

Central Council of the Tlingit & Haida Indian Tribes of Alaska



CLIMATE CHANGE ACTION PLAN

**SOCIOECONOMIC IMPACTS OF CLIMATE CHANGE
IN SOUTHEAST ALASKA**

SALMON - CEDAR - SHELLFISH

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Tlingit & Haida Executive Council Climate Change Committee - for Their Direction and Assistance

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TABLE OF CONTENTS

I.	INTRODUCTION.....	1
II.	REGIONAL CONCERN.....	1
III.	EXECUTIVE SUMMARY	2
IV.	CURRENT CHALLENGES CAUSED BY CLIMATE CHANGE	3
	A. Extreme Weather	
	B. Landslides & Mega-Tsunamis	
V.	FUTURE CHALLENGES	3
	A. Increased Frequency of Extreme Weather Patterns	
	B. Global Pandemics and Other Long-Term Factors	
VI.	SOCIOECONOMIC RESOURCES ENDANGERED BY CLIMATE CHANGE	3-5
	A. Shellfish: Mortality, Paralytic Shellfish Poisoning (PSP), Acidification, Butter Clams	
	B. Salmon: Traditional Ecological Knowledge (TEK), Jurisdiction, Management	
	C. Cedar: Alternative Growth Research	
VII.	FOOD SECURITY	6
	A. Greenhouse Complex Programs and Aquaculture & Mariculture Professionals	
	B. Eons of Technical Knowledge in Food Preservation Turned into Profit	
	C. A Regional Food Catalog & Security Threat Matrix for Each Community	
VIII.	ENERGY	6
	A. An Electric Vehicle (EV) Infrastructure	
	B. New & Renewable Energy Research with Cost/Benefit Comparisons	
	C. Energy Conservation and Efficiency Research & Development Programs	
IX.	HOUSING	6
	A. Rising Lumber Costs – A Reemerging Timber Industry	
	B. Energy Efficient (Heating/Cooling) and Cost-Effective Housing Technologies	
X.	SOLID WASTE	6
	A. New Technologies and Multiple Waste Programs	
XI.	COMMUNITY PRIORITIES	6-8
	A. Community Resource Prioritization Using Threat Matrix Evaluation Tables	

