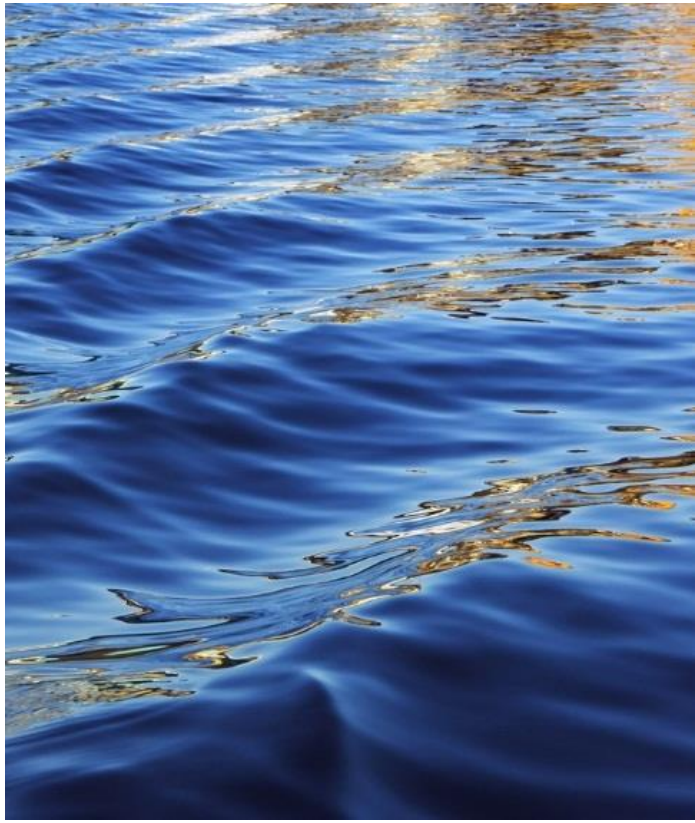
Wildfire and Drought

Tribal Climate and Health Adaptation Webinar #4

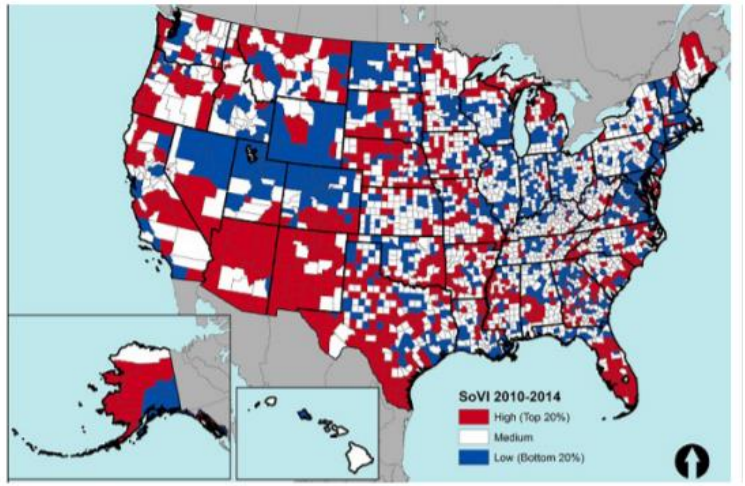


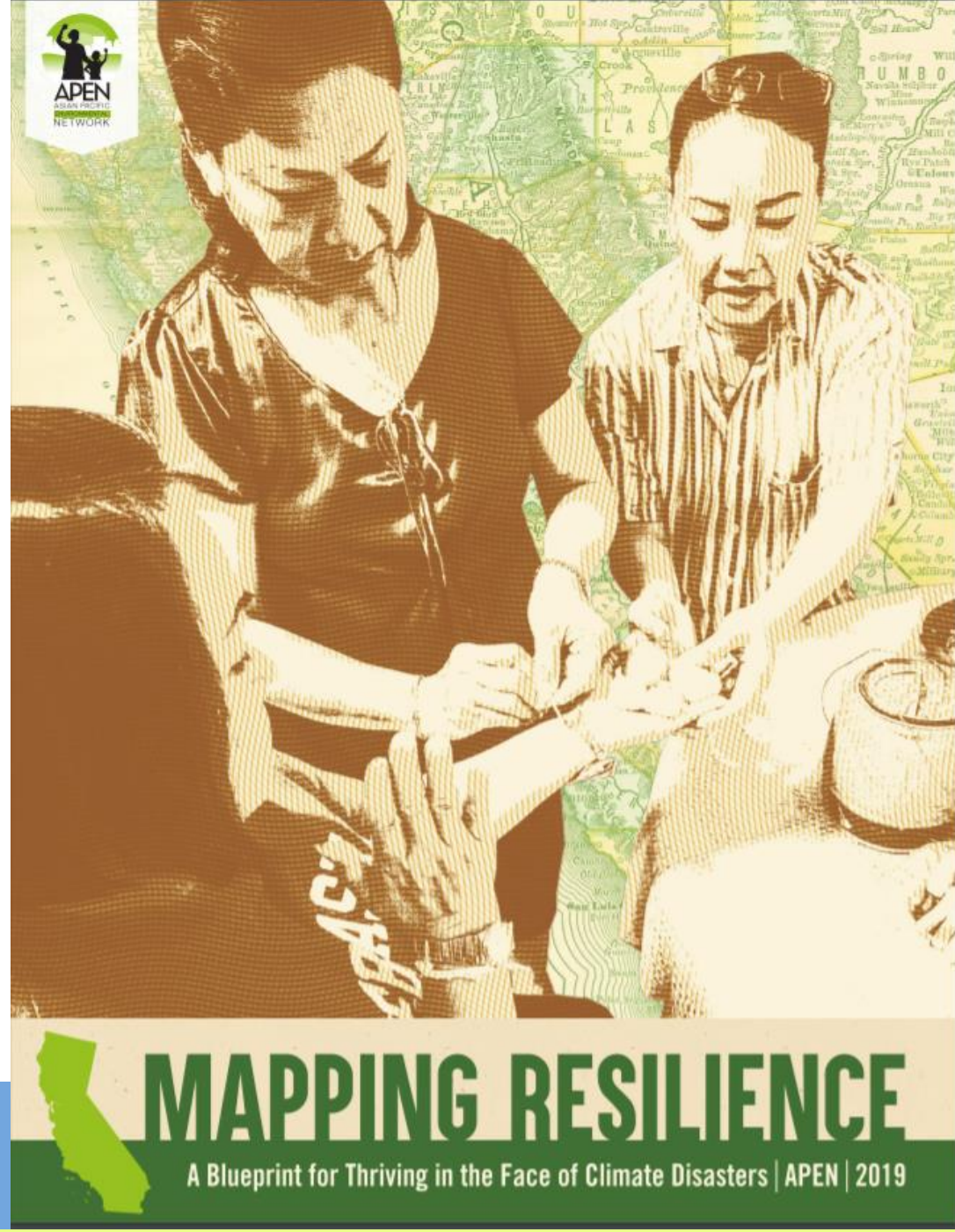
Since Last Webinar

Suggested Reading

- "Mapping Resilience: A Blueprint for Thriving in the Face of Climate Disasters"

Framework 3. Social Vulnerability Index (SoVI®)[110]



