APPENDIX B

BOTANICAL AND FAUNAL SURVEYS

BIOLOGICAL RESOURCES SURVEY

for the

WAIKAPU COUNTRY TOWN PROJECT

WAIKAPU, WAILUKU DISTRICT, MAUI

by

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BIOLOGICAL RESOURCES SURVEY
WAIKAPU COUNTRY TOWN PROJECT
Waikapū, Maui, Hawaii

INTRODUCTION

The Waikapū Country Town Project lies on approximately 520 acres of land on the southeast slopes of the West Maui mountains just south of Waikapū Stream and the village of Waikapū (see Figure 1). The project area straddles the Honoapi′ilani Highway and includes the Maui Tropical Plantation facilities and surrounding agriculture and pasture lands, TMKs (2) 3-6-02:003 por., (2) 3-6-04:003 and 006 por. and (2) 3-6-05:007.

SITE DESCRIPTION

The project area includes about 70 acres that comprise the facilities of the Maui Tropical Plantation. This is surrounded by 50 acres of vegetable farm. On the slopes above this are 150 acres of cattle pasture, and below the highway are 240 acres in sugar cane production. Elevations range from 250 feet at the lower end up to 800 feet at the top of the pastures. Soils are all deep, well-drained alluvial soils which are classified in the Wailuku Silty Clay, Iao Clay and Pulehu Cobbly Clay Loam soil series (Foote et al, 1972). The vegetation consists of a great variety of ornamental plant species on the grounds of the Maui Tropical Plantation, a diversity of vegetable crop plants, pasture grasses and dense fields of sugar cane. Annual rainfall ranges from 25 inches in the lower end up to 30 inches at the top (Armstrong, 1983).

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Waikapū Country Town Project which was conducted during February 2013. The objectives of the survey were to:

1. Document what plant and animal 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.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used to cover all of the diverse habitats represented across the entire project area. The riparian strip along Waikapū Stream was examined more intensively because of its special habitat. Specifically excluded from this survey were the ornamental plants in the Maui Tropical Plantation landscape and the numerous crop plants in the farm area.

DESCRIPTION OF THE VEGETATION

The vegetation, excluding the purely ornamental plants and vegetable crop species, was still quite diverse. A total of 130 plant species were recorded during the survey. Seven species were found to be common within the project area: buffelgrass (*Cenchrus ciliaris*), Guinea grass (*Megathyrsus maximus*), sugar cane (*Saccharum officinarum*), smooth rattlepod (*Crotalaria pallida*), cheeseweed (*Malva parviflora*), ʻuhaloa (*Waltheria indica*) and Java plum (*Syzygium cumini*). These species are found naturally in Hawaii as well as throughout the tropics nearly worldwide and are common.

Just 3 native species were found on the 520 acre project area: ʻuhaloa, koali awahia (*Ipomoea indica*) and popolo (*Solanum americanum*). These species are found naturally in Hawaii as well as throughout the tropics nearly worldwide and are common.

Four plant species found during the survey were introduced over a thousand years ago by Polynesian voyagers: kukui (*Aleurites moluccana*), niu (*Cocos nucifera*), hau (*Talipariti tileaceum*) and ʻihiʻai (*Oxalis corniculata*).

The remaining 123 species were non-native plants including some useful forage grasses, but many are considered to be agricultural or roadside weeds.

The largest portions of this project area are agricultural fields in sugar cane production or are cattle pastures. The narrow Waikapū Stream corridor is another distinctive forested habitat type. The remainder of the project includes the highly manipulated ornamental landscapes of the Maui Tropical Plantation grounds and the ever-changing farm fields, the plant species of which were not deemed important to the purposes of this study and were not included in the plant inventory.

DISCUSSION AND RECOMMENDATION

The vegetation along the project corridor is dominated by non-native species. Only three common indigenous species were found. No federally listed Endangered or Threatened plant species (USFWS, 2012) were found, nor do any plants proposed as candidates for such status occur on the property.

