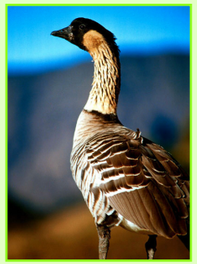
Why Protect Wetlands?



Nēnē, S. Reilly

Wetlands provide many functions that contribute to watershed health and benefit human communities. These important wetland functions are "free" services from nature in the form of "green infrastructure."

Flood Protection. Wetlands can store large amounts of water during storms and heavy rainfall, reducing flood impacts to roads, parking lots and homes.

Surface and Groundwater Supply. Wetlands absorb and release water; they capture the abundance during heavy rains and slowly release it during droughts. This helps recharge groundwater aquifers, which provide nearly all of Hawaii's residential and commercial freshwater.

Water Quality & Sediment Filtration. Wetlands can store, filter, and absorb excess nutrients, sediments, and stormwater pollutants. As a result, less of this material ends up in streams and marine reef areas where it damages these fragile ecosystems.

Pinao, B. Gagné

Biodiversity. The biodiversity of natural wetlands often exceeds that of terrestrial ecosystems, because wetland edges are ecotones; important areas where biological communities blend. Diversity of species adds to the wetland's ability to adapt to change.

Wildlife Habitat. Approximately 60 species of migratory waterbirds and shore birds travel thousands of miles over the Pacific Ocean to winter in Hawai'i and depend on Hawaii's wetlands for resting, immediate refueling, and survival. Numerous bird species use wetlands in Hawai'i for feeding, breeding, and over wintering. Many native Hawaiian plant and animal species evolved to take advantage of Hawaii's unique wetlands. See *"Native Wetland Species."*

'Alae 'ula, USDA NRCS

Recreation and Aesthetics. Wetlands are scenic landscapes that hold both historical and cultural significance. Wetland areas provide opportunities for outdoor recreation and nature activities such as photography, bird watching, nature study, walking trails and fishing.

Native Wetland Species

Hawai'i has 51 rare plant species and 11 rare animal species that are dependent on wetlands. Six federally-listed endangered waterbird species use wetlands, and most depend on Hawaiian wetlands for their survival. These species are endemic to Hawai'i; they are found nowhere else on earth.

Laysan duck, J. Breeden, USGS

- Hawaiian coot; 'alae ke'oke'o
- Hawaiian moorhen; 'alae 'ula
- Hawaiian Stilt; āe'o
- Hawaiian duck; koloa maoli
- Laysan duck
- Hawaiian goose; nēnē

Fossil records show that at least 13 species of endemic Hawaiian waterfowl used wetlands. Of these, only three remain (the ducks and goose listed above). Other wetland species include 'auku'u (Black-crowned night heron) and kōlea (Pacific golden-plover).

'O'opu 'akupa, M. Ramsey

'O'opu 'akupa, an endemic fish, is found in lowland streams and estuaries on all of the main Hawaiian Islands. Native shrimp, such as 'ōpae 'oeha'a, 'ōpae huna, and 'ōpae 'ula feed on algae and can live up to 20 years.

Over 30 species of dragonfly (pinao) and damselfly (pinao 'ula) are endemic to Hawai'i. Most depend on wetlands to complete their life cycle. The most common species of pinao is the globe skimmer, a large, often red dragonfly.

Seeds of wetland sedges, grasses and rushes are a primary food source for many wetland birds. Makaloa, an indigenous sedge, grows in coastal wetland areas, and was used to make the fine woven sleeping mats used by the ali'i; Hawaiian royalty.

Honouliuli marsh, Oahu (palustrine wetland) and 'auku'u, C. Tucker

Threats to Wetlands

Today, native species are outnumbered by introduced and invasive species in Hawaii's wetlands. As introduced species invade ecosystems, they dramatically reduce biodiversity, biological productivity, and ecological function.

Invasive Species Challenges

Non-native predators. Feral cats, mongooses, rodents, cattle egrets, and common barn owls eat native ground-nesting birds and their chicks. Bullfrogs and cane toads eat fish eggs, native insects, and even young waterbirds. These predators can decimate native bird populations.

Non-native plants such as California grass and non-native pickleweed out-compete native plants, and can quickly create single species colonies in wetlands, reducing wetland plant diversity and ecological function.