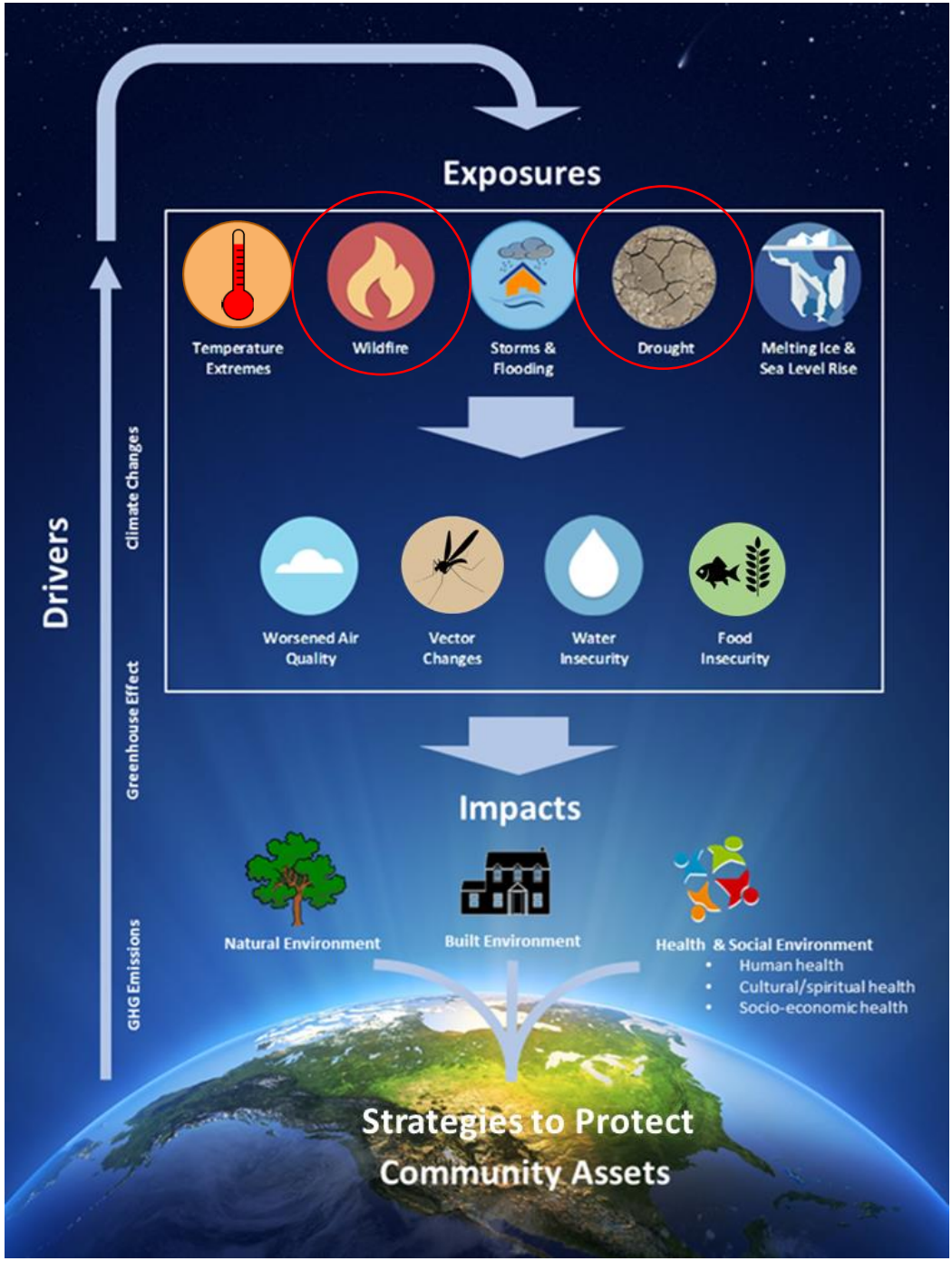


Chat Discussion and Group Poll:

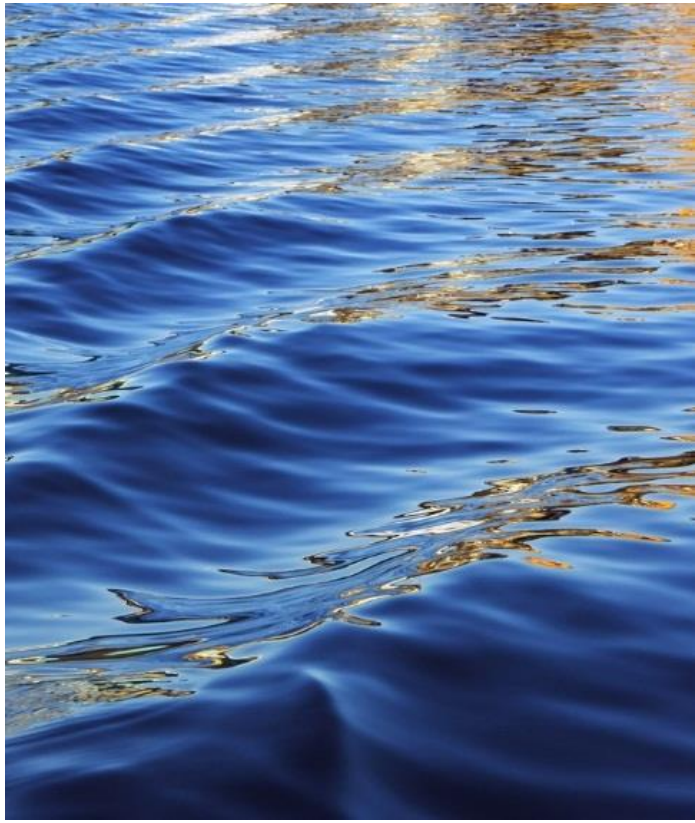
What did you read about that surprised you?

TCHP Framework

- Last session, we covered Temperature Extremes
- Today we dive into wildfire and drought
  - Secondary exposures
  - Impacts
  - Sample strategies
  - Tribal case studies



Wildfire



EXPOSURES

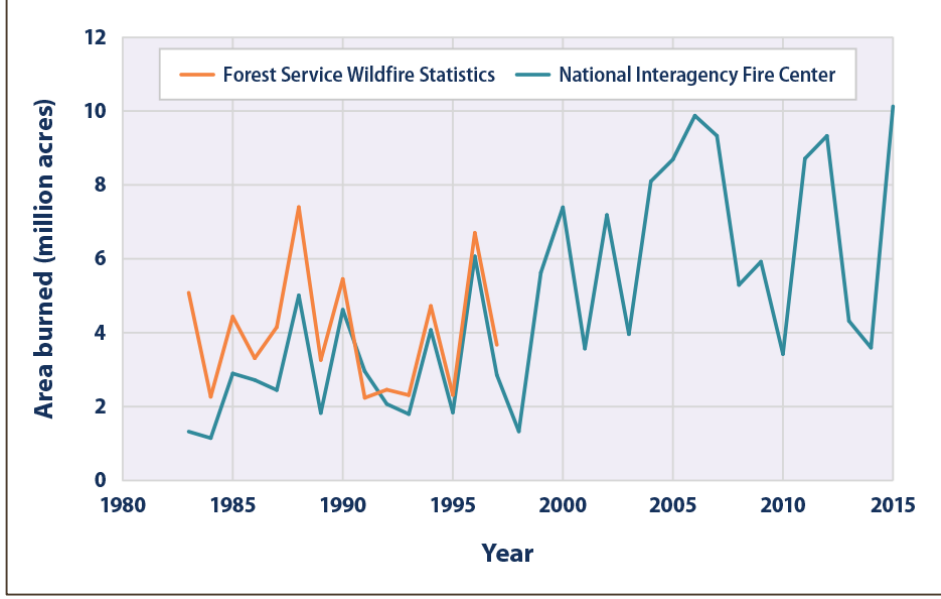
Wildfire

Key Climate Exposure Facts

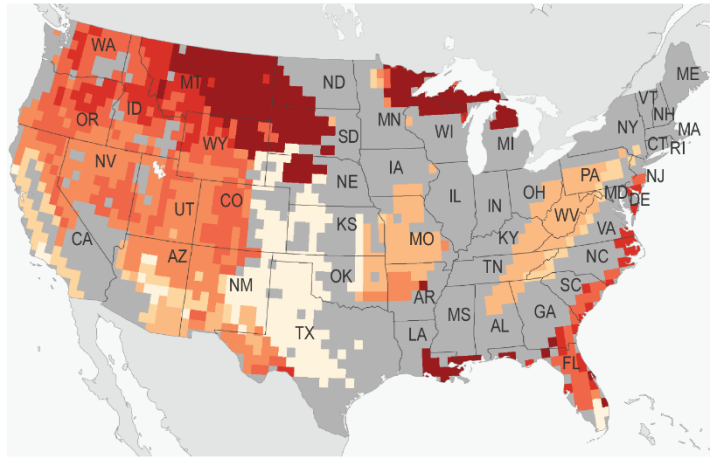
- Incidence of large forest fires in the western US and Alaska increased since early 1980s
- Projected to further increase (frequency and intensity) in those regions as the climate warms/dries, with profound changes to certain ecosystems (e.g. more fuel)
- Longer burn season

Regions Affected

Alaska, Northwest, Southwest



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



Increase in Weeks with Risk of Very Large Fires (%)

0 50 100 200 300 400 500 600

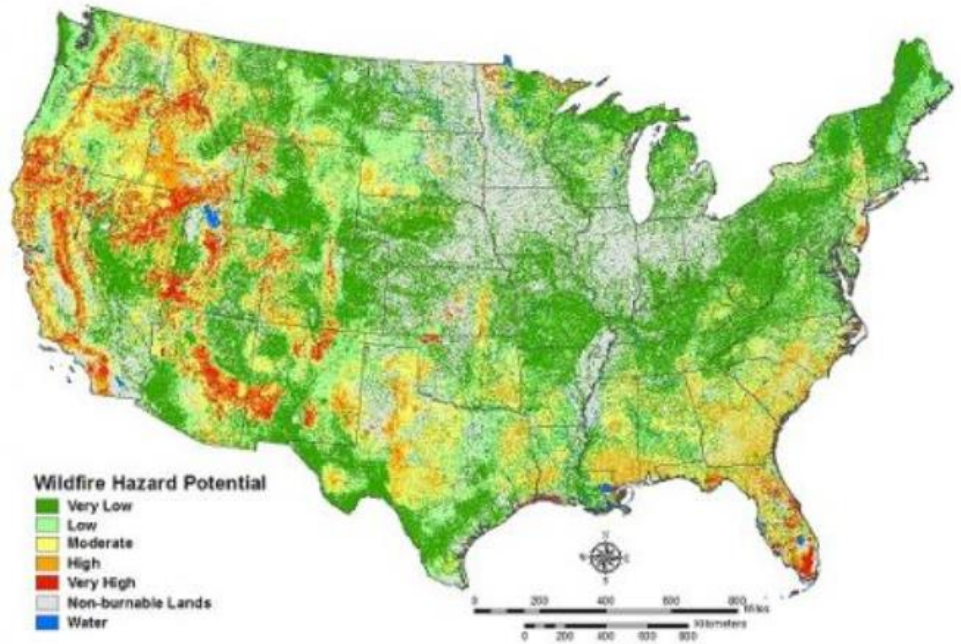
Group Discussion:

What health impacts can you anticipate?

