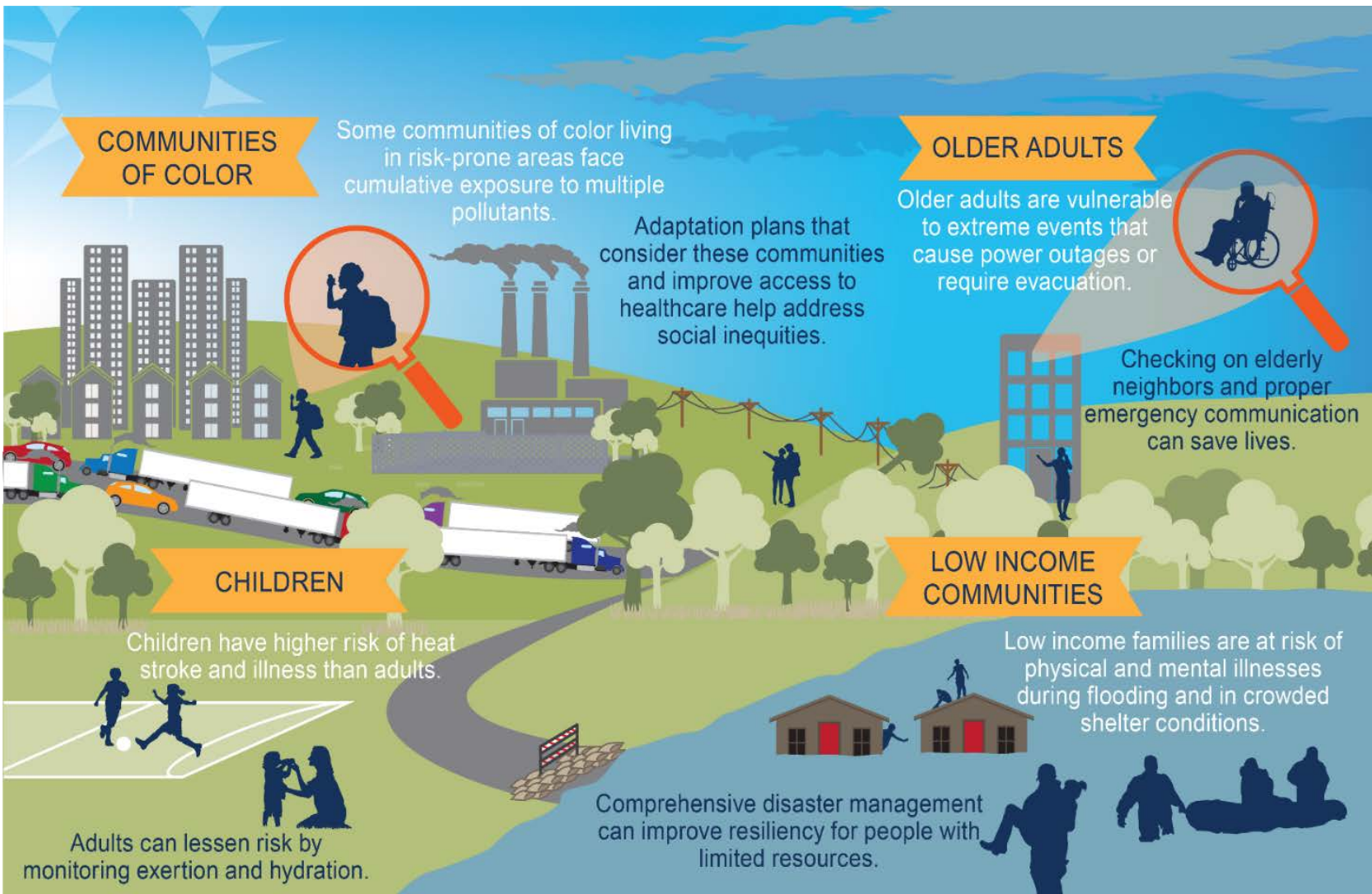
Puyallup Tribe

Climate Change and Human Health



	Climate Driver	Exposure	Health Outcome	Impact
Extreme Heat	More frequent, severe, prolonged heat events	Elevated temperatures	Heat-related death and illness	Rising temperatures will lead to an increase in heat-related deaths and illnesses.
Outdoor Air Quality	Increasing temperatures and changing precipitation patterns	Worsened air quality (ozone, particulate matter, and higher pollen counts)	Premature death, acute and chronic cardiovascular and respiratory illnesses	Rising temperatures and wildfires and decreasing precipitation will lead to increases in ozone and particulate matter, elevating the risks of cardiovascular and respiratory illnesses and death.
Flooding	Rising sea level and more frequent or intense extreme precipitation, hurricanes, and storm surge events	Contaminated water, debris, and disruptions to essential infrastructure	Drowning, injuries, mental health consequences, gastrointestinal and other illness	Increased coastal and inland flooding exposes populations to a range of negative health impacts before, during, and after events.
Vector-Borne Infection (Lyme Disease)	Changes in temperature extremes and seasonal weather patterns	Earlier and geographically expanded tick activity	Lyme disease	Ticks will show earlier seasonal activity and a generally northward range expansion, increasing risk of human exposure to Lyme disease-causing bacteria.
Water-Related Infection (Vibrio vulnificus)	Rising sea surface temperature, changes in precipitation and runoff affecting coastal salinity	Recreational water or shellfish contaminated with <i>Vibrio vulnificus</i>	<i>Vibrio vulnificus</i> induced diarrhea & intestinal illness, wound and blood-stream infections, death	Increases in water temperatures will alter timing and location of <i>Vibrio vulnificus</i> growth, increasing exposure and risk of water-borne illness.
Food-Related Infection (Salmonella)	Increases in temperature, humidity, and season length	Increased growth of pathogens, seasonal shifts in incidence of <i>Salmonella</i> exposure	<i>Salmonella</i> infection, gastrointestinal outbreaks	Rising temperatures increase <i>Salmonella</i> prevalence in food; longer seasons and warming winters increase risk of exposure and infection.
Mental Health and Well-Being	Climate change impacts, especially extreme weather	Level of exposure to traumatic events, like disasters	Distress, grief, behavioral health disorders, social impacts, resilience	Changes in exposure to climate- or weather-related disasters cause or exacerbate stress and mental health consequences, with greater risk for certain populations.

Vulnerable Populations



The Good News

Adaptation is the process of taking actions to reduce or manage risks associated with climate change.

Report prepared by:

Michael Brubaker, MS
Raj Chavan, PE, PhD

ANTHC recognizes all of our technical advisors for this report. Thank you for your support:

Gloria Shellabarger, Kiana Tribal Council	Mike Black, ANTHC
Linda Stotts, Kiana Tribal Council	Brad Blackstone, ANTHC
Dale Stotts, Kiana Tribal Council	Jay Butler, ANTHC
Sharon Dundas, City of Kiana	Eric Hanssen, ANTHC
Crystal Johnson, City of Kiana	Oxenia O'Domin, ANTHC
Brad Reich, City of Kiana	Desirae Roehl, ANTHC
John Chase, Northwest Arctic Borough	Jeff Smith, ANTHC
Paul Eaton, Manillaq Association	Mark Spafford, ANTHC
Millie Hawley, Manillaq Association	Moses Tcheripanoff, ANTHC
Jackie Hill, Manillaq Association	John Warren, ANTHC
John Monville, Manillaq Association	Steve Weaver, ANTHC
James Berner, ANTHC	

© Alaska Native Tribal Health Consortium (ANTHC), October 2011.

Funded by United States Indian Health Service Cooperative Agreement No. AN 08-X59

Through adaptation, negative health effects can be prevented.

