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In Hawai`i, Mangrove's Drawbacks Outweigh Benefits

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Since 2008, Malama O Puna and its partners have been working to clear mangroves from the Big Island, in hopes that eventually the entire island can be mangrove-free.

According to Ann Kobsa, the group's invasive species coordinator, the project was undertaken because on the island of Hawai`i, the mangrove infestations are still few in number and small in scale. Once the infestations are gone, there is only a remote chance for them to return. This makes the prospect of complete eradication feasible for Hawai`i island, unlike other islands, where stands of the red mangrove (*Rhizophora mangle*) are widespread and cover hundreds of acres.

Some residents of the Big Island – most notably Sydney Singer – have challenged the very goal of mangrove eradication, claiming that the thick, dense stands of trees protect the shoreline, provide habitat for fish, and keep coastal waters clear, among other things. The Big Island Invasive Species Committee, on the other hand, has put the red mangrove on its list of "priority target pests," where it joins three other plants (miconia, albizia, and wax myrtle) and two animals (coqui frogs and axis deer). In an information sheet it has prepared on the project, it cites the benefits of mangrove removal, including: elimination of annual shedding of mangrove biomass into tidal waters, resulting in an improvement in water quality; removal of the direct threats to coral reef ecosystems that mangroves pose by their shading and physical obstruction; the recovery of populations of native fish and protection of shorebird habitat; improvement of habitat for green sea turtles and monk seals; and protection and recovery of populations of Hilo beach grass (*Ischaemum byrone*), an endangered species.

Scientists who have looked into the red mangrove's impacts on coastal ecosystems in Hawai`i have little good to say about them. Amanda Demopoulous, a scientist with the U.S. Geological Survey, and Craig Smith, with the University of Hawai`i's Department of Oceanography, compared coastal areas in Hawai`i with mangrove infestations to nearby sand flats with no mangroves. (See their article, "Invasive mangroves alter macrofaunal community structure and facilitate opportunistic exotics," in *Marine Ecology Progress Series,* Vol. 404, published April 8, 2010.) They note that mangrove infestations are welcoming hosts to other non-native species, which "may lead to an invasional 'meltdown,' … accelerating the success of additional invasive species."

"The dominance of cryptogenic [unknown origin] and introduced species in Hawaiian mangrove sediments indicates that invasive mangroves facilitate the persistence and spread of introduced species," they conclude, which could ultimately impact the 500 or so aquatic and marine species that are found nowhere except Hawai`i.

In his lawsuit and elsewhere, Singer has frequently cited the ecosystem services mangroves provide. "[M]angroves are … beneficial to native and exotic fish, provide protection for the shoreline from tsunamis, storm surge, and other wave action, protect the coral reefs from excessive sunlight and storm

runoff and siltation, and comprise a unique environment which is filling an open niche along Hawai`i's evolving shoreline," he stated in his complaint. But according to James Allen, a professor in the School of Forestry of Northern Arizona University, while "mangroves are highly regarded in most parts of the tropics for the ecosystem services they provide," in Hawai`i, "they also have important negative ecological and economic impacts. Known negative impacts include reduction in habitat quality for endangered waterbirds such as the Hawaiian stilt…, colonization of habitats to the detriment of native species (e.g., in anchialine pools), overgrowing native Hawaiian archaeological sites, and causing drainage and aesthetic problems." (See his article, "Mangroves as alien species: the case of Hawai`i," published in *Global Ecology and Biogeography Letters,* 1998.)

What's more, Allen writes, most of the habitats typically occupied by mangroves in Hawai`i had no tree species at all. Thus, mangroves "are not only alien species in Hawaiian wetlands, but they also represent an entirely new life form in the ecosystems they invade, causing dramatic effects on plant community structure … and therefore almost certainly on ecosystem functioning."

A Century in Hawai`i

The red mangrove is native to Florida and the Caribbean. In 1902, the Hawai`i Sugar Planters Association brought it to Hawai`i, where it was planted in southwestern Moloka`i in hopes it would curb runoff from slopes laid bare by livestock and cultivation. Thereafter, it was planted in Kalihi fishpond, on O`ahu (unknown time), and in 1922, it was introduced to He`eia marsh on the windward side of O`ahu. It was introduced to Kealia Pond on Maui in 1960, when 3,000 propagules were planted to hold down dust when the pond was drawn down.

