

**BOTANICAL AND FAUNAL SURVEY  
LIPOA POINT, HONOLUA, MAUI**



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# BOTANICAL AND FAUNAL SURVEY LIPOA POINT, HONOLUA, MAUI

## INTRODUCTION

The project area, Lipoa Point, encompasses about 244 acres (TMK 410010100000). The site is on the north coast of West Maui, located on the north side of Honoapiilani Highway from Honolua Bay in the west to Honokohau Bay in the east. The bulk of the surrounding property is owned by Maui Land and Pineapple. There are also three small private inholdings within the Honolua Valley portion of the site. The north part of the property abuts the ocean. The goal of this survey was to inventory the flora and fauna in the area, to help DLNR and its consultant team develop recommendations for the management of existing and proposed future uses of the project area.

## SITE DESCRIPTION

The project area includes a broad area of moderately sloped land that was once part of a pineapple plantation, but is now fallow. Below this broad shelf the land becomes steeper, eventually becoming cliffs as it reaches the ocean. There are a few small gullies that dissect the land. And part of the site is within the flat bottom of Honolua Valley. The project elevation ranges from sea level to about 200 feet above sea level. Annual rainfall averages 45 inches. Annual air temperature averages 73 degrees Fahrenheit.



Project area, Lipoa Point, Honolua, Maui.



## **BIOLOGICAL HISTORY**

The original vegetation on the site would have been a diverse coastal herbland and dry to mesic shrubland and forest. After the arrival of humans, a series of forces including fire, agriculture, and introduced plants, animals, and diseases transformed the site to predominantly non-native vegetation over most of the site. A few remnants of the native vegetation can be found in the steepest and most windswept locations along the coast. Major uses of the site have included Hawaiian habitation, ranching, a golf course, pineapple cultivation, and recreation.

## **SURVEY OBJECTIVE**

The main objectives of the survey were to:

- Document what plant (terrestrial vascular flora) and animal (birds, bats, mammals, insects) species occur in the site or may likely occur in the existing habitat.
- Provide general recommendations and best management practices to support flora/fauna enhancements and the re-establishment of native flora and fauna throughout the project site and in a handful of high priority sites.



**Honolua Bay, a popular recreation area on the west side of Lipoa Point.**

# **BOTANICAL SURVEY**

## **SURVEY METHODS**

A walk-through botanical survey method was used over representative areas of the site. Extra emphasis was placed on areas with high diversity, such as steep, windswept land near the coast and other pockets of remnant native plants. Binoculars were used to survey areas too steep to survey on foot. High-resolution aerial images were used to help map large scale features. Notes were made on plant species, distribution and abundance.

The site was surveyed in April and May of 2018.



**Taking notes on flora, Lipoa Point.**



## DESCRIPTION OF VEGETATION

There are three main vegetation types within the project area.

### Abandoned Pineapple Fields

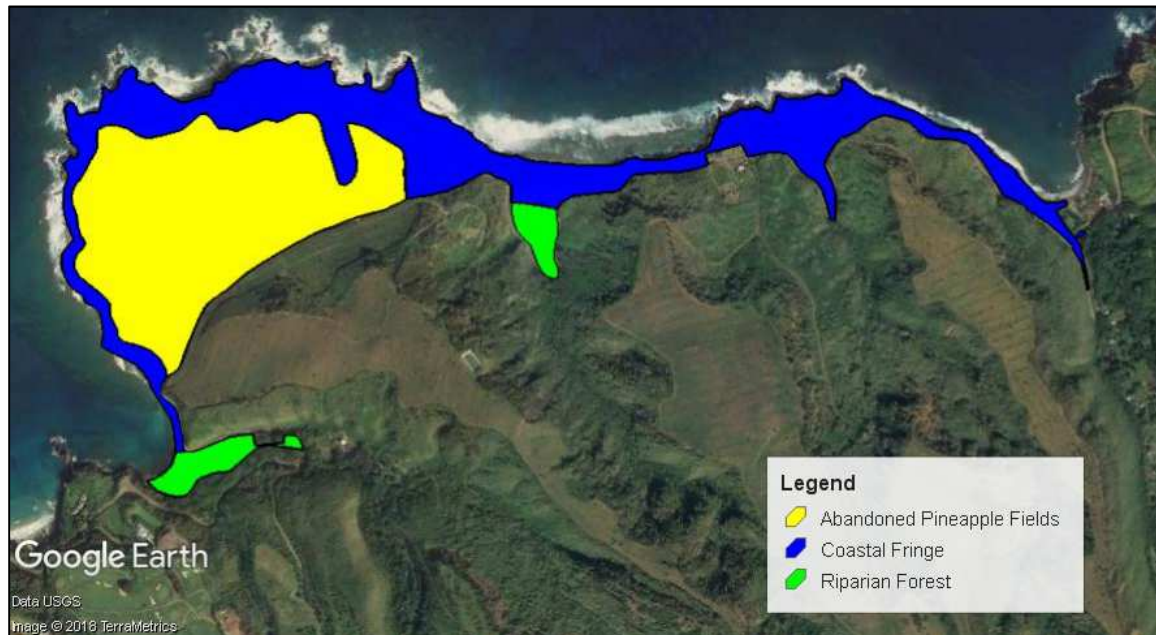
The bulk of Lipoa Point below Honoapiilani Hwy. is a large, open, moderately-sloped area that was once part of a pineapple plantation. Those rows and rows of pineapple fields have since been abandoned. And today the fields are revegetating with a mix of mostly non-native grasses, shrubs, and trees.

### Coastal Fringe

Below the fields where cultivating pineapple was possible, the land steepens, eventually becoming cliffs along the ocean. Closest to the ocean there are scattered patches of remnant native plants. Farther from the ocean, the native plants quickly become less abundant. By the top of the coastal fringe, where it meets the old pineapple fields, the vegetation is virtually all non-native. Near the coast the vegetation is short and herbaceous. Further inland the vegetation becomes taller and woodier.

### Riparian Forest

The bottom of Honolua Valley is moist and has a large canopy of introduced trees, some festooned with draping vines. The understory is a mix of aggressive non-native grasses, shrubs and vines. Scattered about this heavily trafficked area are numerous plantings of edible and ornamental plants. In Pohakupule Gulch, the canopy is shorter and less lush.



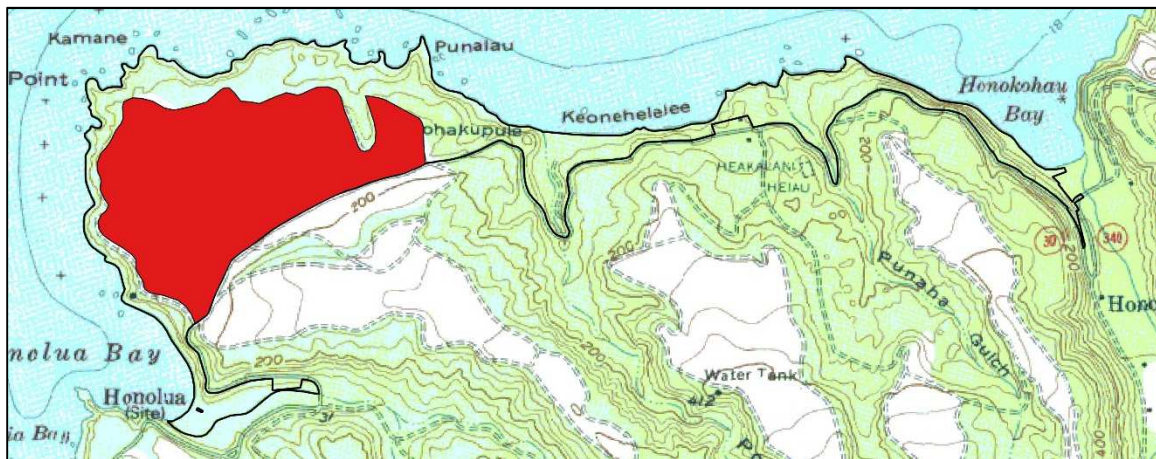
**Main vegetation types at Lipoa Point.**

## ABANDONED PINEAPPLE FIELDS

The bulk of Lipoa Point below Honoapiilani Hwy. is a large, open, moderately-sloped area called Kulaokaea. The area was at times a pasture, golf course, and most recently part of a pineapple plantation. The rows and rows of pineapple fields have since been abandoned. And today the fields at Kulaokaea are revegetating with a mix of mostly non-native grasses, shrubs, and trees.



Abandoned pineapple fields revegetating with a mix of non-native grasses, shrubs, and trees.



Abandoned pineapple field vegetation at Lipoa Point.



There were no native trees found within the abandoned pineapple fields. Non-native trees in the area include ironwood (*Casuarina* spp.), Christmasberry (*Schinus terebinthifolius*), Formosan koa (*Acacia confusa*), and red silky oak (*Grevillea banksii*). There are also some recent plantings of kamani (*Calophyllum inophyllum*), false kamani (*Terminalia catappa*), Australian rock fig (*Ficus platypoda*), and coconut (*Cocos nucifera*).

The only native shrubs observed within the abandoned pineapple fields were a row of aalii (*Dodonaea viscosa*) and hau (*Hibiscus tiliaceus*) near Honoapiilani Hwy. that appear to have been planted, and uhaloa (*Waltheria indica*), a common weedy native found throughout the site.

Non-native shrubs in this area include lantana (*Lantana camara*), haole koa (*Leucaena leucocephala*), hairy horseweed (*Conyza bonariensis*), and balloon plant (*Asclepias physocarpa*). There is also a long planted row of oleander (*Nerium oleander*) around the active roadsides of the property. And a few other non-native ornamentals have been planted, including hibiscus (*Hibiscus rosa-sinensis*).

Herbaceous non-native plants in the abandoned fields include vervain (*Verbena litoralis*), root-beer plant, (*Polygala paniculata*), and upright indigo (*Indigofera suffruticosa*). These are mixed in with the non-native vining cow pea (*Macroptilium atropurpureum*), butterfly pea (*Clitoria ternatea*), and glycine (*Neonotonia wightii*).

No native grasses were encountered in the abandoned pineapple field section. Non-native grasses dominate the site, especially Guinea grass (*Megathyrsus maximus*), sourgrass (*Digitaria insularis*), California grass (*Urochloa mutica*), Natal red top (*Melinis repens*), and pangola (*Digitaria eriantha*).

A large old declining plant of tree tobacco (*Nicotiana glauca*) was growing on the edge of an abandoned dirt roadway. No signs of Blackburn's sphinx moth (*Manduca blackburni*) were observed on the tree tobacco.



**Broad expanse of mostly Guinea grass (*Megathyrsus maximus*) in abandoned pineapple fields.**



Old pineapple plantation infrastructure on edge of abandoned pineapple fields. Lantana (*Lantana camara*), Guinea grass (*Megathyrsus maximus*), and ironwood (*Casuarina* spp.) are common here.



Abandoned fields revegetating. If no management is done, over time this area will likely become forested with non-native trees, as has occurred on the hill in the background.





**Red silky oak (*Grevillea banksii*) is beginning to establish in the abandoned pineapple fields.**



**California grass (*Urochloa mutica*) is dominant in some of the moister sections of the fields.**



**Natal red top (*Melinis repens*) grows in the more open parts of the abandoned pineapple fields.**





A long hedge of oleander (*Nerium oleander*) was planted along the active roads on the margin of the abandoned pineapple fields, and continues to persist.



Also planted in the abandoned fields were a row of native aalii shrubs (*Dodonaea viscosa*).



The common native shrub uhaloa (*Waltheria indica*) is one of the only native plants occurring within the abandoned pineapple fields.

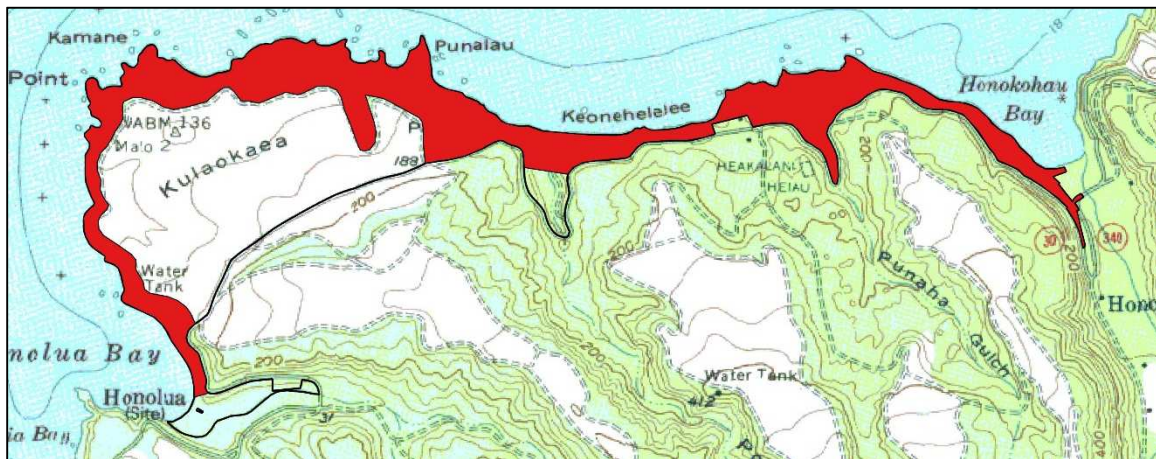


## COASTAL FRINGE

Below the fields where cultivating pineapple was possible, the land steepens, eventually becoming cliffs along the ocean. Closest to the ocean there are scattered patches of remnant native plants. Farther from the coast, the native plants quickly become less abundant. By the top of the coastal fringe, where it meets the old pineapple fields, the vegetation is virtually all non-native. Near the coast the vegetation is generally short and herbaceous. Further inland the vegetation becomes taller and woodier.



Mix of native and non-native plants along coastline at Lipoa Point.



Coastal fringe vegetation at Lipoa Point.



The coastal fringe near the mouth of Honolua Stream is a boulder beach backed by a mix of mostly non-native trees and the questionably indigenous milo (*Thespesia populnea*).

The only native tree in the coastal fringe is the questionably indigenous milo (*Thespesia populnea*). Scattered milo trees are present along the coast, mostly on the western side of Lipoa Point, especially at the mouth of Honolua Stream.

In contrast, non-native trees are abundant in the coastal fringe. Most prevalent is ironwood (*Casuarina equisetifolia* & *C. glauca*). Ironwood occurs as scattered trees and dense thickets, and appears to be increasing in distribution.

Conspicuous planted groves of coconuts (*Cocos nucifera*) and cook pines (*Casuarina columnaris*) are visible along the crest of the coastal fringe. There is also an old planting of golden shower tree (*Cassia fistula*). And a few tree heliotrope (*Tournefortia argentea*) and Manila tamarind (*Pithecellobium dulce*) trees occur along the coast.

The sprawling native shrub naupaka (*Scaevola taccada*) is common over much of the coastal fringe, as is ilima (*Sida fallax*) and ohelo kai (*Lycium sandwicense*). Akoko (*Euphorbia degeneri*) is locally abundant along the coast of the eastern part of Lipoa point. A few plants of akia (*Wikstroemia uva-ursi*) were encountered on the seaward tip of Punalau and further east towards Pohakupule.

Non-native shrubs along the coastal fringe include haole koa (*Leucaena leucocephala*) which dominates large areas, especially near gulches, lantana (*Lantana camara*), tree vitex (*Vitex trifolia*), button mangrove (*Conocarpus erectus*), sourbush (*Pluchea carolinensis*), and Indian fleabane (*Pluchea indica*).



The coastal fringe at Honolua Bay is dominated by Guinea grass (*Megathyrsus maximus*) and haole koa (*Leucaena leucocephala*). There are a few hardy native plants near the coast here.





**The north and east side of Lipoa Point are windswept by the prevailing trade winds. The vegetation here, much of which is native, must be able to cope with the harsh salty and windy conditions.**

Akulikuli (*Sesuvium portulacastrum*) is the most abundant native succulent in the coastal zone, often growing with nena (*Heliotropium curassavicum*). A few healthy patches of schiedea (*Schiedea globosa*) occur near the coast below steep cliffs. The endangered awiwi (*Schenkia sebaeoides*) was present in scattered patches along the coast.

Non-native succulent plants are prevalent in a few spots. Most notable is night blooming cereus (*Hylocereus undatus*), which crawls over the ground and up trees, forming large thickets. Scattered plants of Mauritius hemp (*Furcraea foetida*) are found in the coastal fringe, especially on the rock bands overlooking Honolua Bay. As is prickly pear cactus (*Opuntia ficus-indica*).

Two native grasses occur at Lipoa Point. Konakona grass (*Panicum torridum*) is scattered over coastal cliffs from Honolua Bay to Honokohau Bay. And a more diminutive panicum grass (*Panicum fauriei* var. *fauriei*), for which we encountered a few small patches, is found east of Kamane. The native sedge mau akiaki (*Fimbristylis cymosa*) is common in many areas near the coast. Less common at Lipoa Point are the native sedges cyperus (*Cyperus phleoides*) and pycreus (*Cyperus polystachyos*).

Non-native grasses dominate most of the site not covered by ironwood. By far the most common is Guinea grass (*Megathyrsus maximus*), of which there are multiple forms. Other non-native grasses in the coastal fringe include fingergrass (*Chloris barbata*) sourgrass (*Digitaria insularis*), and Bermuda grass (*Cynodon dactylon*).

Cascading over rock bands and open areas near the coast is the native vine pau o Hiiaka (*Jacquemontia sandwicensis*). Huehue (*Cocculus orbiculatus*) does the same at Pohakupule. At Koenehelelee vines of beach morning glory or pohuehue (*Ipomoea pes-caprae* subsp. *brasiliensis*) crawl over the sand. A large patch of pohinahina (*Vitex rotundifolia*) climbs over the rocks on the west side of Honokohau Bay.



**Ironwood dominates the landscape over most of the coastal fringe, including here at Punalau.**

Non-native vines in the coastal fringe include cow pea (*Macroptilium atropurpureum*), glycine (*Neonotonia wightii*), and wedelia (*Sphagneticola triloba*).

At the mouth of Honolua Stream, the coastal fringe is comprised of mostly large milo trees. Further east the coast is relatively weedy, with cereus, haole koa, and Guinea grass lining the walls behind the rocky shoreline.

Along the coast near the end of the dirt road to access the surfing at Lipoa Point, native coastal plants begin to become more prevalent, especially akulikuli, ilima, and pau o Hiiaka, which cascade down the rock bands in the area. This area in the lee of the cliffs above Honolua Bay is relatively dry.

As one turns the corner on Lipoa Point and reaches Kamane, the exposure to the predominant trade winds increases. In this area native plants continue to become more prolific. Usually occurring in patches near the coast. Elsewhere along the coast is mostly ironwood and Guinea grass. There are also remnants of non-native plantings.

At Punalau and Pohakupule, the full brunt of the tradewinds is felt above the steep cliffs. This is where the most native plants still persist at Lipoa Point. Again, the land further away from the coast in this area is dominated by ironwood and Guinea grass.

Keonehelelee is a sandy beach that continues to short cliffs behind a rocky shore. There are pockets of native plants here, including the endangered awiwi and sprawling ulei. Guinea grass and ironwood dominate the bulk of the area.

Punaha has a small gulch filled with haole koa, Guinea grass, and a host of weedy vines. The shoreline here is sheer and few plants grow on the unstable cliffs except ironwood.

At Honokohau Bay pohinahina sprawls over boulders to the ocean, patches of konakona grass persist in small pockets on the cliffs, and the bulk of the area is dominated by ironwood, haole koa, and Guinea grass.



**Stream mouth at Honokohau Bay. There is a large patch of native pohinahina near here.**





**Much of the coastline of Lipoa Point is rugged, windswept, and steep. This is where the bulk of the remnant native plants occur.**



**Further inland on the coastal fringe, non-native ironwood trees (*Casuarina* spp.) and a mix of aggressive grasses become dominant, with fewer native plants.**





**Typical windswept, low-statured, native-dominated area at Lipoa Point.**



**Mix of common native plants at Lipoa point. These species (mau akiaki, akulikuli, nena, and ilima) can be found almost anywhere there is bare ground in the coastal fringe zone.**





Ilima (*Sida fallax*) and akulikuli (*Sesuvium portulacastrum*) are some of the most common native plants at Lipoa Point, occurring almost anywhere along the coastal fringe.



Less common, but still locally abundant are native akoko shrubs (*Euphorbia degeneri*).



An akia shrub (*Wikstroemia uva-ursi*) on the windswept tip of Punalau.





Scattered across the coastal fringe are patches of native konakona grass (*Panicum torridum*).



Less common at Lipoa Point is the smaller native panicum (*Panicum fauriei* var. *fauriei*).



A few small clumps of the native sedge *Cyperus phleoides* are still persisting at Lipoa Point.





Where ironwood (*Casuarina* spp.) becomes established, virtually nothing else is able to grow.



Ironwood colonizing steep areas near the coast. As the ironwood continues to expand, the remnant native plants here, such as the akulikuli (*Sesuvium portulacastrum*), will be overtaken.