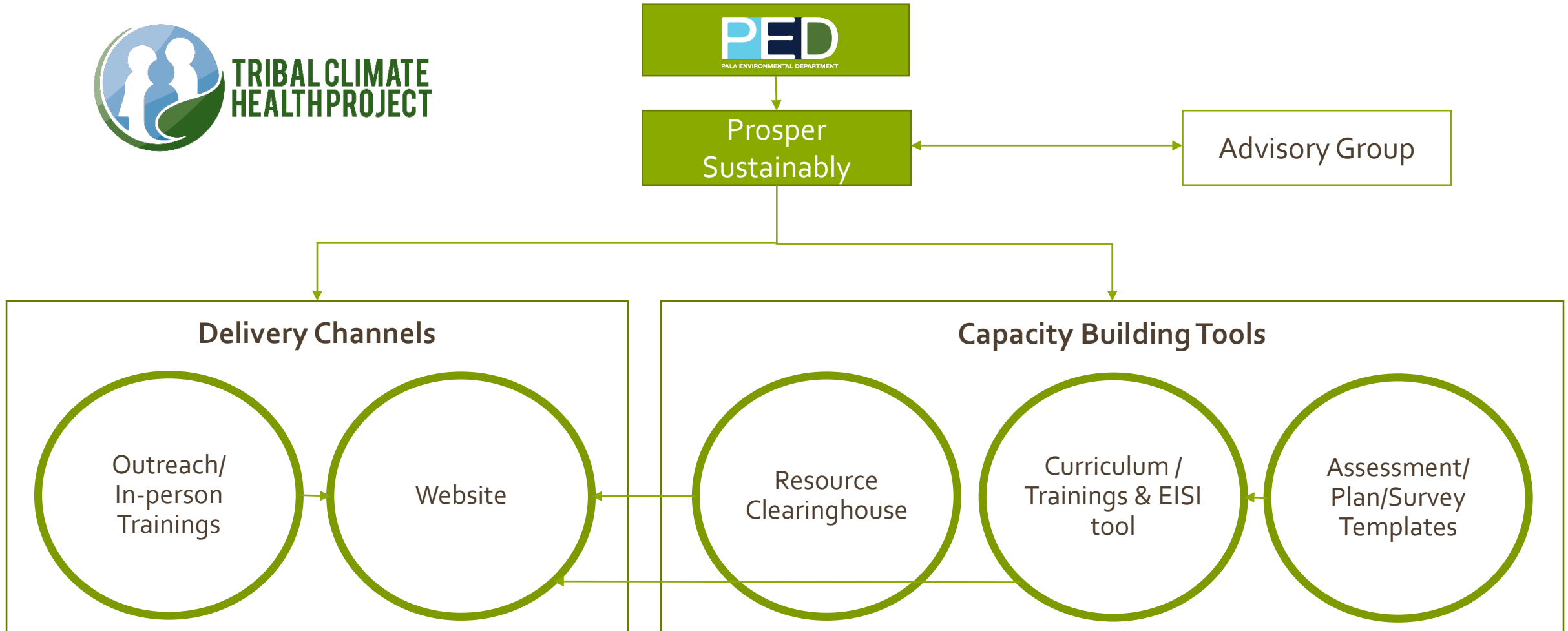


Cover Art:
Whale Bone Mask
by Larry Adams

Group Discussion:

What keeps tribes from acting on climate and health threats?

Tribal Climate Health Project (TCHP) Overview

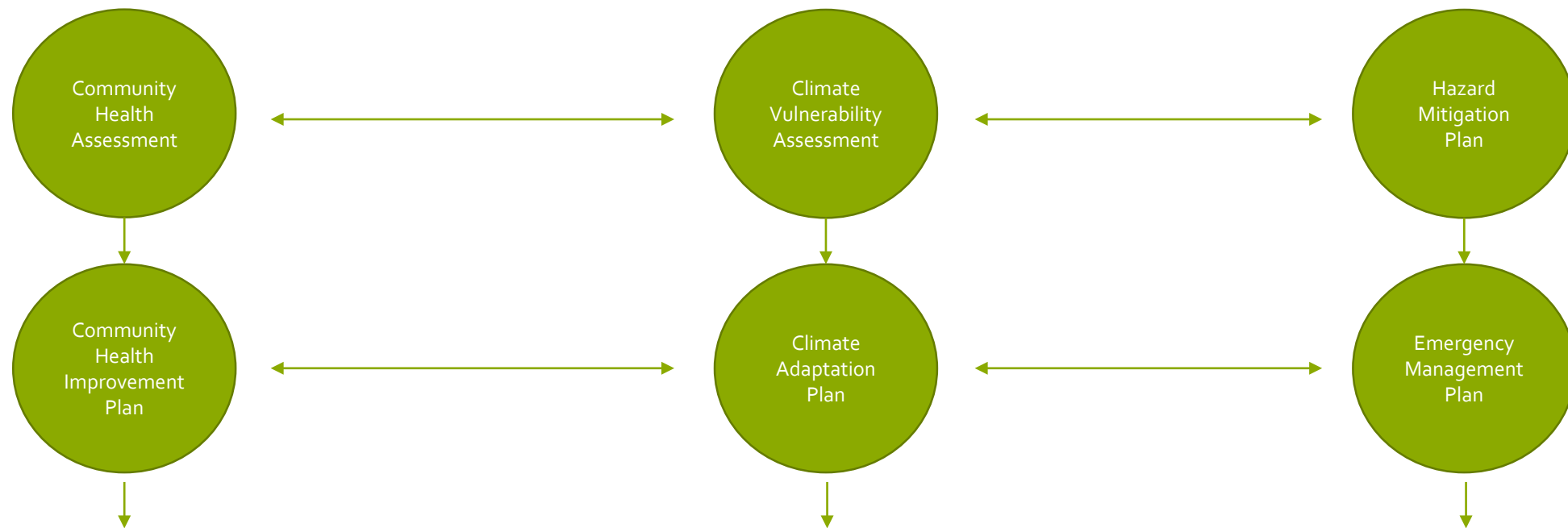


Many Types of Professionals Can Be Involved

Public Health Planning Approach

Climate Adaptation Planning Approach

Emergency Management Approach



Initiates more plans, policies, and actions that can be complementary

Role of Health Professionals in Climate Adaptation

A key partner in community climate action

SIX CORE FUNCTIONS AND 15 KEY STRATEGIES FOR PUBLIC HEALTH TO ADDRESS CLIMATE CHANGE AND HEALTH

1 Leadership and Organizational Capacity

- 1.1 Build climate and health literacy among Public Health and other King County agency leaders and employees
- 1.2 Build capacity to integrate climate change into Public Health and King County programs and align with equity and social justice principles
- 1.3 Develop Public Health leadership at the local, regional and national levels

2 Assessment, Surveillance and Research

- 2.1 Identify, evaluate, and prioritize key climate and health indicators and data
- 2.2 Develop and expand surveillance systems to monitor for and use data on climate-related health effects to provide timely information for Public Health action
- 2.3 Encourage and participate in practical and applicable research related to climate and health

3 Listen and Educate

- 3.1 Collaborate with partners through ongoing opportunities for information sharing that guides climate and health message development
- 3.2 Collaborate with partners to develop key messaging that addresses identified gaps in climate and health knowledge
- 3.3 Disseminate and exchange climate and health information with communities

4 Community Partnership Development and Capacity Building

- 4.1 Engage in climate and health planning that maximizes community ownership and promotes problem solving and collective action
- 4.2 Emphasize community resilience in Public Health partnerships that integrates climate change adaptation and mitigation and all-hazards preparedness

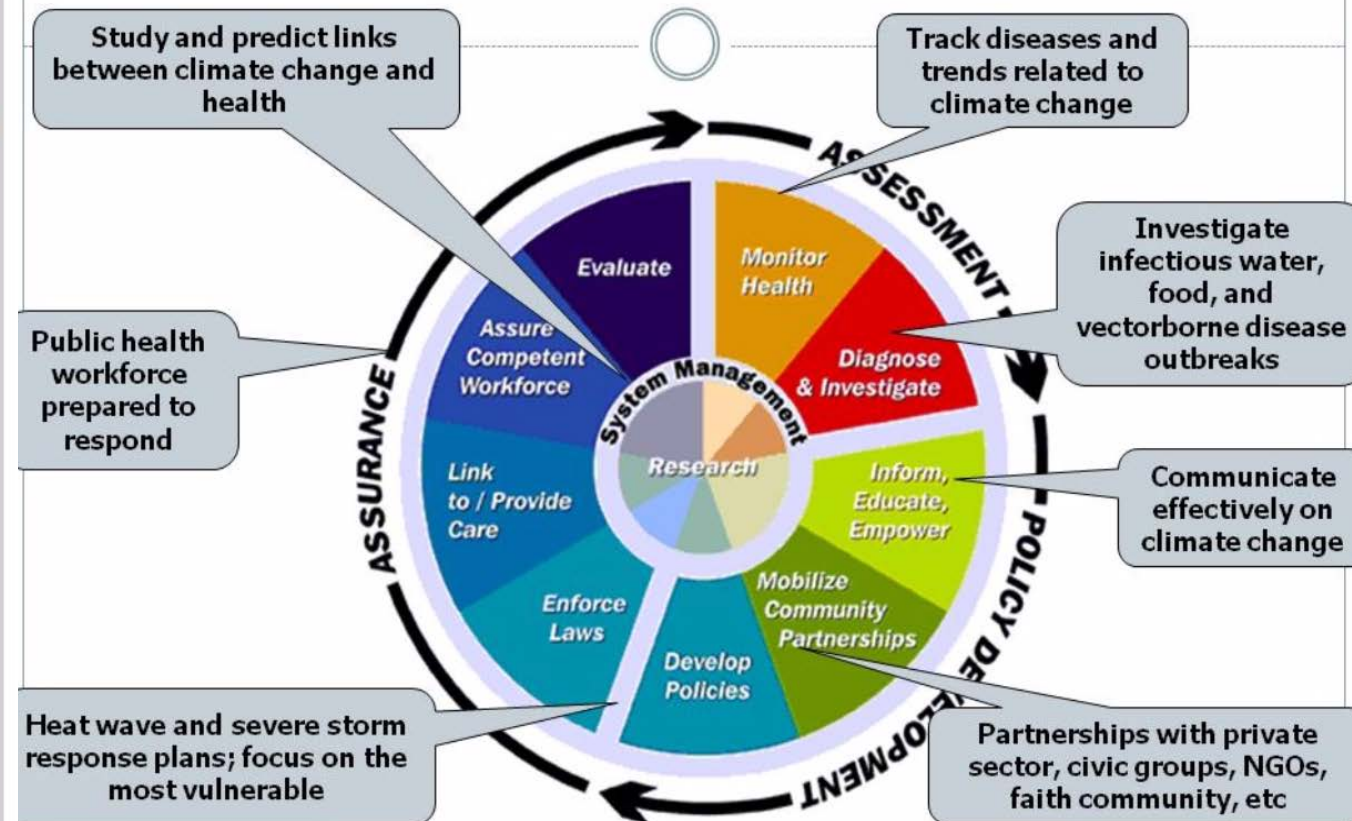
5 Preparedness and Response

- 5.1 Build capacity to effectively prepare for and respond to climate-related health emergencies
- 5.2 Incorporate climate projections into hazard mitigation and public health preparedness planning

