BOTANICAL SURVEY OF MIDWAY ATOLL

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Prepared for:
UNITED STATES FISH AND WILDLIFE SERVICE

2017

BOTANICAL SURVEY OF MIDWAY ATOLL

OBJECTIVES

In order to keep a pulse on the status of plants on Midway, botanical surveys are occasionally conducted. The goals of this survey done June 13-29, 2017 were to:

- Update the current list of plant species known from Midway.
- Conduct corridor and focal surveys for incipient and watchlist species in areas where invasive species are likely to first occur (e.g., roads, piers, residential areas, gardens).
- Conduct random plot surveys at approximately 100 locations across the atoll.
- Assess current status of selected invasive species of concern.
- Provide training on weed identification and survey methods for refuge staff and interns.

Surveying plants on Sand Island.

Surveying plants on Eastern Island.

OVERVIEW

Midway Atoll is located in the North Pacific Ocean, near the northwestern tip of the northwestern Hawaiian Island chain (28N, 177W), and is currently under the jurisdiction of the United States Fish and Wildlife Service as the Midway Atoll National Wildlife Refuge, Battle of Midway National Memorial, and Papahanaumokuakea National Marine Monument.

Midway is home to spectacular wildlife, including numerous seabirds, monk seals, turtles, and other marine life; native Hawaiian coastal vegetation; and a rich commercial and military history, including the Pacific Cable Company, Pan American Airways, and the Battle of Midway.

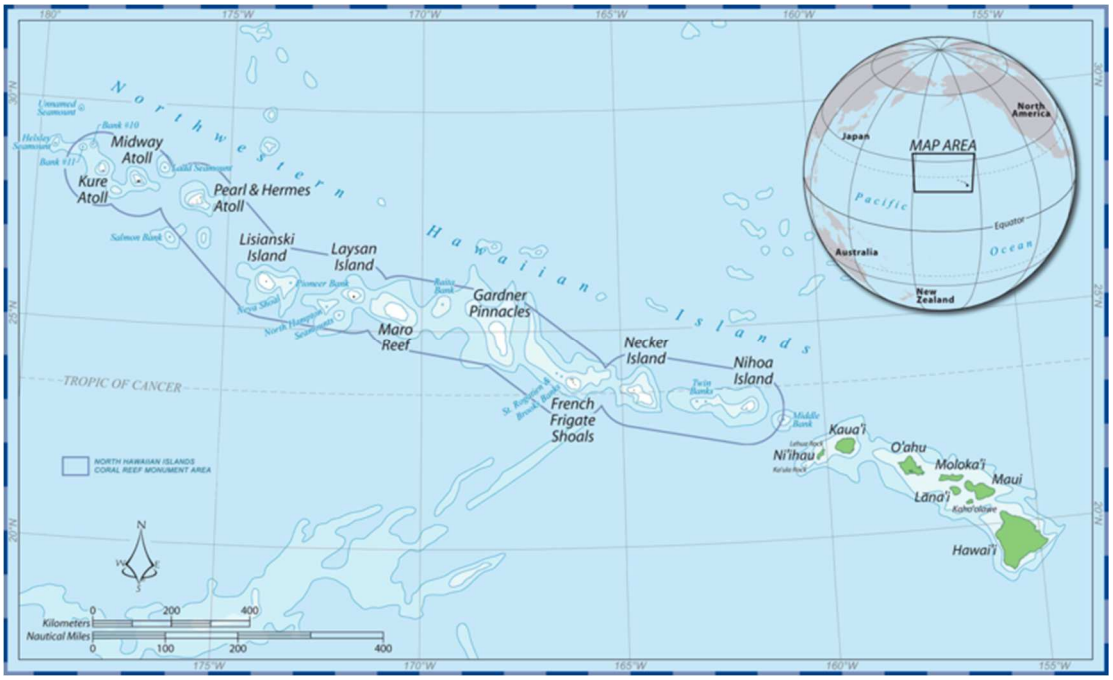
Made up of three islands, Sand (1117 acres), Eastern (336 acres), and Spit (16 acres), Midway is surrounded by a circular reef forming a shallow lagoon around the islands.

The islands consist mostly of sand and coral rubble, much like other northwestern Hawaiian Islands. However, over the years, several tons of soil have been added to make them more amenable to humans.

Additionally, unlike most other Northwestern Hawaiian Islands, Midway's vegetation has been greatly increased and diversified. Some plant species have been intentionally introduced, while others arrived as contaminants.

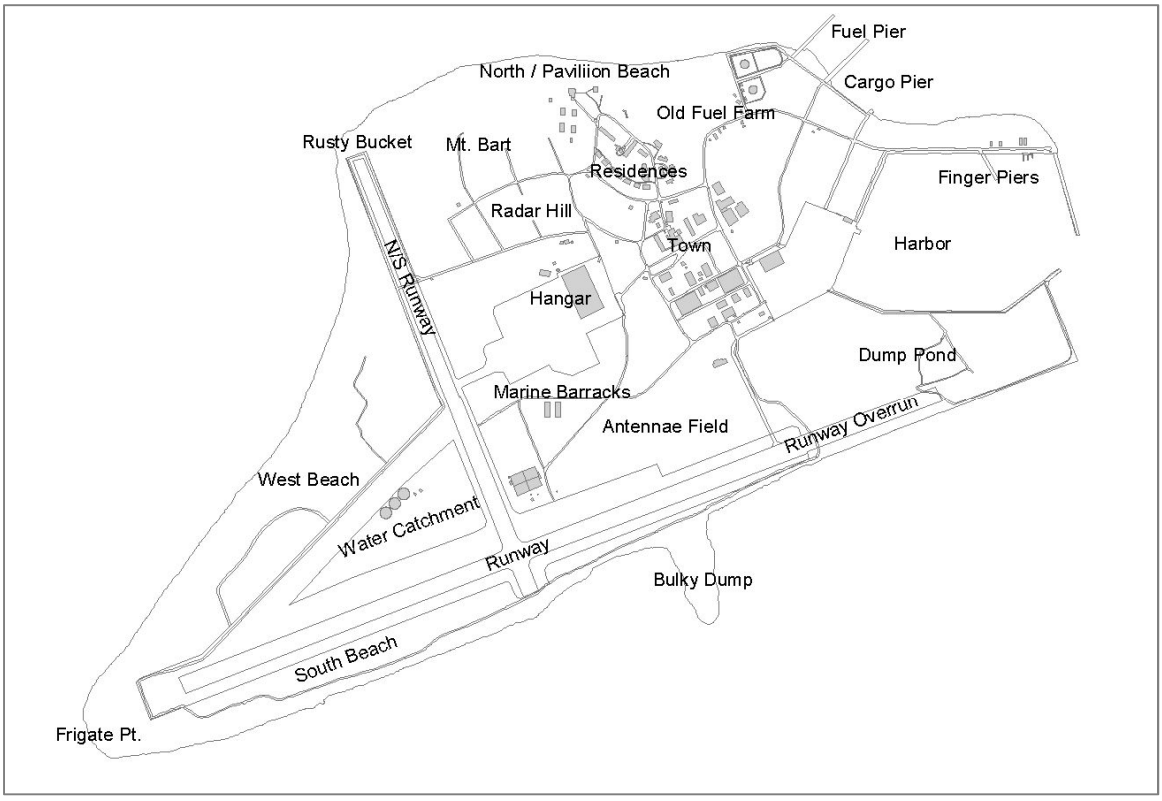
Some plant species have not caused any management issues, such as plumeria (*Plumeria* spp.) and hibiscus (*Hibiscus* spp.). While others, such as golden crown-beard (*Verbesina encelioides*) and ironwood (*Casuarina equisetifolia*), take vast resources to keep in check.

Battle Memorial surrounded by Laysan Albatrosses, Sand Island, Midway Atoll.

