

**FLORA AND FAUNA SURVEY**  
**FOR THE**  
**OLOWALU TOWN MASTER PLAN**  
**OLOWALU, MAUI, HAWAII**

**by**

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# FLORA AND FAUNA SURVEY FOR THE OLOWALU TOWN MASTER PLAN

## INTRODUCTION

The Olowalu Town Master Plan project lies on approximately 636 acres of land TMK (2) 4-8-003:84, 98 through 118, and 124 in Olowalu and Ukumehame in southwestern West Maui (see Figure 1). The property borders the ocean on its southwest side and grades into rough mountainous land on the northeast side. This study, evaluating the flora and fauna resources, was initiated by the owners in compliance with environmental requirements of the planning process.

## SITE DESCRIPTION

This project area encompasses, in its entirety, a large alluvial fan that was created over several millenium by the deposition of soil and rocks washed down by Olowalu Stream from the upper valley. This alluvial fan has a slope of about 10% in its upper portion but the slope becomes gentler as it approaches the coast line where it is only 1 to 3%. The elevation ranges from about 500 feet on the lower slopes of the mountain down to sea level. Olowalu Stream cuts through the alluvial slopes to form a riparian corridor.

Nearly the entire area was formerly farmed in sugar cane agriculture and had a network of access roads, reservoirs and irrigation ditches. Today the fields are fallow and are overgrown with dry grasslands and fast-growing trees. Soils vary considerably. The coastal strip is made up mostly of rough cobble beaches in the northern portion and fine gray sands in the southern portion. The fallow fields are deep, alluvial, silty-loams with abundant loose rock. The lower mountain slopes are rough, broken and stony land (Foote et al, 1972). Rainfall varies from about 13 inches per year near the coast up to about 20 inches per year on the lower slopes of the mountain with the bulk falling during the winter months (Armstrong, 1983).

## BIOLOGICAL HISTORY

In pre-contact times this area would have been a dry native shrubland with a few scattered trees. A good diversity of species would have been present, but with a preponderance of grasses such as pili (*Heteropogon contortus*), kalamälö (*Eragrostis deflexa*) and kākōnakōna (*Panicum torridum*), shrubs such as ‘a’ali’i (*Dodonaea viscosa*), (*Gouania hillebrandii*) no common name and ma’o hauhele (*Hibiscus brackenridgei*) and trees such as wiliwili (*Erythrina sandwicensis*) and ‘ohe makai (*Reynoldsia sandwicensis*).

The Hawaiians had a substantial population in the Olowalu area and developed a complex irrigated agricultural system along the stream corridor. The area would have produced large amounts of kalo (*Colocasia esculenta*) as well as a variety of other food and fiber crops. The ocean was also productive of fish, he’e (octopus) and limu (seaweed species).

Sugar production began in the latter half of the 1800s and in time the entire area was converted to sugar cane agriculture. This began a continuous cycle of plowing, cultivating, burning and harvesting that lasted for over a century until sugar production ended with the last harvest in 1999. Today most of this land stands idle and has reverted to a dry grassland/shrubland that is dominated by hardy, non-native species.

## **SURVEY OBJECTIVES**

This report summarizes the findings of a flora and fauna survey of the Olowalu Town Master Plan which was conducted in May 2010.

The objectives of the survey were to:

1. Document what plant, bird and mammal species occur on the property or may likely occur in the existing habitat.
2. Document the status and abundance of each species.
3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.
4. Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.
5. Note which aspects of the proposed development pose significant concerns for plants or for wildlife and recommend measures that would mitigate or avoid these problems.

# BOTANICAL SURVEY REPORT

## SURVEY METHODS

A walk-through botanical survey method was used focusing on all of the diverse habitat types including the coastline, stream corridor, gulch sides, rocky outcrops, reservoirs, irrigation ditches, forests and open fields. Notes were made on plant species, distribution and abundance, as well as on terrain and substrate. Not recorded were those species on private parcel inclusions that were landscape ornamentals, fruit trees or other recent purposeful plantings.

## DESCRIPTION OF THE VEGETATION

The great majority of this 630 acre property, which is made up of the former sugar cane fields, is presently an open grassland or a mixture of grass and aggressive dryland shrubs and trees. Two species truly dominate and are found in or around every habitat: buffelgrass (*Cenchrus ciliaris*) and 'opiuma (*Pithecellobium dulce*). Also of common occurrence are koa haole (*Leucaena leucocephala*), Java plum (*Syzygium cumini*), 'uhaloa (*Waltheria indica*), kiawe (*Prosopis pallida*), sourbush (*Pluchea carolinensis*) and Castor bean (*Ricinus communis*).