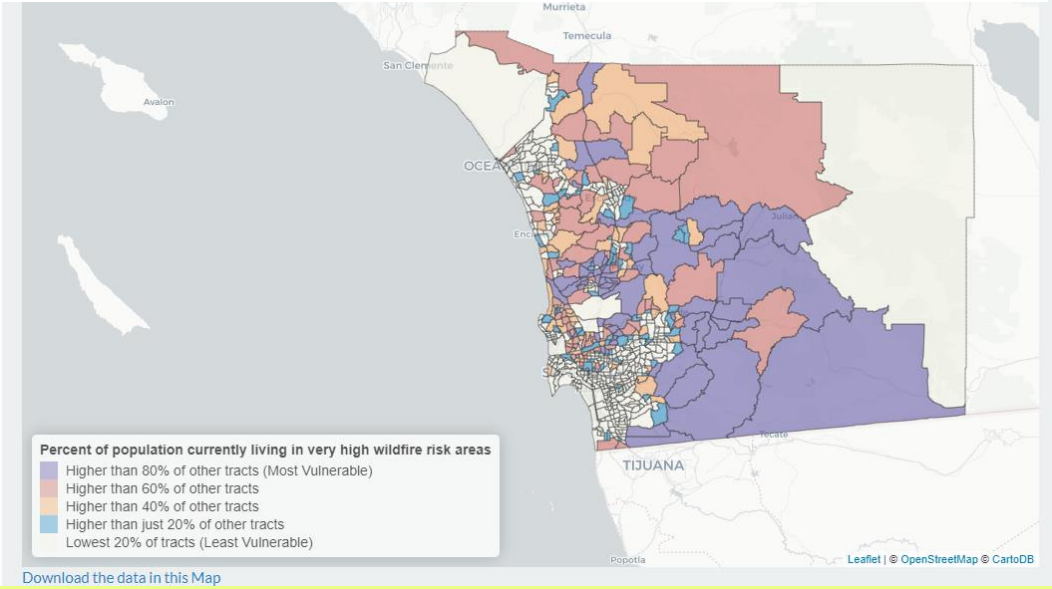
Wildfire

Possible Health Impacts

- Wildfire-related injury and death
  - E.g. Camp Fire, Paradise, CA 2018
    - Deadliest fire in CA history = 86 people died



Classified wildfire hazard potential map



Download the data in this Map

IMPACTS

IMPACTS

Wildfire

Possible Health Impacts

- Mental health impacts including post-traumatic stress, depression, anxiety and grief
  - A Rand study found that one-third of the adult survivors of California wildfires in 2003 suffered depression and one-quarter suffered PTSD.

What happens when people experience a disaster or traumatic event?

Shock and denial are typical responses to large-scale natural disasters, especially shortly after the event. Both shock and denial are normal protective reactions.

Once the initial shock subsides, reactions vary from one person to another. The following are common responses to a traumatic event:

- **Feelings become intense and sometimes are unpredictable.** You may become more irritable than usual, and your mood may change back and forth dramatically. You might be especially anxious or nervous, or even become depressed.
- **Thoughts and behavior patterns are affected.** You might have repeated and vivid memories of evacuating or seeing the fire approach. These flashbacks may occur for no apparent reason and may lead to physical reactions such as rapid heartbeat or sweating. You may find it difficult to concentrate or make decisions, or become more easily confused. Sleep and eating patterns also may be disrupted.
- **Recurring emotional reactions are common.** Reminders or "triggers" such as smoke, ash, sirens or fire trucks can create anxiety.
- **Interpersonal relationships can become strained, particularly if you are living in temporary housing.** You may experience arguments with family or friends. On the other hand, you might become withdrawn and isolated and avoid your usual activities.
- **Physical symptoms may accompany the extreme stress.** For example, headaches, nausea and chest pain may result and may require medical attention. Pre-existing medical conditions may worsen due to the stress.

It is important to realize that there is no one 'standard' pattern of reaction to the extreme stress of traumatic experiences.

IMPACTS

Wildfire

Possible Health Impacts

- Damage to infrastructure limits access to health services, can result in carbon monoxide poisoning
  - Power outages & de-energization
  - Road closures
  - Damaged health and emergency facilities
  - Emergencies can overwhelm health and emergency services
  - Can also lead to school and business closures and economic damages

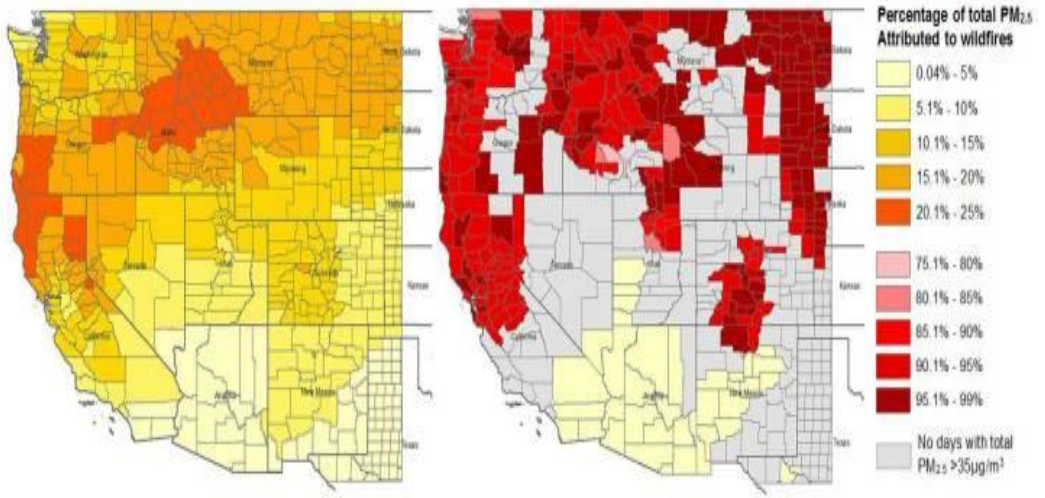
EXPOSURES

Wildfire

Related Exposures

- Contributes to storms and flooding (increased risk of landslides, erosion and mudslides)
- Triggers the following secondary exposures:

- Smoke/particulate matter
- Ticks, Forest Pests
- Water contamination and supply disruption
- Food contamination and supply disruption



Chat Discussion:

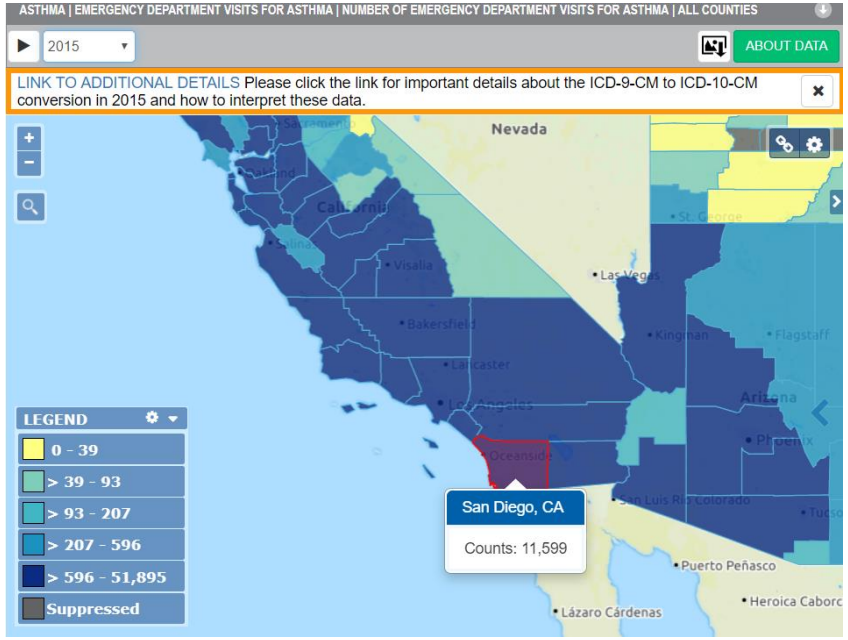
What health impacts can you anticipate?

