



HAWAII'S WETLANDS: MAUKA TO MAKAI

WHAT IS A WETLAND?

Wetlands are lands periodically covered or saturated by fresh or salt water and characterized by:

Hydrology (water): from precipitation, surface flow or shallow groundwater.

Soils: poorly drained and saturated or covered with water for at least two weeks a year.

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

Wetlands can be seasonal or permanent, and are found in landscapes such as depressions, coastal shorelines, fringes along running or standing water, and Hawaii's cloud forests. Wetlands are home to almost one third of threatened and endangered species in the U.S.

In the Hawaiian language, *wai* means water. Many places in Hawaii are named for wetlands and the extraordinary species that live there: Waikiki, Wai'alaie, Waikoloa, Waiāhole, Waipi'o and countless more.



Āe o, C. Tucker

HAWAII'S WETLANDS

NATURAL WETLANDS* MOST COMMON IN HAWAII:

Riverine wetlands are surface water systems found along the edge of rivers or streams. These areas are critical to the endemic koloa maoli.

Palustrine wetlands, such as marshes and bogs, are found in depressions where rain or groundwater collects. Hawaii's rare montane bogs take millions of years to form.

Estuarine wetlands, such as swamps and mudflats, occur on coasts where streams empty into the ocean. These tidally influenced brackish (mixed fresh & salt water) areas provide habitat for fish, shellfish and waterbirds.

Marine wetlands, such as intertidal shorelines, seagrass beds, or tidepools, are saltwater systems, and provide habitat for many species harvested by humans for food.

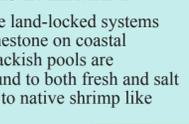
OTHER AQUATIC HABITATS IN HAWAII

Anchialine pools are land-locked systems in porous lava or limestone on coastal shorelines. These brackish pools are connected underground to both fresh and salt water, and are home to native shrimp like 'ōpae 'ula.

Aquaculture Habitats are wet areas created or modified for growing food, including wet taro (kalo) in a lo'i (paddy) and fish ponds. These areas are used by native species, but usually lack the biodiversity and habitat functions found in natural wetlands.



Montane bog, Hakalau Forest NWR, K. Uyebara



Anchialine pool, M. Ramsey



Taro (kalo), C. Tucker

NATIVE WETLAND SPECIES

Hawaii has fifty one rare plant species, eleven rare animal species, and six federally endangered waterbird species that use, or are dependent upon wetlands. These six species are endemic; found only in Hawaii:

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

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 (the black-crowned night heron), and kōlea (the Pacific golden-plover).

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

Native shrimp like 'ōpae 'ula feed on wetland algae. 'O'opu akupa, an endemic fish, is found in lowland streams and estuaries on all of the main Hawaiian Islands. Over 30 species of dragonfly (pinao) and damselfly (pinao 'ula) are endemic to Hawaii, and most depend on wetlands.



'Alae 'ula, USDA NRCS



Nēnē, S. Reilly



'O'opu akupa, G. Smith, USFWS



Koloa maoli, C. J. Denny



Pinao, C. Tucker

WHY PROTECT WETLANDS?

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

Water Quality & Sediment Filtration. Wetlands can store, filter, and absorb excess nutrients, sediments, and pollutants. This reduces the pollution that ends up in streams and marine reef areas.

Surface and Groundwater Supply. Wetlands absorb and release water; they capture excess during heavy rains and slowly release it during droughts. This helps recharge groundwater aquifers.

Biodiversity. Wetlands are transition zones between upland and deep water habitats where biological communities blend and have increased diversity.

Wildlife Habitat. About 60 species of migratory waterbirds and shore birds travel thousands of miles over the Pacific Ocean to winter in Hawaii. Many native Hawaiian plant and animal species have evolved to live in Hawaii's unique wetlands.

Recreation and Aesthetics. Wetlands are scenic landscapes that hold cultural and historical significance. Recreational opportunities include photography, bird watching, walking trails, nature study and fishing.

THREATS TO WETLANDS

Invasive Species Challenges:

Non-native predators. Feral cats, mongooses, rodents, and other predators eat ground-nesting birds and chicks. Cane toads and bullfrogs eat fish eggs, native insects and young waterbirds.

Non-native plants out-compete native plants, quickly taking over wetland areas, reducing plant diversity and ecological function.

Non-native fish eat native damselflies and wetland vegetation, reducing food availability for waterbirds.

Hybridization. The endangered koloa maoli is at risk of extinction due to cross-breeding with feral mallards.

Human Induced Challenges:

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

Climate Change. Rising temperatures lead to rising sea levels and impacts to coastal wetlands. Changes in local precipitation and temperatures will impact montane bogs and ephemeral (seasonal) wetlands.

Development. Many wetlands in Hawaii are being drained or filled for agriculture production, resort development and community expansion.

WETLANDS IN HAWAII



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

YOU CAN HELP WETLANDS!

Some wetlands are open to the public, but some require permission or permits.

- **Learn about wetlands.** Visit the websites below.
- **Volunteer.** Pick up trash and remove invasive plants.
- **Prevent pollution.** Avoid using fertilizer and pesticides on lawns and gardens. These chemicals wash into downstream ecosystems.
- **Don't release exotics.** Call 808-643-PEST or the Humane Society to find out where to take your unwanted pets.
- **Care for wetlands on your property.** If you own a wetland, 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.** If you own a mallard, keep it penned or clipped.
- **Remember: Wild birds need wild food.** Do not feed human food to wild birds.
- **Be a wetland advocate.** Contact your government representative and ask them to support wetland programs.



Koloa maoli, B. Zaun, USFWS

THE AHUPUA'A OR WATERSHED DRAINAGE

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

***WETLAND CLASSIFICATION:** The Cowardin Classification System is a descriptive method developed by the US Fish & Wildlife Service that defines wetlands according to their landscape position and water source. Within broad classes are wetlands known by common names: marsh, bog, mudflat, and swamp. Visit: www.npwrc.usgs.gov/resource/wetlands/classwet

WETLANDS ON THE WEB:
www.hiwetlands.com
www.wetland.org
www.pcvj.org
www.nrcs.gov
www.hear.org
www.fws.gov/wetlands
www.malahawaii.org
www.hawaii.gov/dlnr/dofaw
www.hamakuamarsh.com
www.kawainuamarsh.com
www.projectwet.org
websoilsurvey.nrcs.usda.gov

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