Waikapū Stream is a sensitive environment that needs to be carefully managed, although it is not a special plant habitat in that it has no Endangered or Threatened plants living in or around it. The stream is diverted for agricultural irrigation that contributes to it being periodically dry. Were it not diverted it would almost certainly be a perennial running stream with increased possibilities of harboring native species. As it is now no native plants were found within this riparian channel.

No wetlands occur on the site. Streams are technically not wetlands by federal definition. The remainder of the project area consists of dry upland habitat.

As a result of the above findings it is determined that there is little of botanical concern and that the proposed project is not expected to have a significant negative impact on the botanical resources in this part of Maui. No recommendations with regard to plants are deemed appropriate or necessary.

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 four groups: Ferns, Conifers, Monocots and Dicots. Taxonomy and nomenclature 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 geographical area(s).

   Polynesian = all those plants brought to Hawaii during the course of Polynesian migrations.

   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
FERNS			
NEPHROLEPIDACEAE (Sword Fern Family)			
Nephrolepis brownii (Desv.) Hovencamp & Miyamoto	Asian sword fern	non-native	rare
THELYPTERIDACEAE (Marsh Fern Family)			
Christella parasitica (L.) H. Lev.	----------	non-native	rare
CONIFERS			
ARAUCARIACEAE (Araucaria Family)			
Araucaria columnaris (Forst.) J.D. Hooker	Cook pine	non-native	rare
MONOCOTS			
ALOEACEAE (Aloe Family)			
Aloe vera (L.) N.L. Burm	aloe	non-native	rare
ARECACEAE (Palm Family)			
Cocos nucifera L.	coconut	Polynesian	rare
Dypsis lutescens (Wendl.) Beentjie & Dransfield	golden-fruited palm	non-native	rare
ASPARAGACEAE (Asparagus Family)			
Furcraea foetida (L.) Haw.	Mauritius hemp	non-native	rare
Asparagus plumosus J.G. Baker	climbing asparagus fern	non-native	rare
COMMELINACEAE (Dayflower Family)			
Commelina diffusa N.L. Burm.	honohono	non-native	rare
CYPERACEAE (Sedge Family)			
Cyperus involucratus Rottb.	umbrella sedge	non-native	rare
Cyperus rotundus L.	nutsedge	non-native	uncommon
Eleocharis radicans (Poir.) Kunth	pīpīwai	non-native	rare
Kyllinga brevifolia Rottb.	kilio'opu	non-native	rare
POACEAE (Grass Family)			
Bothriochloa pertusa (L.) A. Camus	pitted beardgrass	non-native	rare
Cenchrus ciliaris L.	buffelgrass	non-native	common
Cenchrus echinatus L.	common sandbur	non-native	rare
Cenchrus purpureus (Schumach.) Morrone	Napier grass	non-native	rare
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	uncommon
Coix lacryma-jobi L.	Job's tears	non-native	rare
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	rare
Digitaria insularis (L.) Mez ex Ekman	sourgrass	non-native	rare
Digitaria violascens Link	kukae pua'a	non-native	rare
Eleusine indica (L.) Gaertn.	wiregrass	non-native	rare
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	non-native	rare
Megathyrsus maximus (Jacq.) Simon & Jacobs	Guinea grass	non-native	common
Melinis repens (Willd.) Zizka	Natal redtop	non-native	uncommon
Paspalum conjugatum Bergius	Hilo grass	non-native	uncommon
Saccharum officinarum L.	sugar cane	non-native	common
Setaria verticillata (L.) P. Beauv.	bristly foxtail	non-native	rare
Sorghum halapense (L.) Pers.	Johnson grass	non-native	uncommon
Urochloa subquadripara (Trin.) R.D. Webster	----------	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
