

Memorandum

DATE October 2, 2020

TO Kristy Williams, MLTPA, Project Management Specialist
John Wentworth, MLTPA, Board President

FROM Tammy L. Seale, PlaceWorks, Climate Action & Resilience Associate Principal
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SUBJECT Eastern Sierra Sustainable Recreation and Tourism Initiative Vulnerability Assessment –
List of Hazards, Populations, and Assets

Introduction

The Eastern Sierra Sustainable Recreation and Tourism Vulnerability Assessment is an effort to analyze how climate change may harm recreation and tourism in the Eastern Sierra Region. The Eastern Sierra Region, or the Project Area, includes Alpine County, Mono County, and Inyo County, as well as the incorporated cities, four national parks, a national historic Site, a national monument, six national forests, and four state parks or reserves within these counties. In addition, the Project Area extends beyond the three-county boundary to include the entire boundary of Yosemite National Park and Sequoia National Park. This work is an opportunity to improve resiliency in the region in a holistic, replicable, and tailored way. The Vulnerability Assessment will serve as the foundation of a series of projects to help safeguard the recreation and tourism economy in the Eastern Sierra Region against both current and future hazard conditions.

Climate change is a long-term change in the average meteorological conditions in an area. Currently, the global climate is changing due to an increase in greenhouse gas (GHG) emissions that trap heat near the Earth's surface, changing Earth's climate system in several ways. These effects can lead to an increase in frequency and intensity of climate change hazards. According to the *California Adaptation Planning Guide*, climate change hazards have the potential to cause fatalities, injuries, property and infrastructure damage, interruption of recreation and tourism, and other types of harm or loss. These hazards can include flooding, severe weather, wildfires, landslides, and drought conditions, among others. This Vulnerability Assessment will evaluate the impacts created by these hazards and the ability of populations, assets, and activities in the Project Area to resist these hazards, and to assess which recreation and tourism activities within the Project Area are most vulnerable to climate change.

List of Hazards to Include in the Vulnerability Assessment

The Vulnerability Assessment will consider the extent to which the hazards identified as relevant for the Eastern Sierra region will be exacerbated by climate change. Table 1 presents PlaceWorks' list of recommended hazards for inclusion in the Vulnerability Assessment, including definitions and data sources. The PlaceWorks team will obtain the related data needed for these items to conduct an effective analysis following review and approval of the list of hazards by MLTPA.

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Table 1. List of Hazards

Hazard	Definition	Data Source
Air Quality, Smoke, and Ash	Air quality hazards include ozone levels that can be exacerbated by climate change and smoke and ash generated by wildfires, including wildfires outside of the project area.	<i>California 4th Climate Change Assessment</i> , CalEnviroScreen 3.0, Great Basin Unified Air Pollution Control District.
Drought	A drought is where conditions are drier than normal for a long period of time, making less water available for people and ecosystems. This hazard will consider loss of snowpack due to lack of precipitation.	Cal-Adapt, <i>California 4th Climate Change Assessment</i> , U.S. Forest Service ArcGIS Tool, <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> .
Extreme Heat & Warm Nights	Extreme heat is when temperatures rise significantly above normal levels. Warm nights are when minimum temperatures remain significantly above normal levels during nighttime hours. This hazard will consider loss of snowpack due to shifts in snow level to higher elevations, earlier snowmelt, and more precipitation falling as rain instead of snow.	Cal-Adapt, <i>California 4th Climate Change Assessment</i> , county hazard mitigation plans, U.S. Forest Service ArcGIS Tool, <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> .
Flooding	Inland flooding is when there is too much water on the ground to be carried away by drains, creeks, or rivers, or to soak into the soil. This includes flooding associated with rain-on-snow events and quickly melting snow.	2018 FEMA flood hazard maps, county hazard mitigation plans, U.S. Forest Service ArcGIS Tool, <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> .
Forestry Pests and Diseases	Pests and diseases caused by bacteria or viruses, fungal infections, and other conditions that can affect the health of forest trees and plants.	<i>California 4th Climate Change Assessment</i> , county hazard mitigation plans, EcoAdapt, <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> .
Human Health Hazards	Human health hazards are bacteria, viruses, parasites, and other organisms that can cause diseases in people. Climate-related human health hazards are often diseases carried by animals that are considered pests, such as mice and rats, mosquitos, and ticks.	<i>California 4th Climate Change Assessment</i> , county hazard mitigation plans.
Landslides and Debris Flows	A landslide happens when a slope, like the side of a hill or mountain, becomes unstable, causing soil and rocks to slide down slope.	California Geologic Survey, county hazard mitigation plans, <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> .