A total of 114 plant species were recorded during the course of the survey. Of these 3 were endemic to the Hawaiian Islands and nowhere else: nehe (*Melanthera lavarum*), alena (*Boerhavia herbstii*) and wiliwili. An additional 15 species were indigenous to Hawaii as well as to other places: (*Cyperus polystachyos*) no common name, pili grass (*Heteropogon contortus*), 'ākulikuli (*Sesuvium portulacastrum*), kou (*Cordia subcordata*), kipukai (*Heliotropium curassavicum*), koali awahia (*Ipomoea indica*), pohuehue (*Ipomoea pes-caprae*), naupaka kahakai (*Scaevola taccada*), 'ilima (*Sida fallax*), hau (*Talipariti tiliaceum*), milo (*Thespesia populnea*), 'uhaloa, 'a'ali'i, 'ili'e'e (*Plumbago zeylanica*) and pōpolo (*Solanum americanum*). Another 4 species were Polynesian introductions: kalo (*Colocasia esculenta*), niu (*Cocos nucifera*), Kō (*Saccharum officinarum*) and kukui (*Aleurites moluccana*). The remaining 92 species were non-native plants that are pasture grasses, escaped ornamentals or agricultural weeds.

## DISCUSSION AND RECOMMENDATIONS

The vegetation throughout the project area is dominated by non-native plant species that have taken over the abandoned sugar cane fields during the last decade. Most prominent among these are buffelgrass and 'opiuma. Buffelgrass has spread throughout the dry leeward districts of Maui where it serves as winter pasture for ranches in these areas. It dries out, however, during the long dry seasons and has proven to be a major fuel for wildfires. Recent fires have highlighted the need for creating and maintaining fuel breaks along key boundaries to protect valuable resources. It is recommended that fuel breaks be considered in project planning until such time as the buffelgrass can be replaced by less flammable landscaping.

'Opiuma too has spread dramatically in the former cane lands. It can be found in every habitat on the property, but grows most prolifically along Olowalu Stream and on the coastal plain where its deep roots can access ground water sources. It grows rapidly in these areas, outcompeting all other vegetation and forms dense thorny thickets. 'Opiuma also carries wildfires and consideration should be given on the coastal flats to creating and maintaining fuel breaks.

Eighteen species of endemic and indigenous native plants were recorded during the survey. All but one of these were found only in areas that had not been cane fields. Six were found growing along the coast, ten were found growing on the steep slopes of upper Olowalu Gulch, and one along an irrigation ditch. Only the hardy ‘uhaloa was found everywhere on the property. While all of the native plants except the ‘uhaloa were of rare occurrence on the property, all are widespread in Hawaii in general.

No federally protected Threatened or Endangered plant species were found during the survey, nor were any found that are candidates for such status. No Critical Habitat for any protected species occurs on or adjacent to this project.

The main threat to federally protected species in this part of West Maui is fire. In 2007 a large fire swept up into the nearby West Maui Natural Area Reserve on the lower slopes of Lihau destroying populations of (*Gouania hillebrandii*) no common name, (*Spermolepis hawaiiensis*) no common name, and kio’ele (*Kadua coriacea*). Other Endangered species occur in wet forests at the summits of Lihau, wawae’iole (*Huperzia mannii*), and of Halepohaku, (*Tetramolopium capillare*) no common name, and (*Lysimachia lydgatei*) no common name about 2 miles mauka of the project area. Another fire earlier this year (May, 2010) burned the ridge below Halepohaku but spared the Endangered plants there. As long as the vegetation remains as it is in the project area it will represent a significant fuel hazard and a threat to human and natural resources both on-site and beyond. Both fuel breaks and certain grazing practices can greatly reduce fuel loading and help protect these resources.

Many of the dryland native plants that grow in leeward West Maui are ideally adapted to the soils and climate. It is recommended that a number of them that have proved successful in the Cultural Reserve plantings in Olowalu Valley be considered for use in landscaping schemes in the Olowalu Town Project.

With the above-mentioned considerations regarding fuel management and the use of fuel breaks, this project is not expected to have a significant negative impact on the botanical resources in this part of West Maui.

## PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within three groups: Ferns, Monocots and Dicots. Taxonomy and nomenclature of these plants are in accordance with Palmer (2003), Wagner et al. (1999) and Staples & Herbst (2005).