**Non-native coral creeper (*Barleria repens*), a bedding plant that escapes into the wild, has become established in many areas along the coastal fringe at Lipoa Point.**



**Tree vitex (*Vitex trifolia*) is persisting in, and spreading from, areas it was planted along the coast.**



**Night-blooming cereus (*Hylocereus undatus*) is also spreading from previous plantings. In some areas it creates virtually impenetrable thickets.**

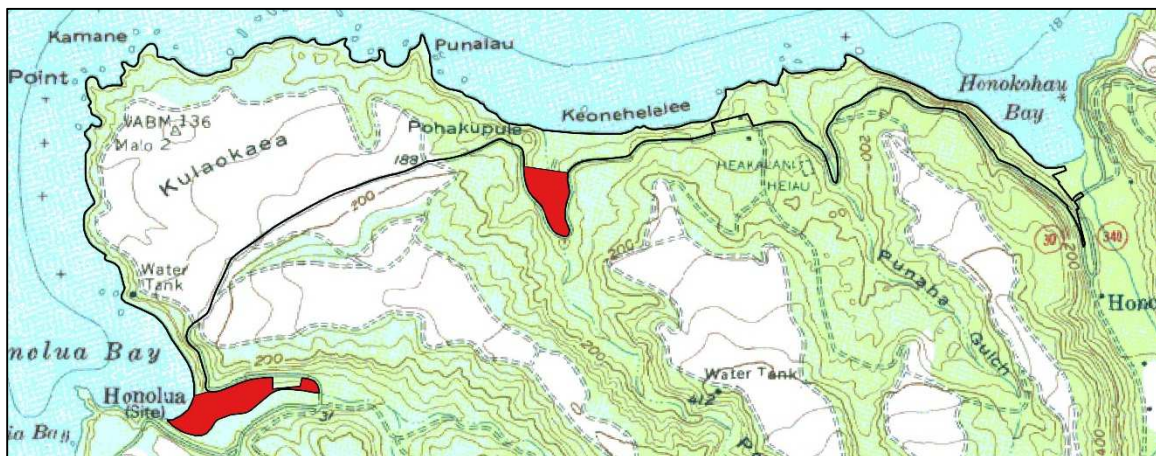


## RIPARIAN FOREST

In the far western part of the property, the flat bottom of Honolua Valley is moist and has a large canopy of introduced trees, some festooned with draping vines. The understory is a mix of aggressive non-native grasses, shrubs and vines. Scattered about this heavily trafficked area are numerous plantings of edible and ornamental plants.



Monkeypod (*Samanea saman*) trees festooned with golden pothos vines (*Epipremnum pinnatum*), and an understory of Guinea grass (*Megathyrsus maximus*) dominate much of the riparian forest section.



Riparian forest vegetation at Lipoa Point.



Milo (*Thespesia populnea*) is the only native tree species in the riparian forest portion of the property. It generally occurs close to the shoreline, and can get quite large in this particular microclimate.

There are many non-native trees in the riparian forest. Monkeypod (*Samanea saman*) is one of the most common, creating a broad canopy over the area, and often festooned with vines. The monkeypods appear to have been planted a long time ago, and are also spreading by seed. Java plum (*Syzygium cumini*) is another large tree in the area, occurring mostly along Honolua Stream.

Along with old plantings around house lots that now appear abandoned, there are many newer plantings by folks who frequent the area, mostly of non-native ornamental and edible plants. Some ornamental plants found in this riparian forest include heliconia (*Heliconia bahia*), wandering jew (*Tradescantia zebrina*), croton (*Codiaeum variegatum*), firespike (*Odontonema cuspidatum*), and crepe ginger (*Costus speciosus*).

Edible plants along the trail to the coast include avocado (*Persea americana*), mango (*Mangifera indica*), papaya (*Carica papaya*), banana (*Musa x paradisiaca*), star fruit (*Averrhoa carambola*), and cassava (*Manihot esculenta*).

Golden pothos (*Epipremnum pinnatum*) is one of the more conspicuous vines in the riparian forest, making a thick ground cover and climbing high into the trees. Cat's claw climber (*Macfadyena unguis-cati*) can similarly be found in the canopy, along with night-blooming cereus (*Hylocereus undatus*) and the native sea bean (*Mucuna gigantea*).

Guinea grass (*Megathyrsus maximus*) is the dominant grass in the riparian forest, generally occurring in the more sunny sites along the valley bottom.

The riparian forest at Pohakupule is shorter and less lush than at Honolua. It also contains less ornamental and edible plants, but has many of the same naturalized species.



**Riparian forest at Honolua Bay. Dominant trees here include monkeypod (*Samanea saman*) and java plum (*Syzygium cumini*), both of which tower over the trail to the beach.**





**Monkeypod tree festooned with cat's claw vine at beginning of trail to Honolua Bay.**



**Honolua Stream meanders through the riparian forest into Honolua Bay.**





The riparian forest in Pohakupule Gulch is less moist, less diverse, and has a shorter canopy.



Flowers of native sea bean vine (*Mucuna gigantea*) dangle from the canopy of the riparian forest.





Milo trees (*Thespesia populnea*) are common along Honolua Stream and near the coast



Guinea grass (*Megathyrsus maximus*) is the dominant grass in the open areas of the riparian forest.



Non-native night-blooming cereus (*Hylocereus undatus*) is also abundant in the forest canopy here, occasionally sending down impressive aerial roots.





**Wandering jew (*Tradescantia zebrina*) is one of numerous ornamental plants established along the trail to the coast in Honolua Valley.**



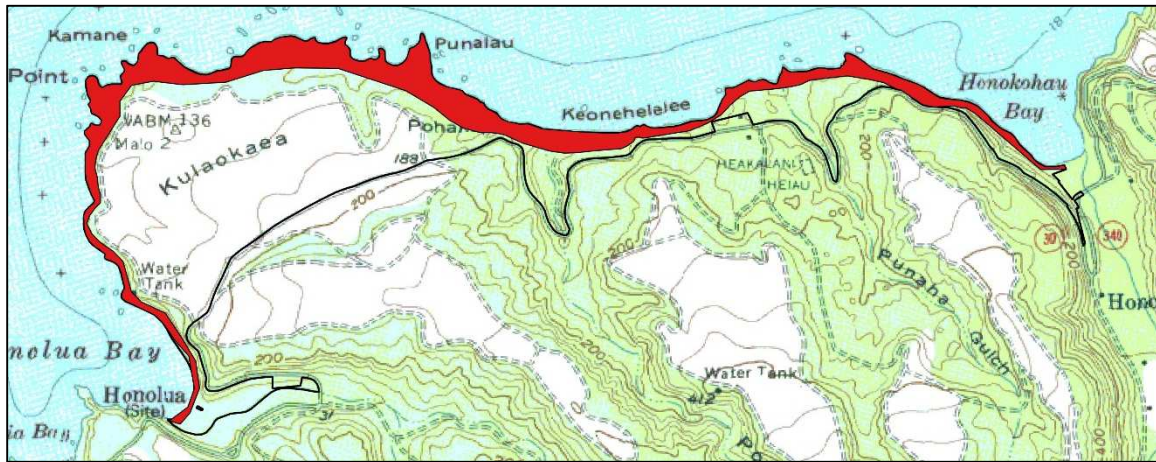
**Croton (*Codiaeum variegatum*) along the trail through Honolua Valley.**



**Firespike (*Odontonema cuspidatum*) in flower along the trail through Honolua Valley.**



## NATIVE PLANT HABITAT RESTORATION



General area of highest native plant diversity at Lipoa Point.

Most of Lipoa Point has been completely converted to non-native plants, with virtually no native plants of significance in the abandoned pineapple fields of Kulaokaea or in the riparian forest areas of Lipoa Point.

The area of greatest native plant diversity on Lipoa Point is the seaward edge of the coastal fringe. This small sliver of coastline contains the richest native coastal plant remnants remaining on Maui. Any habitat restoration within this zone would benefit these increasingly rare native coastal plants and the animals that rely on them.

Most of the restoration work would involve selective removal of ironwood (*Casuarina* spp.) and other aggressive non-native plants that are currently displacing native plants. By doing this, native coastal plants already on the site, and the animals that rely on them, will begin to reestablish.

Additionally, native plants no longer found on the site, but likely once occurring there could be planted. Examples include the coastal sandalwood or iliahi (*Santalum ellipticum*), the endangered prostrate shrub ohai (*Sesbania tomentosa*), and other rare and common native plants found along the northern coastline of West Maui.



Native ohai (*Sesbania tomentosa*). This endangered shrub still persists further east at Papanalaoa, but was not found at Lipoa Point. It could be planted and reestablished at Lipoa Point.



**Highest priority sites for native plant habitat restoration at Lipoa Point.**

The entire area of native coastal plant habitat along the coastline at Lipoa Point is about 60 acres, which would take significant resources to restore and maintain. In an attempt to prioritize the potential areas for restoration, including a handful of potential demonstration sites, the following criteria were developed.

A high priority habitat restoration site at Lipoa Point would have:

- The rarest native plant species.
- The highest number of native plant species.
- Relatively easy access and maintenance.
- Minimal impact on recreation and other activities.

Based on these criteria, four high priority habitat restoration sites were chosen, at Keonehelee, Pohakupule, Punalau, and east of Kamane.

These are the areas of highest plant diversity on the project site. They are relatively easily accessed, yet are naturally protected from invasion by non-native plants by the terrain and harsh salty and windy growing conditions. And they are off the beaten path, in some of the least used areas of the property.



**Endangered native awiwi (*Schenkia sebaeoides*) at Keonehelee, Lipoa Point.**



Native plants encountered at Lipoa Point:

- *Boerhavia repens* (Alena)
- *Chrysopogon aciculatus* (Manienie ula)
- *Cyperus phleoides* (Cyperus)
- *Cyperus polystachyos* (Pycreus)
- *Dodonaea viscosa* (Aalii)
- *Euphorbia degeneri* (Akoko)
- *Fimbristylis cymosa* (Mauu akiaki)
- *Heliotropium curassavicum* (Nena)
- *Hibiscus tiliaceus* (Hau)
- *Ipomoea indica* (Koali awa)
- *Jacquemontia sandwicensis* (Pau o Hiiaka)
- *Lycium sandwicense* (Ohelo kai)
- *Mucuna gigantea* (Sea bean)
- *Panicum fauriei* var. *fauriei* (Panicum)
- *Panicum torridum* (Konakona)
- *Portulaca lutea* (Ihi)
- *Scaevola taccada* (Naupaka)
- *Schenkia sebaeoides* (Awiwi)
- *Schiedea globosa* (Schiedea)
- *Sesuvium portulacastrum* (Akulikuli)
- *Sida fallax* (Ilima)
- *Solanum americanum* (Popolo)
- *Thespesia populnea* (Milo)
- *Vitex rotundifolia* (Pohinahina)
- *Waltheria indica* (Uhaloa)
- *Wikstroemia uva-ursi* (Akia)



Native ihi (*Portulaca lutea*) at Pohakupule, Lipoa Point.

Other native plants growing in coastal areas that may do well at Lipoa Point:

- *Chenopodium oahuensis* (Aweoweo)
- *Dianella sandwicensis* (Uki uki)
- *Eragrostis variabilis* (Kawelu)
- *Euphorbia celastroides* var. *amplectens* (Akoko)
- *Heliotropium anomalum* var. *argenteum* (Hinahina)
- *Lysimachia mauritiana* (Lysimachia)
- *Melanthera integrifolia* (Nehe)
- *Myoporum sandwicense* (Naio)
- *Nama sandwicensis* (Nama)
- *Peperomia blanda* (Alaala wai nui)
- *Plumbago zeylanica* (Iliee)
- *Pseudognaphalium sandwicense* var. *molokaiense* (Ena ena)
- *Santalum ellipticum* (Iiahi)
- *Scaevola coriacea* (Dwarf naupaka)
- *Sesbania tomentosa* (Ohai)
- *Solanum nelsonii* (Popolo)
- *Sporobolus virginicus* (Akiaki)
- *Tetramolopium sylvae* (Pamakani)



Rare pamakani (*Tetramolopium sylvae*) at Akaluaiiki to the east of Lipoa Point. Though not present at Lipoa Point, it could be introduced with a suite of other native plants from nearby coastal areas.



## Plant Restoration Site #1 - Keonehelelee

Stretching along the low cliffs east of the sandy beach at Keonehelelee are pockets of native plants, most notably the endangered awiwi (*Schenkia sebaeoides*). Selective control of aggressive non-native plants, mostly ironwood and Guinea grass, away from known awiwi sites would help this rare native plant. There are also some large patches of the Hawaiian rose or ulei (*Osteomeles anthyllidifolia*) that would be good to get the weeds off. The site is about 2.5 acres in size.



Potential native plant restoration site at Keonehelelee.



Potential native plant restoration site at Keonehelelee.





**Shoreline of Keonehelelee, stretching from Pohakupule Gulch to Punaha Gulch.**

Given the endangered nature of awiwi (*Schenkia sebaeoides*), the target species at this restoration site, folks who are well versed in what it looks like should be leading any weed control efforts in the area.

A half dozen or so pockets of awiwi occur just above the high water mark here. Other native plants found along this stretch of coast include the sedge *Cyperus phleoides* and some clumps of konakona grass (*Panicum torridum*). Patches of ilima (*Sida fallax*) grow amongst the pockets of native plants. A lone patch of *Schiedea globosa* was observed.

The main weeds to be controlled in this area are ironwood (*Casuarina* spp.) and Guinea grass (*Megathyrsus maximus*). Wedelia (*Sphagneticola triloba*), sourbush (*Pluchea carolinensis*), and New Zealand Spinach (*Tetragonia tetragonioides*) would also be good to nip in the bud, before they take over any more awiwi habitat.

Once aggressive non-native plants are removed from around the native plants, the native plants will begin to expand on their own and could be supplemented with plantings. Planting of other native plants not currently found in the area would be relatively doable in parts of this site, given it's ease of access and moderately sloped terrain. Other parts of the site are steeper and greater care would need to be taken when doing restoration.

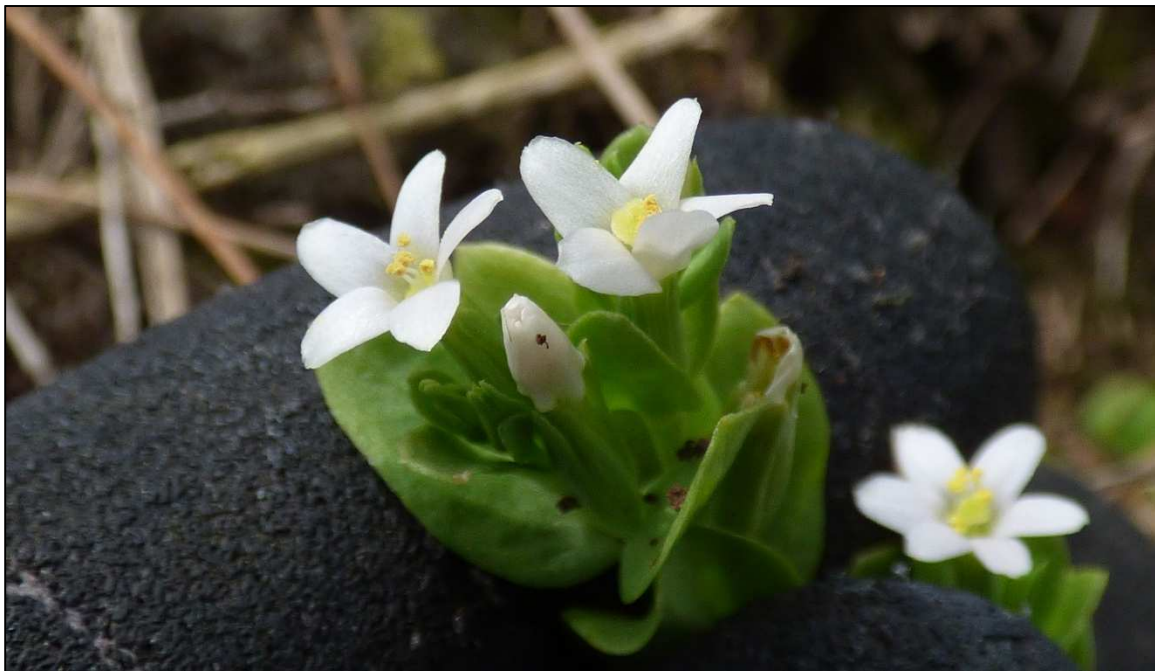


**Native konakona grass (*Panicum torridum*) on rock shelves at Keonehelelee, Lipoa Point. These short-lived annual grasses germinate with the winter rains in pockets of remnant native plants.**





One of the endangered awiwi (*Schenkia sebaeoides*) sites at Keonehelelee. Note ironwood trees that will likely grow much larger and displace the native plants in the area. Selective removal of these aggressive non-natives would help prevent the loss of these rare native plants.



Endangered awiwi (*Schenkia sebaeoides*) foliage and flowers at Keonehelelee, Lipoa Point. Awiwi germinates and grows with wet winter rains. It is a short-lived annual and dies after flowering.





**Another location of awiwi (*Schenkia sebaeoides*) at Keonehelee. This site has both ironwood and non-native grasses encroaching on remnant native plants. Selective removal of weedy plants away from patches of remnant natives would help perpetuate this rare Hawaiian plant.**



**Where ironwood has become established, there are virtually no other plants left in the understory, native or non-native. Controlling ironwood around native plants will give the natives room to grow.**





Close up view of awiwi (*Schenkia sebaeoides*) showing non-native plants growing in and around it. Over time these more aggressive plants will displace the awiwi. A little weeding would go a long way.

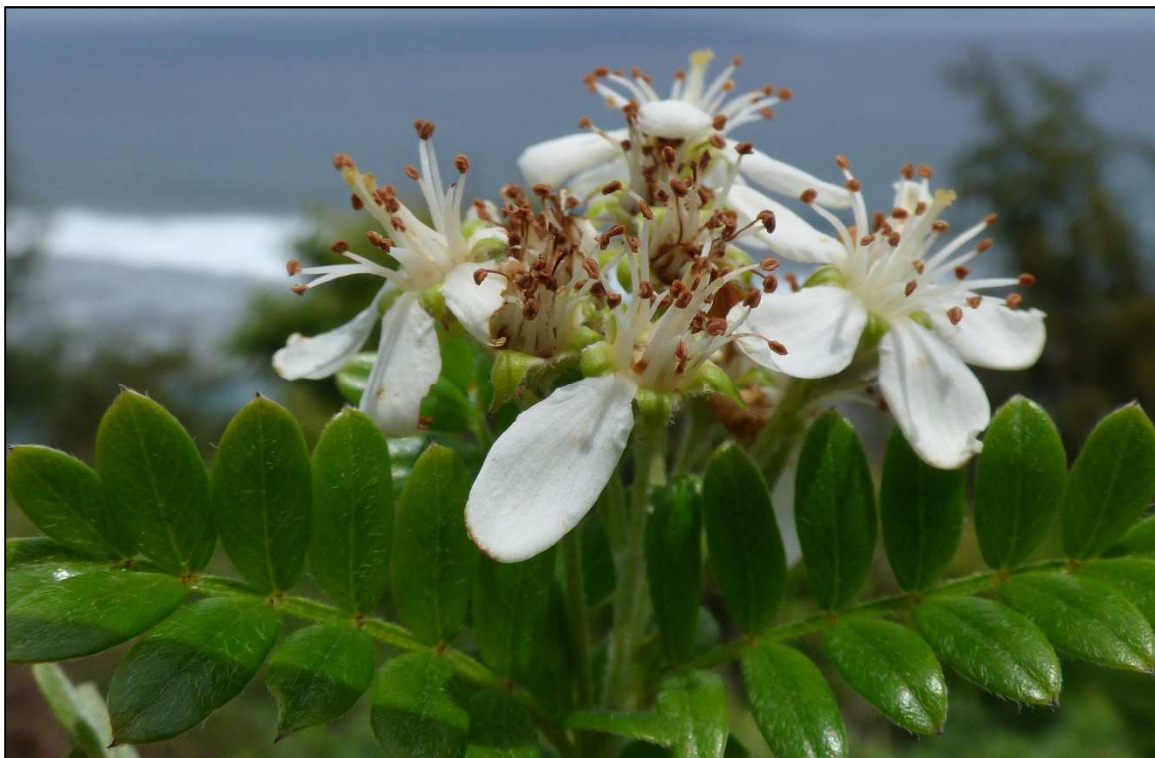


This patch of aggressive non-native wedelia vine (*Sphagneticola triloba*) is poised to overrun the nearby awiwi, as are the ironwood trees. Removing these threats would help the native plants here.





Native *Schiedea globosa* with beer can. Coastal cleanups can help the give the native plants along this stretch of coast room to breath and grow.



Native ulei (*Osteomeles anthyllidifolia*) standing tall above Keonehelelee. Many of the native plants left at Lipoa Point are actually quite strong, and given some attention can thrive.



## Plant Restoration Site #2 - Pohakupule

At the east side of Lipoa Point lies the richest area of native plants. About two acres in size, the terrain is steep and windswept. Removing ironwood away from the remnant native plants is the highest priority at this site. Doing so will result in native plants reestablishing in the areas they have been pushed out of by the ironwood. Extreme care must be taken at this site given the steep terrain.



Potential native plant restoration site at Pohakupule.



Potential native plant restoration site at Pohakupule.





**Coastline at Pohakupule, the richest stretch of remnant native coastal plants left on Maui.**

The coastal fringe from Pohakupule to Punalau is the richest stretch of native coastal plants left on Maui. Not only does this area have large patches of remnant native plants, it also has rare plants, including the endangered awiwi (*Schenkia sebaeoides*).

Native plants at Pohakupule include most of the more common native coastal species found at Lipoa Point. Additionally, some less common plants there include huehue (*Cocculus orbiculatus*), cyperus (*Cyperus phleoides*), akoko (*Euphorbia degeneri*), ulei (*Osteomeles anthyllidifolia*), konakona (*Panicum torridum*), ihi (*Portulaca lutea*), schiedea (*Schiedea globosa*), and akia (*Wikstroemia uva-ursi*).

