WHERE TO START WITH CLIMATE ADAPTATION:
TWO TRIBAL EXAMPLES

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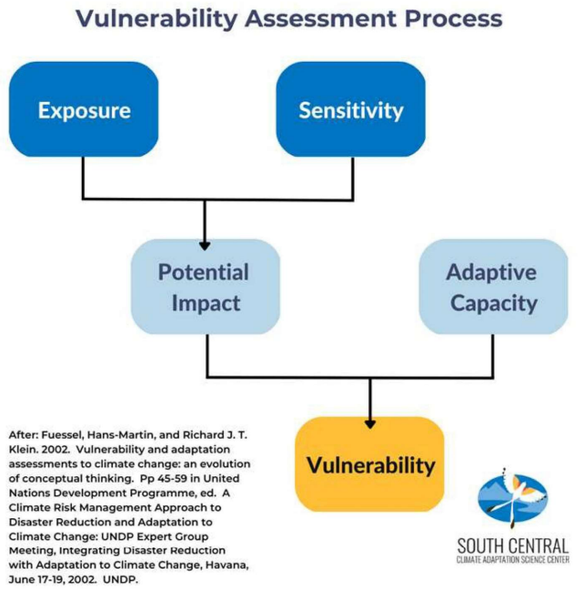
Southwest and South Central Climate Adaptation Science Centers
Tribal Climate Resilience Webinar Series

April 1, 2025

Chickasaw Nation Vulnerability Assessments

- Increase understanding of:
  - How the climate is changing across the Chickasaw Nation jurisdiction
  - How climate change and related effects can affect facilities (buildings, infrastructure, and operations)
- Assess vulnerability of Chickasaw Nation economic centers
  - MegaStar
  - West Bay
  - Winstar
  - Artesian
  - Washita
  - Riverwind



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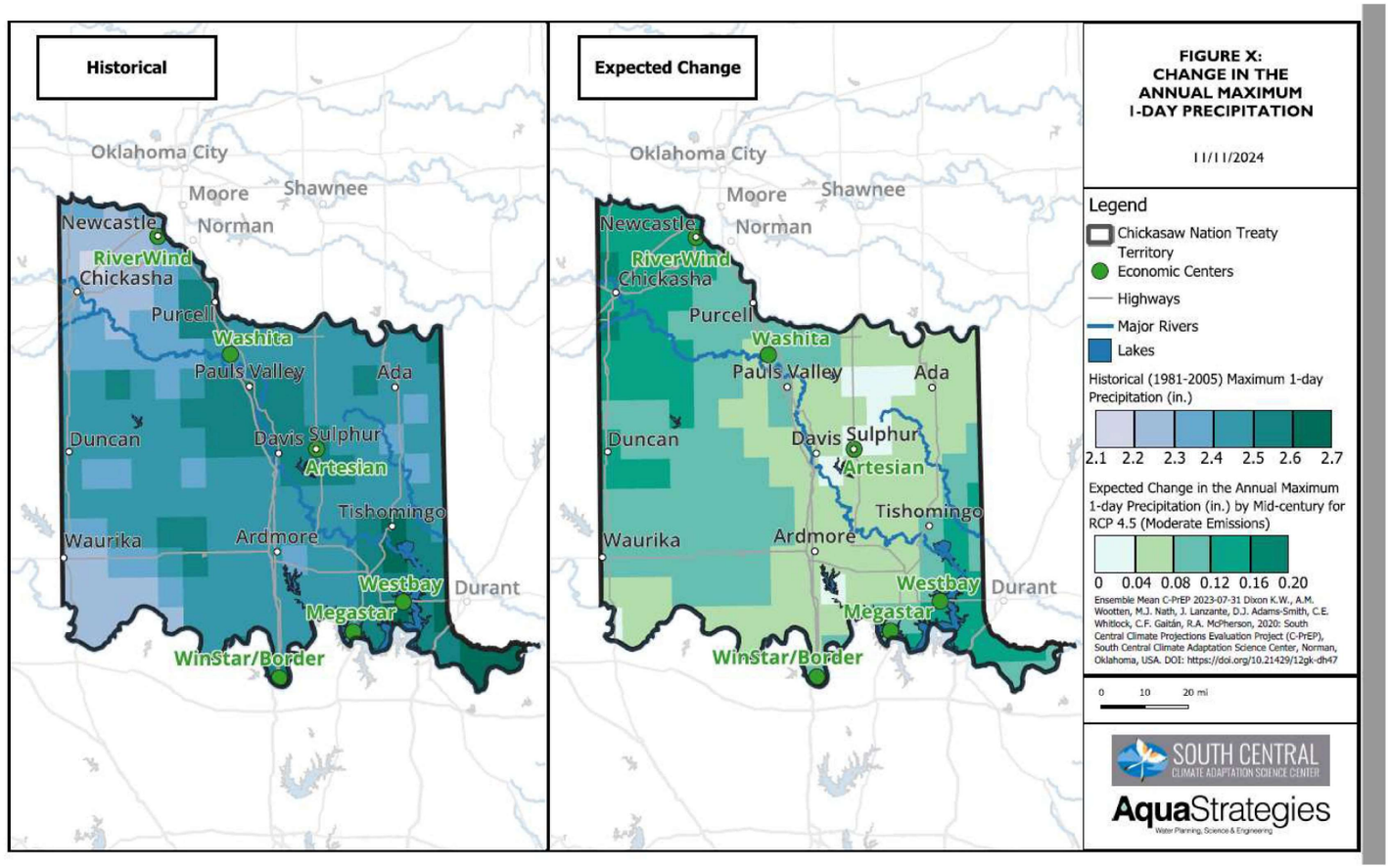
Exposure: Climate Projection Maps



