



APPENDIX C-1
Botanical and Faunal Survey

BOTANICAL AND FAUNA SURVEYS

for the

**MAUI RESEARCH AND TECHNOLOGY PARK
PROPOSED URBAN ZONING EXPANSION PROJECT**

KIHEI, MAUI, HAWAII

by

**ROBERT W. HOBODY
ENVIRONMENTAL CONSULTANT
Kokomo, Maui
October 2008**

Prepared for: Pacific Rim Land, Inc.

**BOTANICAL AND FAUNA SURVEY
MAUI RESEARCH & TECHNOLOGY PARK
PROPOSED URBAN ZONING EXPANSION PROJECT**

INTRODUCTION

The Maui Research & Technology Park Proposed Urban Zoning Expansion Project lies on approximately 356 acres of undeveloped land in upper Kihei TMK (2) 2-2-02:58 (por.) , TMK (2) 2-2-24:04,08 (por.), 14 (por.), 15,16 (por.), 17 (por.). The project area surrounds the existing facilities of Maui Research and Technology Park and is above the Elleair Maui Golf Course. This study was initiated in fulfillment of environmental requirements of the planning process.

SITE DESCRIPTION

The entire project area is presently dry pastureland located on the gentle slopes above Pi'ilani Highway. The area is an arid savannah with low rocky ridges and shallow gullies. Elevations range from 70 feet to 270 feet above sea level. Soils throughout the area are of the Waiakoa Extremely Stony Silty Clay Loam, 3-25 % slopes Series (WID2) which are 30-33 inches deep over hard igneous bedrock (Foote et al, 1972). This soil has moderate permeability, medium runoff and severe erosion hazard. Rainfall averages a scant 8-10 inches per year with the bulk falling during the winter months. (Armstrong,1983). This site lies in the driest part of Maui.

BIOLOGICAL HISTORY

Originally this area would have been a dry native forest/shrubland with such trees as wiliwili (*Erythrina sandwicensis*), 'ohe makai (*Reynoldsia sandwicensis*) and hao (*Rauvolfia sandwicensis*), shrubs such as 'a'ali'i (*Dodonaea viscosa*), ma'o (*Gossypium tomentosum*), 'ilima (*Sida fallax*) and grasses and vines such as pili (*Heteropogon contortus*), kalamalō (*Eragrostis atropioides*), huehue (*Cocculus orbiculatus*) and 'āwikiwiki (*Canavalia pubescens*).

For the past 150 years this area has been grazed by livestock, usually seasonally, following winter rains when the vegetation responds with a flush of growth. This land use has resulted in the gradual loss of native plants species and their replacement with hardy pasture grasses and weeds. During the past 40 years two other environmental disturbances have influenced conditions on the property. Introduced axis deer (*Axis axis*) have built up sizeable herds within this part of Maui. These animals are able to access steeper sites than cattle and have eliminated additional species of native plants.

Also fires have swept through this area a number of times over the years. Charred stumps were encountered throughout the property. Fires, over time, eliminate species not adapted to this type of catastrophic environmental disturbance.

Today few plants species occur on the property and those that do tend to dominate. Few of these are native.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Maui Research & Technology Park Project which was conducted in October, 2008. 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 following routes to ensure maximum coverage of the many areas of this large property. Areas most likely to harbor native or rare plants such as gulches or rocky outcroppings were more intensively examined. Notes were made on plant species, distribution and abundance as well as terrain and substrate.

DESCRIPTION OF THE VEGETATION

The vegetation on this large property was dominated by just two species: kiawe (*Prosopis pallida*) and buffelgrass (*Cenchrus ciliaris*). These two species make up

more than 95% of the plant cover. The kiawe trees create an open woodland across the entire property with denser growth along the rocky gullies. The buffelgrass forms an almost uniform grassland under and between the trees. All other plant species were uncommon to rare on the property. Small parts of the property had no vegetation only bare patches of soil and surface stones.

