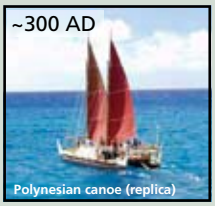
A Cultural Context for Preserving Hawaii's Diverse Ecological Landscape


Hale o Keawe (temple re-construction)

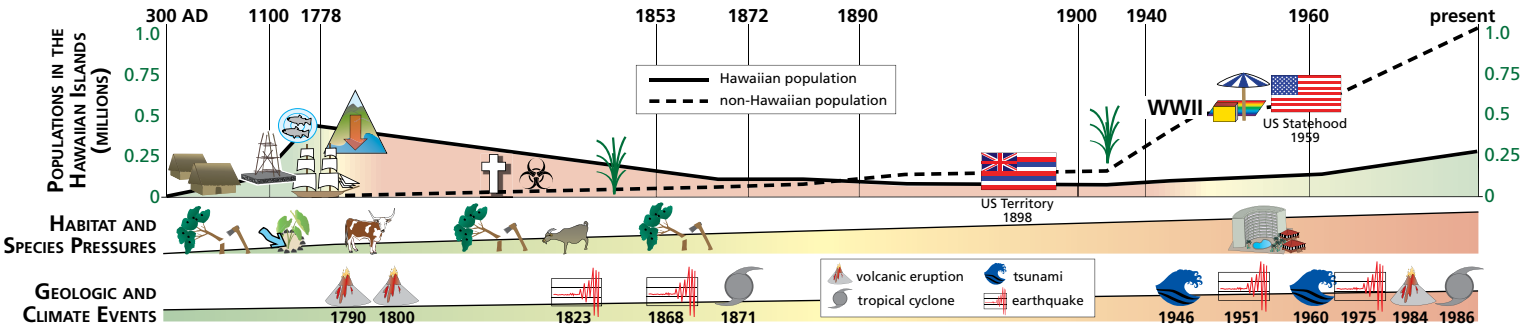
The west coast of the island of Hawai'i contains four national parks with a wealth of cultural resources in diverse ecological landscapes. Since the Hawaiian islands first rose from the ocean, these natural habitats have been changed by lava flows, earthquakes, and tsunamis. Since Polynesians arrived, there has been a close link between the ecological landscape and human inhabitants. From the late 1700s, western influences changed traditional Hawaiian life to ranching and plantation agriculture. Today, threats from rapid development and invasive species provide a challenge to the unique cultural and natural features of these Hawaiian national parks.


Naupaka, a native shrub

Changes to Cultural Resources



Between first Polynesian settlement in ~300 AD and the arrival of Europeans in 1778, the Hawaiian population had grown to between 200,000 and 1,000,000 people. The traditional system of taboos and resource use, *kapu*, ended in 1819 due to western influences and brought many new diseases, reducing the native population to <25,000 over the next century. Traditional land divisions, *ahupua'a*, were replaced with extensive cattle ranching and sugar cane agriculture. Due to the declining local population, workers were brought from Asia and Portugal.



Changes to Natural Resources

With *ahupua'a* in place, fishponds and irrigated crops were integrated with the natural ecology. In the mid-1800s, however, the increasing number of cattle and goats required shrubs and trees be cut in favor of grasslands. The rise in tourism since the 1950s has increased the pace and scale of development.

The National Parks of West Hawai'i Island: agents of change

The national parks of west Hawai'i share several primary stressors on their natural ecosystems. The common stressors shown here are from both human and natural sources, as well as local and global agents of change. These stressors affect many ecosystems, and can represent potential threats to human health or safety.

Common Stressors

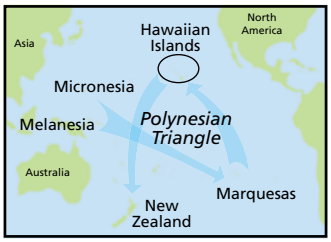
- invasive plants and animals
- development, traffic, and groundwater withdrawal
- natural and man-made fires
- visitor recreation impact
- volcanic eruptions, cyclones, and tsunamis
- rising sea temperatures and sea level rise

The National Parks of West Hawai'i:

1. *Ala Kahakai National Historic Trail*
2. *Kaloko-Honokōhau National Historical Park*
3. *Pu'ukoholā Heiau National Historic Site*
4. *Pu'uhonua o Hōnaunau National Historical Park*

The National Parks of West Hawai‘i Island

Ala Kahakai National Historic Trail: walking in the ancestors' footsteps



The arrival of Polynesians via ocean trails, around 1,500 years ago, resulted in large changes to the flora and fauna on the west side of the island of Hawai'i: partial clearing of dry land vegetation (such as sandalwood and loulu palms), planting of crops such as coconuts and taro, and the introduction of pigs, dogs, and chickens. The development of the *ahupua'a* system of land use, however, meant that the island population lived for many centuries on the island's natural resources. Established in 2000 for the preservation, protection, and interpretation of traditional native Hawaiian culture and natural resources, the *Ala Kahakai National Historic Trail* is a 175-mile trail corridor full of this cultural and natural heritage.

