ROADSIDE SURVEY AND EXPERT INTERVIEWS FOR SELECTED PLANT SPECIES ON LANAI, HAWAII

Funded by:
The Hawaii Invasive Species Council and the Maui Invasive Species Committee

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INTRODUCTION

Invasive plant species pose a threat to Hawaii's economy, ecology, and way of life. Early detection and rapid response is one method used to minimize the damage caused by invasive species. It is hoped that by finding and removing weeds before they become widespread and out of control, that overall control costs will be reduced, removal efforts will be more feasible, and damage to resources will be minimized.

The Maui Invasive Species Committee (MISC) works to prevent, detect, and remove plant species early as part of their overall strategy to combat invasive weeds. MISC is based on the island of Maui, but also conducts work throughout Maui County which includes the islands of Molokai, Lanai, and Kahoolawe. To assist in their early detection efforts on Lanai, we conducted a roadside survey and expert interviews for selected target plant species.

Roadside surveys and expert interviews have proven to be a useful way to detect incipient invasive plants in Hawaii (Starr *et al.* 2003a). Previous surveys of this nature were conducted on Maui in the years 2000-2001 (Starr *et al.* 2006a) and on Molokai in 2005 (Starr *et al.* 2005). In addition, other Hawaiian islands, including Kauai, Oahu, and Hawaii have recently initiated similar early detection surveys through their Island Invasive Species Committees.

We (Starr and Starr) conducted a roadside survey on Lanai from April 2, 2007 through April 5, 2007. We were accompanied by Mike Ade (MISC). Survey methods used for this survey were similar to those used in previous surveys conducted on Maui and Molokai. The purpose of the survey was to gather baseline distribution data for chosen target species and to collect plants believed to be new island records. The goal was to find invasive species which were still at an early stage of the invasion process that could potentially be removed before they became widespread.

METHODOLOGY

Methodology for the survey was derived from similar surveys completed on Maui and Molokai which proved useful in finding new locations of target species as well as finding new invasive species previously not known to be present. Our target species list was also similar to ones used in previous surveys and included 115 plant species, most of which are known to be invasive in the Hawaiian Islands or elsewhere. The list consisted of mainly incipient weed species, or those that were thought to be limited in distribution, as well as MISC target species, and some noxious weeds.

We gathered information and search images for each target species by drawing on prior field experience, literature searches, and information and images on-line. We also reviewed on-line herbarium databases including those of Bishop Museum (www1) and Smithsonian Institute (www2) for collections of target species on Lanai. Information was also sought from other botanical experts with experience on Lanai.

Once on Lanai, we drove all the publicly accessible paved roads and some dirt roads at about 5-10 mph. While driving, we scanned the sides of the road. When we came across a target species, we recorded the location on a global positioning system (GPS) and filled out a datasheet that included species name, naturalized status, and miscellaneous notes. We used a Garmin eTrex GPS unit to record locations. When possible, digital images of target plants were taken.

In addition to searching for target species, we looked out for plants new to the island. When found, voucher specimens were collected and stored in plastic bags in the refrigerator until we returned to Maui to process them. When collecting specimens, we also recorded notes on location and other characteristics. Upon return to Maui from Lanai, all plants were scanned, pressed, dried, and accessioned to BISH along with accompanying data.

Once the survey work was done, we downloaded the GPS data and notes into ArcView to create island wide distribution maps for each target. We then printed out the maps and asked those with botanical expertise (Robert Hobdy and Hank Oppenheimer) on Lanai to review them and add any locations that were missed. Additional locations were also added from literature searches and by incorporating existing GPS data, mostly data previously collected on Lanai by MISC.

RESULTS

Overview

Through our roadside survey, expert interviews, and literature searches, we located 48 (42%) of the 115 target species on Lanai. We drove 105 miles in 4 days and recorded 729 locations for 46 species. Expert interviews, existing GPS data, and literature searches added 856 locations for 18 species, of which 2 species were not observed during road surveys. In addition, we made 23 collections for 22 species, of which 9 are new island records. Over half of the target species were not found on Lanai, suggesting prevention is still an option for these species. Many of the target species were found in limited distribution. In a few instances, a single location was found. These species are potential candidates for rapid response. Some of the target species were widespread, and island-wide removal is no longer an option. Other management strategies, such as removal at high priority sites, may be necessary for these widespread species.

Target species not found

67 (58%) of 115 target species were not found during our roadside survey and expert interviews. Though these species are not yet known to be present on Lanai, they do occur on nearby islands, so the potential for their introduction exists. Prevention and early detection still seem to be an option for these species. Species not found include *Acacia auriculiformis* (earpod wattle), *Acacia mangium* (mangium wattle), *Acacia podalyriifolia* (Queensland silver wattle), *Acacia retinodes* (water wattle), *Antirrhinum orontium* (lesser snapdragon), *Aristolochia littoralis* (calico flower), *Bocconia frutescens* (tree poppy),

Brexia madagascariensis (brexia), *Buddleja davidii* (butterfly bush), *Buddleja madagascariensis* (smoke bush), *Carmona retusa* (funkien tea), *Centranthus ruber* (valerian), *Cestrum diurnum* (day blooming jasmine), *Chrysobalanas icaco* (coco plum), *Cinchona calisaya* (ledger quinine), *Cinchona officianalis* (Loja quinine), *Cinchona pubescens* (quinine), *Cinamomum camphora* (camphor tree), *Cinnamomum verum* (cinnamomum), *Citharexylum caudatum* (juniper berry), *Clerodendrum inerme* (seaside clerodendrum), *Clerodendrum macrostegium* (velvet leaf), *Cortaderia* spp. (pampas grass), *Cotoneaster pannosus* (cotoneaster), *Derris elliptica* (derris), *Ficus benghalensis* (Indian banyan), *Ficus lyrata* (fiddle leaf fig), *Ficus pseudopalma* (Philippine fig), *Ficus religiosa* (bo trees), *Hiptage benhalensis* (hiptage), *Homalanthus populifolius* (bleeding heart), *Hypericum canariense* (Canary Island wort), *Lonicera japonica* (Japanese honey suckle), *Macaranga tanarius* (parasol leaf tree), *Melastoma* spp. (melastome), *Melochia umbellata* (melochia), *Miconia calvescens* (miconia), *Morella cerifera* (wax myrtle), *Olea europaea* subsp. *europaea* (European olive), *Oxyspora paniculata* (oxyspora), *Paederia foetida* (maile pilau), *Paraserianthes lophantha* subsp. *montana* (mountain albizia), *Parkinsonia aculeata* (Jerusalem thorn), *Passiflora laurifolia* (water lemon), *Passiflora ligularis* (Sweet granadilla), *Passiflora tarminiana* (banana poka), *Philadelphus karvinskianus* (philadelphus), *Pimenta racemosa* (Bay rum tree), *Piper aduncum* (spiked pepper), *Pittosporum undulatum* (Victorian box), *Pseudogynoxys chenopodioides* (flame vine), *Pueraria montana* var. *lobata* (kudzu), *Pyracantha* spp. (fire thorn), *Rhodomyrtus tomentosa* (downy rose myrtle), *Rubus discolor* (Himalayan blackberry), *Rubus ellipticus* (yellow Himalayan raspberry), *Rubus glaucous* (raspberry), *Rubus niveus* f. a (hill raspberry 'white stem'), *Rubus niveus* f. b (hill raspberry 'red stem'), *Salsola tragus* (tumbleweed), *Schizachyrium condensatum* (bush beard grass), *Sideroxylon persimile* (bully tree), *Solanum robustum* (prickly solanum), *Solanum torvum* (turkey berry), *Tetrastigma pubinerve* (tetrastigma), *Ulex europaeus* (gorse), and *Verbascum thapsus* (common mullein).

Target species with limited distributions

26 (23%) of 115 species were found to be limited in distribution. In some occasions, a single cultivated site was observed. For others, only a few sites were observed. These species are still in an early stage of invasion and could possibly be removed from the island, given appropriate resources. The species that appear to have limited distribution on Lanai include *Archontophoenix* spp. (Alexander palm), *Arundo donax* (giant reed), *Citharexylum spinosum* (fiddle wood), *Clusia rosea* (autograph tree), *Cryptostegia* spp. (rubber vine), *Delairea odorata* (cape ivy), *Ficus carica* (edible fig), *Ficus deltoidea* (mistletoe fig), *Ficus elastica* (rubber tree), *Ficus macrophylla* (Moreton Bay fig), *Ficus nota* (ficus), *Ficus pumila* (creeping fig), *Ligustrum* spp. (privet), *Livistona chinensis* (Chinese fan palm), *Macaranga mappa* (bingabing), *Phormium tenax* (New Zealand flax), *Pimenta dioica* (all spice), *Piper auritum* (false awa), *Podranea ricasoliana* (purple trumpet vine), *Senecio madagascariensis* (fireweed), *Solandra maxima* (cup of gold), *Thunbergia alata* (black eye Susan vine), *Thunbergia fragrans* (sweet clock vine), *Thunbergia grandiflora* (trumpet vine), *Thunbergia laurifolia* (Bengals blue trumpet vine), and *Tibouchina urvilleana* (glory bush).

Target species with medium sized distributions

15 (13%) of 115 species were found to have medium sized distributions. This category represents species that are not fully widespread, but are not limited in distribution either. Some of these species are locally naturalized. Others are commonly cultivated, but have not yet naturalized. Species such as these are further along in the invasion process, and may be beginning to leave the control priority stage. They may be monitored further and evaluated for control based on their potential threat, ease of control, proximity to natural areas, public sentiment towards removal, and available resources. Species with medium-sized distributions on Lanai include *Anredera cordifolia* (Madeira vine), *Caesalpinia decapetala* (cat's claw), *Cestrum nocturnum* (night blooming jasmine), *Cinnamomum burmannii* (Padang cassia), *Coccinia grandis* (ivy gourd), *Ficus benjamina* (weeping fig), *Ficus* cf. *platypoda* (Port Jackson fig), *Ficus microcarpa* (Chinese banyan tree), *Ochna* spp. (Mickey mouse plant), *Olea europaea* subsp. *cuspidata* (African olive), *Pennisetum setaceum* (fountain grass), *Prosopis juliflora* (long thorn kiawe), *Schefflera arboricola* (dwarf schefflera), *Sphaeropteris cooperi* (Australian tree fern), and *Washingtonia* spp. (fan palms).

Target species with widespread distributions

7 (6%) of 115 species were found to have widespread distributions. These widespread species have been sexually reproductive on Lanai for decades and are further along in their invasion stage. It is unlikely these widespread species could be completely removed from the entire island, given current resources. Strategies to address these species will likely be site led, with the species removed only when a direct threat to local resources. Widespread species on Lanai include *Falcataria moluccana* (Albizia), *Hyparrhenia* spp. (thatching grass), *Leptospermum scoparium* (New Zealand tea), *Morella faya* (fire tree), *Pinus* spp. (pines), *Pittosporum viridiflorum* (cape pittosporum), and *Schefflera actinophylla* (umbrella tree).

Target species known from literature / not observed during survey

There were 5 species we did not observe that have been previously reported in literature. It is not known whether these plants still exist or not. We did not observe *Cinnamomum camphora* (Camphor tree), though it is documented from Lanai (Wagner *et al.* 1999). We did not observe *Melochia umbellata* (melochia), though there are specimens at BISH (www1) collected by G.C. Munro from the Waiakeakua area. Hobdy (pers. comm.) notes it may be present by Palikoae Gulch. We did not observe *Passiflora ligularis* (sweet granadilla), which was previously collected by Forbes in 1913 and by Degener in 1963 (www1). We also did not observe *Rhodomyrtus tomentosa* (downy rose myrtle), though there were specimens at BISH (www1) from the Kapano Gulch area collected by Degener in 1963, and specimens at USNM (www2) from Puu Alii, collected by Ordonez in 1940. Another species we did not observe that was known from voucher collections (www1) was *Sideroxylon persimile*, a spiny tree that was collected in 1952 by Degener who noted the location as "north mauka of Lanai City in forest reserve".

New island records

We made 23 collections of non-native plants on Lanai. Of the 23 collections, 9 were new island records: *Centratherum punctatum* subsp. *punctatum* (centratherum), *Clitorea ternatea* (butterfly pea), *Delairea odorata* (cape ivy), *Dyssodia tenuiloba* (dog fennel), *Eugenia uniflora* (Surinam cherry), *Olea europaea* subsp. *cuspidata* (African olive), *Ruellia brevifolia* (ruellia), *Thunbergia alata* (black eye Susan vine), and *Thunbergia fragrans* (sweet clock vine). Specimens have been accessioned to Bishop Museum.

CONCLUSIONS

During our brief survey, we detected a few species that are invasive elsewhere, yet have limited distribution on Lanai. We also gained baseline data for many other species and collected a few new island records. While this survey has identified much new knowledge, there are still many places we did not get to and plants we may have missed. Because most weeds get their start within 1 km (0.62 mi) of developed areas (Hosking *et al.* 2004), further surveys of these areas on Lanai will likely yield new species and locations. In addition, we did not get off the beaten path very much during our four day survey. Surveys through areas accessible only by foot and the myriad of off road areas may also yield some new findings.

LIST OF TARGET SPECIES

115 target species were searched for during roadside surveys on Lanai (2007) and subsequent expert interviews. This table includes number of locations, naturalized status, and results for survey, expert interview, and literature searches.

Locations: For each species the number of locations found is given. A dash "-" is used to denote no locations were found.

Survey: "Yes" denotes a species was located during the roadside survey and a dash "-" denotes a species was not found.

Experts: "Yes" denotes an additional location was reported from expert interviews or existing GPS data and a dash "-" denotes no additional locations were reported.

Literature: "Yes" denotes additional information was gathered from literature and a dash "-" if no additional information was found.

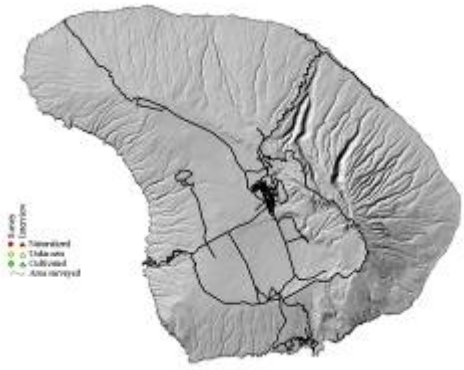
Naturalized: "Yes" denotes species found to be or known to be naturalized on Lanai, a dash "-" denotes species not known to be naturalized, and a "?" denotes questionably naturalized or questionably cultivated.

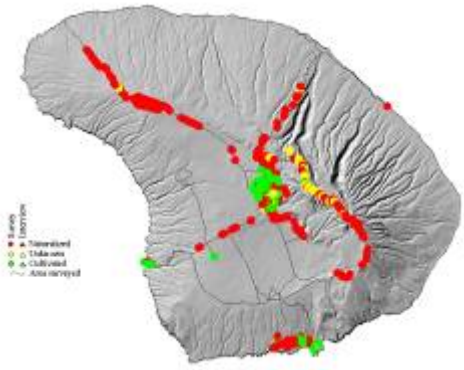
Species	Common Name	Locations	Survey	Experts	Literature	Naturalized
Acacia auriculiformis	Earpod wattle	-	-	-	-	-
Acacia mangium	Mangium wattle	-	-	-	-	-
Acacia podalyriifolia	Queensland silver wattle	-	-	-	-	-
Acacia retinodes	Water wattle	-	-	-	-	-
Anredera cordifolia	Madeira vine	9	Yes	Yes	Yes	Yes
Antirrhinum orontium	Lesser snapdragon	-	-	-	-	-
Archontophoenix spp.	Alexander palm	2	Yes	-	-	-
Aristolochia littoralis	Calico flower	-	-	-	-	-
Arundo donax	Giant reed	4	Yes	Yes	-	Yes
Bocconia frutescens	Tree poppy	-	-	-	-	-
Brexia madagascariensis	Brexia	-	-	-	-	-
Buddleia davidii	Butterfly bush	-	-	-	-	-
Buddleia madagascariensis	Smoke bush	-	-	-	-	-
Caesalpinia decapetala	Cat's claw	2	Yes	Yes	Yes	Yes
Carmona retusa	Carmona	-	-	-	-	-
Centranthus ruber	Valerian	-	-	-	-	-
Cestrum diurnum	Day blooming jasmine	-	-	-	-	-
Cestrum nocturnum	Night blooming jasmine	27	Yes	-	-	Yes
Chrysobalanus icaco	Coco plum	-	-	-	-	-
Cinchona calisaya	Ledger quinine	-	-	-	-	-
Cinchona officianalis	Loja quinine	-	-	-	-	-
Cinchona pubescens	Quinine tree	-	-	-	-	-
Cinnamomum burmanii	Padang cassia	23	Yes	Yes	Yes	Yes
Cinnamomum camphora	Camphor tree	-	-	-	Yes	Yes
Cinnamomum verum	Cinnamon	-	-	-	-	-
Citharexylum caudatum	Juniperberry	-	-	-	-	-
Citharexylum spinosum	Fiddlewood	2	Yes	-	-	?
Clerodendrum inerme	Seaside clerodendrum	-	-	-	-	-
Clerodendrum macrostegium	Velvetleaf glorybower	-	-	-	-	-

Species	Common Name	Locations	Survey	Experts	Literature	Naturalized
Clusia rosea	Autograph tree	8	Yes	-	-	-
Coccinia grandis	Ivy gourd	42	Yes	Yes	Yes	Yes
Cortaderia spp.	Pampas grass	-	-	-	-	-
Cotoneaster pannosus	Cotoneaster	-	-	-	-	-
Cryptostegia spp.	Rubber vine	1	Yes	Yes	-	-
Delairea odorata	Cape ivy	1	Yes	-	-	Yes
Derris elliptica	Poison vine	-	-	-	-	-
Falcataria moluccana	Molucca albizia	87	Yes	Yes	Yes	Yes
Ficus benghalensis	Indian banyan tree	-	-	-	-	-
Ficus benjamina	Weeping fig	25	Yes	-	-	-
Ficus carica	Edible fig	3	Yes	-	-	-
Ficus cf. *platypoda*	Port Jackson fig	29	Yes	Yes	Yes	Yes
Ficus deltoidea	Mistletoe fig	1	Yes	-	-	-
Ficus elastica	Rubber tree	5	Yes	-	-	-
Ficus lyrata	Fiddle leaf fig	-	-	-	-	-
Ficus macrophylla	Moreton bay fig	6	Yes	-	-	Yes
Ficus microcarpa	Chinese banyan	26	Yes	-	Yes	Yes
Ficus nota	Ficus	1	-	Yes	Yes	-
Ficus pseudopalma	Philippine fig	-	-	-	-	-
Ficus pumila	Creeping fig	9	Yes	Yes	-	-
Ficus religiosa	Bo tree	-	-	-	-	-
Hiptage benghalensis	Hiptage	-	-	-	-	-
Homalanthus populifolius	Bleeding heart	-	-	-	-	-
Hyparrhenia spp.	Thatching grass	122	Yes	-	Yes	Yes
Hypericum canariense	Canary Islands wort	-	-	-	-	-
Leptospermum spp.	Tea tree	222	Yes	Yes	Yes	Yes
Ligustrum spp.	Privet	7	Yes	-	-	-
Livistona chinensis	Chinese fan palm	2	Yes	-	-	-
Lonicera japonica	Japanese honeysuckle	-	-	-	-	-
Macaranga mappa	Bingabing	1	Yes	-	-	-
Macaranga tanarius	Parasol leaf tree	-	-	-	-	-
Melastoma spp.	Asian melastome	-	-	-	-	-
Melochia umbellata	Melochia	-	-	Yes	Yes	-
Miconia calvescens	Miconia	-	-	-	-	-
Morella cerifera	Wax myrtle	-	-	-	-	-
Morella faya	Fire tree	100	Yes	Yes	Yes	Yes
Ochna spp.	Mickey mouse plant	11	Yes	Yes	Yes	-
Olea europaea subsp. *cuspidata*	African olive	30	Yes	-	-	Yes
Olea europaea subsp. *europaea*	European olive	-	-	-	-	-
Oxyspora paniculata	Oxyspora	-	-	-	-	-
Paederia foetida	Maile pilau	-	-	-	-	-
Paraserianthes lophantha subsp. *montana*	Mountain Albizia	-	-	-	-	-
Parkinsonia aculeata	Jerusalem thorn	-	-	-	-	-
Passiflora laurifolia	Water lemon	-	-	-	-	-
Passiflora ligularis	Sweet granadilla	-	-	-	Yes	Yes
Passiflora tarminiana	Banana poka	-	-	-	-	-
Pennisetum setaceum	Fountain grass	414	Yes	Yes	Yes	Yes

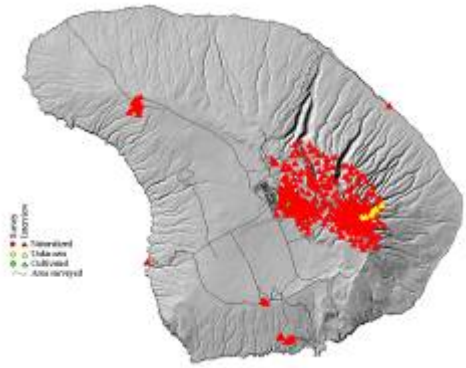
Species	Common Name	Locations	Survey	Experts	Literature	Naturalized
Philadelphus karvinskianus	Philadelphus	-	-	-	-	-
Phormium tenax	New Zealand flax	2	Yes	-	-	?
Pimenta dioica	Allspice	5	Yes	-	Yes	-
Pimenta racemosa	Bay rum tree	-	-	-	-	-
Pinus spp.	Pine tree	62	Yes	Yes	-	?
Piper aduncum	Spiked pepper	-	-	-	-	-
Piper auritum	False awa	1	Yes	-	-	-
Pittosporum undulatum	Victorian box	-	-	-	Yes	Yes
Pittosporum viridiflorum	Cape pittosporum	40	Yes	-	Yes	Yes
Podranea ricasoliana	Podranea	7	Yes	-	-	Yes
Prosopis juliflora	Long thorn kiawe	1	Yes	Yes	-	Yes
Pseudogynoxys chenopodioides	Flame vine	-	-	-	-	-
Pueraria montana var. *lobata*	Kudzu	-	-	-	-	-
Pyracantha spp.	Fire thorn	-	-	-	-	-
Rhodomyrtus tomentosa	Downy rose myrtle	-	-	-	Yes	Yes
Rubus discolor	Blackberry	-	-	-	-	-
Rubus ellipticus	Yellow Himalayan raspberry	-	-	-	-	-
Rubus glaucus	Raspberry	-	-	-	-	-
Rubus niveus f. *a*	Hill raspberry - white stem	-	-	-	-	-
Rubus niveus f. *b*	Hill raspberry - red stem	-	-	-	-	-
Salsola tragus	Tumble weed	-	-	-	-	-
Schefflera actinophylla	Umbrella plant	89	Yes	-	Yes	Yes
Schefflera arboricola	Dwarf schefflera	19	Yes	-	-	?
Schizachyrium condensatum	Beard grass	-	-	-	-	-
Senecio madagascariensis	Fireweed	3	-	Yes	Yes	Yes
Sideroxylon persimile	Bully tree	-	-	-	Yes	Yes
Solandra maxima	Cup of gold	1	Yes	-	-	-
Solanum robustum	Prickly Solanum	-	-	-	-	-
Solanum torvum	Turkey berry	-	-	-	-	-
Sphaeropteris cooperi	Australian tree fern	29	Yes	-	-	-
Tetrastigma pubinerve	Tetrastigma	-	-	-	-	-
Thunbergia alata	Black-eyed Susan vine	8	Yes	-	-	Yes
Thunbergia fragrans	Sweet clock vine	1	Yes	-	-	?
Thunbergia grandiflora	Trumpet vine	5	Yes	-	-	-
Thunbergia laurifolia	Trumpet vine	5	Yes	Yes	Yes	Yes
Tibouchina urvilleana	Glory bush	3	Yes	-	-	-
Ulex europaeus	Gorse	-	-	-	-	-
Verbascum thapsus	Common mullein	-	-	-	-	-
Washingtonia spp.	Fan palms	16	Yes	-	-	Yes

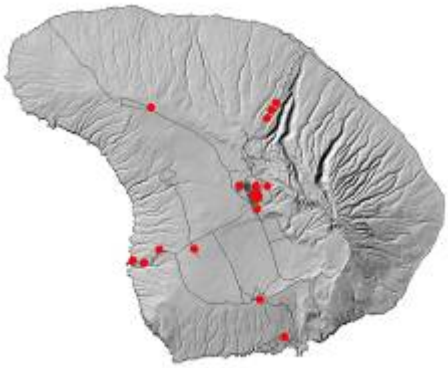
SUMMARY SURVEY MAPS



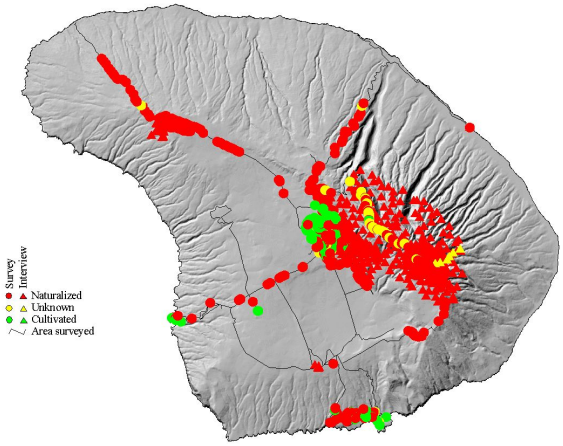


Surveyed 105 miles of roads, and recorded 729 locations for 46 species.