A total of 14 species of plants were recorded during the survey. Of these only 2 were native Hawaiian species. Both 'ilima, and 'uhaloa (*Waltheria indica*) are indigenous to Hawaii as well as other countries and both native species are widespread and of common occurrence in Hawaii.

Had the survey been done during the winter or spring months, a few more plant species would have been found, mostly ephemeral, annual non-native species that either wither during the summer heat or are consumed by cattle or deer. No rare native species would be expected to sprout in this area.

DISCUSSION AND RECOMMENDATIONS

The vegetation throughout the project is dominated by just two non-native plant species, kiawe and buffelgrass. The two native Hawaiian plant species recorded, 'ilima and 'uhaloa, although of uncommon or rare occurrence on the property, are widespread and common in Hawaii in general.

No Federally listed Endangered or Threatened native plants (USFWS, 1999) were encountered during the course of the survey nor were any species that are candidate for such status seen. No special habitats or rare plant communities were seen on the property.

Because the vegetation is dominated by non-native plants, and no rare or protected species occur on or adjacent to the property, there is little of botanical concern and the proposed land uses are not expected to have a significant negative impact on the botanical resources in this part of Maui.

Because much of Kihei is a flood plain and because the soils on the property are subject to erosion, it is recommended that during any land clearing work special care be taken to use accepted contouring and terracing techniques to avoid significant soil runoff.

It is also recommended that native dryland plants known to occur in this area be incorporated into the landscape design of the completed project. The Maui County Planting Plan can be consulted for ideas.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within each of two groups: Monocots and Dicots. Taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner et al. (1999).

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).
 - non-native = all those plants brought to the islands intentionally or accidentally after western contact.
 - polynesian = all those plants brought to the islands by the Hawaiians during the course of their migrations.
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.

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDANCE</u>
MONOCOTS			
POACEAE (Grass Family)			
<i>Cenchrus ciliaris</i> L.	buffelgrass	non-native	abundant
<i>Chloris barbata</i> (L.) Sw.	swollen fingergrass	non-native	rare
<i>Eragrostis pectinacea</i> (Michx.) Nees	Carolina lovegrass	non-native	uncommon
DICOTS			
AMARANTHACEAE (Amaranth Family)			
<i>Amaranthus spinosus</i> L.	spiny amaranth	non-native	rare
ASTERACEAE (Sunflower Family)			
<i>Verbesina encelioides</i> (Cav.) Benth. & Hook.	golden crown-beard	non-native	rare
EUPHORBIACEAE (Spurge Family)			
<i>Chamaesyce hypericifolia</i> (L.) Millsp.	graceful spurge	non-native	rare
FABACEAE (Pea Family)			
<i>Acacia farnesiana</i> (L.) Millsp.	klu	non-native	rare
<i>Desmanthus pernambucanus</i> (L.) Thellung	slender mimosa	non-native	rare
<i>Leucaena leucocephala</i> (Lam.) de Wit.	koa haole	non-native	rare
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	kiawe	non-native	abundant
MALVACEAE (Mallow Family)			
<i>Sida fallax</i> Walp.	'ilima	indigenous	rare
<i>Waltheria indica</i> L.	'uhaloa	indigenous	uncommon

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the project area 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 Endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

RESULTS

MAMMALS

Three mammal species were observed on the property during two site visits. Taxonomy and nomenclature follow Tomich (1986).

Cattle (*Bos taurus*) – Cattle sign was seen over the entire property. One herd was seen during the survey. Larger numbers of cattle are pastured here during the wet season until grass resources are consumed.

Axis deer (*Axis axis*) – Deer sign was found on all parts of the property. This included tracks, droppings, antler rubbings and feeding signs. These herbivores spend the day bedded down in protected locations, then come out in the evening to feed.

Cat (*Felis catus*) – Cat tracks and scat were observed on dusty roads within the project area. Feral cats wander throughout the area hunting for rodents and birds.