The most beneficial restoration work at Pohakupule would be selective removal of aggressive non-native ironwood around the richest pockets of remnant native plants. This would provide the native plants room to grow.

Supplemental plantings of native species from nearby coastal areas would increase the already high native plant diversity in the area.

Extreme care needs to be taken at this site given the steep terrain.



**Patches of native plants are visible in areas of Pohakupule where there aren't ironwood trees.**





**Coastline at Pohakupule. The bases and walls of these cliffs have many remnant native plants.**



**The terrain at Pohakupule is steep. Extreme care needs to be taken when working in the area. Most of the work would involve control of ironwoods that are displacing the native plants. Supplemental plantings of native plants would also benefit parts of the area.**





*Schiedea globosa* and other natives growing at Pohakupule. Note ironwood covering slope and displacing native plants. Selective removal of these ironwoods would help the native plants here.



Another large patch of *Schiedea globosa* being overrun by ironwood. If nothing is done here, over time the ironwoods will continue to expand and smother the native plants.





Native ihi (*Portulaca lutea*) at Pohakupule, the only site this species was observed at Lipoa Point.



Pohakupule has the largest patches of the uncommon native *Schiedea globosa* at Lipoa Point. Selective weeding around these native plants will help assure their continued survival.

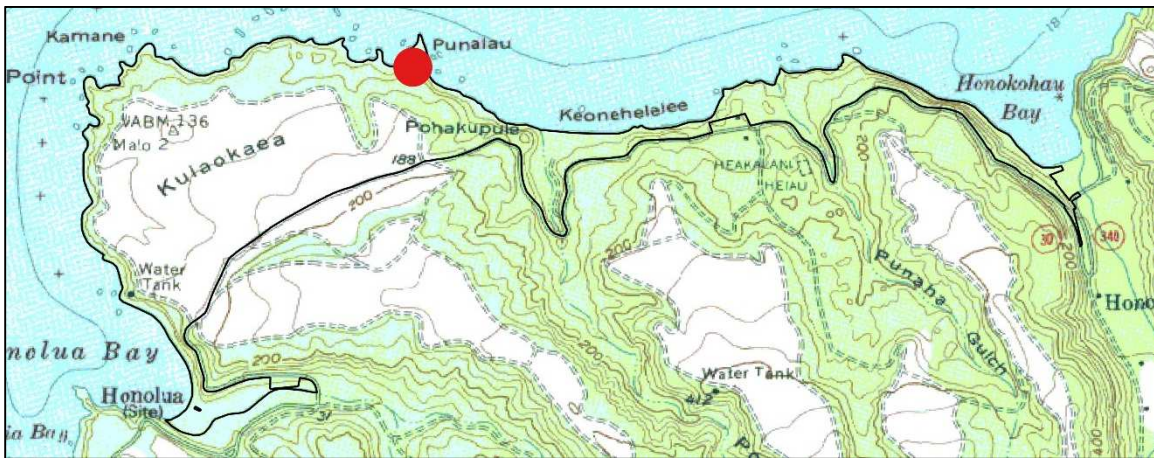


### Plant Restoration Site #3 - Punalau

Parts of the tip of the point at Punalau and nearby areas are covered with almost 100% native plants. The areas of highest richness over this two acre potential restoration site are on the rocky ridges and seaward facing locations. Control of ironwood (*Casuarina* spp.) and other aggressive weeds around existing native plants and supplementing with plantings would help the native flora and fauna reestablish and flourish at this site.



Potential native plant restoration site at Punalau.



Potential native plant restoration site at Punalau.





Potential native plant restoration site at Punalau.

There is a diverse pocket of native plants stretching from near the prominent point at Punalau west across a broad slope to the next ridge top. The continuity of this remnant patch is what makes it a priority restoration site. Diversity could be added through plantings of native plant species found in similar habitat nearby.

The rarest native plant in this area is the low growing akoko shrub (*Euphorbia degeneri*). There is also a diverse mix of more common coastal plants, including akulikuli (*Sesuvium portulacastrum*), ilima (*Sida fallax*), ohelo kai (*Lycium sandwicense*), konakona (*Panicum torridum*), and mau akiaki (*Fimbristylis cymosa*).

Control of ironwood (*Casuarina* spp.) and other aggressive non-native plants around the existing patches of native plants would help give them room to breath and reestablish.

Planting of other native plants not currently found in the area would be especially doable in this site, given it's relative ease of access and flat terrain compared to other areas of remnant native plants along this stretch of coast.

Ohai (*Sesbania tomentosa*) would be a good addition to the mix of natives in the area, and would provide another food source for native yellow-faced bees.



Native ohai (*Sesbania tomentosa*). This endangered shrub still persists further east at Papanalaho, but was not found at Lipoa Point. It could be planted and reestablished at Punalau and other places.





**The tip of the point at Punalau is vegetated with almost 100% native plants.**



**Further inland, the native plants become less prevalent and ironwood begins to dominate. Selective control of the ironwood around these remnant patches of native plants would help give the native plants room to breathe and reestablish in the surrounding area.**





**Though it doesn't look like much, there are many native plants growing in this area. The flat terrain would make control work and planting easier than in other steeper sites along the coast.**



**Area of diverse native plants west of the point at Punalau. This is one of the most continuous patches of remnant native plants at Lipoa Point.**





**Native akoko shrub (*Euphorbia degeneri*). The area around Punalau has the largest patches of this increasingly rare native coastal plant at Lipoa Point.**



**Native akia (*Wikstroemia uva-ursi*) shrub on tip of point at Punalau.**

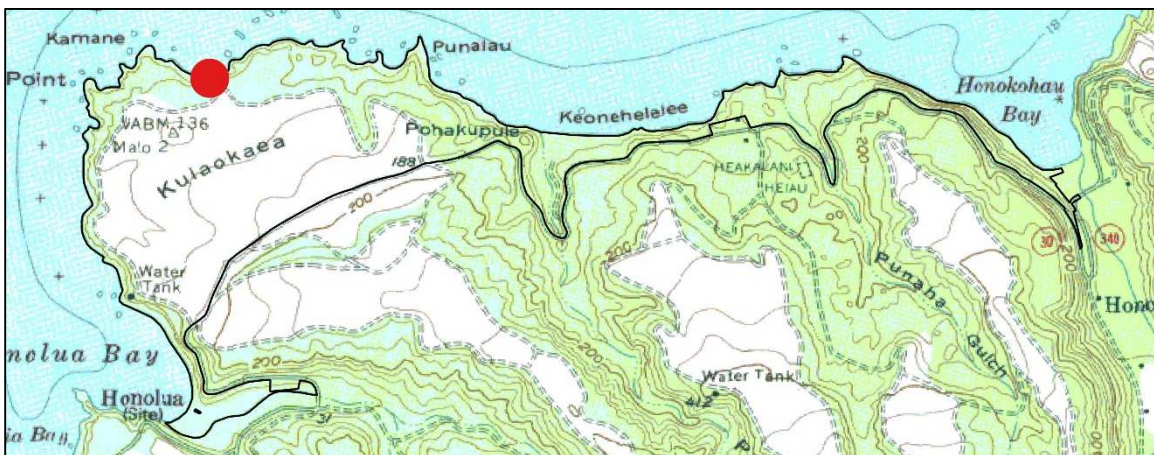


## Plant Restoration Site #4 - Kamane

Below a steep line of cliffs east of Kamane is a large naupaka (*Scaevola taccada*) stand and series of diverse patches of remnant native coastal plants. The core area of native plants is about 0.5 acres. Selective control of ironwood (*Casuarina* spp.) and trimming of naupaka, would help the target plants in the area, native panicum grass (*Panicum fauriei* var. *fauriei*) and schiedea (*Schiedea globosa*).



Potential native plant restoration site at Kamane.



Potential native plant restoration site at Kamane.





**Potential native plant restoration site at Kamane.**

The potential restoration site east of Kamane runs along the shore and up towards the top of the cliff band that backs the cobble beach between the two prominent points.

One of the more conspicuous elements of the site is the large patch of naupaka (*Scaevola taccada*) stretching from the high tide line up into the steep sections of cliff backing the beach. This patch of naupaka supports a healthy population of native naupaka-eating moths (*Udea litorea*).

The main target restoration species at this site is the native panicum grass (*Panicum fauriei* var. *fauriei*), which is scattered about the open, steeper parts of the site. This area had the only locations of this species of panicum grass we came across at Lipoa Point. There is also a patch of schiedea (*Schiedea globosa*) tucked below the cliff line.

Native konakona grass (*Panicum torridum*) was also present at the site, growing on rock shelves along the cliff line. Other common coastal plants on the site include akulikuli (*Sesuvium portulacastrum*) and ohelo kai (*Lycium sandwicense*).

The main step that could help the flora in this location is weed control. Control of ironwood (*Casuarina* spp.) around existing patches of native plants would help provide them some breathing room and allow them to reestablish in the surrounding area.

Weeding the richest patches of native plants would also be helpful. This would take an expert eye and careful hand, but a little bit of work would go a long way.

Additionally, selective trimming of the native naupaka may be warranted in areas where it's encroaching on much less aggressive native plants, such as panicum grass and schiedea. This would be most beneficial on the inland fringe of the naupaka line, where it starts to climb up the cliffs and meets the patches of highest native plant diversity.

Plantings could be done to supplement the species present, using native coastal plants from nearby areas.





**Native panicum grass (*Panicum fauriei* var. *fauriei*) along an access trail to the site.**



**Broad patch of naupaka and line of cliffs with patches of native plants on them and at their bases.**





Native schiedea (*Schiedea globosa*) patch along coast. Control of ironwood around this remnant patch of schiedea would help give it room to breath and reestablish in nearby areas.



Area at base of cliffs with the largest patch of rare native grass (*Panicum fauriei* var. *fauriei*) at Lipoa Point. Trimming the more common and aggressive naupaka (*Scaevola taccada*) away from the rare grass patch would help give the grass and other less aggressive native coastal plants room to grow.



## NATIVE PLANTS

Though dwindling, Lipoa Point has more native plant species than any similar length stretch of coastline on Maui. Below are images, notes, and locations for many of the native plants found at Lipoa Point.



Native ilima (*Sida fallax*), akulikuli (*Sesuvium portulacastrum*), and pau o Hiiaka (*Jacquemontia sandwicensis*) plants growing together at Lipoa Point.



General area of highest native plant diversity at Lipoa Point.

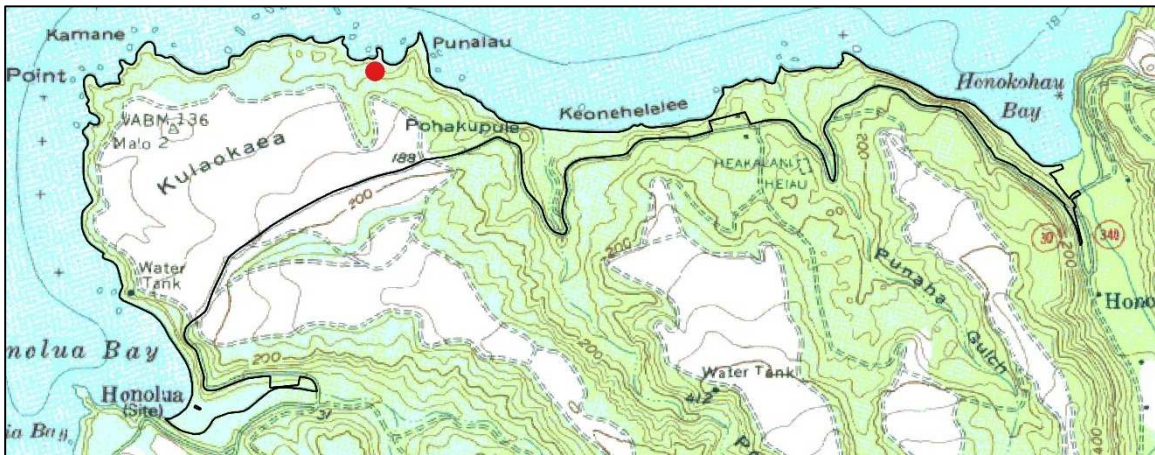


***Boerhavia repens* (Alena)**

A sprawling native vine with sticky fruits and small white to pink flowers. Only found in one location at Lipoa Point, near Punalau. This species is spread to new locations by seabirds and other things that come into contact with the sticky seeds.



**Alena (*Boerhavia repens*) on edge of ironwood thicket.**



**Alena (*Boerhavia repens*) at Lipoa Point.**



***Cocculus orbiculatus* (Huehue)**

Only a couple locations of this slender vine were encountered, between Pohakupule and Punalau. Inconspicuous flowers are followed by dark blue berries.



**Huehue (*Cocculus orbiculatus*) leaves at Pohakupule, Lipoa Point.**



**Huehue (*Cocculus orbiculatus*) at Lipoa Point.**

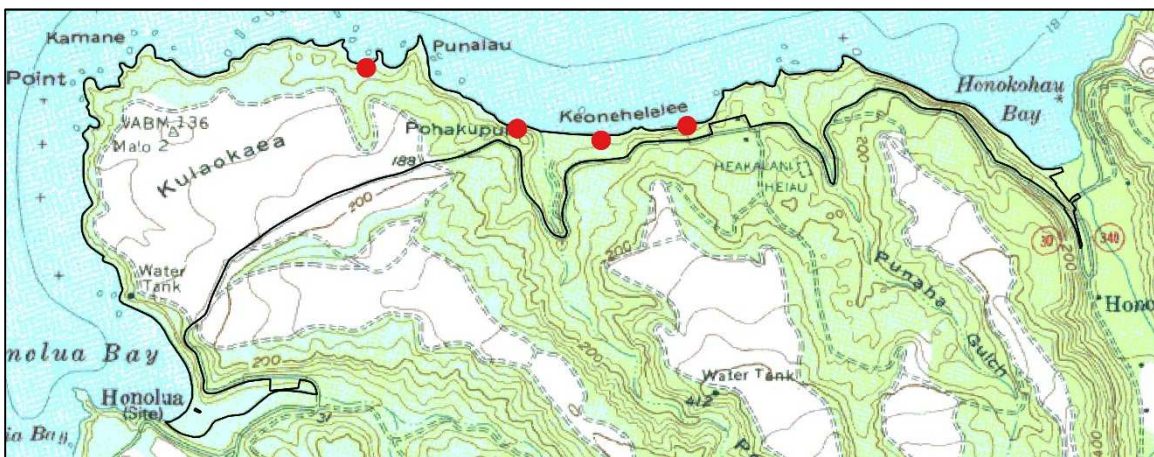


*Cyperus phleoides* (Cyperus)

A native coastal sedge. A few patches were encountered along the coastal fringe. It prefers moist, open sites.



*Cyperus phleoides* at Lipoa Point.



*Cyperus phleoides* at Lipoa Point.



*Cyperus polystachyos* (Pycreus)

This native sedge was encountered on a steep area near the ocean, though it is capable of growing further inland in moist places. At Lipoa Point, this variable species assumes a diminutive form barely a few inches tall. This distinct small form has been called var. *miser* by some workers. However, that name is not officially recognized.



*Cyperus polystachyos* at Lipoa Point.



*Cyperus polystachyos* at Lipoa Point.

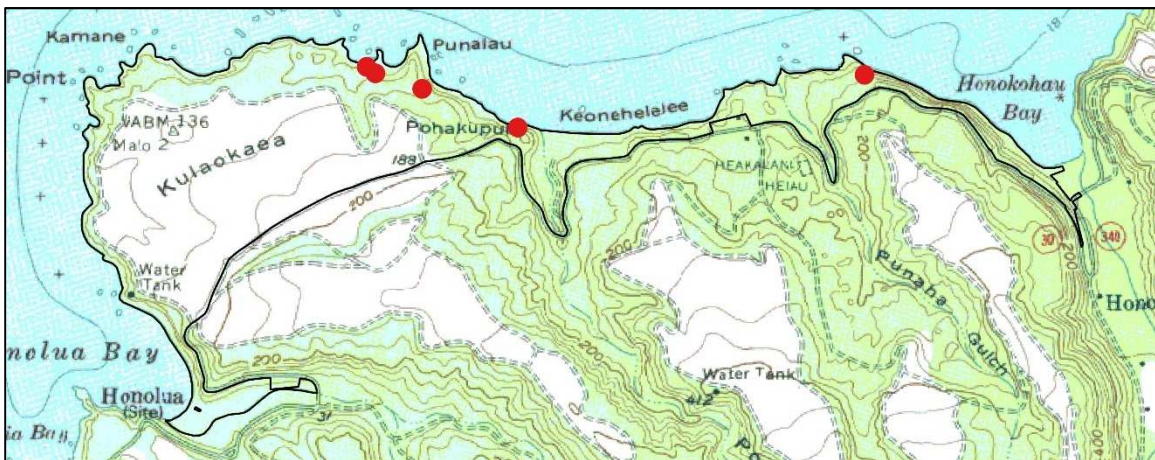


***Euphorbia degeneri* (Akoko)**

A native woody spurge, akoko is locally abundant near the point of Punalau, along the coastal fringe on the east side of Lipoa Point and at the western tip of Honokohau Bay. This species is one of the rarer native plants at Lipoa Point, and is a good food plant for native yellow-faced bees (*Hylaeus* spp.).



**Akoko (*Euphorbia degeneri*) shrub at Lipoa Point.**



**Akoko (*Euphorbia degeneri*) at Lipoa Point.**



***Fimbristylis cymosa* (Mau akiaki)**

One of the more common native plants at Lipoa Point. This clumping native sedge was encountered in many locations along the coastal fringe, often growing in association with akulikuli (*Sesuvium portulacastrum*) and other common coastal natives.



**Mau akiaki (*Fimbristylis cymosa*) at Lipoa Point.**



**Mau akiaki (*Fimbristylis cymosa*) at Lipoa Point.**

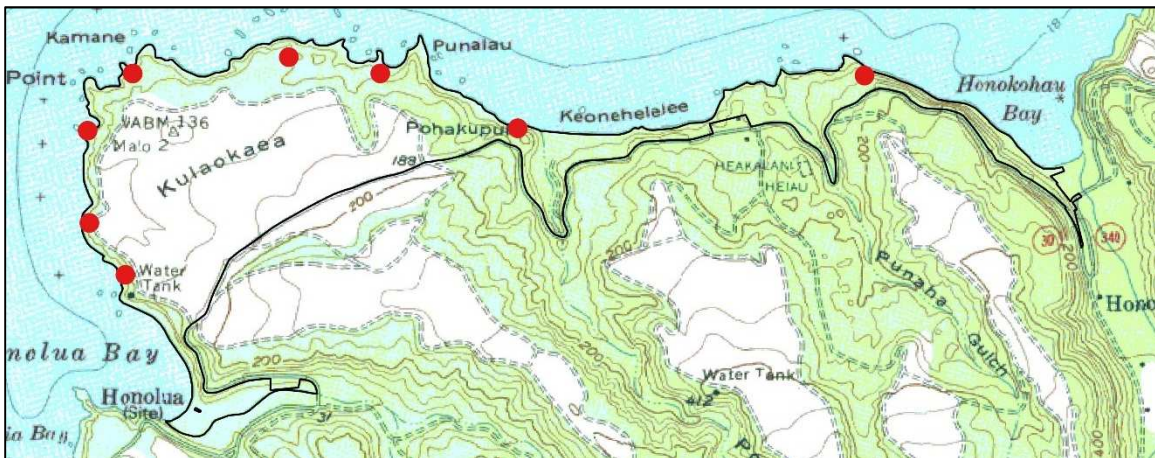


***Heliotropium curassavicum* (Nena)**

Nena is an ephemeral succulent native that is quick to arrive to open ground, but is eventually overtaken by more hardy species. It occurs near the coast over the entire coastal fringe, coming and going in different locations as other vegetation allows.



**Nena (*Heliotropium curassavicum*) at Lipoa Point.**



**Nena (*Heliotropium curassavicum*) at Lipoa Point.**



***Jacquemontia sandwicensis* (Pau o Hiiaka)**

Cascading over the stones and open areas in scattered locations along the coastal fringe are vines of the native pau o Hiiaka. As with many other coastal natives, this species is quick to establish on open ground, but eventually is overrun by more aggressive species.



**Pau o Hiiaka (*Jacquemontia sandwicensis*) at Lipoa Point.**



**Pau o Hiiaka (*Jacquemontia sandwicensis*) at Lipoa Point.**

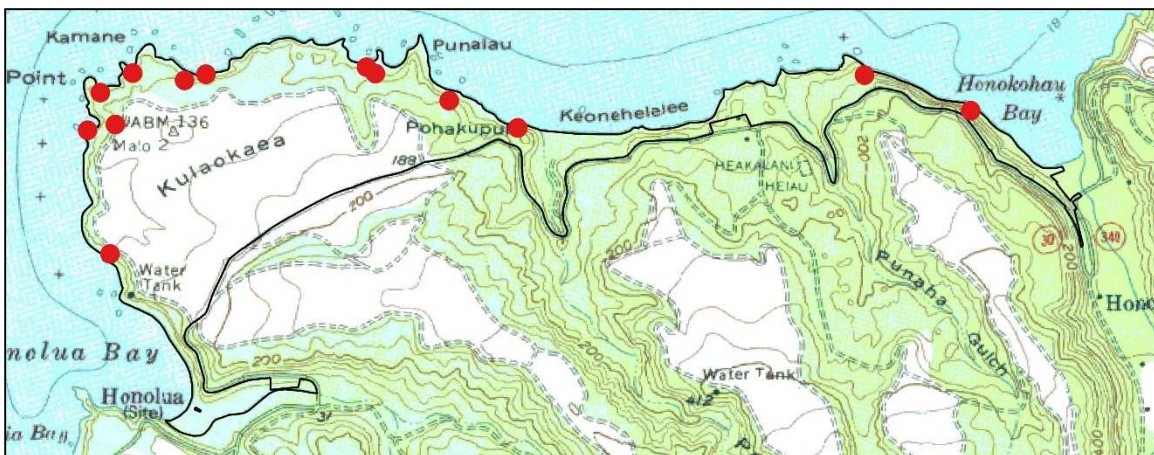


***Lycium sandwicense* (Ohelo kai)**

A native goji berry, ohelo kai is common over much of the coastal fringe of Lipoa Point. In this area, there is more ohelo kai than we have observed anywhere else in Hawaii. The fruit is edible, though not particularly tasty. The flowers are visited by native yellow-faced bees (*Hylaeus* spp.).