DICOTS			
ACANTHACEAE (Acanthus Family)			
Asystasia gangetica (L.) T.Anderson	Chinese violet	non-native	rare
Justicia betonica L.	white shrimp plant	non-native	uncommon
Thunbergia fragrans Roxb.	sweet clock-vine	non-native	rare
AMARANTHACEAE (Amaranth Family)			
Alternanthera pungens Kunth	khaki weed	non-native	rare
Amaranthus spinosus L.	spiny amaranth	non-native	uncommon
Atriplex suberecta Verd.	saltbush	non-native	rare
Chenopodium carinatum R. Br.	keeled goosefoot	non-native	rare
Chenopodium murale L.	'āheahea	non-native	rare
ANACARDIACEAE (Mango Family)			
Mangifera indica L.	mango	non-native	uncommon
Schinus terebinthifolius Raddi	Christmas berry	non-native	rare
APIACEAE (Parsley Family)			
Centella asiatica (L.) Urb.	Asiatic pennywort	non-native	rare
Ciclospermum leptophyllum (Pers.) Sprague	fir-leaved celery	non-native	rare
APOYCYNACEAE (Dogbane Family)			
Asclepias physocarpa (E. Mey.) Schlect.	baloon plant	non-native	rare
Calotropis procera (Aiton) Aiton	small crown flower	non-native	rare
ARALIACEAE (Panax Family)			
Schefflera actinophylla (Endl.) Harms	octopus tree	non-native	rare
ASTERACEAE (Sunflower Family)			
Bidens pilosa L.	Spanish needle	non-native	uncommon
Calyptocarpus vialis Less.	----------	non-native	rare
Conyza bonariensis (L.) Cronq.	hairy horseweed	non-native	uncommon
Crassocephalum crepidioides (Benth.) S. Moore	redflower ragleaf	non-native	rare
Emilia fosbergii Nicolson	red pualele	non-native	uncommon
Emilia sonchifolia (L.) DC.	violet pualele	non-native	rare
Flaveria trinervia (Spreng.) C. Mohr	clustered yellowtops	non-native	rare
Lactuca sativa L.	prickly lettuce	non-native	rare
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	uncommon
Senecio madagascariensis Poir.	fireweed	non-native	rare
Sonchus oleraceus L.	pualele	non-native	uncommon
Synedrella nodiflora (L.) Gaertn.	nodeweed	non-native	rare
Tridax procumbens L.	coat buttons	non-native	uncommon
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	non-native	uncommon
Xanthium strumarium L.	kīkānia	non-native	rare
BASELLACEAE (Basella Family)			
Anredera cordifolia (Ten.) Steenis	Madeira vine	non-native	rare
BIGNONIACEAE (Bignonia Family)			
Spathodea campanulata P. Beauv.	African tulip tree	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
BORAGINACEAE (Borage Family)			
Carmona retusa (Vahl) Masam.	Fukien tea	non-native	rare
Heliotropium aplexicaule Vahl	summer heliotrope	non-native	rare
Heliotropium procumbens Mill.	fourspike heliotrope	non-native	rare
BRASSICACEAE (Mustard Family)			
Lepidium virginicum L.	pepperwort	non-native	rare
CACTACEAE (Cactus Family)			
Hylocereus undatus (Haw.) Britton & Rose	night-blooming cereus	non-native	rare
CASUARINACEAE (She-oak Family)			
Casuarina equisetifolia L.	common ironwood	non-native	uncommon
CLEOMACEAE (Cleome Family)			
Cleome gynandra L.	wild spider flower	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea indica (J. Burm.) Merr.	koali 'awahia	indigenous	rare
Ipomoea triloba L.	little bell	non-native	uncommon
Merremia aegyptia (L.) Urb.	hairy merremia	non-native	rare
CUCURBITACEAE (Gourd Family)			
Momordica charantia L.	bitter melon	non-native	uncommon
EUPHORBIACEAE (Spurge Family)			
Aleurites moluccana (L.) Willd.	kukui	Polynesian	rare
Euphorbia heterophylla L.	kaliko	non-native	rare
Euphorbia hirta L.	hairy spurge	non-native	rare
Euphorbia hypericifolia L.	graceful spurge	non-native	rare
Euphorbia prostrata Aiton	prostrate spurge	non-native	rare
Macaranga tanarius (L.) Mull. Arg.	parasol leaf tree	non-native	uncommon