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Sensitivity: Buildings and Infrastructure

- Basic Infrastructure: On-Site & Off-Site
  - Water supply, quality
  - Wastewater treatment
  - Stormwater
  - Transportation
  - Electric, natural gas, telecommunications
- Increased Customer Needs
  - Cooling and heating
- Building Integrity
  - Leaks, flooding, seeping
  - Wildfire
  - Other extreme weather

- Infrastructure and Facility Conditions
  - Current
  - Increased risk of damage and disruptions
- Operations
  - Customer safety and comfort
  - Staff availability

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Adaptive Capacity

- Factors related to adaptive capacity for buildings and infrastructure
  - Information available (e.g., design flood for drainage)
  - Redundancy
  - Jurisdiction and coordination
- Engineering considerations for six economic centers

- Community engagement / knowledges
  - Past climate / weather events verified by the community
  - Traditional governance as part of adaptive capacity

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Facility Vulnerability Assessments

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Risk Assessment Methodology

Score	Likelihood of Failure	Consequence of Failure
1	Low to No Probability of Component Failure if Recommended Improvement is Not Addressed	Little or No Potential Damage to Treatment Plant Infrastructure & Little or No Risk to Public Health and Welfare
2	Some Probability of Component Failure if Recommended Improvement is Not Addressed	Minor Potential Damage to Treatment Plant Infrastructure & Minor Risk to Public Health and Welfare
3	Elevated Probability of Component Failure if Recommended Improvement is Not Addressed	Potential to Damage to Treatment Plant Infrastructure & Risk to Public Health and Welfare; Likely with Short Term Impacts
4	High Probability of Component Failure if Recommended Improvement is Not Addressed	Potential to Damage to Treatment Plant Infrastructure & Risk to Public Health and Welfare; Likely with Long Term Impacts
5	Component Failure Imminent if Recommended Improvement is Not Addressed	Significant Potential to Damage to Treatment Plant Infrastructure & Risk to Public Health and Welfare; Likely with Long Term Impacts

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Potential Adaptation Measures

- On-Site Upgrades
  - Roofing – leaks and drainage, wind, wildfire (ember) resistance, reflectivity for heat
  - Windows, doors
  - HVAC
  - Insulation
  - Building finishes
  - Drainage, parking
  - Landscaping
  - Electrical, microgrids with battery storage
- Off-Site Improvements / Redundancy
  - Transportation – roads, bridges, culverts
  - Electric capacity and redundancy
  - Drainage, watershed
  - Water, wastewater
  - Telecommunications
  - Solid waste management

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Future Funding Opportunities

Bureau of Indian Affairs
Branch of Tribal Climate Resilience
FY 2023 Annual Awards Summary

Category 2: Implementation

Category 2, Implementation awards are designed to support application of on-the-ground, shovel-ready activities that already have a completed plan in place and are identified in official Tribal planning document(s). Implementation proposals can emphasize co-stewardship opportunities, sacred site access and/or protection, as well as treaty rights protection efforts.

