

# Understanding Trends of Non-Native Invasive Vegetation for the Kawainui Marsh Restoration Project



UH Mānoa Natural Resources and Environmental Management Capstone  
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## Introduction

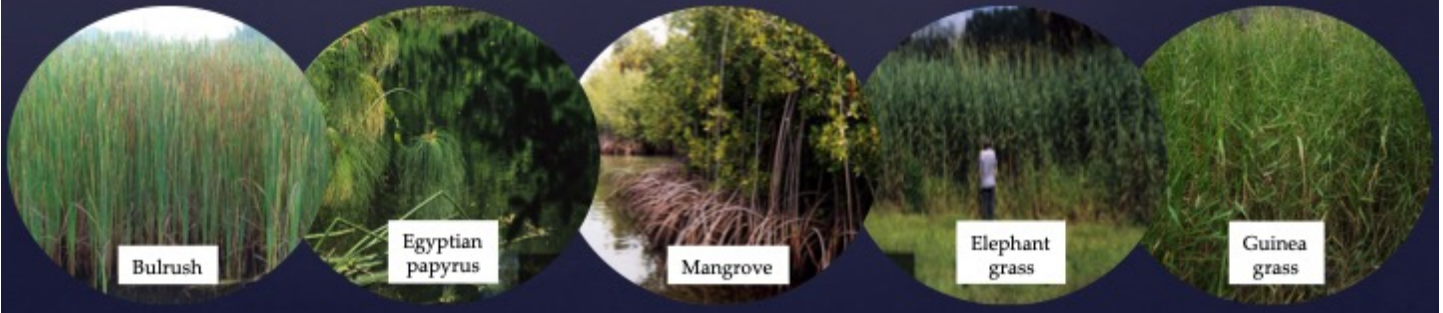
# What are invasive species?

Rapid individual growth rate, adaptable, high reproductive output...

# Why do we care?

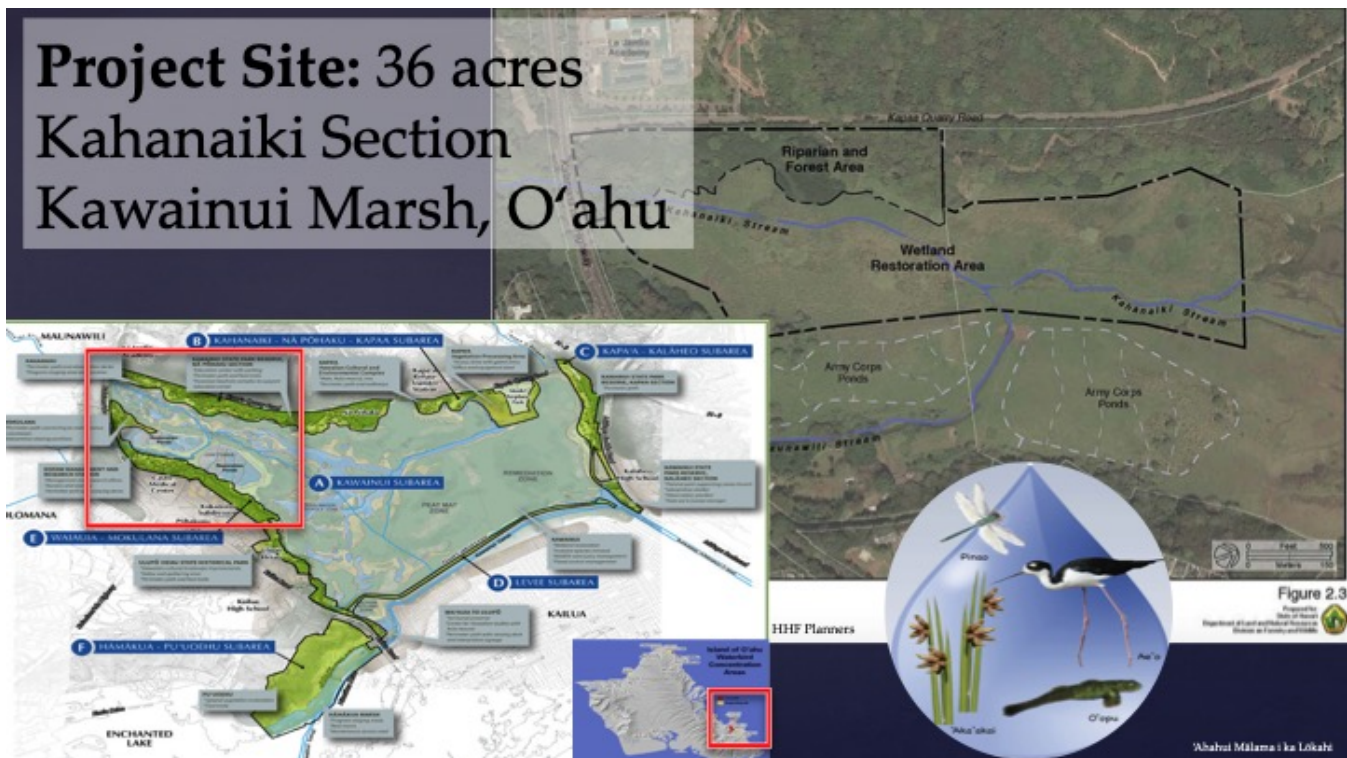
Hawaii is especially vulnerable due to our tropical climate & geographic isolation

