



'Ohi`a – Backbone of Hawai`i's terrestrial ecosystems and culture

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Hawai`i's dominant native forest tree, `ohi`a, *Metrosideros polymorpha*, provides the backbone of Hawai`i's terrestrial ecosystems and the fabric that harbors the rich remains of the archipelago's native fauna and flora, 90% of which is endemic, and at least 20% endangered. Although Hawai`i has lost half of its original native forest, 400,000 hectares of relatively intact `ohi`a forest remains as of 2008. `Ohi`a forest typically consists of 80% `ohi`a trees which reach 25 meters in height.



An upland wet `ohi`a forest on O`ahu (photo: Karl Buermeyer)

Forests dominated by `ohi`a are home to at least 22 extant species of forest birds, the Hawaiian hoary bat, and many of Hawai`i's remaining native plants and invertebrates. Endemic Hawaiian honeycreepers, including 16 on the endangered species list, are dependant on these forests for critical habitat, as they have adapted to feed and nest in `ohi`a trees.



The endemic plant *Cyanea angustifolia* (photo: Karl Buermeyer)



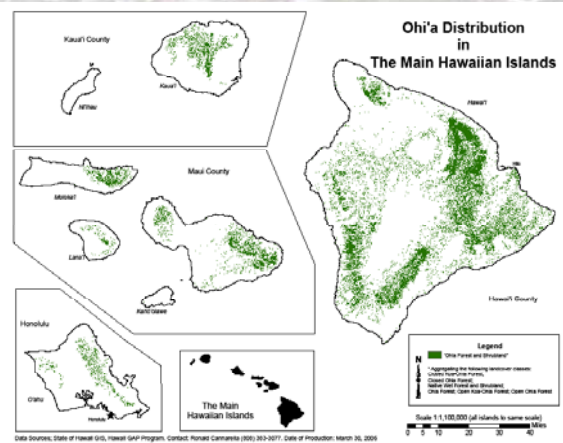
A native Hawaiian *Achatinella* tree snail (photo: Stephen Miller, USFWS)



The emblematic Hawaiian honeycreeper, i'iwi (*Vestiaria coccinea*) on `ohi`a (photo: Jack Jeffrey©)

Hawai`i's isolation has posed a formidable barrier to colonization by terrestrial organisms. Nearly 4000 km separate Hawai`i from the nearest large landmass and 1600 km from the nearest island group, making Hawai`i an evolutionary laboratory. Organisms evolving in this isolation, however, are often naïve to predators and diseases, and vulnerable to competition from invasive species that have escaped from the natural enemies of their home ranges and into Hawai`i's favorable climate.

`Ohi`a is a remarkable generalist, with the ability to dominate a broad range of sites in Hawai`i – from sea level to up to 2500m elevation, and from very wet (up to over 6000mm/yr) to dry (ca. 500mm/yr) sites. It is found as a colonizing species on recent lava flows as well as dominating forests on 4 million-year-old soils. Over its long evolution it has adapted to local environments, but specialization is limited by within-species gene flow.



In addition to supporting a preponderance of Hawai`i's unique natural heritage, `ohi`a lehua has great significance to Native Hawaiians. The tree is considered a form of Laka (deity of the hula) and Pele (deity of volcanoes), and the flowers and foliage are fashioned into lei. The wood is sacred to Ku, one of the four major Hawaiian gods, and is used in carved images, weapons, and tools.



Pele with haku lei of lehua blossoms (painting: Herb Kawainui Kane, © 2002)

In addition to encroachment by development and invasive non-native plants and vertebrates, `ohi`a forests are susceptible to invasion by introduced insect, fungal and microbial pests. A recent report listed 13 insect species, 25 fungal or bacterial diseases, as well as a genus of nematodes that are potential pests of *Metrosideros* and other members of the Myrtle family (Myrtaceae).



Puccinia psidii damage on the endangered *Eugenia koolauensis* (photo: Jane Beachy, Army Environmental, Schofield Barracks)

The fungal pathogen, *Puccinia psidii*, known as "ohi`a rust" in Hawai`i, established and spread throughout the main Hawaiian Islands within months in 2005. While damage to `ohi`a has been minor so far, other native and introduced members of the Myrtle family have been severely impacted. Rose apple (*Syzygium jambos*), an introduced species, has been almost completely defoliated. Similar damage to `ohi`a from another strain of *P. psidii* or another pest could be catastrophic. Repeated destruction of the new growth of `ohi`a trees would result in low reproduction, dieback of the crown, and eventual death of the tree as food reserves are exhausted. The resulting canopy gaps facilitate the invasion of light-loving invasive plants and eventually alter the composition, structure, and function of the forest.

The Hawai`i Department of Agriculture has restricted the importation of plants in the Myrtle family from areas infested by this rust to prevent other, potentially more harmful strains of the rust from being introduced. This may also minimize importation of other pests of Myrtaceae, but only from those restricted areas. Given accelerated trade, a pathways approach to regulating the importation of plants in this family from the mainland and foreign countries is essential to maintaining Hawai`i's unique and fragile ecosystems.



Puccinia psidii damage on a rose apple (*Syzygium jambos*) stand (Photo: Forest and Kim Starr)



Puccinia psidii damage on `ohi`a (photo: Rob Hauff, Hawai`i DLNR, DOFAW)