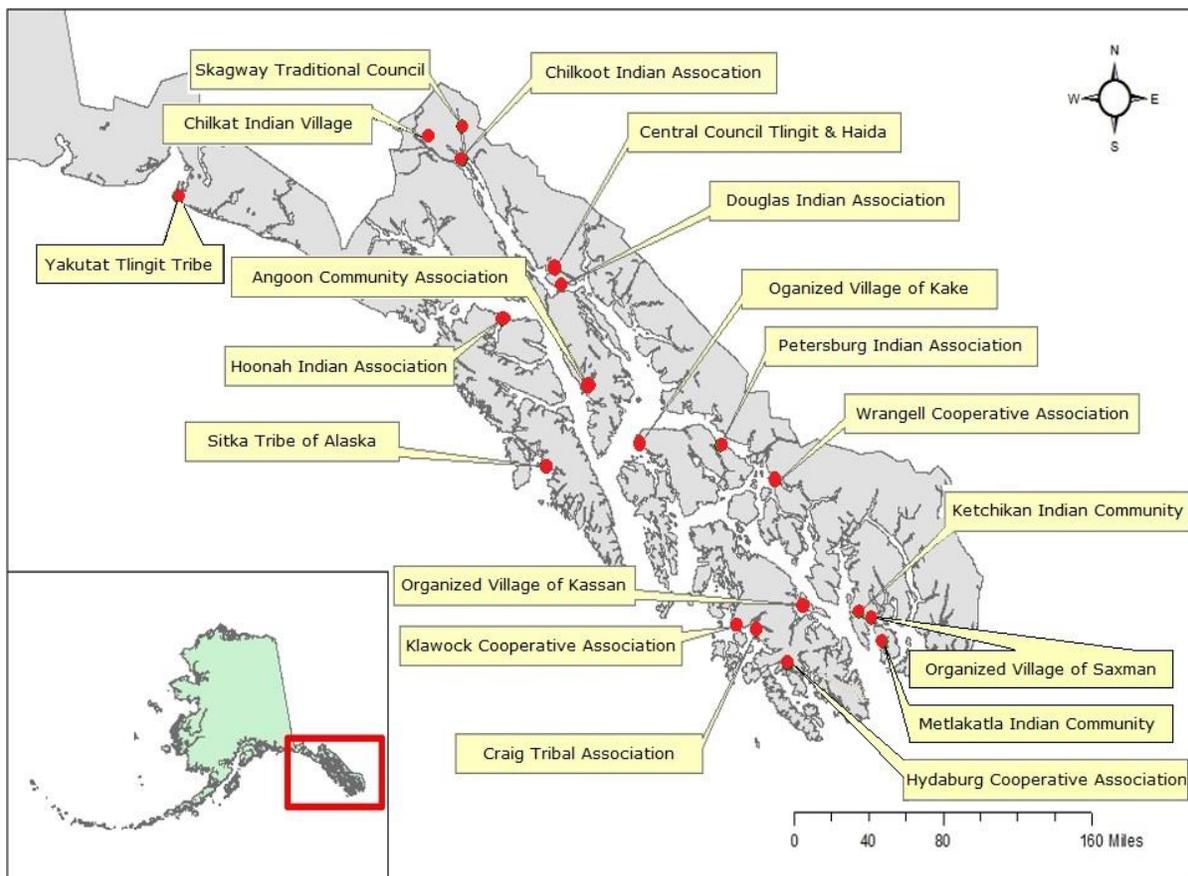
B. Threat Matrix Evaluation Tables: Potential Climate Change Vulnerabilities and Adaptation Strategies

I. INTRODUCTION

Climate change and socioeconomic development have impacted our planet, homes and lives. The effects of climate change are keenly observed, especially here in Southeast Alaska; however, the knowledge of the mechanisms, impacts, and future scenarios of the socioeconomic impacts of climate change are insufficiently understood at this time. This document is an attempt at better understanding and prepare to combat the potential socioeconomic impacts of climate change. This document is also intended to provide an action plan to mitigate, adapt, and take advantage of emerging opportunities regarding the socioeconomic impacts of climate change.

II. REGIONAL CONCERN

Southeast Alaska has a unique ecosystem, and the environment and the effects of Climate Change in Southeast are unique. Our response to this crisis will also continue the tradition of being unique, for we shall lead the way for our entire Aani.



III. EXECUTIVE SUMMARY

A new necessity for Traditional Harvesting and Greenhouse production of foods, building sustainable & renewable energy resources, and finding solutions to energy-efficient & cost-effective housing is fast becoming a reality. Taking steps now to develop these programs is in the Tribe's best interest to better prepare for a rapidly changing climate. Traditional Harvest and greenhouse production can significantly offset the continually increasing food prices and shipping costs. Renewable and non-traditional forms of energy production from Biofuels to Thermal to Wind can offset the costs and carbon release of Greenhouse Gasses (GHG) into the environment. Electric Vehicle (EV) and recharge station implementation would also have positive outcomes for the environment and provide local employment with the development of an EV infrastructure. Our waterways are being assaulted with rising temperatures, increasing extreme weather events, abandoned mines polluting our watersheds, and governments concluding hastily conducted water quality testing and analysis studies only to report that "All is well." However, action must be taken today to protect the future, the people, and our way of life.

Mission of the Central Council of the Tlingit & Haida Indian Tribes of Alaska:

"Preserve our sovereignty, enhance our economic and cultural resources, and promote self-sufficiency and self-governance for our citizens."