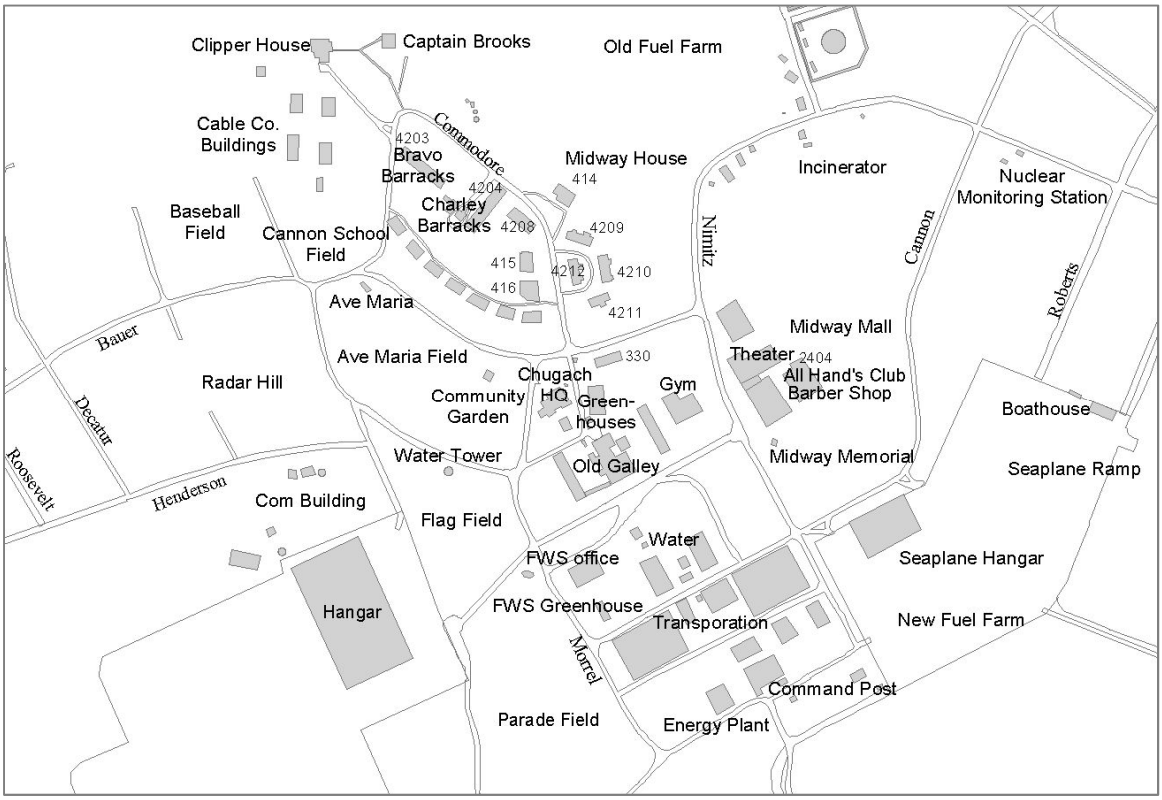


Map of Northwestern Hawaiian Islands.

Satellite image of Midway Atoll.



Map of Sand Island with location names.



Detail map of the Town area of Sand Island with location names.

METHDOLOGY

In the past we have done walk-through botanical surveys on Midway, attempting to cover as much of the atoll as possible, while also spending extra effort in areas of high diversity and potential for new introductions, such as the Town area of Sand Island. This survey was similar, but had the added aspect of testing new methodology, by collecting data in designated focal areas, corridors and randomly located plots. The main methods used were:

- **Focal Area & Corridor Surveys**- Surveys for incipient and watchlist species in areas where invasive species are likely to first occur (e.g., roads, piers, residential areas, gardens).

- **Random Plots** - Inventory of all plant species within 5 m radius circular plots at random locations within each cell of a 4 ha grid overlaying the refuge.

- **Incidental Observations** - Opportunistic observations between formal survey locations, sampling for a limited set of incipient and watchlist species.

Results from the 2017 surveys will be used to assess the efficacy of the methods for monitoring each of the target weed species so that, in the future, changes can be made if necessary.

The methodology is described in much more detail in "A Plan for Weed Inventory and Monitoring on Midway Atoll National Wildlife Refuge" by Robert V. Taylor, Ann Humphrey, and Wieteke Holthuijzen.

Laysan Albatrosses, one of the main wildlife resources guiding vegetation management on Midway.

FOCAL AREA & CORRIDOR SURVEYS

Focal area and corridor monitoring involves surveying for new invaders and existing high priority weed species along corridors (e.g., roads) and in certain, pre-defined areas (e.g., gardens, ports of entry, high traffic areas, etc.) where new non-native species are most likely to appear.

Focal Area Surveys

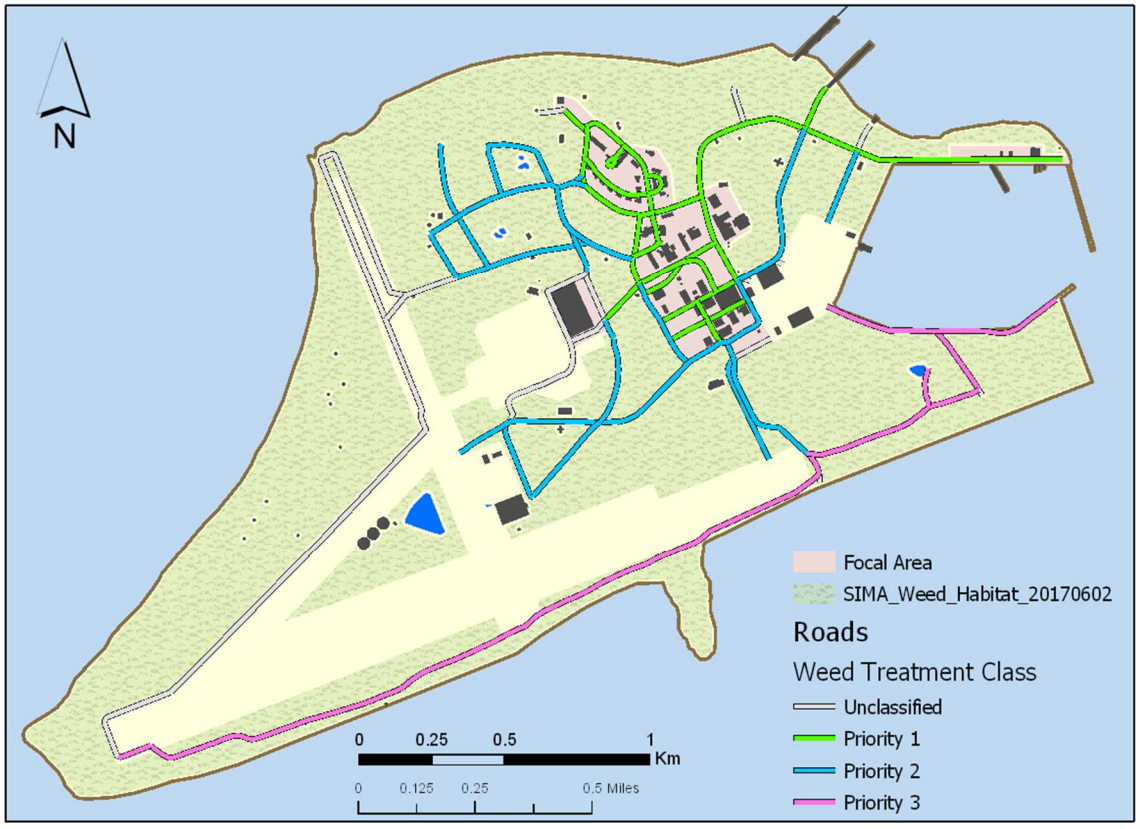
- New and target plant species are searched for, while also recording a running list of plant species on each island and their relative abundance.

- No specific routes or plots are followed, rather a walk-through survey method is used, focusing on portions of the focal area with highest likelihood of new or target plant species.

Corridor Surveys

- Roads and nearby roadsides are surveyed, focusing on new and target plant species, while recording a running list of plant species on each island and their relative abundance.

- Routes are distinct and pre-determined, consisting of roads and adjacent areas within 5-10 m.



Focal area and corridor survey locations.

Focal area survey of Community Garden.

Corridor survey in Town.

