

Two decades of restoration of a highly diverse but degraded dry forest at Auwahi, Maui with insights into changes in invasive rodent communities and hydrologic function

AB Shiels², Erica VONALLMEN¹, AC Medeiros¹

¹University of Hawai'i at Manoa, ²National Wildlife Research Center

Diverse dry forests of Hawai'i, once expansive across leeward landscapes, now occupy less than 2.5% of their original extents due to agricultural conversion, wildfires, and the impacts of non-native plants, vertebrates, and invertebrates.

Originally, the restoration site (Auwahi, Maui island) was dominated by non-native grasses, especially *Cenchrus clandestinus*, with scattered native trees. In 1997, restoration (ungulate exclusion, herbicidal grass control, and outplanting of native shrubs) was initiated on a 4ha tract with the intent of evaluating the feasibility of re-establishing native dry forest. After 15 years, cover of native species increased (20%-98%) while non-native species decreased (87%-2%). The diverse assemblage of dry forest trees, the projects' conservation loci, responded remarkably well with 14 of 22 species establishing seedlings, particularly significant in that reproduction of these species is largely absent elsewhere in the wild, some for as long as a century.

In 2011, at Auwahi, we compared soil hydraulic properties in restored native forests and non-native grasslands. Hydrophobicity and hydraulic conductivity values were significantly higher in forests than grasslands. Using irrigation to simulate winter storms, data indicates that in the forest compared to the grasslands, given equal water inputs, soils accrued higher water content, had greater preferential flow, and transported water to depth more efficiently, to at least the limits of 1m deep sensor probes.

In 2014, with quarterly snap-trapping, we compared invasive rodent communities of the restored native forest and unrestored grassland. In non-native grasslands, the house mouse (*Mus musculus*) was abundant, greatly outnumbering black rats (*Rattus rattus*), 220:1. In the restored forest, black rats, virtually absent in the grasslands, dominated, outnumbering mice 20:1. As black rats are notorious predators of native seeds, vertebrates, and invertebrates, these data suggest that without mitigation, restoration of small forest tracts in Hawai'i and perhaps elsewhere can be compromised by heightened black rat populations accompanying restoration.