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT
LIST OF HAZARDS, POPULATIONS, AND ASSETS**

Hazard	Definition	Data Source
Severe Weather	Severe weather includes intense winds, lightning, hail, intense rainstorms, and related events.	<i>California 4th Climate Change Assessment</i> , county hazard mitigation plans, <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> .
Severe Winter Weather	Severe winter weather includes heavy snowfall, ice storms, extreme cold, avalanches, and similar events.	<i>California 4th Climate Change Assessment</i> . County hazard mitigation plans, <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> .
Wildfire	Wildfires are fires burning in vegetated areas, although they can spread into developed areas between urbanized and wildland areas (called the wildland-urban interface) where they can do damage to people and property.	California Department of Forestry and Fire Protection, Cal-Adapt, county hazard mitigation plans, <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> .

List of Populations and Assets to Include in the Vulnerability Assessment

The Vulnerability Assessment will consider six distinct categories of populations and assets, directly or indirectly related to the recreation and tourism economy, which may be exposed to climate change hazards, including the following:

- » **Populations:** Persons living, working, and/or visiting the Eastern Sierra region who are likely to be disproportionately harmed by climate change.
- » **Infrastructure:** Local, regional, state, and federal infrastructure and other structures that provide important services for recreation and tourism.
- » **Buildings and Facilities:** Essential buildings and facilities that support recreation and tourism activities.
- » **Recreation and Tourism Activities:** Specific recreation and tourism activities that contribute significantly to the Eastern Sierra economy.
- » **Ecosystems and Natural Resources:** A range of natural environments and priority resources in the Eastern Sierra region.
- » **Key Services:** Critical functions carried out by both local, regional, state, federal, and private agencies throughout the community.

Table 2 below provides a list of specific populations and assets for inclusion in the Eastern Sierra Vulnerability Assessment. In the assessment, PlaceWorks will distribute assets into location specific categories as appropriate, such as campgrounds in the Inyo National Forest or bicycle trails in Yosemite National Park. This will provide a more detailed and location specific evaluation.

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Table 2. List of Populations and Assets

Population or Asset	Description	Data Source
Populations		
Hospitality workers	Persons working in or supporting the hotel and lodging industry in the Eastern Sierra region.	U.S. Census
Outdoor workers	People who primarily work outdoors for the national parks/forests, state parks, local/regional parks, or nongovernmental organizations.	U.S. Census
Persons in tribal communities	Big Pine Band of Owens Valley Paiute Shoshone Indians of the Big Pine Reservation, Bishop Paiute Tribe, Bridgeport Paiute Indian Colony of California, Fort Independence Indian Community of Paiute Indians of the Fort Independence Reservation, Paiute Shoshone Indians of the Lone Pine Community of the Lone Pine Reservation, Timbisha Shoshone Tribe, Utu Utu Gwaitu Paiute Tribe of the Benton Paiute Reservation, Death Valley Timbi-Sha Shoshone Band of California, Washoe Tribe of Nevada and California, Miwok Tribes, Western Mono Tribes.	Bureau of Indian Affairs. 2018. American Indian Reservations / Federally Recognized Tribal Entities. https://tpc.maps.arcgis.com/home/item.html?id=688a89d0f30c4b9ab34cec26bc64a792 California Native American Commission. http://nahc.ca.gov/.
Retail workers	Persons working in retail stores located in the Eastern Sierra region that provide goods and services to both local communities and visitors.	U.S. Census
Seasonal residents	Persons who live in the Eastern Sierra region multiple months in a year, but not year-round.	Not mapped
Seasonal residents who live on single access roads	Persons who live in the Eastern Sierra region multiple months in a year and live on a single access road.	Not mapped
Short-term visitors	People who visit the Eastern Sierra region for short periods of time, weekends, or a few days, and who are not permanent residents of the region.	Not mapped
Indoor tourism workers	Persons working in the indoor tourism industry, such as at museums historical sites, visitor centers, and chamber of commerce.	U.S. Census
Travel industry workers	Persons works in industries such as airlines, rental car services, and bus lines that support the Eastern Sierra recreation economy.	U.S. Census