A Vision for the Trail

Because much of the coastal trail remains under private ownership, the largest threat to its cultural and natural resources is rapid development (cattle ranching, hotels, houses, golf courses, marinas, light industry, and roads), bringing with it a multitude of invasive plant and animal species. Securing the *Ala Kahakai National Historic Trail* as land accessible to the public will provide an opportunity for future generations to learn about and preserve Hawaii's unique cultural and natural resources.


ancient coastal trail

once a trail, now busy Ali'i Drive

Historic land trails and water trails provided the means for individuals and communities to trade and communicate.

Kaloko-Honokōhau National Historical Park: keeping the spirit of Kaloko-Honokōhau alive

Nä wai ola o Kane (life-giving waters of the god, *Kane*) provides the life essence in this dry district of West Hawai'i Island. Native Hawaiian conservation values protect the use of the land, sky, and sea by laying out specific guidelines for interactions between humans and nature. *Kaloko-Honokōhau National Historical Park* contains visible reminders, such as *heiau* (temples), *loko i'a* (fishponds), and *ki'i pohaku* (petroglyphs), that speak of the spirit of this place. Today, changes of population, resource use, and development alter the environment by compromising groundwater flow, marine life, and native species. The current challenge for this fragile national park is to keep the spirit alive by preserving these cultural and natural resources in the face of a rapidly developing landscape.


Kaloko Fishpond rehabilitation


honu, green sea turtle


boat harbor, south of the park


new development, north of the park

Cultural and Natural Resources

historic and sacred sites remain culturally significant and relevent today

invasive plants are removed and native plants restored

endangered *ae'o* (Hawaiian stilt) nest in park's coastal wetlands

fed by groundwater, brackish pools still support rare species

Threats and Human Impacts

introduced cats, mongoose, and rats threaten native birds

dense development and heavy traffic cause light, air, and noise pollution

future urban developments will threaten groundwater

groundwater extraction can lead to salt water intrusion into pools

excess nutrient runoff stimulates algae blooms which kill coral

overfishing and increased boat traffic and noise affects marine life

invasive marine species transported by boats can damage native reefs

Park boundary
Park building
lava field
potential impact
ahupua'a boundary
boat harbor

Pu'ukoholā Heiau National Historic Site: preserving Kamehameha's legacy in today's world

At *Pu'ukoholā Heiau National Historic Site*, many key features of this culturally significant park are influenced by waters flowing from *Makeāhua* and *Pōhaukole Gulches*. In 1790 when the *Pu'ukoholā Heiau* was constructed, the bay supported abundant *limu* (seaweed) and fish in clear waters, and *Hale o Kapuni Heiau* (shark temple) was visible. Centuries of cattle ranching and feral pig and goats have spread invasive plants and increased erosion. Recent damming of the stream has increased sediment flow, and the adjacent port, built on landfill, has reduced sediment flushing from the bay. As a result, *Hale o Kapuni Heiau* is now buried, and many native fish can no longer be found.


Pu'ukoholā Heiau (temple)


native milo for dyes and carving


neighboring port and marina


sediment runoff piles up

Cultural and Natural Resources

- restored *heiau* (temples) host Hawaiian historical and cultural events
- invasive plants are removed and native plants are restored
- freshwater upwelling continues to flow in the bay

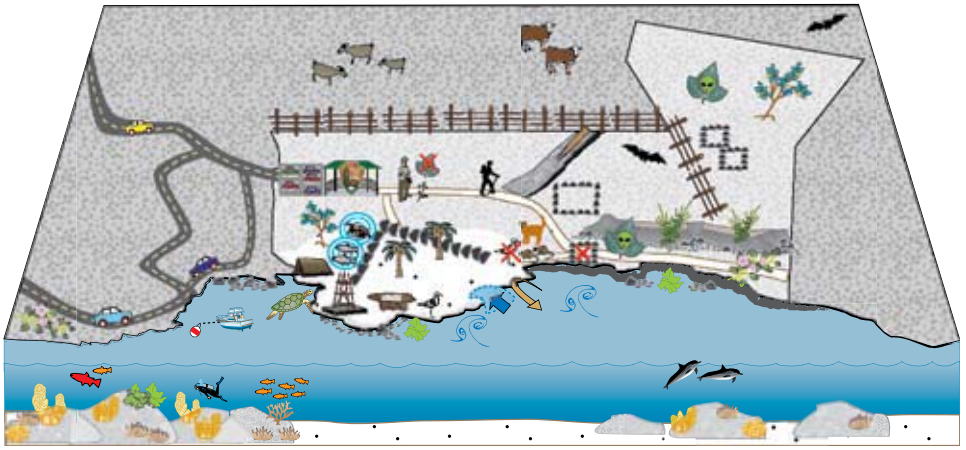
Threats and Human Impacts

- earthen dam has resulted in reduced and irregular stream flow
- tilapia is an introduced fish found in the park pond
- landfill blocks currents from flushing sediment from bay
- sediment fills the bay, reducing fish populations and killing coral
- neighboring development is encroaching on park boundaries
- port and military traffic is increasing noise and pollution
- cattle, feral pigs and goats cause soil erosion and spread invasive plants