Ohelo kai (*Lycium sandwicense*) at Lipoa Point.



Ohelo kai (*Lycium sandwicense*) at Lipoa Point.



***Mucuna gigantea* (Sea bean)**

This sprawling native vine occurs up in the canopy of the riparian forest in the bottom of Honolua Valley and in Pohakupule Gulch. Somewhat cryptic foliage puts forth white flowers that hang from the canopy and eventually drop bean-like seeds that are capable of floating in the ocean.



Sea bean (*Mucuna gigantea*) flowers in Pohakupule Gulch, Lipoa Point.



Sea bean (*Mucuna gigantea*) at Lipoa Point.

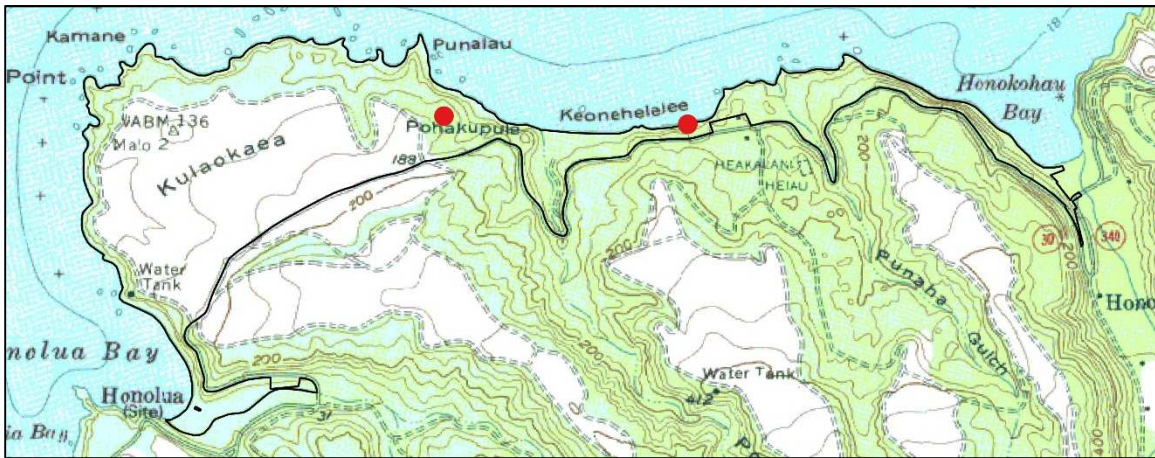


***Osteomeles anthyllidifolia* (Ulei)**

A Hawaiian rose, this sprawling woody shrub creates thickets on the steep walls of the coastal fringe. This species is usually found further back from the ocean than the more succulent coastal plants. We came across ulei patches at Pohakupule and Keonehelelee. On the western side of Honokohau Bay, it drapes down the roadcuts.



Ulei (*Osteomeles anthyllidifolia*) flowers and foliage above Keonehelelee.



Ulei (*Osteomeles anthyllidifolia*) at Lipoa Point.

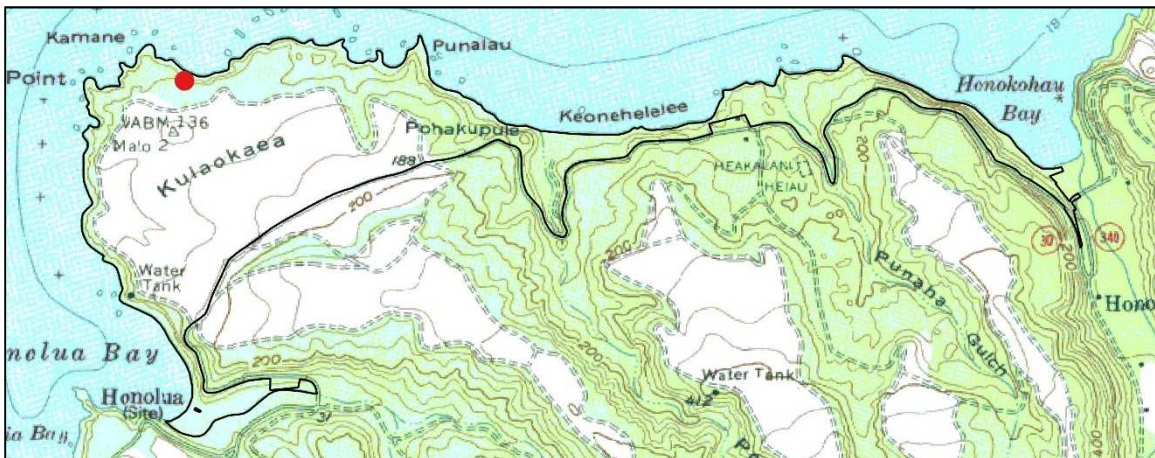


***Panicum fauriei* var. *fauriei* (Panicum)**

A diminutive native grass, this native panicum was found in a few patches on the eastern half of Lipoa Point. This species is an annual requiring open ground, and can be displaced by more aggressive perennial species.



Small patch of *Panicum fauriei* var. *fauriei* near Kamane at Lipoa Point.



*Panicum fauriei* var. *fauriei* at Lipoa Point.

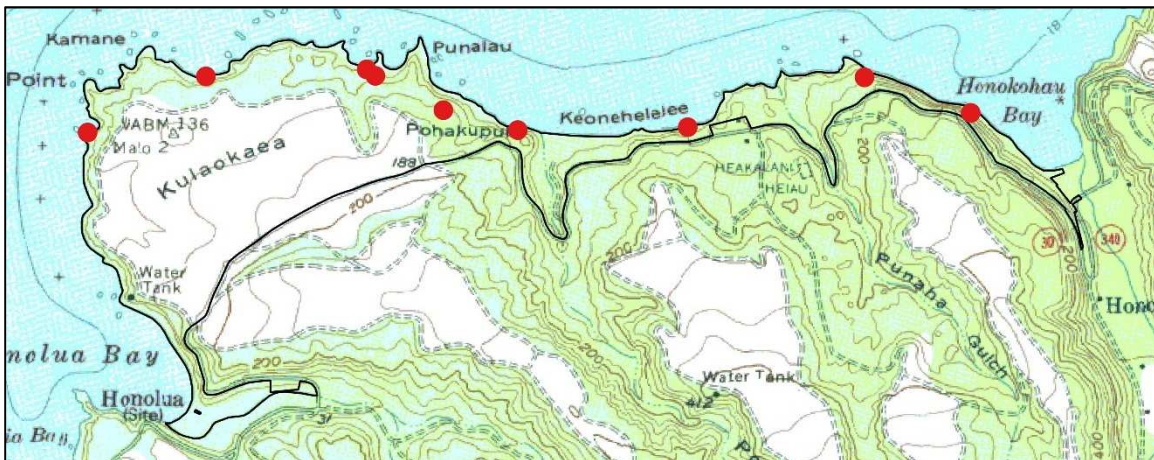


***Panicum torridum* (Konakona)**

An annual native grass, konakona is locally common in many places along the coastal fringe of Lipoa Point. It needs open ground to germinate and grow, and can easily be displaced from areas by more aggressive perennial species.



**Konakona (*Panicum torridum*) seedhead near Kamane, Lipoa Point.**



**Konakona (*Panicum torridum*) at Lipoa Point.**



***Portulaca lutea* (Ihi)**

Scattered patches of this colorful native succulent are found on steep slopes at Pohakupule. The native ihi is related to the non-native pigweed (*Portulaca oleracea*), and capable of hybridizing with it. Ihi is distinguished from pigweed by the larger flowers, greater number of stamens, and corky bark.



Lush patch of ihi (*Portulaca lutea*) at Pohakupule.



Ihi (*Portulaca lutea*) at Lipoa Point.



***Scaevola taccada* (Naupaka)**

Naupaka is a common native coastal shrub. At Lipoa Point it occurs as scattered patches near the coast and inland along the coastal fringe. Though native, and potentially useful in some restoration situations, care should be taken when planting this species as it can quickly outgrow the planting area and overwhelm other less hardy native species.



**Naupaka (*Scaevola taccada*) at Lipoa Point.**



**Naupaka (*Scaevola taccada*) at Lipoa Point.**

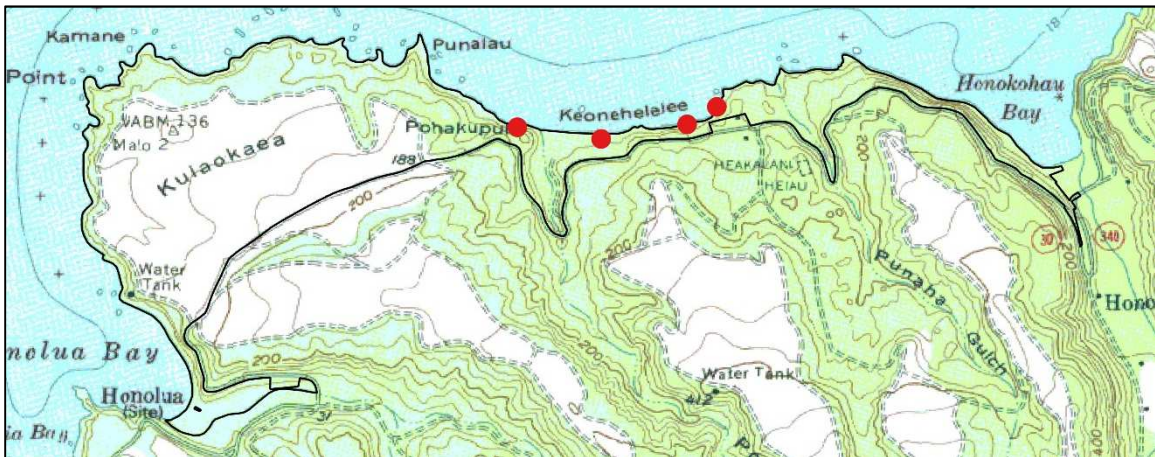


***Schenkia sebaeoides* (Awiwi)**

Awiwi is an endangered ephemeral herb that episodically germinates in wet winters. It was observed during this survey in multiple locations near the coast from Pohakupule through Keonehelelee. A total of 127 plants were observed. At Keonehelelee it was growing within the first few meters of vegetation above the high water mark over a broad area of the coastline. At Pohakupule, where the native vegetation extends further inland, it was higher up on the slope. Focused weed control within and around the awiwi patches would help this rare native plant continue to persist and perhaps someday flourish.



**Awiwi (*Schenkia sebaeoides*) flowers at Keonehelelee.**



**Awiki (*Schenkia sebaeoides*) at Lipoa Point.**



***Schiedea globosa* (Schiedea)**

A few large patches of schiedea grow on the steep areas of Lipoa Point. This is one of the rare native plants at Lipoa Point, and its relative abundance there speaks of the botanical richness this area still has in comparison to other areas on Maui.



**Flowering patch of *Schiedea globosa* at Lipoa Point.**



***Schiedea globosa* at Lipoa Point.**

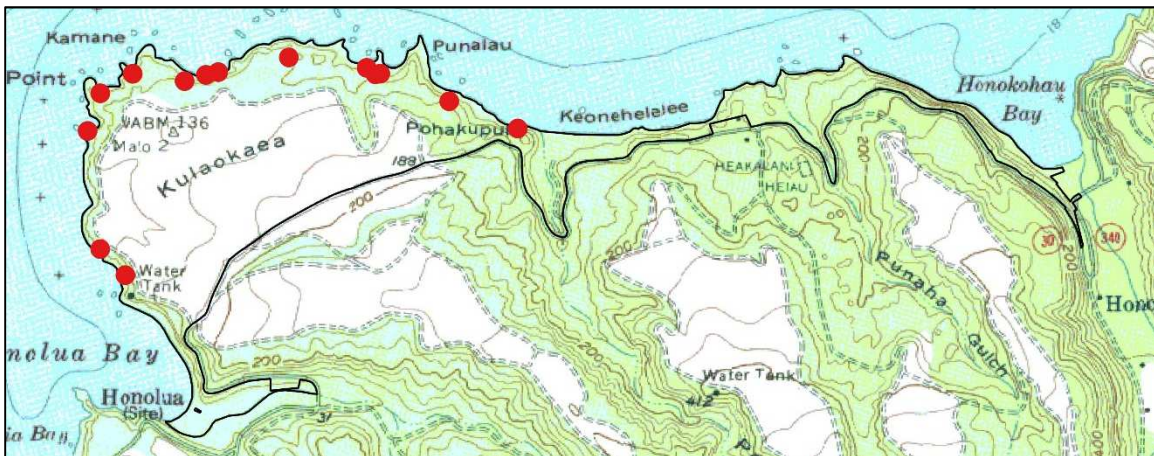


***Sesuvium portulacastrum* (Akulikuli)**

Akulikuli is one of the most common native plant species at Lipoa Point. Generally restricted to the salt-spray zone, this succulent native occurs in scattered patches over the entire coastline.



**Akulikuli (*Sesuvium portulacastrum*) at Lipoa Point.**



**Akulikuli (*Sesuvium portulacastrum*) at Lipoa Point.**

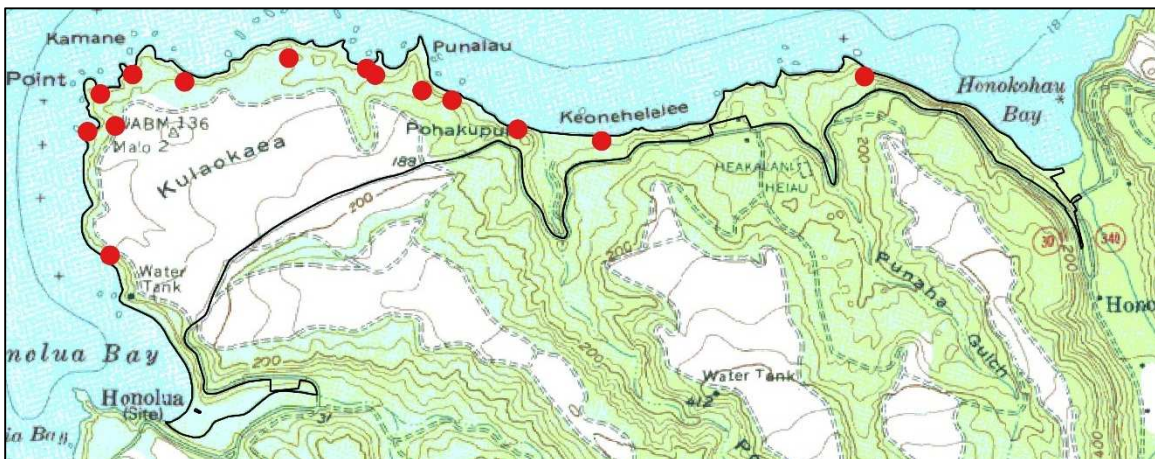


***Sida fallax* (Ilima)**

One of the most common native plants at Lipoa Point, this creeping shrub is found over the entire stretch of the coastal fringe. Native yellow-faced bees (*Hylaeus* spp.) and other insects visit the showy flowers for nectar and pollen. Also used in lei making.



**Ilima (*Sida fallax*) flowers at Lipoa Point**



**Ilima (*Sida fallax*) at Lipoa Point**

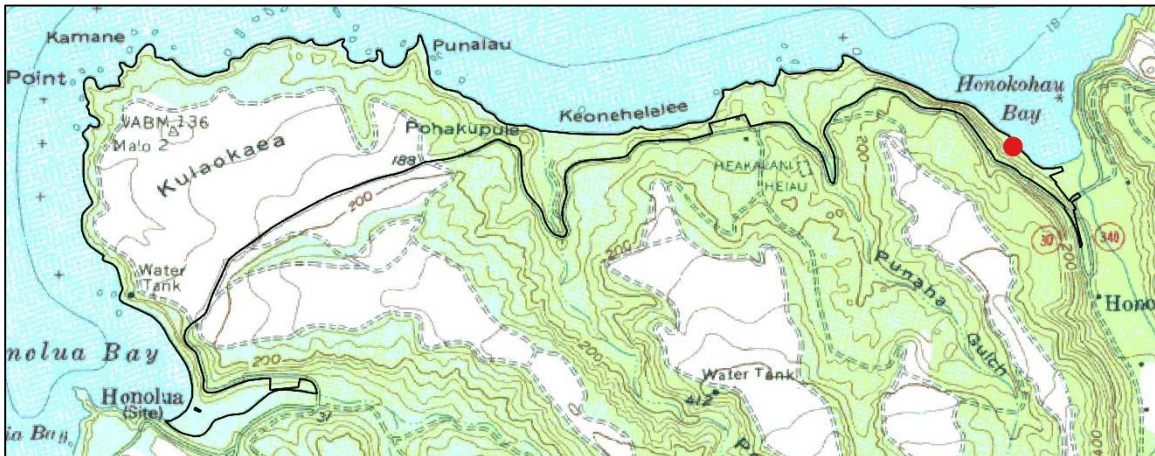


***Vitex rotundifolia* (Pohinahina)**

A large patch of pohinahina extends over the boulders towards the sea on the western shoreline of Honokohau Bay. Many insects were visiting the colorful purple flowers.



**Pohinahina (*Vitex rotundifolia*) flowers and foliage at Honokohau Bay.**



**Pohinahina (*Vitex rotundifolia*) at Lipoa Point.**

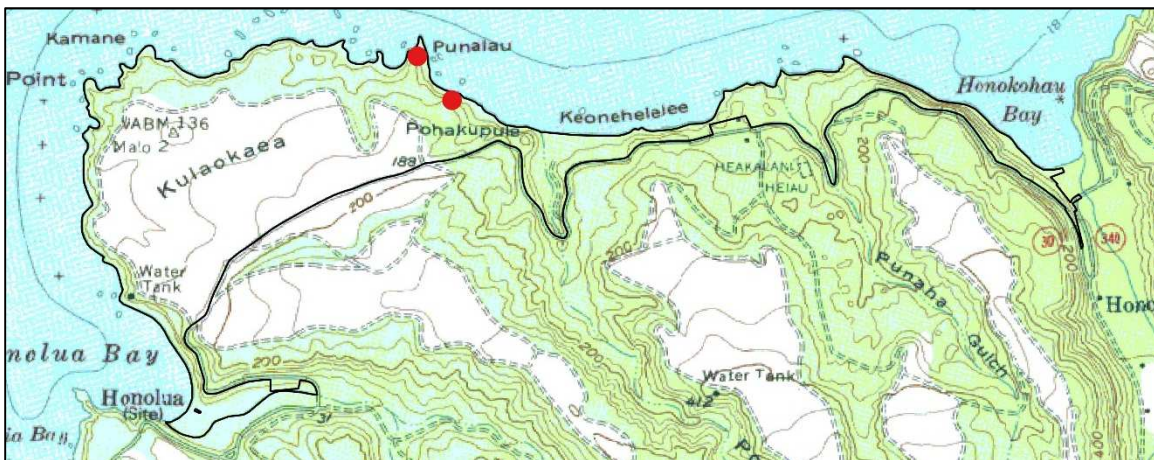


***Wikstroemia uva-ursi* (Akia)**

Akia is a native woody shrub. The leaves and stem have been used to stun fish. It can also be used in lei. One patch was observed at the tip of Punalau and a few more patches were growing between large rocks on the cliffs further east towards Pohakupule.



**Akia (*Wikstroemia uva-ursi*) at Punalau, Lipoa Point.**



**Akia (*Wikstroemia uva-ursi*) at Lipoa Point.**

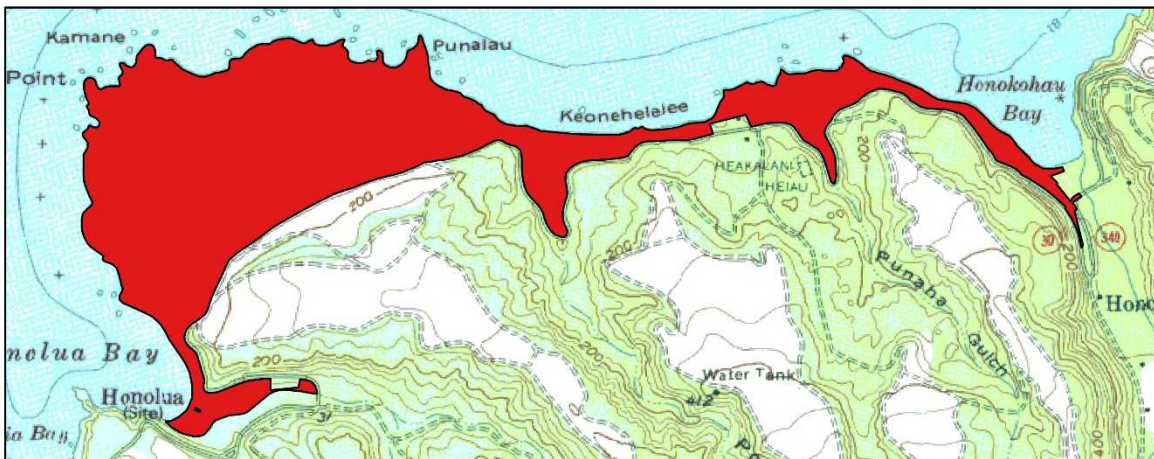


## INVASIVE NON-NATIVE PLANTS

Many of these are incipient, currently found in small amounts at Lipoa Point. Others are widespread and worthy of note because of their dominance of the area.