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Infrastructure		
Airports – commercial service	Eastern Sierra Regional Airport and Mammoth Yosemite Airport	Caltrans. 2019. Airport Boundaries. http://mltpa.maps.arcgis.com/home/item.html?id=1082ad016bc2457ca18451ecc49d1a75
Airports – charter/recreation/general aviation	Furnace Creek Airport, Independence Airport, Stovepipe Wells Airport, Alpine County Airport, Lee Vining Airport, Lone Pine Airport, Bryant Airport, Shoshone Airport.	
Bridges	83 State highway bridges, 61 local roadway bridges, U.S. Forest Service and National Park bridges.	Caltrans. 2019. Local Bridges. http://mltpa.maps.arcgis.com/home/item.html?id=b57bbb540b7e4de7a33b71e276cf4a28 Caltrans. 2019. State Highway Bridges. http://mltpa.maps.arcgis.com/home/item.html?id=f0f31a540f17414ba384127182f4e088
Bicycle trails	Bicycle trails or trails that allow bicycles in local and regional jurisdictions, This includes but is not limited to: Town of Mammoth Lakes, Mammoth Mountain California State Parks, Death Valley National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	MLTPA AGOL Site: USFS Trails, NPS Trails, MCRAT, ICRAT. MLTPA AGOL Site: MMSA Trails (not uploaded yet)
Communication facilities	Cell towers, radio towers, and other communication facilities within the 3 counties, Yosemite National Park, and Kings Canyon-Sequoia National Park.	Mono County GIS. 2018. Communication Sites. http://mltpa.maps.arcgis.com/home/item.html?id=6928264b088d4e3284e79318e1f8d514 Cal OES. 2018. Cal OES – CAPSNET System. http://mltpa.maps.arcgis.com/home/item.html?id=c640f73b9a884b45a9f4f462151e9960#
Culverts	A structure that allows water to flow under a road, railroad, or trail from one side to the other.	Mono County GIS. 2018. Culverts. http://mltpa.maps.arcgis.com/home/item.html?id=72eaeffa06d34530a2bec59940845403

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Dams	54 dams within the Eastern Sierra region.	Department of Water Resources, Division of Safety of Dams. 2018. California Jurisdictional Dams. http://mltpa.maps.arcgis.com/home/item.html?id=98a09bec89c84681ae1701a2eb62f599
Electrical substations	41 electrical substations in the Eastern Sierra region.	California Energy Commission. 2020. California Electrical Substations. http://mltpa.maps.arcgis.com/home/item.html?id=7f37f2535d3144e898a53b9385737ee0
Electrical transmission lines	LADWP and Southern California Edison transmission lines.	California Energy Commission. 2020. California Electric Transmission Lines. http://mltpa.maps.arcgis.com/home/item.html?id=260b4513acdb4a3a8e4d64e69fc84fee
Electric vehicle (EV) charging stations	14 EV charging stations in the Eastern Sierra Region. Five are private or for guest use only and 9 are for public use.	National Renewable Energy Laboratory. 2018. AlternativeFuelStation_USEnergy_2017. https://mltpa.maps.arcgis.com/home/item.html?id=d4a585652c554fd79a64a6023c486ce0
Erosion control structures	Erosion control structures on trails or paths in local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit, for the sections of these assets located within the established project area.	<i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i>
Flood control infrastructure	Levees or general structures in local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	FEMA National Flood Hazard Layer