6 Policy and Planning

- 6.1 Include climate and health considerations in policies and plans at the local, regional and national level
- 6.2 Promote climate-related policies and planning that promote equity and improve health

Public Health Actions: For Climate Change



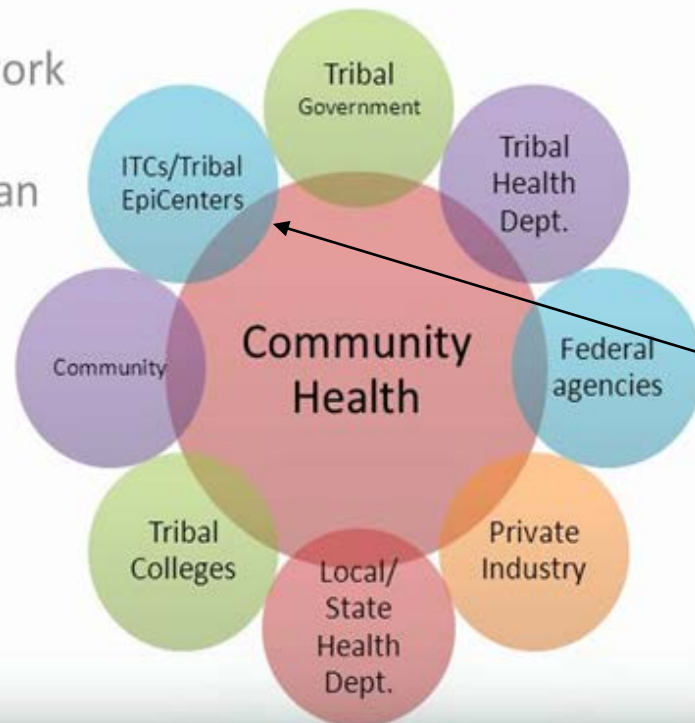
Used with permission from Frumkin H., et.al., CDC NCEH/ATSDR, 2007

Tribal Health Systems and Professionals

Federal gov has a legal role as “guardian” to provide federally funded health care via Indian Health Service. Recent priorities include environmental health, behavioral health, and disaster response, but not specifically “climate change.”

Tribal Public Health Systems

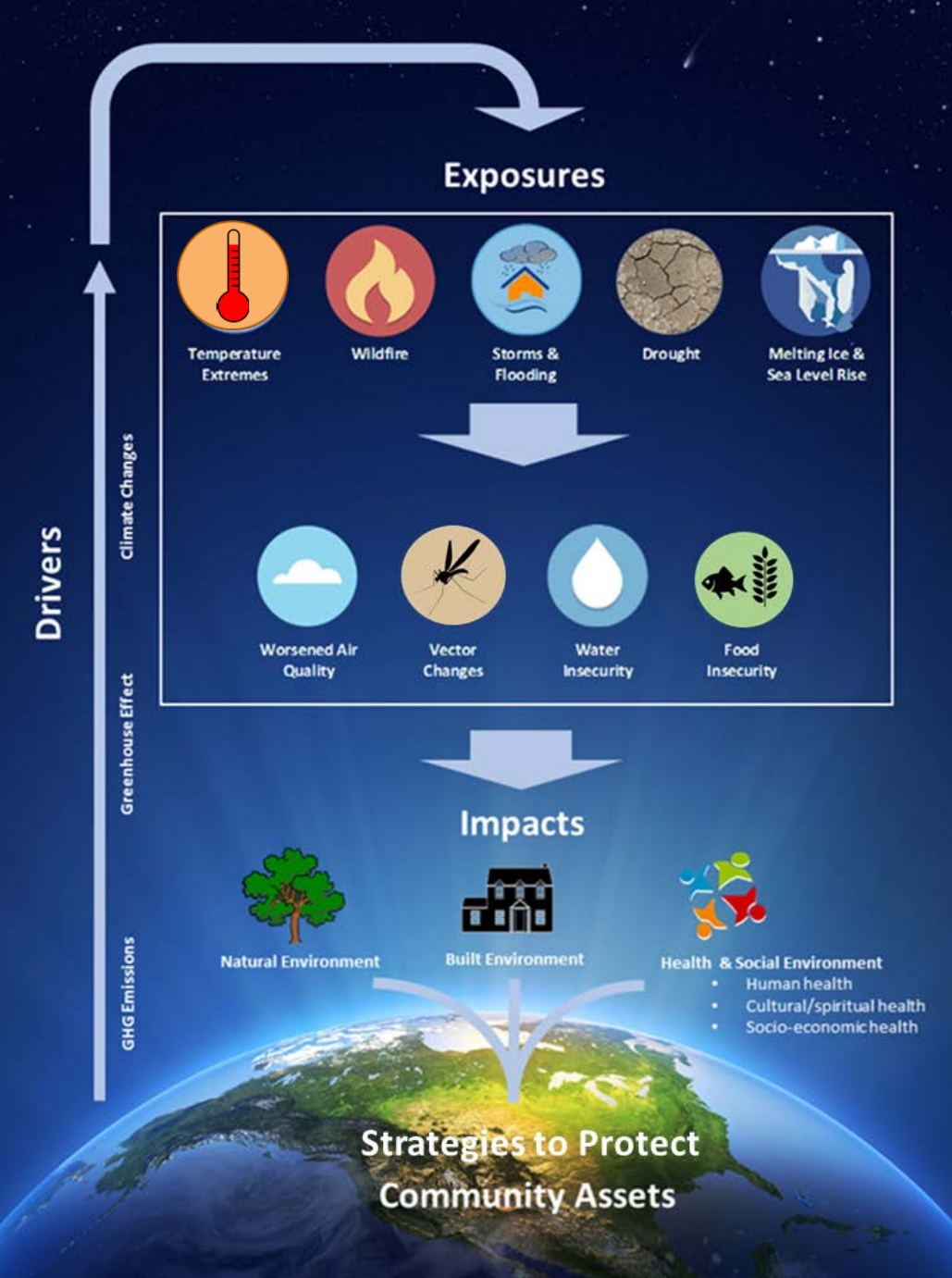
Multiple stakeholders who work in partnership to assure conditions in which people can be healthy.



Resource Constraints and Health Adaptation

LHDs are already dealing with the health impacts of climate change in communities across the United States. However, nearly 9 out of 10 health directors believe that their LHD lacked sufficient resources needed to protect their communities from these health impacts.





TCHP Framework

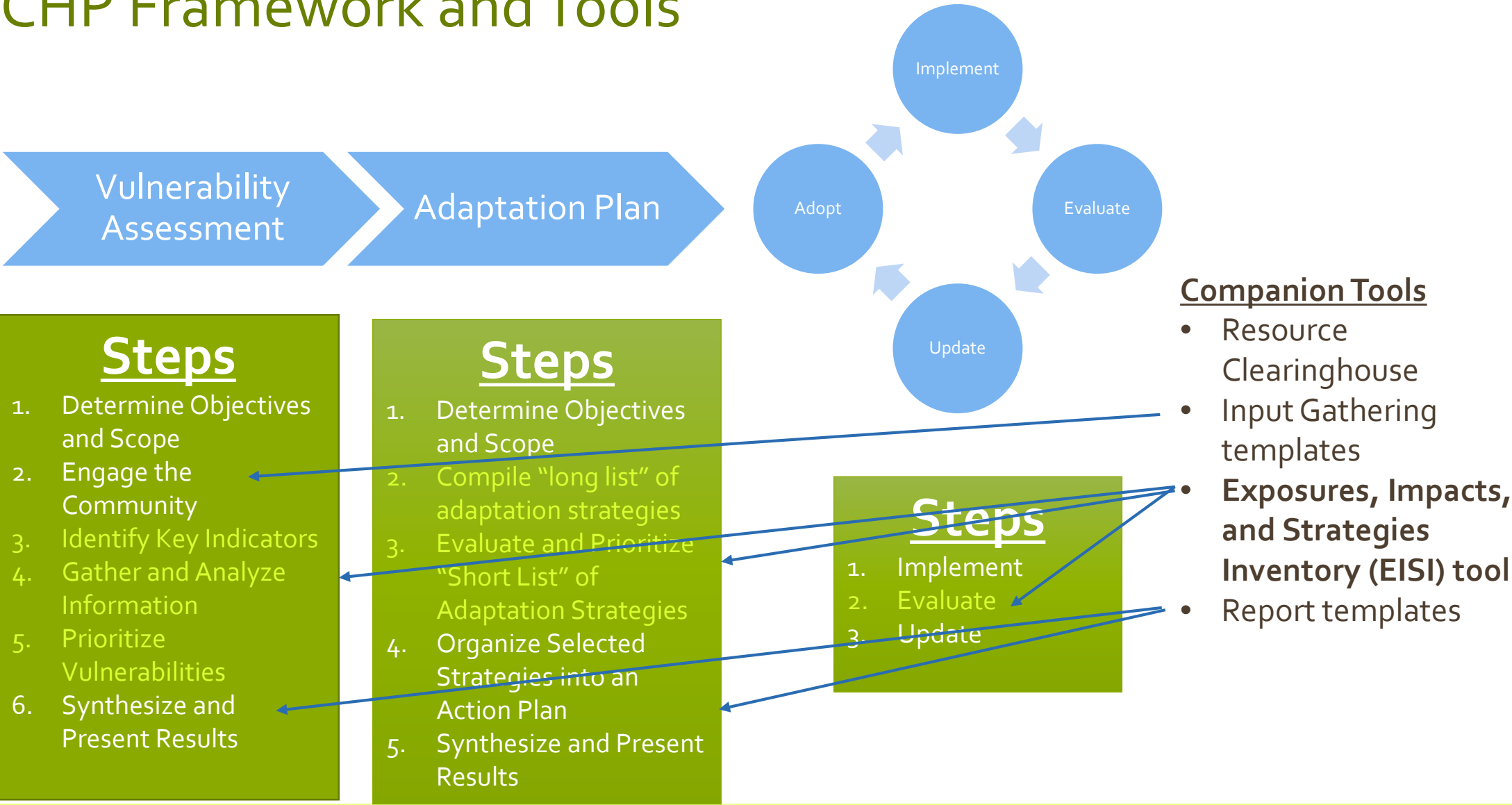
Respiratory health impacts vary by exposure

