

***General Botanical Survey and Vertebrate Fauna Assessment,
TMKs (3rd.) 2-9-003:013, 029 & 060
Wailea, South Hilo District, Island of Hawai‘i***

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Introduction

This biological survey was prepared for Ken Church, landowner of a roughly 4.6-acre property that includes TMKs (3rd.) 2-9-003:013, 029 & 060 (Figure 1) (“the property”). The survey was prepared accessory to an application for a Conservation District Use Permit for consolidation/resubdivision and subsequent activity on the property. As shown in Figures 2 and 3, which are aerial and ground photos of the property, most of the property is covered with lawn and crop plantings, including bamboo, bananas coconut palms and squash, associated with long-standing agricultural use. The landowner plans a residence on Parcel 060, and at present has no plans to develop additional residences on the other parcels. Also planned are agricultural activities on the grassy areas of Parcels 029 and 013 and a structure accessory to this use on Parcel 029. It is our understanding that development will be limited to the already heavily disturbed areas and their fringes. All land not maintained in this manner is located on or adjacent to a sea cliff that is 100 to 140 feet in height or in the Puahanui Stream gulch, the center of which is the north boundary of the property. These steep areas are forested with trees, shrubs and understory plants. The sea cliff itself and the seashore below the cliffs are State property makai of the land owned by Mr. Church.

The objectives of the botanical survey component of this survey were to 1) describe the vegetation; 2) list all species encountered; and 3) determine the likelihood of the presence of rare, threatened or endangered plant species, and to identify the locations of any individuals found. The area was surveyed by Ron Terry and Patrick Hart in November 2014. Plant species were identified in the field and, as necessary, collected and keyed out in the laboratory. Special attention was given to the possible presence of any federally (USFWS 2014) listed threatened or endangered plant species, although the habitat did not indicate a strong potential for their presence.

The survey also included a limited faunal survey restricted to a list of birds and introduced mammals, reptiles, or amphibians observed during the botanical survey. Also considered in this report is the general value of the habitat for native birds and the Hawaiian hoary bat. Not included in the survey were invertebrates or aquatic species or habitat.

Vegetation Type and Influences

The geology of the property consists of Hamakua Volcanics from Mauna Kea that are 70,000 to 250,000 years in age and covered with weathered Pahala Ash (Wolfe and Morris 1996). The natural slope perpendicular to the sea on the interfluvium on the property

between stream gulches is on the order of 5 to 7 percent. Steep slopes over 100 percent (i.e., 45 degrees) are present on Puahanui Stream and on the sea cliffs makai of the property. The area receives an average annual rainfall of about 140 inches (Giambelluca et al 2014)). The natural vegetation of this part of the Hamakua Coast was most likely lowland rain forest dominated by 'ohi'a (*Metrosideros polymorpha*), uluhe (*Dicranopteris linearis*) and hala (*Pandanus tectorius*) (Gagne and Cuddihy 1990). However, the general landscape of the Hamakua Coast has been radically altered by centuries of agriculture and settlement, and little to no native vegetation remains in most locations. Gulches and sea cliffs continue to have remnant spots with at least some native elements, although even these are generally dominated by non-natives.

This property is currently in agriculture and open space but has a history of sugar cane cultivation (Tsukazaki Yeh & Moore 2008). After the cessation of sugar cane cultivation in (presumably) the mid-1980s, the area lay fallow until 1992, after which it was maintained in grass with scattered landscape plantings of crop plants such as bamboo, squash, bananas and coconut palms. A 2004 survey of a portion of the property by botanist Evangeline Funk conducted as part of a previous application for a Conservation District Use Permit (Tsukazaki Yeh & Moore 2008) found a number of weedy species, only two native species (hala and popolo – *Solanum americanum*) and no threatened or endangered plant species.

Results: Vegetation

The vegetation consists of basically three types, as shown in Figures 2a-c:

1. Open, mown grass with scattered maintained plantings of landscape and agricultural species, including non-native grasses, sedges, herbs, vines, shrubs and trees;
2. Gulch vegetation with some hala but primarily non-native trees and shrubs with an understory of herbs, heavily covered by lianas; and
3. Sea cliff fringe vegetation of various non-native trees along with the native hala, with a fairly spare understory of non-native shrubs and herbs with the occasional native vine nanea (*Vigna marina*) and native shrub naupaka (*Scaevola sericea*).