IV. CURRENT CHALLENGES

Extreme Weather. We are in a “more rain, less snow” weather pattern now and will be for the foreseeable future. This is an effect of warming global temperatures. This current weather scenario creates many adverse effects from salmon spawning scoring and ecosystem disruption to lack of snow protection, causing Cedar root death to heatwaves intense enough to cause mass shellfish kill-off. So far, in 2021, it has been reported to be the second wettest on record¹. Extremely intense heatwaves are occurring more frequently, causing multiple species’ mass die-offs (See “Shellfish” section below).

These weather extremes have been the cause of the following events:

1. The Haines DEC 2020 Landslide
2. Ketchikan FEB 2020 Landslide
3. 2015 Icy Bay Landslide and Mega-Tsunami

The COVID-19 Global Pandemic has given us a glimpse and warning of potential future global scenarios; we need to take steps to protect Food Sovereignty, rising fuel costs, loss of Social Normality due to lack of Contact and Loss of Rights and Freedom protections.

V. FUTURE CHALLENGES

One aspect of “future challenges” that can be reported with certainty is that the current pattern of “once-in-a-lifetime” weather events increasing in frequency and intensity suggests that these extreme events will occur more often. Attempting to adjust and adapt to these ever-increasing events, we will need to become better trained and well-versed in adaptation, mitigation, and immersing opportunity strategies for the future of our people.

Finding ways to protect our communities from future pandemics better and the effects of climate change should also become a priority.

¹KINY Radio, *First Half of 2021 Sets Second Place Record for Total Rainfall, July 12, 2021*
(www.kinyradio.com/news/news-of-the-north/first-half-of-2021-sets-second-place-record-for-total-rainfall/)

VI. SOCIOECONOMIC RESOURCES ENDANGERED

Shellfish. We are on the precipice of losing a traditional natural resource. Sampling and testing of shellfish at the Sitka Tribe of Alaska’s SEATOR Lab have shown that for most of the 2020-21 calendar year testing period Butter Clams aka *Saxidomus gigantea* have been unsafe for consumption (See Figure 1 on next page.). Many more species of shellfish were contaminated with Paralytic Shellfish Poisoning (PSP) throughout the period; however, it was Butter Clams that were unsafe for consumption a substantial majority of the time. Warming ocean temperatures are the cause of rising PSP contaminations. Climate change is also a contributing factor to ocean acidification; warming temperatures add fresh water to the ocean system at a rate that affects its chemistry. These ocean chemistry changes are occurring in addition to Green House Gases (GHG) absorption by the sea as described in the Central Council of the Tlingit & Haida’s Climate Change Adaptation Plan.

Active Advisories			
SEATOR sites with shellfish PST levels above the regulatory limit reported between June 19, 2021 – July 18, 2021.			
Community	Beach	Species affected	Date Collected
Juneau	Amalga Harbor	Butter Clam	June 25, 2021
Kasaan	Kasaan Harbor	All Species	June 24, 2021
Ketchikan	Seaport Beach	All Species	June 27, 2021
Kodiak	Mission Beach NE	All Species	June 23, 2021
	Mission Beach SW	All Species	June 23, 2021
	Near Island (N. Trident Basin)	Butter Clam	June 23, 2021
	South Trident Basin	All Species	July 11, 2021
Klawock	City of Klawock Boat Launch	Butter Clam	July 12, 2021
Sitka	Starrigavan North	All Species	June 29, 2021

"All Species" includes all mussel and clam species (including geoduck), oysters, and any other invertebrate such as moon snails.

Figure 1. SEATOR Shellfish Public Safety Advisory

The Pacific Northwest coast from Alaska to Washington State experienced shellfish multispecies Mass Mortality Events from the 2021 Summer Heat Wave. As reported by Sea Grant Washington, a mass mortality event killed off entire coastlines of shellfish, from the article *“The event is being considered a once-in-a-lifetime occurrence because of the coincidence of record high temperatures and midday extreme low tides, leading to unusually high lethal effects on intertidal sea life. This is possibly the first documented shellfish mortality event of this magnitude in modern times”*². The extreme weather event that caused a mass mortality event was documented occurring as far north as Skagway³. In Skagway, July 2021, Blue mussels were overheated on the exposed rocks resulting in waves of shells washing ashore for days.