EXPOSURE	SECONDARY EXPOSURE (WORSENERD AIR QUALITY)	RESPIRATORY HEALTH IMPACTS
Temperature Extremes	More ozone More Aeroallergens	Asthma Bronchitis Lung Cancer COPD More susceptible to respiratory infection Premature death Allergy symptoms
Wildfire	More smoke/particulate matter More air pollutants	Asthma Premature death Low infant birth weight Cardiovascular conditions
Storms & Flooding	Mold exposure	Respiratory problems Mold allergic reactions
Melting Ice & Sea Level Rise	Mold exposure	Respiratory problems Mold allergic reactions
Drought	More dust/particulate matter Airborne fungus More suspended air pollutants	Asthma Premature death Acute bronchitis Pneumonia

Indigenous Populations and Respiratory Health

- Indigenous populations have higher rates of illnesses such as worsening asthma, allergies, chronic obstructive pulmonary disorder (COPD) and other respiratory conditions associated with poor air quality resulting from climate change.
- Among minority children, the prevalence of asthma varies with the highest rates among Blacks and American Indians/Alaska Natives (17%)
- Tribes are more likely to have homes with indoor air quality issues

TCHP Framework and Tools



TCHP Exposures, Impacts and Strategies (EISI) tool

- Understanding what information to collect, where to find it, and how to use it can be overwhelming, especially for communities with limited capacity or resources
- Training helps, but we wanted to lift the burden of work off tribes by economizing certain processes while providing flexibility for local customization
- EISI (Beta) is a companion to make it easier to assess vulnerabilities and select adaptation strategies
- Uses TCHP framework and provides a relational database (based on extensive literature review) and worksheets to help a tribe organize information, determine the severity and likelihood of health and other impact vulnerabilities by reviewing western and indigenous information sources, and make value-based decisions about the highest priority vulnerabilities
- Threads a focus on key impact indicators through the entire process, providing a long term way to monitor changes that matter
- Ties indicators to data sources where available

Gaps, Needs and Recommendations

1. There aren't accessible datasets for each indicator

- Literature review can tell us about relationships, but they play out differently in different communities
 - E.g.
 - Allergy symptoms
 - Mental health and psychosocial consequences
- Sometimes datasets do exist but there just aren't labeled under the framework of "climate change" and they don't have to be.
 - Behavioral health, morbidity and mortality, environmental health indicators can all be helpful
- Emerging data tools have end-users in mind (mapping/charts)
- Recommendation: national "wishlist" of climate and health data needs/gaps that can drive investment in research and data tools

Gaps, Needs and Recommendations

2. Data is often not as meaningful as it could be

- Annual averages aren't tied to the climate event
 - E.g.
 - Asthma cases directly associated with heat waves and elevated ozone levels
 - ER visits for respiratory illness associated with wildfires and particulate matter
 - Hospitalizations for respiratory illness associated with flooding and mold infestations
- Spatial scales often aren't location-specific enough nor tied to tribal boundaries
 - E.g.
 - Asthma rates at County level aren't telling for tribes with a different set of determinants
 - Recommendation: downscale data
- Temporal scales differ
 - To evaluate trends, it is best to have historical, baseline and projected data for an indicator; very limited access to projections for health data
 - Recommendation: develop modeled future health impacts based on climate projections and make accessible through a national database
- Data is difficult to interpret
 - Visuals (charts, maps, etc) can help tribes make a compelling case for action/investment to decision-makers and funders
 - Recommendation: Fund tool development with a focus on user experience and decision-making

Gaps, Needs, and Recommendations

3. Tribes don't often have in-house health/epidemiology personnel and may not have trusted relationships with external health agencies

- E.g.
 - State
 - County
 - IHS/Tribal Epidemiology Centers
 - Health service providers
- Recommendation: build community-based collaboratives on climate and health with tribes and local health partners; establish tribal liaisons between State public health agencies and tribes

4. External agencies aren't collecting or sharing data for climate-related indicators

- Competing priorities
- Agencies aren't always equipped to serve tribes, and sharing data may be a burdensome process
- Recommendation: establish national standard for climate and health data to be surveilled by epidemiologists, informed by consultation with tribes

Wrapping Up

Next Steps for TCHP

- Conduct trainings
- Collaborate with Temperate on USDA funded pilot in CA
- Identify resources to build upon program
- Follow us at:
 - Tribalclimatehealth.org
 - facebook.com/tribalclimatehealth/
- Q&A

TRIBAL CLIMATE & HEALTH ADAPTATION WORKSHOP

This 2-day, interactive training will provide steps, tools, templates, case studies, and other resources that seek to streamline the adaptation planning process and make it easier for tribal health and environmental professionals to understand and address human health exposures and impacts within tribal communities. This training will summarize the latest data and literature on the exposures and impacts of climate change that may impact the health of tribal community members. It will also describe how to identify and select appropriate strategies to address these exposures and impacts.

PROTECTING HEALTH FROM THE ROOTS



PALA, CA

JUNE 5-6, 2019

HTTP://PED.PALATRIBE.COM

Shasta Gaughen
760-891-3515
sgaughen@palatribe.com



Angie Hacker
805-234-5131
ahacker@prospersustainably.com



Thank You

Acknowledgements

- US Environmental Protection Agency
- US Bureau of Indian Affairs
- Members of the TCHP Advisory Group



Climate Change and Health 101 – Key Resources

Guidance

- USGCRP – [Impacts of Climate Change on Human Health in the United States](#)
- USGCRP - [Fourth National Climate Assessment](#)
 - [Climate Science Special Report](#)
 - [Human Health Chapter](#)
 - [Tribes And Indigenous Peoples Chapter](#)
- USGCRP - [Third National Climate Assessment](#)
 - [Indigenous Peoples, Lands, and Resources](#)
 - [Human Health](#)
- USDA - [Climate Change and Indigenous Peoples: A Synthesis of Current Impacts and Experiences](#)
- NASA – [Global Climate Change](#)
- NOAA – [NCA Teaching Resources: Regional Support pages](#)
- EPA – [Climate Change Impacts by Region](#)
- CDC – [Climate and Health Effects](#)
- IPCC – Fifth Assessment - [Chapter 11: Human Health: Impacts, Adaptation, and Co-benefits](#)
- CDC - [Assessing Health Vulnerability to Climate](#)

[Change A Guide for Health Departments](#)

- Indian Health Service – [Environmental Health](#)
- Rising Voices – [Considering Traditional Knowledge In Climate Change Initiatives](#)
- TCHP: [Tribal Climate Health Project](#)

Tools and Templates

- TCHP – [Resources Clearinghouse](#)
- [Tribal Community Health Assessment for Public Health Accreditation – A Practical Guide and Toolkit \(Arizona\)](#)

Examples

Health-led Assessments

- San Diego: [2016 Community Health Assessment](#)
- King County Public Health Department:

[Blueprint for Addressing Climate Change and Health Reports](#)

- California Department of Public Health: [Climate Change and Health Reports](#)
- Oregon Health Authority: [Climate and Health Resilience Plan](#)
- ANTHC - [Climate Change in Kiana, Alaska: Strategies for Community Health](#)
- Michigan Dept. of Health and Human Services: [Michigan Climate and Health Adaptation Program: Strategic Plan Update: 2016 - 2021](#)