Ricinus communis L.	Castor bean	non-native	uncommon
FABACEAE (Pea Family)			
Alysicarpus vaginalis (L.) DC.	alyce clover	non-native	rare
Canavalia cathartica Thouars	maunaloa	non-native	rare
Chamaecrista nictitans (L.) Moench	partridge pea	non-native	uncommon
Crotalaria incana L.	fuzzy rattlepod	non-native	uncommon
Crotalaria pallida Aiton	smooth rattlepod	non-native	common
Crotalaria retusa L.	rattlepod	non-native	rare
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	uncommon
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	non-native	rare
Enterolobium cyclocarpum (Jacq.) Griesbach	elephant earpod	non-native	rare
Indigofera hendecaphylla Jacq.	creeping indigo	non-native	uncommon
Indigofera suffruticosa Mill.	inikō	non-native	uncommon
Leucaena leucocephala (Lam.) de Wit	koa haole	non-native	uncommon
Macroptilium atropurpureum (DC.) Urb.	siratro	non-native	uncommon
Mimosa pudica L.	hilahila	non-native	rare
Neonotonia wightii (Wight & Arnott) Lackey	glycine	non-native	uncommon
Pithecellobium dulce (Roxb.) Benth.	'ōpiuma	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	non-native	rare
Samanea saman (Jacq.) Merr.	monkeypod	non-native	rare
Tamarindus indica L.	tamarind	non-native	rare
LAMIACEAE (Mint Family)			
Hyptis pectinanta (L.) Poit.	comb hyptis	non-native	rare
Leonotis nepetifolia (L.) R. Br.	lion's ear	non-native	uncommon
MALVACEAE (Mallow Family)			
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	non-native	uncommon
Malva parviflora L.	cheeseweed	non-native	common
Malvastrum coromandelianum (L.) Garcke	false mallow	non-native	uncommon
Sida rhombifolia L.	Cuban jute	non-native	uncommon
Talipariti tileaceum Fryxell	hau	Polynesian	rare
Waltheria indica L.	'uhaloa	indigenous	common
MELIACEAE (Mahogany Family)			
Melia azedarach L.	pride-of-India	non-native	rare
MORACEAE (Mulberry Family)			
Ficus microcarpa L. fil.	Chinese banyan	non-native	rare
MYRTACEAE (Myrtle Family)		non-native	
Corymbia citriodora (Hook.) Hill & Johnson	lemon gum	non-native	rare
Eucalyptus robusta Sm.	swamp mahogany	non-native	uncommon
Psidium cattleianum Sabine	strawberry guava	non-native	uncommon
Psidium guajava L.	common guava	non-native	rare
Syzygium cumini (L.) Skeels	Java plum	non-native	common
NYCATAGINACEAE (Four-o'clock Family)			
Boerhavia coccinia Mill.	scarlet spiderling	non-native	uncommon
Mirabilis jalapa L.	four-o'clock	non-native	rare
ONAGRACEAE (Evening Primrose Family)			
Ludwigia octovalvis (Jacq.) Raven	primrose willow	non-native	rare
OXALIDACEAE (Wood Sorrel Family)			
Oxalis corniculata L.	'ihi'ai	Polynesian	uncommon
PAPAVERACEAE (Poppy Family)			
Argemone mexicana L.	Mexican poppy	non-native	rare
PORTULACACEAE (Purslane Family)			
Portulaca oleracea L.	pigweed	non-native	rare
SOLANACEAE (Nighshade Family)			
Datura stramonium L.	jimson weed	non-native	rare
Nicandra physalodes (L.) Gaertn.	apple-of-Peru	non-native	uncommon
Nicotiana glauca R.C. Graham	tree tobacco	non-native	rare
Solanum americanum Mill.	pōpolo	indigenous	rare
Solanum lycopersicum L.	cherry tomato	non-native	rare
Solanum seaforthianum Andr.	Brazilian nightshade	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
VERBENACEAE (Verbena Family)			
Lantana camara L.	lantana	non-native	rare
Stachytarpheta cayennensis (Rich.) Vahl	nettle-leaved vervain	non-native	rare
ZYGOPHYLLACEAE (Creosote Bush Family)			
Tribulus terrestris L.	puncture vine	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 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 Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