Added 856 locations for 18 species though expert interviews, and 23 locations for 22 species through collections.

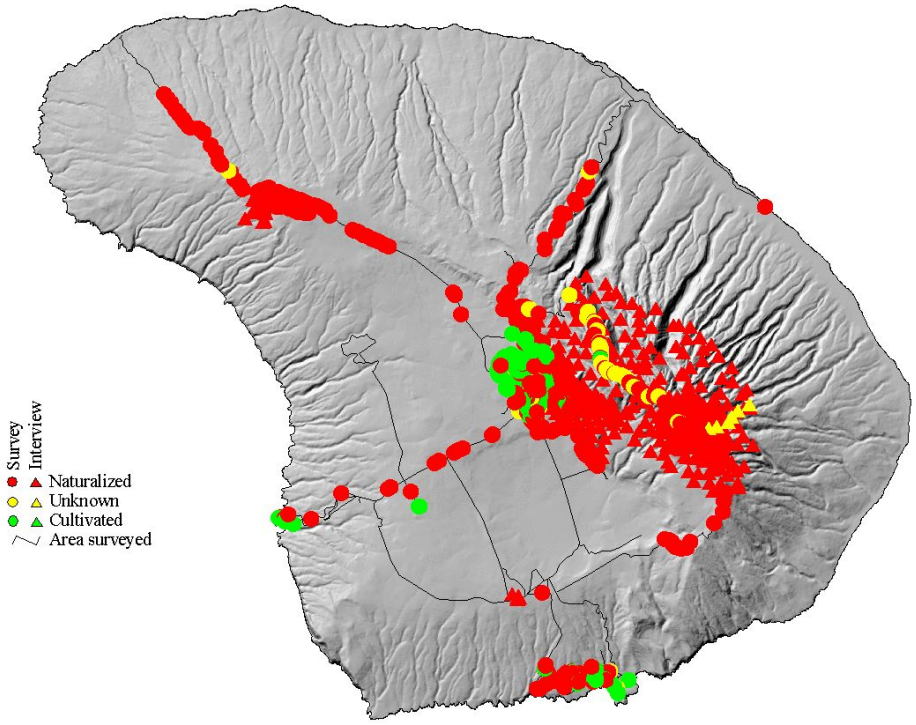


For a total of 1585 locations for 65 species.

DISTRIBUTION MAPS & ANNOTATED CHECKLIST

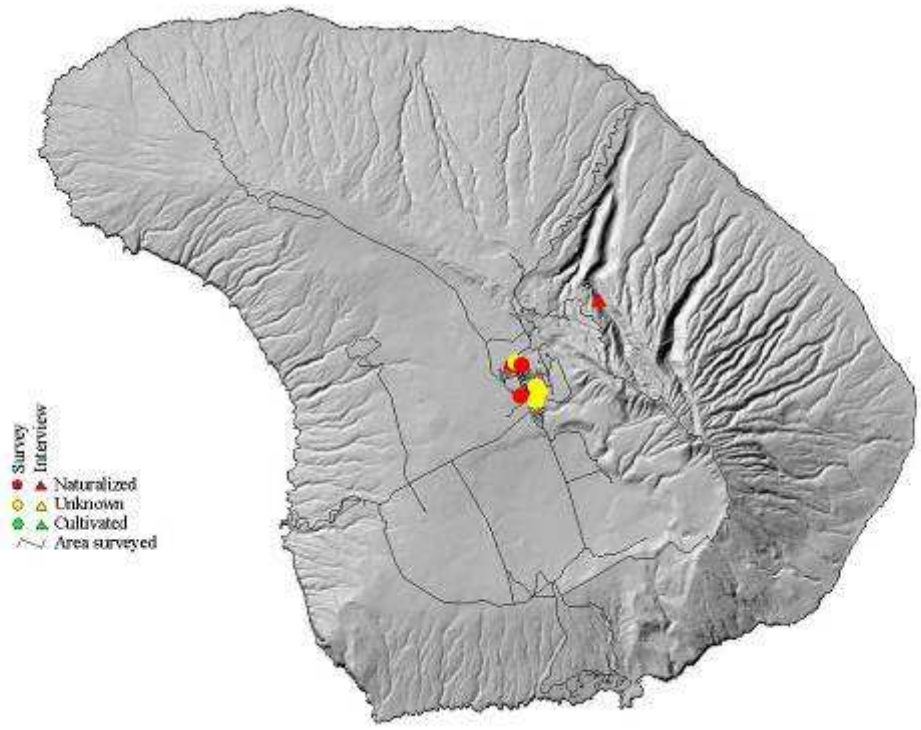
What follows are 48 maps of known distribution for target species we have location information for on the island of Lanai. The maps are a compilation of data from the road survey, expert interviews, and literature searches. Each map includes a scientific name, common name, family name, and brief description including information on native range, notes on cultivation and invasiveness, current known distribution in the Hawaiian Islands, and other miscellaneous items.

The symbols used on the maps are dots for road surveys and triangles for expert interviews and literature searches. Naturalized status is displayed using green for cultivated, red for naturalized, and yellow for plants we were unable to determine status for. A continuous track was taken during the survey and is visible in each map as a gray line.



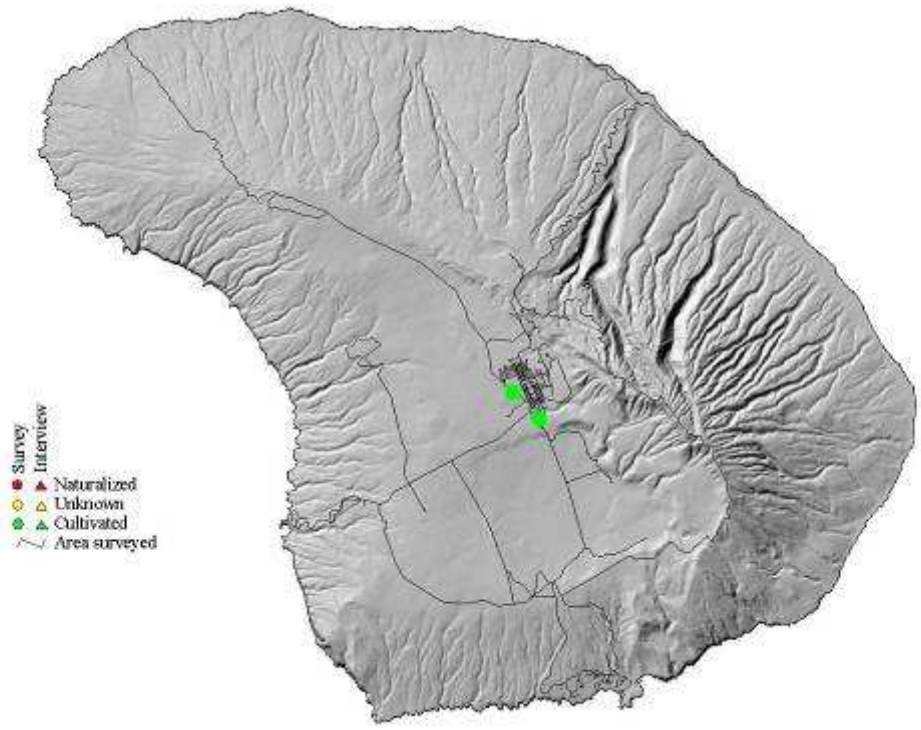
Map showing survey track and all locations recorded during the project.

Anredera cordifolia - Madeira vine (Basellaceae)



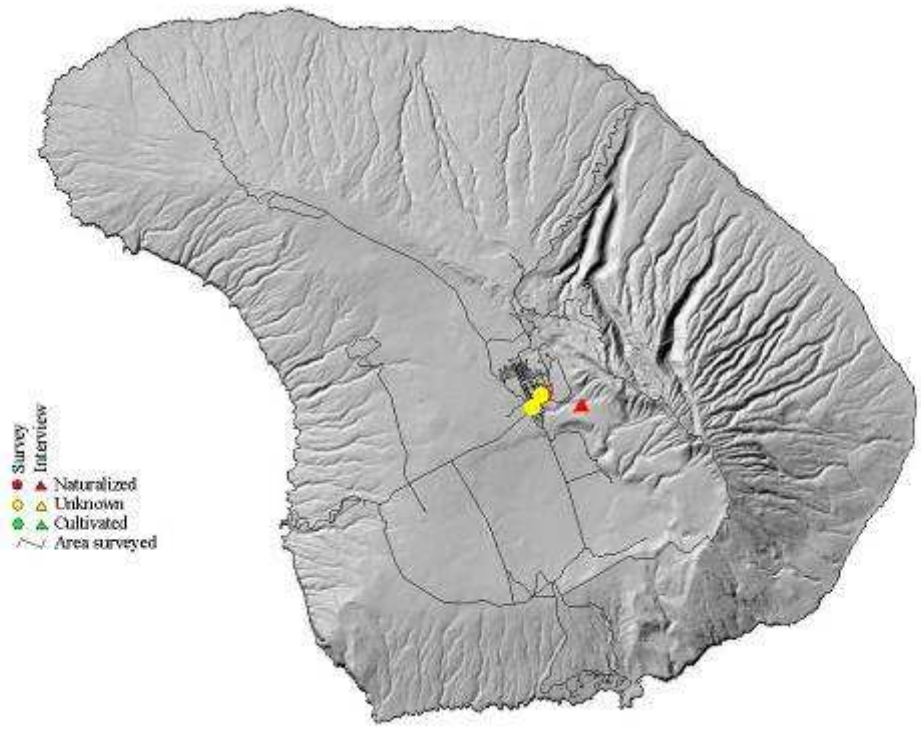
Anredera cordifolia was occasionally cultivated and naturalized in Lanai City, often observed climbing on fences or other objects / plants in yards. Aerial tubers were observed at one location in Lanai City where *A. cordifolia* was climbing high into the canopy of a tree. Expert interviews revealed an additional location at Maunalei Gulch where Derral Stokes reported a 100 ft x100 ft patch (R. Hobdy pers. comm.). *A. cordifolia* was first collected on lanai at the edge of a pineapple field of Lanai City in 1986 (Nagata 1995). *A. cordifolia* is native from Paraguay to southern Brazil and northern Argentina and is widely cultivated in tropical regions of the world (Wagner *et al*. 1999). *A. cordifolia* has become a major pest in places where it is cultivated, such as Hawaii, Australia, New Zealand, South Africa, and other Pacific Islands (HDOA 1992; Auckland Regional Council 1999, PIER 2002, Weeds Australia 2000). *A. cordifolia* is naturalized on all of the main Hawaiian islands, but is not documented from Niihau and Kahoolawe (Nagata 1995, Wagner *et al*. 1999). *A. cordifolia* is a Hawaii state noxious weed (HDOA 1992).

Archontophoenix spp. - Alexander palm - (Arecaceae)



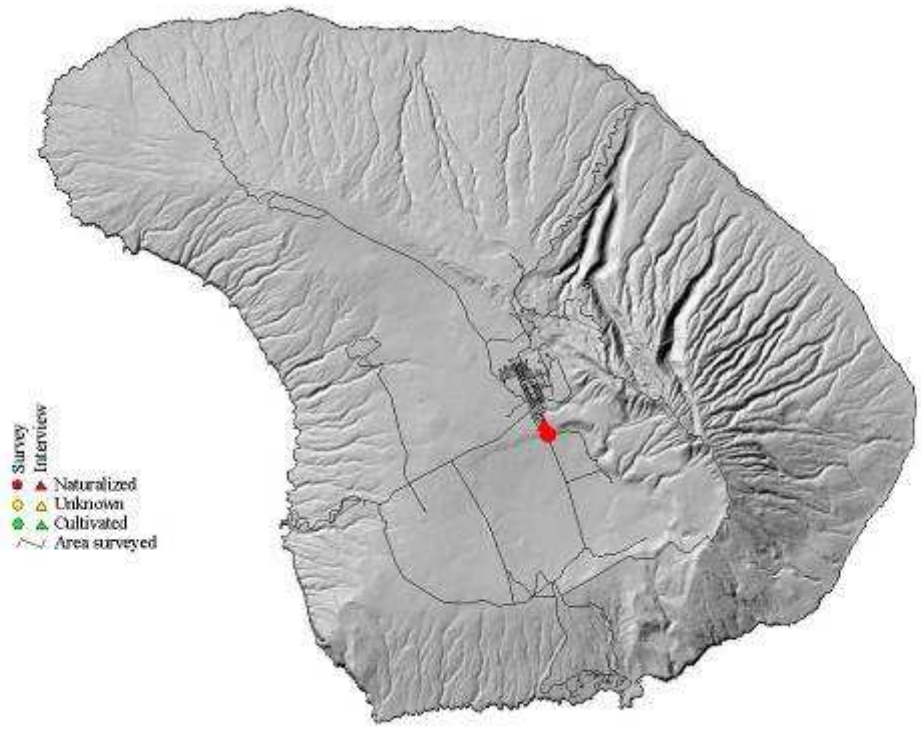
Archontophoenix spp. (*A. alexandrae* and possibly other species) were rarely cultivated with a few trees observed in yards of Lanai City. Only two locations were observed where single medium sized trees were being cultivated for ornament. *A. alexandrae*, native to Queensland, Australia, is a tall palm that is widely cultivated in tropical and subtropical regions of the world. *A. alexandrae* is escaping from plantings and is naturalized in low elevation mesic to wet valleys, especially on the island of Hawaii from Hilo to the Hamakua coast area (Wagner *et al.* 1999). According to Staples and Herbst (2005), *A. alexandrae* is also spreading in a similar fashion on the island of Oahu in the back of Manoa Valley.

Arundo donax - Giant reed - (Poaceae)



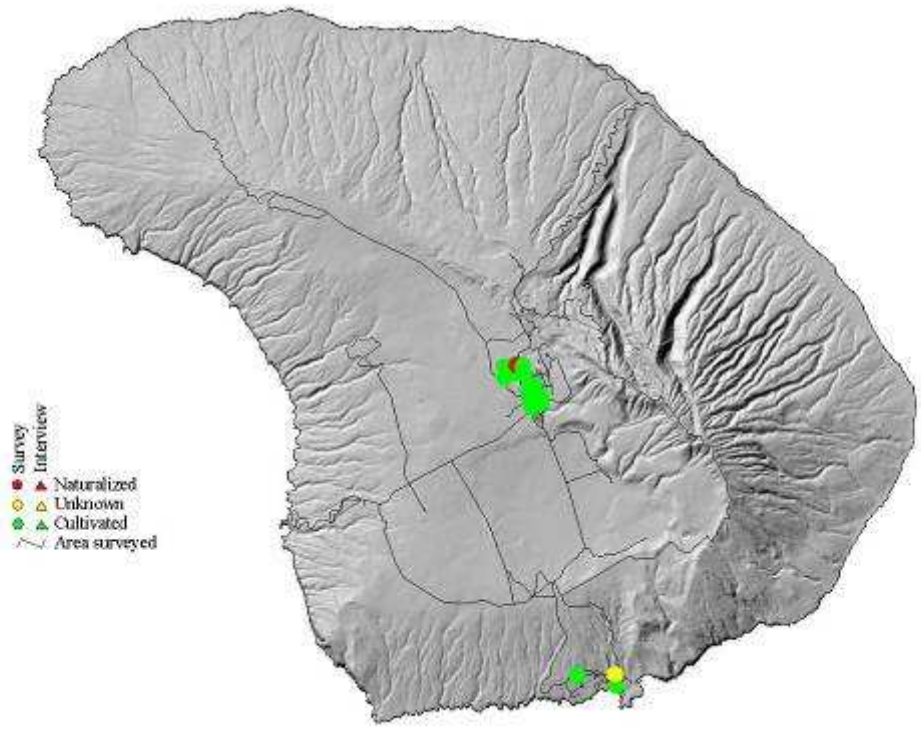
Arundo donax, especially the variegated form, was observed in a few locations in and near Lanai City. A few clumps were seen here and there in yards and sometimes scrub areas adjacent to residential areas. According to MISC, there is also a large (40 ft. tall) patch in a riparian zone in Kapano Gulch. *A. donax*, native to the Mediterranean region, has long been cultivated throughout the world for use in making mats, roofing material, erosion control, and as an ornamental (Neal 1965, Wagner *et al.* 1999). *A. donax* has become invasive in several places where it has been planted, such as California and Florida, where it invades riparian areas and over-runs native plants and riverside habitat (Bodle 1998, Dudley 1998). In Hawaii, *A. donax* is cultivated and reported as naturalized in coastal areas, often in thickets, on Kauai, Oahu, Maui, and Hawaii (Wagner *et al.* 1999). It is also known from a single location on Molokai (Tina Lau pers. comm.) and is a target of the Molokai Invasive Species Committee (MoMISC).

Caesalpinia decapetala - Cat's claw - (Fabaceae)



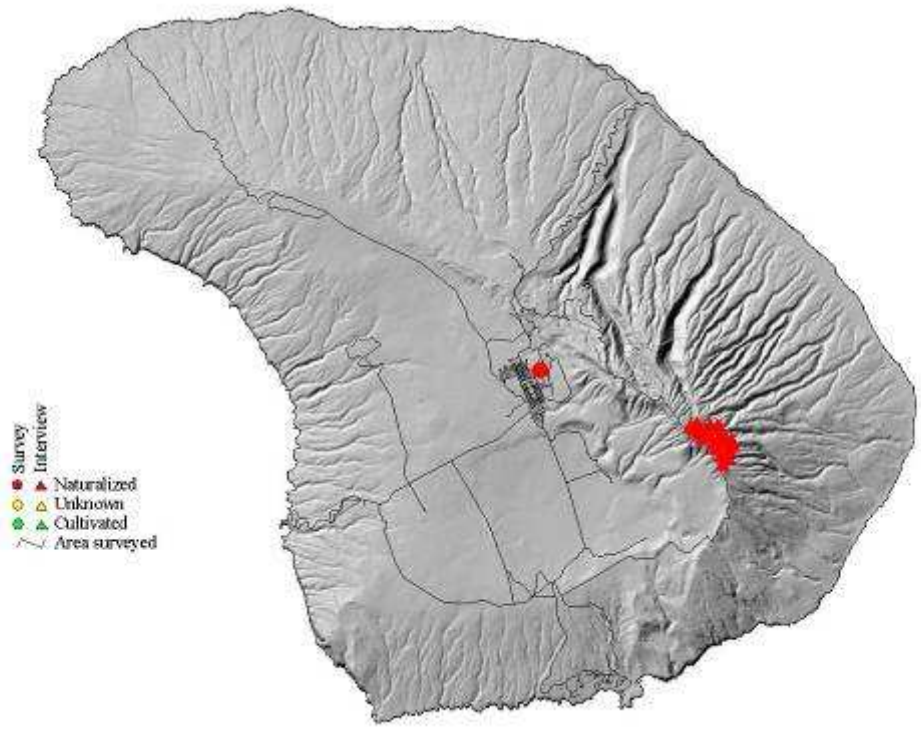
Caesalpinia decapetala was observed during the roadside survey and reported from expert interviews and literature searches as naturalized through much of Kapano Gulch. It was observed sprawling on vegetation and in the canopy of trees in the gulch. *C. decapetala* was first collected on Lanai in 2005 by S. Anderson, E. Anderson, and B. Plunkett who found it throughout the gulch in the 500-550 m (1640 1804 ft) area. A similar species, *C. major* (kakalaioa or yellow knickers) which is either naturalized or possible native (Wagner *et al.* 1999) is also apparently known from this area of Lanai (R. Hobdy pers. comm.). *C. major* can be distinguished from *C. decapetala* by having shorter pods that are covered in spines and seeds that are grayish yellow in color. *C. decapetala*, native to tropical Asia, is a woody vine with sharp thorns and yellow flowers that forms impenetrable thickets (Wagner *et al.* 1999). In Hawaii, it is reported from the islands of Niihau, Kauai, Oahu, East Maui, Hawaii, Molokai, and Lanai (Wagner *et al.* 1999, Tina Lau pers. comm., Starr *et al.* 2006b).