Non-native fish prey on native damselflies and devour wetland vegetation, reducing food availability for waterbirds.

Hybridization. The endangered, endemic koloa maoli duck, found only in Hawai'i, is currently at risk of extinction due to cross-breeding with feral mallards.

'Aimakapā pond, Hawai'i (estuarine wetland), K. Uyehara

Human Induced Challenges

Pollution. Non-point source pollution from agricultural runoff, seepage from septic wastewater, and contaminated stormwater can overwhelm the filtering capacity of wetlands, impacting downstream coastal waters.

Climate Change. Increases in global temperatures contribute to sea level rise, which will impact coastal wetland systems. Future changes in local precipitation and higher temperatures will impact montane bogs at higher elevations, and ephemeral (seasonal) wetlands may dry up.

Development. Many wetlands in Hawai'i have been drained or filled for agriculture production, resort development and community expansion.

You Can Help Wetlands!

Recognize that some wetland areas are open to the public, but some require access permission or permits.

Pinao, C. Tucker

- **Learn about wetlands.** Visit the websites below to learn more.
- **Support local wetland conservation. Volunteer.** Work with your local Land Trust or other conservation organizations. Join a "Friends of: wetland nearest you." Pick up trash and remove invasive plants.
- **Prevent pollution.** Dispose of your waste properly. Avoid using fertilizer and pesticides on lawns and gardens. These chemicals wash into ecosystems and damage them.
- **Don't release exotics.** Exotic fish and aquatic plants should never be dumped or introduced into streams or wetland areas. Call 808-643-PEST or your local Humane Society to find out where to take your unwanted pets.
- **Care for wetlands on your property.** If you own a wetland area, contact the Natural Resources Conservation Service, Department of Land and Natural Resources, or Hawai'i Wetland Joint Venture to get technical assistance for restoration and management.
- **Prevent bird predation.** Keep cats indoors and dogs away from wetlands and endangered bird species.
- **Keep feral mallards out of Hawaii's wetlands.** Feral mallards are not native to Hawai'i. In the wild, they interbreed with native koloa, compete with native birds for food and habitat, and are potential vectors for disease. If you own a mallard, keep it penned or clipped.
- **Remember: Wild birds need wild food.** Feeding wild birds human food prevents them from getting vital nutrition from native plant sources. This can lower birds' life expectancy, affect their ability to reproduce, make them more vulnerable to predators and cause conflicts with humans.

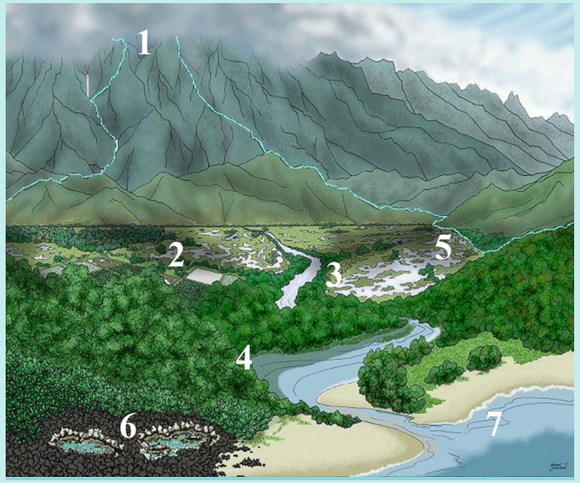
Koloa maoli, B. Zaun USFWS

- **Be a wetland advocate.** Contact your local, state, and national government representative and ask them to support wetland programs.

Wetlands on the Web:

www.hiwetlands.com
www.wetland.org
www.hawaii.gov/dlnr/dofaw
www.pcjv.org
www.nrcs.gov
www.hear.org
www.fws.gov/wetlands
www.malamahawaii.org/koloa
ahahui.wordpress.com
www.hamakuamarsh.com
www.kawainuimarsh.com
www.projectwet.org
websoilsurvey.nrcs.usda.gov

Wetlands in Hawai‘i



1. Montane bog **2.** Aquacultural **3.** Riverine **4.** Estuarine
5. Palustrine Marsh **6.** Anchialine pool **7.** Marine

The Ahupua‘a or Watershed Drainage

Traditionally, ahupua‘a was a subdivision of the moku (island) that went from the mountaintop to the sea following the banks of streams, much like a watershed. Ahupua‘a encompass the land, water, and elements in the sky from the mountain to the sea, and also integrate cultural, human, and spirit resources. All types of wetlands in Hawai‘i can be found within the ahupua‘a: bogs in the upper reaches of the mountains, marshes in the lowlands, and anchialine pools and estuaries near the sea.