RESULTS

MAMMALS

Four species of non-native mammals were observed during four site visits to the project area. These included: cattle (*Bos Taurus*), small Indian mongoose (*Herpestes javanicus auropunctata*), domestic cat (*Felis sylvestris catus*) and domestic dog (*Canis lupus familiaris*). Taxonomy and nomenclature follow Tomich (1986).

Other non-native mammals one might expect to utilize this area include: rats (*Rattus* spp.), mice (*Mus domesticus*) and axis deer (*Axis axis*). Rats and mice feed on seeds, fruits, eggs and succulent vegetation and are in turn preyed upon by cats and mongoose. Axis deer are expanding their range into this area and small herds are occasionally seen during the evenings.

A special effort was made to look for the native Hawaiian hoary bat by making an evening survey to four sites in the project area: one near the top of the project, one in the middle and two along the Waikapū Stream corridor. When present in an area these bats 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. In addition a bat detecting device (Bat Box IIID) was used, set to the frequency of 27,000 to 28,000 hertz which is the typical range within which these bats are known to use for echolocation. No activity was detected using this device.

BIRDS

There was a good diversity of birdlife present on this large project area. Twenty one species were observed during four site visits. This included 20 non-native birds and one migratory bird, the Pacific golden-plover (*Pluvialis fulva*). Four species were common throughout the project area: zebra dove (*Geopelia striata*), common myna (*Acridotheres tristis*), spotted dove (*Streptopelia chinensis*) and chestnut mannikin (*Lonchura malacca*). The remaining 17 species were uncommon or rare of occurrence. Taxonomy and nomenclature follow American Ornithologists' Union (2011).

A few other bird species might be expected in this area and at different times of year. These include the northern mockingbird (*Mimus polyglottos*), the orange-cheeked waxbill (*Estrilda melpoda*) and the barn owl (*Tyto alba*). The indigenous black-crowned night-heron (*Nycticorax nycticorax hoactli*) can occasionally be seen along the stream fishing and roosting in trees when the stream is running. The habitat is also unsuitable for Hawaii's native forest birds that are presently restricted to good quality native forests at higher elevations beyond the range of mosquitoes and the avian diseases they carry and transmit.

INSECTS

Insect life was moderate in numbers of species as well as in total numbers of individuals. Sixteen insect species were recorded during the survey representing six Orders. Taxonomy and nomenclature follow Nishida et al (1992). Most common were: the dung fly (*Musca sorbens*), the Sonoran carpenter bee (*Xylocopa sonorina*), the long-tailed blue butterfly (*Lampides boeticus*) and the globe skimmer dragonfly *(Pantala flavescens*). Native species recorded included: the indigenous globe skimmer dragonfly, the indigenous green darner dragonfly (*Anax junius*) and the endemic and Endangered Blackburn's sphinx moth (*Manduca blackburni*) of which two eggs were seen on leaves of its preferred host plant, the tree tobacco (*Nicotiana glauca*).

AMPHIBIANS

One amphibian, the green frog (*Rana clamitans*), was observed in the pond at the Maui Tropical Plantation.

REPTILES

Two gecko species, the house gecko (*Hemidactylus frenatus*) and the mourning gecko (*Lepidodactylus lugubris*) were observed during the evening survey.

MOLLUSKS

One mollusk, the giant East African snail (*Achatina fulica*) was seen in various parts of the project area.

CONCLUSIONS AND RECOMMENDATIONS

The project area encompasses a variety of highly altered areas which have been the focus of large scale agriculture for over 100 years. Only the narrow Waikapū Stream channel shows some resemblance of its original character.