In some areas, the hala is dense enough that it represents native vegetation that is similar, if not as rich in native species, to what might have been here prior to human settlement and alteration. We did not observe any 'ohi'a or other native trees aside from hala that might be expected to be present if the vegetation were pristine.

Flora

All plant species found on the property during the survey are listed in Table 1. Of the 94+ species detected, four were indigenous (native to the Hawaiian Islands and elsewhere) and none were endemic (found only in the Hawaiian Islands). No rare or unusual plant species were present. Many of the species detected were specifically planted rather than naturally occurring.

Threatened and Endangered Plant Species and Critical Habitat

No threatened or endangered plant species as listed by the U.S. Fish and Wildlife Service appear to be present on the property, nor are there uniquely valuable habitats. No existing or proposed federally designated critical habitat is present on the property.

Botanical Impacts and Recommended Mitigation Measures

The history of continuous disturbance coupled with the lowland context has resulted in a flora and vegetation on the part of the property planned for development that has little value in terms of conserving native vegetation or threatened or endangered plant species. We understand that the hala patches near the sea cliff and within the gulch will not be disturbed and that the semi-native vegetation here will remain intact. As such, no adverse botanical impacts are expected as a result of the proposed development and continuing uses.

Fauna

A total of ten bird species were observed during the survey, all of them common non-natives (see Table 2). We would expect the migratory resident Golden Plover (*Pluvialis fulva*) to be at least occasionally present, as it frequently rests and forages on mowed lawns throughout the State of Hawai‘i during its residence here from August to April.

The area is also undoubtedly utilized by the endemic Hawaiian Hawk (*Buteo solitarius*). The endangered Hawaiian Hawk is widespread, hunting throughout forested, agricultural and even residential areas of the island of Hawai‘i. It nests in large trees and can be vulnerable during the summer nesting season. Aside from the hawk, it is unlikely that native forest birds would make much use of the property because of its relatively low elevation and lack of native plants.

Additionally, it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*) and the threatened Newell’s Shearwater (*Puffinus auricularis newelli*) over-fly the property between the months of May and November. The Hawaiian Petrel was formerly common on the Island of Hawai‘i. This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea, as well as at the mid-to-high elevations of Hualālai. It has within recent historic times been reduced to relict breeding colonies located at high elevations on Mauna Loa and, possibly, Hualālai. Hawaiian Petrels were first listed as an endangered species by the USFWS in 1967 and by the State of Hawai‘i in 1973. Newell’s Shearwaters were also once common on the Island of Hawai‘i. This species breeds on Kaua‘i, Hawai‘i, and Moloka‘i. Newell’s Shearwater populations have dropped precipitously since the 1880s (Banko 1980, Day et al., 2003). This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially *uluhe* (*Dicranopteris linearis*) fern. Newell’s Shearwater was listed as a threatened species by the USFWS in 1975 and by the State of Hawai‘i in 1973.

The primary cause of mortality in both Hawaiian Petrels and Newell’s Shearwaters in Hawai‘i is thought to be predation by alien mammalian species at the nesting colonies.

Collision with man-made structures is considered another significant cause. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals. There is no suitable nesting habitat within or close to the property for either species.

Various mammals would be expected on the property, including small Indian mongoose (*Herpestes a. auropunctatus*), mice (*Mus* spp.), rats (*Rattus* spp.), cats (*Felis catus*) and domestic dogs (*Canis f. familiaris*). None of these alien mammals have conservation value and all are deleterious to native flora and fauna. During the survey, only the mongoose was observed.

Although not detected in the survey, which took place in daylight, the only native Hawaiian land mammal, the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), may also be present in the general area, as it is present in many areas on the island of Hawai'i. They may forage for flying insects on the property on a seasonal basis and may also roost in trees and large shrubs.