Cestrum nocturnum - Night blooming jasmine - (Solanaceae)



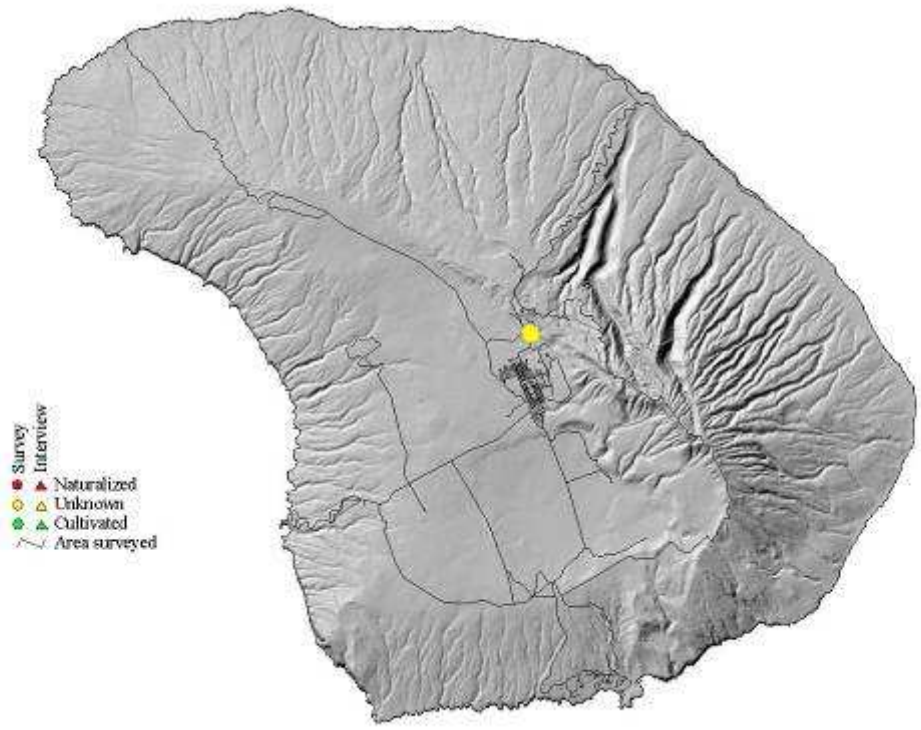
Cestrum nocturnum was observed as commonly cultivated and sparingly naturalized in residential areas of Lanai City and on hotel and condominium grounds of Hulopoe. *C. nocturnum*, native to the Antilles and Central America, is commonly cultivated in Hawaii for its fragrant flowers which bloom at night. *C. nocturnum* is spread by fruit eating birds and is naturalized on at least Kauai, Oahu, Maui, and Hawaii (Wagner *et al.,* 1999; Oppenheimer and Bartlett, 2000; Starr *et al.,* 2003b). *C. nocturnum* is sparingly cultivated on Molokai (Starr *et al*. 2005).

Cinnamomum burmannii - Padang cassia - (Lauraceae)



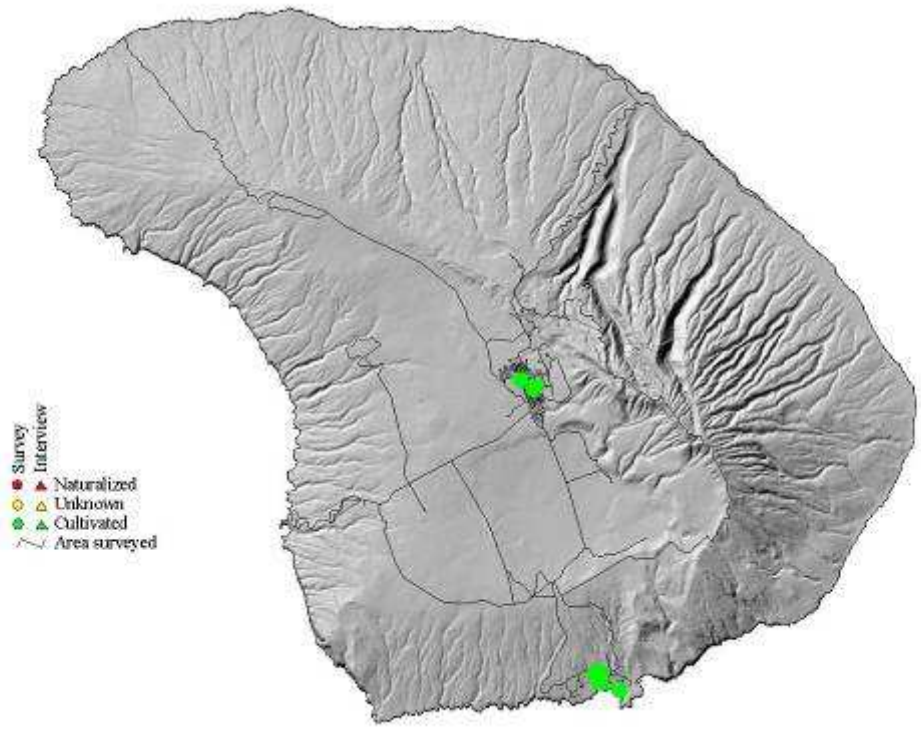
Cinnamomum burmannii was observed as naturalized from the outskirts of Lanai City on Puulani Place in the under story of woodlands bordering the residential areas. It was also reported by H. Oppenheimer and R. Hobdy at the north most fork of Awehi Gulch in the Waiakeakua area where there were a few large trees, thousands of seedlings, and hundreds of saplings. Oppenheimer reports that the three large trees, likely the originals that were planted by G. Munro, have been controlled and that numerous subsequent seedlings have been pulled. *C. burmannii*, native to southeast Asia and Indonesia, is cultivated for use as a spice, for ornamental purposes, and as a forestry tree. In Hawaii, *C. burmannii* is naturalized on Kauai, Oahu, Lanai, Maui, and Hawaii (Wagner and Herbst 1995, Meidell *et al*. 1997, Wagner *et al*. 1997, Wagner *et al.* 1999, Starr *et al*. 2004, Oppenheimer in prep). Meidell *et al*. (1997) report the following about the pest status of *C. burmannii* in Hawaii, "Introduced to northern West Maui around 1920-1935, *C. burmannii* has now become extensively naturalized in the area between Honokohau and Honokahua Valleys, elevation 245-610 m (804-2,001 ft), and is viewed by Puu Kukui Watershed Management staff as a serious pest."

Citharexylum spinosum - Fiddle wood - (Verbenaceae)



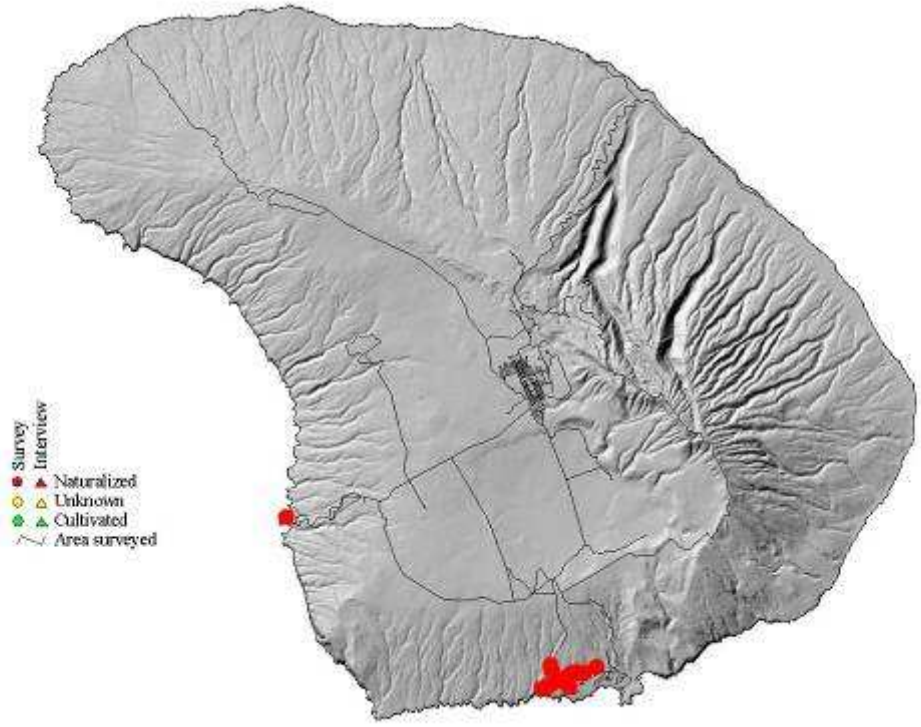
Citharexylum spinosum was observed from a single location at a house located near the Koele Lodge. Two small saplings were observed as possibly naturalized, growing out of a hedge row of bird of paradise (*Strelitzia reginae*). There were no other larger trees nearby and it is not known where these trees came from. It is possible that the saplings originated as contaminants in nursery stock or spread from undetected nearby parent trees. They appeared to be sterile young plants. *C. spinosum*, native to the Caribbean, is cultivated in tropical areas for its attractive orange foliage, fragrant white flowers, and orange fruits. In Hawaii, this species is planted as an ornamental tree as well as a forestry tree. It is known to readily spread from plantings by fruit eating birds on the islands of Oahu, East Maui, and Molokai (Herbarium Pacificum Staff 1998; Starr *et al.* 2002, Starr *et al*. 2006b).

Clusia rosea - Autograph tree - (Clusiaceae)



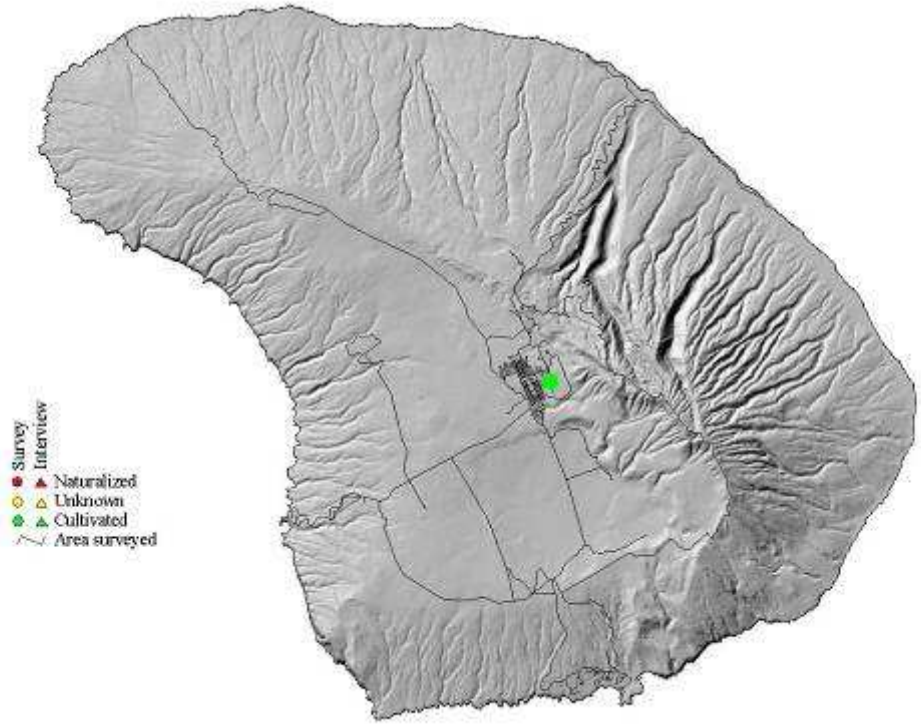
Clusia rosea was found to be occasionally cultivated as an ornamental tree in Lanai City around the post office parking lot, other parking lot areas and yards, and in the Hulopoe area near condominiums and hotels. There was no sign of spread yet. A native to tropical America, *C. rosea* is widely grown as an ornamental in tropical regions of the world. In Hawaii, *C. rosea* is commonly planted as a street, parking lot, or specimen tree. Plants readily spread from initial plantings, dispersed by fruit eating birds, to surrounding areas. Plants thrive in a variety of environments from dry barren lava landscapes to steep cliffs in wet areas. *C. rosea*, like strangler figs, can germinate in the crotch of other trees and grow as epiphytes. They send down aerial roots and will eventually smother the host tree. *C. rosea* is known to be naturalized on Kauai, Oahu, Maui, and Hawaii (Wagner *et al.,* 1999; Oppenheimer and Bartlett, 2000). It is also commonly cultivated on Molokai, but has not yet spread from initial plantings (Starr *et al.* 2005).

Coccinia grandis - Ivy gourd - (Cucurbitaceae)



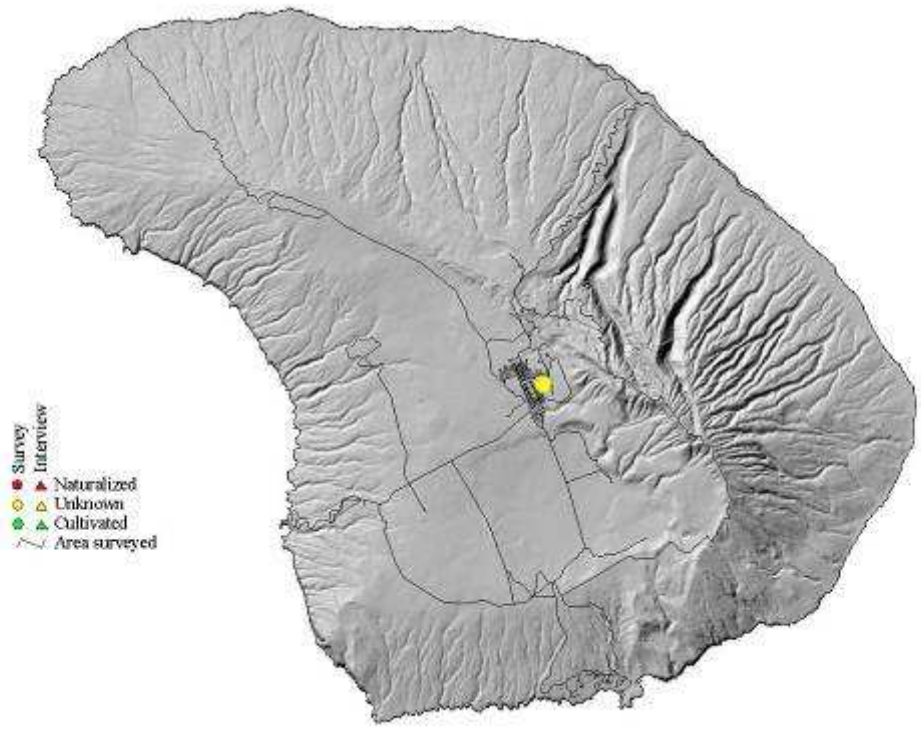
Coccinia grandis was found in scrub and landscaped areas of Hulopoe where it was often seen sprawling in the canopy of trees and on top of shrubbery. Naturalized plants were common in unkept areas along the golf course path, at the golf course nursery, and near condominiums, hotels, and residences. The single patch known from a garden at Kaumalapau harbor has been controlled and was absent. *C. grandis* is native to Africa, India Asia, and Australia (PIER 2002, Wagner *et al*. 1999). It is widely cultivated and has escaped to become a vigorous pest in Hawaii, Australia, Saipan, Texas, and Florida (PIER 2002, PLANTS 2002). In Hawaii, *C. grandis* is documented as naturalized on Oahu, Maui, and Hawaii but is also known to have been present on Lanai, Kauai, and Midway Atoll (Wagner *et al.* 1999, Starr *et al.* 1999, Starr and Martz 1999, Oppenheimer and Bartlett 2000). *C. grandis* is a Hawaii state noxious weed (HDOA 1992).

Cryptostegia spp. - Rubber vine - (Asclepiadaceae)



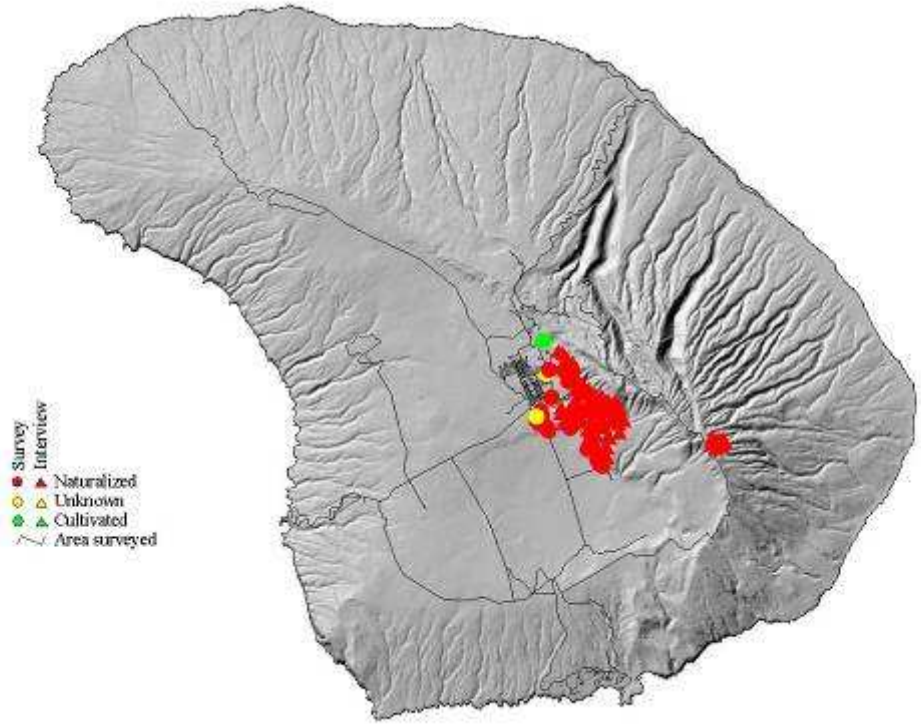
Cryptostegia sp. was known from a single location on Lanai where it was planted in the front yard of a new residence located on Kaunaoa Pl. The plants were discovered by MISC personnel who were surveying for fountain grass (*Pennisetum setaceum*) in the area. Plants were dug up and removed by the gardener of the property. At the time of our survey, we observed the root balls of the plants which had been recently dug up. No signs of regrowth were noted and no other plants were observed during our survey. Both *C. grandiflora* and *C. madagascariensis* are native to Madagascar (DNRM 2001). In Australia, *C. grandiflora* is a declared plant and is said to be one of the greatest threats to natural ecosystems within national park areas in northern Queensland (McFadyen and Harvey 1991). In Florida, *C. madagascariensis* is reported as a category II weed (FLEPPC 1999). In Hawaii, *Cryptostegia* is naturalized on the islands of Molokai (Staples *et al*. 2006), Maui, and Hawaii, though it has not been properly documented as so yet for the latter two islands. The distribution on the island of Hawaii is uncertain, though there are reports of a large infestation near Kawaihae (Christy Martin pers. comm.). It is also present on Oahu. On Maui and Molokai, *Cryptostegia* spp. is a MISC and MoMISC target.

Delairea odorata - Cape ivy - (Asteraceae)



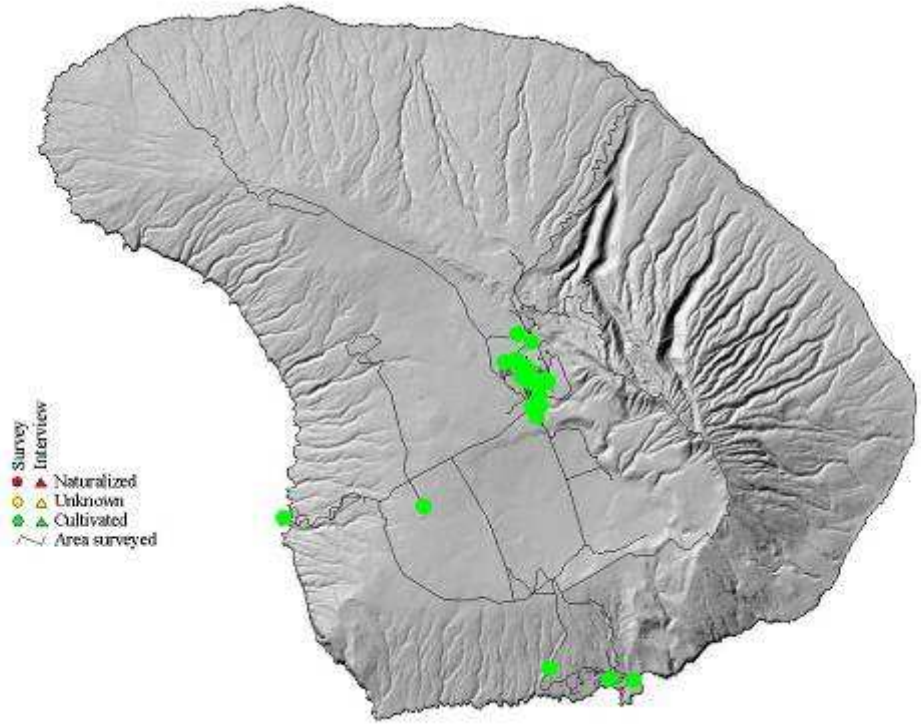
Delairea odorata [*Senecio mikanioides*] was observed as one naturalized patch at a single location mauka of Hotel Lanai, at what appeared to be an abandoned area on the corner of Queen's St. and Ninth St., Lanai City. Vines were sprawling in the area under *Araucaria columnaris* trees and in with other weeds. A collection was made during this survey (Starr-070404-01) representing a new island record for *D. odorata* on Lanai. *D. odorata*, native to Southern Africa, is a popular ornamental climbing vine used in landscaping. *D. odorata* is an aggressive smothering vine that escapes from cultivation and has become a weedy pest in England, California, Oregon, Hawaii, Australia, and New Zealand (Bailey and Bailey 1976, NSW Agriculture 1993, CalEPPC 1994, Wagner *et al.* 1999, PLANTS 2002). In the Hawaiian Islands, *D. odorata* is also known from Maui and Hawaii where it spreads in moist upland areas (Wagner *et al.* 1999).