RANDOM PLOTS

Random plot surveys involve compiling a list of all plant species within 5 m radius circular plots at random locations within each cell of a 4 ha grid overlaying the refuge. We surveyed 132 plots on Sand Island, 24 on Eastern Island, and 3 on Spit Island. Another 27 plots on Eastern Island were surveyed by others. The plots are not permanently marked. GPS navigation to the site is considered complete once the GPS indicates a distance to the plot center of 1-2 m.

The main methods are:

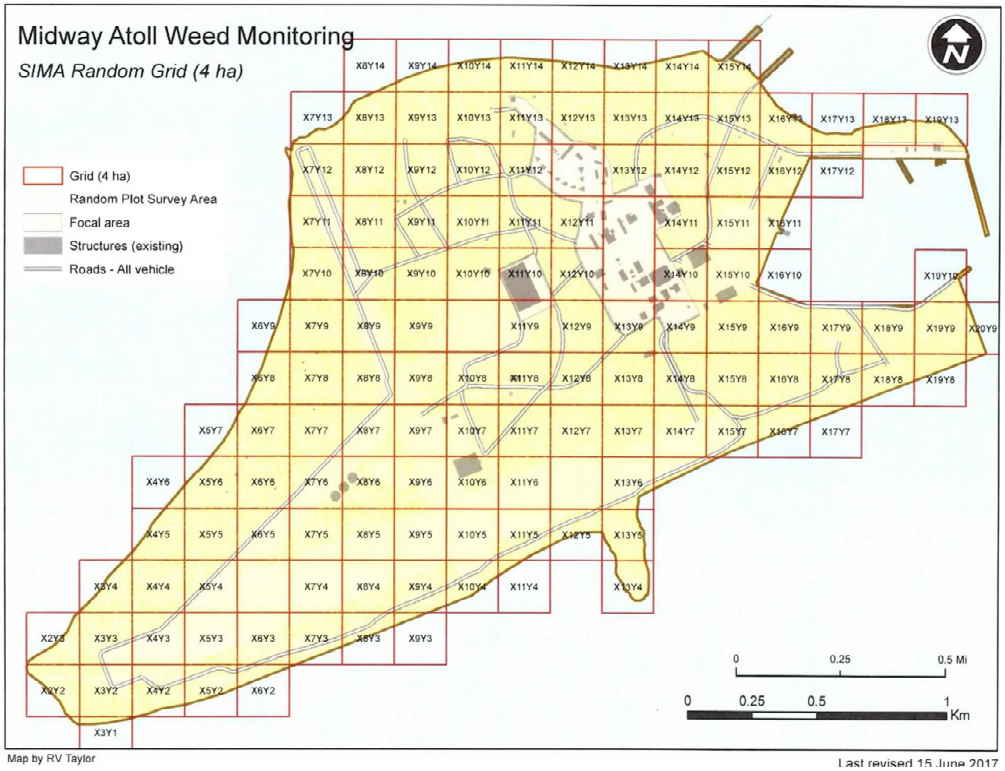
- All plant species within the plot are recorded, along with a qualitative measure of abundance (Few <5%, Moderate 5-25%, Dominant >25%).

- A count is made of the total number of *Verbesina* plants within the plot.

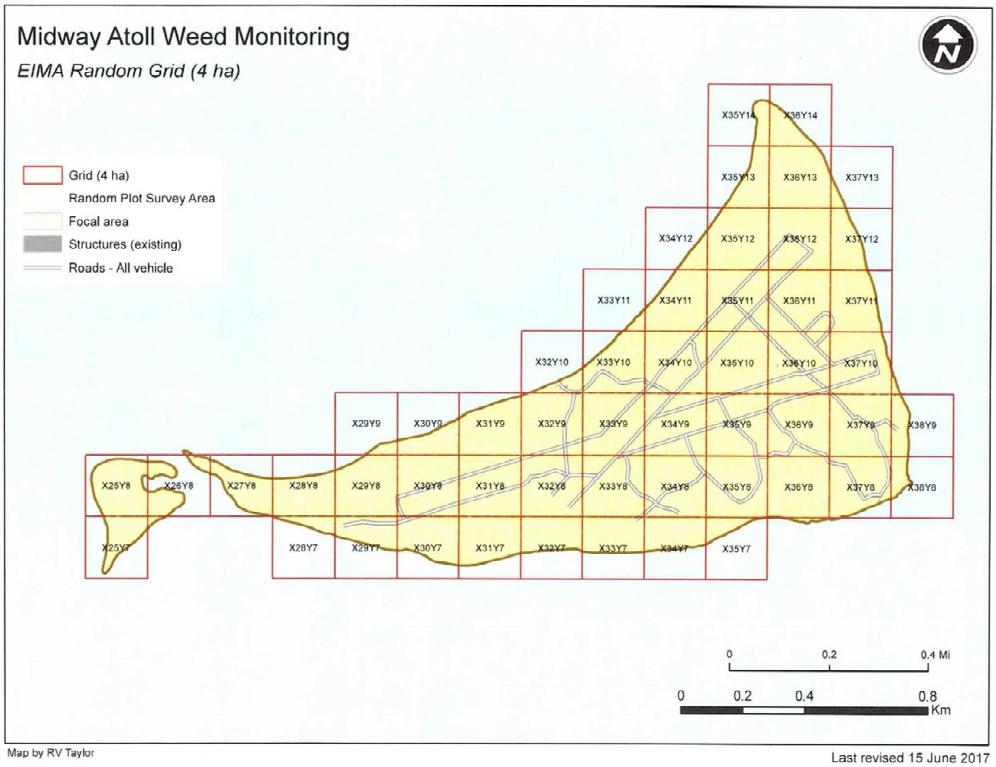
- Percent cover is estimated for natives, non-natives, and bare ground or dead plants.

Random plot results will be reported in "A Plan for Weed Inventory and Monitoring on Midway Atoll National Wildlife Refuge" by Robert V. Taylor, Ann Humphrey, and Wieteke Holthuijzen.

White Tern chick in one of the random plots on Sand Island.



Sand Island random plot grid (4 ha).



Eastern and Spit Island random plot grid (4 ha).

Calibrating random plot methodology near Turtle Beach.

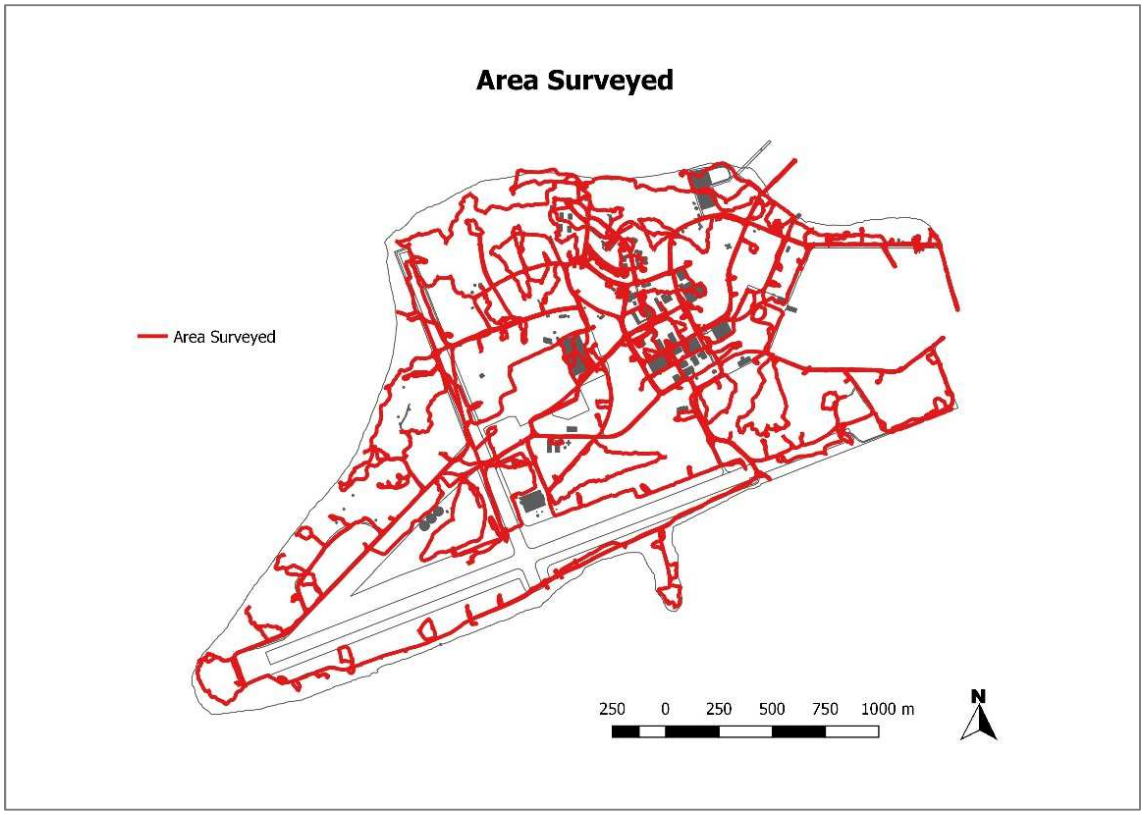
Monitoring a random plot on the southeast side of Spit Island.