There are no native terrestrial reptiles or amphibians in Hawai'i. The only reptile observed was an unidentified species of skink (Family: Scincidae). No other reptiles and amphibians were detected during the survey, but we understand that coqui frogs (*Eleutherodactylus coqui*) are also present. It is likely that the bufo toad (*Bufo marinus*) and several species of gecko and anole lizards are also present.

No invertebrate survey was undertaken as part of the survey, but rare native invertebrates tend to be associated with native vegetation and are very unlikely to be present. Although no lava tube openings were observed, if caves are present, native invertebrates including spiders and insects could be present, especially if the roots of native trees extend into the caves.

Impacts and Mitigation Measures for Fauna

We offer the following recommendations in order to avoid impacts to endangered but widespread native birds and the Hawaiian hoary bat:

- To minimize impacts to the endangered Hawaiian hoary bat, we recommend that trees taller than 15 feet should not be removed or trimmed during the bat birthing and pup rearing season (June 1 through September 15), to the extent practical.
- To minimize impacts to Hawaiian Hawks, we recommend avoiding earthmoving within 100 meters of tall trees or tree cutting during the breeding season for Hawaiian Hawks (March through the end of September). If this time period cannot be avoided, arrange for a hawk nest search to be conducted by a UH Hilo biologist or other qualified biologist. If hawk nests are present in or near the project site, all land clearing activity should cease until the expiration of the breeding season.

- If any of the homes or other activities incorporate outdoor lighting, they may attract endangered Hawaiian Petrels and Newell's Shearwaters, which may become disoriented by the lighting, resulting in birds being downed. To avoid the potential downing of Hawaiian Petrels and Newell's Shearwaters by their interaction with outdoor lighting, we recommend no construction or unshielded equipment maintenance lighting after dark between the months of April and October. All permanent lighting should be shielded in strict conformance with the Hawai'i County Outdoor Lighting Ordinance (Hawai'i County Code Chapter 9, Article 14), which requires shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting.

Report Limitations

No biological survey of a large area can claim to have detected every species present. Some plant species are cryptic in juvenile or even mature stages of their life cycle. Dry conditions can render almost undetectable plants that extended rainfall may later invigorate and make obvious. Thick brush can obscure even large, healthy specimens. Birds utilize different patches of habitat during different times of the day and seasons, and only long-term study can determine the exact species composition. The findings of this survey must therefore be interpreted with proper caution; in particular, there is no warranty as to the absence of any particular species.