Other mammals that likely occur on the property, but which were not seen, include rats (*Rattus rattus*), mice (*Mus domesticus*), mongoose (*Herpestes auropunctatus*) and pigs (*Sus scropha*). Rats and mice feed on seeds and herbaceous vegetation and mongoose hunt for the rodents as well as birds. Feral pigs are scattered throughout the dry country and make forays onto adjacent landscaped properties to feed at night.

A special effort was made to look for the native Hawaiian hoary bat by making an evening survey of the property. These bats are known to occur sporadically at mid elevations across Kula. While they have been rarely recorded in the Kihei area, little is known about their habitats and range in this locality. When present in an area they can be easily identified as they forage for insects, their distinctive flight patterns clearly

visible in the glow of twilight. No evidence of such activity was observed though visibility was excellent and plenty of flying insects were seen. In addition a bat listening device (Batbox IIID) was employed, set to the frequencies of 27,000 to 28,000 hertz, which is the frequency range these bats are known to use. No bats were detected using this unit.

BIRDS

There were moderate numbers of a diverse array of birds observed on the property despite the dry conditions and general lack of feed. Fourteen species of non-native birds including one migratory species were recorded. Taxonomy and nomenclature follow American Ornithologists' Union (2005).

Zebra dove (*Geopelia striata*) – Small groups of these doves were seen and heard on all parts of the property feeding in ground clearings.

Common myna (*Acridotheres tristis*) – Mynas were seen throughout the property in the kiawe trees and flying about.

Spotted dove (*Streptopelia chinensis*) – Several of these large doves were seen flying across the property and landing in the kiawe trees.

Nutmeg mannikin (*Lonchura punctulata*) – Small flocks of these small light brown birds were seen in the trees.

Gray francolin (*Francolinus pondicerianus*) – Families of these francolins were seen on the margins of grassy openings and their calls were heard across the property.

House sparrow (*Passer domesticus*) – Several small flocks of these sparrows were seen feeding in kiawe trees.

House Finch (*Carpodacus mexicanus*) – Flocks of these finches were observed in kiawe trees in the early mornings and pairs were seen thereafter flying between trees.

Red-crested cardinal (*Paroaria coronata*) - Several red-crested cardinals were seen in a kiawe tree feeding on Kiawe beans.

Pacific golden-plover (*Pluvialis fulva*) – A few individuals were seen feeding in openings across the property.

Java sparrow (*Padda oryzivora*) – Two substantial flocks of these colorful birds were seen in kiawe trees on the lower part of the property during the mornings.

Northern mockingbird (*Mimus polyglottos*) – Two mockingbirds were seen in a kiawe tree feeding on kiawe beans.

Japanese white-eye (*Zosterops japonica*) – Two white-eyes were seen feeding in a kiawe tree near the bottom of the property.

Northern cardinal (*Cardinalis cardinalis*) – Two of these red birds were seen in the kiawe trees. More were heard calling further afield.

Black francolin (*Francolinus francolinus*) – One of these striking brown and black birds was seen on the ground near the bottom of the property.

A few other non-native birds might be expected to be found on this property such as wild turkey (*Meleagris gallopavo*), African silverbill (*Lonchura cantans*) and cattle egret (*Bubulcus ibis*). This area in its present condition is not suitable for Hawaii's native forest birds that typically live at much higher elevations in native forests.

INSECTS

While insects in general were not tallied, they were abundant throughout the area and fueled the bird life observed. One native Sphingid moth, Blackburn's sphinx moth (*Manduca blackburni*) has been put on the Federal Endangered species list and this designation requires special focus (USFWS 2000). Blackburn's sphinx moth is known to occur in parts of East Maui and Central Maui but is not presently known from the Kihei area. Its native host plants are species of 'aiea (*Nothocestrum spp.*) and non-native alternative host plants are tobacco (*Nicotiana tabacum*) and tree tobacco (*Nicotiana glauca*). None of these plants were found on the property, and no Blackburn's sphinx moth or their larvae were seen.