INCIDENTAL SURVEYS

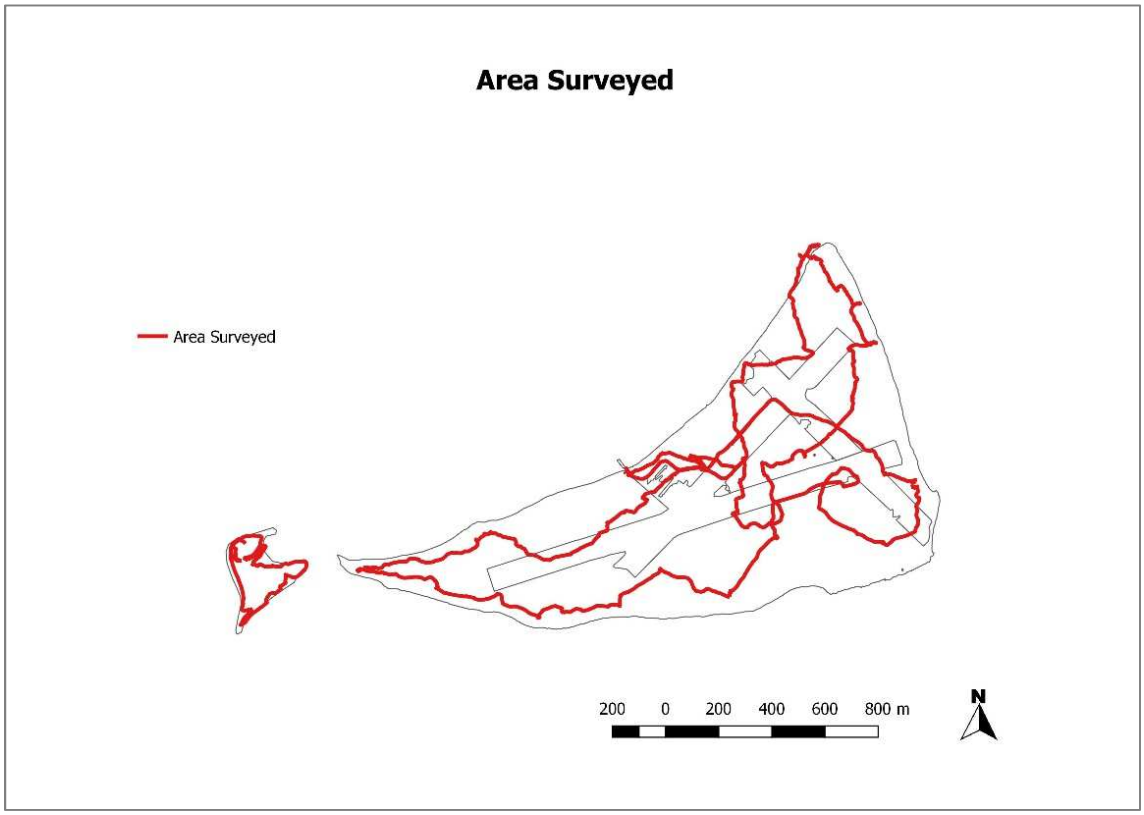
Incidental surveys involve looking for a list of target species and any species new to the atoll when travelling from one survey site to the next.

- GPS waypoints are recorded for each incidental sighting with species name and any notes.
- GPS tracklogs are recorded during surveys, to show areas that were and were not surveyed.
- All species observed are used to update the Midway Plant List, by recording a running list of plant species on each island and their relative abundance.

Looking for plants at Base Camp on Eastern Island during incidental surveys between random plot locations.



Area surveyed on Sand Island.



Area surveyed on Eastern and Spit Islands.

WEED IDENTIFICATION TRAINING

While on island, we provided training on weed identification and survey methods to refuge staff and interns. This included multiple weed tours, where field sites were visited and plants of interest were identified and discussed.

- The Community Garden and some of the residences were surveyed, looking at the cultivated plants and their potential to be invasive on Midway.

- Plant identifications were made around the Catchment area, where there happens to be a lot of different plant species, many of which don't occur elsewhere on Midway.

- Site visits were made to a subset of incipient species, especially near the Cargo Pier, where a few incipient species reside in low numbers.

Identifying plants in the Community Garden and discussing relative potential to be invasive on Midway.

RESULTS & DISCUSSION

There were 194 plant taxa observed, 27 (14%) were native and 167 (86%) were non-native. One of the biggest changes since our last survey is the continued reduction of *Verbesina* over the entire atoll, opening up vast areas for other species to dominate in its wake.

Also apparent are the removal of some of the ironwood groves and structures, leading to more open habitat types. Many of these open areas have been revegetated with native plants. As a result of continued restoration efforts, a critical mass appears to have been reached for a few of the species, which are now able to propagate on their own, such as *Eragrostis variabilis*.

There were five new plant species recorded from the atoll this survey. One of these, *Boerhavia coccinea*, was likely an unintentional contaminant on a human or bird. The other four were intentionally introduced. All were found in the Town area of Sand Island.

After years of control efforts, many invasive plant species are no longer known from Midway. Examples of the presumed eradications include sandbur (*Cenchrus echinatus*), Guinea grass (*Megathyrsus maximus*), and African tulip (*Spathodea campanulata*).

Many species remain at highly reduced levels and possibly could be eradicated, such as haole koa (*Leucaena*), castor bean (*Ricinus*), and lantana (*Lantana*). A few species we declared eradicated in the past were present this survey, including cup grass (*Eriochloa procera*) and sprangletop (*Leptochloa uninervia*). A few species have increased in distribution and warrant watching, namely sea grape (*Coccoloba*) and horseweed (*Conyza* spp.)

Questions of how best to manage each plant species will perpetually exist, the answers changing as the vegetation, wildlife, and people on the atoll change. By understanding the habitat preferences of the different bird species on Midway and where folks would prefer those birds be located, a vision for which plant species to promote where comes to light.

Though more could always be done, the vegetation management appears well balanced and is making great strides. It's amazing what has been accomplished out on this idyllic outpost.

Laysan Albatrosses thriving at Midway Atoll.

NEW PLANTS

Five new plant species were observed this survey. One of these, *Boerhavia coccinea*, was likely an unintentional contaminant on a human or bird. The other four were intentionally introduced edible plants. All were found in the Town area of Sand Island.

***Boerhavia coccinea* (Scarlet spiderling)**
A few plants were present in the Community Garden and along the roadside near Ave Maria. Resembling the native *B. repens* (alena), but distinguished by red flowers borne on long inflorescences. This species can be weedy and would be good to eradicate if possible. First observed in 2015 by Meg Duhr-Schultz.

***Persicaria odorata* (Vietnamese coriander)**
This odiferous wetland plant was cultivated outside a couple residences. Used in Asian cooking, the plants were grown from recently planted starts from Oahu. This is the first time we've encountered this species, which appears to have the potential to be invasive in wetland situations. It would be good to keep this species out of wetlands and moist sites on Midway, preferably containing it in pots, and optimally only growing it in the Hydroponics Greenhouse.

***Luffa acutangula* (Angled Luffa, Ridged gourd)**
A few vines were observed in the Community Garden. Used as a vegetable, the plants did not appear well tended, with many fruits that had gone past ripe and were rotting and releasing seeds. If folks wish to grow this species on Midway, it would be best to do so in the Hydroponics Greenhouse, where other vine-like plants are healthier and have less potential to become weedy.