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Figure 1. Property TMK Map

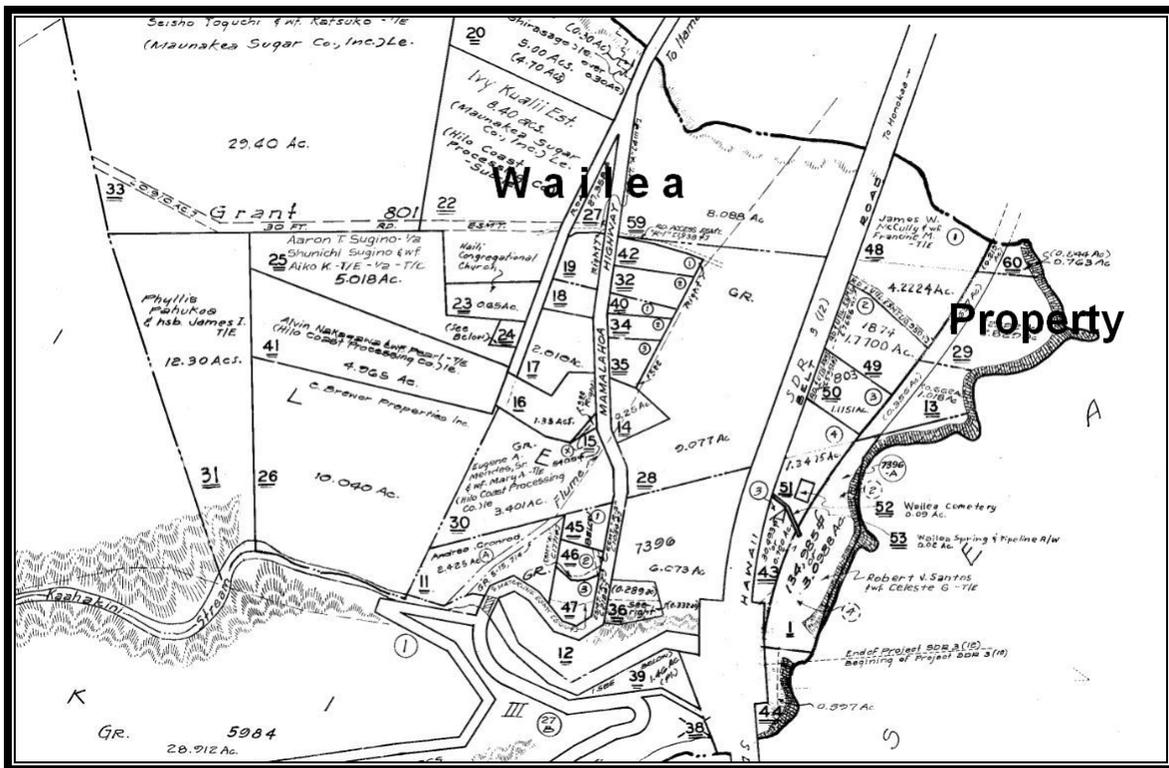