Ironwood (*Casuarina* spp.) displacing ilima (*Sida fallax*) and other native plants at Lipoa Point.



General location of non-native plants at Lipoa Point.

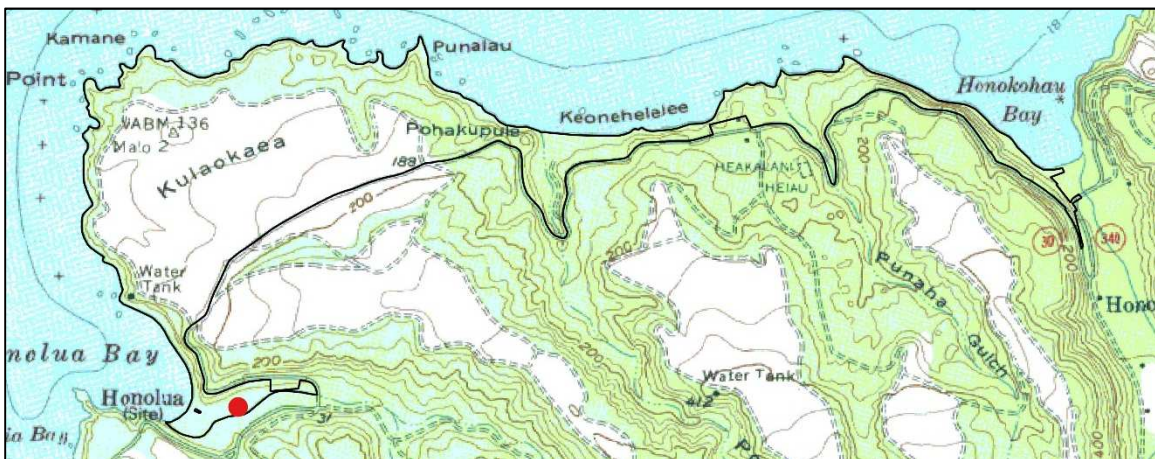


***Ardisia elliptica* (Inkberry)**

Established along Honolua Stream in the riparian forest section of the property, inkberry is just starting to become established. Left unchecked, it has the potential to create dog-hair thickets that would displace the ornamental and edible plants and make walking through the area difficult. Though this species will likely continue to reinvade the site from nearby areas, occasional control of the incipient population along Honolua Stream will help keep it in check.



**Inkberry (*Ardisia elliptica*) in fruit along the Hana Highway.**



**Inkberry (*Ardisia elliptica*) at Lipoa Point.**

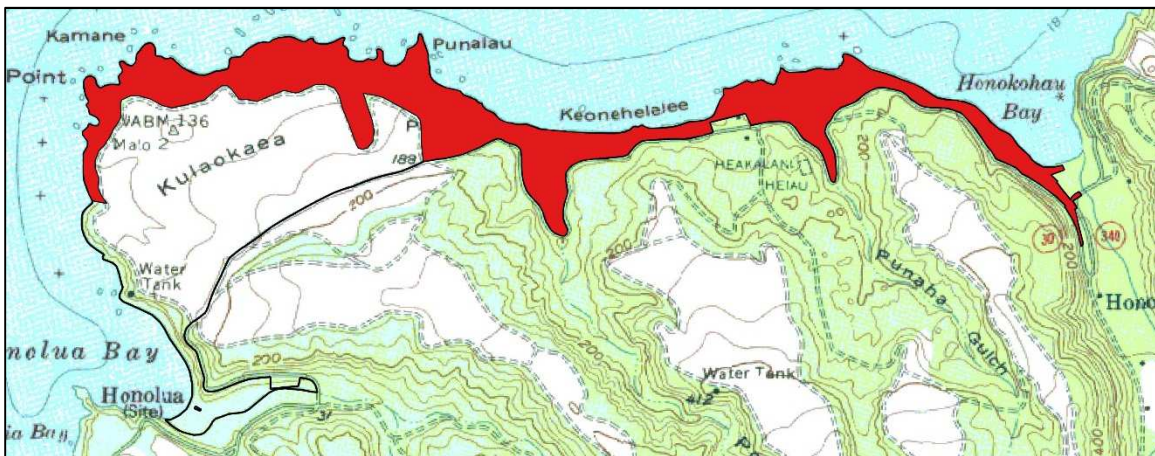


***Casuarina equisetifolia* & *C. glauca* (Ironwood)**

Widespread over most of the coastal fringe, including plantings along the abandoned pineapple field boundary, ironwood is currently the greatest threat to the remnant native vegetation at Lipoa Point. What makes this species particularly damaging is its ability to grow on steep, salty, windswept cliffs, and to exclude virtually all vegetation underneath it. Left unchecked, ironwood will likely eventually take over all of Lipoa Point.



**Ironwood (*Casuarina equisetifolia* & *C. glauca*) at Lipoa Point.**



**Ironwood (*Casuarina equisetifolia* & *C. glauca*) at Lipoa Point.**

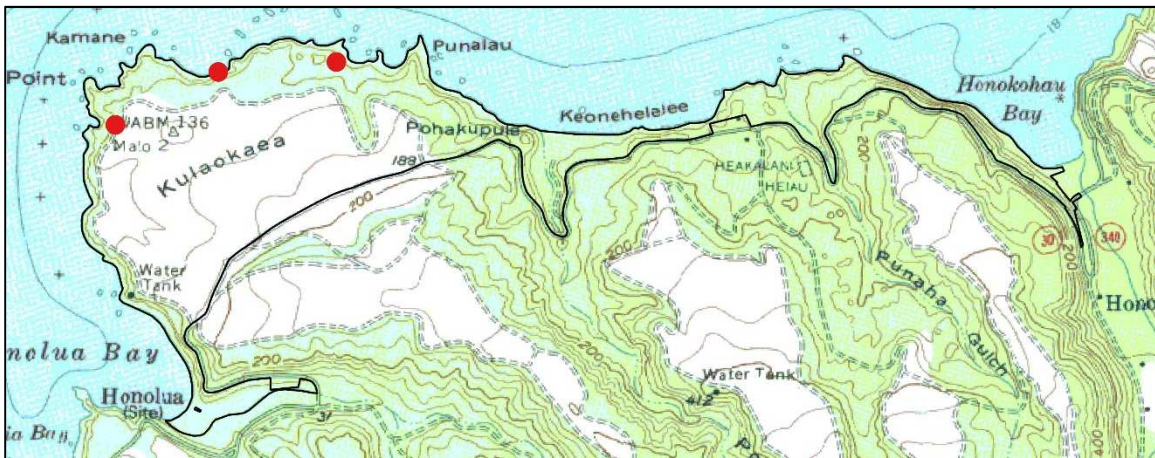


***Conocarpus erectus* (Button mangrove)**

A few patches of button mangrove occur along the coastal fringe of Lipoa Point. They appear to have been planted a while ago and have been vegetatively spreading since. The main concern is they occur in areas that would otherwise likely be occupied by native coastal plants. Control of button mangrove around the best remaining patches of native plants would help the native flora and fauna at Lipoa Point.



**Button mangrove (*Conocarpus erectus*) thicket along coast at Lipoa Point.**



**Button mangrove (*Conocarpus erectus*) at Lipoa Point.**

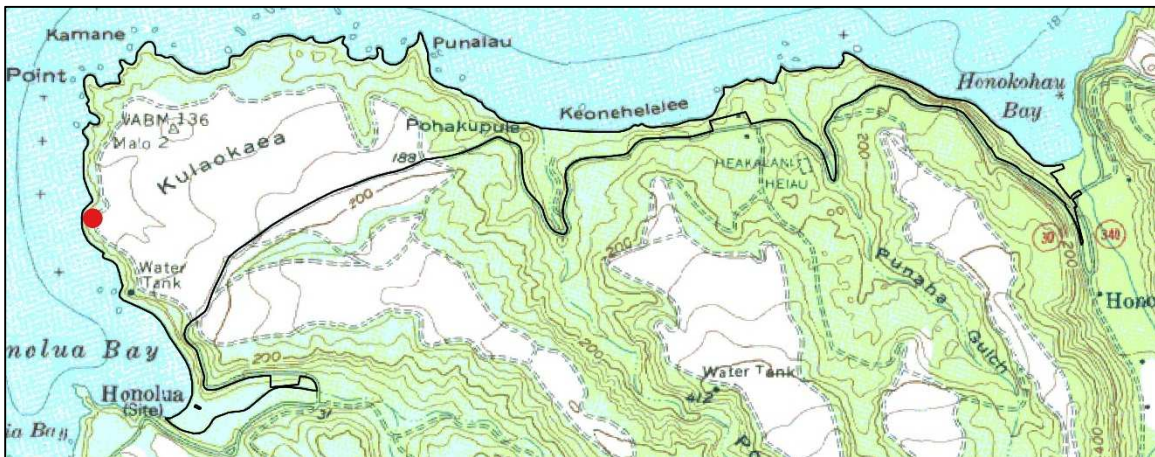


***Ficus platypoda* (Australian rock fig)**

A young tree of Australian rock fig appears to have been planted at the end of the dirt road on the west side of Lipoa Point. This species can get very large and has bird-dispersed fruit that are able to germinate and grow on trees, cliffs, and infrastructure. It would be relatively easy to remove this single small tree now before it becomes too large to manage and starts to spread to nearby areas.



Young Australian rock fig tree (*Ficus platypoda*) at Lipoa Point.



Australian rock fig (*Ficus platypoda*) at Lipoa Point.

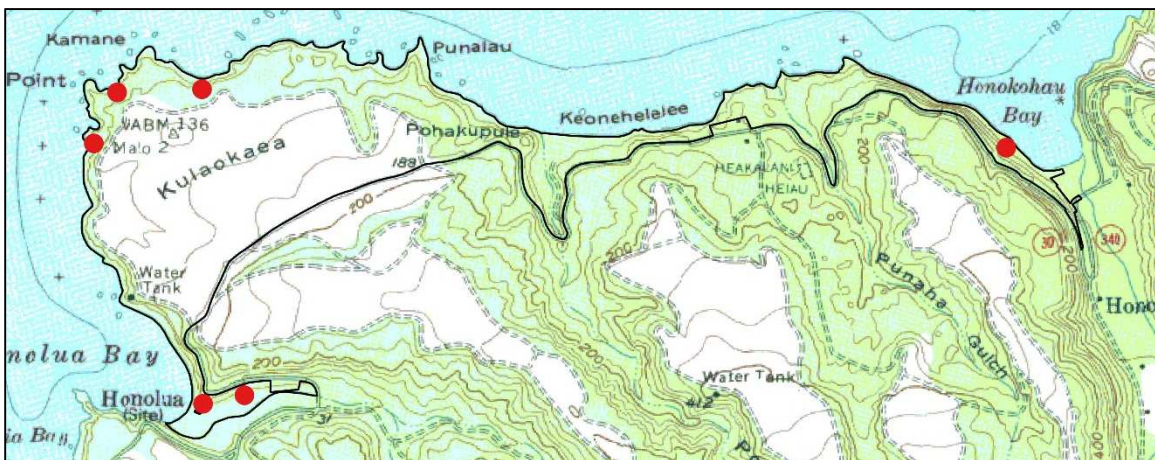


***Hylocereus undatus* (Night-blooming cereus)**

Though showy in the riparian forest of Honolulu Valley, night-blooming cereus may be good to selectively control in some areas of the coastal fringe. Along with displacing native plants, this sprawling succulent creates virtually impenetrable thickets that will increasingly limit access to the coast. This is most apparent around the area of Kamane.



**Machete cut trail through a night-blooming cereus thicket at Lipoa Point.**



**Night-blooming cereus (*Hylocereus undatus*) at Lipoa Point.**

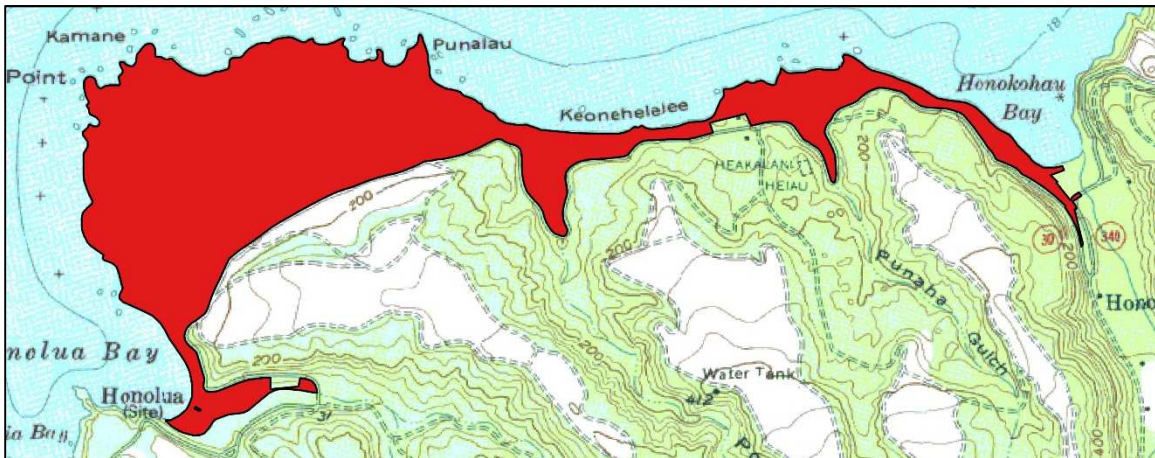


***Megathyrus maximum* (Guinea grass)**

Guinea grass is by far the most common plant at Lipoa Point. It can be found in all the vegetation types, from the windswept coastal fringe, through the abandoned pineapple fields, into the open areas of the riparian forest. Any vegetation management at Lipoa Point will undoubtedly include work on Guinea grass.



**Guinea grass (*Megathyrus maximum*) at Lipoa Point.**



**Guinea grass (*Megathyrus maximum*) at Lipoa Point.**

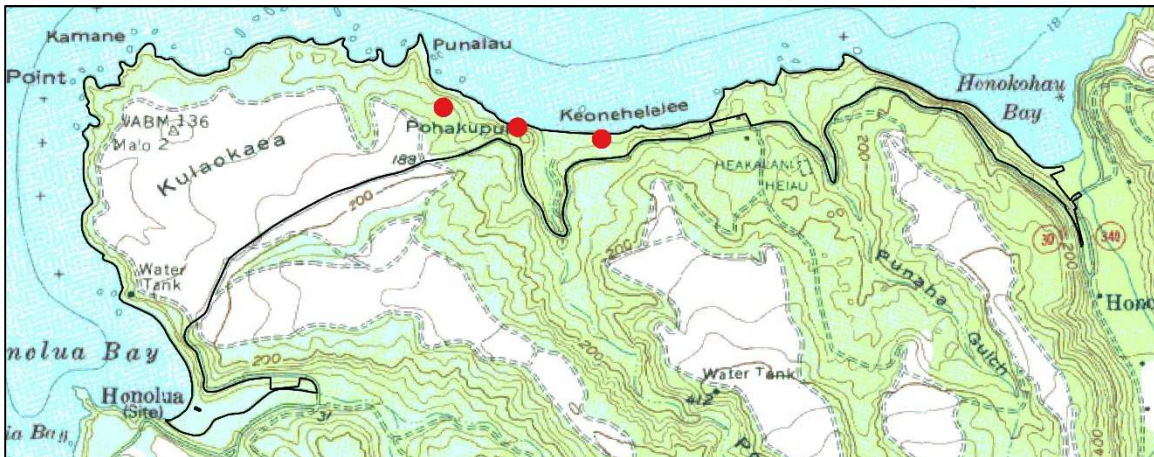


***Sphagneticola triloba* (Wedelia)**

A colorful groundcover in moist places, wedelia is capable of smothering native plants along the coastal fringe of Lipoa Point, including the endangered awiwi (*Schenkia sebaeoides*). Controlling this creeping vine in areas near native plants will help protect the native flora and fauna of Lipoa Point.



**Wedelia (*Sphagneticola triloba*) vines at Lipoa Point.**



**Wedelia (*Sphagneticola triloba*) at Lipoa Point.**

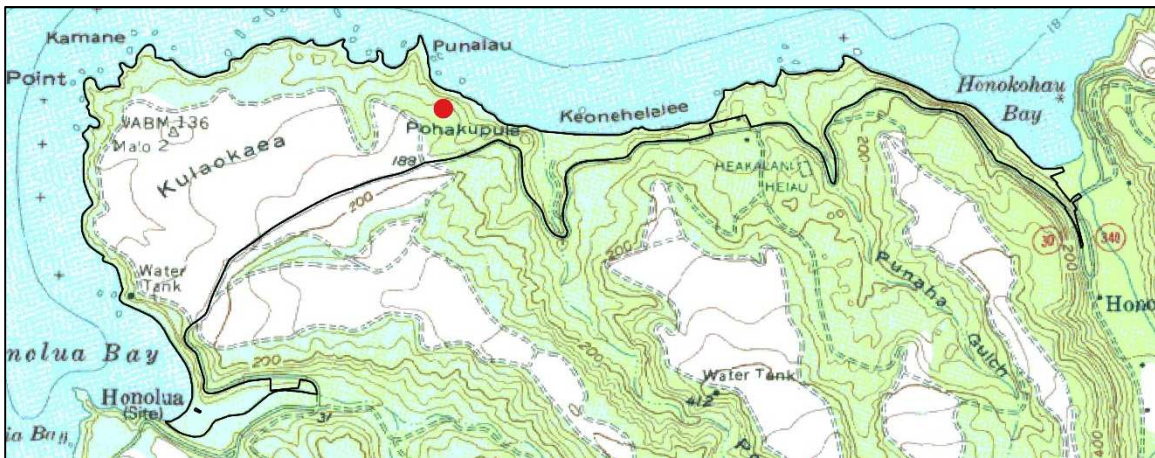


***Vitex trifolia* (Tree vitex)**

Similar to button mangrove, tree vitex appears to have been planted a while ago as ornament, was abandoned, and has been spreading into nearby areas. It too is displacing native plants along the coastal fringe of Lipoa Point. Control near native plants will help the native plants return to the areas they have been displaced from.



Tree vitex (*Vitex trifolia*) thicket at Lipoa Point.



Tree vitex (*Vitex trifolia*) at Lipoa Point.



## PLANT SPECIES LIST

Following is a checklist of all vascular plant species inventoried during field studies. For each species, the following information is provided:

- Family, Scientific, and Common names.
- Bio-geographical status / nativity:
  - Endemic = Native to Hawaii; not naturally occurring anywhere else in the world.
  - Indigenous = Native to Hawaii and also to one or more other geographic area(s).
  - Non-native = Brought to Hawaii intentionally or accidentally by humans.
- Abundance of each species within each vegetation type in the project area:
  - (D) Dominant = Forming a major part of the vegetation within the project area.
  - (C) Common = Widely scattered throughout the area or locally abundant within a portion of it.
  - (O) Occasional = Scattered sparsely throughout the area or occurring in a few small patches.
  - (R) Rare = Only a few isolated individuals within the project area.