For each species, the following information is provided:

1. Scientific name with author citation
2. Common English or Hawaiian name.
3. Bio-geographical status. The following symbols are used:
  - endemic = native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.
  - indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).
  - polynesian introduction = plants introduced to Hawai'i in the course of Polynesian migrations and prior to western contact.
  - non-native = all those plants brought to the islands intentionally or accidentally after western contact.
4. Abundance of each species within the project area:
  - abundant = forming a major part of the vegetation within the project area.
  - common = widely scattered throughout the area or locally abundant within a portion of it.
  - uncommon = scattered sparsely throughout the area or occurring in a few small patches.
  - rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
<b>FERNS</b>			
AZOLLACEAE (Mosquito Fern Family)			
<i>Azolla filiculoides</i> Lam.	mosquito fern	non-native	rare
NEPHROLEPIDACEAE (Sword Fern Family)			
<i>Nephrolepis brownii</i> (Desv.) Hovencamp & Miyam.	Asian sword fern	non-native	rare
PTERIDACEAE (Brake Fern Family)			
<i>Adiantum raddianum</i> C. Presl.	maidenhair fern	non-native	rare
THELYPTERIDACEAE (Marsh Fern Family)			
<i>Christella parasitica</i> (L.) H. Lev.	-----	non-native	rare
<b>MONOCOTS</b>			
ARACEAE (Aroid Family)			
<i>Colocasia esculenta</i> (L.) Schott	kalo, taro	Polynesian	rare
ARECACEAE (Palm Family)			
<i>Cocos nucifera</i> L.	niu, coconut	Polynesian	rare
<i>Washingtonia filifera</i> (Andre) S. Watson	California washingtonia	non-native	unc
<i>Washingtonia robusta</i> H. Wendland	Mexican washingtonia	non-native	rare
COMMELINACEAE (Spiderwort Family)			
<i>Commelina diffusa</i> N.L. Burm.	honohono	non-native	rare
CYPERACEAE (Sedge Family)			
<i>Cyperus polystachyos</i> Rottb.	-----	indigenous	rare
<i>Cyperus rotundus</i> L.	nut sedge	non-native	rare
<i>Cyperus sp.</i>	-----	non-native	rare
<i>Kyllingia brevifolia</i> Rottb.	kilio'opu	non-native	rare
POACEAE (Grass family)			
<i>Brachiaria subquadripata</i> (Trin.) Hitchc.	-----	non-native	rare
<i>Cenchrus ciliaris</i> L.	buffelgrass	non-native	abundant
<i>Chloris barbata</i> (L.) Sw.	swollen fingergrass	non-native	uncommon
<i>Chloris virgata</i> Sw.	feather fingergrass	non-native	rare
<i>Coix lacryma-jobi</i> L.	Job's tears	non-native	rare
<i>Cynodon dactylon</i> (L.) Pers.	Bermuda grass	non-native	uncommon
<i>Digitaria ciliaris</i> (Retz.) Koeler	Henry's crabgrass	non-native	rare
<i>Digitaria setigera</i> Roth	kukae pua'a	non-native	rare
<i>Eleusine indica</i> (L.) Gaertn.	wiregrass	non-native	rare
<i>Eragrostis pectinacea</i> (Michx.) Nees	Carolina lovegrass	non-native	rare
<i>Heteropogon contortus</i> (L.) P.Beauv ex Roem & Schult.	pili	indigenous	rare
<i>Melinis repens</i> (Willd.) Zizka	Natal redtop	non-native	uncommon
<i>Panicum maximum</i> Jacq.	Guinea grass	non-native	uncommon
<i>Paspalum conjugatum</i> Bergius	Hilo grass	non-native	rare
<i>Pennisetum purpureum</i> Schumach.	Napier grass	non-native	rare
<i>Polypogon monspeliensis</i> (L.) Desf.	rabbitfoot grass	non-native	rare
<i>Saccharum officinarum</i> L.	kö, sugar cane	Polynesian	rare
<i>Sacciolepis</i> (L.) Chase	Glenwood grass	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
<i>Setaria parviflora</i> (Poir.) Kerguelen	yellow foxtail	non-native	rare
<i>Setaria verticillata</i> (L.) P. Beauv.	bristly foxtail	non-native	rare
<i>Stenotaphrum secundatum</i> (Walter) Kuntze	St. Augustine grass	non-native	rare
<i>Urochloa mutica</i> (Forssk.) T.Q. Nguyen	California grass	non-native	rare
<b>DICOTS</b>			
AIZOACAE (Fig-marigold Family)			
<i>Sesuvium portulacastrum</i> (L.) L.	ākulikuli	indigenous	rare
<i>Trianthema portulacastrum</i> L.	-----	non-native	rare
AMARANTHACEAE (Amaranth Family)			
<i>Amaranthus spinosus</i> L.	spiny amaranth	non-native	uncommon
<i>Atriplex semibaccata</i> R.Br.	Australian saltbush	non-native	rare
<i>Atriplex suberecta</i> Verd.	saltbush	non-native	rare
ANACARDIACEAE (Mango Family)			
<i>Mangifera indica</i> L.	mango	non-native	rare
ASTERACEAE (Sunflower Family)			
<i>Ageratum conyzoides</i>	maile hohono	non-native	rare
<i>Bidens pilosa</i> L.	Spanish needle	non-native	rare
<i>Conyza bonariensis</i> (L.) Cronq.	hairy horseweed	non-native	uncommon
<i>Crassocephalum crepidioides</i> (Benth.) S. Moore	redflower ragleaf	non-native	rare
<i>Emilia fosbergii</i> Nicolson	red pualele	non-native	rare
<i>Lactuca sativa</i> L.	prickly lettuce	non-native	rare
<i>Melanthera lamarum</i> (Gaud.) Wagner & Rob.	nehe	endemic	rare
<i>Pluchea carolinensis</i> (Jacq.) G. Don	sourbush	non-native	common
<i>Pluchea indica</i> (L.) Less.	Indian fleabane	non-native	rare
<i>Senecio madagascariensis</i> Poir.	fireweed	non-native	rare
<i>Synedrella nodiflora</i> (L.) Gaertn.	nodeweed	non-native	rare
<i>Verbesina encelioides</i> (Cav.) Benth. & Hook.	golden crown-beard	non-native	rare
BORAGINACEAE (Borage Family)			
<i>Cordia subcordata</i> Lam.	kou	indigenous	rare
<i>Heliotropium curassavicum</i> L.	kipukai	indigenous	rare
<i>Heliotropium procumbens</i> Mill.	fourspike heliotrope	non-native	rare
<i>Tournefortia argentea</i> L. fil.	tree heliotrope	non-native	rare
BRASSICACEAE (Mustard Family)			
<i>Nasturtium microphyllum</i> Boenn ex Rchb.	leko, watercress	non-native	rare
CARICACEAE (Papaya Family)			
<i>Carica papaya</i> L.	papaya	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
<i>Ipomoea alba</i> L.	moonflower	non-native	rare
<i>Ipomoea indica</i> (J. Burm.) Merr.	koali awahia	indigenous	rare
<i>Ipomoea pes-caprae</i> (L.) R.Br.	pōhuehue	indigenous	rare
<i>Ipomoea triloba</i> L.	little bell	non-native	rare
<i>Merremia aegyptia</i> (L.) Urb.	hairy merremia	non-native	uncommon



SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
<b>CUCURBITACEAE (Gourd Family)</b>			
<i>Cucumis dipsaceus</i> Ehrenb. ex Spach	hedgehog gourd	non-native	rare
<i>Momordica charantia</i> L.	bitter melon	non-native	uncommon
<b>EUPHORBIACEAE (Spurge Family)</b>			
<i>Aleurites moluccana</i> (L.) Willd.	kukui	Polynesian	rare
<i>Chamaesyce hirta</i> (L.) Millsp.	hairy spurge	non-native	uncommon
<i>Chamaesyce hypericifolia</i> (L.) Millsp.	graceful spurge	non-native	rare
<i>Chamaesyce prostrata</i> (Aiton) Small	prostrate spurge	non-native	rare
<i>Ricinus communis</i> L.	Castor bean	non-native	common
<b>FABACEAE (Pea Family)</b>			
<i>Acacia farnesiana</i> (L.) Willd.	klu	non-native	rare
<i>Chamaecrista nictitans</i> (L.) Moench	partridge pea	non-native	rare
<i>Crotalaria pallida</i> Aiton	smooth rattlepod	non-native	uncommon
<i>Desmanthus pernambucanus</i> (L.) Thellung	slender mimosa	non-native	uncommon
<i>Desmodium tortuosum</i> (Sw.) DC.	Florida beggarweed	non-native	rare
<i>Erythrina sandwicensis</i> Degener	wiliwili	endemic	rare
<i>Indigofera hendecaphylla</i> Jacq.	creeping indigo	non-native	rare
<i>Indigofera suffruticosa</i> Mill.	inikö	non-native	rare
<i>Leucaena leucocephala</i> (Lam.) de Wit	koa haole	non-native	common
<i>Macroptilium atropupureum</i> (DC.) Urb.	siratro	non-native	rare
<i>Macroptilium lathyroides</i> (L.) Urb.	wild bean	non-native	rare
<i>Peltophorum pterocarpum</i> (A.P. de Candolle) K.Heyne	yellow poinciana	non-native	rare
<i>Pithecellobium dulce</i> (Roxb.) Bentham	'opiuma	non-native	abundant
<i>Prosopis pallida</i> (Willd.) Kunth	kiawe	non-native	common
<i>Samanea saman</i> (A.P. de Candolle) Merrill	monkeypod	non-native	uncommon
<b>GOODENIACEAE (Goodenia Family)</b>			
<i>Scaevola taccada</i> (Gaertn.) Roxb.	naupaka kahakai	indigenous	rare
<b>LAMIACEAE (Mint Family)</b>			
<i>Leonotis nepetifolia</i> (L.) R.Br.	lion's ear	non-native	rare
<i>Salvia occidentalis</i> Sw.	West Indian sage	non-native	rare
<b>MALVACEAE (Mallow Family)</b>			
<i>Abutilon grandifolium</i> (Willd.) Sweet	hairy abutilon	non-native	rare
<i>Malvastrum cormandelianum</i> (L.) Garcke	false mallow	non-native	rare
<i>Sida fallax</i> Walp.	'ilima	indigenous	rare
<i>Sida rhombifolia</i> L.	Cuban jute	non-native	uncommon
<i>Talipariti tileaceum</i> (L.) Fryxell	hau	indigenous	rare
<i>Thespesia populnea</i> (L.) Sol. ex Correa	milo	indigenous	rare
<i>Waltheria indica</i> L.	'uhaloa	indigenous	common
<b>MELIACEAE (Mahogany Family)</b>			
<i>Melia azedarach</i> L.	pride of India	non-native	uncommon
<b>MORACEAE (Mulberry Family)</b>			
<i>Ficus macrophylla</i> Desf. ex Pers.	Moreton Bay fig	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
<i>Ficus religiosa</i> L.	Bo tree	non-native	rare
MYRTACEAE (Myrtle Family)			
<i>Eucalyptus rudis</i> Endl.	desert gum	non-native	rare
<i>Psidium guajava</i> L.	common guava	non-native	rare
<i>Syzygium cumini</i> (L.) Skeels	Java plum	non-native	common
NYCTAGINACEAE (Four-o'clock Family)			
<i>Boerhavia coccinea</i> Mill.	scarlet spiderling	non-native	uncommon
<i>Boerhavia herbstii</i> Fosb.	alena	endemic	rare
ONAGRACEAE (Evening Primrose Family)			
<i>Ludwigia octovalvis</i> (Jacq.) Raven	primrose willow	non-native	rare
PASSIFLORACEAE (Passion Flower Family)			
<i>Passiflora foetida</i> L.	love-in-a-mist	non-native	uncommon
PLUMBAGINACEAE (Leadwort Family)			
<i>Plumbago zeylanica</i> L.	'ilie'e	indigenous	rare
PORTULACACEAE (Purslane Family)			
<i>Portulaca oleracea</i> L.	pigweed	non-native	rare
SAPINDACEAE (Soapberry Family)			
<i>Dodonaea viscosa</i> Jacq.	'a'ali'i	indigenous	rare
SCROPHULARIACEAE (Figwort Family)			
<i>Buddleia asiatica</i> Lour.	dog tail	non-native	rare
SOLANACEAE (Nightshade Family)			
<i>Nicotiana glauca</i> R.C. Graham	tree tobacco	non-native	rare
<i>Solanum americanum</i> Mill.	pöpolo	indigenous	rare
<i>Solanum lycopersicum</i> L.	cherry tomato	non-native	rare
VERBENACEAE (Verbena Family)			
<i>Lantana camara</i> L.	lantana	non-native	rare