Falcataria moluccana - Molucca albizia - (Fabaceae)



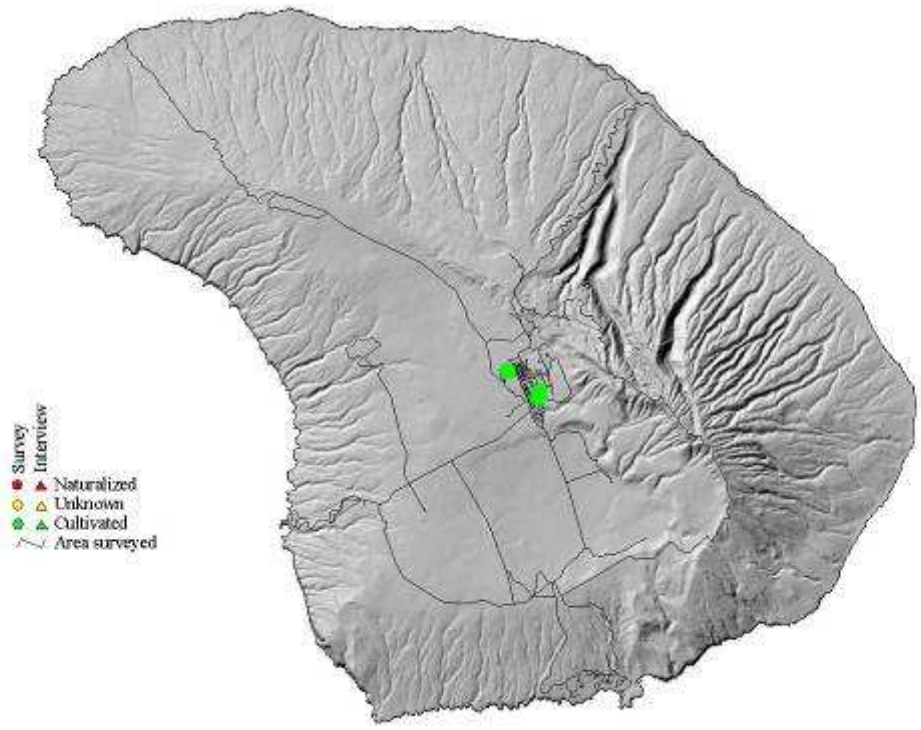
Falcataria moluccana was locally abundant in areas in and around Lanai City, Kapano Gulch, the golf course, and Hoike Rd. where large forestry plantings and subsequent naturalized plants were observed. Trees of all size classes were observed in these areas. Expert interviews added locations in the area behind the golf course and in the Waiakeakua areas. *F. moluccana* is native to the Moluccas, New Guinea, New Britain, and the Solomon Islands (Wagner *et al.* 1999). In Hawaii, *F. moluccana* is naturalized in disturbed mesic to wet areas, 25-600 m (82-1,968 ft), on Kauai, Oahu, Molokai, Maui, Hawaii (Wagner *et al.* 1999, Oppenheimer and Bartlett 2002), and now Lanai (Oppenheimer in prep).

Ficus benjamina - Weeping fig - (Moraceae)



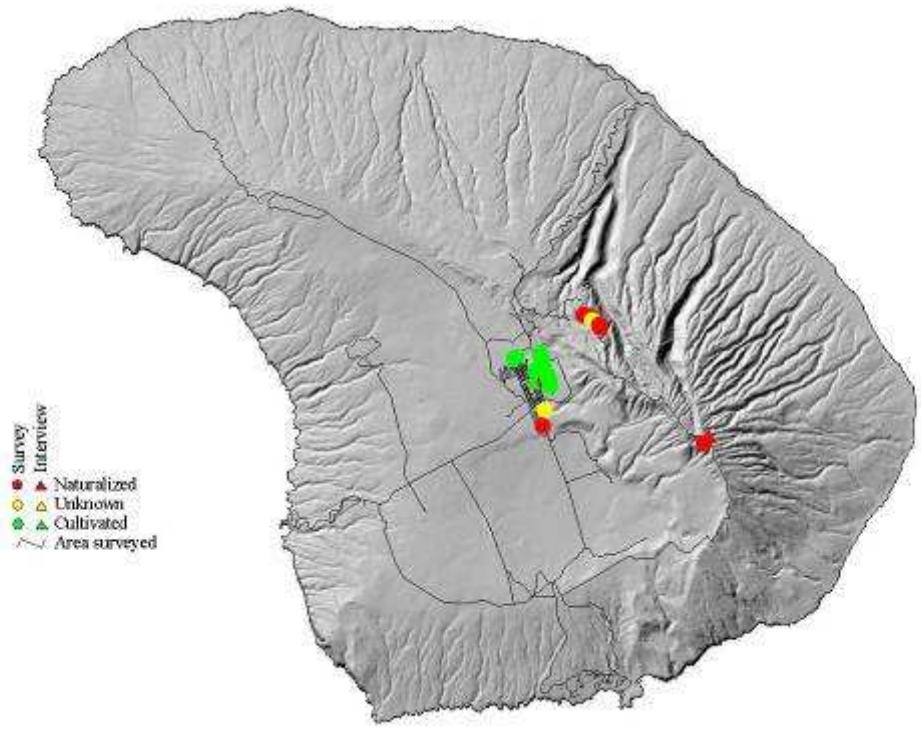
Ficus benjamina was one of the most commonly cultivated trees on Lanai. It was observed in the Lanai City area and other developed areas, such as Kaumalapau Hwy., and Hulopoe. *F. benjamina* is native to a large area including India, southern China, Southeast Asia, Malaysia, the Philippines, northern Australia, and the islands of the South Pacific (Riffle 1998). *F. benjamina* is not invasive in Hawaii yet due to the absence of its associated pollinator wasp. The only reference found of this species becoming invasive elsewhere in the world is in Western Australia, where the tree is reported as invading cliffs in a few areas around the lower Swan River in Perth (Randall 2002). Should the associated wasp arrive in Hawaii, there may be the potential for *F. benjamina* to spread on its own.

Ficus carica - Edible fig - (Moraceae)



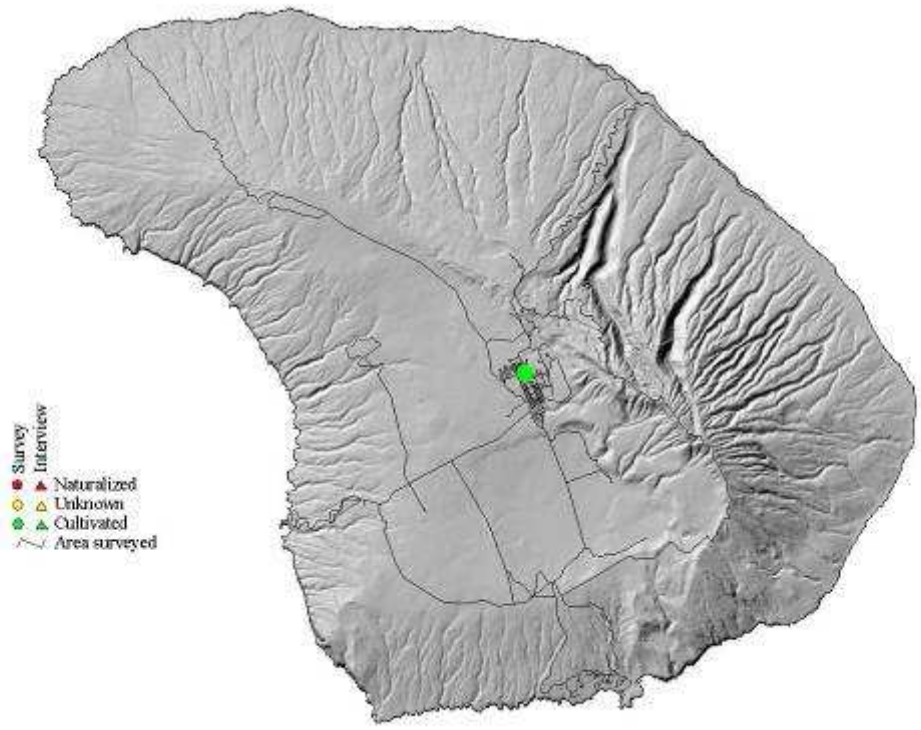
Ficus carica was occasionally cultivated in yards of Lanai City. *F. carica* is thought to be native to Western Asia (California Rare Fruit Growers, Inc. 1996). Though *F. carica* is not invasive in Hawaii today due to the unsuccessful introduction of its associated pollinator wasp, *Blastophaga psenses*, in 1909 (Wagner *et al.* 1999), it is considered invasive in riparian habitats in Australia and California (Randall 2002, CalEPPC 1999). Should the associated wasp be reintroduced today in Hawaii, there could be the potential for *F. carica* to begin to spread on its own.

Ficus cf. *platypoda* - Port Jackson fig - (Moraceae)



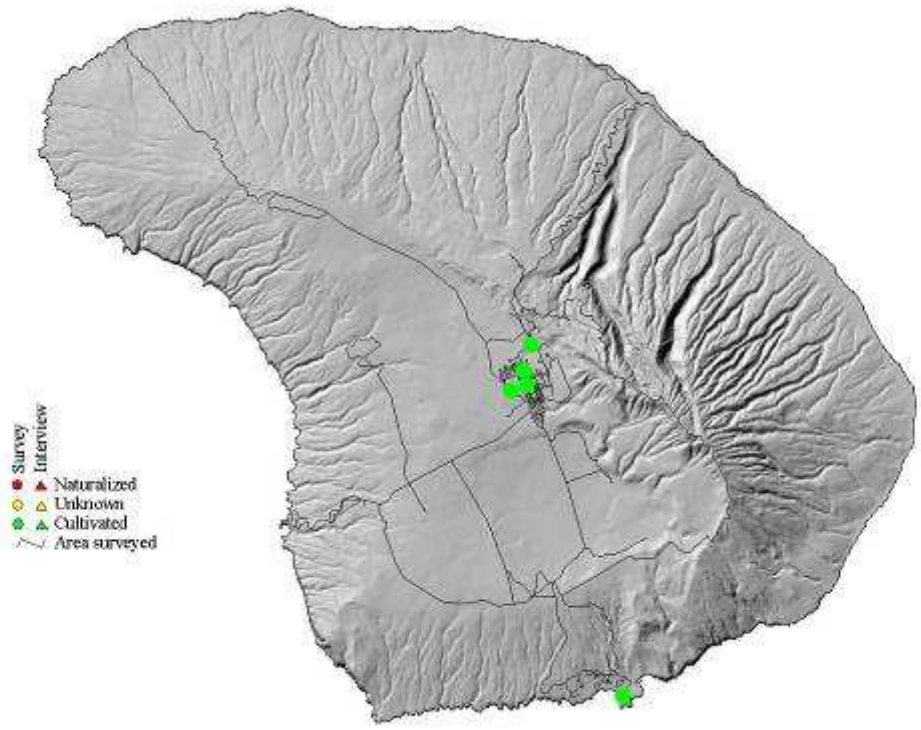
Ficus cf. *platypoda* were spreading locally in areas where they were previously planted including Lanai City and along the Munro Trail or Lanaihale Rd. Trees were often seen growing epiphytically in other trees and on fenceposts. Additional locations were reported from the Waiakeakua area where scattered individuals were coming up through the uluhe (*Dicranopteris linearis*) (H. Oppenheimer pers. comm.). *F.* cf. *platypoda* was previously collected by Herbst in 1976 on Keomoku Rd. (www1) and more recently by Oppenheimer. *F.* cf. *platypoda* is native to New South Wales and Queensland, Eastern Australia (Bailey and Bailey 1976, Haley 1997b). The associated pollinator wasp, *Pleistodontes imperialis,* has been introduced to New Zealand and Hawaii where this species is now spreading and has become a pest (Haley 1997b, DLNR-DOFAW 2002). In Hawaii, *F.* cf. *platypoda* was a popular forestry tree and several thousands were planted on Oahu, Maui, and Hawaii during the 1920's-1930's (Skolmen 1960). This species is now documented as naturalized on Oahu, Maui, Hawaii (Nagata 1995, Oppenheimer and Bartlett 2000, Oppenheimer 2003), and now Lanai (Oppenheimer in prep). In Hawaii, *F.* cf. *platypoda* are spreading from yards and forestry areas, filling gulches and germinating on fence posts and on other vegetation, including native forest species, such as koa (*Acacia koa*) and ohia (*Metrosideros polymorpha*) (Starr *et al.* 2006a),

Ficus deltoidea - Mistletoe fig - (Moraceae)



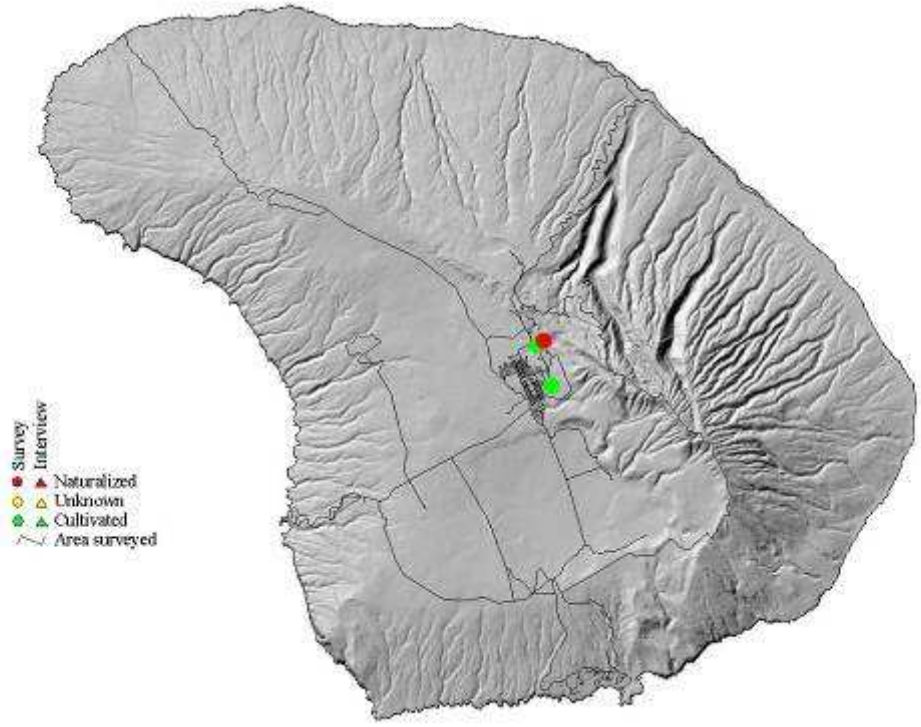
Ficus deltoidea, one small plant, was observed being cultivated in a single yard in Lanai City. *F. deltoidea* is native to S.E. Asia to Borneo, and the Philippines (Brickell and Zuk 1997). *F. deltoidea* is currently not spreading sexually in Hawaii due to the lack of its associated pollinator wasp. *F. deltoidea* is sparingly cultivated in Hawaii and only a few other specimens have been observed in cultivation on the islands of Kauai and Maui. Though this species is not widely known as invasive elsewhere and is not widely planted in Hawaii, if the associated pollinator wasp was introduced, there could be the potential for it to become naturalized. It also exhibited somewhat aggressive vegetative growth on the island of Kauai where it was observed being cultivated as a hedge or wind break (pers. obs.).

Ficus elastica - Rubber tree - (Moraceae)



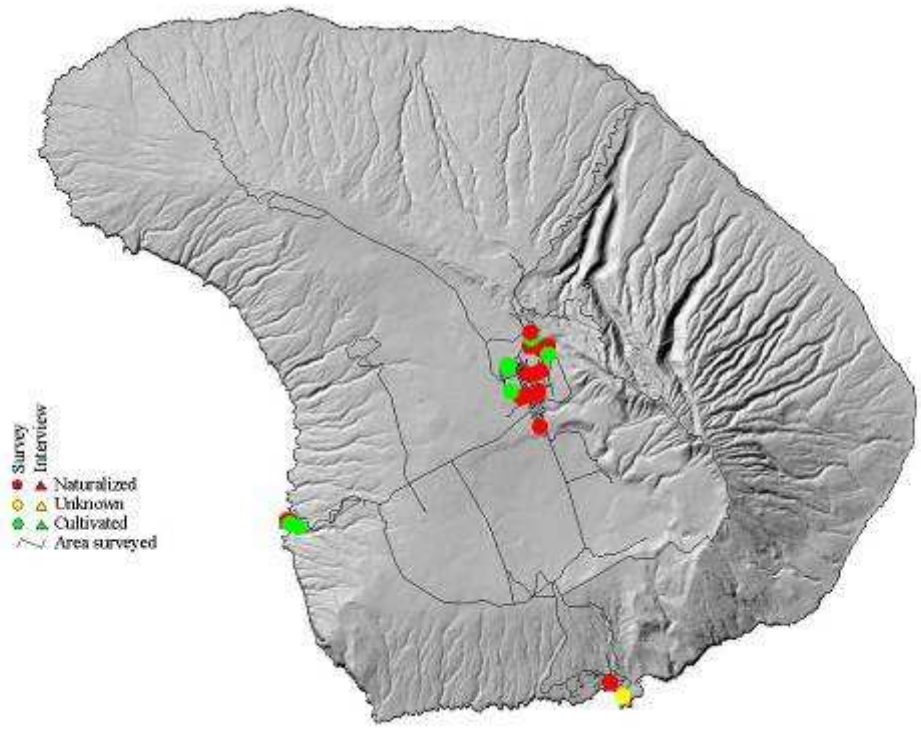
Ficus elastica was occasionally cultivated in yards and garden areas of Lanai City, Koele, and Hulopoe. *F. elastica* is native to Nepal, Bhutan, northeast India, Myanmar (Burma), Malaya, Sumatra, and Java (Riffle 1998). This species is widely cultivated throughout the world. There is no evidence of it ever becoming invasive anywhere. *F. elastica* currently does not spread in Hawaii due to the lack of it's associated pollinator wasp.

Ficus macrophylla - Moreton Bay fig - (Moraceae)



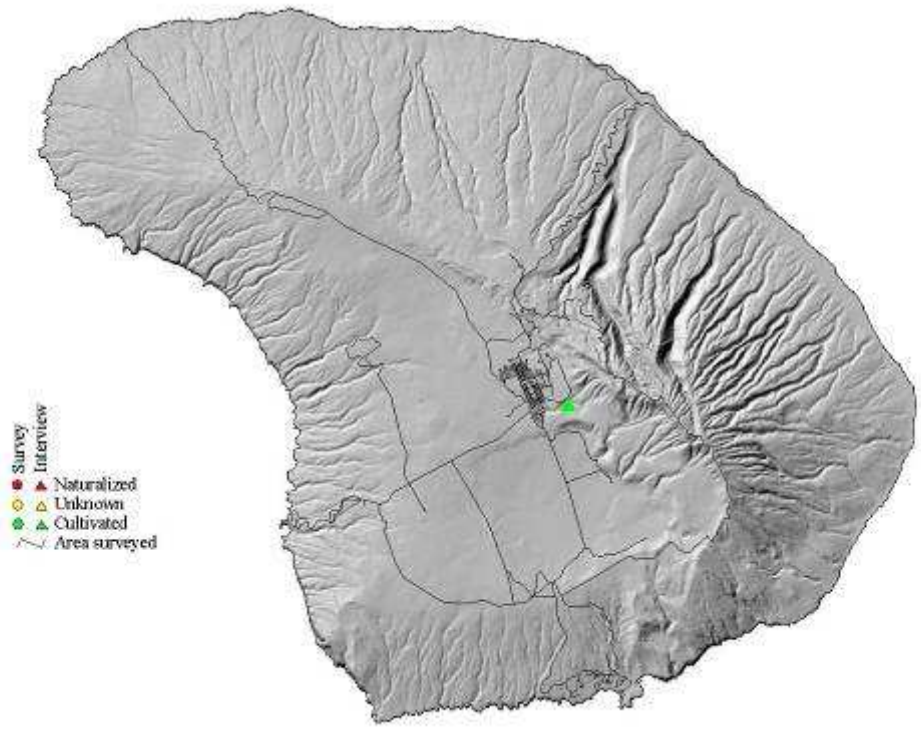
Ficus macrophylla were observed in large plantings with naturalized plants nearby. Seedlings were often growing epiphytically in other plants. *F. macrophylla* is native to tropical Queensland and northern New South Wales in Australia (Riffle 1998). The pollinator wasp for *F. macrophylla, Pleistodontes frogatti,* recently arrived in New Zealand, allowing this species to spread. Invasive characteristics include prolific fruit production, small seeds that are bird dispersed, ability to invade both disturbed and native forests, and difficulty in control due to epiphytic growth and steep terrain. In Hawaii, over 36,000 trees were planted for reforestation between 1910 and 1960, mostly on Hawaii and Oahu, with fewer on Kauai (Skolmen 1960). The pollinator wasp was purposefully introduced to Hawaii in 1921 (Wagner *et al.* 1999). The wasp successfully established and reproduction of *F. macrophylla* has now been documented on Molokai, Maui, and Hawaii (Oppenheimer and Bartlett 2000, Starr *et al.* 2002, Oppenheimer 2006). In addition, two trees, along with the associated wasps, were found on Midway Atoll, though no sign of spread was documented at the time (Starr and Martz 1999).

Ficus microcarpa - Chinese banyan - (Moraceae)



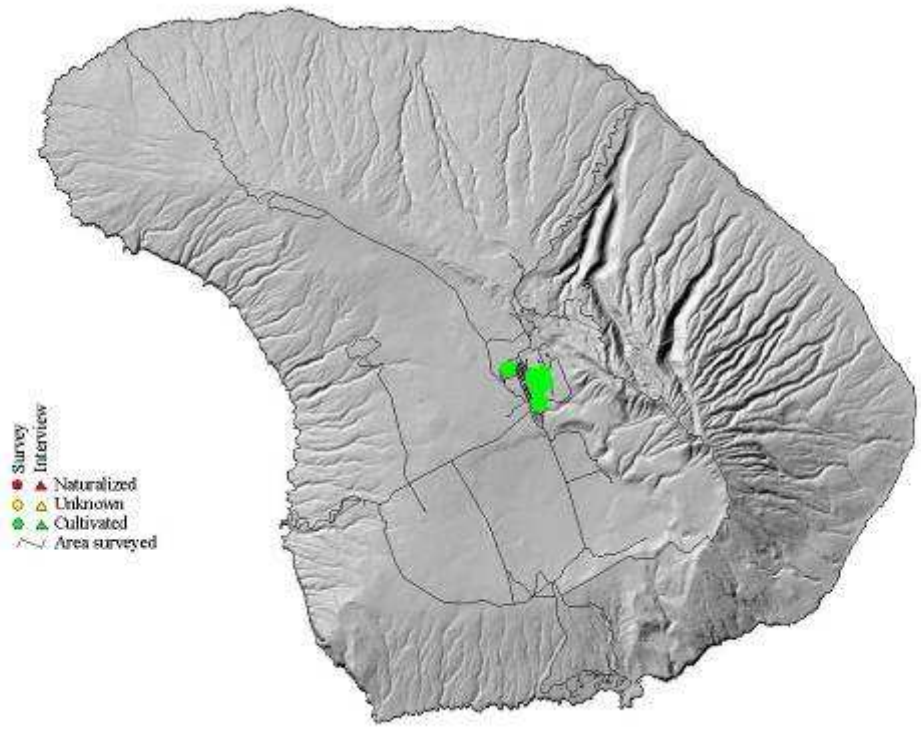
Ficus microcarpa was widely cultivated and naturalized in the areas of Lanai City, Koele, Kaumalapau harbor, and Hulopoe, often seen growing epiphytically in other plants and on structures. Naturalized plants were mostly noted nearby plantings and not far into natural areas yet. *F. microcarpa* is native from Ceylon to India, southern China, Ryukyu Islands, Australia, and New Caledonia (Wagner *et al.* 1999). *F. microcarpa* is established in at least Hawaii, Florida, Bermuda, several islands in the Pacific, and from Mexico to South America (McKey 1989, Owen 1996, PIER 2002). *F. microcarpa* is a well known invader due to several characteristics, including: popularity in the horticulture industry and ability to get around the globe in large numbers, intentional and unintentional introduction of pollinator wasps, large fruit production, dispersal agents such as birds, bats, rodents, and others, and ability to grow in inhospitable places with little requirements. It has the added ability to disperse more often due to its small fruit size which allows the fruit to be taken by a larger number of dispersal agents. In addition, Bronstein (1989) proposes that *F. microcarpa* has the ability to establish with a smaller population size due to its "asynchronous" fruiting cycle which allows wasps to find fruits of all life stages throughout the year. In Hawaii, *F. microcarpa* is known from the islands of Oahu, Maui, and Hawaii, but probably all of the main islands (Wagner *et al*. 1999). It has also been reported from Molokai (Hughes 1995), Lanai (Oppenheimer in prep), Kauai (Lorence *et al*. 1995), and Midway Atoll (Starr *et al*. 2002). It is also known to spread via fruit eating birds to offshore islets located near infested areas on the main island of Maui (Starr *et al*. 2006c).