All of the mammals recorded are common non-native species of no particular concern. None of the Endangered native bats were detected during the survey. However, theses bats do occur in many parts of Maui and are known to be highly mobile both on a daily (nightly) basis and seasonally. They have been observed from sea level to high elevations. Their movements appear to coincide with surges in insect activities and are thus likely to be tied to food availability for the bats.

Birdlife here, as well, is dominated by widespread introduced species that merit no special environmental protections. The habitat is unsuitable for Hawaii's native forest birds that are presently restricted to native habitats at higher elevations, beyond the range of mosquitoes that are carriers of lethal avian diseases for which these native birds have almost no resistance.

One indigenous waterbird, the auku′u or black-crowned night-heron, while not seen during the survey, often can be found in Waikapū Stream's forested channel when the water is running. They feed on mollusks, crustaceans and small fish. These birds are relatively common throughout Hawaii as well as in the Western USA and Mexico and carry no special protected federal status under the Endangered Species Act.

While no protected seabirds were found on the property, the 'ua'u and 'a'o are known to overfly the area at dawn and dusk to their burrows high in the mountains between the months of March and November. In late fall young birds fledge from their burrows to take their first tentative flights out to sea. These inexperienced birds are easily confused and distracted by bright lights and often crash to the ground where they are particularly vulnerable to being run over by vehicles or killed by predators. It is recommended that any significant outdoor lighting such as street lights or flood lights that are incorporated into the project design be shielded to direct the light downward so that it is not visible from above.

Three native insects were recorded during the survey. The indigenous dragonflies, the globe skimmer and the green darner are both widespread and common both in Hawaii and elsewhere, and are of no particular conservation concern. The Blackburn's sphinx moth, however, is an Endangered species and is of special concern. Just two individuals of its preferred host plants, the tree tobacco, were found on the northern end of the sugar cane fields at the base of a stockpiled sand pile. These two plants were carefully examined for eggs, larvae or signs of feeding. One plant was found to have two mature eggs on separate leaves. The eggs had turned brown, indicating they were ready to hatch out young larvae. Tree tobacco plants are not native to Hawaii, but fall under the protection of the Endangered Species Act (1973) during the period of their association with the Endangered Blackburn's sphinx moth. It is recommended that this occurrence be reported to the U.S. Fish and Wildlife Service so that the required protections and management actions can be clarified.

The occurrences of the non-native amphibians, reptiles and mollusks are of no particular interest or concern.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within six groups: Mammals, Birds, Insects, Amphibians, Reptiles and Mollusks. 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 over wintering/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.