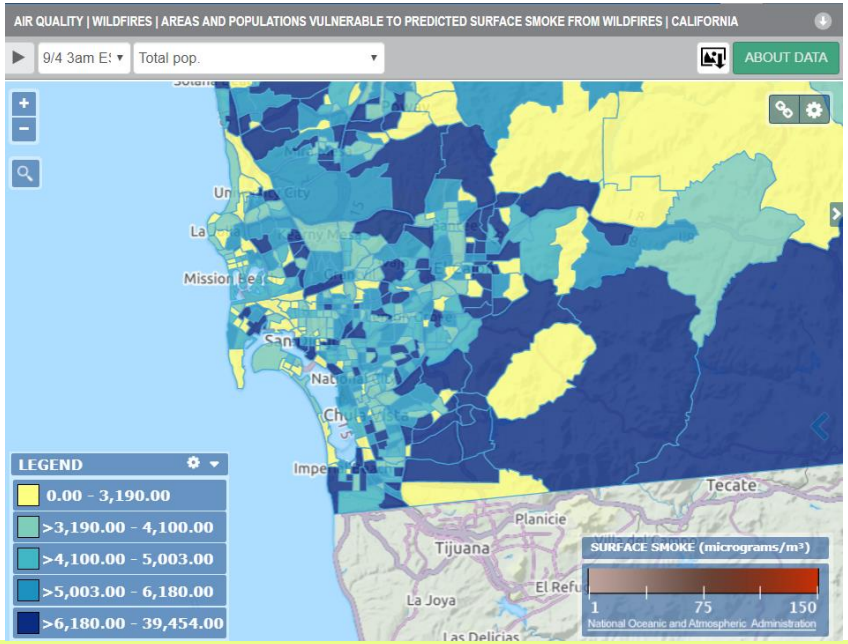
IMPACTS

Wildfire

Possible Health Impacts

- Respiratory and cardiovascular illness
  - Exposure to smoke-related air pollutants, including particulate matter (PM) from wildfires has been associated with a wide range of human health effects
  - Smoke hazard can last for weeks
- Valley Fever





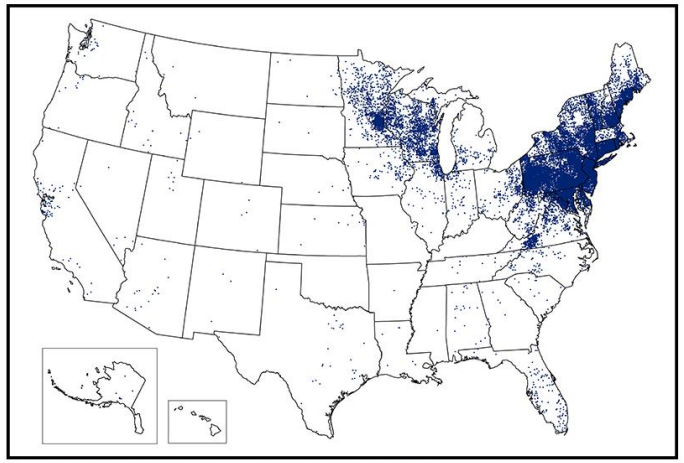
IMPACTS

Wildfire

Possible Health Impacts

- Vector borne disease (Lyme)

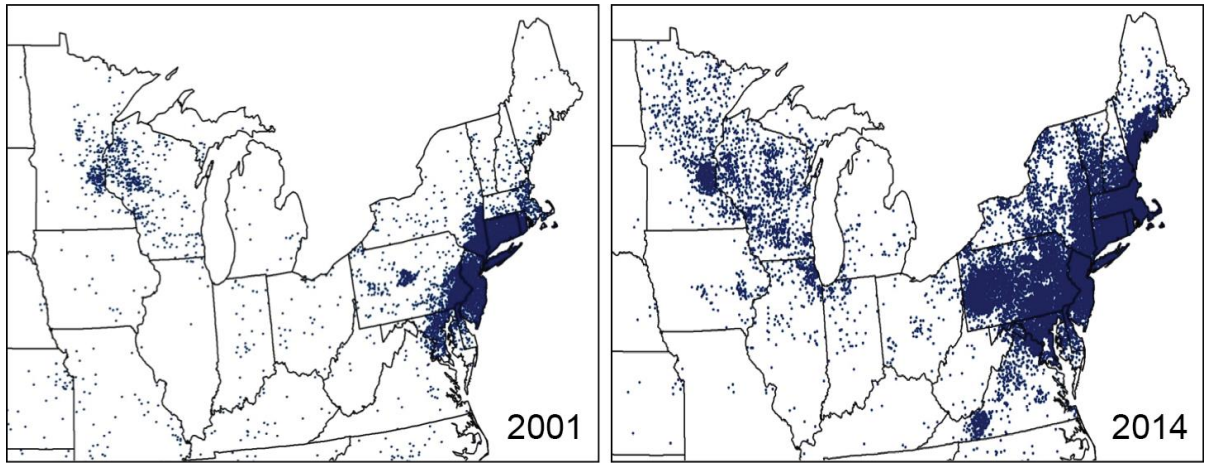
Reported Cases of Lyme Disease — United States, 2017



1 dot placed randomly within county of residence for each confirmed case

In 2016, Massachusetts transitioned to a surveillance method that relies primarily on laboratory reports. This method does not currently align with the national surveillance case definition as set by the Council of State and Territorial Epidemiologists (CSTE). Therefore, information on most Lyme disease cases occurring in Massachusetts is not sent to CDC. Please contact the MA Department of Public Health for case numbers.

Changes in Lyme Disease Case Report Distribution



IMPACTS

Wildfire

Possible Health Impacts

- Infections and illness from water
- Drinking water supply interruption
  - Tribe may need to use water supply to fight fire
  - Further stress to many tribes that rely on limited groundwater sources
  - Wildfire may limit transport of water supplies
- Lack of nutritional and medicinal abundance
  - Wildfire may limit transport of food supplies

Wildfire

IMPACTS

Vulnerable Populations

- Children and elders
- Transit-dependent populations
- Neighborhoods in a fire severity zone or wildland urban interface
- Households lacking defensible space
- People susceptible to health impacts from poor air quality
- People with mental, behavioral, and cognitive disorders
- Electricity-dependent populations
- Outdoor workers

Sample of Population Sensitivity and Adaptive Capacity Factors

- Population in high-risk wildfire area
- Percent of land covered by forest
- Hospitals per 100,000
- Economic hardship or social vulnerability index
- Size of water supply

IMPACTS

Wildfire

Possible Impacts to Social, Economic and Cultural Health

- Displacement, destruction of historical or cultural sites/assets
- Disruptions to culturally important activities and species (e.g. outdoor traditional events, Oak loss)
- Lost school days and business revenues
- Economic damage (e.g. wildfire response and recovery costs; timber losses, insurance premiums)

Chat Discussion:

How might cultural wellbeing and traditional ways of life be disrupted by wildfire?