Loss of native ecosystem function, economic repercussions, and degradation of socio-cultural value.

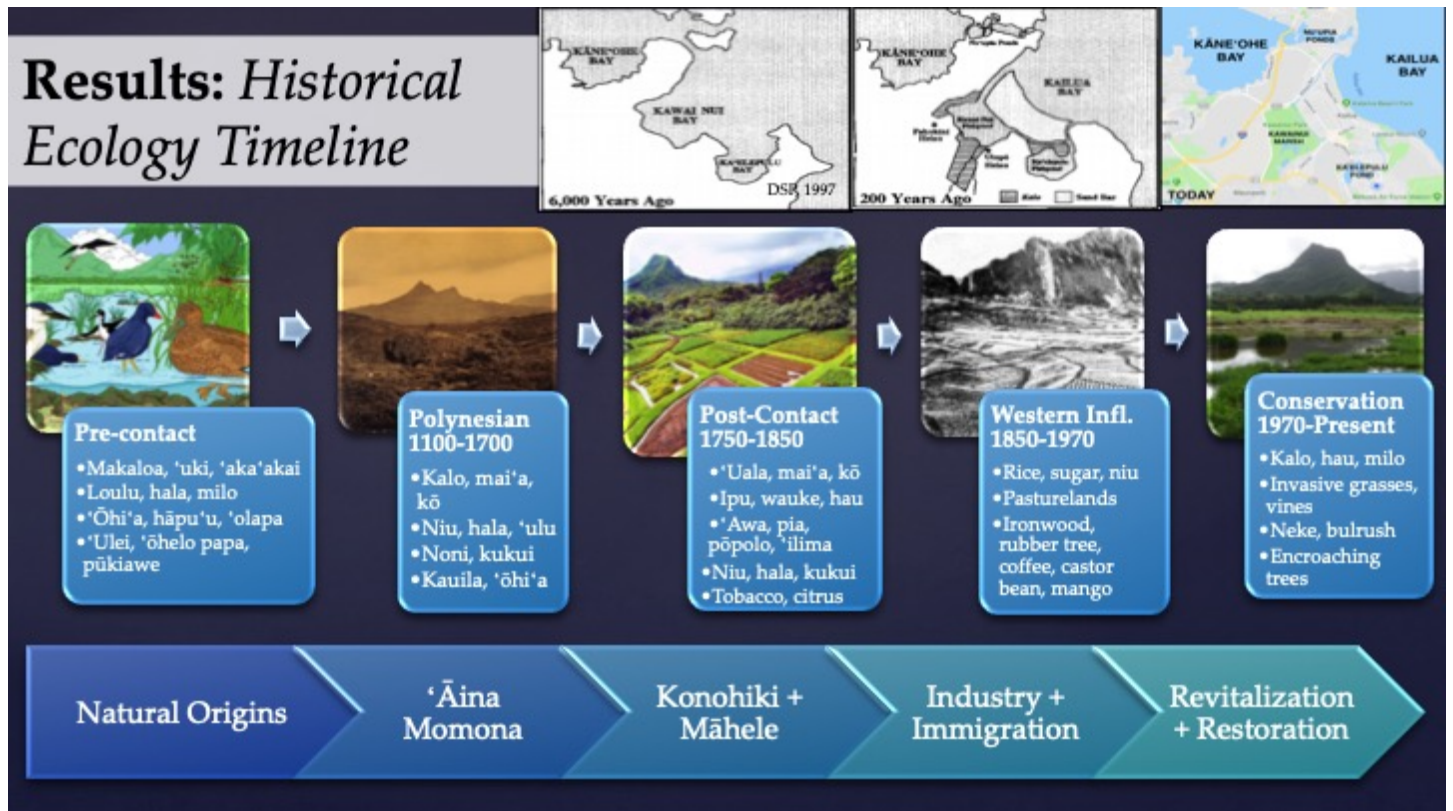


## Project Site

**Project Site: 36 acres**  
**Kahanaiki Section**  
**Kawainui Marsh, O'ahu**



## Historical Ecology Timeline



## Plant Community Analysis

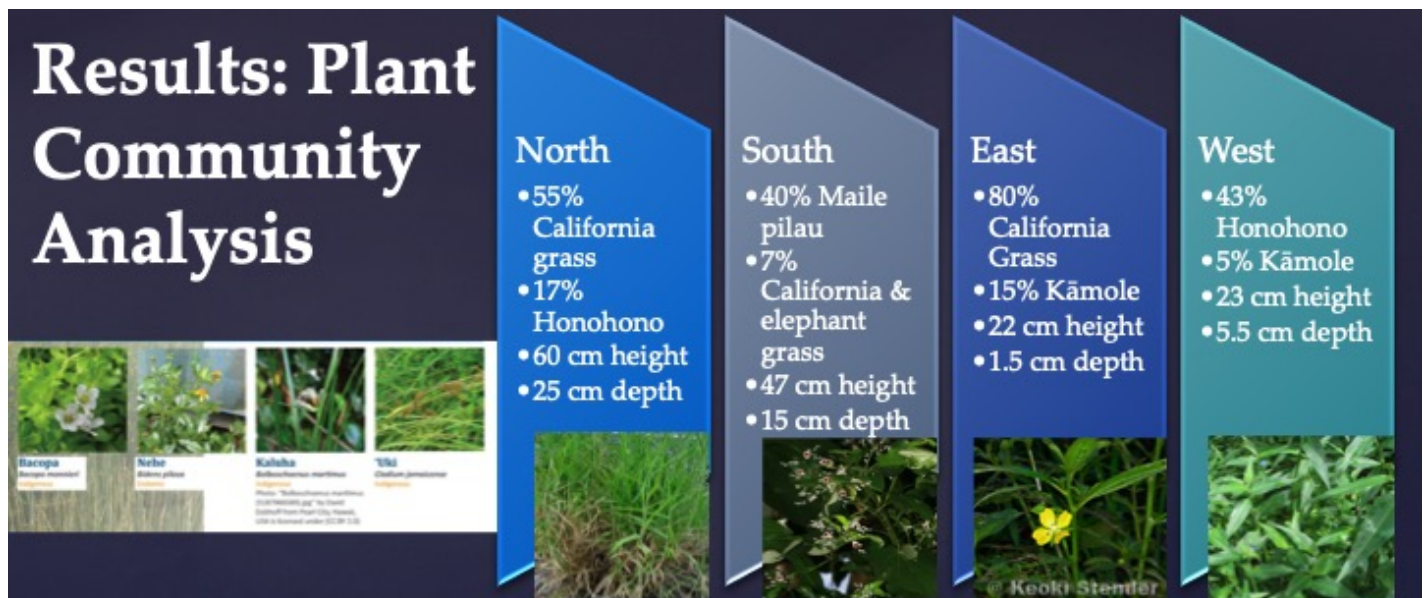


Table 3. Comparative list of targeted invasive species and complimentary restoration species

Targeted Invasive Species	Complimentary Restoration Species
California grass	'Ae'ae ( <i>Bacopa monnieri</i> ) + 'uki ( <i>Cladium jamaicense</i> ).
Maile pilau	'Ākulikuli ( <i>Sesuvium portulacastrum</i> ) + kaluhā ( <i>Bolboschoenus maritimus</i> )
Honohono	'Ākulikuli ( <i>Sesuvium portulacastrum</i> ) + 'ahu'awa ( <i>Cyperus javanicus</i> )
Elephant grass	'Uki ( <i>Cladium jamaicense</i> ) + 'ae'ae ( <i>Bacopa monnieri</i> )

## Reccomendations

# Results: Recommendations Report

- Arranged low to high in cost of resources and time
- Small patch invasive plant removal + companion planting
- Re-engagement with kānaka

Category of Restoration	Currently	Low	Medium	High
Plant community	No ongoing out planting	Rich seeding mixes	Companion planting	Micro-habitat studies for suitable out planting
Landscape - invasive control	Regular weed eating, quarterly herbicide & mashing	Mowing, weed eating, or targeted herbivore use for grass control	Herbicide treatment	Marsh mashing
Landscape - alternative control	None	Community stomping days	Addition of carbon-rich substrates	Controlled disturbances like flooding or burns
Physical environment	Leveled topography from machines	Return stream flow	Increase landscape heterogeneity	Restoration of physio-chemical structure
Bio-cultural	Some cultivated cultural plants	Restore lo'i kalo	Restore agroforestry systems	Restore loko wai
Community	Monthly public workdays	Create spaces for cultural practices and ritual	Community work and share days	Community-based management
Scale of Restoration	Control of grasses at landscape level, no restoration	Control grasses in smaller isolated patches	Maintenance of high quality habitat in small patches	Full restoration of native plant community