Number of Awards: 30

Amount Funded: $73,590,743

Awards up to $4,000,000

https://www.bia.gov/sites/default/files/media_document/2023_annual_awards_summary.pdf

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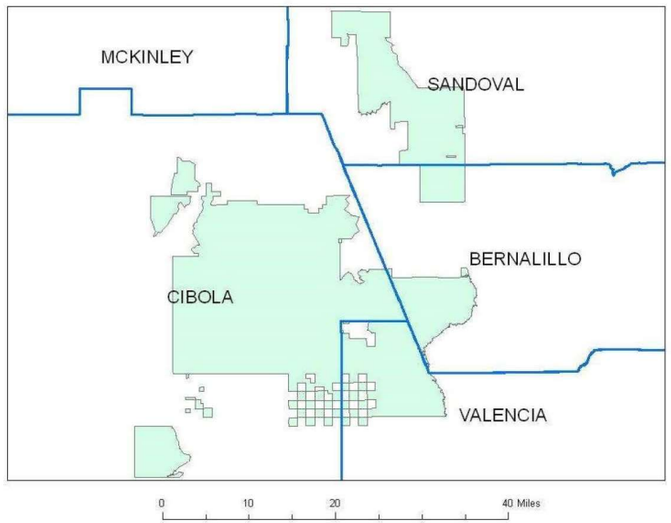
Pueblo of Laguna – Six Villages



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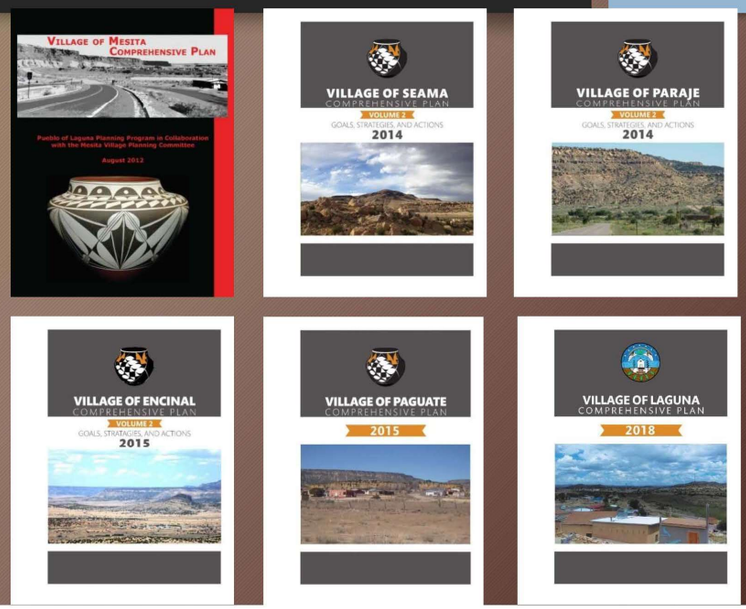
Village Comprehensive Plans

- Specific location
- Unique identity
- Responsibilities of mayordomos
- Community participation
- Compiled into Pueblo-wide plans



Village Comprehensive Plans

Comprehensive – *except not much on climate change*

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Introducing Climate Adaptation Planning through Council Priorities