Research into aquaculture/mariculture, shellfish farming, clam-bed seeding, and new species acclimating into our environment is essential for the wellbeing of our people.

*Social cost of losing shellfish as a resource: **IRREPLACEABLE***
*Economic cost of losing shellfish as a resource: **PRICELESS***
*Potential of losing shellfish as a resource: **HIGH***

² <https://wsg.washington.edu/impacts-from-the-summer-2021-heatwave-on-washington-shellfish/>

³ <https://www.leonetnetwork.org/en/posts/show/72F79911-94B7-4104-B13B-A1A46525CAFE>

VI. SOCIOECONOMIC RESOURCES ENDANGERED (CONT.)

Salmon. The history of non-indigenous mismanagement of our natural resources is evident in the history of the decline in returns and regrowth. Climate change contributing to declining factors only increases potential catastrophe with dwindling salmon returns and no real remedy planned or proposed federally or by the State. It is in all our communities' best interest to act now to mitigate, adapt and take advantage of any emerging opportunities brought on by the effects of a changing climate.

With the loss of just one natural resource, our way of life is in jeopardy; today, we are on the verge of losing many. Traditional Ecological Knowledge (TEK): Caused by climate change, all salmon species spawning times are shifting⁴, and the Alaska Department of Fish and Game (AKDFG) fish-counters do not seem to have taken into consideration these spawning time changes. Therefore, the evidence suggests that the AKDFG fish count is incorrect, making forecasting unreliable, inaccurate, and wrong. It is necessary to research ways to gain jurisdiction of our traditional fishing areas and then perform proper fish-management programs using the 10,000 years of technical experience and expertise that we have acquired.

*Social cost of losing salmon as a resource: **IRREPLACEABLE***
*Economic cost of losing salmon as a resource: **PRICELESS***
*Potential of losing salmon as a resource: **HIGH***

Cedar. The cultural value of the many plants and animals in Southeast Alaska is incalculable and irreplaceable. Clear-cut timber practices are an excellent example of a destructive social-economic process. The actual cost and damage that occurred operating with these practices were felt in many ways; with the poor returns of salmon to river and stream systems negatively affected, to the decades-long aesthetic damage to thousands of acres in our Aaní. Clear-cut deferability and riverine and stream protection practices are now in place.

Restoration of the affected areas should be researched and prioritized. Research additional ways to revitalize cedar growth, for example, research fluctuating altitude-strata seedling planting practices, invest in greenhouse production of culturally significant flora, research and create an "Ecological Calendar" (ecological clues, i.e., *date when a flower blooms*) to demonstrate and more easily predict the shifting seasons.

*Social cost of losing cedar as a resource: **IRREPLACEABLE***
*Economic cost of losing cedar as a resource: **PRICELESS***
*Potential of losing cedar as a resource: **HIGH***

⁴ *Traditional Ecological Knowledge: Jay Erickson – Gheiwán, Wooshkeetaan – Toos' Díx'ee Hít, Teikweidi – yadi, Hoonah Kaawu*

VII: FOOD SECURITY

As a community, it is recommended that we invest in building greenhouse compounds and complexes. We need to become Agriculture – Aquaculture – Mariculture specialists and experts. **The thousands of years of knowledge that we possess is our capital.** Facilitating and investing in a reemergence of Native Food Preservation Technology of local food resources is a mitigation strategy that communities can begin to implement today. A regional-wide Food Security Threat Matrix should be created for each community, with this data compiled into a regional food security report. Create and archive a catalog of all traditional flora and fauna food resources, with a section detailing endangered resources.

VIII. ENERGY

It is recommended we invest in creating of an Electric Vehicle (EV) infrastructure, new & renewable energy research, research in New-Energies with Cost/Benefit Comparisons, invest in energy conservation and efficiency research and programs.