Changing Exposures and Impacts – Key Resources

Guidance

- USGCRP – [Impacts of Climate Change on Human Health in the United States](#)
- USGCRP - [Fourth National Climate Assessment](#)
 - [Climate Science Special Report](#)
 - [Human Health Chapter](#)
 - [Tribes And Indigenous Peoples Chapter](#)
- USGCRP - [Third National Climate Assessment](#)
 - [Indigenous Peoples, Lands, and Resources](#)
 - [Human Health](#)
- EPA [Climate Change Indicators in the United States](#)
- EPA - [Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment](#)
- CDC - [Assessing Health Vulnerability to Climate Change A Guide for Health Departments](#)
- IPCC – [Chapter 11: Human Health: Impacts, Adaptation, and Co-benefits](#)
- APHA – [How Climate Change Affects Your Health](#)
- Tribal Public and Environmental Health Think Tank – [Priorities in Tribal Public Health](#)

- National Indian Health Board – [Climate Ready Tribes](#)

Tools and Templates

- TCHP - [Exposures, Impacts, Strategies Inventory \(EISI\) tool – Beta Version](#)
- TCHP – [Blog: “Data Sources to Assess Tribal Climate and Health Data”](#)
- TCHP – [Resources Clearinghouse](#)

Examples

- Reuters - [Biloxi-Chitimacha-Choctaw](#)
- UNC - [Thinning Ice at Shishmaref, Alaska](#)
- National Wildlife Federation - [White Mountain Apache Tribe \(Arizona\) and the Rodeo Chediski Fire](#)
- US Climate Resilience Toolkit – [Navajo Nation: Hotter, Drier Climate Puts Sand Dunes on the Move](#)
- U.S. Climate Resilience Toolkit - [Mescalero Apache Tribe Adapts to Warmer and Drier Climate](#)

- National Wildlife Federation – [Flash Flood on The Drought-Impacted Hopi Reservation; Thinning Ice Threatens Alaska Native Village of Shishmaref, Alaska](#)
- Climate Adaptation Knowledge Exchange – [The Igliniit Inuit Sea Ice Use and Occupancy Project](#)
- U.S. Climate Resilience Toolkit - [Inupiaq Work to Preserve Food and Traditions on Alaska's North Slope](#)
- NIH - [Climate Ready Tribes](#)
- High Country News – [Northern California tribes face down massive wildfires](#)

Assessing Your Vulnerabilities – Key Resources

Guidance

- Oregon Climate Change Research Institute - [Tribal Climate Adaptation Guidebook](#) (Steps 1, 2 and 3)
- International Tribal Environmental Professionals - [Adaptation Planning Toolkit](#)
- [US Climate Resiliency Toolkit](#)
 - [Tribal National Topic](#)
- CDC: [Assessing Health Vulnerability to Climate Change: A Guide for Health Departments](#)
- [CDC Community Health Needs Assessment](#)
- U.S. Center for Disease Control and Prevention: [Building Resilience Against Climate Effects \(BRACE\)](#)
- [IPCC – Chapter 11: Human Health: Impacts, Adaptation, and Co-benefits](#)
- [ITEP Webinar \(2018\)](#)

Tools and Templates

- TCHP - [Exposures, Impacts, Strategies Inventory \(EISI\) tool – Beta Version](#)
- TCHP - [Pala Vulnerability Assessment Sample](#)

- TCHP - [Climate Vulnerability Experiences and Priorities Survey Template](#)
- TCHP – [Blog: “Data Sources to Assess Tribal Climate and Health Data”](#)
- TCHP – [Resources Clearinghouse](#)
- CDPH – [Template for Assessment of Local Climate Mitigation, Adaptation, and Resilience](#)
- International Tribal Environmental Professionals – [Resolution Template](#)

Examples

- NIHB - [Tribal Climate Champions: Spotlight on Gila River Indian Community](#)
- US Dept of Energy - [Makah Tribal Engagement](#)
- UW Climate Impacts Group - [Makah Interview](#)
- [Swinomish Indigenous Health Indicators video](#)
- [Shoshone-Bannock Tribe video](#)
- [Collville Tribes Climate Change Page](#)
- Oregon State Health Authority – [Climate and health video](#)

Tribal Vulnerability Assessments

- [Pala Vulnerability Assessment](#)
- [Community Observations on Climate Change: Nashagak River Trip Report](#)
- [Climate Change Vulnerability of Native Americans in the Southwest](#)
- [Puyallup Climate Change Impact Assessment](#)
- Upper Snake River Watershed: [Climate Change Vulnerability Assessment](#)
- [Swinomish Climate Change Initiative Impact Assessment Technical Report](#)
- Jamestown S’Klallam Tribe: [Climate Vulnerability Assessment and Adaptation Plan](#)

Adaptation Planning – Key Resources

Guidance

- Oregon Climate Change Research Institute - [Tribal Climate Adaptation Guidebook](#) (Step 4 and 5)
- [US Climate Resiliency Toolkit](#) – Investigate Options
- [US Climate Resiliency Toolkit - Tribal National Disaster Risk Reduction](#)
- [BIA - U.S. Indigenous Peoples Resilience Actions](#)
- [IPCC – Chapter 11: Human Health: Impacts, Adaptation, and Co-benefits](#)
- State of [California - Adaptation Planning Guide](#)
- International Tribal Environmental Professionals - [Adaptation Planning Toolkit](#)
- EPA ARC-X - [Regional Guides for Adapting to Climate Change](#)
- EPA – [Community-Based Adaptation To A Changing Climate](#)
- University of Tulsa College of Law – [Climate Change and Tribal Water Rights: Removing Barriers to Adaptation Strategies](#)
- Journal of Nurse Practitioners – [Indigenous Native American Healing Traditions](#)
- The Resource Innovation Group - [Transformational Resilience](#)
- RAND- [Building Resilient Communities: An Online Training \(User's Guide and Audio Transcript\)](#)
- RAND- [Building Community Resilience to Disasters: A Way Forward to Enhance National Health Security](#)
- FEMA: Discussion Guide: [Social Capital in Disaster Mitigation and Recovery](#)

Tools and Templates

- TCHP - [Exposures, Impacts, Strategies Inventory \(EISI\) tool – Beta Version](#)
- TCHP - Pala Adaptation Plan Template (pending)
- TCHP – [Resources Clearinghouse](#)
- International Tribal Environmental Professionals – [Resolution Template](#)

Examples

Tribal Adaptation Plans

- [Climate Change in Kiana, Alaska: Strategies for Community Health](#)
- Confederated Salish and Kootenai Tribes: [Climate Change: Strategic Plan](#)
- Navajo Nation: [Considerations for Climate Change and Variability Adaptation on the Navajo Nation](#)
- Nez Perce Tribe: [Clearwater River Subbasin Climate Change Adaptation Plan](#)
- Oglala Lakota Nation: [Oyate Omniciyé | Oglala Lakota Plan](#)
- Puyallup Tribe of Indians: [Climate Change Impact Assessment and Adaptation Options](#)
 - [Puyallup Tribe's video](#)
- Red Lake Band of Chippewa Indians: [A Climate Adaptation Plan for the Red Lake Band of Chippewa Indian](#)
- Shinnecock Indian Nation: [Climate Change Adaptation Plan](#)

- St. Regis Mohawk Tribe: [Climate Change Adaptation Plan for Akwesasne](#)
- Swinomish Tribe: [Swinomish Climate Change Initiative Climate Adaptation Action Plan](#)
- Village of Newtok: [Relocation Report: Newtok to Mertarvik](#)
- Yakama Nation: [Climate Adaptation Plan for the Territories of the Yakama Nation](#)
- Yurok Tribe: [Yurok Tribe and Climate Change: An Initial Prioritization Plan](#)
- Pacific Northwest Tribal Climate Change Project's Climate Change Adaptation Strategies by Sector
- [Climate Change Preparedness Plan for the North Olympic Peninsula](#)
- [Blackfeet Climate Change Adaptation Plan](#)
- [Shoshone-Bannock Tribes Climate Change Vulnerability Assessment and Adaptation Plan](#)

Implement, Evaluate, and Update – Key Resources

Guidance

- Oregon Climate Change Research Institute - [Tribal Climate Adaptation Guidebook](#) (Steps 4 and 5)
- [U.S. Climate Resilience Toolkit](#)
- [BIA Tribal Resilience](#)

Tools and Templates

- TCHP - [Exposures, Impacts, Strategies Inventory \(EISI\) tool – Beta Version](#)

Examples

Progress Reports

- US Bureau of Reclamation - [Climate Change Adaptation Strategy: 2016 Progress Report](#)
- Makah Tribe: [Climate Adaptation Dashboard](#)



Temperature Extremes

Key Climate Exposure Facts

- Increased **1.8 degrees F** from 1895 - 2016
- Projected to increase **2.8 – 7.3 degrees F** by 2071 – 2100
- Season shifts and more extreme cold events

