

# Food & Fiber

Climate Vulnerability Assessment and Adaptation Strategies for Maui, Lānaʻi, and Kahoʻolawe

## ECOSYSTEM SERVICE DESCRIPTION

Agriculture, aquaculture, hunting, fishing, and gathering are used to obtain food and fiber resources, and these include many traditional cultural practices such as feral pig hunting, taro cultivation, fishpond aquaculture, and forest, marine, and shoreline gathering. Native species historically and currently harvested for ethnobotanical purposes are critical links to bridge past and present Hawaiian culture. Commercial food production was dominated by sugarcane and pineapple plantations for most of the twentieth century; however, both of these crops have declined significantly over the last several decades. Since 1980, the production of macadamia nuts, coffee, and diversified agriculture (e.g., fruits and vegetables) has increased dramatically.



## ECOSYSTEM SERVICE VULNERABILITY

Food and fiber ecosystem services are vulnerable to climate-driven factors that affect water quality and/or supply, increasing stress in cultivated and native species. Disturbances, such as storms, wildfire, insects, and disease, impact water resources and can also cause damage or mortality in species that are cultivated or harvested. Non-climate stressors introduce nutrients and pollutants into habitats where many species are sensitive to contaminants and impact surface and groundwater availability used for irrigation. Invasive species compete with native species for resources, alter predator/prey dynamics, and can change ecosystem structure and function, affecting food and fiber availability. Overall, food security in the Hawaiian Islands is low, but some successful restoration efforts are occurring and public support for this ecosystem service is high.

PROJECTED FUTURE CHANGES	POTENTIAL IMPACTS ON FOOD & FIBER
Increased <b>water temperatures</b>	<ul style="list-style-type: none"> <li>Altered aquatic species growth, distribution, and abundance</li> <li>Increased likelihood of Pythium rot in taro</li> </ul>
Increased <b>ocean acidification</b>	<ul style="list-style-type: none"> <li>Reduced calcification in harvestable marine organisms</li> </ul>
Reduced <b>precipitation</b> and increased <b>drought risk</b> <i>Except for windward slopes</i>	<ul style="list-style-type: none"> <li>Reduced health of native ecosystems due to water stress</li> <li>Limited production and potential crop mortality due to decreased soil moisture and water availability</li> </ul>
Increased <b>air temperatures</b> +2.0°C (3.6°F) to +3.5°C (6.3°F)	<ul style="list-style-type: none"> <li>Increased thermal stress and evapotranspiration, reducing agricultural production</li> </ul>
Increased rate of <b>sea level rise</b> and <b>shoreline change</b>	<ul style="list-style-type: none"> <li>Increased erosion, flooding, and saltwater intrusion, affecting coastal food sources and taro crops</li> </ul>
Increased frequency and strength of <b>tropical storms/hurricanes</b>	<ul style="list-style-type: none"> <li>Introduction of large amounts of sediment into lowland/coastal habitats</li> <li>Inundation of taro fields and fishponds</li> </ul>
Increased <b>wildfire</b>	<ul style="list-style-type: none"> <li>Native habitat damage and possible conversion to non-native grasslands</li> </ul>
Increased <b>insects and disease</b>	<ul style="list-style-type: none"> <li>Damage and mortality in both cultivated and native species</li> </ul>

### Canoe plants, other moveable plants, & non-native animals



### Reef/nearshore ecosystems & native forest plants



### Drivers of Ecosystem Service Vulnerability

- **Climatic factors and disturbance regimes:** Water temperature, ocean pH, precipitation, drought, air temperature, sea level rise, tropical storms/hurricanes, wildfire, insects, disease
- **Non-climate factors:** Residential & commercial development, pollution/poisons, roads/highways/trails, groundwater development, water diversions, invasive species (pathogens/parasites, flammable grasses, mammalian predators, ungulates, trees/shrubs, reptiles/amphibians)

