Stream Habitats

Climate Vulnerability Assessment and Adaptation Strategies for Kaua'i

HABITAT DESCRIPTION

Stream habitats – including perennial streams, intermittent streams, and manmade waterways – occur at varied elevations and have flowing water. High streamflow variability is common due to small catchment basins, steep slopes, and limited channel storage. Kaua'i has 61 perennial streams, 45 of which are continuous to the ocean. The Wailua and Hanalei Rivers have the largest discharges. Streams are critically important for all of Kaua'i's native aquatic fauna, including endemic 'o'opu (gobies), 'ōpae (shrimps), and snails.

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HABITAT VULNERABILITY

Streams are sensitive to climatic factors and disturbance regimes that reduce water availability, which limits habitat availability, connectivity, and quality, impacting aquatic species migration, recruitment, and survival. Streams are also sensitive to reduced water quality (e.g., from saltwater intrusion or wildfire). Non-climate stressors can further reduce water availability (e.g., water diversions), alter surface runoff and flood volumes (e.g., impermeable surfaces), or degrade water quality by increasing contaminant and sediment delivery (e.g., agriculture, invasive ungulates). Low biodiversity (relative to mainland systems), high endemism, and current habitat alteration and degradation reduce adaptive capacity. However, streams are abundant and flow restoration promotes biotic community recovery.

PROJECTED FUTURE CHANGES	POTENTIAL IMPACTS ON STREAM HABITATS
Reduced **baseflows**	• Lower streamflows reduce habitat availability and connectivity, potentially impacting species migration, recruitment, and survival
Changes in **precipitation**; variable **drought risk** *Increased in low elevation leeward areas; decreased at high elevations*	• Drier conditions will increase the number of zero-flow days, may reduce ocean connectivity, and may reduce the number of perennial streams • Drought can eliminate flooding regimes
Increasingly variable **riverine flooding;** increased frequency and strength of **tropical storms/hurricanes**	• Flooding signals native larval recruitment • Flooding may help mitigate parasitism and prevent invasive species dominance • Temporarily alters community composition and channel structure via scour • Temporarily degrades water quality and increases turbidity by delivering sediment and contaminants
Increased **saltwater intrusion**	• Reduced freshwater habitat availability at stream mouths • Upstream shifts in species distribution
Increased **wildfire**	• Increased erosion and sediment delivery • Increased runoff and flooding by removing vegetation

Drivers of Habitat Vulnerability

- **Climatic factors and disturbance regimes:** Streamflow, precipitation amount & timing, drought, tropical storms/hurricanes, saltwater intrusion, wildfire, riverine flooding
- **Non-climate factors:** Water diversions, invasive species (trees, shrubs, ungulates fish), agriculture & aquaculture, groundwater development, roads/ highways/trails, energy production, residential & commercial development, pollution & poisons

ADAPTIVE CAPACITY

Factors that enhance adaptive capacity:

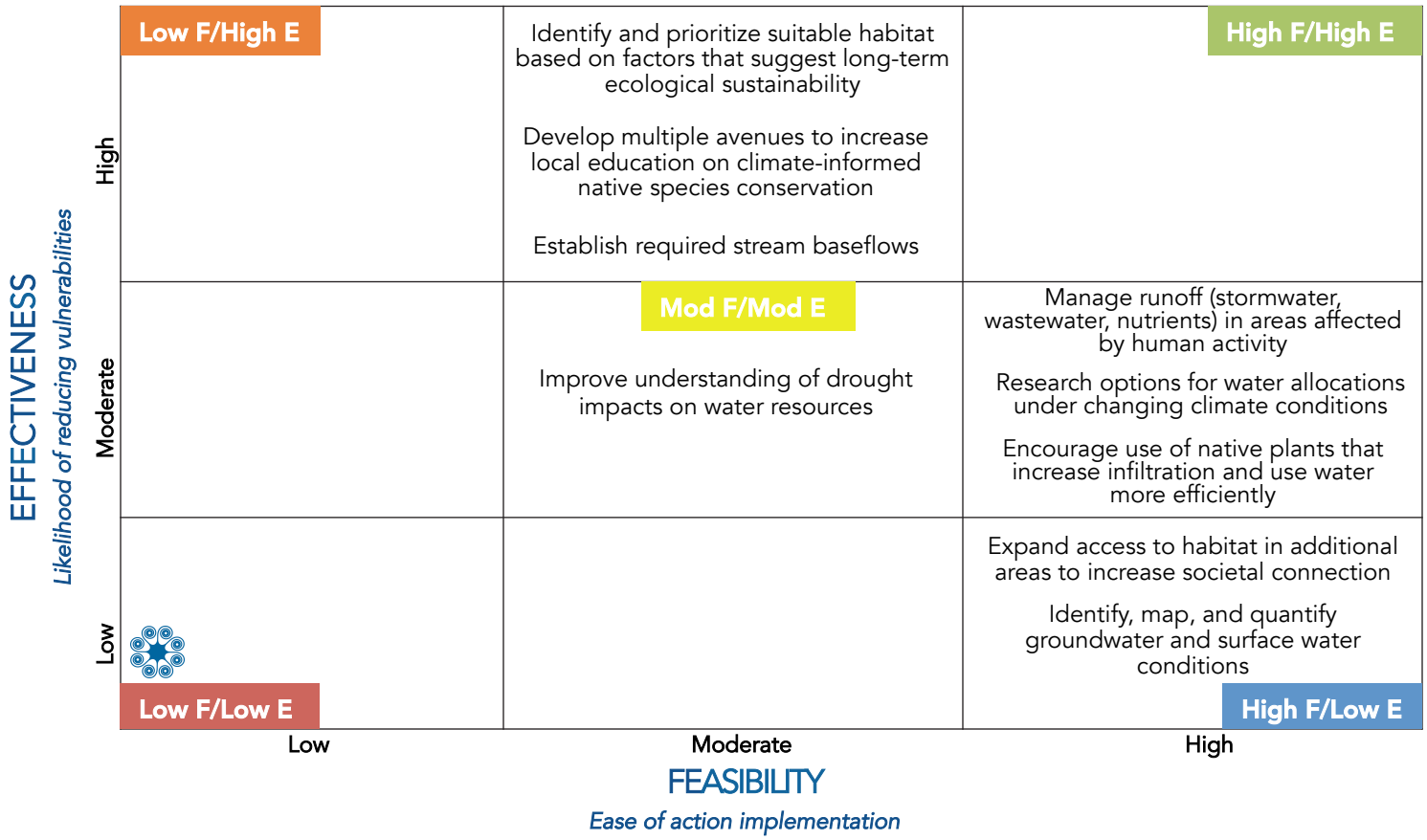
+ Abundant habitat area
+ Natural flow restoration promotes biotic community recovery
+ Native forest restoration may help maintain streamflow in a drier climate
+ Watershed management plans and best management practices may help buffer some impacts

Factors that undermine adaptive capacity:

– Degraded habitat integrity due to water quality impairments, water diversions, and channel alterations
– Low diversity and high endemism increases vulnerability to impacts
– Steep stream gradients can reduce colonization and recovery opportunities
– Streams compete with development for water

ADAPTATION STRATEGIES FOR STREAM HABITATS

Types of Adaptation Approaches	Adaptation Strategy	Specific Action
Resistance: Prevent climate change from affecting a resource. *Near-term approach*	Maintain/improve water quantity and quality	• Manage runoff (stormwater, wastewater, nutrients) in areas affected by human activity
Resilience: Help resources weather climate change by avoiding the effects of or recovering from changes *Near- to mid-term approach*	Maintain water availability	• Establish required stream baseflows to maintain native stream species, cultural practices, and traditional rights • Encourage use of native plants that increase filtration and use water more efficiently
Response: Intentionally accommodate change and adaptively respond to variable conditions *Long-term approach*	Use assisted colonization to restore rare species	• Identify and prioritize suitable habitat based on factors that suggest long-term ecological sustainability
Knowledge: Gather information about climate impacts and/or management effectiveness in addressing climate challenges *Near- to long-term approach*	Increase understanding of water quantity, quality, and allocations under changing climate conditions	• Identify, map, and quantify groundwater and surface water conditions • Improve understanding of drought impacts on water resources • Research options for water allocations under changing climate conditions
Collaboration: Coordinate efforts and capacity across landscapes and agencies *Near- to long-term approach*	Increase citizen outreach, education, and science to increase awareness and support for managing habitats in light of climate change	• Develop multiple avenues to increase local education on climate-informed native species conservation • Expand access to habitat in additional areas to increase societal connection and value



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.

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