IMPACTS

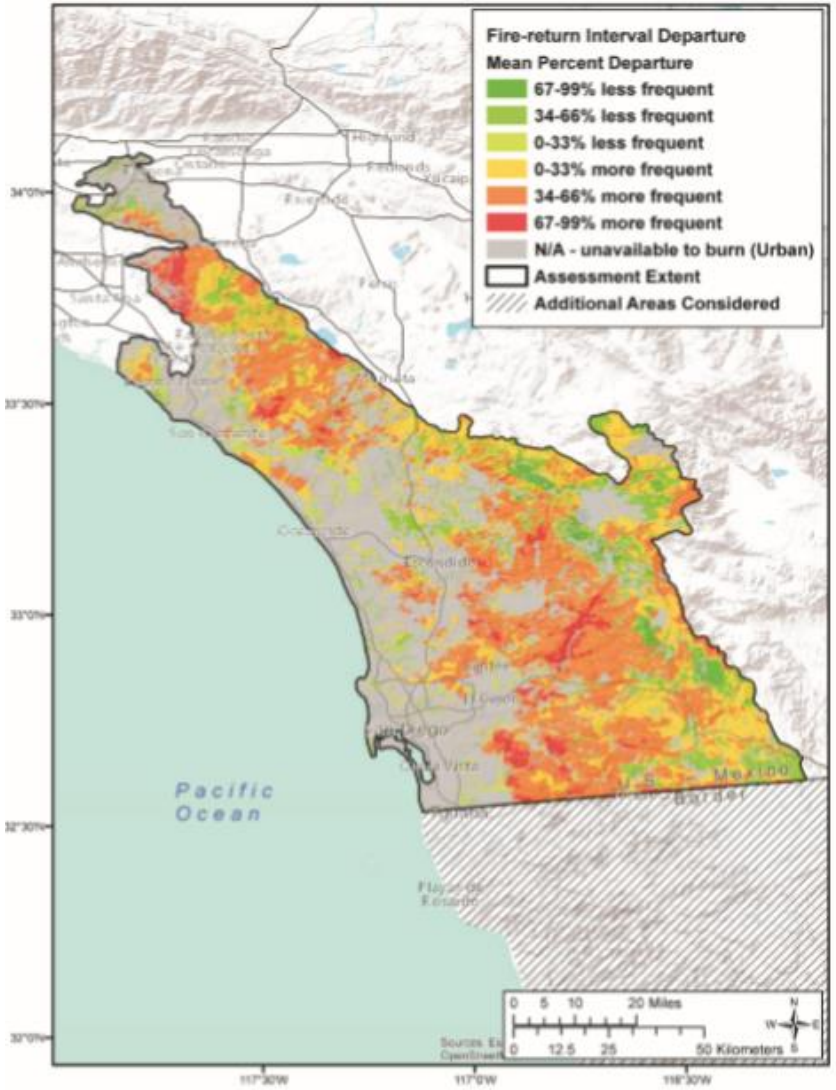
Wildfire

Possible Natural Environment Impacts

- As many tribes know, wildfire is part of a natural cycle
- Wildfire related disruptions, declines and stresses to habitats, waterways, and important or sensitive plant and wildlife species (e.g. invasive forest pests, conversion to flammable grasses, wildlife migration)

Possible Built Environment Impacts

- Damage to homes, business, and critical facilities Disruption to public services and infrastructure (e.g. power, telecommunications, roads)
- Stress on water supplies



Chat Discussion:

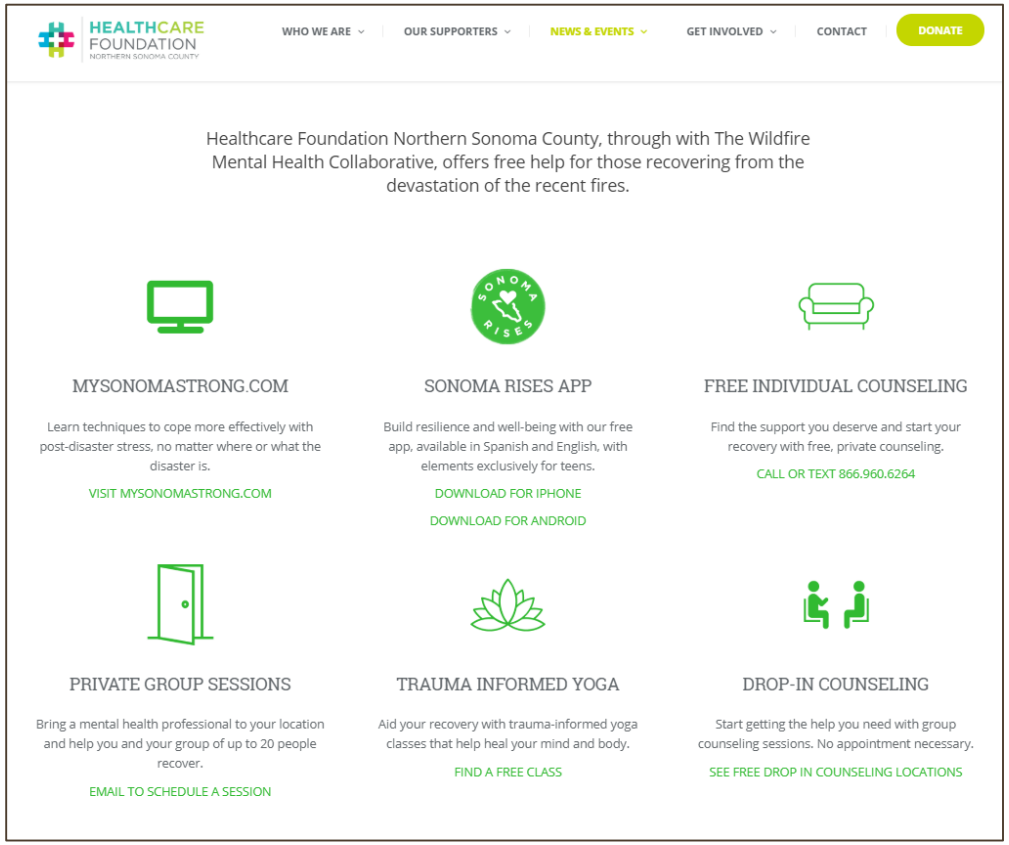
What adaptation strategies may be able to reduce negative impacts to your community?

STRATEGIES

Wildfire

Sample Strategies to Address Impacts

- Develop an emergency or health management plan to anticipate and prepare public services and evacuation plans for wildfire risks. Include procedures for post-disaster repairs and needs.
- Update air quality improvement plans to include exposure to wildfire
- Conduct outreach to encourage residents to sign up for emergency communication resources
- Conduct wildfire management strategies in adjacent forest lands such as prescribed burns and thinning to reduce wildfire risk
- Collaborate to enhance training and capacity of emergency tribal response teams



Group Discussion:

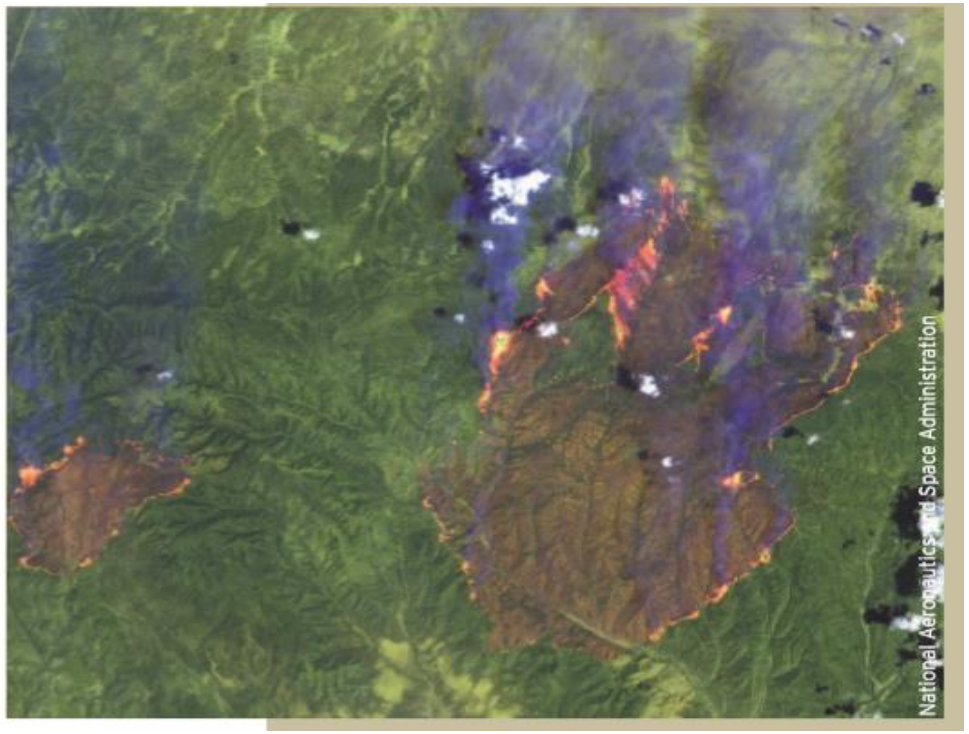
What partners in your community are already working on wildfire response?