## ADAPTIVE CAPACITY

### Factors that enhance adaptive capacity:

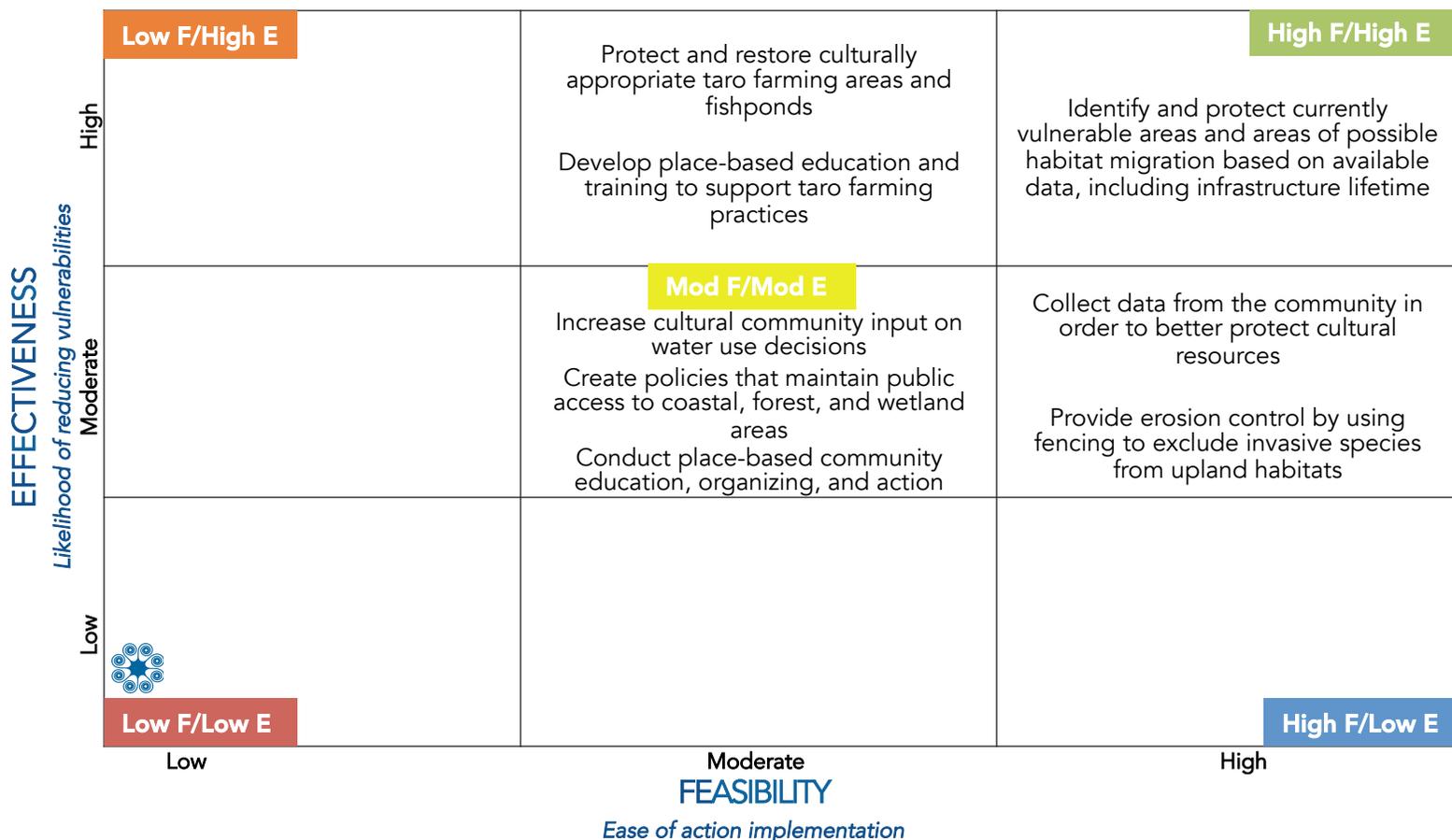
- + High public value
- + Taro production has increased
- + Some fishpond restoration efforts have been successful
- + Taro fields and fishponds support endangered waterbirds, increasing incentives for habitat conservation

### Factors that undermine adaptive capacity:

- Relatively low societal support, with very little funding available for this ecosystem service
- Low food security in the Hawaiian Islands

# ADAPTATION STRATEGIES FOR FOOD & FIBER

Types of Adaptation Approaches	Adaptation Strategy	Specific Action
<b>Resistance:</b> Prevent climate change from affecting a resource. <i>Near-term approach</i>	Manage invasive species	<ul style="list-style-type: none"> <li>Provide erosion control by using fencing to exclude invasive species from upland habitats</li> </ul>
<b>Resilience:</b> Help resources weather climate change by avoiding the effects of or recovering from changes <i>Near- to mid-term approach</i>	Protect cultural practices related to food & fiber provisioning	<ul style="list-style-type: none"> <li>Create policies that maintain public access to coastal, forest, and wetland areas</li> <li>Protect and restore culturally appropriate taro farming areas and fishponds</li> <li>Increase cultural community input on water use decisions</li> </ul>
<b>Response:</b> 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"> <li>Identify and protect currently vulnerable areas and areas of possible habitat migration based on available data, including infrastructure lifetime</li> </ul>
<b>Knowledge:</b> Gather information about climate impacts and/or management effectiveness in addressing climate challenges <i>Near- to long-term approach</i>	Increase understanding of resources in need of protection	<ul style="list-style-type: none"> <li>Collect data from the community in order to better protect cultural resources</li> </ul>
<b>Collaboration:</b> Coordinate efforts and capacity across landscapes and agencies <i>Near- to long-term approach</i>	Increase community participation in place-based restoration	<ul style="list-style-type: none"> <li>Develop place-based education and training to support taro farming practices</li> <li>Conduct place-based community education, organizing, management, and action focused on native habitat restoration, cultural practices, and climate change impacts</li> </ul>



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](http://www.bit.ly/HawaiiClimate).

Hilberg LE, Gregg RM. 2018. Food & Fiber: Vulnerability and Adaptation Brief for Maui, Lāna'i, and Kaho'olawe. EcoAdapt, Bainbridge Island, WA.

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