Ficus nota - Fig - (Moraceae)



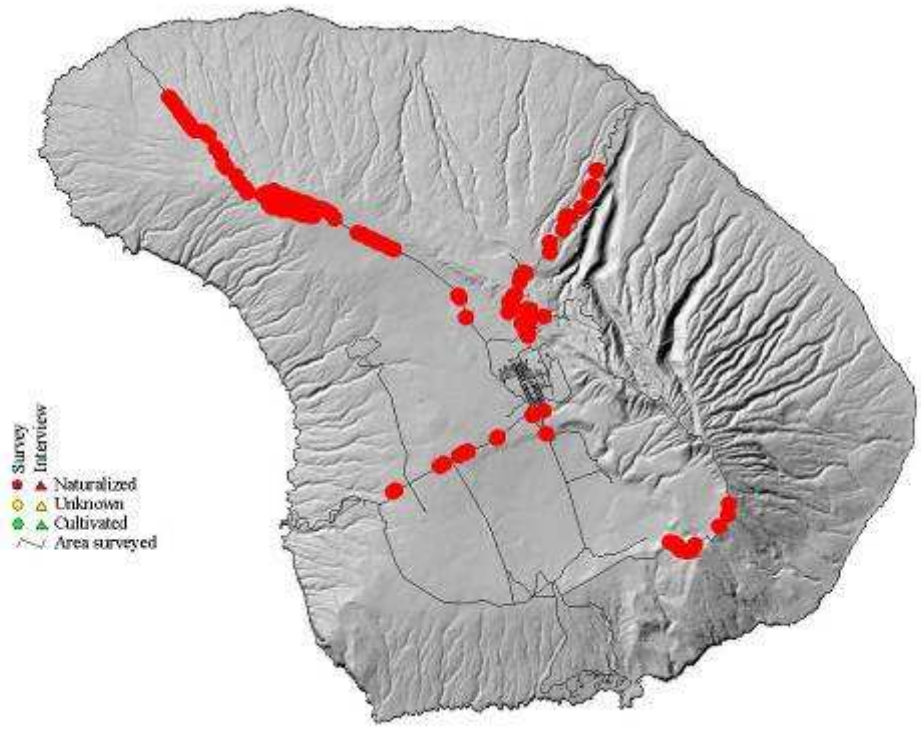
Ficus nota was not observed during this survey. *F. nota* was previously collected in Kapano Gulch by Degener in 1963 (www1). Hobdy reports that he also observed this *Ficus* tree with the metal tag still attached located in Kapano Gulch. *F. nota* is native to the Philippines and Northern Bornea (Herbarium Pacificum Staff 1998). In Hawaii, over 25,000 trees were planted in forest reserves from 1922-1932 on the islands of Kauai, Oahu, and Hawaii (Wagner *et al.* 1999). It is now naturalized on Oahu and Hawaii (Herbarium Pacificum Staff 1998, Wagner *et al*. 1999).

Ficus pumila - Creeping fig - (Moraceae)



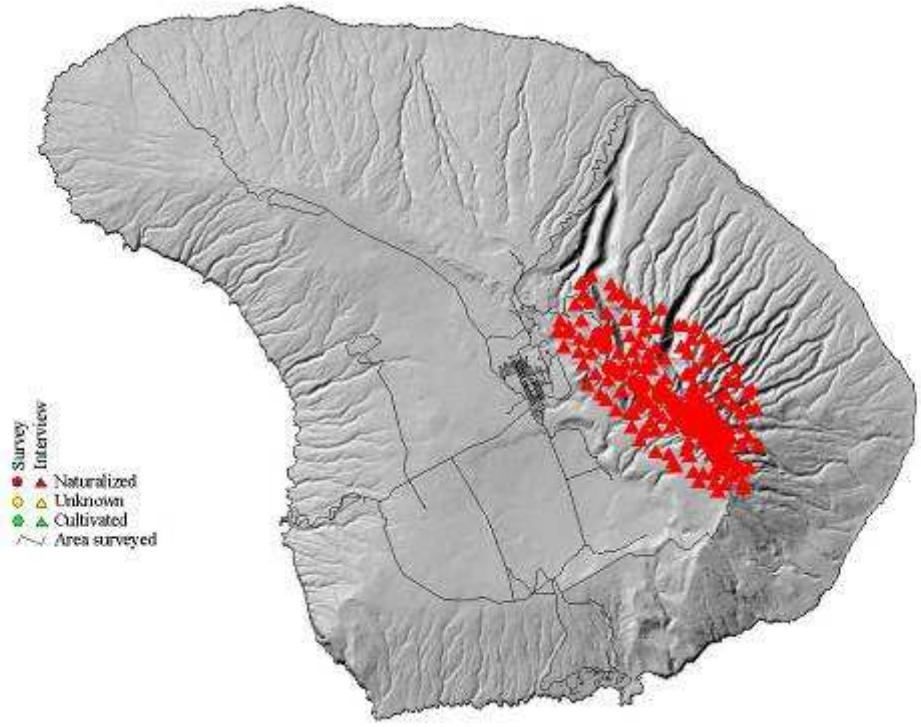
Ficus pumila was commonly cultivated on rock walls and observed climbing trees and buildings in Lanai City. *F. pumila* was previously collected in the Kapano Gulch area by S. Anderson, E. Anderson, and B. Plunkett. *F. pumila*, native from South China through Malaysia, is a creeping vine like fig plant that is commonly planted as an ornamental in Hawaii and other warm climates of the world as a cover on rock walls, trees, and other structures. In Hawaii and most other places where *F. pumila* is cultivated, sexual reproduction of the plant does not occur because without its associated pollinator wasp present, the seeds are not viable. Though not known to spread by seeds yet, *F. pumila* is capable of aggressive vegetative growth and can become a nuisance by climbing high into trees and growing beyond the desired area. It is not documented as naturalized in Hawaii.

Hyparrhenia spp. - Thatching grass - (Poaceae)



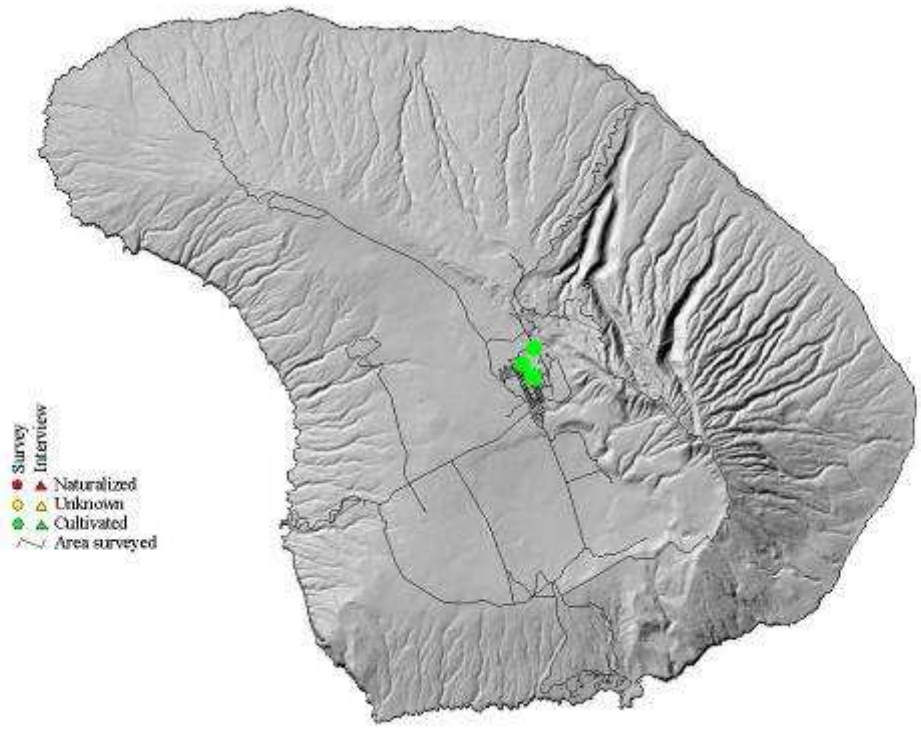
Hyparrhenia spp. was common along roads just outside of Lanai City. Two species are known from Lanai, *Hyparrhenia hirta* and *H. dregeana* (www1). We did not distinguish to species level in our map, though we did observe what appeared to be the common *H. hirta* and occasionally a different form, perhaps *H. dregeana*, and made a collection(Starr-070404-04) to help confirm this. *H. hirta* is native to tropical Africa and commonly spreads in places where it is planted. These fire adapted grasses are widely planted throughout the tropics as pasture grasses, produce numerous seeds, and are widely established. *H. hirta* is adventive on Molokai and Lanai (Wagner *et al.* 1999).

Leptospermum scoparium - New Zealand tea tree - (Myrtaceae)



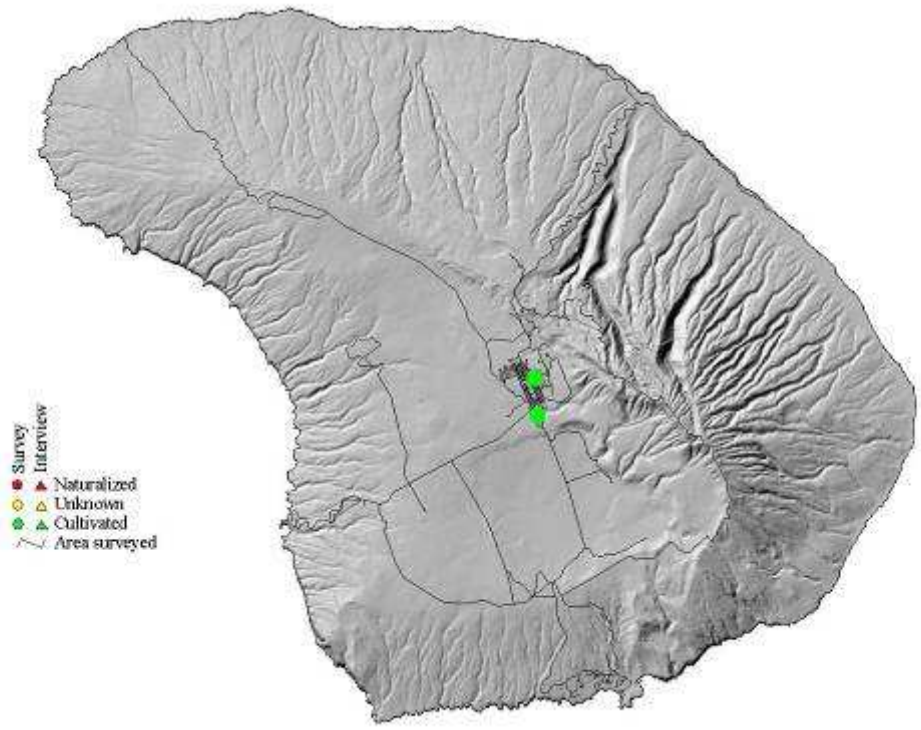
Leptospermum scoparium was widely planted and naturalized along the Munro Trail / Lanaihale area. Additional locations were added from expert interviews extending the distribution further out along Lanaihale where *L. scoparium* is spreading into eroded lands and through the *Eucalyptus* into the badlands. Plants were readily occupying degraded / eroded areas and sides of the trail. No cultivated plants were observed in town. Planted on Lanai by G.C. Munro. Specimens at BISH (www1) from Munro include those with dates from 1927 and 1928. First documented as spreading by Hobdy in 1985 who noted "Planted prior to 1930 by G.C. Munro, many seedlings and saplings reproducing" (www1). *L. scoparium*, native to New Zealand, is cultivated as an ornamental and as a forestry tree in Hawaii. Several other species are cultivated and naturalized as well. *L. scoparium* is spreading from plantings into disturbed mesic to wet forests on the islands of Kauai, Oahu, and Lanai (Wagner *et al.,* 1999).

Ligustrum spp.- Privet - (Oleaceae)



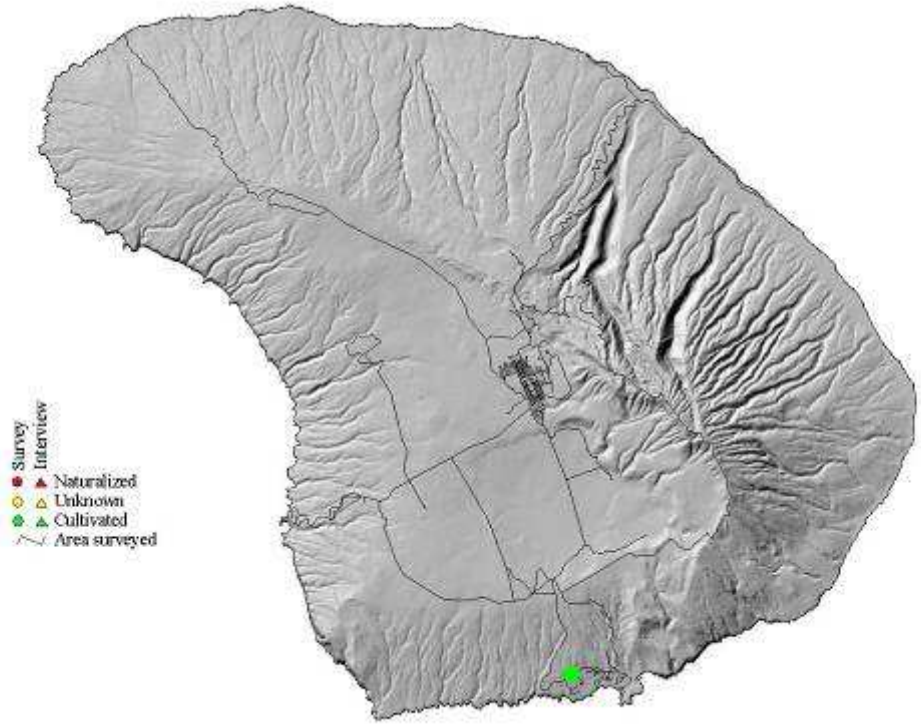
Ligustrum spp. were rarely cultivated in Lanai city, usually as a hedge. Several *Ligustrum* species are known from Hawaii, with *L. sinense* being the more weedy of the species. We did not distinguish to species during our mapping and it was likely one of the not so weedy species that was being cultivated around town. *L. sinense* is native to temperate Asia. In Hawaii, *L. sinense* was recently reported as naturalized on the islands of Kauai and Hawaii (Herbarium Pacificum Staff 1999, Lorence and Flynn 1999, Wagner *et al*. 1999). On Kauai, according to Lorence and Flynn (1999), "This species has become naturalized profusely around the cabins at Kokee State Park and now extends far into the forest". Collections were made along Halemanu road near cabins in degraded *Acacia koa* mesic forest, and on Faya road in *Acacia/Metrosideros* forest at an elevation of 1,060 m (3,478 ft). On the island of Hawaii, *L. sinense* was collected in Hawaii Volcanoes National Park, near the Thurston Lava Tube, at an elevation of 3,800 ft (1,158 m), in closed *Metrosideros* forest (Herbarium Pacificum Staff 1999).

Livistona chinensis - Chinese fan palm - (Arecaceae)



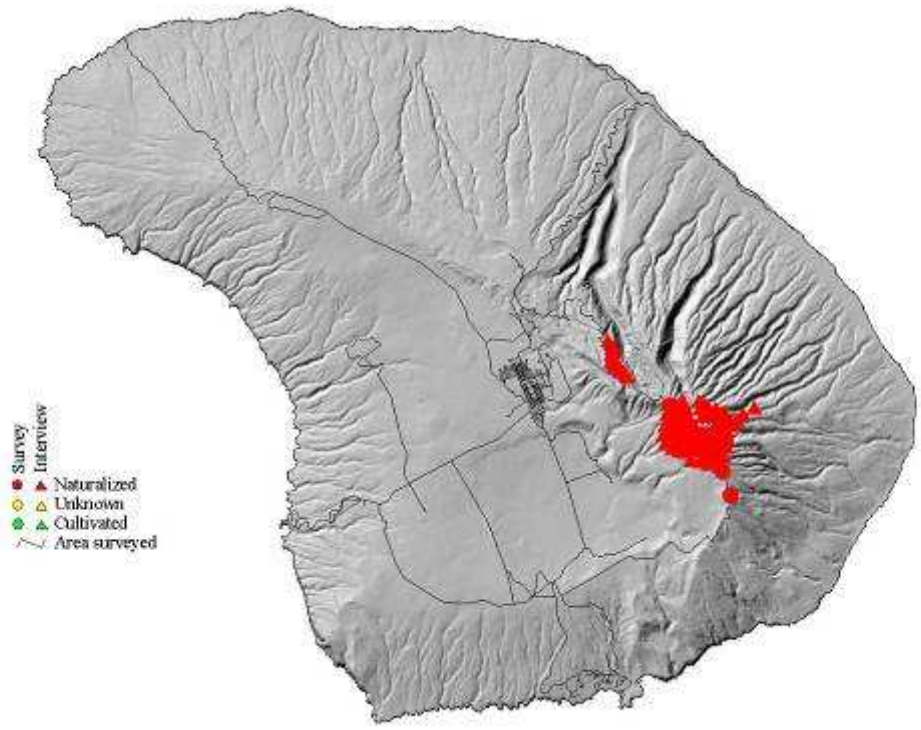
Livistona chinensis was rarely cultivated in yards of Lanai City. No naturalized plants were observed. *L. chinensis* is native to Southern Japan and central China, Ryukyu Islands, and Taiwan (Dehgan 1998, Wagner *et al.* 1999). In Hawaii, *L. chinensis* is naturalized on the islands of Oahu and Maui (Wagner *et al.* 1999, Oppenheimer 2003). On Maui, *L. chinensis* prefers moist areas, such as Haiku to Hana, rather than hot dry habitats, and can typically be seen spreading from plantings into nearby gulches, streams, and shady secondary disturbed forested areas (Starr *et al.* 2006a).

Macaranga mappa - Bingabing - (Euphorbiaceae)



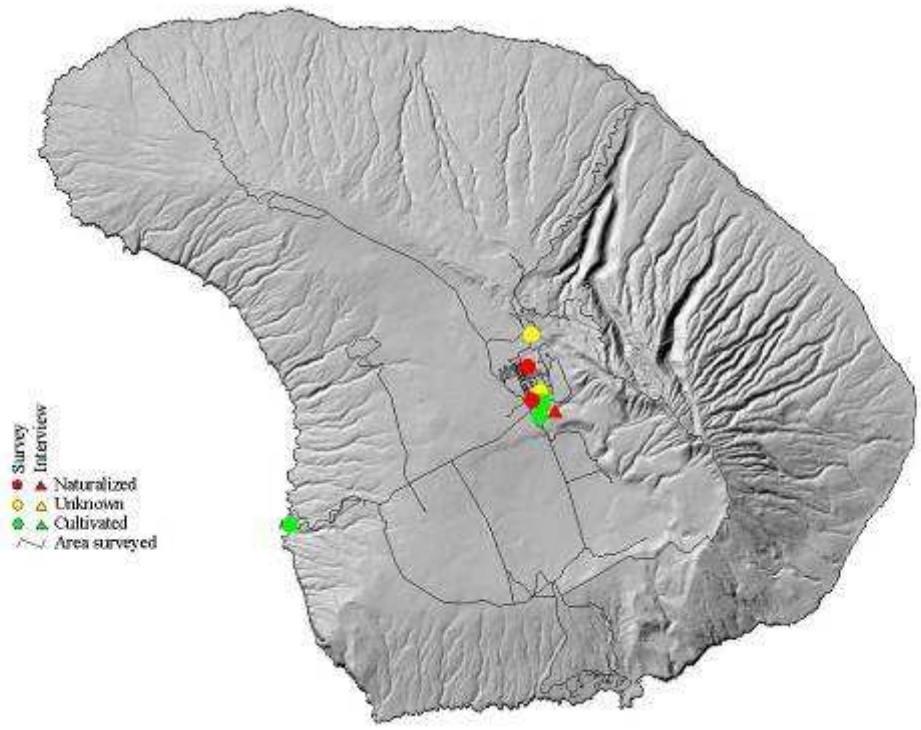
Macaranga mappa was sparingly cultivated at a single residence in Hulopoe where two small plants were observed among plantings along a driveway. It is uncertain whether they were being intentionally cultivated or were contaminants in other potted materials. *M. mappa* is native to the Philippines (Wagner *et al.* 1999). It is cultivated in tropical areas as an ornamental and forestry tree. *M. mappa* is a large leaved tree in Hawaii that is spread by fruit eating birds and forms large dense stands in low elevation moist to mesic areas, 0-220 m (722 ft), on the islands of Oahu and Hawaii (Wagner *et al.* 1999). On Maui, *M. mappa* has been found being transported to nurseries as a contaminant in potted plants shipped from infested areas of Hawaii (Starr *et al*. 2006a).