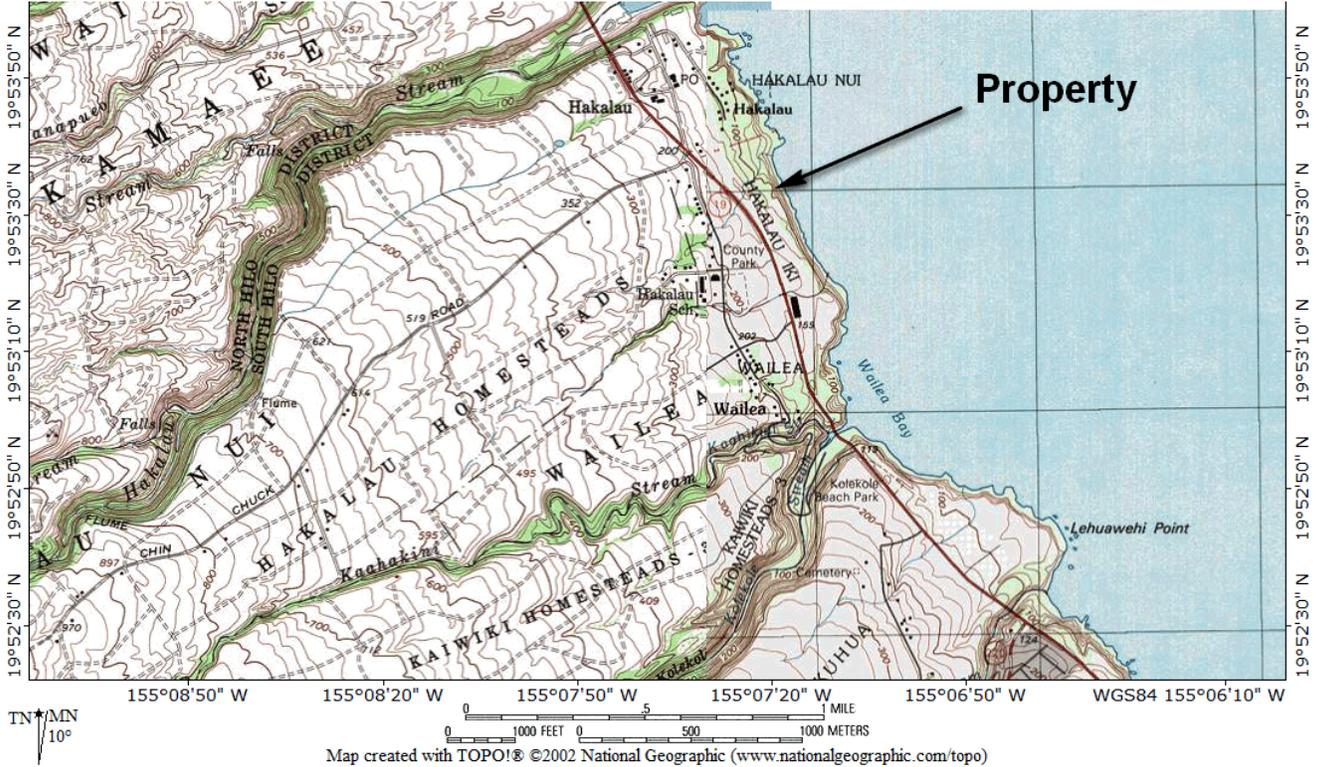
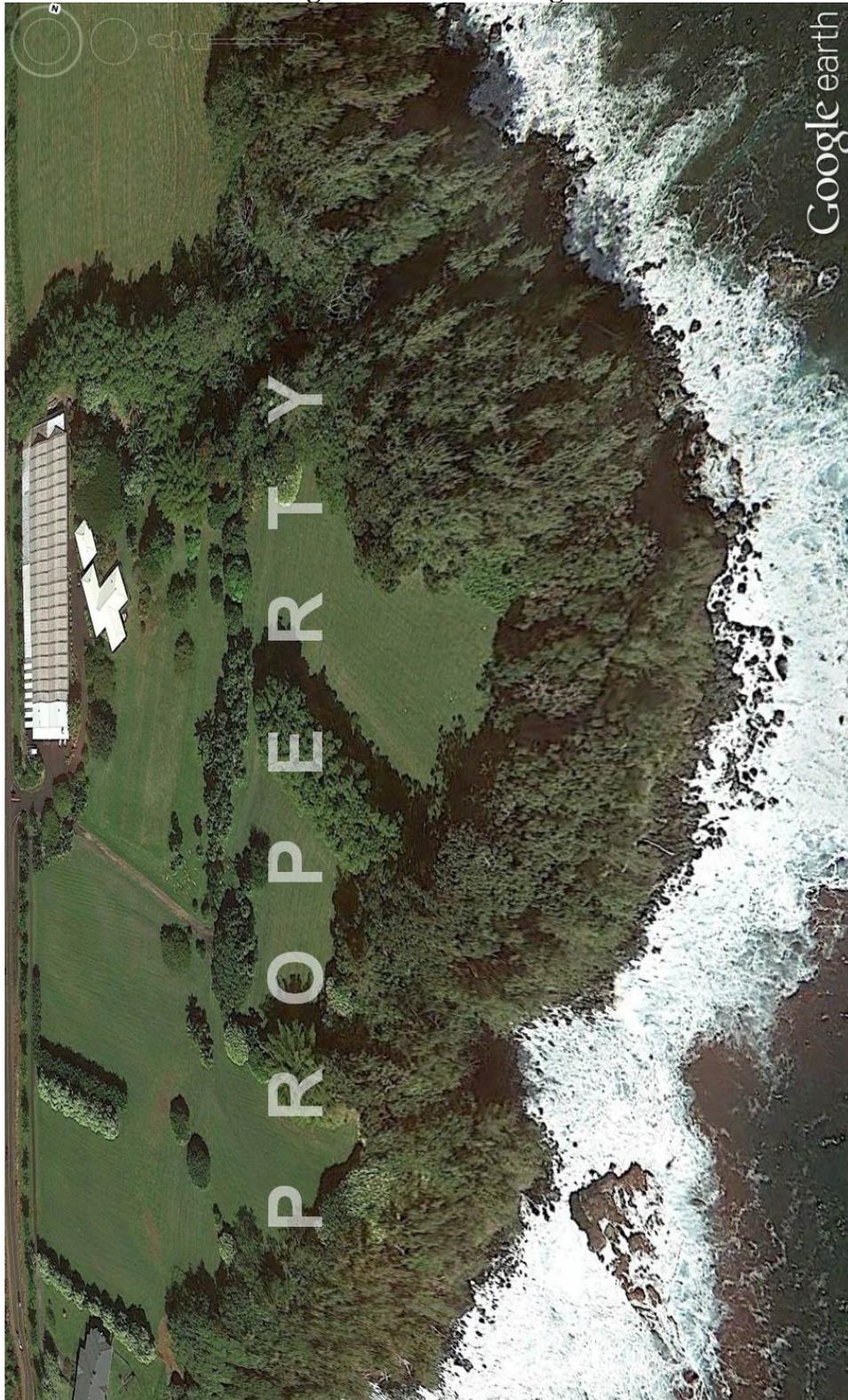