Initial adoption, 2007

Infrastructure

2016 Capital Improvement Plan
Funded through Debt Service Fund for 2016
Approved by Council August 22, 2015

LINE #	DEPT/ VILLAGE	PROJECT TITLE	TOTAL COST	POL CIP FUNDING APPROVED 9/27/14	POL CIP FUNDING APPROVED 8/22/15	OTHER POL FUNDING (before or out of CIP cycle)	POL CIP TRANSFER FUNDING	OTHER APPROVED FUNDING	TOTAL AVAILABLE + PENDING	NOTES ON FUNDING SOURCES
FUNDED THROUGH THE PUEBLO OF LAGUNA DEBT SERVICE FUND FOR 2016, APPROVED AUGUST 22, 2015										
Buildings and Facilities										
1	COO	K Campus Sports Fields & Infrastructure - Design and Construct								
2	LRC	Laguna Rainbow Center Improvements								
3	LAGUNA	Laguna Baseball and Recreation Complex - Design								
4	PARAJE	Paraje Subdivision Playground - Design								
5	SEAMA	Seama Community Building Improvement - Construction								
6	SEAMA	Seama Community Center (new) - Construction								
Irrigation Infrastructure										
7	ENCINAL	Encinal Irrigation Realignment - Construction								
8	PAGUATE	Paguate Comprehensive Irrigation Project (Farming Feasibility)								feasibility study
Transportation I										
9	ASD									d diet design shortfall transferred
10	ASD									
11	PW									d design. Does not match amount
12	PW									prior worksheet but not now. Shortfall
Vehicles and Equ										
13	PS									
		TOTAL								

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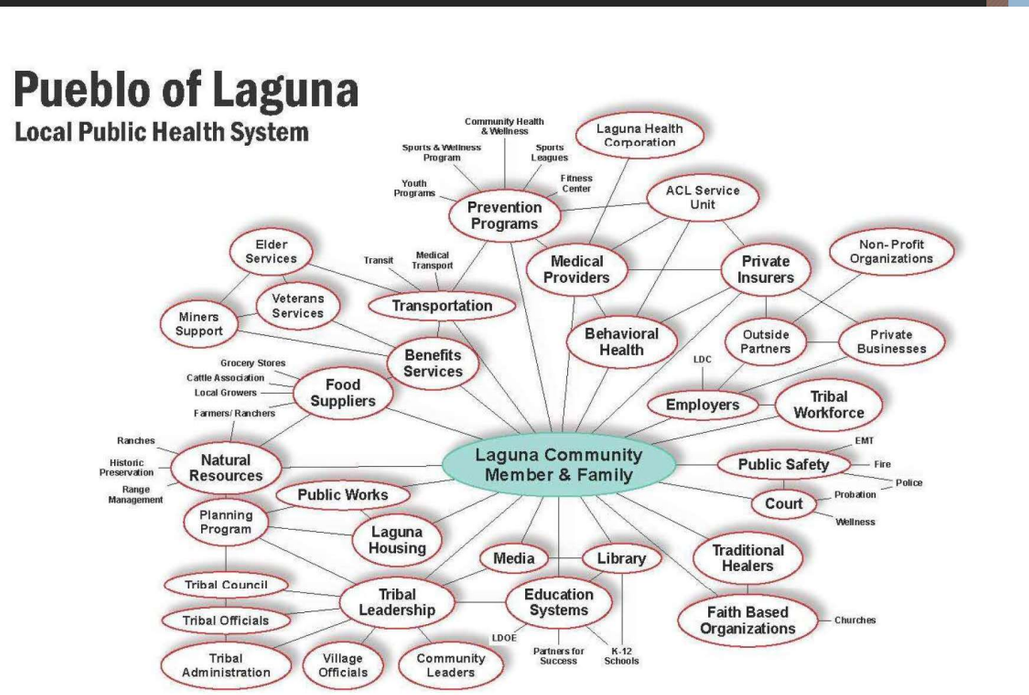
Health


Pueblo of Laguna
Local Public Health System
Laguna Community Member & Family
Prevention Programs
Community Health & Wellness
Sports & Wellness Program
Sports Leagues
Youth Programs
Fitness Center
Laguna Health Corporation
ACL Service Unit
Medical Providers
Private Insurers
Non- Profit Organizations
Behavioral Health
Outside Partners
Private Businesses
Transportation
Transit
Medical Transport
Elder Services
Veterans Services
Miners Support
Benefits Services
Food Suppliers
Grocery Stores
Cattle Association
Local Growers
Farmers/ Ranchers
Natural Resources
Ranches
Historic Preservation
Range Management
Public Works
Planning Program
Laguna Housing
Tribal Council
Tribal Officials
Tribal Administration
Tribal Leadership
Village Officials
Community Leaders
Media
Library
Education Systems
LDOE
Partners for Success
K-12 Schools
Traditional Healers
Faith Based Organizations
Churches
Employers
LDC
Tribal Workforce
Public Safety
EMT
Fire
Police
Court
Probation
Wellness
Created by the Pueblo of Laguna, 8/18/2016
Consensus Workshop Facilitated by the UNM Center for Native American Health