- Park boundary
- Park building
- lava field
- landfill
- shark temple ruin

Pu'uhonua o Hōnaunau National Historical Park: a place of refuge for cultural and natural resources

Pu'uhonua o Hōnaunau National Historical Park has an incredible wealth of cultural and natural features shaped by early Hawaiian settlement patterns. Post-contact land management included historic ranching, recreational use, and vegetation removal. Today, many of these features are threatened by prolific, invasive plants, sea level rise, and other natural and human-caused disturbances. Introduced, fast-growing, invasive plants continue to out-compete native plant species and damage historic and prehistoric structures. Once a sanctuary of life, the park is now a place of refuge to the cultural and natural resources within, where they are preserved for present and future generations.




Hawaiian fishing canoe


Heleipālala Fishpond


koa haole, a highly invasive tree


invasive roots dislodge ancient walls

Cultural and Natural Resources

- some historic sites have been restored and remain culturally significant
- partially fenced park boundaries keep out some domestic and feral animals
- native and rare plant species find habitat in cliffs and on coastlines
- invasive plants are removed and native plants are restored
- fragile brackish pools still support unique and rare species
- endangered bats, sea turtles, and shorebirds still visit the park

Threats and Human Impacts

- cattle and feral animals spread invasive plants in the park
- introduced cats, rats, and mongoose threaten native bird populations
- storm surf, subsidence, and rising sea levels cause beach erosion

- Park boundary
- Park building
- lava field
- canoe house
- Great Stone Wall
- trail

The National Parks of West Hawai'i Island: understanding, protecting, and managing important resources that share cultural and natural values

The historical link between native Hawaiian culture and the natural environment means that all natural resources (native species, water features, and landscapes) also have cultural significance. This inseparable link underscores the importance of maintaining both the natural and spiritual value of west Hawai'i parks.


protecting sacred sites

Common Stressors	Threats and Human Impacts		Management Responses
 Invasive Species	Invasive species not only displace native species, but can alter the whole ecological balance within parks.	Invasive Species	Identify new introductions through monitoring and target programs of invasive removal and replacement with native species.
 Adjacent Land and Resource Use	Rapid, urban, industrial, and tourism-based development adjacent to parks may increase nutrients, impact groundwater withdrawal, and increase invasive species.	Adjacent Land and Resource Use	Monitor park resources and participate in cooperative efforts with adjacent land users for best management practices.
 Fire	Human activity has greatly increased fire frequency which enhances grasses over woody vegetation, promotes invasive species, and increases erosion.	Fire	Monitor non-native species spread by fire in an effort to prevent, detect, rapidly respond to, and manage invasions, and educate visitors about fire safety.
 In Park Use	Visitor use can negatively impact parks by promoting non-native species introduction, disturbing plants and animals, and damaging historic sites.	In Park Use	Educate visitors about the reason for designated trails, and protecting the unique, but fragile natural and cultural resources within the parks.
 Natural Hazards	Volcanic activity, tropical cyclones, tsunamis, and earthquakes pose threats to local populations of native species and may enhance non-native species invasions.	Natural Hazards	Monitor and restore natural resources and cultural sites within parks that are impacted by natural events.
 Climate Change	Increased sea surface temperature, rising sea levels, and increased storm frequency from global climate change may cause species loss, flooding, and coastal erosion.	Climate Change	Provide long-term monitoring in diverse habitats to understand the effects of climate change and provide learning opportunities for the public.

Facilitated by the **Integration and Application Network (IAN)** of the **University of Maryland Center for Environmental Science (UMCES)**, the Pacific Island Network provided west Hawai'i Island Parks with an understanding of how conceptual diagrams can be constructed and used to communicate complex ecological principles, and held workshops to identify key issues and features of the four parks.

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Hawai'i National Park workshops (clockwise from top left): Ala Kahakai, Kaloko-Honokōhau, Pu'uhonua o Hōnaunau, and Pu'ukoholā Heiau

The National Park Service is implementing Inventory & Monitoring programs (http://science.nature.nps.gov/im) nationwide though a series of 32 networks. The Pacific Island Network (PACN) is based at Hawai'i Volcanoes National Park and coordinates biological and abiological inventories and long-term monitoring of natural resources found within the Pacific Island parks. Additional Information on the Pacific Island Network can be found at http://www1.nature.nps.gov/im/units/pacn/.

Nine university/research institutions and six federal agencies comprise the Chesapeake Watershed Cooperative Ecosystem Studies Unit (CW CESU; http://cesu.al.umces.edu). These partners provide leadership in watershed science and stewardship.

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