Morella faya - Fire tree - (Myricaceae)



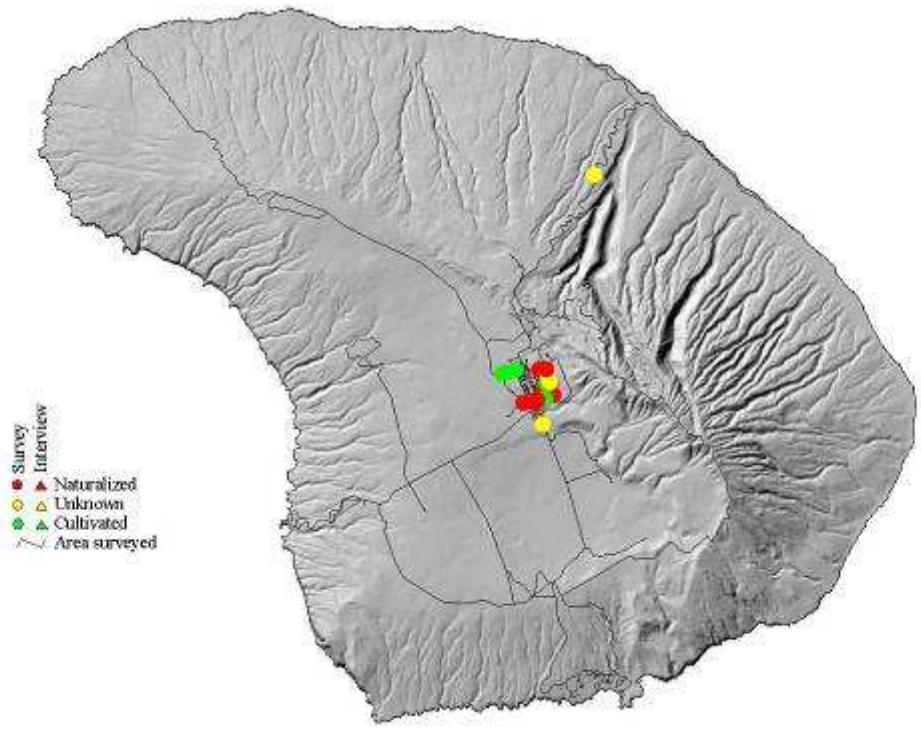
Morella faya [*Myrica faya*] was found to be widely planted and naturalized along the Munro Trail and Lanaihale areas, especially the southeastern portion of the trail. Numerous large trees and saplings were observed along the trail and spreading off into the distance in disturbed and eroded areas. Additional locations were added through expert interviews in the wetter eastern section of Lanaihale where *M. faya* is planted and spreading, especially on disturbed ground. It was not observed being cultivated anywhere on Lanai. Several collections have been made from Lanai (www1) from the Lanaihale areas, where it was noted to be reseeding as early as 1963 by Degener. *M. faya* is native to the Canary Islands, Madeira, and the Azores (Wagner *et al*. 1999). *M. faya* was introduced to Hawaii in the late 1800's presumably by Portuguese laborers for ornamental purposes and for making wine out of the fruits (Little and Skolmen 1989). It was then cultivated and planted throughout the Hawaiian Islands in reforestation efforts (Skolmen and Little 1989). It is also cultivated as an ornamental tree in yards and gardens. In Hawaii, *M. faya*, is now naturalized and considered a serious pest, becoming dominant in many areas, occurring in mesic to wet forest, 150-1,310 m (492-4,298 ft), on Kauai, Oahu, Lanai, Maui, and Hawaii (Oppenheimer *et al.* 1999, Wagner *et al.* 1999). *M. faya* is a Hawaii state noxious weed (HDOA 1992).

Ochna spp. - Mickey mouse plant - (Ochnaceae)



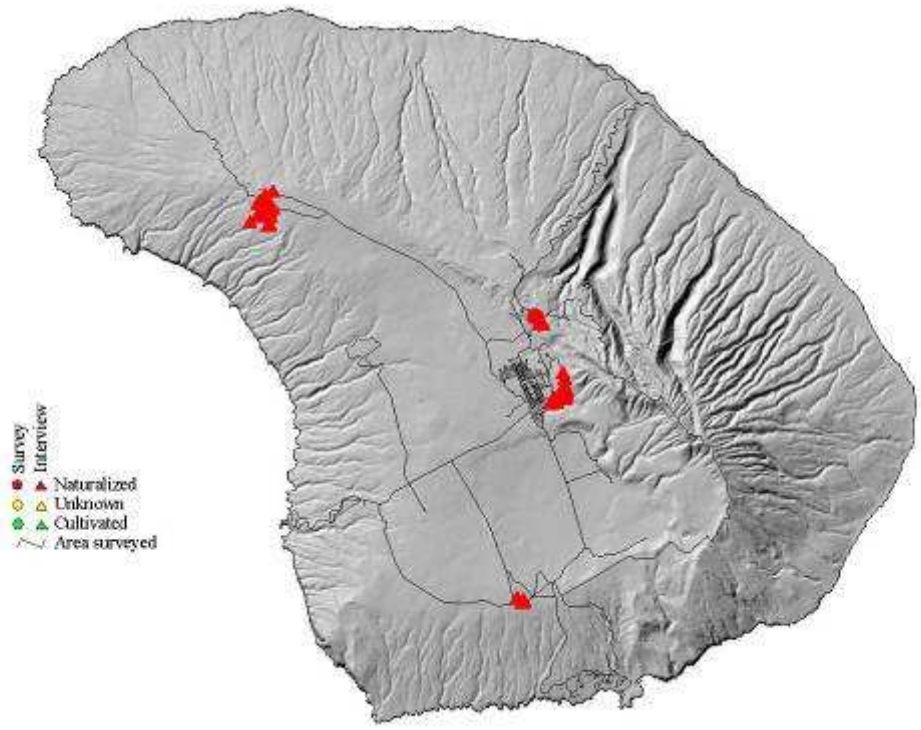
Ochna spp. were occasionally cultivated and naturalized near home sites, especially in Lanai City, and rarely in the Kaumalapau area. Naturalized plants of *Ochna thomasiana* were previously collected by S. Anderson, E. Anderson, and B. Plunkett from the Kapano Gulch area (Starr *et al.* 2006b). *O. serrulata* is native to the eastern Cape of Good Hope region in South Africa (Palgrave 1988). *O. thomasiana* is native to southeastern Africa (Whistler 2000). In Hawaii, both species are known to spread from initial plantings via bird dispersed fruits and frequently volunteer nearby homes, gardens, and disturbed areas. *O. serrulata* is naturalized at Manuka, Hawaii (Herbarium Pacificum staff 1998). *O. thomasiana* is naturalized on Oahu, Maui, and Lanai (Herbarium Pacificum staff 1998, Oppenheimer 2003, Oppenheimer 2004, Starr *et al.* 2006b).

Olea europaea subsp. *cuspidata* - African olive - (Oleaceae)



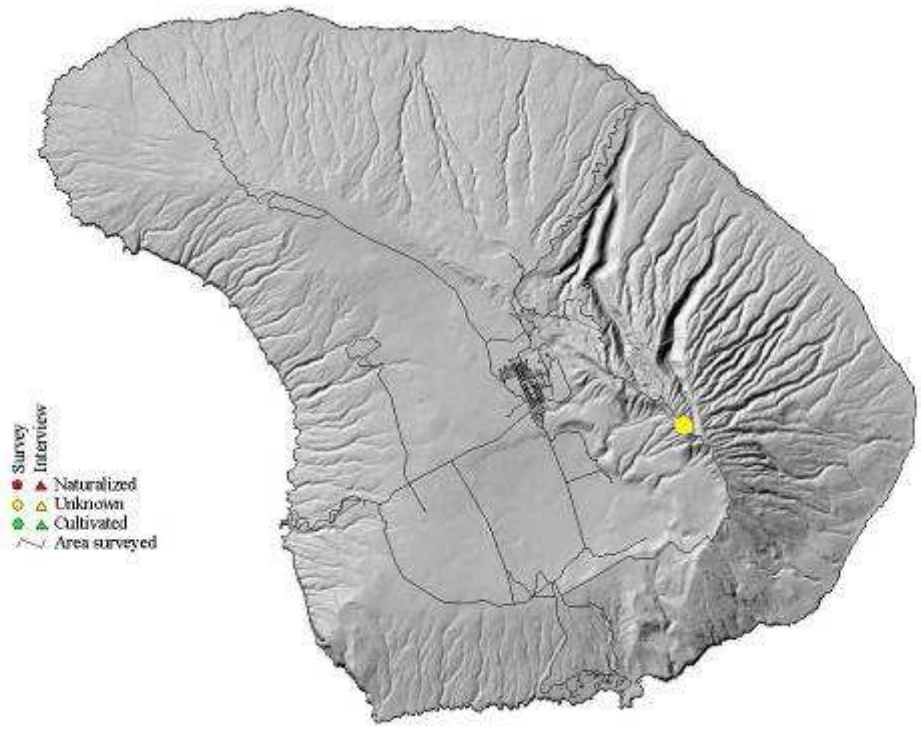
Olea europaea subsp. *cuspidata* was cultivated as a hedge plant and naturalized in and near Lanai City and one small area on Keomoku Rd. A collection was made during this survey (Starr-070403-04) representing a new island record for this species from Lanai. *O. e.* subsp. *cuspidata* is native to the Mediterranean region (Wagner *et al.* 1999). In Hawaii, this particular subspecies is commonly cultivated as a hedge or windbreak and sometimes as single trees. This species is widely planted and is spread by fruit eating birds into nearby areas. In Hawaii, it is naturalized on the islands of Hawaii, Kauai, and Maui (Wagner *et al.* 1999; Lorence *et al*. 1995; Starr *et al*. 1999). A single cultivated tree is known from Midway Atoll (Starr and Martz 1999).

Pennisetum setaceum - Fountain grass - (Poaceae)



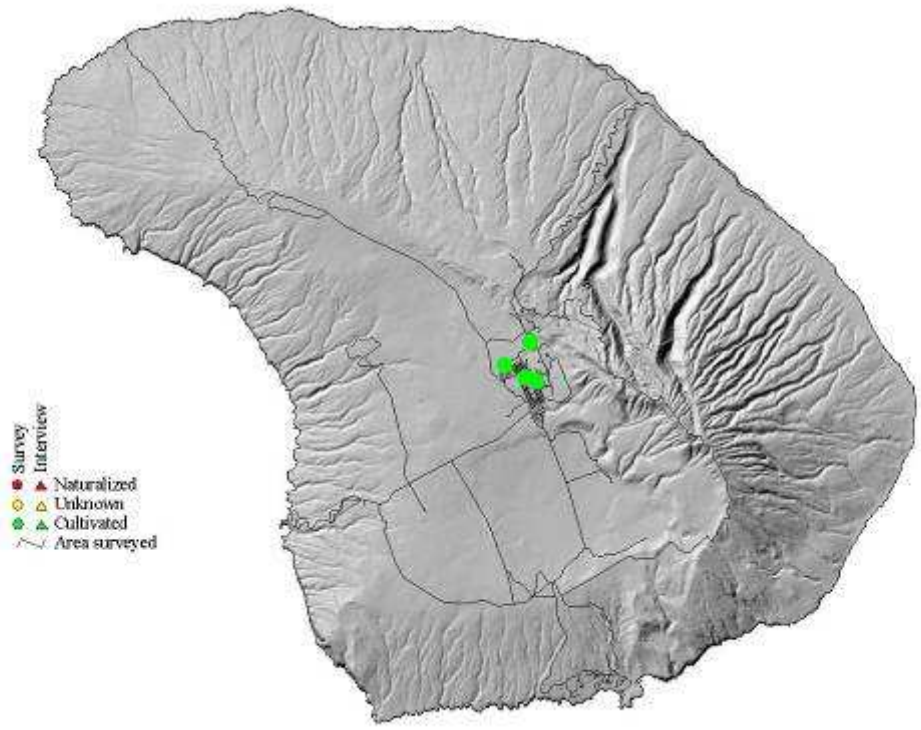
Pennisetum setaceum was observed in the Koele area on the edge of the golf course under ironwood trees (*Casuarina equisetifolia*). Two sterile young plants were observed and pulled. This was a site that had previous control work done. Existing GPS data added several other sites, most of which have had some control already, in the following areas: near Kanepuu in eroded soils, areas around the golf course just outside Lanai City, and in abandoned fields along Miki Rd. and Kaupili Rd. Various other grass species (*Pennisetum* sp. and *Sporobolus* sp.) occur in the same areas and add to the difficulty of picking this species out of a sea of grasses. *P. setaceum* is native to northern Africa. It is an aggressive fire adapted grass that can form monotypic stands and is considered a pest plant in many parts of North America and Hawaii. In Hawaii, *P. setaceum* is known from the islands of Kauai, Oahu, Lanai, Kahoolawe, Maui, and Hawaii (Wagner *et al*. 1999, Starr *et al.* 2006b). *P. setaceum* is a Hawaii state noxious weed (HDOA 1992).

Phormium tenax - New Zealand flax - (Agavaceae)



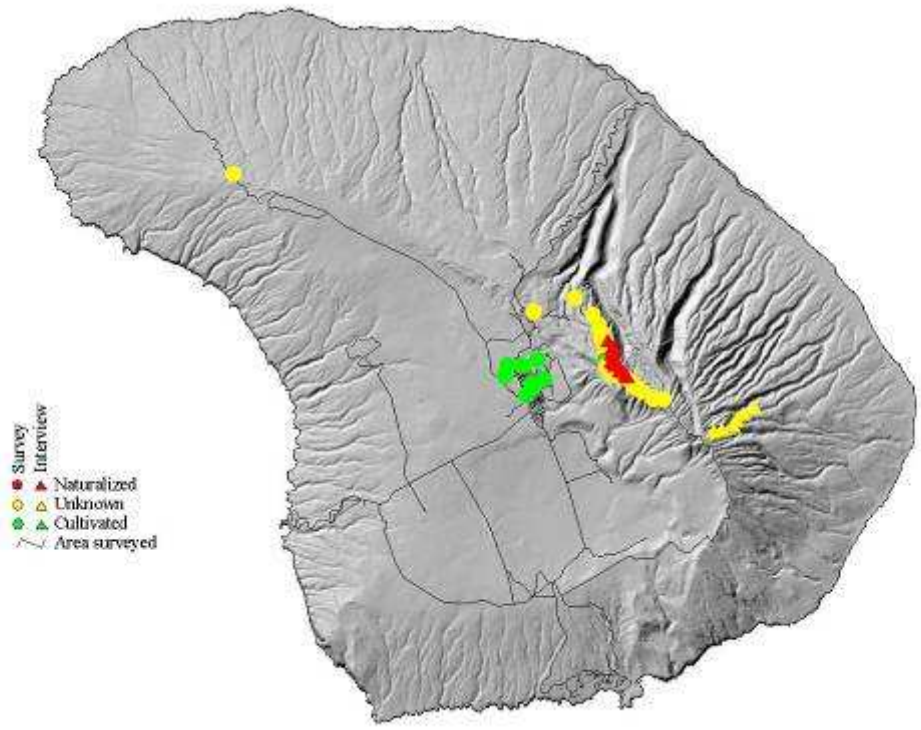
Phormium tenax was found along the Munro Trail near the summit of Lanaihale. These plants were originally planted by G.C. Munro and are scattered along the road and sometimes off the road a bit. It is not yet coming up in areas where it could perhaps do well in. Because rare native *Partulina* snails can be found living on these plants, removal of the plants may not be possible. *P. tenax* is native to New Zealand and is cultivated as a specimen plant in gardens. *P. tenax* has been cultivated in Hawaii since at least 1871 and is now known to be naturalized on the islands of Kauai and Molokai (Wagner *et al*. 1999). On Molokai, established populations occur in Kamakou Preserve, in ohia (*Metrosideros polymorpha*) forest, disturbed grassland, boggy soils, and pig disturbances, at approximately 3,750 ft (1,143 m); and along roads in forest reserves at an elevation of about 2,500 ft (762 m) (Tina Lau pers. comm.).

Pimenta dioica - Allspice - (Myrtaceae)



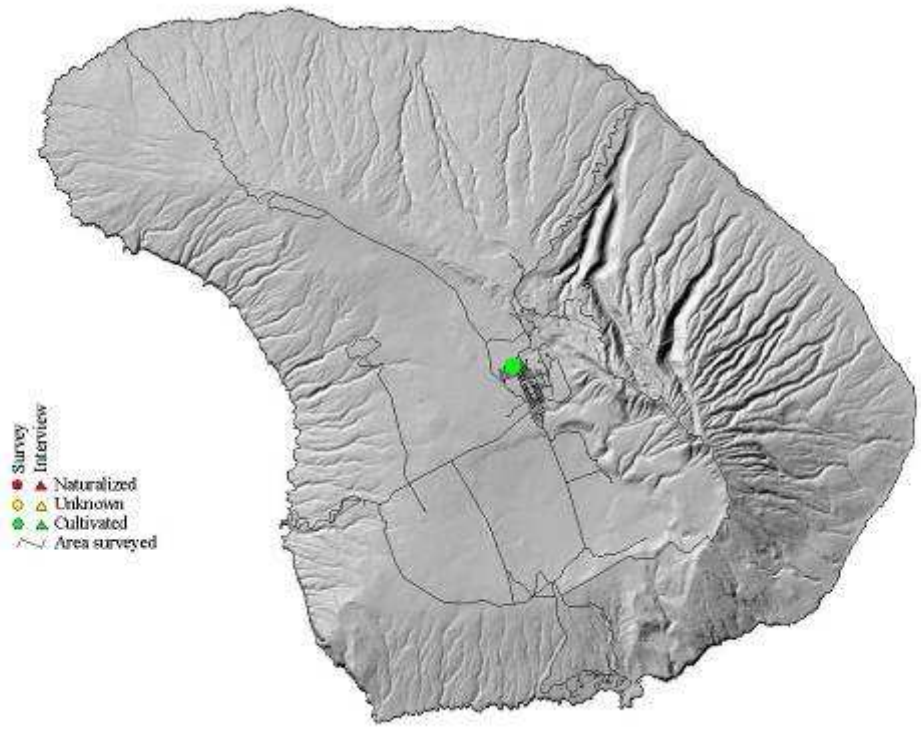
Pimenta dioica was rarely cultivated in Lanai City and Koele. The largest planting was at the post office where trees were planted around the parking lot area and around the lodge at Koele. *P. dioica*, native to the West Indies, southern Mexico, and Central America, is widely cultivated in warm regions of the world (Riffle 1998). *P. dioica* is spread by fruit eating birds and has escaped from cultivation in some areas, including Tonga and Hawaii (PIER 2003). In Hawaii, *P. dioica* has long been cultivated. It was recently published as naturalized for the islands of Kauai and Maui (Lorence *et al*. 1995, Wagner *et al.* 1999, Starr *et al*. 2003b). On Maui, it was reported from Haiku, a moist lowland site, with many seedlings and scattered juveniles coming up in a thicket of guava (*Psidium guajava*) (Starr *et al*. 2003b). It is also spreading on Oahu (C. Chimera pers. comm., R. Hobdy pers. comm.).

Pinus spp. - Pines - (Pinaceae)



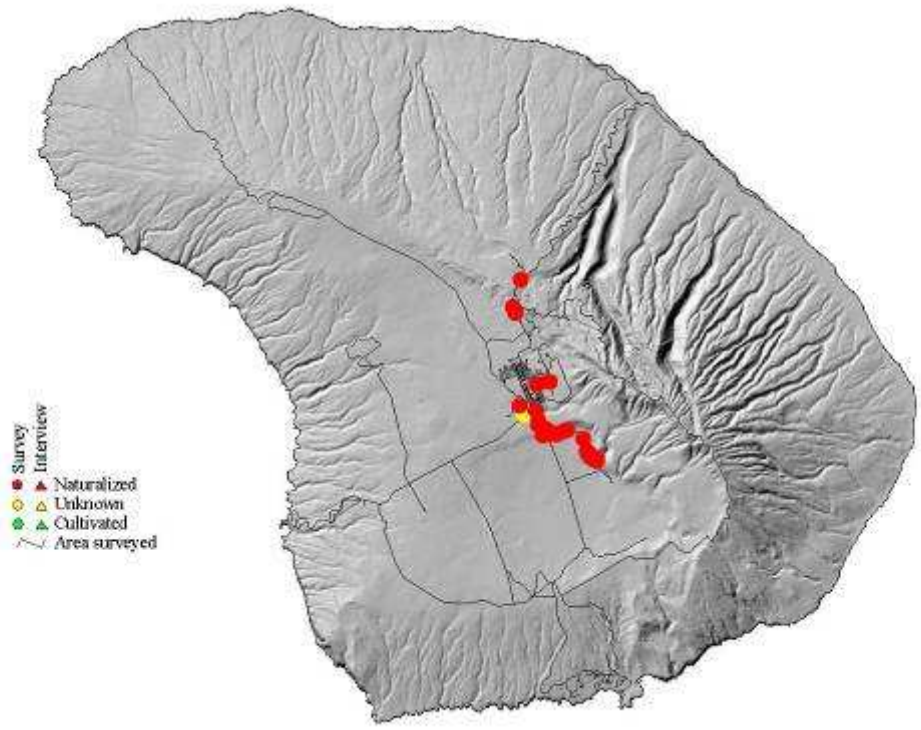
Pinus spp. were occasionally cultivated in Lanai City, Kanepuu, and along the Munro Trail at Lanaihale. In some areas, we were uncertain whether pines were cultivated, naturalized, or both. Expert interviews added several locations of naturalized plants on gulch walls near the Munro Trial and from cultivated plants on windward ridges towards the eastern portion of Lanaihale. Several *Pinus* species are planted on Lanai, including Monterey pines (*Pinus radiata*), which apparently are not that healthy on Lanai, loblolly pines (*Pinus taeda*), slash pines (*Pinus elliotii*) (R. Hobdy *pers. comm*.), and Jeffrey pines (*Pinus jeffreyi*), which have a lemony scent (H. Oppenheimer pers. comm.). For our maps, we did not distinguish to species. *Pinus* spp. have been widely planted in the Hawaiian Islands in reforestation efforts. Pines are large quick spreading trees that dominate and shade out all other plants in their way. In Hawaii, pines thrive in sub-alpine and mesic forest habitat (Starr *et al.* 2006a).