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Hiking and horseback riding trails	Trails that allow hiking and/or horseback riding in local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	MLTPA AGOL Site: ESSRP Developed Recreation Sites, ICRAT, MCRAT, NPS_Trails, USUS_Trails_NonMotorized.
Lookout points	Cape Horn Vista Point, Leavitt Falls Vista Point, Grant Lake Scenic Viewpoint, Bald Mountain Lookout, Black Point Fissures, and Twin Lakes Vista.	MLTPA AGOL Site: ESSRP Developed Recreation Sites.
Major roads and highways	US-6, US-395, SR-4, SR-41, SR-88, SR-89, SR-108, SR-120, SR-127, SR-136, SR-140, SR-158, SR-168, SR-182, SR-190, SR-203, SR-266.	Caltrans. 2017. California_State_Highway. http://mltpa.maps.arcgis.com/home/item.html?id=22cd676ed1f74a7290f64dd1dc9b8363
Off-road vehicle areas	Snow-mobile or off-road vehicle paths for both summer and winter use in local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	MLTPA AGOL Site: ESSRP Developed Recreation Site, NPS_Trails, USFS_OSV_Routes,
Parking lots	Parking areas and parking lots associated with outdoor recreation and tourism facilities in local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	MLTPA AGOL Site: ESSRP Developed Recreation Site, ICRAT, MCRAT, Alpine County Parks, Mono County Parks, Inyo County Parks.
Power plants	33 power plants (1 natural gas, 2 solar, 7 geothermal, and 23 hydro-electric) in the Eastern Sierra region.	California Energy Commission. 2019. California Electric Power Plants. http://mltpa.maps.arcgis.com/home/item.html?id=b3e56d5c29004564830b452356623a86

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

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Ski Areas	Kirkwood Ski Area, Heavenly Ski Area, Carson Pass Snowpark, Mammoth Mountain Ski Area, June Mountain Ski Area, Badger Pass, and cross-country skiing areas.	MLTPA AGOL Site: ESSRP Developed Recreation Site.
Water and wastewater infrastructure	These facilities treat water for public use and treat wastewater so it can be safely discharged into the environment. These facilities service local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	State Water Resource Control Board. 2020. Wastewater Treatment Facilities. http://mltpa.maps.arcgis.com/home/item.html?id=0663b61d76b645419f2d40ebe5a70a22
Buildings and Facilities		
Campgrounds	184 campgrounds within the counties, Inyo National Forest, Humboldt Toiyabe National Forest, Stanislaus Forest, El Dorado National Forest, Town of Mammoth Lakes, Yosemite National Park, Kings Canyon National Park, Sequoia National Park, and BLM land.	MLTPA AGOL Site: ESSRP Developed Recreation Sites. Yosemite National Park Website, Kings Canyon and Sequoia National Park website.
Community centers	Kirkwood Community Center, Turtle Rock Park Community Center, Antelope Valley Community Center, Mono County Senior Citizens, Mono County Community Center, Community Center Park, Benton Community Center, Crowley Lake Community Center, Chalfant Community Center, Inyo Mono Senior Program.	Review of Google maps.
Developed picnic areas	27 picnic areas within the Eastern Sierra region.	MLTPA AGOL Site: ESSRP Developed Recreation Site.
Gas stations	An establishment along a roadway that sells gasoline and diesel products.	Cal OES. 2019. CA Energy Commission – Gas Stations. http://mltpa.maps.arcgis.com/home/item.html?id=ec575b2693f64199866bc18744d232fe
Golf courses	Six golf courses within the Eastern Sierra region.	Review of Google maps. MLTPA AGOL Site: ESSRP_Golf_Courses. (Use this layer)

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

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Government and administrative buildings	The administrative and operational facilities in local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	N/A
Historic buildings and facilities	Buildings and facilities listed on the National Register of Historic Places and/or on the California Office of Historic Preservation list of California Historic Landmarks.	Cal OES. 2019. National Register of Historic Places (Public). http://mltpa.maps.arcgis.com/home/item.html?id=873fa18787ec4166987dd9d5090753df
Homes and residential structures	Homes and residential structures within the Eastern Sierra Region that support permanent residents, seasonal residents, and seasonal visitors.	N/A
Hotels and lodging	Establishments providing accommodations, meals, and other services to travelers or visitors.	Local and regional land use and zoning maps.
Interpretive sites	Recreation sites that inform visitors of the meaning and relationships contained in the area through personal experience and illustrations. These are located in California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	MLTPA AGOL Site: ESSRP Developed Recreation Site.
Medical facilities	Mammoth Hospital, Northern Inyo Hospital, Southern Inyo Healthcare District	American Hospital Association. 2020. CA_Hospitals_DHCS. https://www.arcgis.com/home/item.html?id=96dc8403d949420f98bf9fe9bd8a0351

