

Cultural Coastal Habitats

Climate Vulnerability Assessment and Adaptation Strategies for Kaua'i

HABITAT DESCRIPTION

Cultural coastal habitats include: lo'i pa'akai (salt ponds), loko i'a (fishponds), lo'i kalo (flooded taro farmland), and iwi kūpuna (ancestral burials). The salt ponds in Hanapēpē are used to cultivate pa'akai (sea salt). Fishponds include saltwater, brackish, or freshwater enclosures (natural or artificial) historically used to cultivate fish, plants, and other freshwater and saltwater food sources in coastal areas. Kalo is primarily cultivated in the Hanalei Valley and provides a staple food in Hawaiian culture. Iwi kūpuna are traditionally buried along the coast and highly valued and carefully protected within Hawaiian culture.



HABITAT VULNERABILITY

Cultural coastal habitats are vulnerable to changes in climate factors and disturbances that affect water availability and quality and increase pollutants and sediment delivery. Sea level rise, coastal flooding, and erosion are likely to alter habitat extent, and disturbances (e.g., storms, wind) may also destroy structures or contribute to injury or mortality of crops and fish stocks. Non-climate stressors contribute to cultural coastal habitat loss and degradation by damaging structures, increasing sedimentation, introducing nutrients and contaminants, and allowing the establishment of invasive species. The historical extent of all cultural coastal habitats is significantly reduced, but many groups influence support and protection.

PROJECTED FUTURE CHANGES	POTENTIAL IMPACTS ON CULTURAL COASTAL HABITATS
Increased rate of sea level rise and saltwater intrusion +0.4m (1.3 ft) to +3.3m (10.8 ft)	<ul style="list-style-type: none"> Flood damage and/or destruction of fishponds, kalo crops, and iwi kūpuna Increased water and soil salinity, altering lo'i kalo and fishpond habitat quality
Increased air temperatures +2.0°C (3.6°F) to +3.5°C (6.3°F)	<ul style="list-style-type: none"> Altered germination in wetland plants More rapid evaporation in salt ponds, potentially speeding production
Reduced and/or more variable streamflow	<ul style="list-style-type: none"> Reduced kalo survival during low flows Increased fishpond sedimentation during high flows
Increased drought risk and changes in precipitation	<ul style="list-style-type: none"> Limited water availability for lo'i kalo Changes in salt harvest amount and season length (needs dry conditions)
Increased stream and ocean temperatures	<ul style="list-style-type: none"> Increased disease in kalo crops Altered behavior, growth, and survival of fishpond species
Increased frequency and strength of tropical storms/hurricanes and high winds , increasingly variable riverine flooding	<ul style="list-style-type: none"> Damage and mortality within native species, especially those already stressed by drought Possible loss of kalo crops due to flooding Damage to irrigation infrastructure
Increased insects and disease	<ul style="list-style-type: none"> Crop damage and/or native aquatic species mortality

Fishponds, lo'i kalo



Salt ponds, iwi kūpuna



Drivers of Ecosystem Service Vulnerability

- Climatic factors and disturbance regimes:** Sea level rise, saltwater intrusion, air temperature, streamflow, drought, stream temperature, sea surface temperature, precipitation, tropical storms/hurricanes, wind, riverine flooding, disease, insects
- Non-climate factors:** Residential & commercial development, invasive trees/shrubs, recreation, pollutions & poisons

ADAPTIVE CAPACITY

Factors that enhance adaptive capacity:

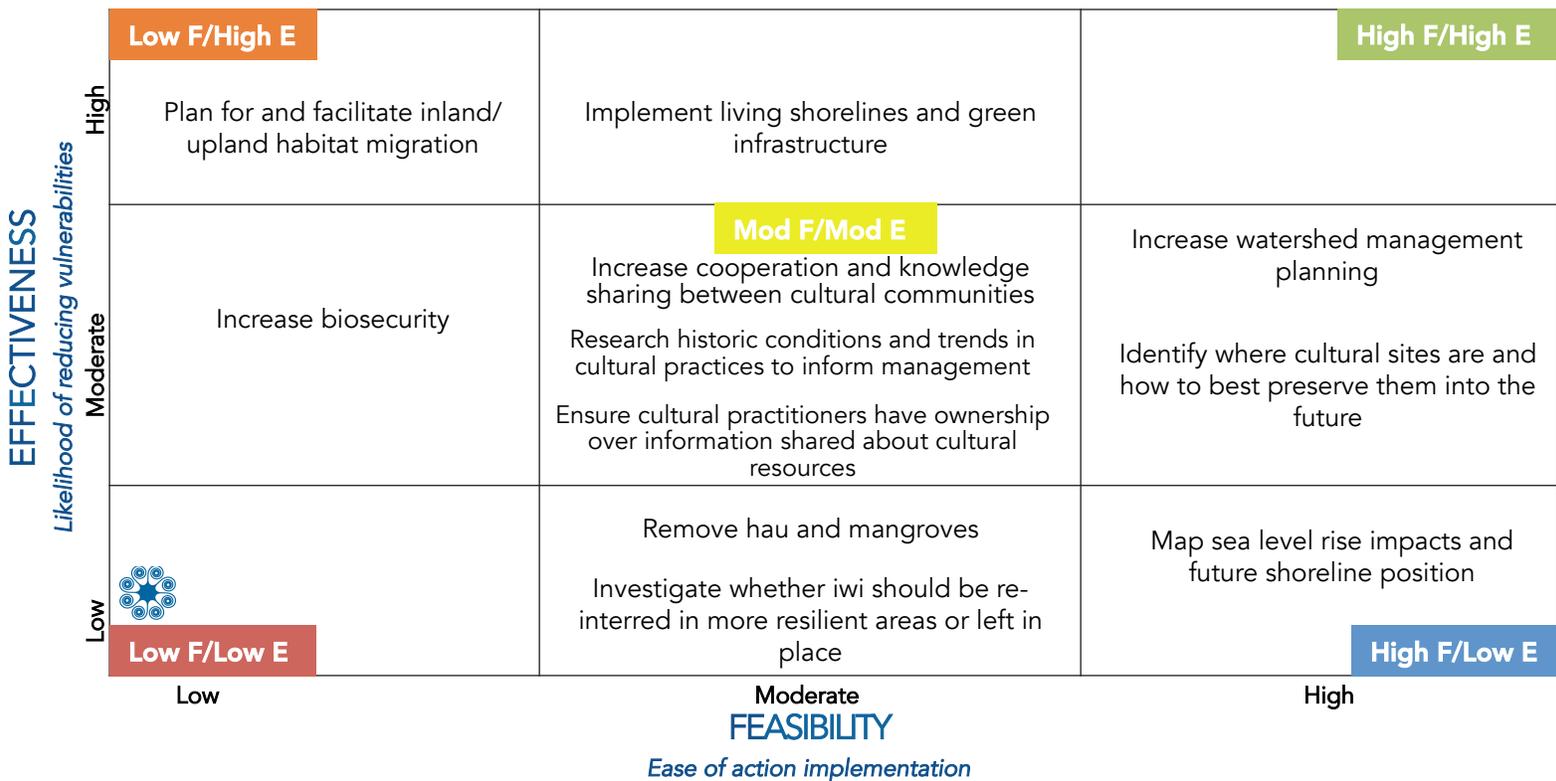
- + High habitat extent, which includes the majority of Hawaiian kalo production and almost all salt production
- + High diversity in fishpond species and kalo varieties
- + Rights to access land and continue traditional practices is protected by the state constitution

Factors that undermine adaptive capacity:

- Fishpond systems and lo'i kalo are fragmented by factors such as development and water diversions
- Habitat degradation (e.g., hydrological alterations) reduces habitat recovery from disturbances
- Relatively low public and societal support

ADAPTATION STRATEGIES FOR CULTURAL COASTAL HABITATS

Types of Adaptation Approaches	Adaptation Strategy	Specific Action
Resistance: Prevent climate change from affecting a resource. <i>Near-term approach</i>	Manage invasive species	<ul style="list-style-type: none"> Remove hau and mangroves Increase biosecurity
Resilience: Help resources weather climate change by avoiding the effects of or recovering from changes <i>Near- to mid-term approach</i>	Maintain water quality and quantity	<ul style="list-style-type: none"> Increase watershed management planning
	Protect cultural sites and practices	<ul style="list-style-type: none"> Identify where cultural sites are and how to best preserve them into the future Investigate whether iwi should be re-interred in more resilient areas or left in place Ensure cultural practitioners have ownership over what kind and detail of information is shared about important cultural resources
Response: Intentionally accommodate change and adaptively respond to variable conditions <i>Long-term approach</i>	Anticipate and facilitate habitat migration	<ul style="list-style-type: none"> Plan for and facilitate inland/upland habitat migration Implement living shorelines and green infrastructure
Knowledge: Gather information about climate impacts and/or management effectiveness in addressing climate challenges <i>Near- to long-term approach</i>	Research sea level rise impacts on cultural coastal habitats and traditional practices	<ul style="list-style-type: none"> Research historic conditions and trends in cultural practices to inform current management Map sea level rise impacts and future shoreline position
Collaboration: Coordinate efforts and capacity across landscapes and agencies <i>Near- to long-term approach</i>	Support linkages between cultural practitioners	<ul style="list-style-type: none"> Increase cooperation and knowledge sharing between cultural communities



Further information and citations can be found in the Hawaiian Islands Climate Vulnerability and Adaptation Synthesis and other products available online at www.bit.ly/HawaiiClimate.