Figure 2a. Aerial Image



Base Map © Google Earth

Figure 3. Property Vegetation Photos



3a. Maintained vegetation over most of property ▲ ▼ 3b. Gulch vegetation



Figure 3. Property Vegetation Photos



3c. Sea cliff vegetation ▲ ▼ 3d. Gulch flows to sea as waterfall (off property)

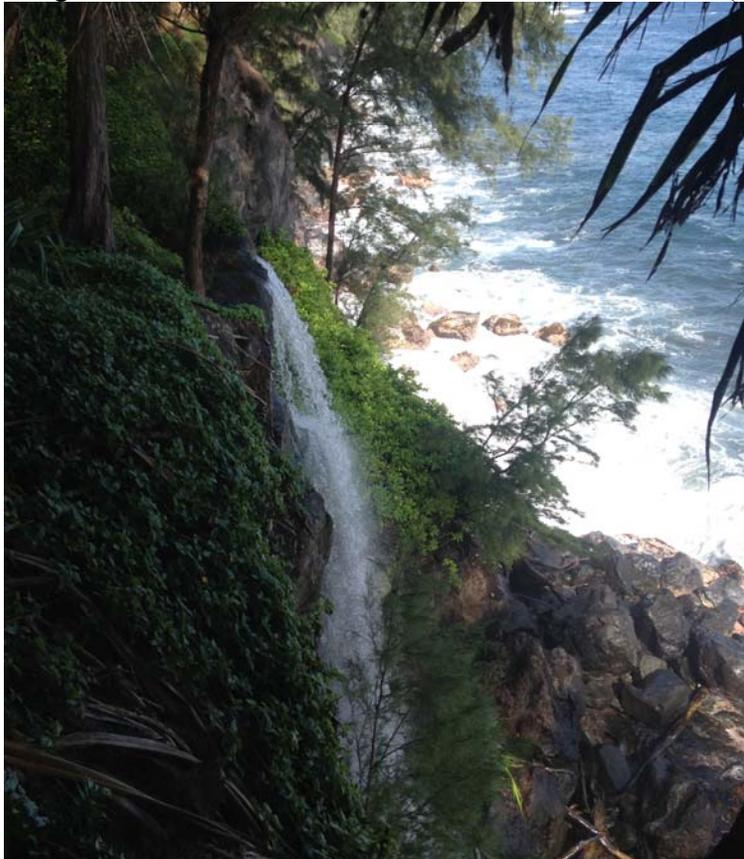


Table 1. Plant Species Observed on Property*

Scientific Name	Family	Common Name	Life Form	Status*
<i>Adiantum hispidulum</i>	Pteridaceae	Rough maidenhair fern	Fern	A
<i>Ageratum conyzoides</i>	Asteraceae	Ageratum	Herb	A
<i>Aleurites moluccana</i>	Euphorbiaceae	Kukui	Tree	A
<i>Alocasia macrorrhizos</i>	Araceae	Ape	Shrub	A
<i>Archontophoenix alexandrae</i>	Arecaceae	Alexander palm	Tree	A
<i>Ardisia elliptica</i>	Myrsinaceae	Shoebuttton ardisia	Tree	A
<i>Asystasia gangetica</i>	Acanthaceae	Chinese violet	Herb	A
<i>Bambusa vulgaris</i>	Poaceae	Yellow clumping bamboo	Tree	A
<i>Begonia sp.</i>	Begoniaceae	Begonia	Herb	A
<i>Canavalia cathartica</i>	Fabaceae	Maunaloa	Vine	A
<i>Carica papaya</i>	Caricaceae	Papaya	Tree	A
<i>Casuarina equisetifolia</i>	Casuarinaceae	Ironwood	Tree	A
<i>Cecropia obtusifolia</i>	Cecropiaceae	Cecropia	Tree	A
<i>Centella asiatica</i>	Apiaceae	Gotu kola	Herb	A
<i>Chamaecrista nictitans</i>	Fabaceae	Partridge pea	Herb	A
<i>Chamaesyce hirta</i>	Euphorbiaceae	Hairy spurge	Herb	A
<i>Chamaesyce hypericifolia</i>	Euphorbiaceae	Graceful spurge	Herb	A
<i>Citharexylum sp.</i>	Verbenaceae	Fiddlewood	Tree	A