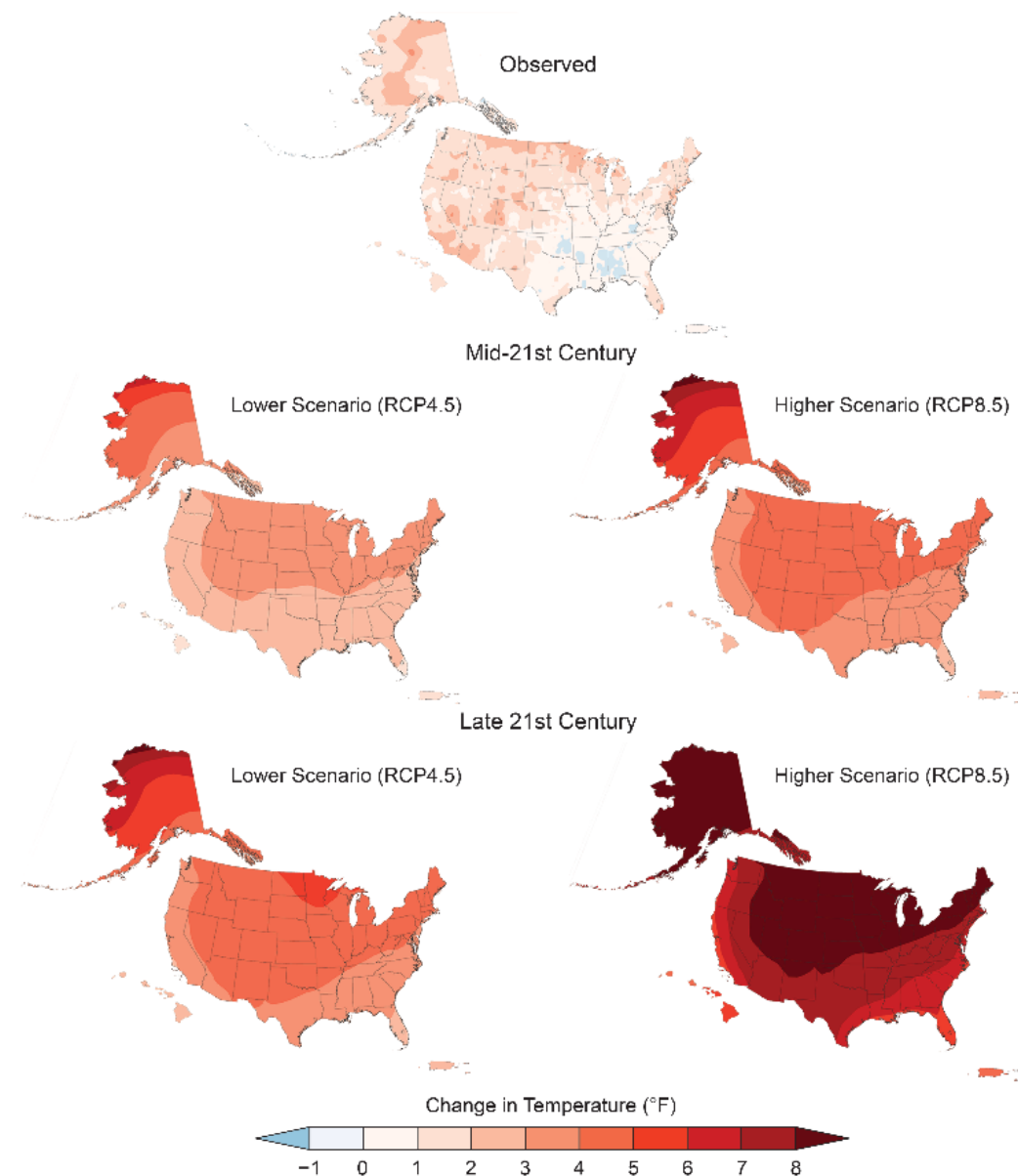
Related Exposures

- Contributes to wildfire and drought
- Triggers the following secondary exposures:



Regions Affected

All – Southwest particularly vulnerable to extreme heat



Group Discussion:
What health impacts can you anticipate?



Temperature Extremes

Possible Human Health Impacts

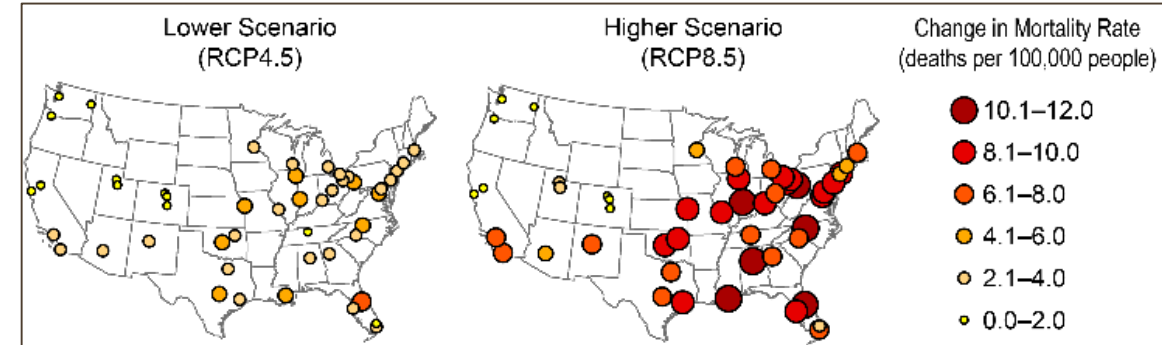
- Heat-related illness and death
- Hypothermia
- Power outages limit access to health services, can result in carbon monoxide poisoning
- Mental, behavioral and cognitive wellbeing
- Respiratory illness and allergic symptoms
- Vector-borne disease (e.g. Lyme, West-Nile, Zika, Dengue)
- Infections and illness from contaminated water and food
- Lack of nutritional and medicinal abundance

Sample of Population Sensitivity and Adaptive Capacity Factors

- Urban heat island
- Tree canopy
- Households with air-conditioning
- Population size of vulnerable individuals

Tribal Case Study

- Mescalero Apache Tribe (New Mexico)





Wildfire

Key Climate Exposure Facts

- Incidence of large forest fires in the western US and Alaska increased since early 1980s
- Projected to further increase in those regions as the climate warms, with profound changes to certain ecosystems
- Longer burn season

Related Exposures

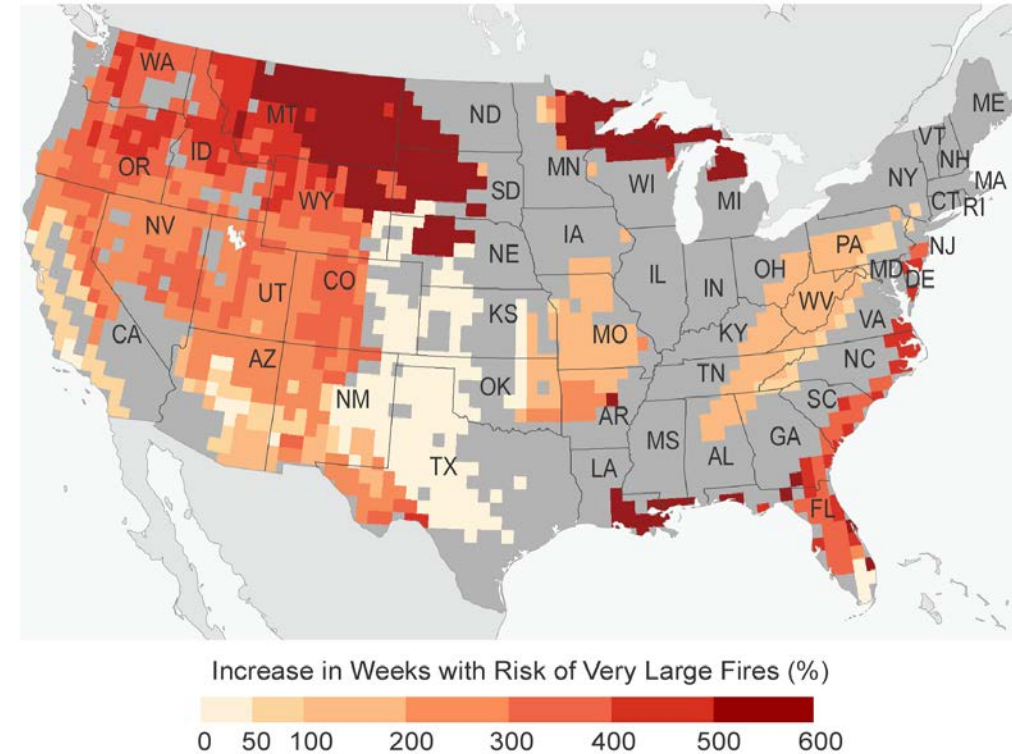
- Contributes to storms and flooding
- Triggers the following secondary exposures:



Regions Affected

Alaska, Northwest, Southwest

Projected Increase in Risk of Very Large Fires by Mid-Century



Group Discussion:
What health impacts can you anticipate?