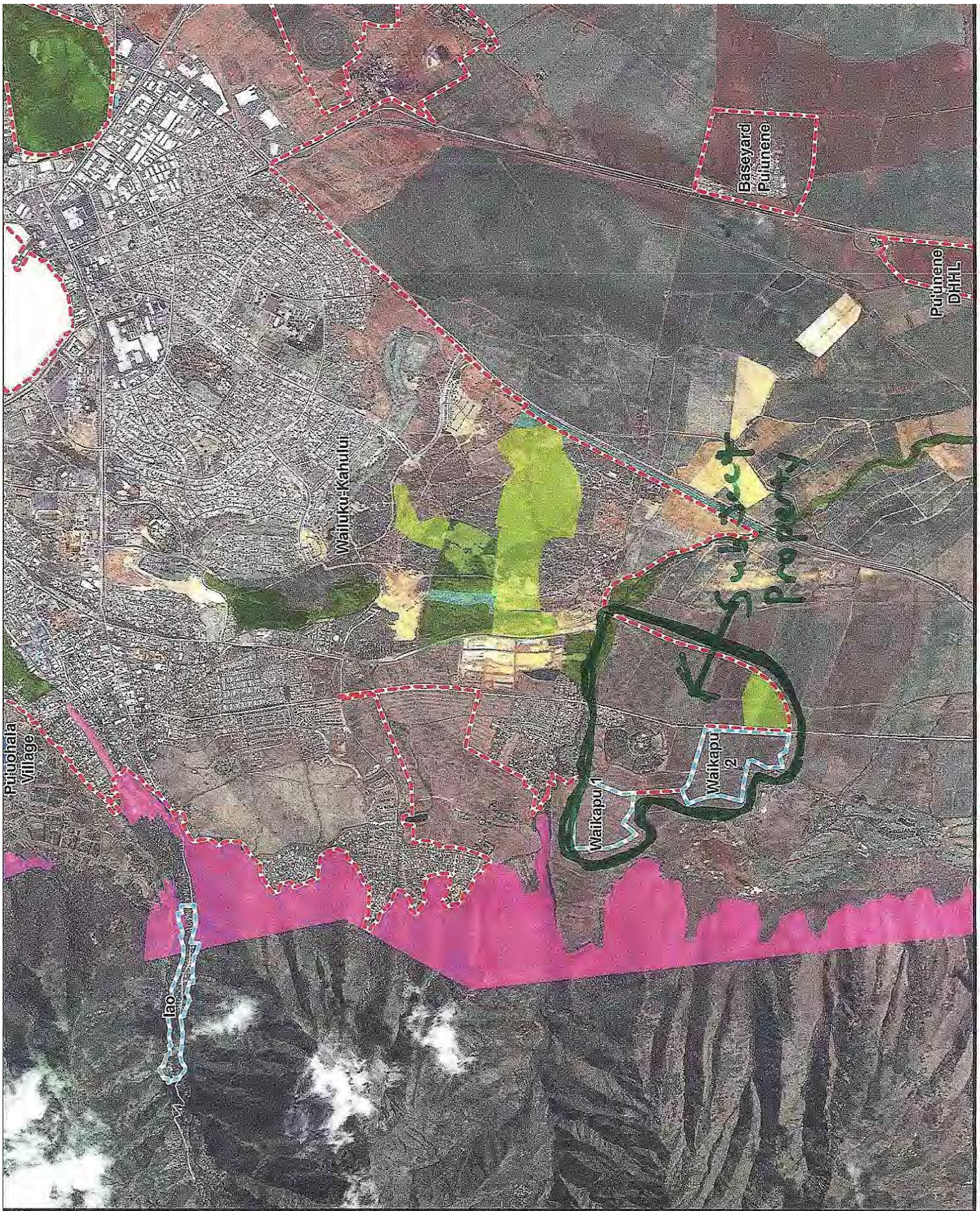
   uncommon = only one flock or several individuals seen within the project area.