<i>Citrus maxima</i>	Rutaceae	Pomelo	Tree	A
<i>Citrus reticulata</i>	Rutaceae	Tangerine	Tree	A
<i>Clusia rosea</i>	Clusiaceae	Autograph tree	Tree	A
<i>Cocos nucifera</i>	Arecaceae	Coconut	Tree	A
<i>Coffea arabica</i>	Rubiaceae	Coffee	Shrub	A
<i>Coix lachryma-jobi</i>	Poaceae	Job's tears	Grass	A
<i>Colocasia esculenta</i>	Araceae	Taro	Shrub	A
<i>Commelina diffusa</i>	Commelinaceae	Honohono	Herb	A
<i>Cordyline fruticosa</i>	Agavaceae	Ti	Shrub	A
<i>Crassocephalum crepidioides</i>	Asteraceae	Crassocephalum	Herb	A
<i>Crepis capillaris</i>	Asteraceae	Hawk's beard	Herb	A
<i>Commelina diffusa</i>	Commelinaceae	Honohono	Herb	A
<i>Crotalaria sp.</i>	Fabaceae	Crotalaria	Herb	A
<i>Cucurbita pepo</i>	Cucurbitaceae	Squash, pumpkin	Vine	A
<i>Cyperus involucratus</i>	Cyperaceae	Umbrella sedge	Sedge	A
<i>Cyperus polystachyos</i>	Cyperaceae	Cyperus	Herb	A
<i>Cyperus rotundus</i>	Cyperaceae	Purple nut sedge	Herb	A
<i>Cyrtomium falcatum</i>	Dryopteridaceae	Holly fern	Fern	A
<i>Desmodium triflorum</i>	Fabaceae	Desmodium	Herb	A
<i>Diplazium esculentum</i>	Athyriaceae	Warabi	Fern	A
<i>Eleusine indica</i>	Poaceae	Wiregrass	Herb	A
<i>Emilia sonchifolia</i>	Asteraceae	Pualele	Herb	A
<i>Epipremnum pinnatum</i>	Araceae	Pothos vine	Vine	A
<i>Eucalyptus robusta</i>	Myrtaceae	Eucalyptus	Tree	A
<i>Ficus microcarpa</i>	Moraceae	Chinese banyan	Tree	A
<i>Garcinia sp.</i>	Clusiaceae	Mangosteen	Tree	A
<i>Hedychium sp.</i>	Zingiberaceae	Ginger	Herb	A
<i>Ipomoea triloba</i>	Convolvulaceae	Little bell	Vine	A