Several other mangrove species have been planted. Three have not been seen since the middle of the 20th century. Others have shown limited tendencies to spread. One species, Conocarpus erectus, introduced in 1946 from Bahamas, is still widely planted as an ornamental, according to Allen; it has "escaped cultivation and established small wild populations on some islands."

By far the most common mangrove in Hawai`i is the red mangrove, found on all islands except (possibly) Ni`ihau and Kaho`olawe. By 1977, dense, monotypic stands of mangrove were estimated to occupy nearly a third of all estuarine intertidal habitat in the state.

Efforts to remove mangroves from selected areas began in the early 1980s. One of the earliest was at Nu`upia Ponds, at Kane`ohe Marine Corps Air Station on O`ahu, where 20 acres of mangrove were cleared to improve habitat for the Hawaiian stilt. As described by M.J. Rauzon and D.C. Drigot, the project lasted 20 years, took thousands of volunteer hours, and cost more than $2.5 million in contract labor. "Mangroves were cleared by hand, shovels, and chain saws in archaeologically sensitive areas and grappled with heavy tracked equipment in less-sensitive areas," they write. (See their article, "Red

mangrove eradication … in a Hawaiian wetland…," in *Turning the Tide: The Eradication of Invasive Species,* edited by C.R Veitch and M.N. Clout, 2002.)

Starting in 1988, and for the next seven years, crews at Kaloko-Honokohau National Historical Park cleared mangroves from the park. Aerial photos show no trees in Kaloko fishpond in 1972; by 1990, "solid mangrove thickets had become the dominant shoreline vegetation," according to a report on the work by Rizal Fronda, Melia Lane-Kanahele, and Bryan Harry. "Control of the red mangrove … was difficult, physically and mechanically demanding, and expensive."

The National Park Service had adopted a "four-fold mosaic" approach to vegetation management, they note. It was intended to "favor and re-establish vegetation typical of pre-historic Polynesian landscapes; where appropriate, favor native vegetation; where applicable, favor vegetation desirable for breeding habitat of endangered stilts and coots; and remove vegetation detrimental to significant archaeological sites." The red mangrove, they continue, "is an anathema to all these park objectives."

"Mangrove roots penetrated the smallest openings in the ancient ruins and any activity more than careful handwork in removing trees irreparably destroys the old ruins – the principal feature for which this National Historical Park was established. Spraying the mangrove was not an acceptable alternative. The tree has a thick leathery leaf from which liquids fall off even when the weed killer is mixed with a wetting agent…. Also, chemicals could not be considered for use because of their unknown impact upon native fish and crustaceans" they report. Helicopters and boats had to haul away the cut trees. Difficult footing "made use of chainsaws hazardous."

The park must continue to be vigilant. "Neglecting 'weeding maintenance' of the controlled mangrove for merely a few years would nullify this control effort and revert the ponds back into mangrove thickets," the report states. "There is a constant source of new seed pods floating along the coast from other nearby mangrove infestations, sites over which the park has no jurisdiction." (The Alulu Bay site, where Malama O Puna proposes to take out the mangroves, is the worst of these.) To remove the new mangroves, park workers either cut them down with a string trimmer or burn them out with a methane flame-thrower.

Patricia Tummons

Terry Cooper June 20, 2017 | Reply

Thanks for the information concerning the reasons not to plant mangroves along the shoreline.

Are there any plants that are native to Hi. that might serve the same purpose without adversely impacting the native fauna? Might it

be possible for one to be developed by one of the Universities, or are there other species that might be found elsewhere in the world that would suffice, also without damaging the eco-system? I am mostly familiar with what was done in Fl.

There they also built sand berms and planted sea oats to help keep the sand in place. They also installed concrete berms in the water to try to prevent the sand from being washed away, but those seemed to created dangerous currents in their immediate vicinity, and they still had to do constant beach reconstitution by dredging recovered sand.

As sea levels rise because of climate change, Hi. is going to be particularly vulnerable to flooding, and the sea overtaking the land. Now, is definitely time to start making plans to protect life and property from the encroachment of the ocean. Even if mangroves were not detrimental to the native fauna, I'm not sure they would be enough to offer the kind of protection that will ultimately be needed. Some areas, like NYC are looking at the seawalls that the Dutch have built. Irrespective of what is done, it will be very costly, and doing nothing will be even more so.

Mahalo,

Terry Cooper

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