IX. HOUSING

The rising lumber and timber harvesting costs could reinitialize a lucrative timber industry. Research into a viable Timber program is recommended. We also recommend investing in more energy-efficient and cost-effective homes and into researching home heating & cooling technology. By partnering with organizations like the Cold Climate Housing Research Center (CCHRC)⁵ communities in Southeast Alaska could be on the ‘cutting-edge’ of efficient housing technologies.

X. SOLID WASTE

Our recommendation is to research high-performance incinerators for non-recyclable materials. Partnerships should be formed with Northern Arizona University’s Institute for Tribal Environmental Professionals Multiple Solid Waste Programs; The Tribal Solid Waste Education & Assistance Program (TSWEAP), and The Tribal Waste and Response Assistance Program (TWRAP)⁶.

XI. COMMUNITY PRIORITIES

Using the Potential Climate Change Vulnerabilities and Adaptation Strategies for Tribal Communities matrix (see following two pages) each community is recommended to reevaluate this matrix, encouraged to adjust the priorities, and add items they feel are essential resources for their areas that will be affected by climate change. These evaluations will help these communities prioritize their concerns regarding natural resources in an inevitably changing climate.

⁵ <http://cchrc.org/about/cchrc/>

⁶ <https://www7.nau.edu/itep/main/Waste/>

Threat Matrix Evaluation Table: Potential Climate Change Vulnerabilities

DRIVERS									
	HIGHER TEMPERATURES	EARLIER SNOWMELT	MORE RAIN, LESS SNOW	MORE EXTREME FLOODEVENTS	DRAINAGE BASIN, GROUNDWATER DROUGHTS	SEA LEVEL RISE / OCEAN ACIDIFICATION	MORE EROSION	MORE FREQUENT & INTENSE WILDFIRES	CUMULATIVE IMPACTS
SUBSISTENCE ACTIVITIES	Shift or loss of traditional fish, plant and animal species	Barriers to fish species migration/ movement; shift or loss of traditional fish, plant, and animal species	Greater stress on cold-water species from warmer runoff; shift or loss of traditional fish, plant, and animal species	Reduced water quality for traditional aquatic species; habitat disturbance/loss	Reduced productivity/ greater stress on traditional fish, plant, and animal species	Loss of coastal/tidal wetland habitats and species; ocean and estuarine food web changes; loss of shellfish	Reduced water quality for traditional aquatic species; stream channel changes; habitat disturbance/loss	Reduced water quality for traditional aquatic species; increased sedimentation in streams; habitat and species disturbance/ loss	Dietary changes; loss of local food resources; change in hunting/ gathering practices; loss of income and culture
TRADITIONAL PRACTICES									Loss of culture & traditional medicinal plants and materials for jewelry, sculptures, ceremonial pieces, basketry, nets, and lodgings.
SACRED SITES & PRACTICES	Shift or loss of traditional fish, plant, and animal species	Reduced streamflows in summer/fall	Reduced streamflows in summer/fall	Damage to sacred sites; temporary inaccessibility to sacred sites; exposure of sacred artifacts and remains	Reduction in streamflows; reduced productivity/ greater stress on traditional fish, plant, and animal species	Inundation of/ damage to sacred sites; loss of access to sacred sites; shift or loss of traditional coastal species	Damage to sacred sites; loss of access to sacred sites; exposure of cultural resources	Damage to sacred sites; species disturbance/loss	Loss of traditional materials for ceremonies; loss or exposure of sacred sites, artifacts, & remains; changes in traditional timing of spiritual practices
WATER SUPPLY	Changes in runoff timing reducing seasonal availability; higher water demands	Reduced reliability; less groundwater recharge; decrease in summer/ fall runoff	Changes in runoff timing reducing seasonal availability; less groundwater recharge; reduced reliability	Damage to conveyance infrastructure; increased treatment; service interruptions	Reduced availability and reliability of surface water; less groundwater recharge; increased treatment; increased potential for overdrafting groundwater	Damage to coastal conveyance infrastructure; reduced supplies; increased treatment; degradation of coastal aquifers	Damage to conveyance infrastructure; increased treatment	Damage to conveyance infrastructure; increased treatment; service interruptions; sedimentation	Reduction in water availability; reduced quality or increased contamination of local surface and groundwater supplies; increase in water-related illnesses; potential conflicts over water rights; higher human water demands reduce water needed to support ecosystems/ species
WATER QUALITY	Increase in water-borne illnesses; taste and odor issues; decrease in dissolved oxygen increase in algal blooms; impacts to aquatic species	Seasonal changes in quality due to decreased summer/fall runoff	Seasonal changes in quality (such as reduced dissolved oxygen) due to decreased summer/fall runoff	Wastewater spills; contaminated stormwater runoff; turbidity	Increase in water-borne illnesses; taste and odor issues; higher contaminant loading; increase in algal blooms; decrease in dissolved oxygen; impacts to aquatic species	Increased by-products from treating brackish water; inundation of wastewater treatment facilities or discharge impacts; salinity intrusion into aquifers	Damage to conveyance and wastewater infrastructure; increased turbidity	Damage to infrastructure, increased turbidity/ sedimentation	
HEALTH	Increased mortality rates (especially for children and elderly); poor air quality; allergens increase; illnesses ¹ exacerbated; increased healthcare costs	Reduced water supply reliability and quality	Change in prevalence & spread of disease; reduced water supply reliability and quality	Change in prevalence & spread of diseases; mortality; displacement ²	Change in prevalence & spread of diseases; mortality; reduced water supply reliability; increased malnutrition; increased health care costs	Displacement; illness due to poor water quality; reduced coastal water supply reliability	Displacement; poor water quality; mudslides	Poor air and water quality; displacement; illnesses exacerbated, esp. respiratory illnesses; mortality; mudslides	Overall reduction in community health; increase in chronic and infectious diseases; increased health care costs; impacts associated with displacement