<i>Kyllinga brevifolia</i>	Cyperaceae	Kili‘o‘opu	Herb	A
<i>Kyllinga nemoralis</i>	Cyperaceae	Kili‘o‘opu	Herb	A
<i>Lantana camara</i>	Verbenaceae	Lantana	Shrub	A
<i>Litchi chinensis</i>	Sapindaceae	Lychee	Tree	A
<i>Macaranga tanarius</i>	Euphorbiaceae	Bingabing	Shrub	A
<i>Malvaviscus penduliflorus</i>	Malvaceae	Turk’s cap	Herb	A
<i>Mangifera indica</i>	Anacardiaceae	Mango	Tree	A
<i>Megathyrsus maximus</i>	Poaceae	Guinea grass	Herb	A
<i>Melinis repens</i>	Poaceae	Red top grass	Herb	A
<i>Melochia umbellata</i>	Sterculiaceae	Melochia	Tree	A
<i>Merremia tuberosa</i>	Convolvulaceae	Wood rose	Vine	A
<i>Mimosa pudica</i>	Fabaceae	Sleeping grass	Herb	A
<i>Morinda citrifolia</i>	Rubiaceae	Noni	Tree	A
<i>Musa x paradisiaca</i>	Musaceae	Banana	Shrub	A
<i>Nephelium lappaceum</i>	Sapindaceae	Rambutan	Tree	A
<i>Nephrolepis multiflora</i>	Nephrolepidaceae	Sword Fern	Fern	A
<i>Odontonema cuspidatum</i>	Acanthaceae	Odontonema	Shrub	A
<i>Oplismenus sp.</i>	Poaceae	Basket grass	Herb	A
<i>Oxalis corniculata</i>	Oxalidaceae	Creeping wood sorrel	Herb	A
<i>Oxalis debilis</i> var. <i>corymbosa</i>	Oxalidaceae	Pink wood sorrel	Herb	A
<i>Paederia foetida</i>	Rubiaceae	Maile pilau	Vine	A
<i>Pandanus tectorius</i>	Pandanaceae	Hala	Tree	I
<i>Panicum repens</i>	Poaceae	Torpedo grass	Herb	A
<i>Paspalum conjugatum</i>	Poaceae	Hilo grass	Herb	A
<i>Pennisetum purpureum</i>	Poaceae	Napier grass	Herb	A
<i>Persea americana</i>	Lauraceae	Avocado	Tree	A
<i>Philodendron sp.</i>	Araceae	Philodendron	Shrub	A
<i>Phlebodium aureum</i>	Polypodiaceae	Phlebodium	Fern	A
<i>Phyllanthus sp.</i>	Euphorbiaceae	Phyllanthus	Herb	A
<i>Phymatosorus grossus</i>	Polypodiaceae	Maile-scented fern	Fern	A
<i>Pinus spp.</i>	Pinaceae	Pine	Tree	A
<i>Pluchea symphytifolia</i>	Asteraceae	Sourbush	Shrub	A
<i>Polygala paniculata</i>	Polygalaceae	Bubble-gum plant	Herb	A
<i>Psidium cattleianum</i>	Myrtaceae	Strawberry guava	Tree	A
<i>Psidium guajava</i>	Myrtaceae	Guava	Shrub	A
<i>Saccharum officinarum</i>	Poaceae	Sugar cane	Herb	A
<i>Scaevola sericea</i>	Goodeniaceae	Naupaka	Shrub	I
<i>Schefflera actinophylla</i>	Araliaceae	Octopus tree	Tree	A
<i>Solanum americanum</i>	Solanaceae	Popolo	Shrub	I
<i>Spathodea campanulata</i>	Bignoniaceae	African tulip	Tree	A
<i>Sphagneticola trilobata</i>	Asteraceae	Wedelia	Herb	A
<i>Syzygium jambos</i>	Myrtaceae	Rose apple	Tree	A
<i>Thunbergia fragrans</i>	Acanthaceae	White thunbergia	Vine	A
<i>Thunbergia grandifolia</i>	Acanthaceae	White thunbergia	Vine	A
<i>Trema orientalis</i>	Ulmaceae	Trema	Tree	A
<i>Urochloa mutica</i>	Poaceae	California grass	Herb	A
<i>Vigna marina</i>	Fabaceae	Nanea, Beach pea	Vine	I

A=Alien E=Endemic I=Indigenous END=Federal and State Listed Endangered

Table 2. Bird Species Observed on Property

Scientific name	Common name	Status
<i>Acridotheres tristis</i>	Common Myna	Alien Resident
<i>Cardinalis cardinalis</i>	Northern Cardinal	Alien Resident
<i>Carpodacus mexicanus</i>	House Finch	Alien Resident
<i>Geopelia striata</i>	Zebra Dove	Alien Resident
<i>Leiothrix lutea</i>	Red-billed Leiothrix	Alien Resident
<i>Lonchura punctulata</i>	Nutmeg Mannikin	Alien Resident
<i>Serinus mozambicus</i>	Yellow-Fronted Canary	Alien Resident
<i>Sicalis flaveola</i>	Saffron Finch	Alien Resident
<i>Streptopelia chinensis</i>	Spotted Dove	Alien Resident
<i>Zosterops japonicus</i>	Japanese White-eye	Alien Resident