***Cucurbita maxima* (Pumpkin, Squash)**
A few struggling vines in the Community Garden and a few more healthy plants in the Hydroponics Greenhouse were observed. Some of the pumpkin/squashes were made into a tasty dessert like soup while we were there. As mentioned above for Vietnamese coriander and luffa, the Hydroponics Greenhouse is the best place to grow produce on Midway, as the plants are better cared for, and the potential for establishment and spread is minimized.

***Thymus vulgaris* (Thyme)**
Herbaceous plant being grown in the Hydroponics Greenhouse. Used as a cooking herb. It seems unlikely this species will become invasive on Midway.

COLLECTIONS

A few plant collections were made during the survey.

For each species, a voucher number, scientific name, and significance are given. Vouchers will be deposited at Bishop Museum and any relevant new records will be published in Bishop Museum's Occasional Papers.

170616-01 - *Boerhavia coccinea* (Scarlet spiderling) - New Island Record
170628-01 - *Ricinus communis* (Castor bean) - New Island Record - Fertile Material
170617-01 to 05 - *Euphorbia* spp. (Spurges) - Material collected to better determine ID.
170620-01 to 02 - *Euphorbia* spp. (Spurges) - Material collected to better determine ID.

Pressing plant collections.

Looking at microscopic features of *Euphorbia* spp.

PLANT ERADICATIONS

After years of control efforts, many invasive plant species are no longer known from Midway. Examples of the presumed eradications include sandbur (*Cenchrus echinatus*), Guinea grass (*Megathyrsus maximus*), African tulip (*Spathodea campanulata*), and New Zealand spinach (*Tetragonia tetragonioides*).

Some species have previously been declared eradicated on Midway and were re-introduced and then re-eradicated, such as ivy gourd (*Coccinia grandis*) and guava (*Psidium guajava*). Others reappeared from seed or were overlooked and have since been re-eradicated, like Chistmasberry (*Schinus terebinthifolius*).

A number of species have been significantly reduced in abundance, but still have a persistent seed bank requiring follow up, such as hairy abutilon (*Abutilon grandifolium*), spiny amaranth (*Amaranthus spinosus*), haole koa (*Leucaena leucocephala*), cheeseweed (*Malva parviflora*), and buffel grass (*Cenchrus ciliaris*).

The control program on Midway has been highly successful in eradicating a number of invasive plants and reducing even more to near eradication levels. Many of these and others are discussed further in the Annotated Plant Checklist.

Ivy gourd is an invasive edible vine that was eradicated in 1999, intentionally re-introduced some time before 2008, and then re-eradicated. This picture is from 2008, when we found ivy gourd to be well established in multiple locations. Ivy gourd was not observed in 2015 or 2017 and is presumed eradicated, again.

SPECIES TO WATCH

There are a few species that are invasive elsewhere, but are currently not invasive on Midway. Watching these will allow for the greatest number of control options if deemed necessary. Octopus tree (*Schefflera actinophylla*) seemingly has the potential to spread, given ample fruit and mynah birds to spread the seeds. It would be good to watch for seedlings of this species.

A few edible plants should be watched, including swamp cabbage (*Ipomoea aquatica*) and bitter melon (*Momordica charantia*). Preferably these vines would not be grown on Midway, and would be easiest to watch / contain if only grown in the Hydroponics Greenhouse.

Sea grape (*Coccoloba uvifera*) is expanding in range. It wasn't that long ago folks said it didn't spread by seed, which obviously isn't the case. It probably won't be too long from now that folks will want sea grape controlled in places, especially around buildings and other infrastructure.

Natives can also be invasive and a few merit watching. Control of naupaka (*Scaevola*), which is expanding in range, already occurs, to create corridors for humans and birds to access areas. As naupaka continues to expand, we anticipate an increase in control effort necessary to maintain these corridors and protect other resources. Things to watch include albatrosses and other bird species that don't do well in naupaka, native plants, duck seeps, and island infrastructure.

Cyperus polystachyos has also become more prevalent in recent years, especially near the runway overrun. Considered native, even though a relative late comer to the atoll, this sedge appears to act a bit like *Verbesina*, creating waist-high monotypic stands, especially in moist areas. We can see a day when folks will decide to take action against this sedge. We suggest keeping an eye on success of albatrosses and other birds in areas dominated by this species.

Many of these and others are discussed further in the Annotated Plant Checklist.

Beautiful and edible, swamp cabbage (*Ipomoea aquatica*), is a Federal Noxious Weed that has previously been released into and then removed from seeps on Sand Island. If folks are reluctant to eradicate this species from Midway, since it makes a tasty stir fry, then continue to contain it to the Hydroponics Greenhouse and watch for it in wetlands. Images from coastal wetland on Maui and Clipper House on Midway.

GARDENS

Four of the five new plant species recorded on Midway this survey were found in gardens.

For as long as people have been living on Midway there have been gardens. The locations of gardens, types of plant species, and care given to the gardens fluctuates over time.

In 2017, there continued to be less gardens. The decline appears attributable to less people on-island, occasional efforts to remove the most invasive or unused plants, and large scale removal of plants around buildings during the lead abatement project. Continued reduction of planting areas around the buildings will likely occur as future petrel mitigation measures are implemented to prevent buildings from being undermined.

Though less common than they used to be, personal gardens are still present on Midway, mainly around houses. The plants are a mix of mostly edible, but some ornamental. Most of the plants appear poorly and only occasionally cared for. A few gardens look completely abandoned. In addition, potentially invasive species are being grown, including bitter melon (*Momordica charantia*), Chinese banyan (*Ficus microcarpa*), and turkeyberry (*Solanum torvum*).

The Community Garden used to overflow with produce, but is now mostly abandoned. Nearby banana patches appear untended and in such poor health they are unable to produce edible fruit.

The Hydroponics Greenhouse stands in stark contrast to this, producing an amazing array of beautiful produce. Along with being safer from lead and other contaminants stand point, it can produce a lot more food of higher quality, takes up less wildlife habitat, and minimizes establishment and spread of potentially invasive species.

It makes sense to continue to gradually move food production to the Hydroponics Greenhouse.

A bounty of produce growing in the Hydroponics Greenhouse.

RESTORATION

The restoration of native plants appears to have increased in both effort and sophistication, with an increasing number of areas on Midway dominated by native plants.

Some of the species that have done well include the native bunchgrass (*Eragrostis variabilis*), aweoweo (*Chenopodium oahuense*), and the rare popolo (*Solanum nelsonii*). *Eragrostis* is now self-regenerating, creating abundant seedlings in many areas.

Those that have struggled include ilima (*Sida fallax*), maia pilo (*Capparis sandwichiana*), aki aki grass (*Sporobolus virginicus*), and the dwarf bunchgrass (*Eragrostis paupera*). Perhaps it is just a matter of time before the optimal techniques and locations for these species come to light.

Along with more native plants being propagated and outplanted, seeds have also been scattered with promising results. Additionally, a database is used to track seed stock, propagation, and planting information to better track current work and inform future efforts.

As with the reduction in *Verbesina*, the increase in native plant restoration areas is impressive, showcasing what can be accomplished with persistent diligence.

Native bunchgrass (*Eragrostis variabilis*) self-regenerating near Turtle Beach.

WHAT BIRDS DO YOU WANT WHERE? -- BUILD IT AND THEY WILL COME

We're often asked what management recommendations we have for areas. In wildlife dense sites like Midway, we find it useful to ask "What birds do you want where?". Another way to look at it is "Build it and they will come".

By understanding the habitat preferences of the different bird species on Midway, how many of each bird species folks would like, and where folks would prefer those birds to be located, a vision for which plant species to promote where comes to light.

For example, if one wants to have White Terns in an area, ironwoods suffice. However, if folks would prefer more Gray-backed Terns in an area, then taking the site down to gravel and small plants would be better. To dissuade albatrosses from using an area, naupaka can be planted. For no birds, a paved surface seems to work.

It isn't as simple as painting by numbers, many plant species have habitat preferences of their own, such as naupaka and *Tournefortia* generally doing best along the coast. Additionally, bird species have cues beyond vegetation, such as Black-footed Albatrosses that usually nest close to the shore and have strong site fidelity.