¹Illnesses - includes chronic, infectious, and vector borne diseases

²Displacement - encompasses associated health consequences, including mortality, due to economic disruption, loss of personal income, and disruption of social networks

Threat Matrix Evaluation Table: Potential Climate Change Adaptation Strategies

DRIVERS									
	CUMULATIVE IMPACTS	HIGHER TEMPERATURES	EARLIER SNOWMELT	MORE RAIN, LESS SNOW	MORE EXTREME FLOODEVENTS	LONGER, MORE FREQUENT DROUGHTS	SEA LEVEL RISE / OCEAN ACIDIFICATION	MORE EROSION	LONGER WILDFIRE SEASON / MORE FREQUENT & INTENSE WILDFIRES
SUBSISTENCE ACTIVITIES	Dietary/harvest changes; loss of local food resources; change in hunting/ gathering practices and crop yields; loss of income; changes in fire management (fewer burning windows)	Restore habitat to provide thermal refugia (i.e., riparian corridors); manage ecosystems to promote native species; promote traditional practices to restore traditional landscapes; promote policies that ensure tribal rights for subsistence practices	Restore habitat to remove barriers to fish migration; restore meadows restoration and implement forestry practices that help retain water in upper watersheds	Restore habitat to provide thermal refugia for cold waterspecies; manage ecosystems to promote native species; promote traditional practices to restore traditional landscapes; promote policies that ensure tribal rights for subsistence practices	Restore and enhance existing floodplain and wetland habitat; restore and manage watersheds to reduce erosion	Restore and manage habitat to promote native species; implement land use practices that promote water retention on-site; remove or minimize invasive species	Restore wetlands; manage sediment to maintain/ enhance wetland elevations; restore subtidal habitat to attenuate storm surge; promote traditional practices to restore traditional landscapes; protect upland habitat and transition zones to allow for wetland migration	Restore and enhance riparian corridors; promote forest management and reforestation practices that reduce erosion	Reduce forest density where needed via mechanical or hand thinning and/or prescribed burning; restore soil mantle; construct and maintain fuel breaks; restore meadows to help retain water; remove or minimize invasive species
TRADITIONAL PRACTICES	Loss of culture & traditional medicinal plants and materials for jewelry, sculptures, ceremonial pieces, basketry, nets, and lodgings; change in harvest								
SACRED SITES & PRACTICES	Loss of traditional materials for ceremonies; loss of sacred sites; changes in traditional timing of spiritual practices, restrictions on ceremonial use of fire	Restore and manage ecosystems to promote traditional materials/ native species; promote traditional practices to restore traditional landscapes	Restore forests and implement practices that help retain water in upper watersheds; promote traditional practices to restore traditional landscapes	Restore and manage ecosystems to promote traditional materials/ native species; promote traditional practices to restore traditional landscapes	Restore habitat to buffer sacred sites; build infrastructure (i.e., levees, sea walls) to protect sacred sites	Restore and manage habitat to promote native species; implement land use practices that promote water retention & reduce forest fuels; remove or minimize invasive species	Restore habitat to buffer sacred sites; build infrastructure to protect sacred sites; promote traditional practices to restore traditional landscapes	Restore habitat to buffer sacred sites; build infrastructure to protect sacred sites	Manage fuel loads to reduce fire severity; create fire breaks to protect sacred sites; remove or minimize invasive species; restore habitat
