



Developing Coastal Wetland Restoration Techniques to Enhance Coastal Habitats at Ahua Reef, Hickam AFB, HI

Project # 11-320

Background:

Hawaii has lost nearly 31% of its coastal wetlands as a result of human activities and the remaining coastal wetlands have been further degraded due to invasion by fast growing, non-native plants, particularly mangroves (*Rhizophora* spp.) and pickleweed (*Batis maritima*). These species displace native vegetation, choke out open water and mudflats necessary for Hawaiian waterbirds, and negatively affect water quality and hydrology. All Hawaiian waterbirds are endangered and, therefore, it is not surprising that most wetland creation and restoration projects in the Hawaiian Islands are focused on managing habitat for these endangered species. Much less attention has been given to native wetland plants, potentially because high vegetative cover is often not appropriate to maximize habitat use by Hawaiian waterbirds. Very few projects have investigated techniques to restore native wetland plants and rarely has there been consistent monitoring of outplanted native species. Records of success and failure of native wetland plant restoration efforts are largely anecdotal.



Pickleweed invasion at Ahua Reef, Hickam AFB, HI.

Objective:

The overarching goal of this study was to develop seeding and outplanting techniques for several wetland plant species under various invasive species control strategies in order to guide other wetland restoration or mitigation projects on DoD installations in the Pacific Island region. The specific objectives was to investigate species-specific techniques for outplanting and seeding Hawaiian coastal wetland species and determine species-specific responses to different weed control methods and watering regimes.

Summary of Approach:

Ahua Reef is a 1.6 hectare wetland and mud and reef flat largely degraded by invasion of pickleweed. In a randomized block design, we established eight 14.5 m² plots and manually pulled pickleweed from four plots, and applied 1% solution of the herbicide Habitat® (EPA Reg No. 241-426) to pickleweed in the remaining four plots. We transplanted five Hawaiian wetland species: *Cyperus javanicus*, *Cyperus polustachyos*, *Fimbristylis cymosa*, *Lysium sandwicense*, and *Sesuvium portulacastrum*. Plants were randomly subjected to four weeding watering treatments: watering + weeding, watering + no weeding, no watering + weeding, and no weeding + no watering. We measured survival and growth of outplanted natives over a period of five months.

Benefit:

Results of this study will provide coastal wetland managers scientific guidelines for appropriate selection of pickleweed control method and planting techniques of native Hawaiian wetland species.

Accomplishments:

Survival and percent cover of all outplanted species and re-growth of pickleweed was significantly higher in mechanical than herbicide treated plots; probably due to negative effects of the residual herbicide in the soil. Habitat® is an effective herbicide that could be used for large scale control of pickleweed; however, a time interval of 100-200 days is recommended between site preparations and outplanting to allow for natural dissipation of the herbicide to occur. Weeding every other month decreased pickleweed cover. *S. portulacastrum* had the highest survival and cover of all native outplants while *Lycium sandwicense* had the lowest cover at the end of the study. Initial watering might be essential for the establishment of the outplanted species. Subsequent weeding and watering may not be necessary at least when the weeds are not abundant. But, if not weeded later it is likely that the outplanted natives would succumb to the aggressive growth of invasive pickleweed.

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