## FAUNA SURVEY REPORT

### SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the property were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species, abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding. In addition an evening visit was made to the area to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the ōpe'ape'a or Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

### RESULTS

#### MAMMALS

Five species of non-native mammals were recorded in the project during four site visits. Taxonomy and nomenclature follow Tomich (1986).

Domestic Cat (*Felis catus*) – One cat was seen hunting in the grasslands, but numerous tracks were seen along dirt roads.

Domestic dog (*Canis familiaris*) – Dogs and dog tracks were seen in the coastal area where people bring them to the beach or walk them along the coast.

Horse (*Equus caballus*) – Several horses were pastured in the middle of the property.

Cattle (*Bos Taurus*) – Several cattle were pastured in a separate area.

Axis deer (*Axis axis*) – A few deer tracks were seen in a pasture in the northern part of the property.

A dense cover of vegetation prevented good visibility of other ground dwelling mammals in much of the property, but one might expect to see rats (*Rattus* spp.) mice (*Mus domesticus*) and mongoose (*Herpestes auropunctatus*). Rats and mice feed on seeds, fruits and herbaceous vegetation while mongoose prey on these rodents and birds.

A special effort was made to look for the Hawaiian hoary bat by making an evening survey. Observations were made at two locations overlooking Olowalu Stream using both visual and electronic techniques. When present in an area these bats are clearly visible in the glow of twilight as they forage for insects that become active in the evening. No bats were seen. In addition a bat detection device (Batbox IIID) was employed, set to the frequency of 27,000 hertz that these bats are known to use for echo-location. No bat activity was detected at either location using this device.

## **BIRDS**

There was good birdlife diversity in this dry area. Seventeen species of birds were recorded during four site visits, including fifteen non-native species, one migratory species and one native and Endangered species (USFWS, 2009), the Hawaiian goose or nēnē. Taxonomy and nomenclature follow American Ornithologists' Union (2005).

Common myna (*Acridotheres tristis*) - Mynas were common and were found throughout the property.

Zebra dove (*Geopelia striata*) – These small doves were seen in small groups feeding in clearings and along roadways.