Wildfire

Possible Human Health Impacts

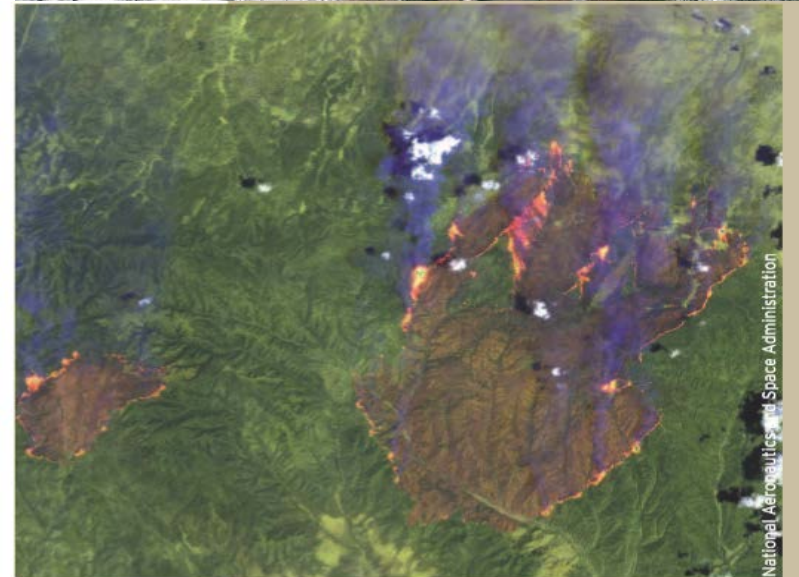
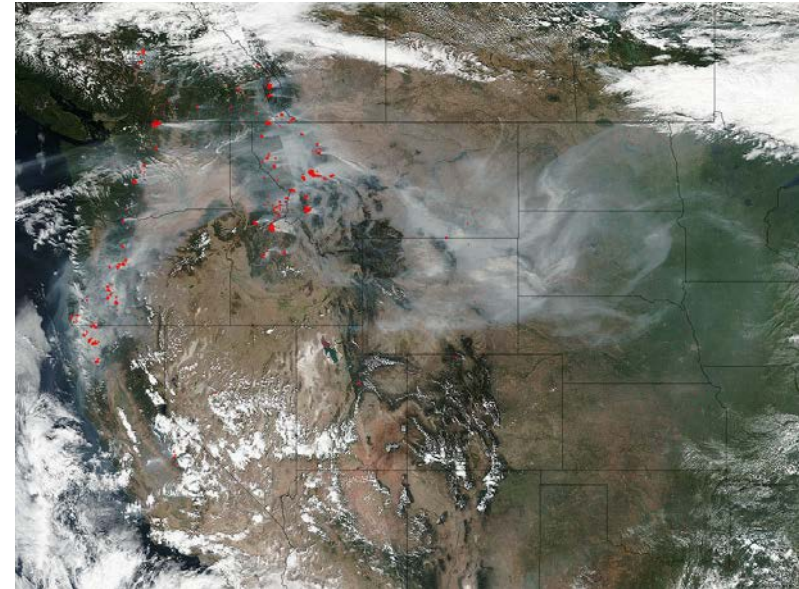
- Wildfire-related injury and death
- Damage to infrastructure limits access to health services, can result in carbon monoxide poisoning
- Mental health impacts including post-traumatic stress, depression, anxiety and grief
- Respiratory and cardiovascular illness and Valley Fever
- Vector borne disease (Lyme)
- Infections and illness from water
- Lack of nutritional and medicinal abundance

Sample of Population Sensitivity and Adaptive Capacity Factors

- Population size of vulnerable individuals

Tribal Case Study

- White Mountain Apache Tribe (Arizona) and the Rodeo Chediski Fire





Storms & Flooding

Key Climate Exposure Facts

- Increased extreme rainfall events, an upward trend in north Atlantic Hurricane activity and in increase in tropical cyclone activity trigger flash floods, prolonged flooding along rivers and streams, and coastal flooding exacerbated by sea level rise

Related Exposures

- Contributes to storms and flooding (including landslides and mudslides)
- Triggers the following secondary exposures:



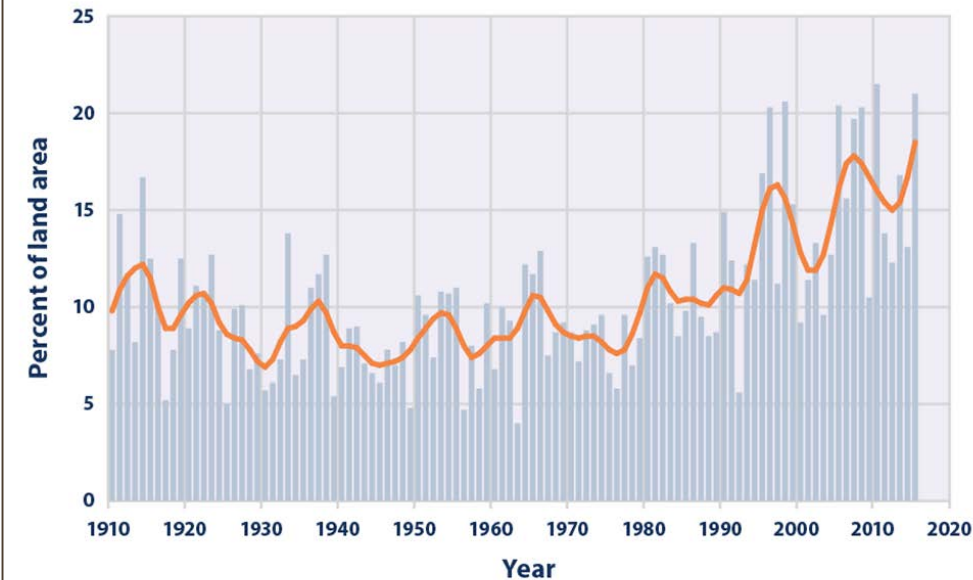
Regions Affected

All – varying degrees and types of storms and flooding

“When a child my mother taught me the legends of our people; taught me of the sun and sky, the moon and stars, the clouds and storms. She also taught me to kneel and pray to Usen for strength, health, wisdom and protection.”

Geronimo (Apache)

Extreme One-Day Precipitation Events in the Contiguous 48 States, 1910–2015



Data source: NOAA (National Oceanic and Atmospheric Administration). 2016. U.S. Climate Extremes Index. Accessed January 2016. www.ncdc.noaa.gov/extremes/cei.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.

Group Discussion:
What health impacts can you anticipate?



Storms and Flooding

Possible Human Health Impacts

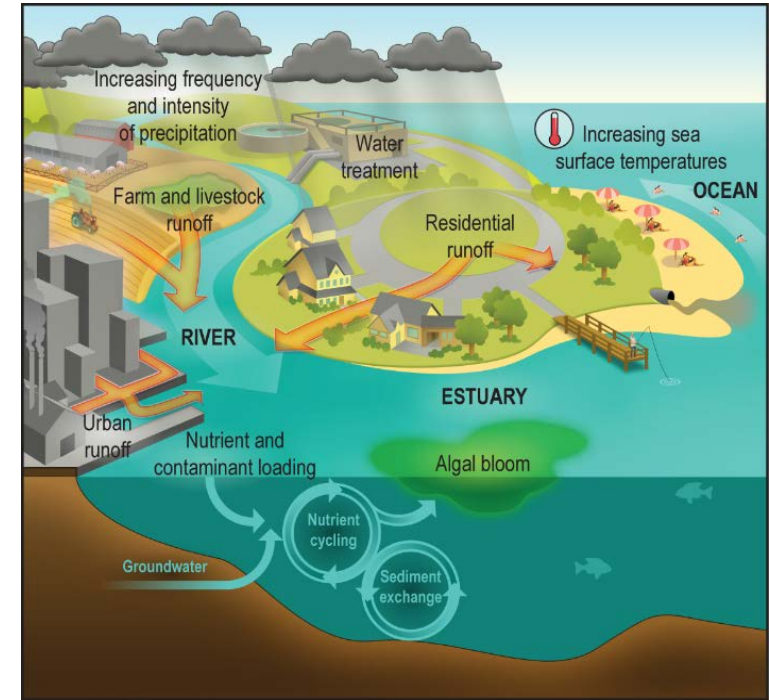
- Storm and flooding-related injury and death
- Damage to infrastructure limits access to health services, can result in carbon monoxide poisoning
- Mental health impacts including post-traumatic stress, depression, anxiety and grief
- Illness associated with mold exposure
- Vector borne disease (e.g. West-Nile, Zika, Dengue)
- Infections and illness from contaminated water and marine food
- Lack of nutritional and medicinal abundance

Sample of Population Sensitivity and Adaptive Capacity Factors

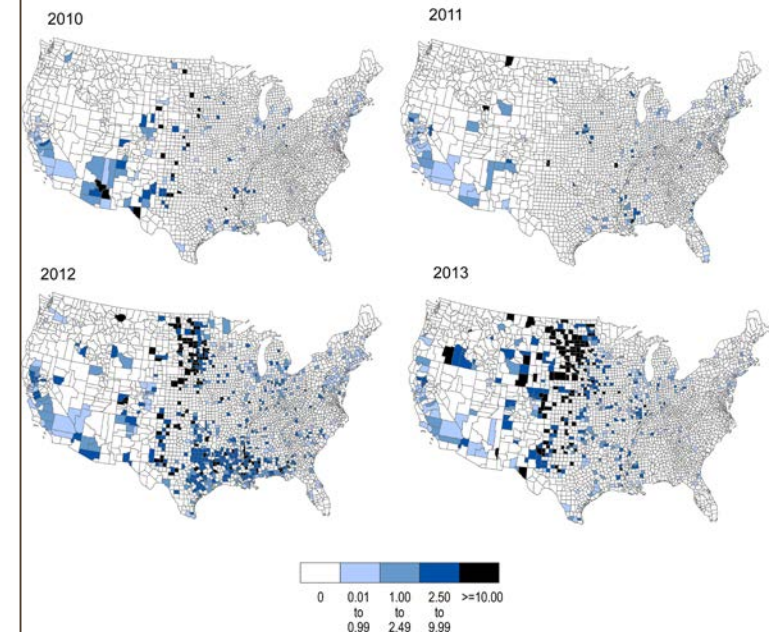
- 100 and 500 year flood area
- Hydrogeological conditions
- Population size of vulnerable individuals