Piper auritum - False awa - (Piperaceae)



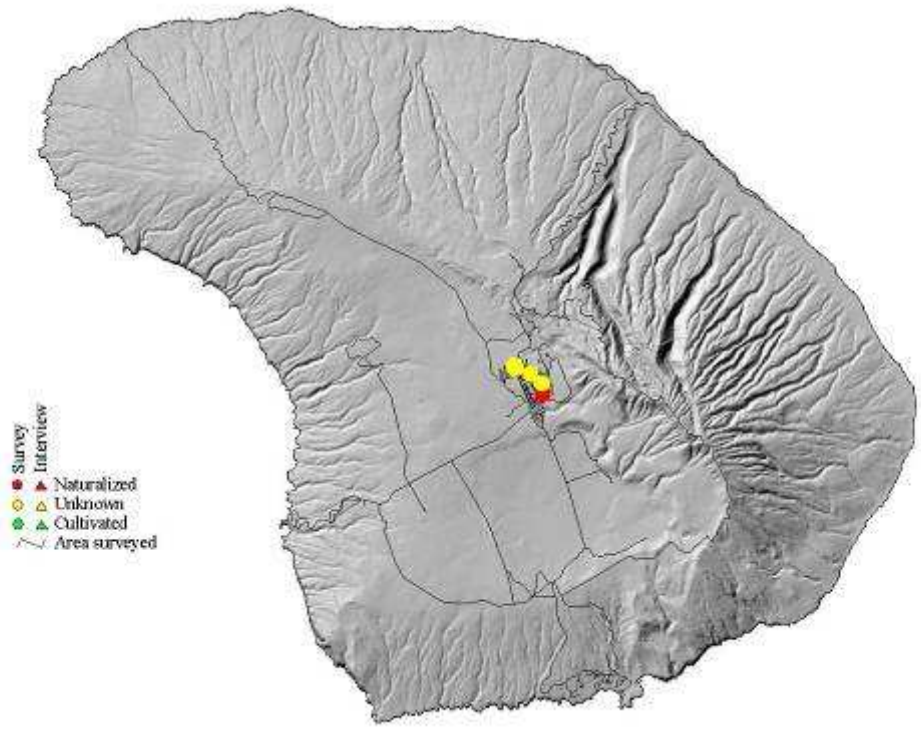
Piper auritum was observed from one planting in Lanai City. Regular awa (*Piper methysticum*) was also being cultivated on the same parcel. *P. auritum* is native to Costa Rica (PIER 2002). It is considered invasive in Tonga and Samoa (PIER 2002). In Hawaii, recently documented as naturalized on Kauai and Oahu (Lorence and Flynn 2006). Lorence and Flynn (2006) report the following, "False sakau is now a widespread weed in the Pacific and there is a concern that it could become so in the Hawaiian Islands as well." In Hawaii, *P. auritum* is cultivated in botanical gardens and is sometimes mistaken for awa (*P. methysticum*) which is traditionally used in the production of kava, a drink. It is known to spread aggressively in low wet disturbed habitats on Maui, including the areas of Nahiku and other parts of Hana Hwy (pers. obs.). *P. auritum* is distinguished from *P. methysticum* by having leaves that are fringed with white hairs and smell like anise when crushed (PIER 2002).

Pittosporum viridiflorum - Cape pittosporum - (Pittosporaceae)



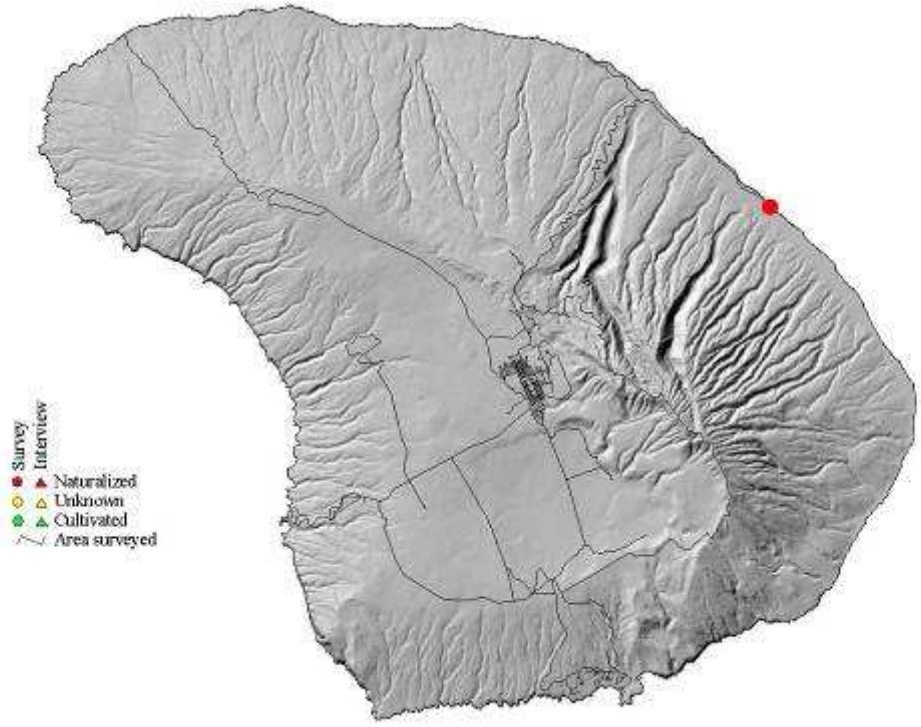
Pittosporum viridiflorum was widely cultivated and naturalized near Kapano Gulch and in yards and undeveloped areas in the southern part of Lanai City. *P. viridiflorum*, native to South Africa, is cultivated in Hawaii as an ornamental plant (Wagner *et al.* 1999). In Hawaii, *P. viridiflorum* was first collected in 1954. It spreads from plantings via bird dispersed seeds and is now naturalized on the islands of Hawaii, Lanai, and Maui (Starr *et al*. 1999, Wagner *et al*. 1999).

Podranea ricasoliana - Podranea - (Bignoniaceae)



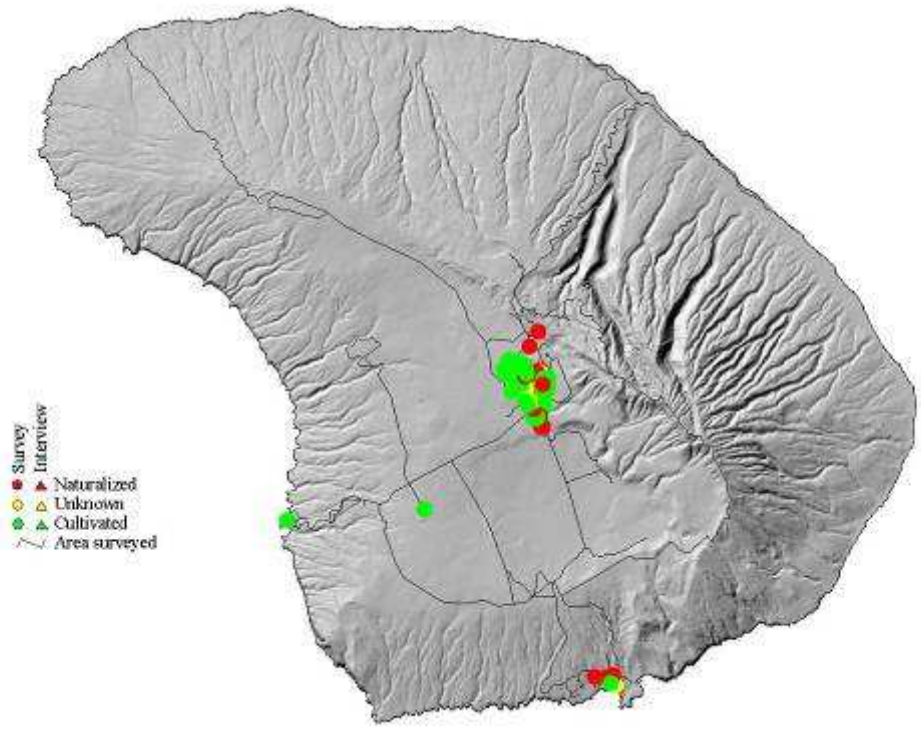
Podranea ricasoliana was occasionally cultivated and naturalized on Lanai, especially on the margins of Lanai City. *P. ricasoliana*, a vine with showy purple to pink trumpet like flowers, is native to South Africa and is widely cultivated. It has vigorous growth and can spread vegetatively from plantings, smothering nearby vegetation and objects. In Hawaii, this plant is rarely planted in new gardens and is generally observed persisting after being abandoned. Seeds are occasionally produced, with long seedpods containing papery winged seeds.

Prosopis juliflora - Long thorn kiawe, long leaf kiawe - (Fabaceae)



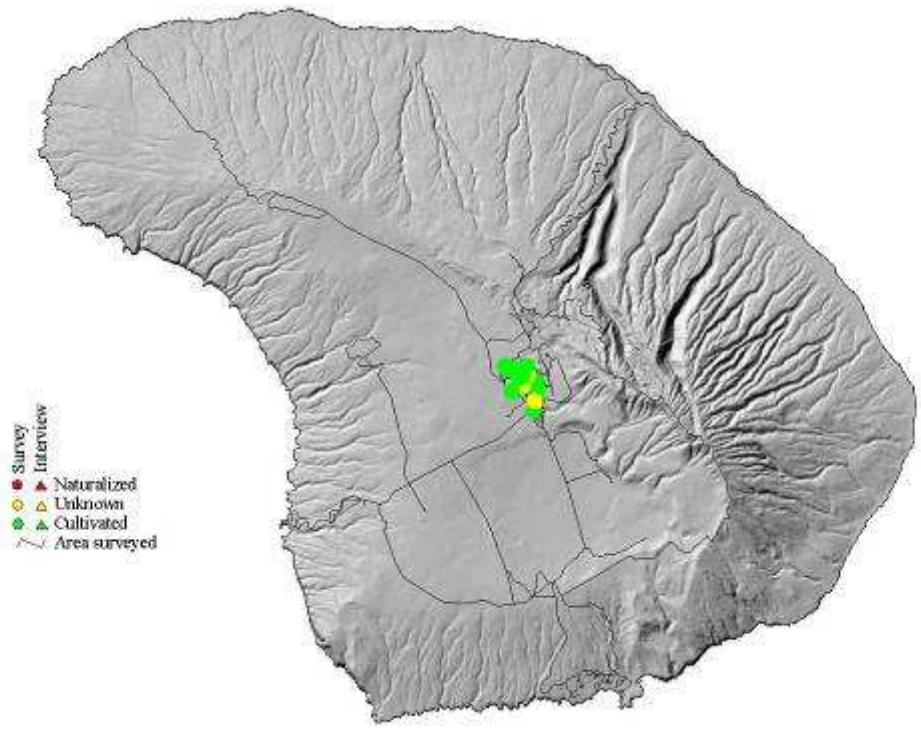
Prosopis juliflora or what appears to be this species, and perhaps a hybrid swarm, was found as a continuous thicket near the coast along Keomoku Rd. This species is distinguished from *P. pallida* by having longer leaflets that are glabrous. However, the two have been taxonomically confused for some time, and we were unable to definitively distinguish the two enough to confidently map this species. H. Oppenheimer had made a collection that will help pin down the identity of the plants found on Lanai. *P. juliflora* is native to the Neotropics, and has been introduced to many tropical areas (Wagner et al. 1999). In Hawaii, this spiny tree has been documented from Oahu (Wagner et al. 1999), is a target control species for KISC on Kauai, is now also known from Lanai (Oppenheimer in prep), and was recently observed being cultivated as a hedge at a new house being built near the ocean at Papohaku, Molokai (Starr *et al*. 2005) and is now a MoMISC target. On Oahu, this species was first documented in 1978 by Herbst and Walker who noted that *P. pallida* also grows in the same area and appears to hybridize with *P. juliflora* (Wagner *et al*. 1999).

Schefflera actinophylla - Octopus tree- (Araliaceae)



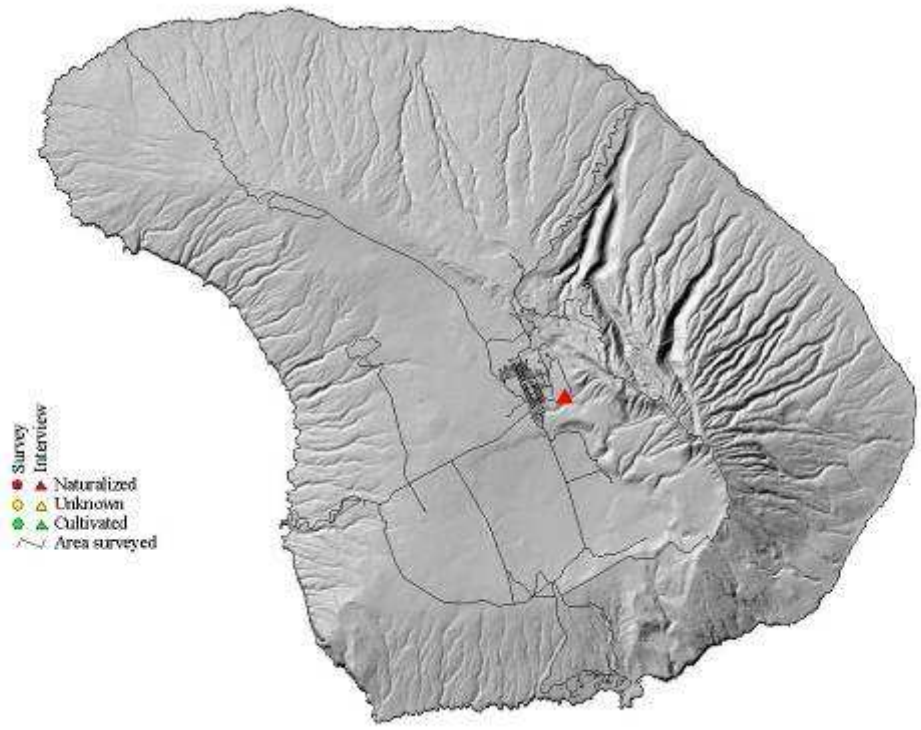
Schefflera actinophylla was one of the most commonly cultivated plants on Lanai. It was observed as widely cultivated and naturalized in Lanai City and Hulopoe where it was often growing epiphytically in other plants and on structures. It was also occasionally cultivated in places along Kaumalapau Hwy. *S. actinophylla* is native to Australia and New Guinea and is widely cultivated as a tropical ornamental (Wagner *et al.* 1999). In Hawaii, *S. actinophylla* is naturalized in relatively low elevation, mesic, disturbed areas at least on Kauai, Oahu, Maui, and Hawaii, but probably on all the main islands (Wagner *et al*. 1999).

Schefflera arboricola - Dwarf octopus tree- (Araliaceae)



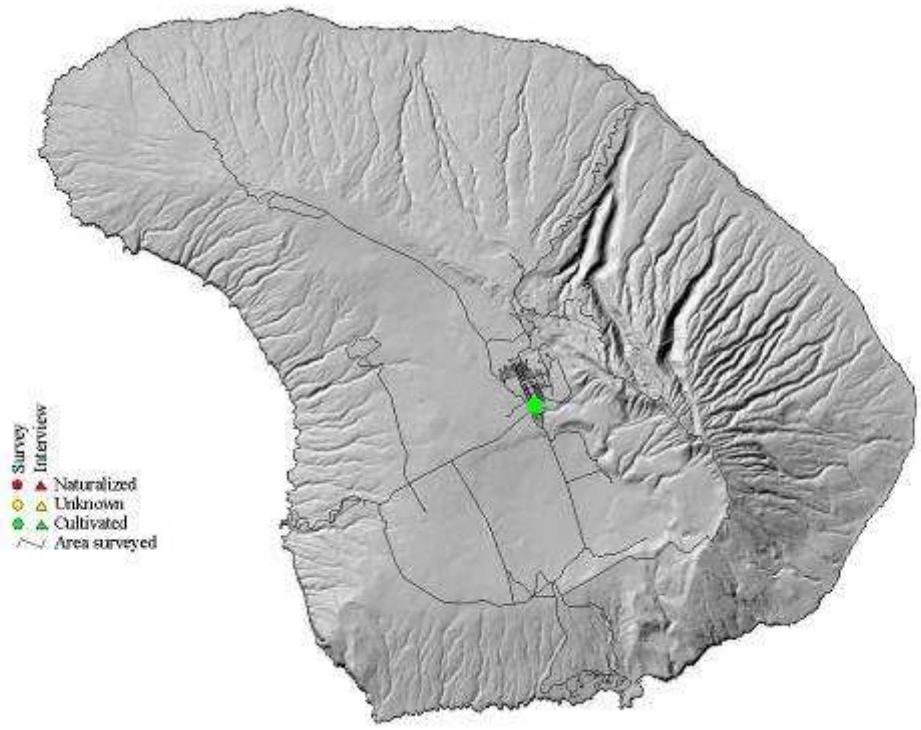
Schefflera arboricola was commonly cultivated and questionably naturalized in Lanai City. *S. arboricola*, native to Taiwan, is similar in appearance and behavior to the related species, *S. actinophylla*, but is more compact. *S. arboricola* produces numerous bird dispersed fruits and occasionally spreads in moist lowland areas where it comes up in nooks of tree branches and on fence posts. This species is a popular ornamental in Hawaii and was recently documented as naturalized on Maui (Starr *et al.* 2003).

Senecio madagascariensis - Fireweed - (Asteraceae)



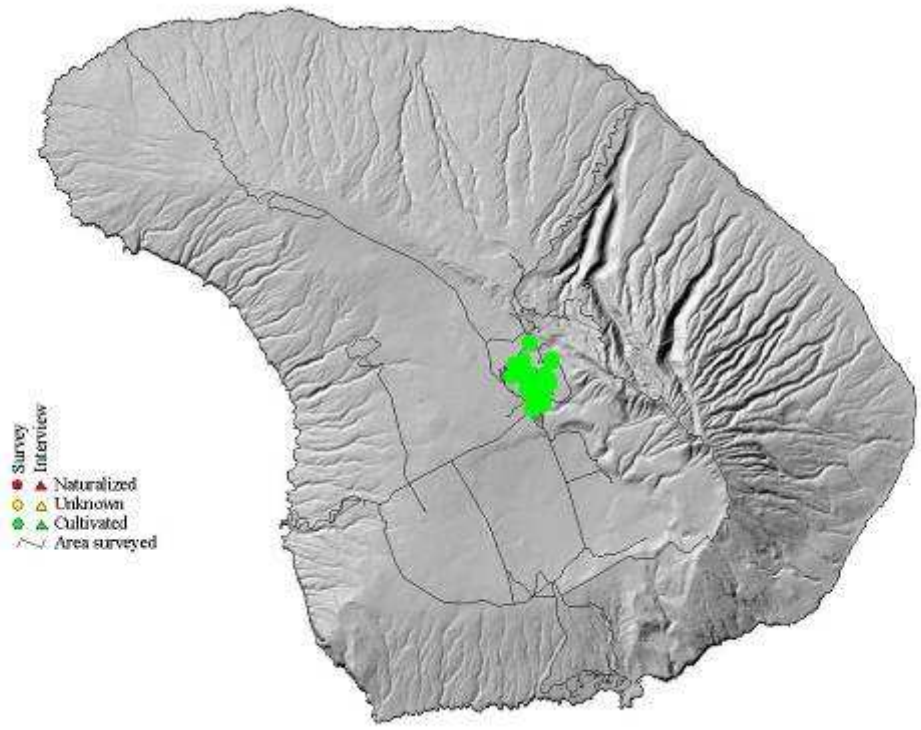
Senecio madagascariensis was not observed during our roadside survey. However, it was previously collected by S. Anderson and E. Anderson at the Koele golf course representing a new island record for Lanai (Starr et al. 2006b) and has been removed from the same area by MISC staff during fountain grass work. *S. madagascariensis* is native to Madagascar and South Africa (Motooka *et al.* 1996. *S. madagascariensis* is toxic to livestock and grazing animals, is a heavy seeder which easily disperses and forms dense stands. It is a pest in Australia, New Zealand, and Hawaii. In Hawaii, *S. madagascariensis* is now naturalized on Kauai, Oahu, Maui, and Hawaii (Lorence *et al*. 1995, Starr *et al*. 1999, Wagner *et al*. 1999, Oppenheimer and Bartlett 2002, Herbst *et al*. 2004). It is a Hawaii state noxious weed (HDOA 1992).

Solandra maxima - Cup of gold - (Solanaceae)



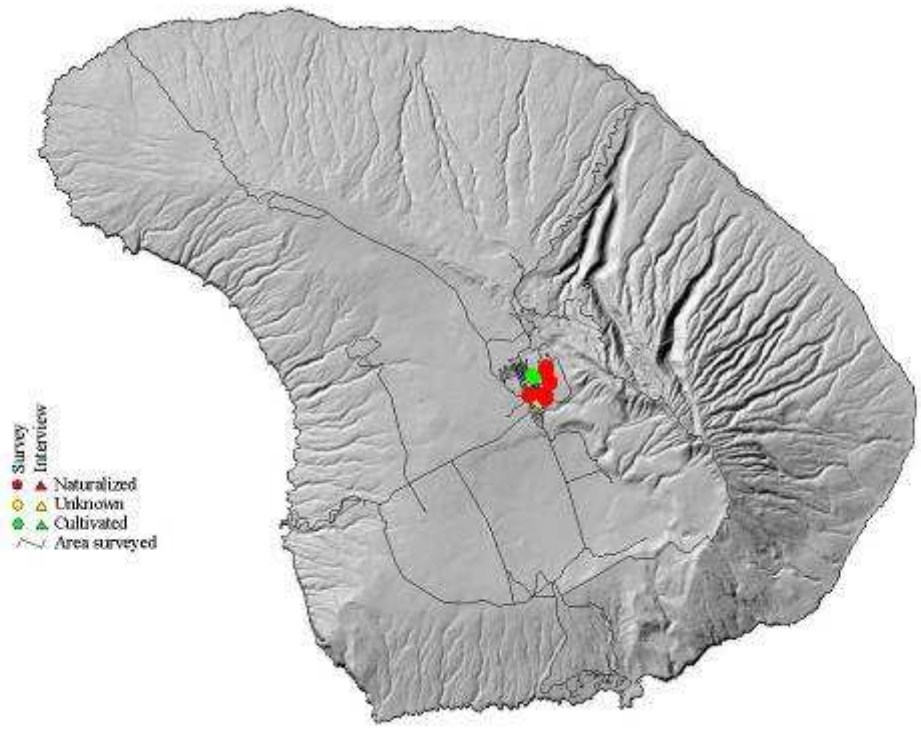
Solandra maxima was observed being cultivated at a single site in the front yard of a residence in Lanai City on Kaumalapau Rd. *S. maxima* is native to Mexico and is commonly cultivated in tropical areas for its large showy fragrant flowers. In Hawaii, it has long been cultivated and is said to persist, especially near Hilo, Hawaii (Wagner *et al*. 1999). It is also a pest in Kokee, Kauai (F. Krauss pers. comm.).