All that said, the next time a question arises as to what to do with the vegetation in an area, it is useful to ask "What birds do you want where?". Build it and they will come.

Laysan Albatrosses prefer soft sand and vegetation to hard runway. The military realized this and paved large areas to keep sites free of nesting albatrosses. As the abandoned runways become covered with sand and vegetation, the albatrosses are returning to the area.

WHAT WOULD YOU DO IF IT WAS NATIVE? -- STRUCTURE VS. COMPOSITION

Often we're asked what management actions to take for a particular non-native plant species, especially in regards to whether to control it or not. In these situations, we find it helpful to ask "What would you do if it was native?". In many cases, the answer will be "Enjoy it".

If the plant isn't causing harm, the fact that it is non-native shouldn't immediately result in control efforts. This is especially true in many Wildlife Refuges where the vegetation is predominantly non-native, and in many cases is being readily utilized by wildlife.

Tree heliotrope (*Tournefortia*) is non-native, yet is occasionally promoted, as it provides good bird habitat. Bermuda grass (*Cynodon*) functions well for a number of bird species, and is also tolerated and occasionally promoted. These are pragmatic decisions.

One tool that could help guide managers is a matrix of plant and bird species on Midway. Each plant species could be noted whether it is thought to have a positive, negative, or neutral effect on each of the bird species, regardless of whether the plant is native or not.

By taking into consideration how wildlife interacts with each plant species (structure), rather than purely the nativity of each species (composition), wildlife will reap the greatest benefits, and vegetation management will be the most effective.

Tree heliotrope (*Tournefortia*) is classified as non-native on Midway, yet provides good habitat / structure for numerous bird species.

VERBESINA

The increased management of golden crown-beard (*Verbesina encelioides*) at Midway has resulted in one of the greatest reductions in a non-native plant species we've ever witnessed. *Verbesina* went from a habitat type in 2008, to scattered hot spots in 2015, to very low numbers in 2017. *Verbesina* is still present in many places, and will require continued vigilance to manage, but it's amazing what has been accomplished.

2008. Sea of *Verbesina* in field south of Seaplane Hangar, Sand Island.

2017. Virtually no *Verbesina*. Vegetation in area is now Bermuda grass and mixed native plants.

ANNOTATED CHECKLIST

The following annotated checklist provides additional detail on selected species. Included is an image, map, and notes on history and current status. Emphasis is on incipient invasive plants.

The maps show known distribution in 2017, and when available, all previously known locations.

Included below are the main references used in the annotated checklist history section. The year listed is the year of survey. The year in parenthesis is the year the reference was published, if different than year of survey. More detail for the history of these species can be found in Starr & Starr 2015. Full citations for these references are located at the end of this report.

1933 - Meagher
1954 - Neff & DuMont (1955)
1979 - Apfelbaum et al. (1983)
1995 - Bruegmann (1998)
1999 - Starr & Martz
2001 - Starr & Martz
2008 - Starr & Starr
2012 - Aspey
2012 - Schubert
2013 - Schubert
2015 - Starr & Starr
2017 - Starr & Starr

Surveying plants on Eastern Island.

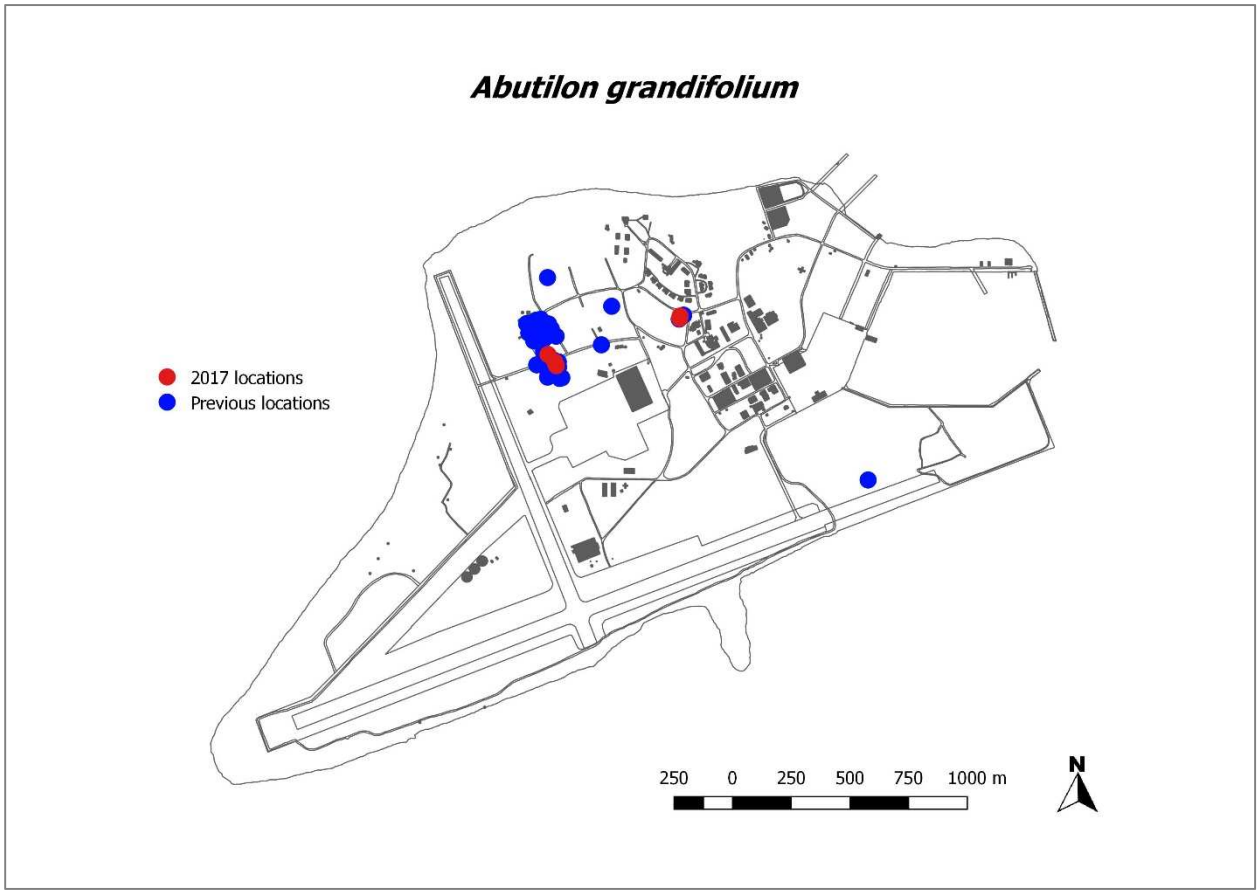
Abutilon grandifolium (Hairy Abutilon)

CURRENT

Control efforts have kept this species at low levels. A few small plants were found near the Doctor's Cemetery and one large seeding plant that appeared to have been recently controlled was in the Community Garden. Continued control efforts will help keep this species at tolerable levels, and if plants are controlled before they seed, eradication seems potentially feasible.

HISTORY

A widespread tropical weed of New World origin, cultivated for ornament, and readily escaping. First collected on Midway in 1980. In 1999, it was naturalized in weedy areas near the Doctor's Cemetery. In 2008, the same area had become choked with this large lanky plant, many of which were well overhead. There were also a couple smaller populations in the Community Garden, on the margin of the ironwood forest along the Runway Overrun, and near Radar Hill. In 2015 only one plant was found, adjacent to the Community Garden. The large reduction in distribution was due to control efforts since 2008.