Wildfire

Tribal Case Study

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

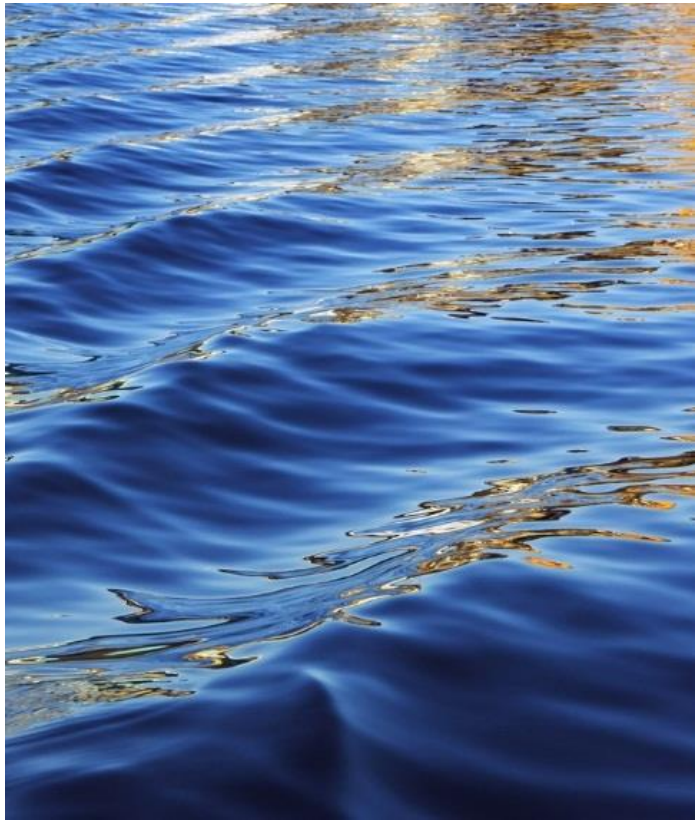
- Reputation for skilled fire management
- Apache tribe burned approximately 462,000 acries, 59% on Fort Apache Reservation
- Burned half of Tribe's timber lands (valued at $237M)



Wildfire

Trainee Examples

Drought



EXPOSURES

Drought

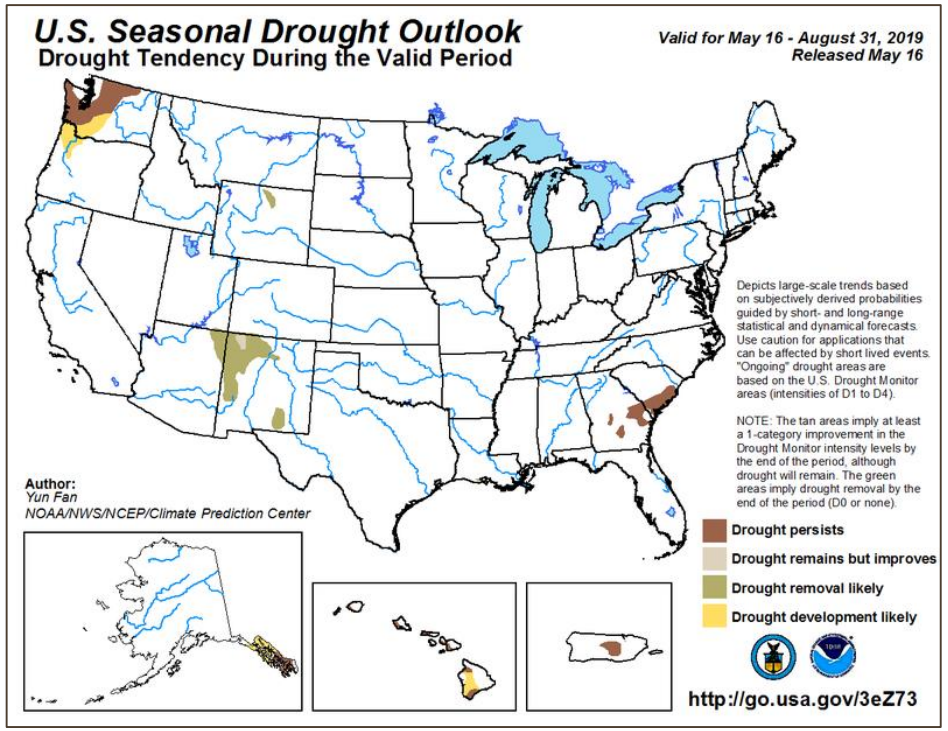
Key Climate Exposure Facts

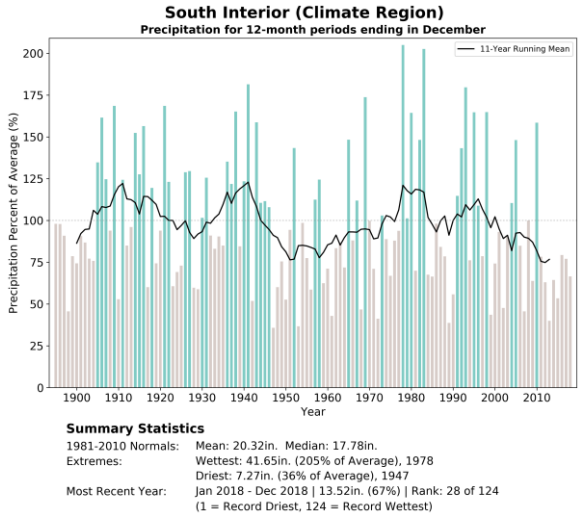
- Recent drought or water deficits have reached record in intensity in parts of the country.
- Strong evidence that climate change increases evapotranspiration and soil moisture deficits (CSSR)
- One of the most pervasive climate-induced weather exposures for tribes

Regions Affected

Southwest, Great Plains

Group Discussion:
What health impacts can you anticipate?





Dry Days SD County

Drought

Possible Health Impacts

IMPACTS

- Mental health impacts including anxiety, grief, and helplessness (e.g. displacement, economic change or insecurity, damage of local environment)

"Mni Wiconi" – Lakota for "Water is Life"

SAMHSA: Warning signs for emotional distress related to drought may include:

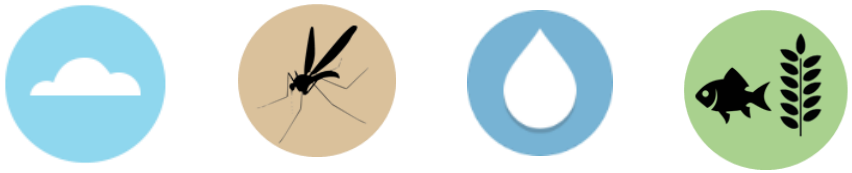
- Feelings of overwhelming anxiety
- Constant worrying
- Trouble sleeping and other depression-like symptoms
- Disputes between people over limited water supplies
- Health concerns related to dust, low water flow, or poor water and air quality
- Financial concerns related to crop failures, low supply and demand of agricultural-related products, or rising food prices

Drought

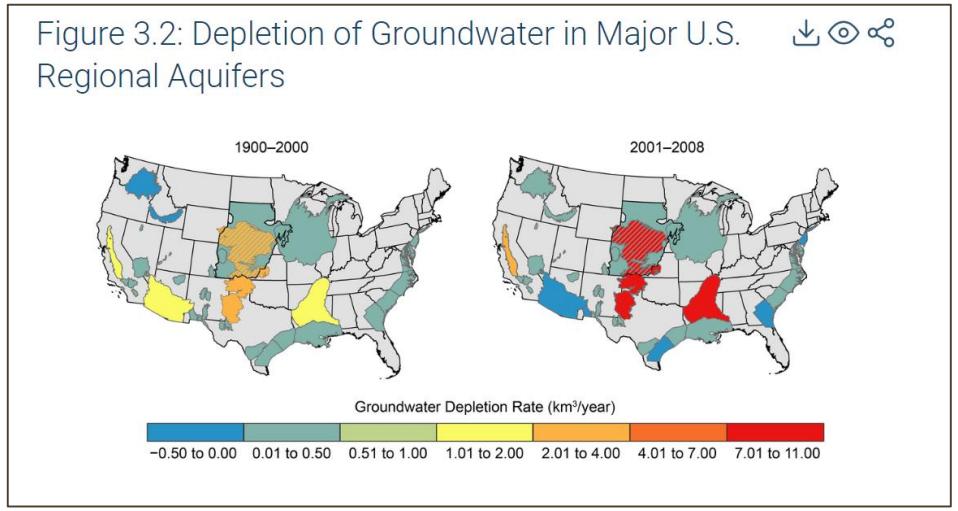
EXPOSURES

Related Exposures

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



- Dust, allergens, and ozone
- Water supply disruption
- Lower agricultural yields
- West Nile Virus
- Hantavirus (rodents)
- Forest infestation and disease



Group Discussion:

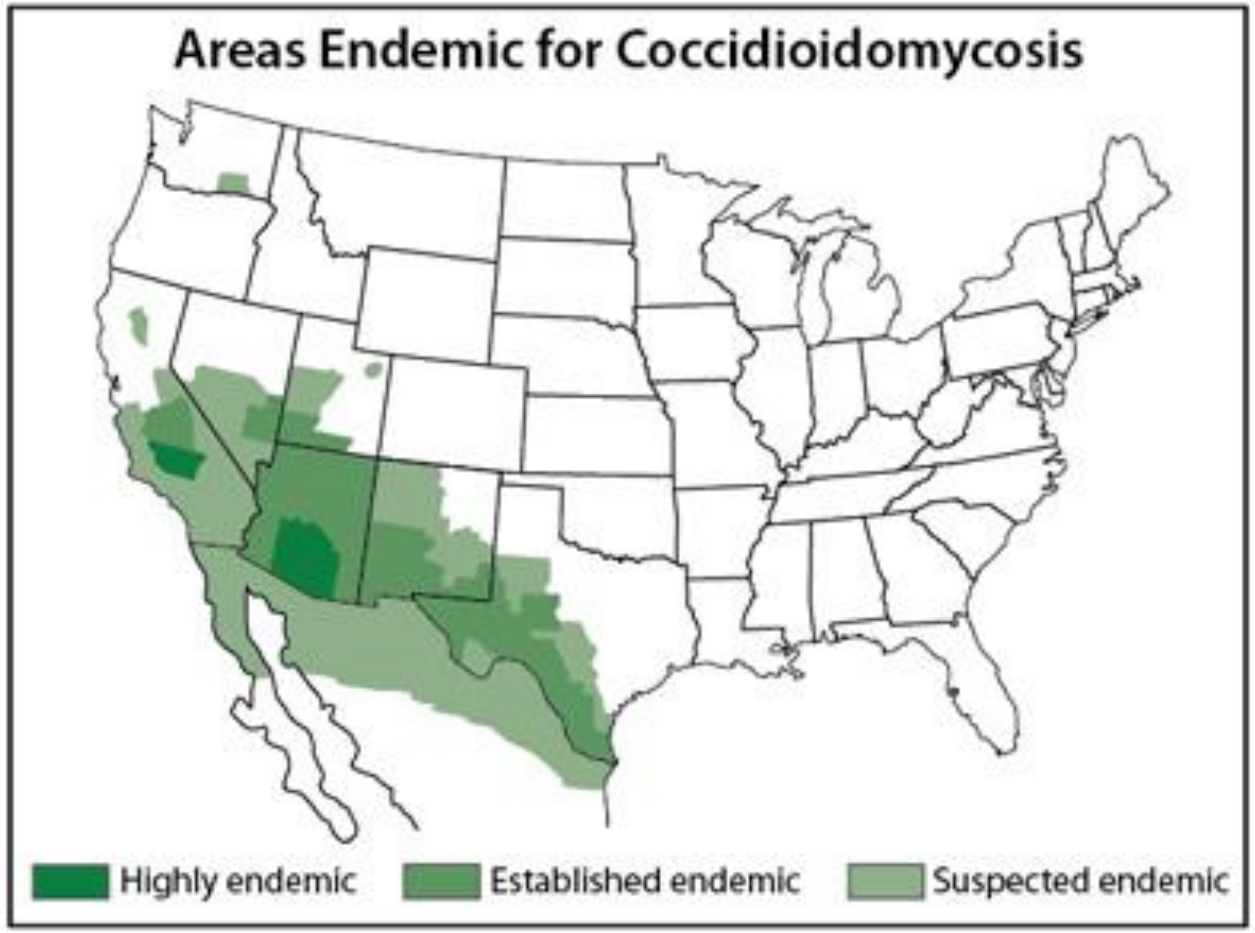
What health impacts can you anticipate?

IMPACTS

Drought

Possible Health Impacts

- Respiratory and cardiovascular illness
- Valley Fever

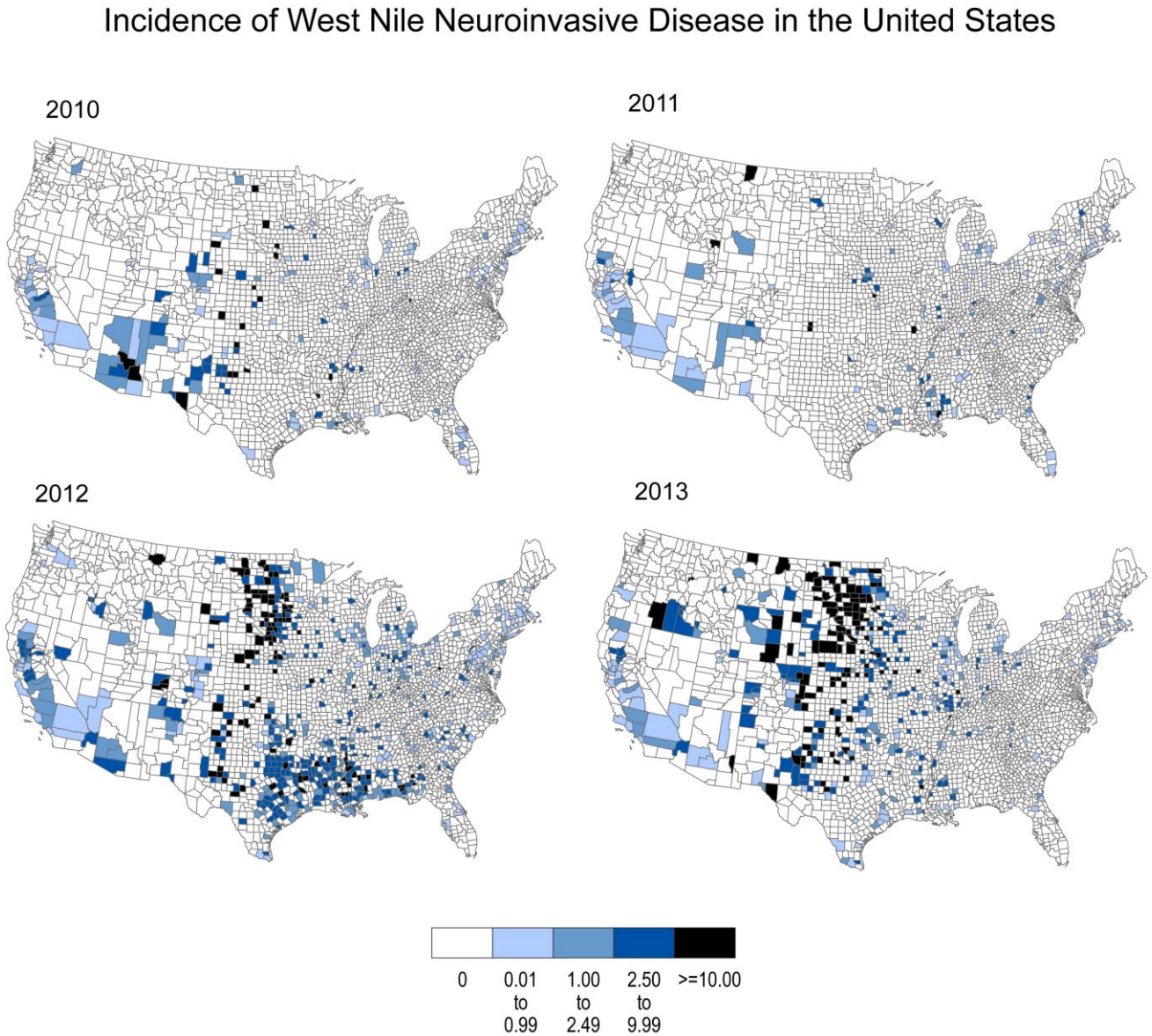


IMPACTS

Drought

Possible Health Impacts

- Vector borne disease
  - E.g. West-Nile, Hantavirus (rodents)



Drought

Possible Health Impacts

- Drinking water supply interruption
- Lack of nutritional and medicinal abundance

IMPACTS

Drought

IMPACTS

Vulnerable Populations

- Children and elders
- Communities reliant on groundwater for drinking water
- Agricultural workers
- People susceptible to health impacts from poor air quality
- People with mental, behavioral, and cognitive disorders
- Electricity-dependent populations

Sample of Population Sensitivity and Adaptive Capacity Factors

- Population size of vulnerable individuals
- Food environment index
- Proximity to transit
- Size of water system (including storage)

