

# Food & Fiber

Climate Vulnerability Assessment and Adaptation Strategies for Hawai'i

## ECOSYSTEM SERVICE DESCRIPTION

Food and fiber ecosystem services include non-industrial diversified agriculture that is ecologically and culturally appropriate, intended for local consumption, and carried out within a closed system. Aquaculture, hunting, fishing, and gathering, all of which involve traditional cultural practices, are also used to obtain food and fiber resources. Native, non-native, and invasive species are all utilized for food and fiber. Some non-native and invasive species (e.g., pigs, deer) compete with native species for resources, and can change the structure and function of native ecosystems, affecting conservation efforts as well as food and fiber availability.



## ECOSYSTEM SERVICE VULNERABILITY

Climate-driven changes may reduce water supply and quality, impacting cultivated crops and native species by stressing native ecosystems and limiting crop irrigation and plant growth. Food and fiber species may also be impacted by disturbances that damage habitats and infrastructure and cause direct species injury or mortality (e.g., storms, wildfire, insects, disease). Non-climate stressors reduce habitat extent, introduce pollutants, and diminish surface water and groundwater sources, degrading habitat quality and availability for harvestable plant and animal species. Additionally, invasive plants and wildlife alter native ecosystems, in many cases out-competing native species for resources or leading to the damage or decline of cultivated and/or wild plants and animals.



### Drivers of Ecosystem Service Vulnerability

- **Climatic factors and disturbance regimes:** Precipitation, soil moisture, air temperature, tropical storms/hurricanes, riverine flooding, sea level rise, saltwater intrusion, drought, streamflow, wind & circulation, wildfire, insects, disease
- **Non-climate factors:** Residential & commercial development, agriculture & aquaculture, pollution & poisons, energy production, roads/highways/trails, groundwater development, water diversions, recreation, invasive species (parasites & pathogens, flammable grasses, amphibians/reptiles, mammalian predators, ungulates, trees/shrubs, fish, social insects), population growth

PROJECTED FUTURE CHANGES	POTENTIAL IMPACTS ON FOOD & FIBER
Changes in <b>precipitation</b> , reduced <b>soil moisture</b> , and increased <b>drought risk</b>	<ul style="list-style-type: none"> <li>• Reduced health and integrity of native ecosystems due to water stress</li> <li>• Changes in crop suitability for areas that become significantly wetter or drier</li> </ul>
Increased <b>air temperatures</b>	<ul style="list-style-type: none"> <li>• Increased thermal stress and evapotranspiration</li> </ul>
Increased frequency and strength of <b>tropical storms/hurricanes</b> and increasingly variable <b>riverine flooding</b>	<ul style="list-style-type: none"> <li>• Introduction of large amounts of sediment into lowland/coastal habitats</li> <li>• Inundation of taro crops and fishponds and the destruction of infrastructure</li> <li>• Damage to forest vegetation and potential loss of crops</li> </ul>
Increased rate of <b>sea level rise</b> and <b>saltwater intrusion</b> +0.4m (1.3 ft) to +3.3m (10.8 ft)	<ul style="list-style-type: none"> <li>• Loss of taro crops due to inundation and increased water and/or soil salinity</li> <li>• Shifts in estuarine and fishpond habitat abundance and distribution</li> </ul>
Lower and/or more variable <b>streamflows</b>	<ul style="list-style-type: none"> <li>• Reduced survival of taro crops due to changes in water flow through fields</li> <li>• Increased fishpond sedimentation and contamination during high flows</li> </ul>
Changes in <b>wind and circulation</b>	<ul style="list-style-type: none"> <li>• Reduced rainfall at high elevations, increasing plant water stress</li> </ul>
Increased <b>wildfire</b>	<ul style="list-style-type: none"> <li>• Native habitat damage and increased post-burn runoff and erosion</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>

