Mixohaline Waters

Description: Often referred to as 'brackish', mixohaline describes the delicate balance of water that is neither fresh nor marine. So why should we be concerned about mixed-up waters? Coastal wetlands, estuaries, anchialine pools, and some groundwaters are examples of these biologically and anthropologically vital resources. These water bodies provide unique habitat for organisms that include fish, waterfowl, rare shrimp, and plants.

On many oceanic islands, fresh water (supplied by rainfall) can be found underground floating on a layer of brackish water called the "transition zone." These layers of fresh and brackish water flow down to the margins of the islands and mix with seawater filtering through the rocks below. Groundwater flow influences the condition of biotic habitats and communities primarily by supplying fresh water and nutrients to plants and animals.

Cultural Significance: Historically, mixohaline water bodies, although undrinkable, provided people with water for agriculture, aquaculture, bathing, food harvesting and processing materials. This resulted in human settlements gathered around these important water resources. Subsequently, coastal strand communities contribute to the accretion of beaches used by turtles and seals which were also sources of food. In Hawaii, resources from mixohaline habitats were often traded for resources from the forests or ocean.

Inventories: Related inventories in Pacific Island Network (PACN) parks include vegetation of the American Memorial Park (AMME) wetland, aquatic fauna of Kauhakō Lake in Kalaupapa NHP (KALA), and both flora and fauna of the fishponds and anchialine pools along the Ala Kahakai National Historic Trail (ALKA), which includes the National Parks on the island of Hawai'i. Accurate identification and mapping of the wetlands and anchialine pools is a vital component of these inventories.

Monitoring: Anchialine pool biota and water quality are presently monitored along ALKA, particularly at Kaloko-Honokōhau NHP (KAHO) in conjunction with adjacent land use changes. As PACN Vital Signs protocols are completed, water quality, fish, and invertebrates will be monitored in many of the identified mixohaline waters.

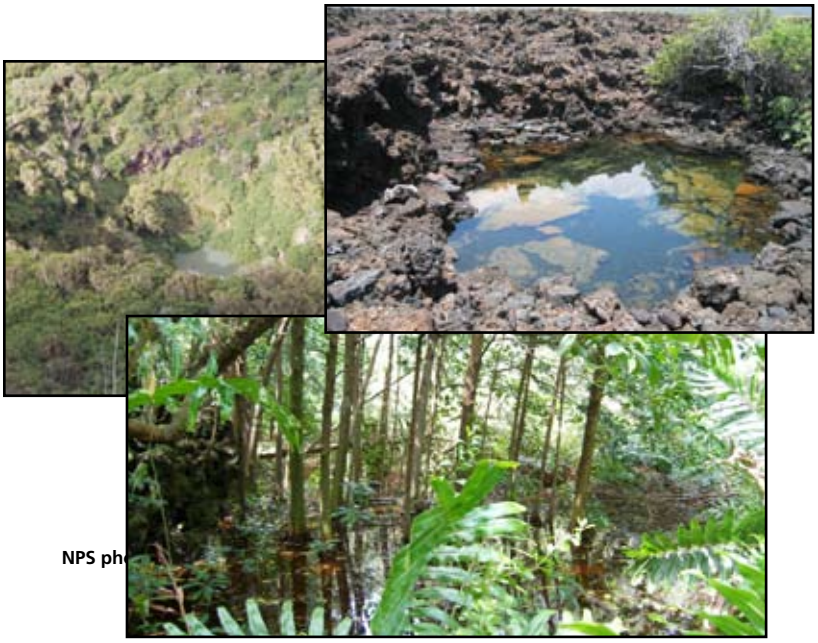
Data: The three main databases compiled by NPS for the PACN (NatureBib, NPSpecies, and Dataset Catalog) provide the most comprehensive resource for the many types of mixohaline water bodies found therein. Additionally, the Natural Heritage Program of the Nature Conservancy of Hawaii published a biological database of rare species and natural communities in anchialine pools in Hawaii in 1987.

Status & Trends: Many mixohaline resources are impacted by people (e.g. developments). For example, human encroachment has negatively affected hydrology near the AMME wetland, threatening its unique flora and fauna. Human uses of the resources in and around Pearl Harbor have contributed to contamination of the groundwater. Anchialine pools and fishponds range from pristine to heavily impacted. Even reconstruction of the wall enclosing Kaloko fishpond is contributing to changes in its water quality. Only the remote anchialine pools of Hawai'i Volcanoes NP, and KALA's Lake Kauhakō are currently undisturbed.

Management: The extreme range of conditions found in these mixohaline habitats supports very specialized and rare biota necessitating management protection. The wetland in AMME has two endangered species of birds, the nightingale reed-warbler (*Acrocephalus luscinia*) and the Mariana common moorhen (*Gallinula chloropus guami*); as well as a species of concern, the humped tree snail (*Partula gibba*). The top 4 m of Lake Kauhakō is brackish and supports an array of algae and invertebrates. Anchialine pools and fishponds contain fish, endemic shrimp, snails, calcareous algae, sea grass, and provide specialized habitat for endangered birds, native plants, amphibians, and the endemic Hawaiian damselfly (*Megalagrion xanthomelas*). Long-term monitoring of mixohaline water bodies and their biota should provide resource managers with the necessary information to sustain their critical existence.

Where to see mixohaline waters:

Anchialine pools and fishponds are common in West Hawai'i National Parks. In addition, Lake Kauhakō in KALA and the wetlands of AMME are other important examples of mixohaline resources.



NPS ph

From left to right: Lake Kauhakō at KALA; Wetlands at AMME; and an anchialine pool at KAHO.