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

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Miscellaneous visitor-serving park facilities	Restrooms, play structures, and other facilities in local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	MLTPA AGOL Site: ESSRP Developed Recreation Site.
Public safety buildings	Local and regional fire stations, police stations, and sheriff stations in local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	N/A
Ranger Stations	7 ranger stations in the USFS area, 7 ranger stations in Yosemite National Park, 14 ranger stations within Kings Canyon/Sequoia National Park, 1 ranger station in Devils Postpile National Monument, 3 ranger stations in Death Valley National Park.	U.S. Forest Service. 2020. ArcGIS Tool. https://usfs.maps.arcgis.com/apps/MapJournal/index.html?appid=8e405de85b964f7592d83b53303cd82a National Park Service websites for each park or monument.
Restaurants and food establishments	Establishments where people sit and eat meals that are prepared and served on-site.	Local and regional land use and zoning maps.
Retail centers	Buildings that supports economic activities such as retail and tourism.	Local and regional land use and zoning maps.
RV Parks	RV Parks and Campsites within local and regional jurisdictions, California State Parks, Death Valley National Park, Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit.	HCD. 2019. MobileHomesRVParks. http://mltpa.maps.arcgis.com/home/item.html?id=2385151e48b04d86a9f58471e058c062
Short-term rentals	Homes that are rented out for short periods of time persons in the short-term visitor category.	<i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i>