Exposure

- Temperature
  - Hotter days ☑
  - Longer heatwaves ☑
  - Decreased freezing periods ☑
- Precipitation
  - Greater variability ☑
  - Heavier rainfall at one time ☑
  - Other extreme weather, e.g. hail, snowstorms
- Extreme Wind

Even harder to model

- Associated Events
  - Drought
  - Flooding, Erosion
  - Fire

Likely, but hard to model

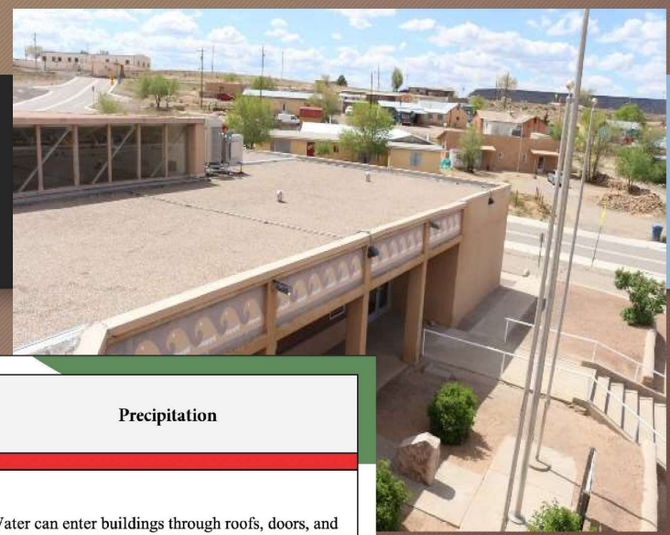
Sensitivity: Infrastructure and Buildings

- Types
  - Transportation – roads, bridges, bicycle/pedestrian
  - Water and Wastewater
  - Natural Gas and Electric
  - Telecommunications
  - Government and Community Buildings
  - Housing
- Tiered approach
  - General description of impacts
  - Review of PERs, as-builts for selected facilities
  - Site checks

Infrastructure Overview

	Temperature	Precipitation
Buildings	Buildings will absorb more heat and require more energy to cool. Heat absorption is affected by orientation, building materials, roof color, door and window types and conditions, and shading.	Water can enter buildings through roofs, doors, and windows, and seep through exterior materials. Flooding can affect structural integrity.
Roads, Bridges, Pedestrian/Bike Facilities, and Railways	Impacts may include pavement softening, bridge decking expansion, and warping and buckling of rail tracks. Heat may discourage community members from using bike and pedestrian facilities.	Flooding, erosion, and siltation affect all transportation facilities. The degree of impact is affected by culvert size and conditions of bridge piers, substructures, and foundations. Silt can make bike and pedestrian trails impassable.
Water and Wastewater *Also electric, natural gas, telecommunications*	Equipment for water and wastewater treatment may be sensitive to high heat. High temperatures can affect pH, microbial activity, and chemical composition. Higher temperatures often increase demand for water, possibly requiring additional supply and system capacity.	Flooding and erosion can affect exposed pipes, wells, water treatment, sewage treatment, lagoons, and lift stations. Extreme precipitation can reduce lagoon storage volume.

Profile: Tribal Building



	Temperature	Precipitation
Overview of Effects on Buildings	Buildings will absorb more heat and require more energy to cool down due to climate change. Heat absorption is affected by orientation, building materials, insulation, roof color, door and window types and conditions, and shading. The ability to open windows can ensure circulation during power outages.	Water can enter buildings through roofs, doors, and windows, and infiltrate through exterior materials. Flooding can affect structural integrity. Flooding and erosion can limit access to buildings.
Tribal Building	The building faces northeast with the front entrance on the northwest side, acceptable to limit heat transfer. The overhang at the main entrance protects against heat, but other doors and windows are exposed. Cement block building materials have a high thermal mass and limit heat absorption by the building. Stucco limits heat absorption by the building, compared to other materials. Windows are of varying types and conditions, with varying levels of heat transfer. Some can be opened. Metal doors have good weather stripping. Some door frames are damaged, which increases heat transfer.	The roof needs to be replaced. Roof flashing appears to be damaged or incorrectly installed. Tar sealant is deteriorating. There is extensive evidence of ponding and patching. Windows on the south side of the building leak, and some window frames are deteriorating. Stucco can allow water to seep into the building. There are poor drainage conditions around canales. The building and surrounding site have existing issues with on-site and off-site drainage. Flooding from off-site runoff affects the south and southeast portions of the site. Access is via NM Highway 124, with more than one access point in the Village.