## ADAPTIVE CAPACITY

### Factors that enhance adaptive capacity:

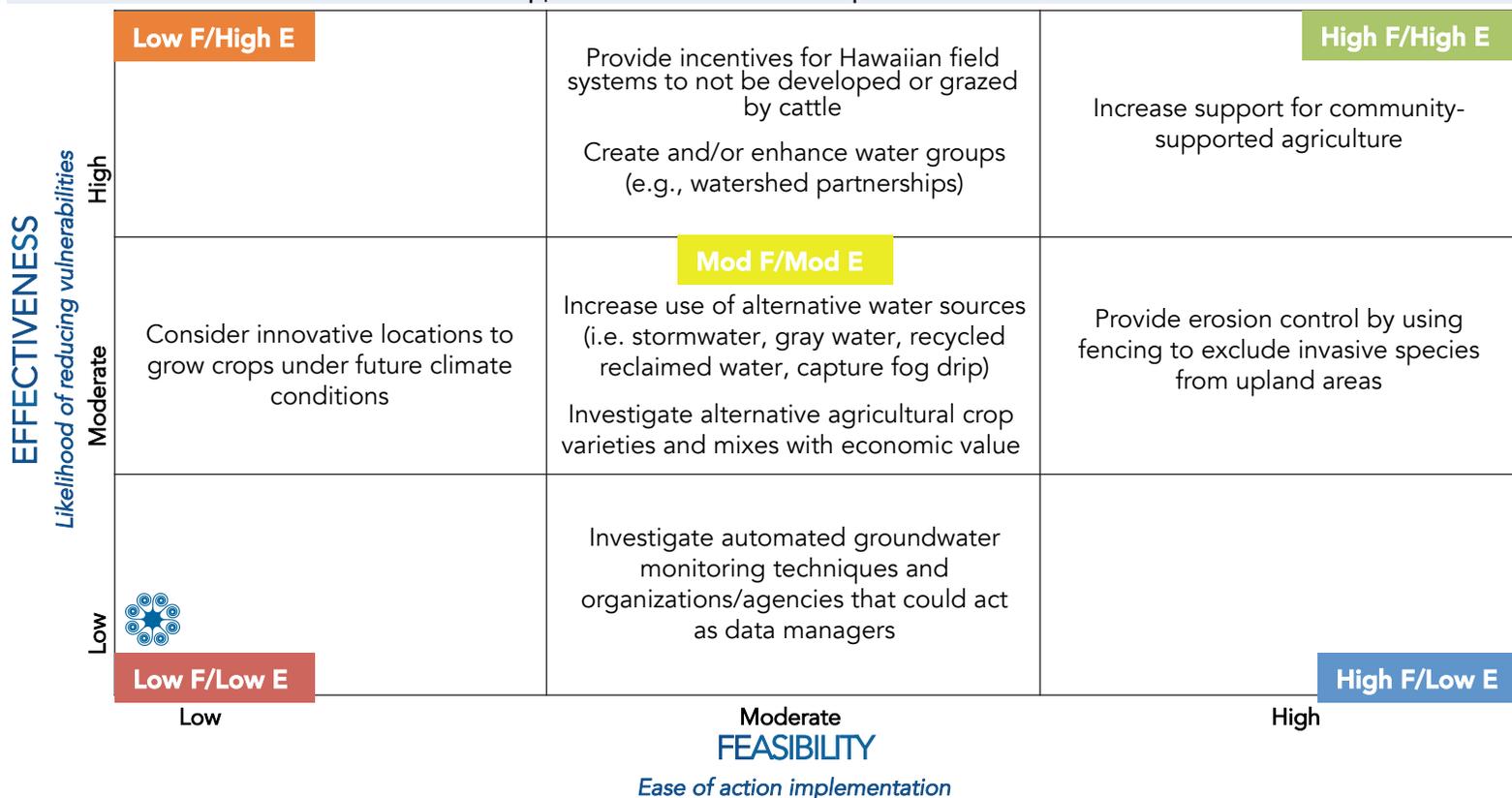
- + High public value and willingness to change behavior to continue accessing this service
- + Traditional agrosystems are more resilient than conventional systems under changing conditions
- + Increased interest in restoring fishpond systems

### Factors that undermine adaptive capacity:

- Relatively low societal support (e.g., society often values cheap, imported food more than local and sustainably produced food)
- Low food security in the Hawaiian Islands due to high dependence on imported goods and energy

# 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>	Maintain/improve water quantity and quality	<ul style="list-style-type: none"> <li>Provide incentives for Hawaiian field systems to not be developed or grazed by cattle</li> </ul>
	Manage soil health and stability	<ul style="list-style-type: none"> <li>Provide erosion control by using fencing to exclude invasive species from upland areas</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>	Preserve water supplies by increasing water use efficiency	<ul style="list-style-type: none"> <li>Increase use of alternative water sources (i.e. stormwater, gray water, recycled reclaimed water, capture fog drip)</li> </ul>
<b>Response:</b> Intentionally accommodate change and adaptively respond to variable conditions <i>Long-term approach</i>	Promote climate-adapted agricultural practices	<ul style="list-style-type: none"> <li>Investigate alternative agricultural crop varieties and mixes with economic value</li> <li>Consider innovative locations to grow crops under future climate conditions</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 water resources and their value	<ul style="list-style-type: none"> <li>Investigate automated groundwater monitoring techniques and organizations/agencies that could act as data managers</li> </ul>
	<b>Collaboration:</b> Coordinate efforts and capacity across landscapes and agencies <i>Near- to long-term approach</i>	Strengthen conversations about water as public trust
	Support whole systems approaches to agricultural production	<ul style="list-style-type: none"> <li>Increase support for community-supported agriculture (CSAs)</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).

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