Tribal Case Study

- Flash Floods on the Drought-Impacted Hopi Reservation



Incidence of West Nile Neuroinvasive Disease in the United States





Melting Ice & Sea Level Rise

Key Climate Exposure Facts

- Rising temperatures are reducing global ice volume and surface extent
- Global mean sea level (GMSL) has risen by about 7–8 inches (about 16–21 cm) since 1900, with about 3 of those inches (about 7 cm) occurring since 1993 (CSSR)

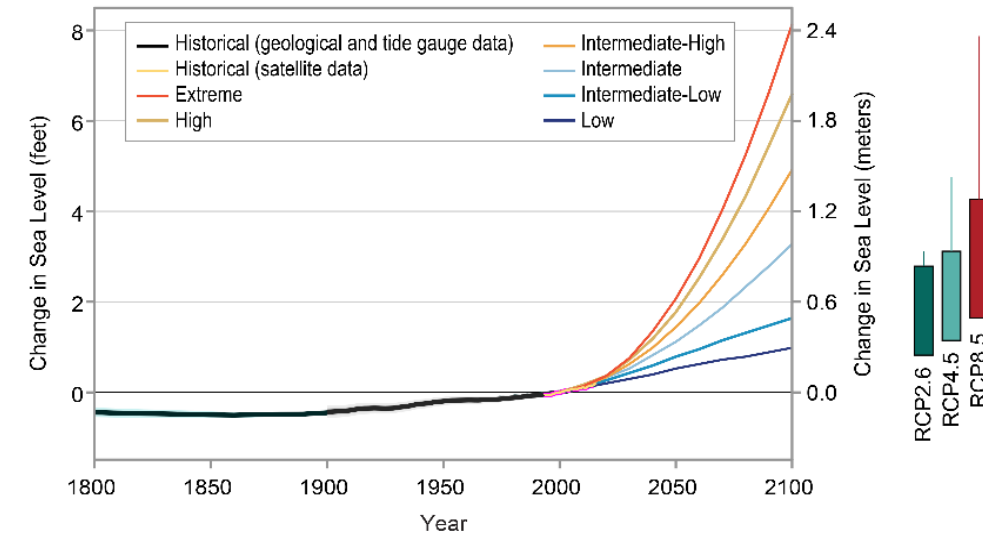
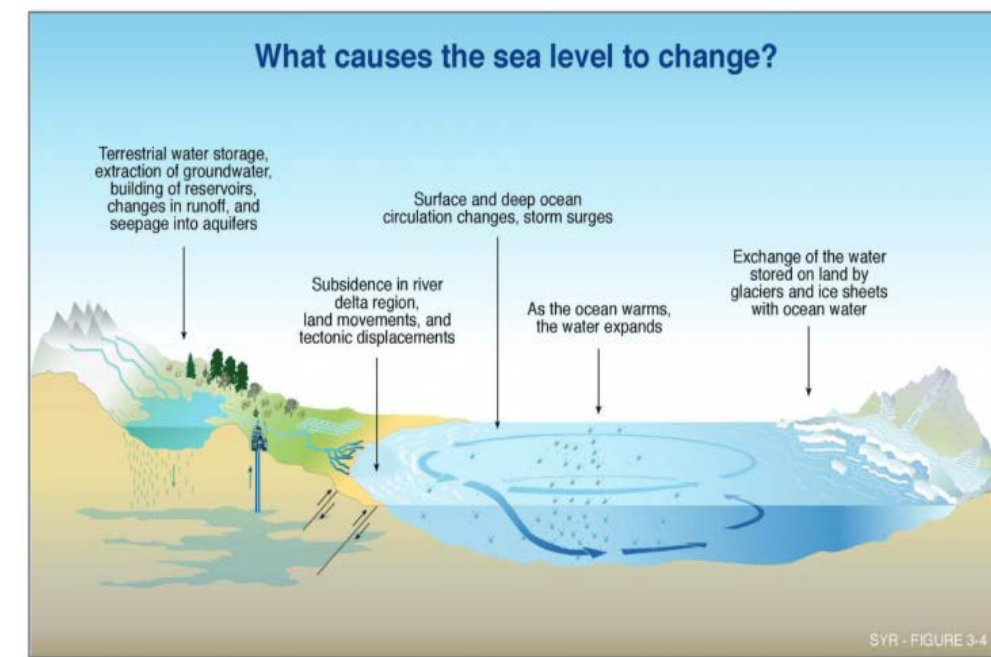
Related Exposures

- Contributes to storm surges and coastal flooding
- Triggers the following secondary exposures:



Regions Affected

Alaska, Coastal



Group Discussion:
What health impacts can you anticipate?



Melting Ice and Sea-level Rise

Possible Human Health Impacts

- Storm surges increase “Storm and Flooding” health impacts. In addition:
- Melting, thinning and thawing ice-related injuries (e.g. hunting and fishing)
- Lack of nutritional abundance due to loss of safe hunting, fishing or herding practices
- Mental health impacts including post-traumatic stress, depression, anxiety and grief
- Prehistoric diseases unearthed

Sample of Population Sensitivity and Adaptive Capacity Factors

- Proximity to coast, ice and permafrost

Tribal Case Study

- Thinning Ice at Shishmaref, Alaska
- Relocation of Biloxi-Chitimacha-Choctaw tribe (LA)





Drought

Key Climate Exposure Facts

- Recent drought or water deficits have reached record in intensity in parts of the country.
- Strong evidence that climate change increases evapotranspiration and soil moisture deficits (CSSR)
- One of the most pervasive climate-induced weather exposures for tribes

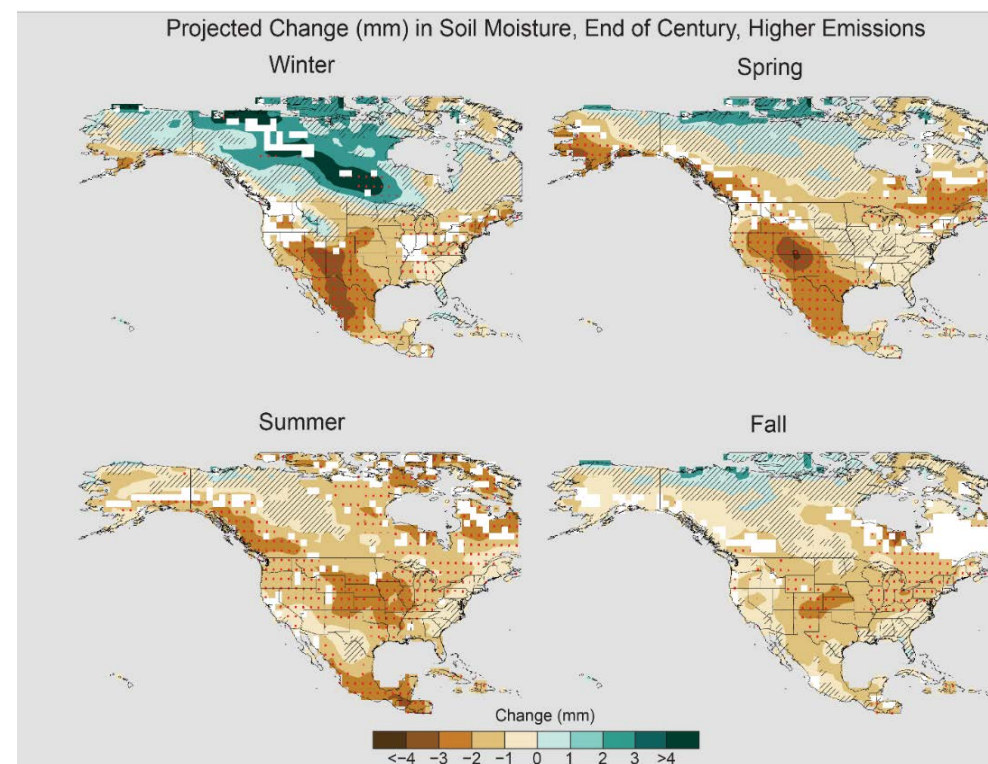
Related Exposures

- Contributes to wildfire and storms and flooding
- Triggers the following secondary exposures:



Regions Affected

Southwest, Great Plains



Group Discussion:

What health impacts can you anticipate?



Drought

Possible Human Health Impacts

- Mental health impacts including anxiety and grief (e.g. displacement, economic change)
- Respiratory and cardiovascular illness (e.g. Valley Fever)
- Vector borne disease (e.g. West-Nile, rodents)
- Lack of nutritional and medicinal abundance

Sample of Population Sensitivity and Adaptive Capacity Factors

- Population size of vulnerable individuals

Tribal Case Study

- Navajo drought conditions

“Mni Wiconi” – Lakota for “Water is Life”



A Record of Change: Science and Elder Observations on the Navajo Nation