CONCLUSIONS AND RECOMMENDATIONS

Fauna surveys are seldom comprehensive due to the short window of observation, the seasonal nature of animal activities and the usually unpredictable nature of their daily movements. This survey, however, should be considered fairly representative due to the abundance of food resources present throughout and adjacent to the area and the resulting level of animal use. No native forest birds occur anywhere in the vicinity of this property. All of the other bird species are widespread and common and of no particular environmental concern.

It is noted that while the threatened Newell's Shearwater (*Puffins auricularis newelli*) and endangered Hawaiian Petrel (*Pterodrom phaeopygia sandwichensis*) were not observed on the property during the site visits, these seabirds are known to occur and use habitats high within the mountains of Maui. They fly over lowland sites during the breeding season (March through December) to access their burrows in the mountains.

It is recommended that the following mitigation measures be implemented to minimize potential impacts to these seabirds.

- Lights within the project area to be shielded so the bulb is not visible at or above the bulb height.
- No night construction associated with the development of the project during the peak fallout period September 15 to December 15.
- Disseminate information about seabird fallout to all staff working on site prior to initiation of work.
- In the event that a downed seabird is found alive, contact the U.S. Fish and Wildlife Service within 24 hours.
- If the seabird is found alive, place the bird in a kennel and contact the Hawaii Department of Land and Natural Resources Biologist or the National Park Service Biologist for instructions on where to bring the bird.

No Federally Endangered or Threatened species were encountered during the course of the survey and no special habitats were identified. The proposed changes in land use should have no significant negative impact on the fauna resources in this part of Maui.

No special recommendations are deemed necessary or appropriate with regard to the fauna resources on this property.

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).

migratory = all species that spend part of their annual life cycle in Hawaii and part of it elsewhere. Migrant birds typically spend their spring and summer months breeding in the arctic and their fall and winter months in Hawaii.

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

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.

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>STATUS</u>	<u>ABUNDANCE</u>
<u>MAMMALS</u>			
Cattle	<i>Bos taurus</i>	non-native	common
Axis deer	<i>Axis axis</i>	non-native	common
Feral cat	<i>Felis catus</i>	non-native	rare
<u>BIRDS</u>			
Zebra dove	<i>Geopelia striata</i>	non-native	common
Common myna	<i>Acridotheres tristis</i>	non-native	uncommon
Spotted dove	<i>Streptopelia chinensis</i>	non-native	uncommon
Nutmeg mannikin	<i>Lonchura punctulata</i>	non-native	uncommon
Gray francolin	<i>Francolinus pondicerianus</i>	non-native	uncommon
House sparrow	<i>Passer domesticus</i>	non-native	uncommon
House finch	<i>Carpodacus mexicanus</i>	non-native	uncommon
Red-crested cardinal	<i>Paroaria coronata</i>	non-native	rare
Pacific golden-plover	<i>Pluvialis fulva</i>	migratory	rare
Java sparrow	<i>Padda oryzivora</i>	non-native	rare
Northern mockingbird	<i>Mimus polyglottos</i>	non-native	rare
Japanese white-eye	<i>Zosterops japonicus</i>	non-native	rare
Northern cardinal	<i>Cardinalis cardinalis</i>	non-native	rare
Black francolin	<i>Francolinus francolinus</i>	non-native	rare

Literature Cited

- American Ornithologists' Union 2005. Check-list of North American Birds. 7th edition. American Ornithologists' Union. Washington D.C.
- Armstrong, R. W. (ed.) 1983. Atlas of Hawaii. (2nd. 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.
- Tomich, P.Q. 1986. Mammals in Hawaii. Bishop Museum Press, Honolulu.
- U.S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and Plants. 50 CFR 17.11 & 17.12
- 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. Univ. of Hawai'i Press and Bishop Museum Press. Honolulu.