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Tribal cultural sites	Cultural sites on tribal lands that support recreation and tourism. Tribal lands include, but are not limited to, lands owned or managed by Big Pine Band of Owens Valley Paiute Shoshone Indians of the Big Pine Reservation, Bishop Paiute Tribe, Bridgeport Paiute Indian Colony of California, Fort Independence Indian Community of Paiute Indians of the Fort Independence Reservation, Paiute Shoshone Indians of the Lone Pine Community of the Lone Pine Reservation, Timbisha Shoshone Tribe, Utu Utu Gwaitu Paiute Tribe of the Benton Paiute Reservation, Death Valley Timbi-Sha Shoshone Band of California, Washoe Tribe of Nevada and California.	Bureau of Indian Affairs. 2018. American Indian Reservations / Federally Recognized Tribal Entities. https://tpc.maps.arcgis.com/home/item.html?id=688a89d0f30c4b9ab34cec26bc64a792 California Native American Commission. http://nahc.ca.gov/.
Visitor centers	Buildings and facilities that provide educational information to visitors about the park, site, or general area.	MLTPA AGOL Site: ESSRP Developed Recreation Site.
Water recreation sites	Lakes, rivers, and streams that support water-based recreation. There are water recreation sites in the Kings Canyon National Park, Sequoia National Park, Yosemite National Park, El Dorado National Forest, Humboldt-Toiyabe National Forest, Inyo National Forest, Stanislaus National Forest, and Lake Tahoe Basin Management Unit , LADWP land, and Bureau of Land Management land.	MLTPA AGOL Site: ESSRP Developed Recreation Site, ICRAT, MCRAT, American Whitewater Data (Pending)
Recreation and Tourism Activities^{1,2}		
Bicycling	Riding bicycles or other non-motorized vehicles on paved or unpaved trails.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Camping, backpacking, primitive camping	The activity of staying away from home in a shelter such as a tent or recreation vehicle.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Cross-country skiing	Skiing or snowshoeing where skiers rely on their own momentum to move across snow-covered terrain.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Backcountry Skiing	Skiing, or Snowboarding in the backcountry, not on a developed ski area. This sport is characterized by human powered ascents and downhill style ski descents typically conducted on federal public lands. Human-powered snow sports include backcountry skiing and alpine touring.	MLTPA AGOL Site: Backcountry Ski Zones (delivery and upload pending)
Downhill skiing	Skiing, snowboarding, or related activity on a downhill slope, usually involving chairlifts or pully systems.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Driving for pleasure	Driving in a car, motorcycle, or other vehicle for reasons related to fun or pleasure.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Fishing	The activity of catching fish for either food or sport.	MLTPA AGOL Site: ESSRP Developed Recreation Site, ICRAT, MCRAT, CA Lakes Clipped to ESSRP Extent. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Gathering forest products	The activity of collecting forest products such as firewood, plants, or rocks and minerals.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Hiking/walking	The activity of going on long walks, usually on a trail or footpath.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Horseback riding	Riding horses in designated areas or trails.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Hunting	The activity of catching terrestrial animals or game for either food or sport.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Motorized trail activities	A summer activity of using an off-road vehicle on a designated trail or path.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Other snow activities	Activities that occur during winter or when snow is on the ground (excluding downhill and cross-country skiing) such as snowmobiling, ice skating, and snow shoeing.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Picnicking	The activity of eating outdoors in a park or designated picnic site.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Rock climbing	. Rock Climbing is a multidisciplinary activity in which humans move over stone in a variety of ways. Some of the different disciplines include bouldering, sport climbing, traditional climbing, scrambling and peak bagging. The Eastern Sierra region is rich in all disciplines of rock climbing. Climbers flock to the area all months of the year to take advantage of the world class climbing opportunities found here.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Viewing natural features and wildlife	Viewing scenic features, natural resources, or wildlife.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Visiting historic sites and nature centers	The activity of traveling to designated historic sites, cultural centers, or nature centers.	MLTPA AGOL Site: ESSRP Developed Recreation Site. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Water-based activities	Motorized boating, jet skiing, kayaking, stand up paddle boarding, canoeing, windsurfing, swimming, and other water-based activities that do not include fishing.	MLTPA AGOL Site: ESSRP Developed Recreation Site, ICRAT, MCRAT, CA Lakes Clipped to ESSRP Extent. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Wellness	The activity of reducing tension or anxiety in nature.	MLTPA AGOL Site: ESSRP Developed Recreation Site, ICRAT, MCRAT. <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Ecosystems and Natural Resources³		
Aquatic and open water	Ecosystems that have permanent sources of water, such as lakes, streams, and rivers.	EcoAdapt vulnerability assessments for the Sierra and Southern California regions.
Mixed conifer forest	Montane hardwood conifer, Sierran mixed conifer, subalpine conifer, eastside pine, Jeffrey pine, pinyon-juniper, ponderosa pine, red fir.	EcoAdapt vulnerability assessments for the Sierra and Southern California regions.
Deciduous forest	Broadleaf trees, shrubs, perennial herbs, and mosses.	EcoAdapt vulnerability assessments for the Sierra and Southern California regions.
Desert scrub	Joshua tree, Pinyon-juniper at higher elevations. Desert wash, desert riparian, palm oasis, desert succulent shrub, and alkali scrub at lower elevations.	EcoAdapt vulnerability assessments for the Sierra and Southern California regions.
Desert woodland	Xeric woodlands with high temperatures and lack of regular precipitation.	EcoAdapt vulnerability assessments for the Sierra and Southern California regions.
Grassland	Annual grassland, perennial grassland.	EcoAdapt vulnerability assessments for the Sierra and Southern California regions.
Shrubland	Alpine dwarf-shrub, bitterbrush, sagebrush, low sage, montane chaparral, mixed chaparral, chamise-redshank chaparral, juniper, aspen, montane riparian, valley foothill riparian.	EcoAdapt vulnerability assessments for the Sierra and Southern California regions.
Wetland	Marshes, ponds, or edges of lakes that are low-lying and frequently flood.	EcoAdapt vulnerability assessments for the Sierra and Southern California regions.
Sensitive and critical wildlife species	The critical habitat identified by the U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, or a bi-state report for Burrowing Owl, Mountain Yellow Legged Frog, Sage Grouse, Sierra Nevada Yellow Legged Frog, Yosemite Toad, Pacific Fisher, Sierra Nevada Bighorn Sheep, and Fish Slough milk-vetch.	EcoAdapt vulnerability assessments for the Sierra and Southern California regions and the Inyo National Forest Land Management Plan.
Scenic Views	A visual resource that attracts people to the town and wider area for its intrinsic beauty.	N/A
Key Services		
Air services	Air services include private planes and commercial airlines that provide access to and from other regions of California and the United States.	Caltrans. 2019. Airport Boundaries. http://mltpa.maps.arcgis.com/home/item.html?id=1082ad016bc2457ca18451ecc49d1a75 <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i>