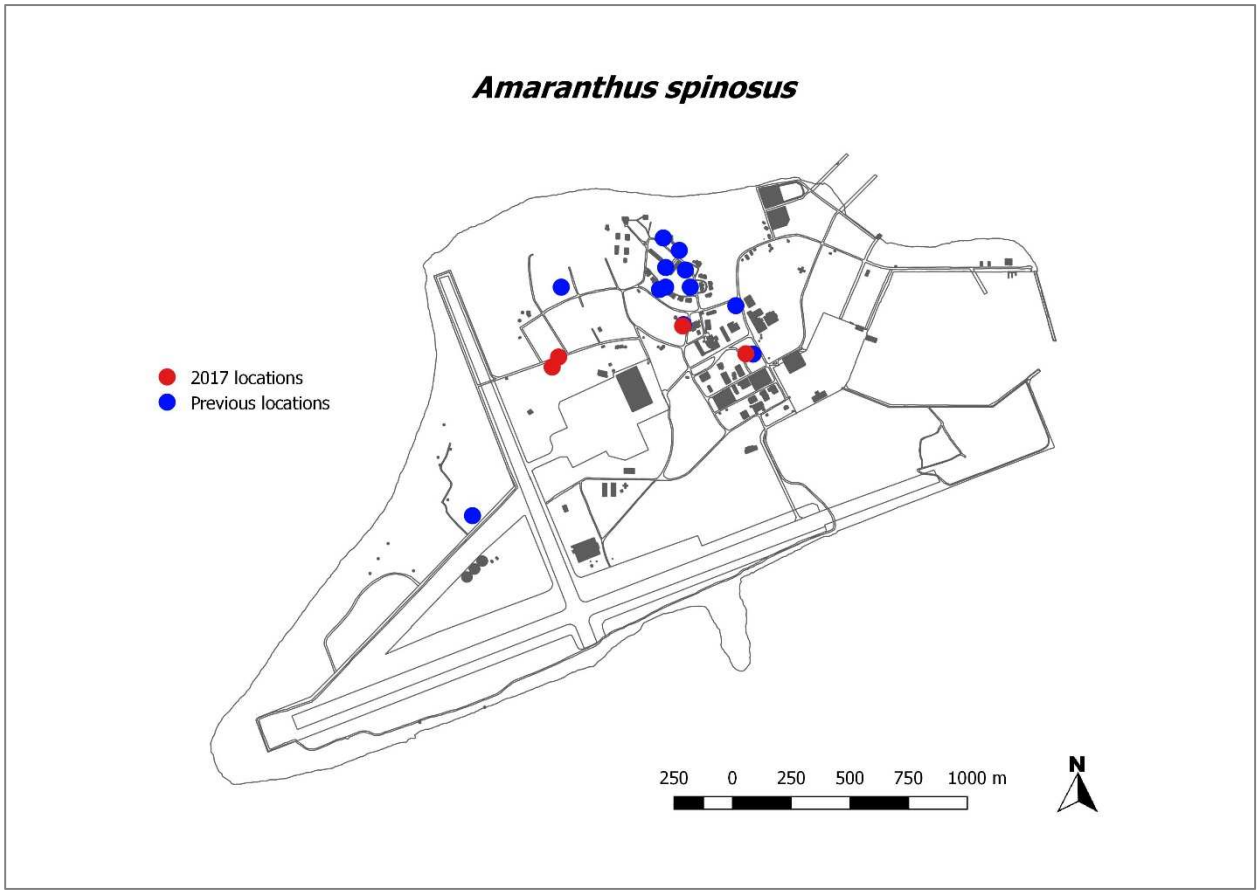
Amaranthus spinosus (Spiny amaranth)

CURRENT

This species appears to currently remain at low numbers, in town and near the Doctor's Cemetery, especially along roadsides. Regular control work in these areas will help continue to keep this spiny plant in check.

HISTORY

Widespread in warmer regions. On Midway, not observed in 1995, though urban areas were not surveyed extensively. In 1999, it was restricted to a few small patches in lawn on the north part of Sand Island. In 2008, this spiny shrub was observed around the residential housing, especially near 416 Commodore Ave. and around the Medical Clinic. Midway Biotech maps from 2012 and 2013 show this species to be found in low numbers in most sectors of Town. In 2015, this species was reduced to just a few scattered plants in Town.



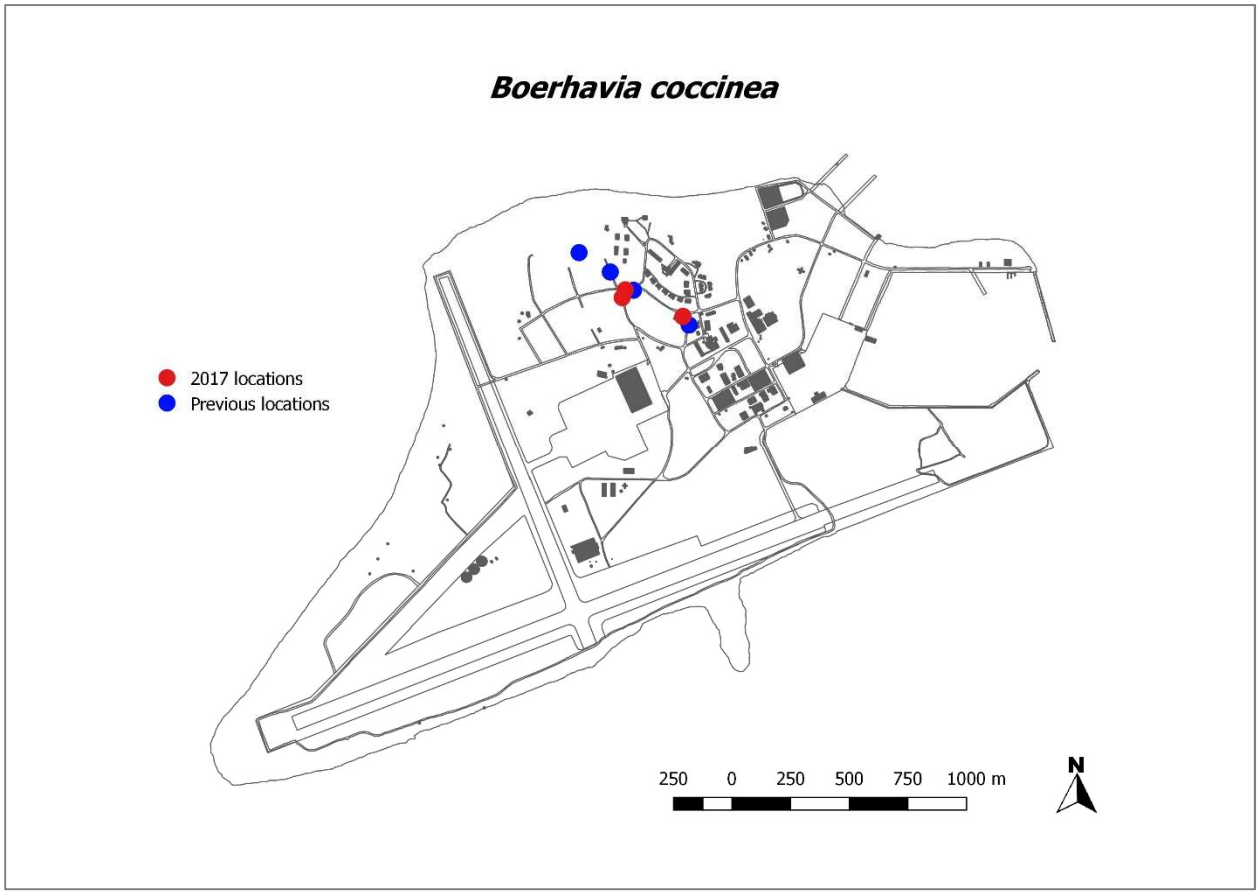
Boerhavia coccinea (Scarlet spiderling)

CURRENT

A few plants were present in the Community Garden and along the roadside near Ave Maria. A collection was made to document the presence on Midway and help confirm the identity. The similarity to the native *Boerhavia* will complicate identification for control, but this species can be weedy and would be good to eradicate if possible.

HISTORY

Widespread globally. Native range unknown, but perhaps includes the southwest United States and parts of Mexico. Common weed in disturbed dry lowland sites in the Main Hawaiian Islands. First observed on Midway in 2015 by Meg Duhr-Schultz and sighted again in 2016 spreading along roads and nearby areas from Ball Field to the Community Garden. Resembling the native *Boerhavia repens* (alena), but distinguished by magenta flowers borne on long inflorescences.