Family	Scientific Name	Common Name	Nativity	Riparian	Coastal	Pineapple
Malvaceae	<i>Abutilon grandifolium</i>	Hairy abutilon	Non-native			O
Fabaceae	<i>Acacia confusa</i>	Formosa koa	Non-native	R	R	O
Euphorbiaceae	<i>Acalypha wilkesiana</i>	Beefsteak	Non-native	R		
Asteraceae	<i>Ageratum conyzoides</i>	Maile honohono	Non-native		R	
Euphorbiaceae	<i>Aleurites moluccana</i>	Kukui Nut tree	Non-native	O		
Araceae	<i>Alocasia macrorrhizos</i>	Ape	Non-native	R		
Xanthorrhoeaceae	<i>Aloe vera</i>	Aloe	Non-native		R	
Amaranthaceae	<i>Alternanthera pungens</i>	Khaki weed	Non-native		R	
Amaranthaceae	<i>Amaranthus viridis</i>	Slender amaranth	Non-native	R		
Primulaceae	<i>Anagallis arvensis</i>	Scarlet pimpernel	Non-native		O	
Araucariaceae	<i>Araucaria columnaris</i>	Cook pine	Non-native		O	O
Araucariaceae	<i>Araucaria heterophylla</i>	Norfolk Island pine	Non-native		R	
Primulaceae	<i>Ardisia elliptica</i>	Inkberry	Non-native	O		
Asclepiadaceae	<i>Asclepias physocarpa</i>	Balloon plant	Non-native		R	O
Acanthaceae	<i>Asystasia gangetica</i>	Chinese violet	Non-native		O	
Amaranthaceae	<i>Atriplex semibaccata</i>	Australian saltbush	Non-native		O	
Oxalidaceae	<i>Averrhoa carambola</i>	Star fruit	Non-native	O		
Acanthaceae	<i>Barleria repens</i>	Coral creeper	Non-native		C	
Asteraceae	<i>Bidens pilosa</i>	Beggar's tick	Non-native	R		
Blechnaceae	<i>Blechnum appendiculatum</i>	Blechnum	Non-native	R		
Nyctaginaceae	<i>Boerhavia coccinea</i>	Scarlet boerhavia	Non-native		O	O
Nyctaginaceae	<i>Boerhavia repens</i>	Alena	Endemic		R	
Scrophulariaceae	<i>Buddleia asiatica</i>	Dog tail	Non-native	O		



Family	Scientific Name	Common Name	Nativity	Riparian	Coastal	Pineapple
Combretaceae	<i>Calophyllum inophyllum</i>	Kamani	Non-native			R
Asteraceae	<i>Calyptocarpus vialis</i>	Calyptocarpus	Non-native	R		
Fabaceae	<i>Canavalia cathartica</i>	Maunaloa	Non-native		R	
Caricaceae	<i>Carica papaya</i>	Papaya	Non-native	O		
Fabaceae	<i>Cassia fistula</i>	Golden shower tree	Non-native		R	
Casuarinaceae	<i>Casuarina equisetifolia</i>	Ironwood	Non-native	O	C	O
Casuarinaceae	<i>Casuarina glauca</i>	Longleaf ironwood	Non-native		D	
Fabaceae	<i>Chamaecrista nictitans</i>	Partridge pea	Non-native		O	O
Amaranthaceae	<i>Chenopodium murale</i>	Lamb's quarters	Non-native		R	
Poaceae	<i>Chloris barbata</i>	Finger grass	Non-native		O	
Poaceae	<i>Chrysopogon aciculatus</i>	Manienie ula	Indigenous		R	
Lauraceae	<i>Cinnamomum burmannii</i>	Padang cassia	Non-native	C		
Verbenaceae	<i>Citharexylum spinosum</i>	Fiddlewood	Non-native	R		
Rutaceae	<i>Citrus</i> sp.	Citrus	Non-native	R		
Fabaceae	<i>Clitoria ternatea</i>	Butterfly pea	Non-native		R	
Polygonaceae	<i>Coccoloba uvifera</i>	Sea grape	Non-native		R	
Menispremeaceae	<i>Cocculus orbiculatus</i>	Huehue	Indigenous		R	
Arecaceae	<i>Cocos nucifera</i>	Coconut	Non-native	C	O	O
Euphorbiaceae	<i>Codiaeum variegatum</i>	Croton	Non-native	R		
Rubiaceae	<i>Coffea arabica</i>	Coffee	Non-native	C		
Araceae	<i>Colocasia esculenta</i>	Taro	Non-native		R	R
Commelinaceae	<i>Commelina diffusa</i>	Honohono	Non-native			O
Combretaceae	<i>Conocarpus erectus</i>	Button mangrove	Non-native		O	
Asteraceae	<i>Conyza bonariensis</i>	Hairy horseweed	Non-native	R	C	C
Boraginaceae	<i>Cordia subcordata</i>	Kou	Indigenous		R	
Asparagaceae	<i>Cordyline fruticosa</i>	Ti leaf	Non-native	O	R	
Brassicaceae	<i>Coronopus didymus</i>	Swinecress	Non-native		R	
Costaceae	<i>Costus speciosus</i>	Crepe ginger	Non-native	R	R	
Fabaceae	<i>Crotalaria pallida</i>	Smooth rattle pod	Non-native		R	
Asteraceae	<i>Cyanthillium cinereum</i>	Little ironweed	Non-native			
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	Christella	Non-native	R		
Poaceae	<i>Cynodon dactylon</i>	Bermuda grass	Non-native		R	
Cyperaceae	<i>Cyperus phleoides</i>	Cyperus	Endemic		R	
Cyperaceae	<i>Cyperus polystachyos</i>	Pycurus	Indigenous		O	
Cyperaceae	<i>Cyperus rotundus</i>	Nut sedge	Non-native	R		
Poaceae	<i>Dactyloctenium aegyptium</i>	Beach wire grass	Non-native	R	O	
Fabaceae	<i>Desmanthus pernambucanus</i>	Slender mimosa	Non-native	R	R	
Fabaceae	<i>Desmodium tortuosum</i>	Florida beggarweed	Non-native	R		
Fabaceae	<i>Desmodium triflorum</i>	Tick clover	Non-native		R	
Araceae	<i>Dieffenbachia seguine</i>	Dumb cane	Non-native	R		
Poaceae	<i>Digitaria ciliaris</i>	Henry's crab grass	Non-native		C	
Poaceae	<i>Digitaria eriantha</i>	Pangola grass	Non-native			O
Poaceae	<i>Digitaria insularis</i>	Sourgrass	Non-native		R	O
Sapindaceae	<i>Dodonaea viscosa</i>	Aalii	Indigenous			O



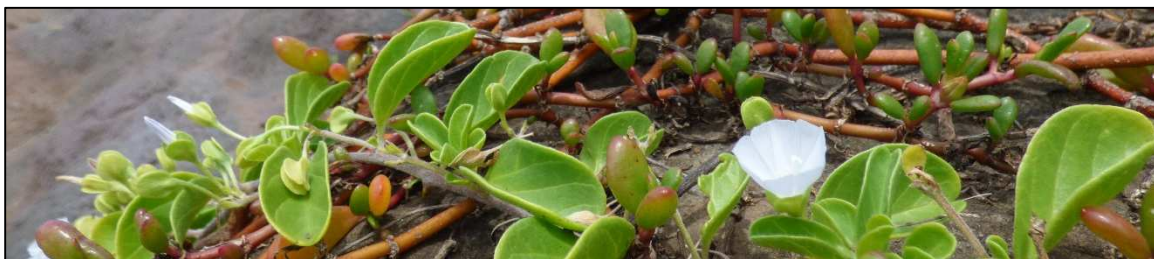
Family	Scientific Name	Common Name	Nativity	Riparian	Coastal	Pineapple
Poaceae	<i>Eleusine indica</i>	Wire grass	Non-native	R	O	
Asteraceae	<i>Emilia sp.</i>	Pualele	Non-native	R	O	
Araceae	<i>Epipremnum pinnatum</i>	Golden pothos	Non-native	D	R	
Poaceae	<i>Eragrostis pectinacea</i>	Carolina love grass	Non-native	R		
Asteraceae	<i>Erigeron belliioides</i>	Daisy fleabane	Non-native		O	
Euphorbiaceae	<i>Euphorbia degeneri</i>	Akoko	Endemic		O	
Euphorbiaceae	<i>Euphorbia prostrata</i>	Prostrate spurge	Non-native		R	
Euphorbiaceae	<i>Euphorbia serpens</i>	Matted sandmat	Non-native		R	
Moraceae	<i>Ficus benjamina</i>	Weeping fig	Non-native		R	
Moraceae	<i>Ficus microcarpa</i>	Chinese banyan	Non-native	O		
Moraceae	<i>Ficus platypoda</i>	Australian rock fig	Non-native	R		
Cyperaceae	<i>Fimbristylis cymosa</i>	Mauu akiaki	Indigenous		C	
Asparagaceae	<i>Furcraea foetida</i>	Mauritius hemp	Non-native		O	O
Malvaceae	<i>Gossypium barbadense</i>	Sea island cotton	Non-native		R	
Proteaceae	<i>Grevillea banksii</i>	Kahili flower	Non-native			O
Heliconiaceae	<i>Heliconia bihai</i>	Lobster claw	Non-native	R		
Boraginaceae	<i>Heliotropium curassavicum</i>	Nena	Indigenous		O	
Malvaceae	<i>Hibiscus rosa-sinensis</i>	Hibiscus	Non-native			R
Malvaceae	<i>Hibiscus tiliaceus</i>	Hau	Indigenous			O
Cactaceae	<i>Hylocereus undatus</i>	Night-blooming cereus	Non-native	C	O	
Fabaceae	<i>Indigofera suffruticosa</i>	Upright indigo	Non-native	R		O
Convolvulaceae	<i>Ipomoea alba</i>	Moon flower	Non-native	R		
Convolvulaceae	<i>Ipomoea indica</i>	Koali awa	Indigenous		R	
Convolvulaceae	<i>Ipomoea ochracea</i>	Yellow morning glory	Non-native	R		
Convolvulaceae	<i>Ipomoea pes-caprae</i> subsp. <i>brasiliensis</i>	Pohuehue	Indigenous		R	
Convolvulaceae	<i>Ipomoea triloba</i>	Little bell	Non-native	R		
Convolvulaceae	<i>Jacquemontia sandwicensis</i>	Pau o hiiaka	Endemic		O	
Acanthaceae	<i>Justicia betonica</i>	White shrimp plant	Non-native	O	R	
Crassulaceae	<i>Kalanchoe pinnata</i>	Air plant	Non-native		R	
Crassulaceae	<i>Kalanchoe tubiflora</i>	Chandelier plant	Non-native		R	
Verbenaceae	<i>Lantana camara</i>	Lantana	Non-native	O	O	C
Lamiaceae	<i>Leonotis nepetifolia</i>	Lion's ear	Non-native	R		
Brassicaceae	<i>Lepidium sp.</i>	Lepidium	Non-native			O
Fabaceae	<i>Leucaena leucocephala</i>	Haole koa	Non-native	C	O	
Solanaceae	<i>Lycium sandwicense</i>	Ohelo kai	Indigenous		C	
Bignoniaceae	<i>Macfadyena unguis-cati</i>	Cat's claw climber	Non-native	C		
Fabaceae	<i>Macroptilium atropurpureum</i>	Macroptilium	Non-native		O	O
Malvaceae	<i>Malvastrum coromandelianum</i>	False mallow	Non-native		R	
Anacardiaceae	<i>Mangifera indica</i>	Mango	Non-native	O		R
Euphorbiaceae	<i>Manihot esculenta</i>	Tapioca	Non-native	R		
Poaceae	<i>Megathrysus maximus</i>	Guinea grass	Non-native	D	O	D
Poaceae	<i>Melinis repens</i>	Natal red-top	Non-native			O
Fabaceae	<i>Mimosa pudica</i>	Sensitive plant	Non-native	R		



Family	Scientific Name	Common Name	Nativity	Riparian	Coastal	Pineapple
Nyctaginaceae	<i>Mirabilis jalapa</i>	Four-o'clock	Non-native	R		
Cucurbitaceae	<i>Momordica charantia</i>	Bitter melon	Non-native	R		O
Rubiaceae	<i>Morinda citrifolia</i>	Noni	Non-native	O	R	R
Fabaceae	<i>Mucuna gigantea</i>	Sea bean	Indigenous	O	R	
Musaceae	<i>Musa x paradisiaca</i>	Banana	Non-native	O		
Fabaceae	<i>Neonotonia wightii</i>	Glycine	Non-native	O	R	O
Apocynaceae	<i>Nerium oleander</i>	Oleander	Non-native		O	C
Solanaceae	<i>Nicotiana glauca</i>	Tree tobacco	Non-native		R	
Solanaceae	<i>Nicotiana tabacum</i>	Tobacco	Non-native		R	
Acanthaceae	<i>Odontonema cuspidatum</i>	Firespike	Non-native	R		
Poaceae	<i>Oplismenus hirtellus</i>	Basketgrass	Non-native	O		
Cactaceae	<i>Opuntia ficus-indica</i>	Prickly pear cactus	Non-native		O	
Oxalidaceae	<i>Oxalis corniculata</i>	Yellow wood sorrel	Non-native		O	
Oxalidaceae	<i>Oxalis debilis</i> var. <i>corymbosa</i>	Pink wood sorrel	Non-native	R		
Poaceae	<i>Panicum faurei</i> var. <i>faurei</i>	Panicum	Endemic		O	
Poaceae	<i>Panicum torridum</i>	Konakona	Endemic		O	
Passifloraceae	<i>Passiflora edulis</i>	Lilikoi, passion fruit	Non-native	R		
Passifloraceae	<i>Passiflora suberosa</i>	Corkscrew passionflower	Non-native	R	R	O
Lauraceae	<i>Persea americana</i>	Avocado	Non-native	R		
Polypodiaceae	<i>Phlebodium aureum</i>	Lauae haole	Non-native	R	R	
Euphorbiaceae	<i>Phyllanthus debilis</i>	Phyllanthus	Non-native		R	
Polypodiaceae	<i>Phymatosorus grossus</i>	Lauae	Non-native		R	
Fabaceae	<i>Pithecellobium dulce</i>	Opiuma	Non-native	C	O	O
Asteraceae	<i>Pluchea carolinensis</i>	Sourbush	Non-native		R	O
Asteraceae	<i>Pluchea indica</i>	Indian fleabane	Non-native		R	
Caryophyllaceae	<i>Polycarpon tetraphyllum</i>	Polycarpon	Non-native		R	
Polygalaceae	<i>Polygala paniculata</i>	Root beer plant	Non-native		R	
Portulacaceae	<i>Portulaca lutea</i>	Ihi	Indigenous		R	
Portulacaceae	<i>Portulaca oleracea</i>	Pigweed	Non-native		O	O
Portulacaceae	<i>Portulaca pilosa</i>	Hairy pigweed	Non-native		O	
Fabaceae	<i>Prosopis pallida</i>	Kiawe	Non-native	R	O	
Myrtaceae	<i>Psidium guajava</i>	Guava	Non-native		R	
Euphorbiaceae	<i>Ricinus communis</i>	Castor bean	Non-native	R		
Fabaceae	<i>Samanea saman</i>	Monkeypod tree	Non-native	C		O
Goodeniaceae	<i>Scaevola taccada</i>	Naupaka	Indigenous		C	
Anacardiaceae	<i>Schefflera actinophylla</i>	Octopus tree	Non-native	R		
Gentianaceae	<i>Schenkia sebaeoides</i>	Awiji	Endemic		R	
Caryophyllaceae	<i>Schiedea globosa</i>	Schiedea	Endemic		O	
Anacardiaceae	<i>Schinus terebinthifolius</i>	Christmas berry	Non-native	O	O	O
Fabaceae	<i>Senna surattensis</i>	Scrambled egg plant	Non-native		R	
Aizoaceae	<i>Sesuvium portulacastrum</i>	Akulikuli	Indigenous		C	
Poaceae	<i>Setaria palmifolia</i>	Palm grass	Non-native	O		
Poaceae	<i>Setaria verticillata</i>	Bristly foxtail	Non-native		O	



Family	Scientific Name	Common Name	Nativity	Riparian	Coastal	Pineapple
Malvaceae	<i>Sida ciliaris</i>	Red sida	Non-native		R	
Malvaceae	<i>Sida fallax</i>	Ilima	Indigenous		C	
Solanaceae	<i>Solanum americanum</i>	Popolo	Indigenous		O	
Solanaceae	<i>Solanum seaforthianum</i>	Vining solanum	Non-native	R		
Asteraceae	<i>Sonchus oleraceus</i>	Sow thistle	Non-native	R	O	O
Bignoniaceae	<i>Spathodea campanulata</i>	African tulip tree	Non-native	C		
Asteraceae	<i>Sphagneticola trilobata</i>	Wedelia	Non-native	R	R	
Poaceae	<i>Sporobolus africanus</i>	Rat tail	Non-native		R	
Verbenaceae	<i>Stachytarpheta cayennensis</i>	Vervain	Non-native	R		
Verbenaceae	<i>Stachytarpheta jamaicensis</i>	Jamaican vervain	Non-native		O	
Araceae	<i>Syagrus romanzoffiana</i>	Queen palm	Non-native	R		
Asteraceae	<i>Synedrella nodiflora</i>	Node weed	Non-native	O		
Araceae	<i>Syngonium podophyllum</i>	Arrowhead plant	Non-native	O		
Myrtaceae	<i>Syzygium cumini</i>	Java plum	Non-native	C	O	
Combretaceae	<i>Terminalia catappa</i>	False kamani	Non-native		R	R
Aizoaceae	<i>Tetragonia tetragonioides</i>	New Zealand spinach	Non-native		C	O
Malvaceae	<i>Thespesia populnea</i>	Milo	Indigenous	C	O	O
Acanthaceae	<i>Thunbergia fragrans</i>	Sweet clock-vine	Non-native	O		C
Boraginaceae	<i>Tournefortia argentea</i>	Beach heliotrope	Non-native		O	
Commelinaceae	<i>Tradescantia zebrina</i>	Wandering Jew	Non-native	R		
Asteraceae	<i>Tridax procumbens</i>	Coat buttons	Non-native	R		
Acanthaceae	<i>Unknown Acanthaceae</i>	Acanthaceae	Non-native	R		
Poaceae	<i>Unknown bamboo</i>	Bamboo	Non-native	R		R
Arecaceae	<i>Unknown palm</i>	Spiny palm	Non-native	R		
Poaceae	<i>Urochloa mutica</i>	California grass	Non-native		O	C
Verbenaceae	<i>Verbena litoralis</i>	Vervain	Non-native			O
Lamiaceae	<i>Vitex rotundifolia</i>	Pohinahina	Indigenous		R	
Lamiaceae	<i>Vitex trifolia</i>	Vitex	Non-native		R	
Malvaceae	<i>Waltheria indica</i>	Uhaloa	Indigenous			O
Thymelaeaceae	<i>Wikstroemia uva-ursi</i>	Akia	Endemic		R	
Arecaceae	<i>Wodyetia bifurcata</i>	Foxtail palm	Non-native		R	
Araceae	<i>Xanthosoma robustum</i>	Ape	Non-native	R		
Asteraceae	<i>Youngia japonica</i>	Oriental hawksbeard	Non-native		R	
Zingiberaceae	<i>Zingiber zerumbet</i>	Shampoo ginger	Non-native	O		



**Pau o Hiiaka (*Jacquemontia sandwicense*) and akulikuli (*Sesuvium portulacastrum*) at Lipoa Point.**



## **FAUNAL SURVEY**

### **SURVEY METHODS**

A walk-through survey method was conducted in conjunction with the botanical survey. Field observations were made with the aid of binoculars and by listening to vocalizations. A series of five minute point counts were made across various habitats.

Notes were made on species, abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding. Conspicuous insects, especially those of conservation concern, were noted.

The site was surveyed in April and May of 2018.



**Looking and listening for wildlife, Honolua Bay.**



## BATS

Native Hawaiian Hoary Bats (*Lasiurus cinereus semotus*) are present over all of Maui. They roost in trees and are active at night, preying on insects. Detailed surveys for bats were not performed for this survey, but the general bat habitat can be characterized.

The abandoned pineapple fields are likely of little value to Hawaiian Hoary Bats. Bats may occasionally transit over the open, short-statured, windy area, but are unlikely to find significant food sources or roosting sites.

The ironwood thickets along the coast are probably somewhat better for bats, offering some potential foraging and roosting sites, but the short trees and windy location would presumably not be optimally desirable to bats.

The best potential bat habitat at Lipoa Point is likely the calmer areas with large trees in the riparian forest area of Honolua Valley. This area likely could provide good foraging and roosting sites for bats. If detailed studies were undertaken, this is likely the general location where highest bat detections would occur.

The main thing to keep in mind about potential bats at Lipoa Point is to avoid cutting large trees (>15 ft. tall) in the summer months when bats are pupping. Hawaiian Hoary Bats roost in tall trees in sheltered areas. The bats give birth to and raise their young in the summer. Avoiding cutting large trees during the summer months will help minimize potential impacts to young bats that have not yet learned to fly. Additionally, not using barbed wire on fences would also help reduce potential harm to Hawaii's native bats.



**Hawaiian Hoary Bat, Olinda, Maui.**



Restoration of bats is in its infancy. To date, restoration efforts have involved planting blocks of native trees, mostly koa (*Acacia koa*), with wide corridors between the blocks to allow room for the bats to fly around in the calmer area between the rows of trees.

Along with planting trees, clearing corridors through solid blocks of non-native vegetation to create areas the bats can freely fly has also been employed in attempts to restore bat habitat in Hawaii. Corridors will best serve Hawaiian hoary bats if they are at least 500 ft. long and at least 30 ft. wide.

There is the potential to do bat restoration at Lipoa Point. Any large plantings of trees with room to fly around them will likely result in bats utilizing the site more. The abandoned pineapple fields have the greatest potential for improvement of bat habitat.

Milo (*Thespesia populnea*) may be the best option at Lipoa Point, though it might not reach the desired height in the harsh environment. Alternatively, corridors could potentially be cut through the continuous blocks of ironwood (*Casuarina* spp.) trees near the coast. This would accomplish the creation of corridors and the removal of an invasive tree that is displacing the native flora and fauna in that area.

The key things to help bats at Lipoa Point are to avoid cutting large trees (>15 ft. tall) in the summer months when bats are pupping, and to not use barbed wire on fencing.



**Young koa trees (*Acacia koa*) planted in Ulupalakua as bat mitigation for the Auwahi Wind Farm. Rows between the trees are areas for bats to forage for insects. Similar reforestation or landscaping in the open areas of Lipoa Point would likely result in more bats utilizing the site.**



## NON-NATIVE MAMMALS

No evidence of feral ungulates was observed. Pigs (*Sus scrofa*) are known from upland areas nearby. Deer (*Axis axis*) and goats (*Capris hircus*) could likely survive in the area, but no signs of them were observed.

Pet dogs were observed at the highly trafficked areas near Honolua Bay.

A few cats, including kittens, were present at the parking lot at Keonehelelee and further into Pohakupule Gulch. A cat skull was found near the end of the dirt road at Honolua Bay. Cat scat was observed in multiple locations.

A few mongooses were observed darting into the vegetation, from Honokohau to Honolua.

Other mammals likely to utilize this property, but which were not observed or heard include rats (*Rattus spp.*) and mice (*Mus domesticus*).



Cat in parking lot at Keonehelelee, Lipoa Point.