Northern cardinal (*Cardinalis cardinalis*) – These bright red cardinals were seen and heard calling in trees throughout the property.

Japanese white-eye (*Zosterops japonicus*) – These small green birds were seen in trees and shrubs feeding on insects.

Gray francolin (*Fracnolinus pondicerianus*) – These beige francolins were heard calling throughout the grasslands and a few flushed from cover.

Chestnut mannikin (*Lonchura Malacca*) – Several flocks of these small reddish-brown birds were seen feeding on grass seeds in open country.

Chicken (*Gallus gallus*) – Flocks of chickens were seen scratching for bugs in the coastal kiawe forests and along Olowalu Stream.

House finch (*Carpodacus mexicanus*) – Small groups of these finches were seen feeding in trees in the lower and middle parts of the property.

Spotted dove (*Streptopelia chinensis*) – Several individuals of these large doves were seen in trees and in flight over the property.

Black francolin (*Francolinus francolinus*) – A few of these black francolins were seen and others heard making their buzzing calls from the grasslands.

Nutmeg mannikin (*Lonchura punctulata*) – A few small flocks of these brown mannikins were seen in brush and feeding in the grasslands.

Northern mockingbird (*Mimus polyglottos*) – Several individuals were seen in the topmost branches of trees calling incessantly.

African silverbill (*Lonchura cantans*) – A couple flocks of these small beige birds were seen in the grasslands and heard making their quiet high-pitched calls.

House sparrow (*Passer domesticus*) – A few of these sparrows were seen in the lower part of the property near human habitations.

Wandering tattler 'Ulii (*Heteroscelus incanus*) - One of these migrant waterbirds was seen on the banks of a reservoir near the top of the property.

Red-crested cardinal (*Paroaria coronata*) – One red-crested cardinal was observed in kiawe forest in the southern part of the property.

Nēnē, Hawaiian goose (*Branta sanvicensis*) – Tracks of nēnē were seen in mud in an irrigated pasture. These Endangered geese are multiplying in West Maui and are frequently sighted by the water management crew and people at the Olowalu Cultural Reserve. They are attracted to the fringes of water features or temporarily irrigated areas. They are extremely wide-ranging in their daily activities, flying 10 miles or more between stops.

A few other non-native birds might be expected to use this habitat but the area is unsuitable for Maui's native forest birds which now only occupy native forests at higher elevations beyond the range of mosquitoes and the avian diseases they carry. Also the two reservoirs that are still functional have steep, artificial banks and deep water that greatly reduce their usefulness as habitat for Hawaii's native waterbirds.

No ae'o or Hawaiian stilt (*Himantopus mexicanus knudseni*), 'alae ke'oke'o or Hawaiian coot (*Fulica alai*) or koloa or Hawaiian duck (*Anas wyvilliana*) were seen in these reservoirs or were reported as being seen by the water management crew in the area.

## **INSECTS**

While insects in general were not recorded, they were observed and their status noted. No native insects were seen. This habitat is not suitable for most native species. One Endangered native moth, Blackburn's sphinx moth (*Manduca blackburni*)(USFWS,2000), could occur in this type of habitat. Its host plants are native 'aiea species (*Nothoestrum* spp.) and non-native species of tree tobacco (*Nicotiana glauca*), tobacco (*Nicotiana tabacum*) and tomato (*Solanum lycopersicum*). Of these only a few young tree tobacco plants were found within the property. Each of the tree tobacco plants found were carefully examined and no Blackburn's sphinx moths or their larvae were detected.

Also a number of damselflies were seen along the open ditch and the upper reservoir, but these proved to be the non-native Familiar bluet (*Enallagma civile*) and not one of our native species.

## **DISCUSSION AND RECOMMENDATIONS**

Most of the environment within the project area is heavily disturbed from over 100 years of intensive agricultural activity that involved land clearing, plowing the soil, cultivation, burning and harvesting in continuous cycles. Much of the steeper ground that was not in cane production has also periodically been burned in wildfire events. Little remains of native habitats and species except along the coastline and on steep rocky gulch sides. No native mammals or insects were found and sign of only one native bird, the nēnē, was detected.

Nēnē, as mentioned above, are wide-ranging, opportunistic birds that are attracted to certain types of water features and other types of irrigated and open landscapes where lush grasses grow. They like to spend some time feeding and resting in such places, but then move on to other sites during the course of

each day. These sites are widespread and diverse in character. Individually, each of these sites could be considered important habitat for these Endangered geese but would not fall into the category of being considered critical to their survival. The irrigated pasture on this property is a type of temporary habitat that is useful to nēnē in the broad scheme of things in West Maui.