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Communication services	Communication services include radio, television, cellular and landline phone, and Internet.	<p>Mono County GIS. 2018. Communication Sites. http://mltpa.maps.arcgis.com/home/item.html?id=6928264b088d4e3284e79318e1f8d514</p> <p>Cal OES. 2018. Cal OES – CAPSNET System. http://mltpa.maps.arcgis.com/home/item.html?id=c640f73b9a884b45a9f4f462151e9960#</p> <p><i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i></p>
Emergency medical services	Emergency medical response services are usually ambulances but may also be fire or police respondents if ambulances are not available.	<p>American Hospital Association. 2020. CA_Hospitals_DHCS. https://www.arcgis.com/home/item.html?id=96dc8403d949420f98bf9fe9bd8a0351</p>
Electricity delivery	Services provided by Southern California Edison, LADWP, and other electrical providers.	<p>California Energy Commission. 2020. California Electric Transmission Lines. http://mltpa.maps.arcgis.com/home/item.html?id=260b4513acdb4a3a8e4d64e69fc84fee</p> <p><i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i></p>
Information services	Services that provide park and emergency information to seasonal residents and visitors.	<p><i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i></p> <p>Recreation and General Management Plans.</p>
Government services	Local, regional, State, and federal government administration services such as those that provide fishing and access permits.	Recreation and General Management Plans.
Mail service	Services provided by the United States Postal Service, Amazon, FedEx, and other mail or package delivery services in the Eastern Sierra region.	<p>United States Postal Service</p> <p><i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i></p>
Public safety response	Fire and police services provided by local police and fire departments, county sheriff and fire departments, CAL FIRE, California Highway Patrol, and the U.S. Forest Service.	Recreation and General Management Plans.

**EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT**

LIST OF HAZARDS, POPULATIONS, AND ASSETS

Population or Asset	Description	Data Source
Road access	Road clearing services (snow and tree removal) provided by County Public Works Department, Caltrans, National Parks Service, and U.S. Forest Service.	<i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Search and Rescue	Services provided by fire departments, sheriff departments, and volunteers to help those who become lost or injured during recreation and tourism activities.	<i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Trail maintenance	Trail maintenance and restoration services provided by, the U.S. Forest Service, National Park Service, Bureau of Land Management, and a variety of local partners.	<i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Transit access	Public transit access is provided by the Eastern Sierra Transit agency. This agency provides transit services to the eastern sierra region including Mammoth Lakes, Sierra Hikers, Dial-a-Ride, and longer routes along US Route 395.	MLTPA AGOL Site: ESSRP Transit Stops (Layer pending, it will be a combination of ESTA and Yarts data). <i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.
Vital goods	Delivery of goods and services that provide basic needs for health and comfort. These include food, fuels such as gasoline and propane, medicine, basic hygienic supplies, and clothing, among others.	Recreation and General Management Plans.
Water and wastewater	These services involve treating and transporting water to be used by customers and transporting and treating wastewater so it can be safely released into the environment. These services are provided by water districts, community services districts, public utility districts, private wells, and septic systems.	<i>Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada</i> Recreation and General Management Plans.

Conclusion and Next Steps

PlaceWorks prepared these lists based on the Vulnerability Assessment Method Recommendation Memo dated August 12, 2020. The hazards are based on those selected for the Town of Mammoth Lakes Vulnerability Assessment and review of other vulnerability assessments in the project areas prepared by EcoAdapt and the U.S. Forest Service. The infrastructure, buildings and facilities, and recreation and tourism activities are based on the U.S. Forest Service Region 4 and Region 5 Vulnerability Assessments. The recreation and tourism activities, specifically, were compiled based on Table 5.12 of the *Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada*. PlaceWorks will begin the Vulnerability Assessment upon confirmation of the hazards, populations, and assets.

EASTERN SIERRA SUSTAINABLE RECREATION AND TOURISM INITIATIVE
CLIMATE VULNERABILITY ASSESSMENT
LIST OF HAZARDS, POPULATIONS, AND ASSETS

Endnotes

¹ This selection is based on the Table 5.12 of the U.S Forest Service's *Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada*.

² Each asset type will be assessed based on location in a specific jurisdiction, park, or forest.

³ The ecosystems and natural resources are based on ICF's landcover types in the study area and focal habitats.