   rare = only one or two seen within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MAMMALS			
Bos taurus L.	cattle	non-native	common
Herpestes javanicus auropunctatus Hodgson	small Asian mongoose	non-native	uncommon
Felis sylvestris catus L.	domestic cat	non-native	rare
Canis lupus familiaris L.	domestic dog	non-native	rare
BIRDS			
Geopelia striata L.	zebra dove	non-native	common
Acridotheres tristis L.	common myna	non-native	common
Streptopelia chinensis Scopoli	spotted dove	non-native	common
Lonchura malacca L.	chestnut mannikin	non-native	common
Padda oryzivora L.	Java sparrow	non-native	uncommon
Passer domesticus L.	house sparrow	non-native	uncommon
Francolinus pondicerianus Gmelin	gray francolin	non-native	uncommon
Carpodacus mexicanus Muller	house finch	non-native	uncommon
Cardinalis cardinalis L.	northern cardinal	non-native	uncommon
Aratinga mitrata Tschudi	mitred conure	non-native	uncommon
Gallus gallus L.	chicken	non-native	uncommon
Lonchura punctulata L.	nutmeg mannikin	non-native	rare
Bubulcus ibis L.	cattle egret	non-native	rare
Columba livia Gmelin	rock pigeon	non-native	rare
Francolinus francolinus L.	black francolin	non-native	rare
Zosterops japonicus Temminck & Schlegel	Japanese white-eye	non-native	rare
Phasianus colchicus L.	Chinese ring-necked pheasant	non-native	rare
Lonchura cantans Gmelin	African silverbill	non-native	rare
Paroaria coronata Miller	red-crested cardinal	non-native	rare
Pluvialis fulva Gmelin	Pacific golden-plover	migratory	rare
Zenaida macroura L.	mourning dove	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
INSECTS			
Order ARANAE - true spiders			
ARANEIDAE (Orb Weaver Spider Family)			
Gasteracantha mammosa Koch	Asian spiny-backed spider	non-native	rare
Order DIPTERA - flies			
CALLIPHORIDAE (Blow Fly Family)			
Rhinia testacea Robineau - Desvoidy	----------	non-native	rare
MUSCIDAE (House Fly Family)			
Musca domestica L.	house fly	non-native	rare
Musca sorbens Wiedemann	dung fly	non-native	common
SYRPHIDAE (Hoverfly Family)			
Simosyrphus grandicornis Macquart	Australian hoverfly	non-native	rare
Order HETEROPTERA - true bugs			
APHIDIDAE (Aphid Fmaily)			
Aphis craccivora Koch	cow pea aphid	non-native	rare
Order HYMENOPTERA - bees, wasps & ants			
APIDAE (Honey Bee Family)			
Apis mellifera L.	honey bee	non-native	uncommon
Xylocopa sonorina Smith	Sonoran carpenter bee	non-native	common
FORMICIDAE (Ant Family)			
Pheidole megacephala Fabricius	big-headed ant	non-native	uncommon
Order LEPIDOPTERA - butterflies & moths			
LYCAENIDAE (Gossamer-winged Butterfly Family)			
Lampides boeticus L.	long-tail blue butterfly	non-native	common
PAPILIONIDAE (Swallowtail Butterfly Family)			
Papilio xutha L.	Asian swallowtail	non-native	rare
PIERIDAE (White & Sulphur Butterfly Family)			
Phoebis agarithe Boisduval	large orange sulphur butterfly	non-native	rare
Pieris rapae L.	cabbage butterfly	non-native	uncommon
SPHINGIDAE (Sphinx Moth Family)			
Manduca blackburni Butler	Blackburn's sphinx moth	endemic	rare
Order Odonata - dragonflies & damselflies			
AESHNIDAE (Hawker Dragonfly Family)			
Anax junius Drury	green darner	indigenous	uncommon
LIBELLULIDAE (Skipper Dragonfly Family)			
Pantala flavescens Fabricius	globe skimmer	indigenous	common

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
AMPHIBIANS			
Rana clamitans Latreille	green frog	non-native	rare
REPTILES			
Hemidactylus frenatus Schlegel	house gecko	non-native	rare
Lepidodactylus lugubris Dumeril & Bibron	mourning gecko	non-native	rare
MOLLUSKS			
Achatina fulica Ferussac	giant east African snail	non-native	uncommon



Planning Department Directed Growth Map - 17 November 2010 C3 Long Range Planning Division - Deptartment of Planning - County of Maui

Figure 2 – Entrance to the Maui Tropical Plantation facilities

Figure 3 – An open field alongside the Maui Tropical Plantation

Figure 4 Entrance to the commercial farm


Figure 5 Rows of vegetables in the commercial farm.

Figure 6 – View of the pasture lands in the upper part of the project area.

Figure 7 A portion of fenced pasture land with grazing cattle.

Figure 8 Sugar cane fields in the lower portion of the project area.

Figure 9 A lateral view of the narrow, forested Waikapū stream where it passes through agricultural lands.

Figure 10 Densely forested rocky river bed of Waikapū stream.

Figure 11 A densely grassy section of Waikapu stream with running water following a rain event.

Figure 12 A tree tobacco plant (*Nicotiana glauca*), the preferred host plant for the Blackburn's sphinx moth (*Manduca blackburni*), an Endangered species.

Figure 13 A close up of a tree tobacco leaf with a mature egg of an Endangered Blackburn's sphinx moth.

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