## BIRDS



One of many chickens along the trail to the coast at Honolua Bay.

The birds at Lipoa Point are currently almost all non-native. Conspicuous along the trail to the beach at Honolua Bay are numerous chickens or Red Junglefowl (*Gallus gallus*). Also in the riparian forest are Chinese Hwamei (*Garrulax canorus*) and White-rumped Shama (*Copsychus malabaricus*), a relative newcomer to Maui.

In open areas of the abandoned pineapple fields the main birds encountered were Japanese White-eye (*Zosterops japonicus*), Northern Cardinal (*Cardinalis cardinalis*), Common Myna (*Acridotheres tristis*), and House Finch (*Haemorhous mexicanus*).

Along the coast were a couple migratory birds, Wandering Tattler (*Tringa incana*) and Pacific Golden-Plover (*Pluvialis fulva*).

Other birds observed or heard include Black francolin (*Francolinus francolinus*), House Sparrow (*Passer domesticus*), Red-crested Cardinal (*Paroaria coronata*), Rock Pigeon (*Columba livia*), Scaly-breasted Munia (*Lonchura punctulata*), Spotted Dove (*Streptopelia chinensis*), and Zebra Dove (*Geopelia striata*).



White-rumped Shama, a relative newcomer to Maui, at Honolua Bay.

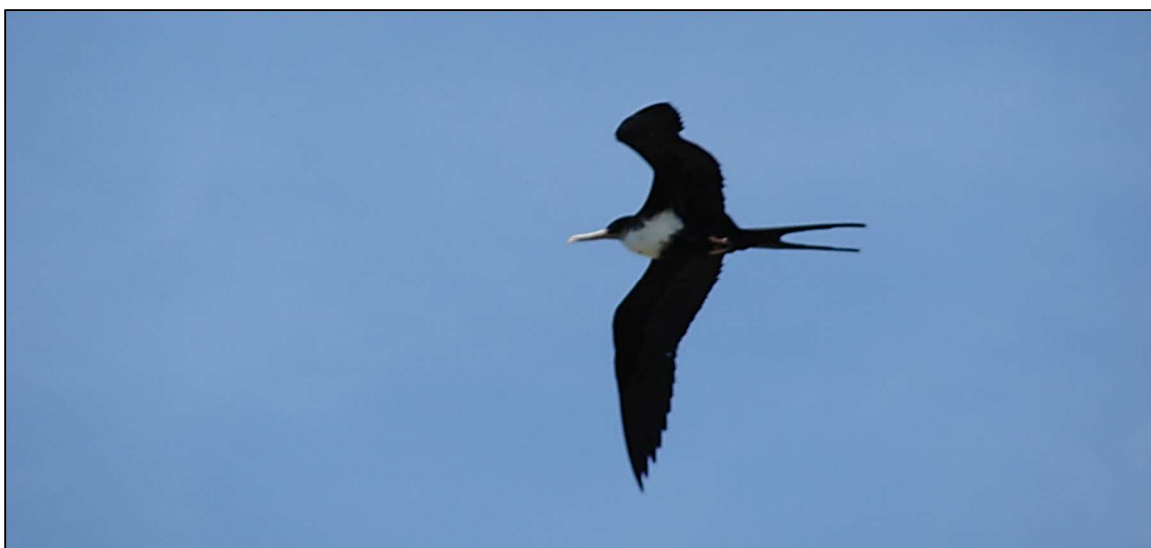




**Red-crested Cardinal at Lipoa Point.**

Non-native birds not encountered, but possibly occurring at Lipoa Point include Gray Francolin (*Francolinus pondicerianus*), Cattle Egret (*Bubulcus ibis*), and Java Sparrow (*Lonchura oryzivora*).

Though not observed during this survey, seabirds reported from within a few miles of Lipoa Point include Great Frigatebird (*Fregata minor*), Wedge-tailed Shearwater (*Ardenna pacifica*), Newell's Shearwater (*Puffinus newelli*), Hawaiian Petrel (*Pterodroma sandwichensis*), Bulwer's Petrel (*Bulweria bulwerii*), Laysan Albatross (*Phoebastria immutabilis*), Black-footed Albatross (*Phoebastria nigripes*), White-tailed Tropicbird (*Phaethon lepturus*), Red-tailed Tropicbird (*Phaethon rubricauda*), and Black Noddy (*Anous minutus*).



**Great Frigatebirds or Iwa (*Fregata minor*) are regularly reported gliding across the sky at Lipoa Point. This one was gliding on Midway Atoll.**



## SEABIRD RESTORATION

Lipoa Point likely used to be covered with a cacophony of breeding seabirds, and has the potential to support vast numbers of them in the future. However, there are currently little to no seabirds breeding there despite ample habitat. This is likely because they are killed by non-native predators, such as cats, dogs, mongooses, and rats when they try to breed there. However, they do fly by the area. And with protection and restoration, seabirds could once again become abundant at Lipoa Point.

Wedge-tailed Shearwaters nest at nearby Hawea Point. After years of site protection, restoration, and predator control by local community groups, the shearwaters have increased in numbers there. Similar work could be done at Lipoa Point in pockets of areas along the coast where seabirds are most likely to nest.

Additionally, predator-proof fences could be built to even better protect seabirds, creating seabird sanctuaries at Lipoa Point. Options for predator-proof fences range from small enclosures to long fences that would protect much of the point.

Native seabird species, some of which are endangered, that could likely benefit from a predator-proof seabird sanctuary at Lipoa Point include Wedge-tailed Shearwater, Hawaiian Petrel, Bulwer's Petrel, Newell's Shearwater, Laysan Albatross, Black-footed Albatross, White-tailed Tropicbird, Red-tailed Tropicbird, and Black Noddy. All of these have been reported from within a few miles of Lipoa Point.



**Wedge-tailed Shearwater, Midway Atoll. This species commonly flies offshore of Lipoa Point, breeds at nearby Hawea Point, and would likely be able to live and breed again at Lipoa Point if protected from non-native predators.**





**Seabirds in flight at Midway Atoll. These same species could potentially call Lipoa Point home.**

The main features that make Lipoa Point a potentially good site for native seabirds are the windswept area next to the open ocean and flat and sloping areas on land with rocks and other features to nest near. The relatively undeveloped surrounding areas also results in minimal lights at night that could potentially disorient the birds.

Being somewhat elevated above the ocean is also a benefit to protecting seabirds at Lipoa Point. If a predator-proof fence was built at Lipoa Point, it would be one of the higher elevation predator-proof fences along the coast in Hawaii. This would make it less at risk from storm surge, large tsunami events, and sea level rise.

Predator-proof fences are tall enough to prevent animals from jumping over, have a hood to prevent animals from climbing over, mesh that is small enough to keep mice out, and a skirt that prevents animals from digging under. Additionally, gates are installed to allow access to the area.

Predator-proof fences are expensive. One possible way to pay for them is through mitigation. Entities that anticipate harming endangered seabirds need to mitigate for that. This could potentially be accomplished by creating a seabird sanctuary at Lipoa Point and working to protect and restore the habitat for the species impacted.



**Predator-proof fence at Kilauea Point, Kauai. Photo Ann Bell USFWS. Lipoa Point also seems poised to be a seabird restoration site, utilizing predator-proof fencing to create a seabird sanctuary.**



## Seabird Restoration Options

When weighing each seabird restoration option for Lipoa Point, we used the following criteria as guidance. An optimal seabird restoration site at Lipoa Point would:

- Protect the greatest number of seabirds and seabird species.
- Be relatively easy to access and maintain.
- Have minimal impact on recreation and other activities.

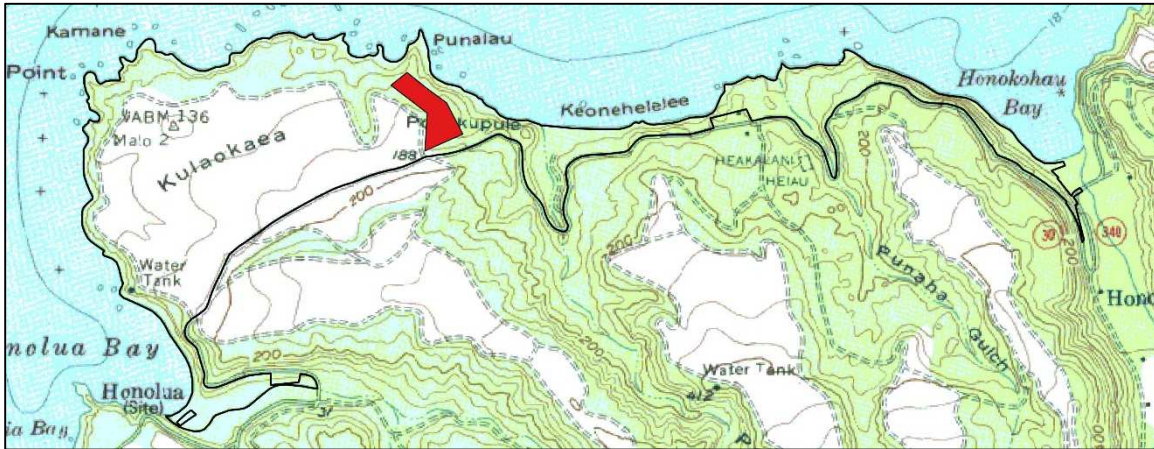
With that in mind, three potential seabird restoration options utilizing predator-proof fences are outlined. The seabird sanctuaries range in size from 6-174 acres. All are focused on protecting the best seabird habitat, along the windswept coasts of Lipoa Point.



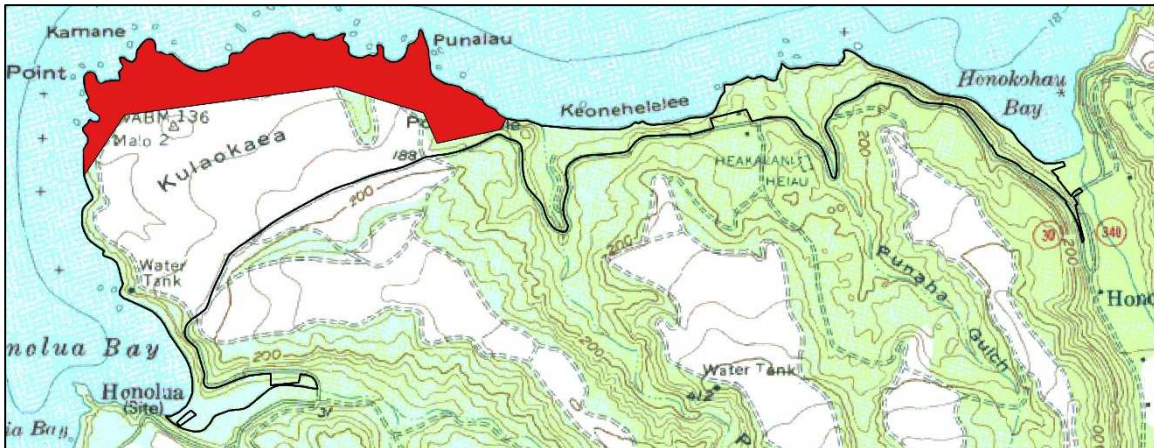
**Predator-proof fence near Makamakaole, West Maui. This fence was paid for and is being maintained as mitigation for the Kaheawa Wind Farms. Since installation, endangered native seabirds have begun to return to the protected site to breed.**



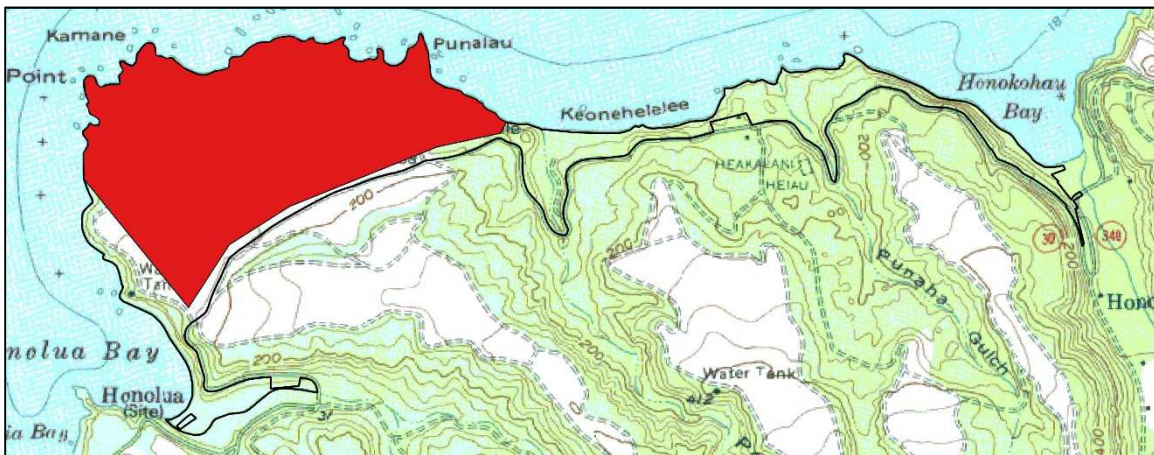
## Potential Seabird Restoration Sites



Potential seabird sanctuary near Punalau.



Potential seabird sanctuary along the northern coastal fringe of Lipoa Point.

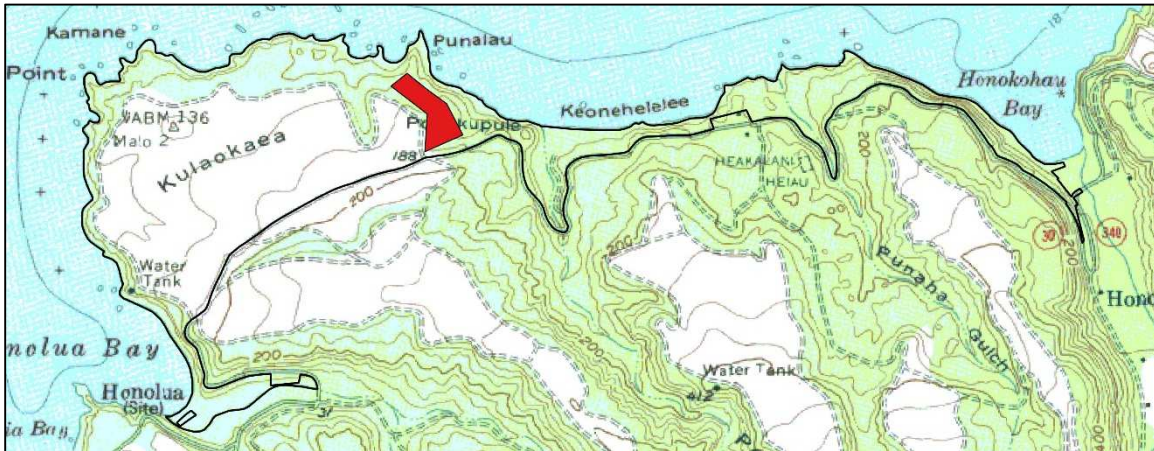


Potential seabird sanctuary over the bulk of Lipoa Point.



## Potential Seabird Restoration Site #1 - Punalau

The highest and most windswept area of Lipoa Point is the coast from Punalau to Pohakupule, on the east side of Lipoa Point. This area has both flat ground and steep areas with rocks for the birds to nest near. It is also relatively easy to access and is in a less frequented part of the parcel. Additionally, it is sited to not overlap existing trails and roads. It would take about a half mile of fence to protect the six acres of habitat here.



Potential seabird sanctuary near Punalau.

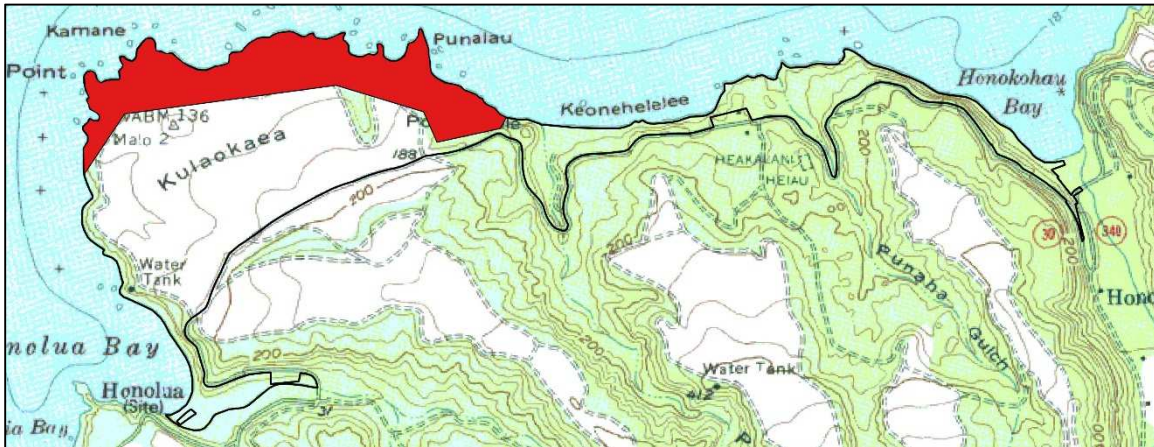


Potential seabird sanctuary near Punalau.



## Potential Seabird Restoration Site #2 - Northern Coastal Fringe

This is the option that would make the most difference for seabirds and keep the bulk of the point open for other uses. A one mile predator-proof fence would protect about 62 acres of seabird habitat on the northern coastal fringe of Lipoa Point. This is also where most of the native plants remain. Pedestrian gates could be placed where the fence crosses existing trails, to allow continued access to the coast.



Potential seabird sanctuary along the northern coastal fringe of Lipoa Point.

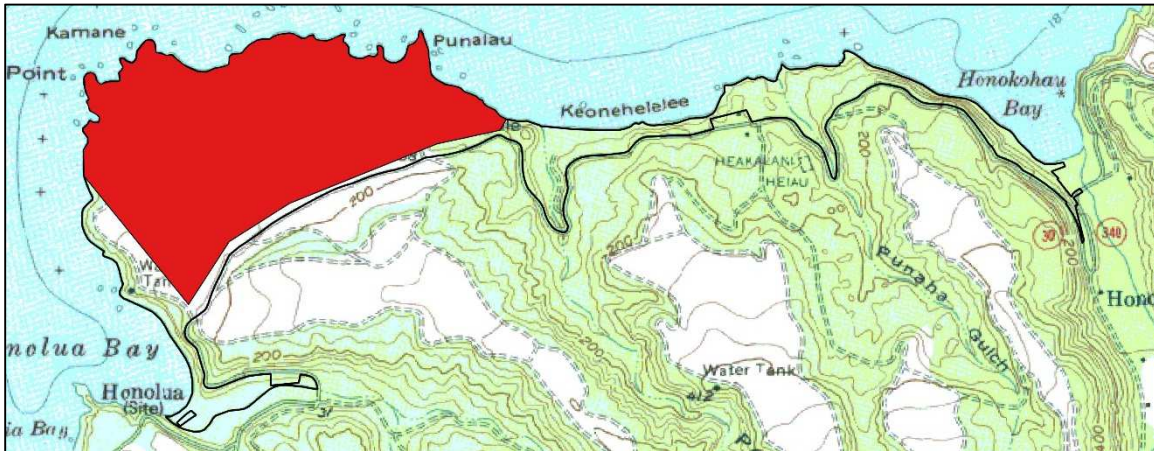


Potential seabird sanctuary along the northern coastal fringe of Lipoa Point.

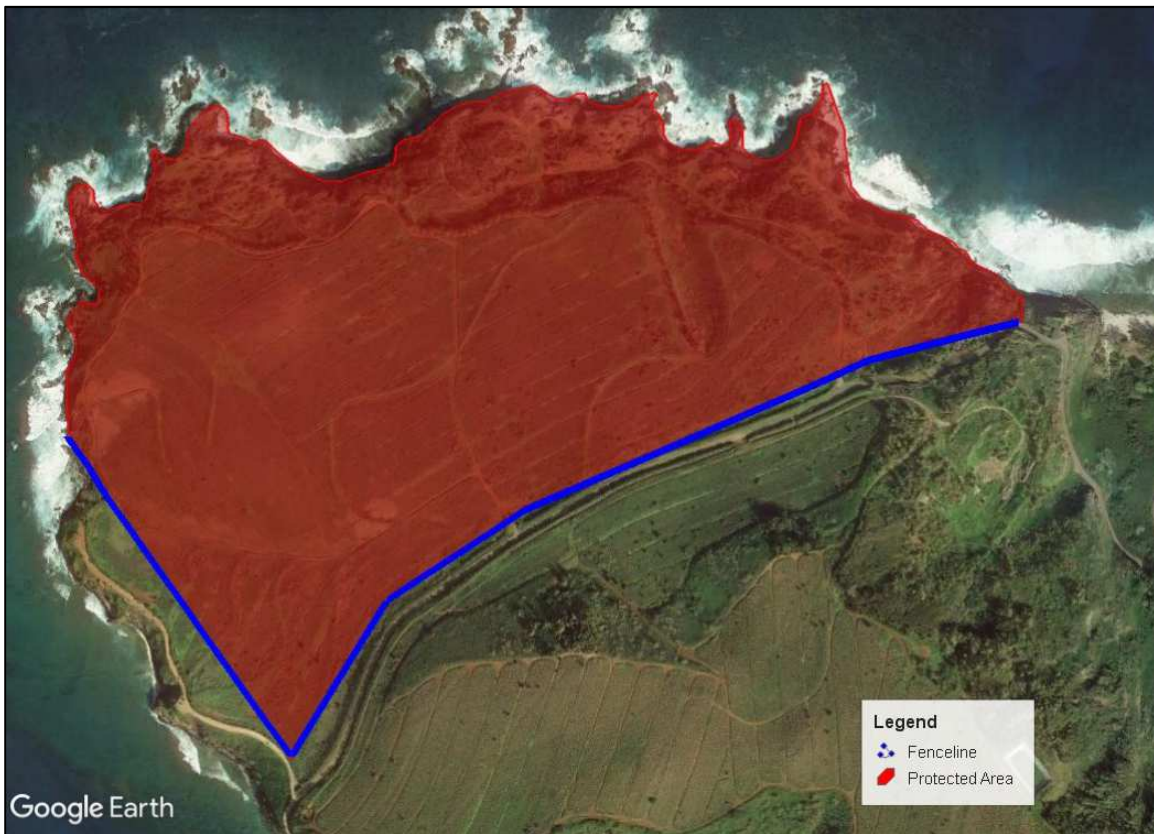


### Potential Seabird Restoration Site #3 - Lipoa Point

The most ambitious approach would be to fence off the bulk of Lipoa Point and turn the whole area of Kulaokaea and the coastal fringe into a seabird sanctuary. Pedestrian gates could be placed at existing access points. In this configuration, 1.14 miles of fence would protect 174 acres. This configuration would protect the most habitat. It would also require the most maintenance and most limit other potential uses of the area.