## Discussion

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- Kawainui was once the piko of an 'āina momona
- Drastic alterations in hydrological dynamics, nutrient, and plant community explain current restoration struggles
- Limitations of plant community survey
- Potential implications of climate change
- Future plant management must synergize restoration alternatives to achieve long-term goals

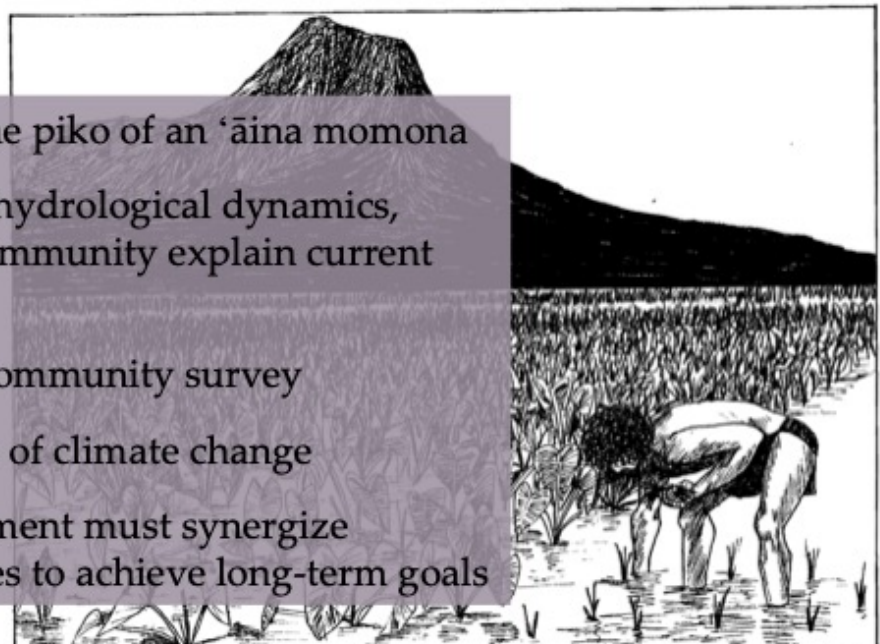


Figure 1.10 Artist's Rendition of Hawaiian Planter Harvesting Taro from Wetland Cultivated Fringe of the Kawai Nui Loko (Inland Freshwater Fishpond), ca. 500 Years Before the Present (Artist: Donna Kanahelo)

## Conclusions

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- Ecological patterns are intimately linked with management regimes
- The landscape varies, therefore the management must also vary
- Invasive plants will always be a part of this landscape
- One entity cannot do this alone
- Sustainable restoration and management requires re-engagement with people and Kawainui

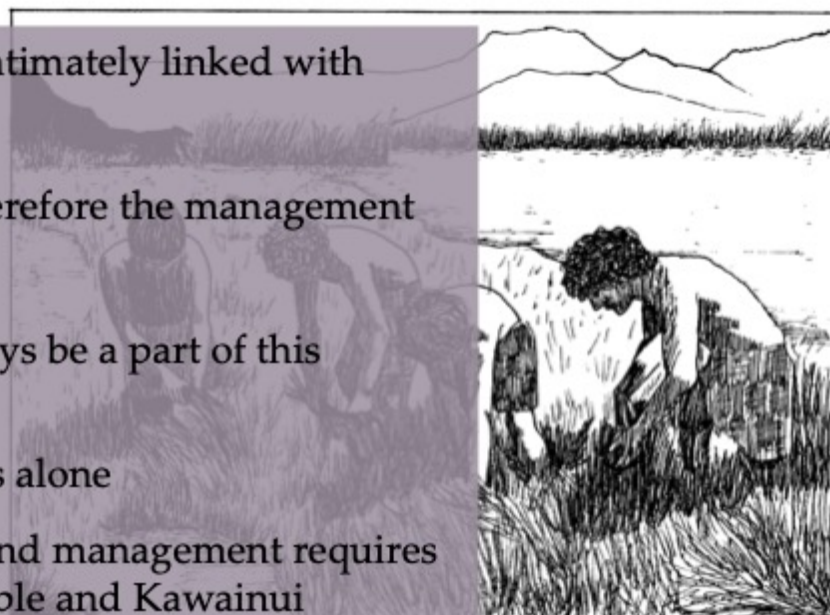


Figure 1.12 Artist's Rendition of Vegetation Clearing by Hawaiians in the Fishpond at Kawai Nui in Honor of Hauwahine, the Mo'o Guardian Goddess of the Pond, ca. 500 Years Before the Present (Artist: Donna Kanele)

**Waipahē wale. As gentle as still water. Said of a person who is genial and kind. (MKP – ‘Ōlelo no‘eau No. 2916) How do wetlands help our community and how can we kōkua to care for wetlands?**