PUEBLO OF LAGUNA

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Profile: NM Highway 124

- Higher temperatures:
  - Pavement may soften but is adequate for the near-term
  - Use of bike and pedestrian facilities may be reduced due to heat
- Precipitation:
  - One bridge has extreme sedimentation and limited drainage
  - Another bridge has undersized drainage capacity

- Connectivity:
  - High

- Adaptive Capacity:
  - Limited baseline information from plan sets
  - Owned and managed by NMDOT

Sensitivity: Health and Wellness

Health and Wellness Concerns
Heat Stroke
Diabetes (Complications)
Heart Disease (Exacerbation)
Kidney Disease (Exacerbation)
Mental Health (Stress, Anxiety, Helplessness, Depression, Suicide)
Indoor Air Quality
Language, Culture, and Identity
Access to Community Spaces (Which Enhance Social Cohesion)
Waterborne Diseases (Drinking Water)
Access to Physical Activity (Ability to be Outside)
Vector-borne Diseases
Asthma
Allergies
Strains on Social Relationships
Post-Traumatic Stress Disorder (PTSD)
Injuries from Extreme Weather Events

Health Impacts

Existing Health Issues

Also "emerging issues"

	Heat	Drought	Wildfires
Diabetes	Individuals with diabetes are more sensitive to heat stress and more prone to dehydration during heat waves.	Reduced drinking water supplies can lead to dehydration and worsen diabetes. Drought can decrease plants and animals used as traditional foods and medicines.	*No direct connection*
Heart Disease	Heat stress worsens heart disease outcomes. Persistent exposure to heat can lead to more hospitalizations related to heart disease.	Drought can decrease plants and animals used as traditional foods and medicines.	Smoke and particulates from wildfires can worsen heart disease.
Kidney Disease	Higher temperatures and heat waves worsen kidney disease.	Reduced drinking water supplies can lead to dehydration and worsen kidney disease.	*No direct connection*
Asthma	Heat can increase hospitalizations for asthma. Higher temperatures also increase the formation of ground-level ozone which worsens asthma and other respiratory diseases.	Drought conditions can cause airborne particles, which worsen asthma and other respiratory diseases.	Smoke and particulates from wildfires exacerbates asthma and other respiratory diseases.
Access to Physical Activity	Higher temperatures and heat waves can limit outdoor physical activity, increasing the risk of obesity.	Drought conditions can cause airborne particles, which limit outdoor physical activity, increasing the risk of obesity.	Smoke from wildfires limits outdoor physical activity, increasing the risk of obesity.

Wellness Impacts

Sensitivity and Impacts	Heat	Heavy Rainfall and Flooding	Drought	Wildfires
Mental Health	Higher temperatures and extreme weather events can cause stress, anxiety, depression, and possibly suicide. Transportation route closures, utility failures, and building damage from climate and weather changes can also affect mental health.			
Loss of Culture, Language, and Identity	Higher temperatures and extreme weather can affect the natural world and our relationship to it, the practice of traditional activities, eating and sharing traditional foods, and the language and stories associated with cultural activities.			
Access to Community Spaces	Higher temperatures and extreme weather events reduce or limit outdoor gatherings, increase isolation, and decrease social cohesion.			
Strain on Social Relationships	High temperatures tend to increase aggression. Heat waves may isolate people in their homes, where there may be unsafe relationships.	Extreme events can isolate people in their homes, where there may be unsafe relationships, or require evacuation to alternate housing, causing more strain on relationships.		
Post-Traumatic Stress Disorder (PTSD)	More frequent heat waves, extreme rainfall and floods, drought, and wildfires can trigger PTSD.			

THANK YOU!

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