Potential seabird sanctuary over the bulk of Lipoa Point.



Potential seabird sanctuary over the bulk of Lipoa Point.





**Typical potential seabird restoration habitat at Lipoa Point.**



**Laysan Albatross colony in similar habitat on Midway Atoll.**



Along with installing a predator-proof fence and removing the predators, there are other actions and best management practices that could help attract and promote reestablishment of seabirds at Lipoa Point.

Social attraction is the technique of using decoys and calls of the target species to lure them into safe breeding areas. These areas can be fitted with man-made burrows for the birds. Game cameras help track visits to the burrows by birds and potential predators.

Once a colony has been established and begun to flourish, many of these initial techniques will no longer need to be implemented, though fence maintenance and predator monitoring will still need to occur.



**Social attraction speaker, bird decoy, game camera, and man-made burrow in predator exclusion fence at Makamakaole, West Maui. Similar techniques could be used at Lipoa Point.**



**Newell's Shearwater decoy next to man-made burrow at Makamakaole, West Maui. As simple as it looks, it works. This endangered seabird species is now reestablishing in the area. The same could be done for this species and others at Lipoa Point.**





**Local community members working to protect and restore native seabirds at nearby Hawea Point.**



**Could this be the future of Lipoa Point? Seabirds in flight on Midway Atoll.**



## BIRD SPECIES LIST

Following is a checklist of the bird species inventoried at Lipoa Point during surveys. For each species the following information is provided:

- Common & Scientific name
- Bio-geographical status / nativity:
  - Endemic = Native to Hawaii; not naturally occurring anywhere else in the world.
  - Indigenous = Native to Hawaii and also to one or more other geographic area(s).
  - Non-native = Brought to Hawaii intentionally or accidentally by humans.
- Abundance of each species within the project area:
  - Abundant = Many flocks or individuals seen throughout area at all times of day.
  - Common = A few flocks or well scattered individuals throughout the area.
  - Uncommon = Only one flock or several individuals seen within the project area.
  - Rare = only one or two seen within the project area.

<b>Common name</b>	<b>Scientific name</b>	<b>Nativity</b>	<b>Abundance</b>
Black francolin	<i>Francolinus francolinus</i>	Non-native	Rare
Chinese Hwamei	<i>Garrulax canorus</i>	Non-native	Occasional
Common Myna	<i>Acridotheres tristis</i>	Non-native	Rare
House Finch	<i>Haemorhous mexicanus</i>	Non-native	Rare
House Sparrow	<i>Passer domesticus</i>	Non-native	Occasional
Japanese White-eye	<i>Zosterops japonicus</i>	Non-native	Occasional
Northern Cardinal	<i>Cardinalis cardinalis</i>	Non-native	Common
Pacific Golden-Plover	<i>Pluvialis fulva</i>	Indigenous	Rare
Red Junglefowl	<i>Gallus gallus</i>	Non-native	Common
Red-crested Cardinal	<i>Paroaria coronata</i>	Non-native	Rare
Rock Pigeon	<i>Columba livia</i>	Non-native	Occasional
Scaly-breasted Munia	<i>Lonchura punctulata</i>	Non-native	Rare
Spotted Dove	<i>Streptopelia chinensis</i>	Non-native	Occasional
Wandering Tattler	<i>Tringa incana</i>	Indigenous	Rare
White-rumped Shama	<i>Copsychus malabaricus</i>	Non-native	Rare
Zebra Dove	<i>Geopelia striata</i>	Non-native	Occasional



## INSECTS

A complete inventory of the insects was beyond the scope of this survey. Conspicuous insects were noted and special effort was made to look for insects of conservation concern. Very little survey work has been done on insects in the lowland areas of West Maui, and there is still much to be discovered, including new undescribed native species. Some of the more conspicuous and noteworthy insects we came across are noted below.

### YELLOW-FACED BEES

Native yellow-faced bees (*Hylaeus* spp.) (Hymenoptera: Colletidae) were once common across all Hawaii. Today they are mostly absent in the lowlands. An exception are a few coastal areas, where pockets of remnant native plants support small populations of native yellow-faced bees. Lipoa Point is just such a place.

Recently listed as endangered, one of the rare native yellow-faced bees (*H. assimulans*) has been documented from Lipoa Point. There are another half dozen or so native *Hylaeus* species that utilize similar habitat that could also possibly occur at Lipoa Point.

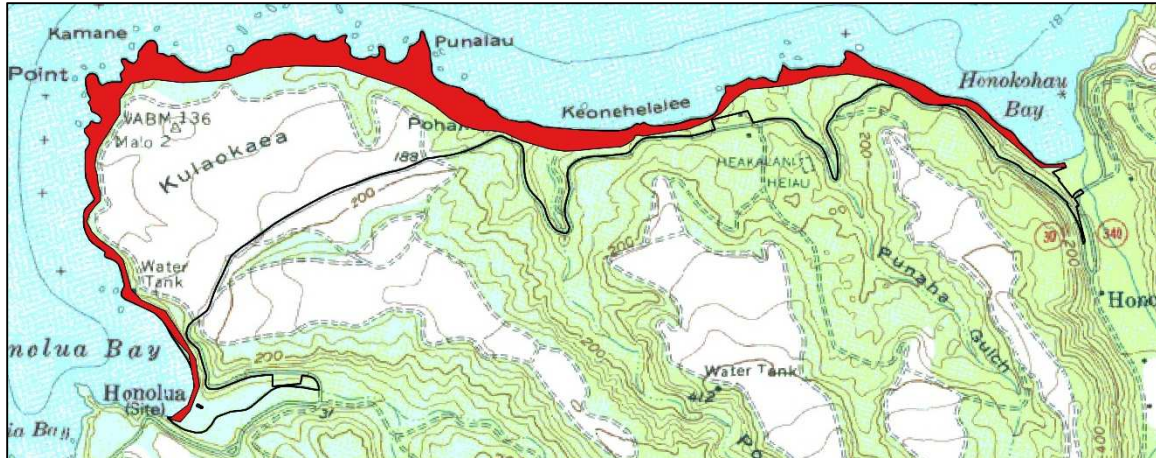
The best way to help the native bees at Lipoa Point is protection and restoration of the remnant native coastal plant habitat. Native Hawaiian bees feed almost exclusively on native plants. By restoring the native plants, the native bees are similarly restored.

Additionally, the non-native tree heliotrope (*Tournefortia argentea*) is a reliable food source for native bees and should be left in restoration areas. If it starts to get dense and crowd out endangered plants, it could be thinned out, this would also help reduce ants, but having at least a few around is highly beneficial for these native bees.



Endangered yellow-faced bee (*Hylaeus assimulans*) at Lipoa Point. Photo by Lahaina Photography.





**Area of greatest likelihood to encounter native yellow-faced bees (*Hylaeus* spp.) at Lipoa Point. This is also the area where management would most benefit these rare native bees.**

Native yellow-faced bees (*Hylaeus* spp.) are most likely to be found in areas of highest native plant diversity. At Lipoa Point, this is along the seaward edge of the coastal fringe. Efforts to protect and restore these areas of remnant native plants will also benefit these increasingly imperiled native yellow-faced bees.

Restoring areas from the bottom of the coastal fringe to the top will help provide a range of areas for different native plants to thrive and areas for the bees to nest in. Additionally, having more of the coastal natives and bee nesting sites further inland, will help protect the bees against surge from large storm events, tsunami, and sea level rise. In 2015, large waves wiped out an entire population of bees living on a rocky point in Kahuku, Oahu.

Another restoration approach in its infancy in Hawaii are nest blocks for native bees. The native yellow-faced bees like to nest in holes in coral rocks that have washed ashore or in the hollow stems of coastal plants. After laying eggs, females seal the holes with a type of waterproof cellophane. Providing nest blocks of suitable size with protection from invasive ants has been shown to help bees reestablish in an area.

Artificial nests for the native yellow-faced bees can be created from wood and hung from trees. Holes that match the bee size are drilled into the wooden blocks to create nesting sites for the bees. The cord that attaches the nest blocks to a branch is covered with a sticky substance that prevents crawling predators, like ants, from getting inside.

Additionally, more detailed surveys for *Hylaeus*, with a goal of further determining species present, distribution, nesting sites, and food plant preferences will help shed light on these rare native gems at Lipoa Point and help guide their management.

The United States Fish and Wildlife coastal program may have matching funds and guidance for efforts to learn more about and protect the native bees at Lipoa Point.



## HYPOSMOCOMA MOTHS

Able to survive in some of the least hospitable areas of Hawaii, native fancy-cased moths (*Hyposmocoma* spp.) (Lepidoptera: Cosmopterigidae) are abundant over much of the coastal rocky areas of Lipoa Point.

Most prevalent to our eyes were the "burrito" shaped larvae/pupae that were common in sheltered areas on large stones and cliff faces across the entire coastal fringe, especially where lichen grows.

The burrito shaped larvae create a sleeping bag type structure they stick bits of mud and lichen to while they crawl around and graze on lichen and fungi. Larvae pupate in the cases they make. Adults emerge as small moths that can be found on the stones as well.

These could possibly be new undescribed native species.



Native fancy-cased moth (*Hyposmocoma* spp.) habitat in sheltered areas on stones and cliff faces.

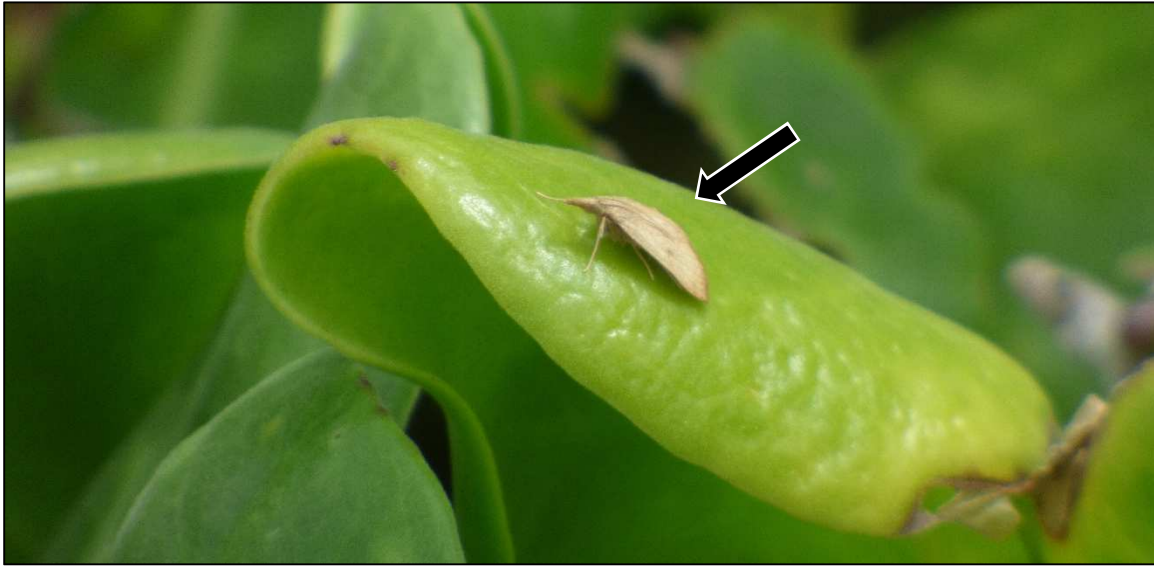


Fancy-cased moth (*Hyposmocoma* sp.) "burrito" shaped larvae adorned with bits of soil tucked in a crevice on a cliff face above Honolulu Bay. These native moths are locally common at Lipoa Point.



## NAUPAKA MOTH

Much of the naupaka (*Scaevola taccada*) along the coast is being fed on by the native naupaka moth (*Udea litorea*) (Lepidoptera: Crambidae). The larvae feed on the underside of naupaka leaves, protected by a blanket of silk. When they reach full size they pupate under the silk, emerging as a yellow brown moth. Along with abundant larvae and pupae on leaves, the adult moths flush as the naupaka is brushed. These moths were especially abundant in the large naupaka patch east of Kamane.



Native naupaka moth (*Udea litorea*) adult on naupaka at Kamane, where they are abundant.



Naupaka moth (*Udea litorea*) pupa under silk blanket on underside of naupaka leaf.



## BLACKBURN'S SPHINX MOTH

The Blackburn's sphinx moth (*Manduca blackburni*) (Lepidoptera: Sphingidae) is an endangered native moth that often feeds on the weedy, non-native tree tobacco (*Nicotiana glauca*). A few plants of tree tobacco were observed in various parts of the site. The plants were searched for evidence of Blackburn's sphinx moth.

No eggs, larvae, frass, feeding damage or adults of the Blackburn's sphinx moth were observed. The only insect feeding damage on tree tobacco appeared to be from slugs. The only other Solanaceae encountered were tobacco (*Nicotiana tabacum*) and ohelo kai (*Lycium sandwicense*), both of which also had no evidence of Blackburn's sphinx moth. Though Blackburn's sphinx moths were not encountered, there are host plants on the site that could support them, and it is probable they could be on the site at times.

Tree tobacco is relatively short lived, usually no more than a few years. It is also capable of quickly colonizing disturbed sites. As a result, locations of tree tobacco will fluctuate over time. Searching for tree tobacco and Blackburn's sphinx moth in areas slated for management before that occurs will help assure this endangered moth is not harmed. Allowing the non-native, often weedy, tree tobacco to flourish on the property, along with plantings of native Solanaceae, will help reestablish this endangered moth.



Blackburn's sphinx moth larva on tree tobacco (*Nicotiana glauca*) at Puu o Kali, Maui.



Tree tobacco (*Nicotiana glauca*) in abandoned pineapple fields at Lipoa Point.



## INSECT SPECIES LIST

Following is a checklist of the insect species inventoried during the field work. For each species the following information is provided:

- Order, Family, Scientific & Common name
- Bio-geographical status / nativity:
  - Endemic = Native to Hawaii; not naturally occurring anywhere else in the world.
  - Indigenous = Native to Hawaii and also to one or more other geographic area(s).
  - Non-native = Brought to Hawaii intentionally or accidentally by humans.

Order	Family	Scientific Name	Common Name	Nativity
Araneae	Araneidae	<i>Argiope appensa</i>	Garden spider	Non-native
Araneae	Araneidae	<i>Gasteracantha mammosa</i>	Asian spiny back crab spider	Non-native
Blattodea	Blaberidae	<i>Diploptera punctata</i>	Pacific cockroach	Non-native
Coleoptera	Coccinellidae	<i>Coelophora inaequalis</i>	Variable ladybird beetle	Non-native
Coleoptera	Coccinellidae	<i>Olla v-nigrum</i>	Ashy grey ladybird beetle	Non-native
Hemiptera	Flatidae	<i>Melormenis basalis</i>	West Indian flatid	Non-native
Hemiptera	Plataspidae	<i>Coptosoma xanthogramma</i>	Black stink bug	Non-native
Hemiptera	Psyllidae	<i>Heteropsylla cubana</i>	Haole koa psyllid	Non-native
Hemiptera	Reduviidae	<i>Haematoloecha rubescens</i>	Red assassin bug	Non-native
Hemiptera	Tingidae	<i>Corythucha gossypii</i>	Cotton lace bug	Non-native
Hymenoptera	Agaonidae	<i>Josephiella microcarpae</i>	Ficus gall wasp	Non-native
Hymenoptera	Ampulicidae	<i>Ampulex compressa</i>	Emerald cockroach wasp	Non-native
Hymenoptera	Aphidae	<i>Unknown aphids</i>	Aphids	Non-native
Hymenoptera	Apidae	<i>Apis mellifera</i>	Honey bee	Non-native
Hymenoptera	Apidae	<i>Xylocopa sonorina</i>	Sonoran carpenter bee	Non-native
Hymenoptera	Colletidae	<i>Hylaeus sp.</i>	Yellow faced bee	Endemic
Hymenoptera	Formicidae	<i>Anoplolepis gracilipes</i>	Yellow crazy ant	Non-native
Hymenoptera	Formicidae	<i>Ochetellus glaber</i>	Black household ant	Non-native
Hymenoptera	Formicidae	<i>Paratrechina longicornis</i>	Long legged ant	Non-native
Hymenoptera	Formicidae	<i>Pheidole megacephala</i>	Big headed ant	Non-native
Hymenoptera	Formicidae	<i>Solenopsis geminata</i>	Tropical fireant	Non-native
Hymenoptera	Pompilidae	<i>Tachypompilus analis</i>	Red-tailed spider wasp	Non-native
Lepidoptera	Cosmopterigidae	<i>Hyposmocoma sp.</i>	Fancy case moth	Endemic
Lepidoptera	Crambidae	<i>Omiodes blackburni</i>	Coconut leaf roller	Endemic
Lepidoptera	Crambidae	<i>Spoladea recurvalis</i>	Beet webworm	Non-native
Lepidoptera	Crambidae	<i>Udea litorea</i>	Naupaka moth	Endemic



Order	Family	Scientific Name	Common Name	Nativity
Lepidoptera	Geometridae	<i>Macaria abydata</i>	Haole koa looper	Non-native
Lepidoptera	Nymphalidae	<i>Agraulis vanillae</i>	Passionvine butterfly	Non-native
Lepidoptera	Nymphalidae	<i>Danaus plexippus</i>	Monarch butterfly	Non-native
Lepidoptera	Pieridae	<i>Eurema nicippe</i>	Sleepy orange butterfly	Non-native
Lepidoptera	Pieridae	<i>Phoebis agarithe</i>	Yellow butterfly, Large orange sulphur	Non-native
Lepidoptera	Pieridae	<i>Pieris rapae</i>	Cabbage butterfly	Non-native
Lepidoptera	Psychidae	<i>Brachycyttarus griseus</i>	Grass bagworm	Non-native
Mantodea	Mantidae	<i>Tenodera sinensis</i>	Chinese preying mantis	Non-native
Odonata	Libellulidae	<i>Pantala flavescens</i>	Globe skimmer	Indigenous
Orthoptera	Acrididae	<i>Schistocerca nitens</i>	Vagrant locust	Non-native
Orthoptera	Tettigoniidae	<i>Conocephalus saltator</i>	Cricket	Non-native
Thysanoptera	Phlaeothripidae	<i>Gynaikothrips ficorum</i>	Cuban laurel thrips	Non-native



**Native yellow-faced bee (*Hylaeus* sp.), an important pollinator of native plants such as ilima, and one of the rare native Hawaiian gems that would benefit from protection and restoration of Lipoa Point.**

## REFERENCES

Daly, H. V. and K. N. Magnacca. 2003. Insects of Hawaii: Volume 17 Hawaiian *Hylaeus* (*Nesoprosoptis*) Bees (Hymenoptera: Apoidea). University of Hawaii Press, Honolulu, HI.

Giambelluca, T. W., X. Shuai, M. L. Barnes, R. J. Alliss, R. J. Longman, T. Miura, Q. Chen, A. G. Frazier, R. G. Mudd, L. Cuo, and A. D. Businger. 2014. Evapotranspiration of Hawaii. Final report submitted to the U.S. Army Corps of Engineers - Honolulu District, and the Commission on Water Resource Management, State of Hawaii.

Nishida, G. M. 2002. Hawaii Arthropod Checklist Fourth Edition. Bishop Museum Technical Report 22: iv+313 pp.

Pyle, R.L., and P. Pyle. 2009. The Birds of the Hawaiian Islands: Occurrence, History, Distribution, and Status. B.P. Bishop Museum, Honolulu, HI, U.S.A. Version 1.

Schmitz, P. and D. Rubinoff. 2008. Three new species of *Hyposmocoma* (Lepidoptera, Cosmopterigidae) from the Hawaiian Islands, based on morphological and molecular evidence. *Zootaxa* 1821: 49-58.

Sullivan, B.L., C.L. Wood, M.J. Iliff, R.E. Bonney, D. Fink, and S. Kelling. 2009. eBird: a citizen-based bird observation network in the biological sciences. *Biological Conservation* 142: 2282-2292.

Tomich, P. Q. 1986. Mammals in Hawaii. Bishop Museum Press, Honolulu, HI.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the Flowering Plants of Hawaii. Univ. of Hawaii Press and Bishop Museum Press, Honolulu, HI.



Surfer at Honolua Bay.

"I ka nalu pu ki, mehe 'iwa ke kikaha" - On the high-shooting wave, like a seabird gliding.