Perhaps a more attractive and permanent shallow-sided water feature could be created within the upper portion of the proposed cultural reserve area that would attract nēnē as well as the ae'o, 'alae ke'oke'o and koloa. This could provide good habitat for these Endangered birds and serve as an educational and cultural component of this project. At any rate both developers and residents should be educated about the Endangered status of the nēnē and encouraged to support and delight in the resurgence in the numbers of these beautiful birds. In addition there are two abandoned plantation reservoirs on the property that could be restored to use that would serve as additional waterbird habitat as well as attractive and educational water features for the project.

While the Endangered öpe'ape'a was not found during the survey, there is no reason not to expect its presence during the winter months when insect populations spike, attracting these bats to the lowlands and along the shoreline. Öpe'ape'a roost individually in trees and shrubs, under ledges in gulches during the day and are active in the evening and throughout the night. Assuring that such vegetation and habitat is retained will allow these bats to thrive here when they are present.

This property is not suitable habitat for two protected seabird species, the Endangered 'ua'u or Hawaiian petrel (*Pterodroma sandwichensis*) and the Threatened 'a'o or Newell's shearwater (*Puffinus newelli*), which are known to nest high in the West Maui Mountains during the summer and fall months. These birds, however, must fly over the lowlands during the evening and early mornings hours to get to their burrows and then to return to the open ocean. During the late fall when the young birds are fledging they are inexperienced and uncertain fliers. These young birds are often confused by bright lights, whereupon they crash into the light source, injuring themselves and becoming vulnerable to being struck by vehicles or being attacked by dogs or cats. It is recommended that all major outdoor light sources within the project area such as street lights and flood lights be shielded so that the light is directed downward to avoid this situation.

The lower reaches of Olowalu Stream flows to the ocean only about 5-15 days out of the year. The stream was dry at the time of the survey. Thus no aquatic fauna were observed. The stream has a long history of diversion for agricultural purposes and this use continues today. The owners are considering returning a portion of the water to the stream to restore a perennial flow. In anticipation of this action it is recommended that any vehicular or pedestrian bridges across the stream be constructed as single spans so that no support piers are placed within the stream corridor to obstruct natural flow of the waters.

Other than the above considerations and recommendations, no other wildlife concerns are anticipated and the proposed project is not expected to have a significant negative impact on the fauna resources in this part of West Maui.

## ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within two groups: Mammals and Birds. For each species the following information is provided:

1. Common name
2. Scientific name
3. Bio-geographical status. The following symbols are used:

endemic = native only to Hawaii; not naturally occurring anywhere else in the world.

indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).

non-native = all those animals brought to Hawaii intentionally or accidentally after western contact.

migratory = spending a portion of the year in Hawaii and a portion elsewhere. In Hawaii the migratory birds are usually in the overwintering/non-breeding phase of their life cycle.

4. Abundance of each species within the project area:

abundant = many flocks or individuals seen throughout the 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.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
<b>MAMMALS</b>			
Feral cat	<i>Felis catus</i>	non-native	uncommon
Domestic dog	<i>Canis familiaris</i>	non-native	rare
Horse	<i>Equus caballus</i>	non-native	rare
Cattle	<i>Bos taurus</i>	non-native	rare
Axis deer	<i>Axis axis</i>	non-native	rare
<b>BIRDS</b>			
Common myna	<i>Acridotheres tristis</i>	non-native	common
Zebra dove	<i>Geopelia striata</i>	non-native	common
Northern cardinal	<i>Cardinalis cardinalis</i>	non-native	common
Japanese white-eye	<i>Zosterops japonicus</i>	non-native	common
Gray francolin	<i>Francolinus podicerianus</i>	non-native	uncommon
Chestnut mannikin	<i>Lonchura malacca</i>	non-native	uncommon
Chicken	<i>Gallus gallus</i>	non-native	uncommon
House finch	<i>Carpodacus mexicanus</i>	non-native	uncommon
Spotted dove	<i>Streptopelia chinensis</i>	non-native	rare
Black francolin	<i>Francolinus francolinus</i>	non-native	rare
Nutmeg mannikin	<i>Lonchura punctulata</i>	non-native	rare
Northern mockingbird	<i>Mimus polyglottos</i>	non-native	rare
African silverbill	<i>Lonchura cantans</i>	non-native	rare
House sparrow	<i>Passer domesticus</i>	non-native	rare
Wandering tattler	<i>Heteroscelus incanus</i>	migratory	rare
Red-crested cardinal	<i>Paroaria coronata</i>	non-native	rare
Nēnē, Hawaiian goose	<i>Branta sanvicensis</i>	endemic	rare