Drought

IMPACTS

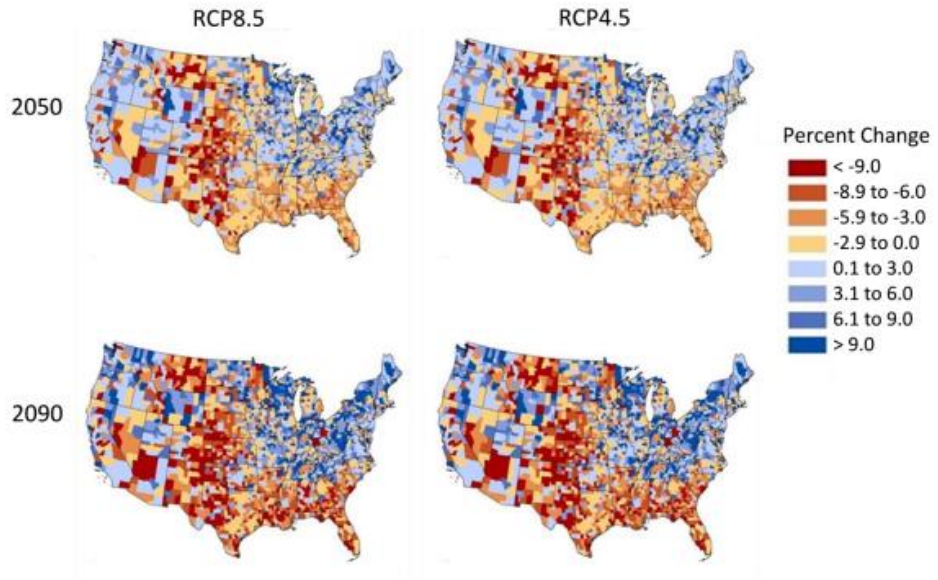
Possible Impacts to Social, Economic and Cultural Health

- Displacement
- Disruptions to culturally important activities and species (e.g. fishing)
- Lost school days and business closures
- Economic damage (e.g. agricultural losses)
  - CA Climate Assessment: water shortages could cost up to $1B/year

Relocation – Domestic Migration

Figure 9.1. Climate Change-Induced Domestic Migration

Relative net differences in county-level population projections by RCP and year. Values represent the average percentage change across the five GCMs compared to a "no climate change" control scenario.



"In Northwestern California, drought has decimated the salmon stock, an important food, economic, and ceremonial resource for the Yurok, Hoopa Valley, and Karuk tribes on the Klamath and Trinity rivers."
- Mapping Resilience Report

Chat Discussion:

How might cultural wellbeing and traditional ways of life be disrupted by drought?

Drought

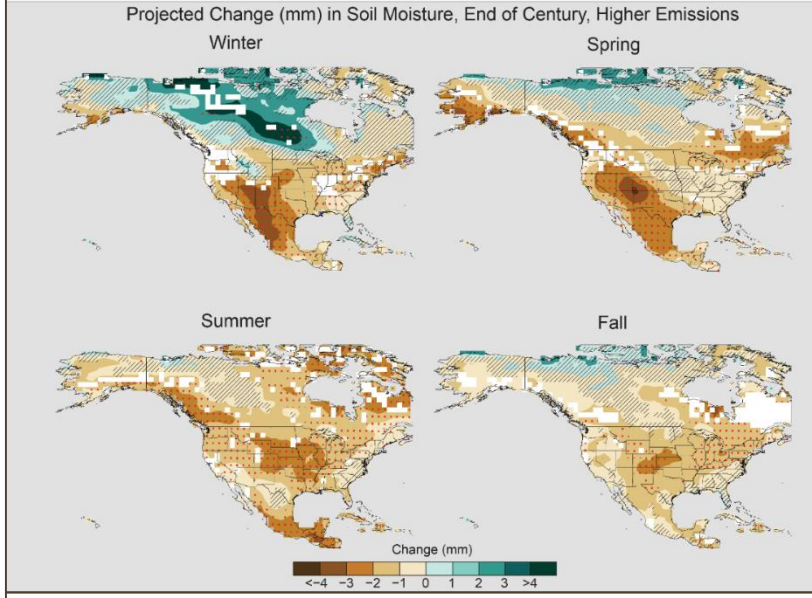
IMPACTS

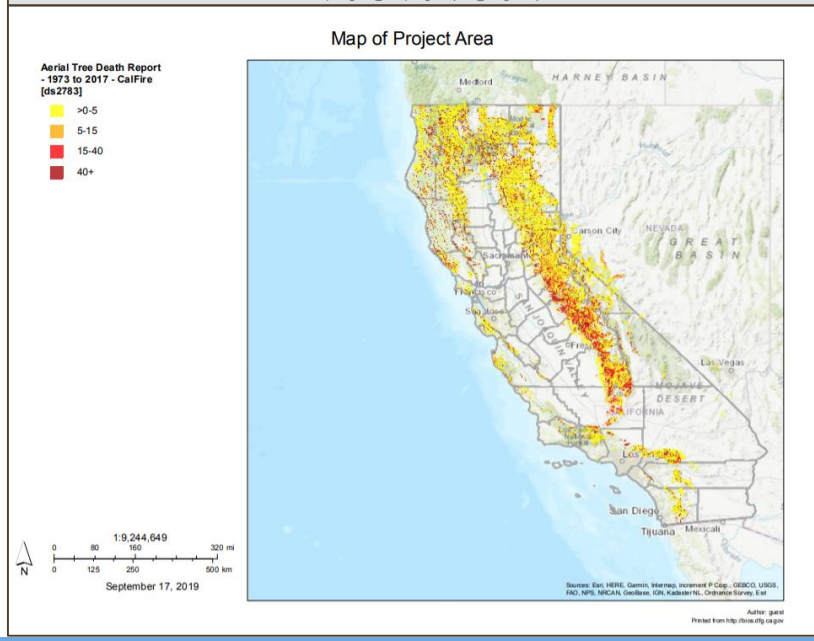
Natural Environment Impacts

- Drought related disruptions, declines and stresses to habitats, waterways, and important or sensitive plant and wildlife species (e.g. tree mortality, pest infestation, decline in wetlands, riparian tree diebacks, wildlife migration, loss of waterways and aquatic species)

Built Environment Impacts

- Disruption to public services and infrastructure (e.g. water systems)
- Disruption to agricultural operations





Chat Discussion:

What adaptation strategies may be able to reduce negative impacts to your community?

STRATEGIES

Drought

Sample Strategies to Address Impacts

- Create or update Drought Contingency Plans
- Restrict development in high-risk areas to reduce water burden
- Develop or promote water conservation or efficiency program to help households, businesses and agricultural operations replace irrigation systems and install water recycling systems and water conservation measures
- Build infrastructure needed for aquifer storage and recovery
- Diversify options for water supply and expand current sources
- Increase water storage capacity

FEMA Fact Sheet

Federal Insurance and Mitigation Administration

Aquifer Storage and Recovery

Purpose

The President's 2015 Opportunity, Growth, and Security Initiative (OGSI), Executive Order 13653 Preparing the United States for the Impacts of Climate Change, the President's 2013 Climate Action Plan, FEMA's Climate Change Adaptation Policy, and the 2014-2018 FEMA Strategic Plan, all identify the risks and impacts associated with climate change on community resilience to natural hazards, and direct Federal agencies to support climate resilient infrastructure.

FEMA is encouraging communities to incorporate methods to mitigate the impacts of climate change into eligible Hazard Mitigation Assistance (HMA) funded risk reduction activities by providing guidance on mitigating flood and drought conditions. FEMA has developed initial guidance on flood and drought mitigation activities including green infrastructure methods, expanded ecosystem service benefits, and three flood reduction and drought mitigation activities: Aquifer Storage and Recovery (ASR), Floodplain and Stream Restoration (FSR), and Flood Diversion and Storage (FDS).

FEMA encourages communities to use this information in developing eligible HMA project applications that leverage risk reduction actions and increase resilience to the impacts of climate change.

Project Description

Aquifer Storage and Recovery is capturing water when it is abundant such as a rainy season or during spring snow melts, storing the water in the subsurface in brackish aquifers, and recovering the water when needed. There are two types of aquifers, confined and unconfined. A confined aquifer is a closed system and, for these projects, can only be recharged using an injection well. Project design includes a "mixing zone" which is created between the injected water and native groundwater to ensure variations in water quality are managed safely and effectively.

An unconfined aquifer can be recharged either by using an injection well or by allowing surface water to infiltrate and seep into the aquifer. Through infiltration, the surface water helps replenish groundwater supplies; the surface water mixes with native groundwater, and slowly flows through the aquifer. The appropriate method of recharge, and source and treatment of water added to the aquifer should be based on specific site conditions and may include drinking water, raw and/or partially treated surface water, and, infrequently, raw groundwater or reclaimed water. Communities can recover the stored water from the aquifer by using a well and use the water as a freshwater supply.

Group Discussion:

What partners in your community are already working on drought response?

Drought

Tribal Case Study

- Navajo drought conditions

Wrapping Up

Thank you for being part of our training community!

Suggested reading (complete before next webinar)

- National Wildfire Federation: "Facing the Storm: Indian Tribes, Climate-Induced Weather Extremes, and the Future for Indian Country"

Next webinar:

October 1, 2019 (9AM PST / Noon EST)

Storms & Flooding, Melting Ice and Sea Level Rise (Module 2)

Questions?