WATER SUPPLY	Reduction in water availability; reduced quality or increased contamination of local surface and/or groundwater supplies; increase in water-related illnesses; potential conflicts over water rights; reduction in water needed to support ecosystems/ species due to higher human demand; loss of ag. income	Increase storage capacity; improve conjunctive management; conserve water; restore habitat	Increase storage capacity; facilitate groundwater recharge basins; conserve water and energy; restore habitat in upper watersheds	Increase storage capacity; facilitate groundwater recharge basins; conserve water and energy; restore habitat in upper watersheds	Reinforce or relocate vulnerable conveyance infrastructure; improve treatment capacity	Increase storage capacity; improve conjunctive management; conserve water and energy; promote reduction of forest fuels	Reinforce or relocate vulnerable conveyance infrastructure; improve treatment capacity; diversify supply portfolio; consider desalination	Protect vulnerable conveyance infrastructure with habitat buffers; improve treatment capacity	Create fire breaks to protect infrastructure; improve treatment capacity; manage fuel and restore habitat to reduce risk
WATER QUALITY		Improve treatment capacity; promote use of wetlands in wastewater treatment	Habitat restoration that helps retain water in upper watershed to support summer/fall baseflows	Habitat restoration to support summer/fall baseflows; groundwater recharge/ conjunctive use	Improve wastewater systems to avoid spills; use green infrastructure to filter stormwater runoff	Improve treatment capacity; promote use of wetlands in wastewater treatment	Reinforce or relocate of wastewater facilities; brackish water desalination; wetland restoration	Protect vulnerable conveyance and wastewater infrastructure; improve treatment capacity	Fire breaks to protect infrastructure; improve treatment capacity; fuel management and habitat restoration to reduce risk
HEALTH	Overall reduction in community health; increase in chronic and infectious diseases; increased health care costs; impacts associated with displacement ¹	Establish community cooling centers; develop renewable energy sources; provide education and outreach on heat-related illnesses	Improve water supply reliability and water quality (see strategies above)	Provide education and outreach on disease prevention; improve water supply reliability and water quality (see strategies above)	Provide education and outreach on disease prevention; establish emergency shelters; establish funding for recovery assistance	Education and outreach on disease prevention; establish emergency water supplies; establish funding for assistance programs	Improve infrastructure to protect communities; improve water supply reliability and water quality (see strategies above)	Establish emergency shelters and water supplies; establish funding for recovery assistance	Establish emergency shelters and water supplies; establish funding for recovery assistance

¹Displacement - encompasses associated health consequences, including mortality, due to economic disruption, loss of personal income, and disruption of social network