*Wetland Classification

The Cowardin Classification System is a descriptive method developed by the US Fish & Wildlife Service that categorizes and defines wetlands according to their landscape position and water source. Within these broad classes fall types of wetlands known by common names, such as marshes, bogs, swamps, and mudflats. For more info, visit: **www.npwrc.usgs.gov/resource/wetlands/classwet.**

Credits: Wetland illustrations (front and back covers): Naomi Swenson.
Cover photos: *Hule‘ia National Wildlife Refuge, Kaua‘i,* A. Henry.
Bottom row, L to R: *‘Alae ke‘oke‘o* (C. Tucker), *Pinao* (B. Gagné), *‘O‘opu nōpili* (G. Smith, USFWS), *‘Alae ‘ula* (C. Tucker).

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Hawaii’s Wetlands

Mauka to Makai

An Introduction to Wetlands in Hawai‘i

What is a Wetland?

Wetlands are lands that are periodically covered or saturated by fresh or salt water. Three main elements that characterize wetlands are:

Āe‘o, C. Tucker

Hydrology: Water creates and maintains all wetlands, and can derive from precipitation, surface flow (tidal action or streams) or shallow groundwater.

Soils: Wetland soils are poorly drained and are saturated or covered with water for at least two weeks per year.

Vegetation: Wetland plants are adapted to grow, reproduce, and persist in water or saturated soils.

Wetlands are complex ecosystems, often with both technical and legal definitions. Wetlands in Hawai‘i can be seasonal or permanent, and are found in many landscapes, including depressions (craters or shallow pools); coastal mudflats; fringes along running or standing water (such as streams or tidal waters); and in Hawaii’s unique cloud forests.

Montane Bog, Hawai‘i (palustrine wetland), K. Uyehara

Within Hawaii’s watersheds, wetlands provide important functions such as flood protection, improved water quality, and habitat for native birds, insects and plants. Wetlands are biologically productive habitats and are home to almost one third of the threatened and endangered species in the U.S.

In the Hawaiian language, ***wai*** means water. Many places in Hawai‘i are named for nearby wetlands and the species that live there: Waikīkī, Wai‘alae, Waikoloa, Waiāhole, Waipi‘o, Waimea and countless more.

Koloa maoli, © J. Denny

Hawaii’s Wetlands

Natural wetlands* most common in Hawai‘i:

Riverine wetlands are found along the quiet edge of rivers or streams. These freshwater wetlands are fed by surface flow and are important to the endemic koloa maoli.

Palustrine wetlands are found in depressions where rainfall or groundwater collects. Some common names are marshes and bogs. Vegetation includes trees, shrubs and herbaceous plants. Hawaii’s rare montane bogs take millions of years to form and are found in high elevation, high rainfall areas.

Estuarine wetlands occur on coasts where streams empty into the ocean. Affected by the tide, these brackish systems contain both fresh and salt water. These wetlands are nursery grounds for young fish and shellfish. Mudflats exposed by the tide offer rich feeding areas for waterbirds.

Marine wetlands are salt water systems, such as tidepools, intertidal shorelines, or seagrass beds. These areas provide habitat for many species harvested by humans for food.

Tidepool, O‘ahu (marine wetland) C. Tucker

Hanalei River, Kaua‘i (riverine wetland) K. Uyehara

Other Aquatic Habitats in Hawai‘i

Aquaculture Habitats are wet areas created or modified for the growing of food. These include traditional wet taro (kalo) grown in a lo‘i (paddy) and fish ponds, which are both very important to Hawaiian culture. These areas are used by native species, but usually lack the full range of biodiversity and habitat functions found in natural wetlands.

Taro (kalo), C. Tucker

Anchialine pools are land-locked systems formed in porous lava or limestone on coastal shorelines. These rare and declining ecosystems are connected underground to fresh and salt water, and are home to native shrimp like ‘ōpae ‘ula.

Right: Anchialine pool, Maui and ‘ōpae ‘ula, M. Ramsey