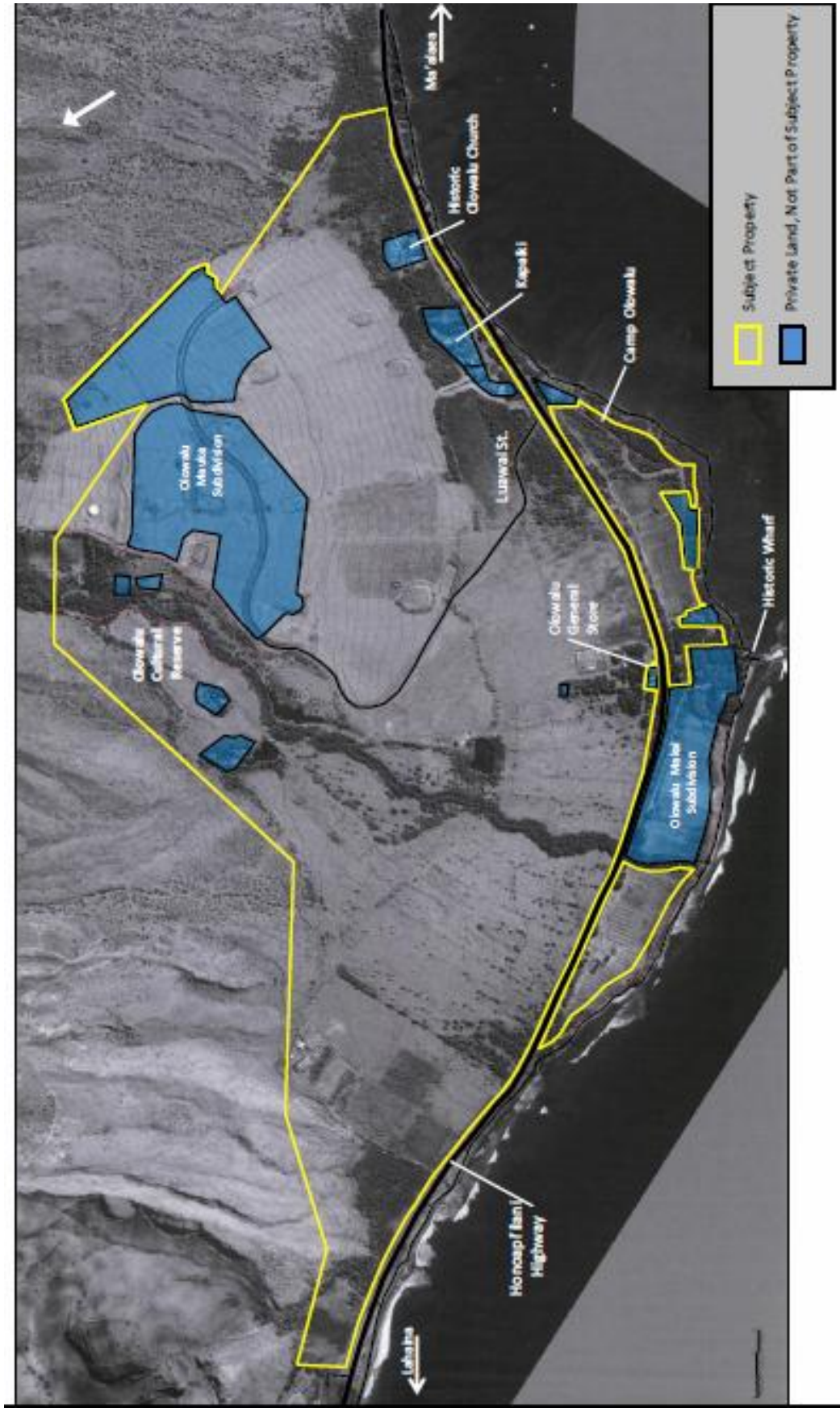


Figure 1 – Project Area

## Literature Cited

- American Ornithologists Union 2005. Check-list of North American Birds 7<sup>th</sup> edition. American Ornithologist's Union. Washington D.C.
- Armstrong, R. W. (ed.) 1983. Atlas of Hawaii. (2<sup>nd</sup>. ed.) University of Hawaii Press.
- Foote, D.E. , E.L. Hill, S. Nakamura, and F. Stephens. 1972. Soil survey of the islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. U.S. Dept. of Agriculture, Soil Conservation Service. Washington, D.C.
- Palmer, D.D. 2003. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu.
- Staples, G.W. & D.R. Herbst 2005. A Tropical Garden Flora, Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu.
- Tomich, P.Q. 1986. Mammals in Hawaii. Bishop Museum Press, Honolulu.
- U.S. Fish and Wildlife Service. 2009. Endangered and threatened wildlife and Plants. 50 CFR 17.11 & 17.12. (update of 1999 listings)
- U.S. Fish and Wildlife Service. 2000. Endangered and threatened wildlife and plants: determination of endangered status for Blackburn's sphinx moth from Hawaii. Federal Register 65(21): 4770-4779.
- Wagner, W. L., D.R. Herbst, and S. H. Sohmer. 1999. Manual of the flowering plants of Hawai'i. University of Hawai'i Press and Bishop Museum Press. Honolulu.