Sphaeropteris cooperi - Australian tree fern - (Cyathaceae)



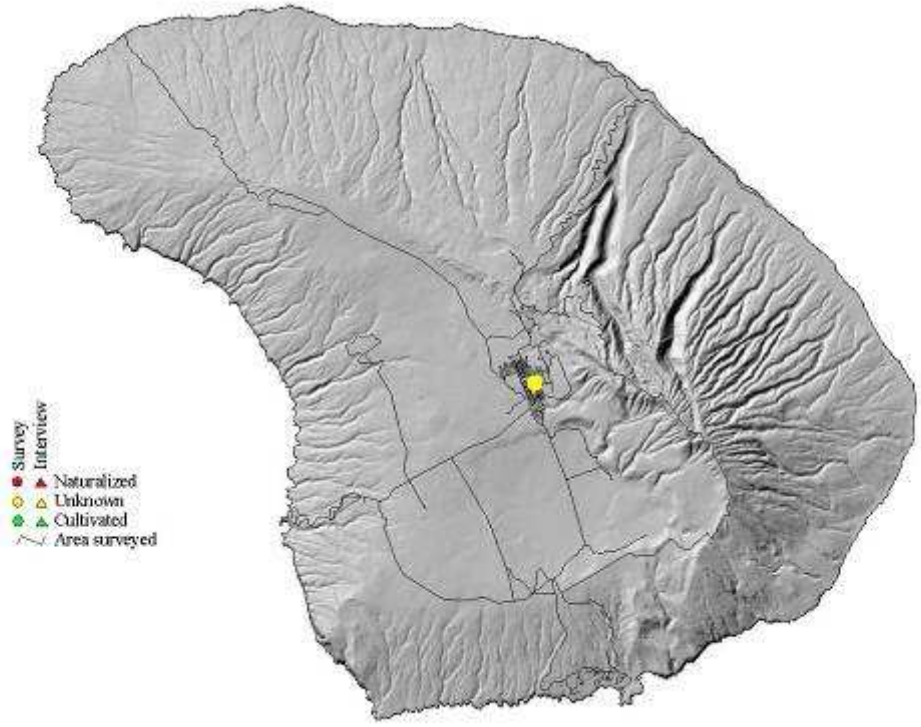
Sphaeropteris cooperi was widely cultivated in Lanai City. Some very old and tall plants were observed. No naturalized plants were seen and it is not known to be in natural areas of Lanai yet. *S. cooperi*, native to Australia, is commonly cultivated as an ornamental plant. In Hawaii, *S. cooperi* was reported as escaping from cultivation as early as 1950 on Oahu. Today, it is naturalized on Kauai, Oahu, Maui, and Hawaii and is considered one of the worst weeds in Kipahulu Valley of Haleakala National Park, Maui (Palmer, 2003). It is also currently a MoMISC target for eradication.

Thunbergia alata - Black-eye Susan vine - (Acanthaceae)



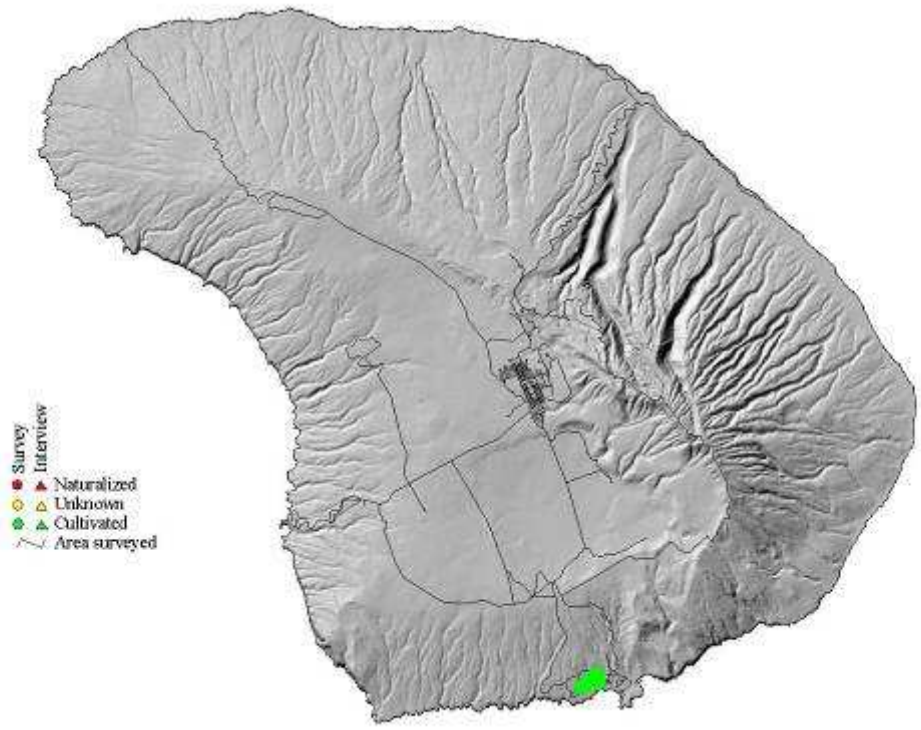
Thunbergia alata was occasionally cultivated and naturalized in and around Lanai City. A collection was made during this survey (Starr-070403-02) representing a new island record for this species on Lanai. It was not observed far from Lanai City. *T. alata*, native to tropical eastern Africa, is a sprawling vine that is often cultivated for its attractive flowers. It is widely cultivated and naturalized in other tropical regions of the world. In Hawaii, *T. alata* was first reported from Oahu in 1864-1865 and is now known from at least Kauai, Molokai, Maui, and in Hilo and Volcano Village, Hawaii (Wagner *et al.* 1999, Oppenheimer 2003). On Maui, this species can be seen blanketing gulches in dry to mesic areas of windward East Maui.

Thunbergia fragrans - Sweet clock vine - (Acanthaceae)



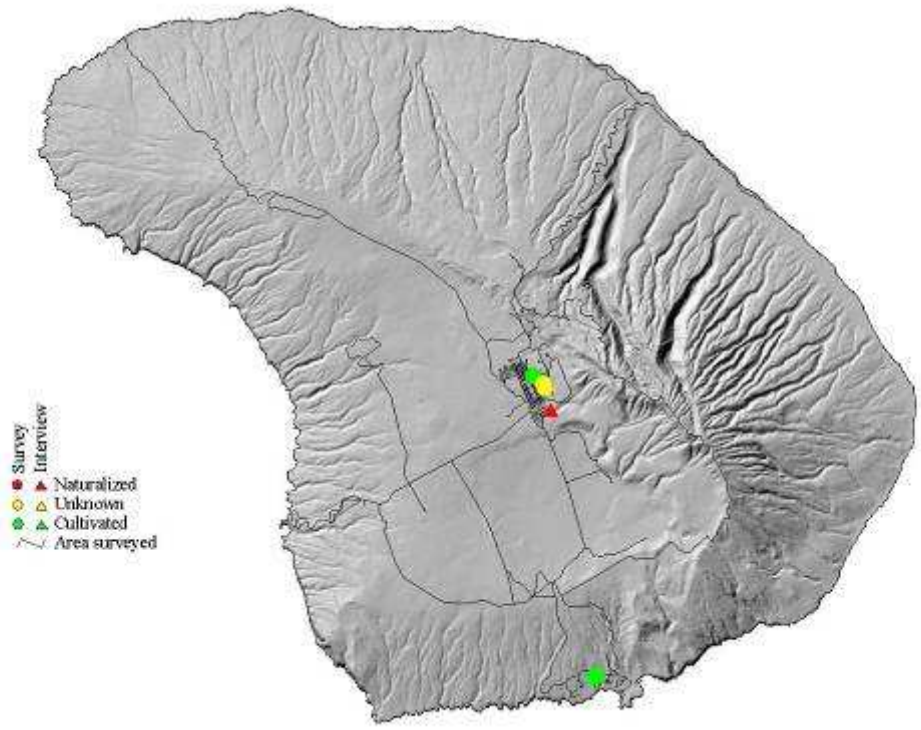
Thunbergia fragrans was rarely cultivated and sparingly naturalized in Lanai City. A collection was made during this survey (Starr-070403-08) representing a new island record for this species on Lanai. It was not yet observed outside of Lanai City. *T. fragrans* is native to India and Ceylon (Wagner *et al*. 1999). In Hawaii, *T. fragrans* was first collected on Kauai in 1916 and is now naturalized on probably all of the main islands (Wagner *et al*. 1999). On Maui, it is commonly observed naturalized nearby pineapple fields and other moist disturbed sites.

Thunbergia grandiflora - Trumpet vine - (Acanthaceae)



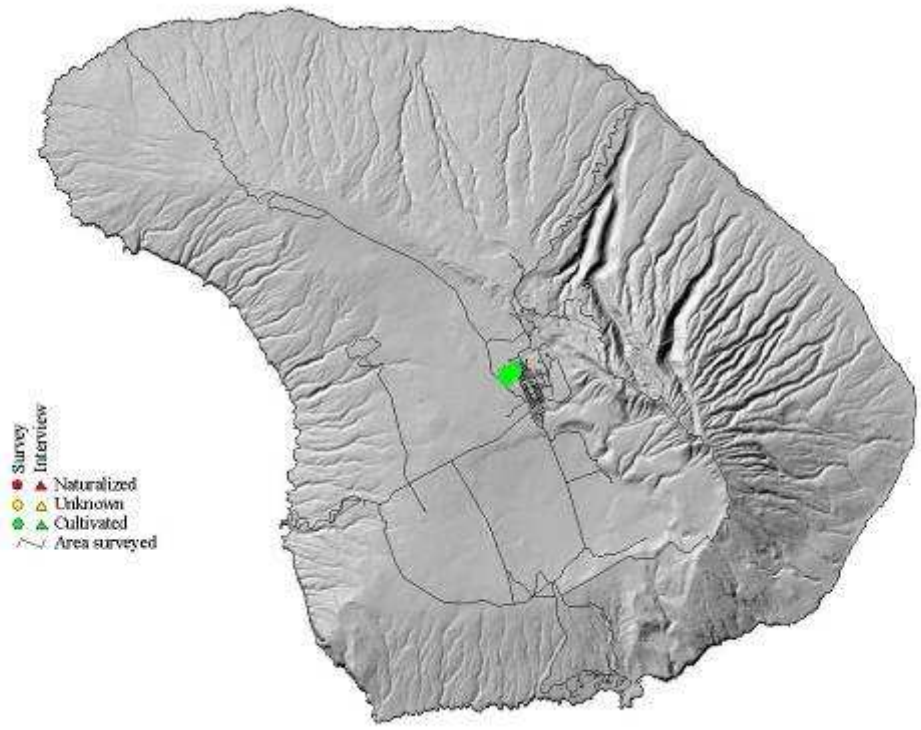
Thunbergia grandiflora was rarely cultivated in the Hulopoe area where it was usually grown as a hanging vine on trellises fronting condominiums. *T. grandiflora* is native to India (Wagner *et al.* 1999). *T. grandiflora* is an aggressive climber and is difficult to control once established due to large underground tuberous roots. In Australia, *T. grandiflora* is a declared noxious weed (Weeds Australia 2000). In Hawaii, *T. grandiflora* was first collected on Oahu in 1937 and is now sparingly adventive along hiking trails or margins of urban areas at least on Kauai, Oahu, Maui, and Hawaii (Wagner *et al.* 1999, Starr *et al*. 2002). In Hawaii, this species is often cultivated on trellises at hotels and condominiums.

Thunbergia laurifolia - Blue trumpet vine - (Acanthaceae)



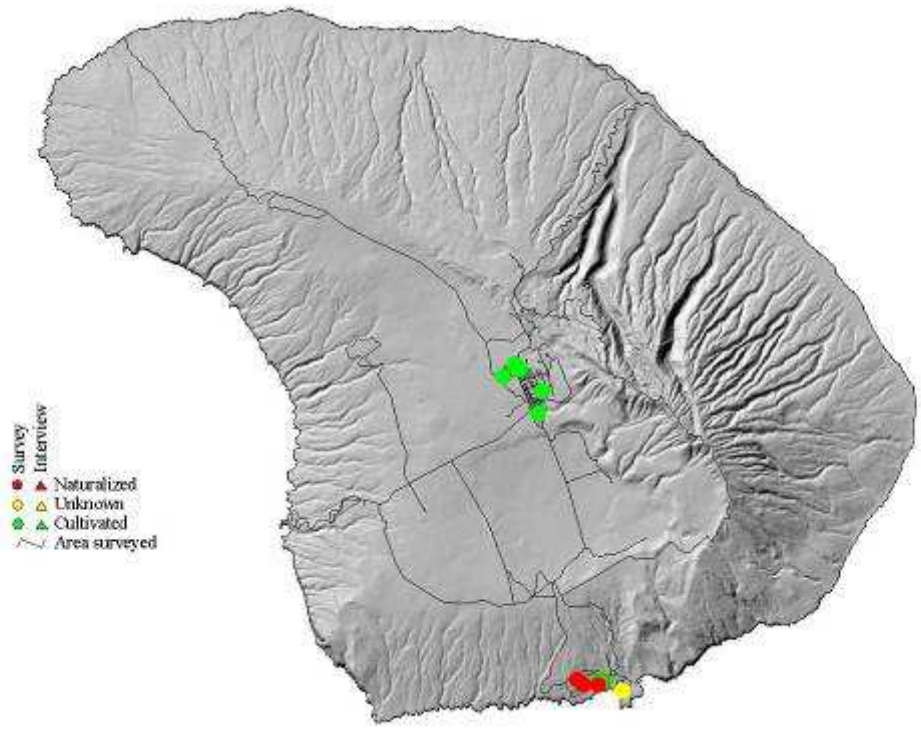
Thunbergia laurifolia was rarely cultivated in Lanai City and in the Hulopoe area. *T. laurifolia* was first collected as naturalized by S. Anderson, E. Anderson, and B. Plunkett from the Kapano Gulch area (Starr *et al.* 2006b). *T. laurifolia* is native to India (Wagner *et al.* 1999). It has similar aggressive growth and invasive attributes as *T. grandiflora*. In Hawaii, *T. laurifolia* was first collected on Oahu in 1890 and is now sparingly adventive along hiking trails or margins of urban areas at least on Kaua'i, Oahu, Lanai, and Maui (Starr *et al.* 1999, Wagner *et al.* 1999, Starr *et al.* 2006b).

Tibouchina urvilleana - Glory bush - (Melastomataceae)



Tibouchina urvilleana was rarely cultivated in Lanai City where a few plants were observed in yards in the same neighborhood. *T. urvilleana* is native to southern Brazil (Rio Grande do Sul to Rio de Janeiro) (Wagner *et al*. 1999). *T. urvilleana* forms dense thickets in moist areas of Hawaii (Smith 1985). *T. urvilleana* was first collected on the island of Hawaii in 1917 and is now naturalized on Kauai, Oahu, Maui, and Hawaii (Wagner *et al*. 1999). *T. urvilleana* is a Hawaii state noxious weed (HDOA 1992).

Washingtonia spp. - Mexican and California fan palm - (Arecaceae)



Washingtonia sp. was sparingly cultivated and naturalized, especially near Hulopoe. *W. filifera* (California palm), *W. robusta* (Mexican fan palm), and *W.* x *filabusta* (hybrids between the former two species) are large fan palms native to the west coast of the United States and Mexico that are commonly cultivated as ornamental street and landscape trees. In Hawaii, these palms were recently reported as naturalized on the island of Maui (Oppenheimer and Bartlett 2002). *Washingtonia* spp. tend to prefer hot dry areas near the coast where they are close to the water table, such as in ditches, near wetlands, and in other plantings. In there areas, *Washingtonia* spp. readily germinate and form thickets. Branches are armed with stout spines. They are apparently a fire hazard due to their thick petticoats which form along the trunk.

VOUCHER SPECIMENS

This list includes plant specimens collected during roadside surveys on Lanai (2007). All specimens are accessioned at BISH. A more detailed description for each species is below, including observed status on Lanai, previous collections, and collection number. The following notations were used (NIR=New island record, 2nd=Second collection, Add=Additional material, ID=Identification needed, Adv=Adventive).

Voucher #	Scientific name	Location	Significance
070402-01	*Dyssodia tenuiloba*	Kaumalapau Hwy.	NIR
070402-02	*Clitoria ternatea*	Hulopoe Dr.	NIR
070402-03	*Bidens alba* var. *radiata*	Road to airport	2nd
070402-04	*Kalanchoe daigremontianum*	Kaumalapau Hwy.	2nd
070402-05	*Acacia aneura*	Kaumalapau Hwy.	2nd
070402-06	*Pennisetum* sp.	Kaupili Rd.	ID
070402-07	*Centratherum punctatum* subsp. *punctatum*	Kapano Gulch	NIR
070403-01	*Lantana montevidensis*	Queen's St., Lanai City	Add
070403-02	*Thunbergia alata*	Queen's St., Lanai City	NIR
070403-03	*Ruellia brevifolia*	Queen's St., Lanai City	NIR
070403-04	*Olea europaea* subsp. *cuspidata*	Queen's St., Lanai City	NIR
070403-05	*Eugenia uniflora*	Queen's St., Lanai City	NIR
070403-06	*Tecomaria capensis*	Queen's St., Lanai City	Adv
070403-07	*Barleria repens*	Lanai City	2nd
070403-08	*Thunbergia fragrans*	Lanai City	NIR
070403-09	*Buddleja asiatica*	Puulani St., Lanai City	Add
070403-10	*Hyptis pectinacea*	Behind Experience golf course	2nd
070403-11	*Bothriochloa* sp.	Lanai City	ID
070404-01	*Delairea odorata*	Ninth St., Lanai City	NIR
070404-02	*Passiflora suberosa*	Kanepuu	Add
070404-03	*Neonotonia wightii*	Keomoku Rd.	2nd
070404-04	*Hyparrhenia dregeana*	Keomoku Rd.	2nd
070404-05	*Pennisetum* sp.	Keomoku Rd.	ID

***Acacia aneura* - Mulga acacia - Fabaceae**
A medium sized tree found and collected along the old Kaumalapau Rd. Many large trees and naturalized plants were observed around the quarry and along Kaupili Rd. Previously collected by K. Wood *et al.* in 1990 and published as a new island record by Wagner and Herbst (1995). Collected again during this survey (Starr-070402-05).

***Barleria repens* - Barleria - Acanthaceae**
This creeping bedding plant with salmon colored flowers was occasionally cultivated and naturalized in Lanai City. Previously collected by Oppenheimer representing a new island record for Lanai (Oppenheimer 2003). Collected again during this survey (Starr-070403-07).

***Bidens alba* var. *radiata* - Beggars tick - Asteraceae**
A few scattered plants were found along the road to the airport. Previously collected by Oppenheimer from the same area representing a new island record for Lanai (Oppenheimer in prep). Collected again during this survey (Starr-070402-03).

***Bothriochloa* sp. - Bothriochloa - Poaceae**
This grass was common on the margins of the road near the new housing developments in the new part of Lanai City. A collection was made for further identification (Starr-070403-11).

***Buddleja asiatica* - Dogtail - Buddlejaceae**
This small shrub was widespread around Lanai City. Previously documented from Lanai as naturalized along the Munro Trail by Oppenheimer and Bartlett (2002). Also collected during this survey (Starr-070403-09).

***Centratherum punctatum* subsp. *punctatum* - Larkdaisy - Asteraceae**
A few scattered plants of this purple flowered herb were observed as naturalized in the Kapano Gulch area just outside Lanai City. A collection was made (Starr-070402-07) representing a new island record for Lanai.

***Clitorea ternatea* - Butterfly pea - Fabaceae**
This small herb was observed in the Hulopoe area in disturbed unkept scrub on Hulopoe Dr. This collection (Starr-070402-02) represents a new island record for Lanai.

***Delairea odorata* - Cape ivy - Asteraceae**
A patch of this vine was observed near the Hotel Lanai. It may be sparingly naturalized or a remnant from an abandoned garden. Collected during this survey (Starr-070404-01) representing a new island record for Lanai.

***Dyssodia tenuiloba* - Dog fennel - Asteraceae**
This small yellow flowered herb was found and collected along Kaumalapau Hwy., occasionally cultivated and naturalized in Lanai City, locally common at the cemetery above Koele, and also noted from a small patch on Keomoku Rd. This collection (Starr-070402-01) represents a new island record for Lanai.

***Eugenia uniflora* - Surinam cherry - Myrtaceae**
This medium sized tree often grown for its edible acidic fruit was widely cultivated in Lanai City and naturalized in scrub areas nearby. Collected during this survey (Starr-070403-05) representing a new island record for Lanai.

***Hyparrhenia dregeana* - Thatching grass - Poaceae**
Previously documented from Lanai by Herbst and Wagner (1996) from along Keomoku Rd. What appeared to be this species was also collected during this survey (Starr-070404-04).

***Hyptis pectinata* - Comb hyptis - Lamiaceae**
This small plant was growing in the scrub along forestry roads above the golf course. Previously documented from Lanai by Oppenheimer (in prep). Collected again during this survey (Starr-070403-10).

***Kalanchoe daigremontianum* - Mother of millions - Crassulaceae**
This succulent plant was common along a stretch of the old road to Kaumalapau where it was spreading along the roadside and cascading down steep rock slopes. Previously collected in the same area by Oppenheimer representing a new island record for Lanai (Oppenheimer in prep). Collected again during this survey (Starr-070402-04).

***Lantana montevidensis* - Creeping lantana - Verbenaceae**
The purple flowered form of this creeping lantana was found to be widely cultivated and naturalized in and around Lanai City. Previously known from Lanai (Wagner *et al.* 1999). Collected again during this survey (Starr-070403-01).

***Neonotonia wightii* - Glycine - Fabaceae**
This sprawling vine is present, but not yet widespread on Lanai. Previously collected by Oppenheimer (in prep) from Lanai. Collected again during this survey (Starr-070404-03) from Keomoku Rd.

***Olea europaea* subsp. *cuspidata* - African olive - Oleaceae**
This medium sized tree was widely planted as a hedge and is now naturalized near Lanai City. Collected during this survey (Starr-070403-04) representing a new island record for Lanai.

***Passiflora suberosa* - Huehue haole - Passifloraceae**
This sprawling vine was previously collected by R. Hobdy and documented as naturalized on Lanai by Wagner *et al.* (1997). Collected again during this survey from near Kanepuu (Starr-070404-02).

***Pennisetum* sp. - Pennisetum - Poaceae**
An unknown *Pennisetum* was scattered along Kaupili Rd. (Starr-070402-06) and Keomoku Rd. (Starr-070404-05). Collections were made to assist with further identification.

***Ruellia brevifolia* - Ruellia - Acanthaceae**
This small red flowered herb was common on the margins of Lanai City. Collected during this survey (Starr-070403-03) representing a new island record for Lanai.

***Tecomaria capensis* - Cape honeysuckle - Bignoniaceae**
This orange flowered vine or shrub was spreading (adventive) from an abandoned property near Lanai City. Collected during this survey (Starr-070403-06).

***Thunbergia alata* - Black eyed Susan vine - Acanthaceae**
Occasionally cultivated and naturalized in and around Lanai City. A collection was made during this survey (Starr-070403-02) representing a new island record for Lanai.

***Thunbergia fragrans* - Sweet clock vine - Acanthaceae**
This sprawling vine with white flowers was rarely cultivated and sparingly naturalized in Lanai City. A collection was made during this survey (Starr-070403-08) representing a new island record for Lanai.

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