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**

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<th>Driving Factor</th>
<th>Potential Impacts on Cultural Coastal Habitats</th>
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| Increased rate of sea level rise and saltwater intrusion | • 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 | • Altered germination in wetland plants  
• More rapid evaporation in salt ponds, potentially speeding production |
| Reduced and/or more variable streamflow | • Reduced kalo survival during low flows  
• Increased fishpond sedimentation during high flows |
| Increased drought risk and changes in precipitation | • Limited water availability for lo‘i kalo  
• Changes in salt harvest amount and season length (needs dry conditions) |
| Increased stream and ocean temperatures | • Increased disease in kalo crops  
• Altered behavior, growth, and survival of fishpond species |
| Increased frequency and strength of tropical storms/hurricanes and high winds | • 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 | • Crop damage and/or native aquatic species mortality |

**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**

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<tr>
<th>Types of Adaptation Approaches</th>
<th>Adaptation Strategy</th>
<th>Specific Action</th>
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| **Resistance:** Prevent climate change from affecting a resource. *Near-term approach* | Manage invasive species | • Remove hau and mangroves  
• Increase biosecurity |
| **Resilience:** Help resources weather climate change by avoiding the effects of or recovering from changes *Near- to mid-term approach* | Maintain water quality and quantity | • Increase watershed management planning |
| | Protect cultural sites and practices | • 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 *Long-term approach* | Anticipate and facilitate habitat migration | • 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 *Near- to long-term approach* | Research sea level rise impacts on cultural coastal habitats and traditional practices | • 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 *Near- to long-term approach* | Support linkages between cultural practitioners | • Increase cooperation and knowledge sharing between cultural communities |

**Likelihood of reducing vulnerabilities**
- **Low F/Low E**
  - Plan for and facilitate inland/upland habitat migration
  - Increase biosecurity
- **Low F/High E**
  - Implement living shorelines and green infrastructure
  - Remove hau and mangroves
  - Investigate whether iwi should be re-interred in more resilient areas or left in place
- **High F/High E**
  - Increase watershed management planning
  - Identify where cultural sites are and how to best preserve them into the future
  - Map sea level rise impacts and future shoreline position

**Ease of action implementation**
- **High**
- **Moderate**
- **Low**

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.

Hilberg LE, Gregg RM. 2018. Cultural Coastal Habitats: Vulnerability and Adaptation Brief for Kaua’i. EcoAdapt, Bainbridge Island, WA. Produced in cooperation with the Pacific Islands Climate Change Cooperative, with funding from the U.S. Fish and Wildlife Service.