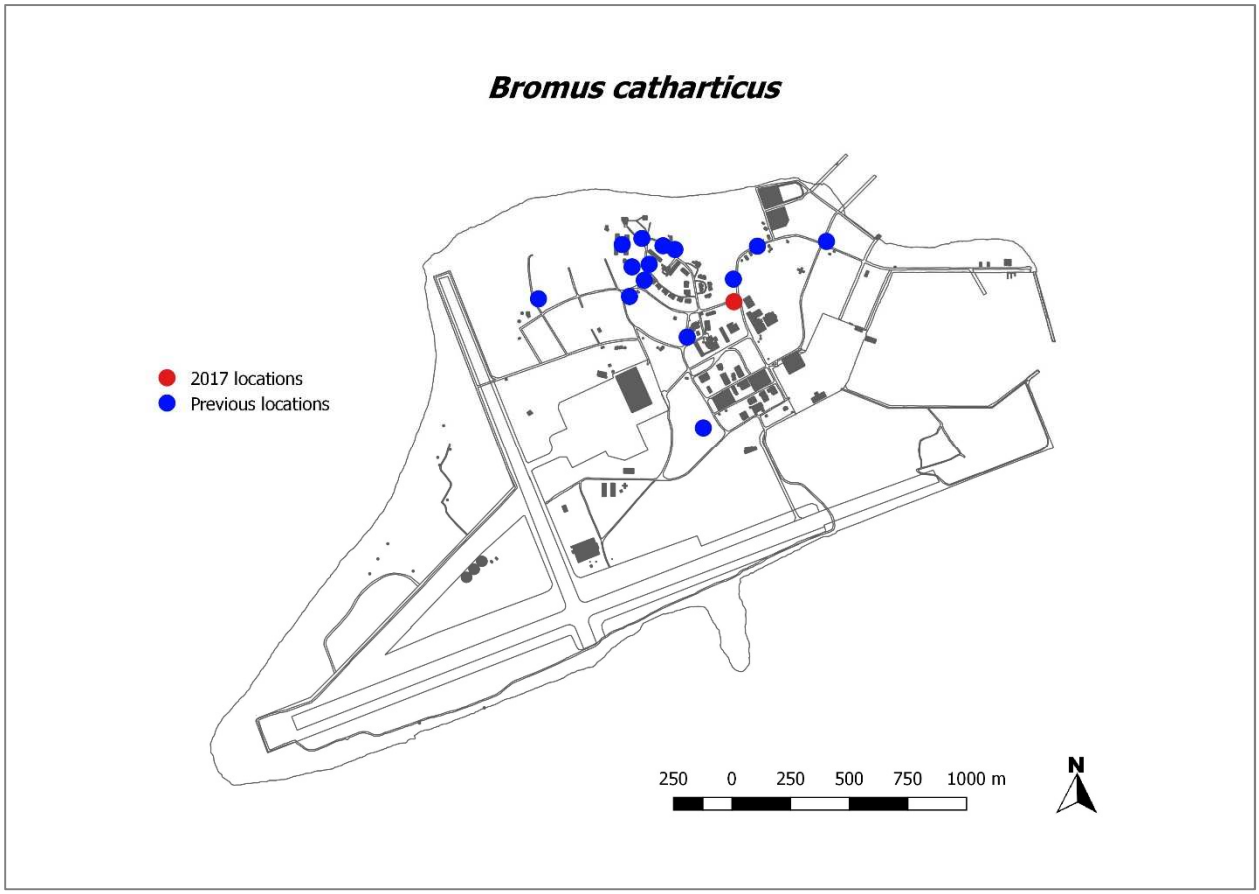
Bromus catharticus (Prairie grass)

CURRENT

Only one patch observed in 2017, near the old Cricket Field. It seems to have a persistent seedbank in this area. Continued control should help keep this species at tolerable levels.

HISTORY

Native to South America. On Midway, first collected in 1979. In 1999, found near Pavilion Beach. In 2008, this large clumping grass was much more conspicuous, perhaps due to the no-mow approach being taken. Found in many lawns around town, especially around the Midway House. In 2015, the status was mostly the same, this robust grass was found mostly around the residences and in the field across from Charlie Barracks. If unchecked, it can form dense patches.



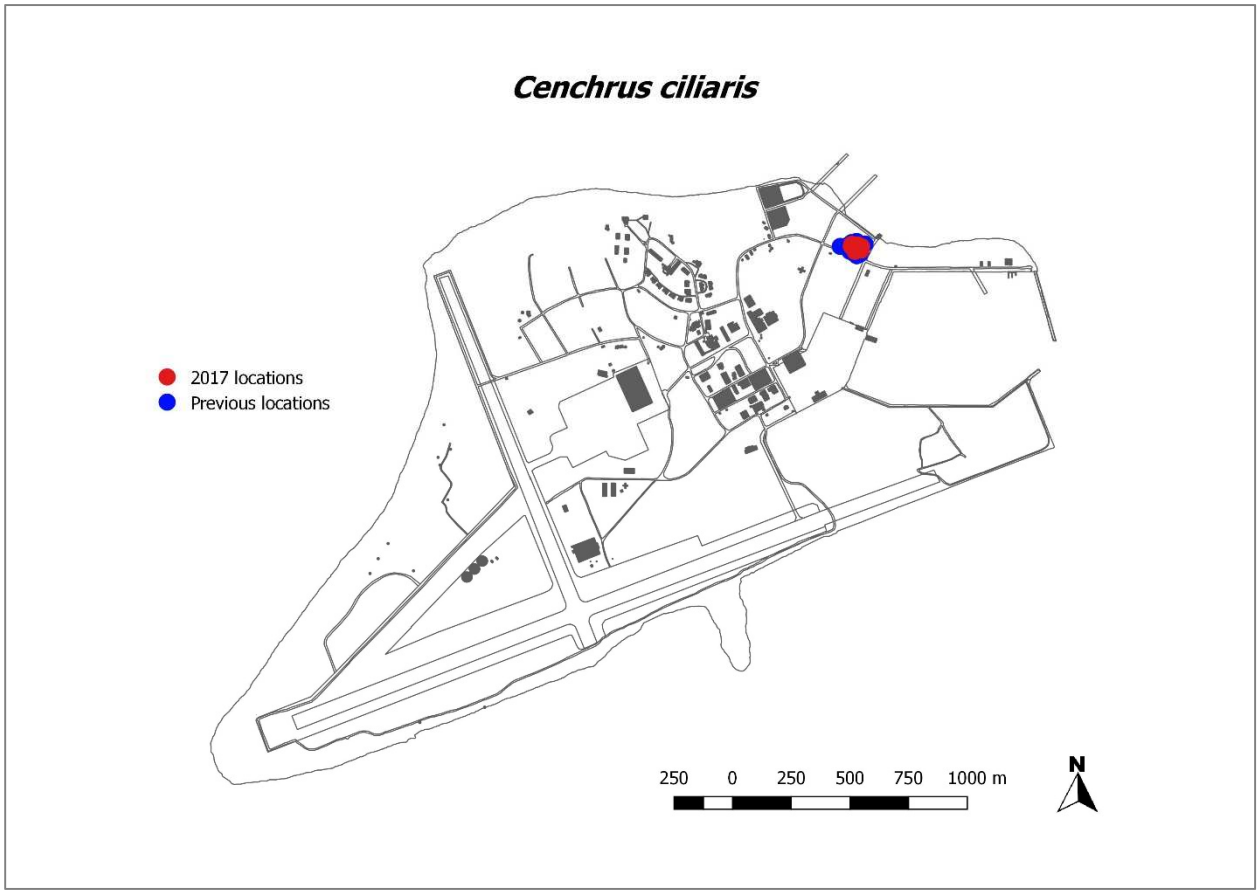
Cenchrus ciliaris (Buffel grass)

CURRENT

By 2017, buffel grass again appeared forgotten about. A few dozen scattered clumps were present in the same area. After weighing pro and cons, control work was to begin again. One suggestion was to make this location an extension of the Hale Honu restoration site, increasing focus on the area, and phasing out this species in favor of more wildlife friendly plants.

HISTORY

Native to Africa and tropical Asia, buffel grass is the dominant grass in dry lowland areas of Hawaii. First collected on Midway in 1999, it was restricted to a few dozen patches on a grassy lawn near the Cargo Pier. Plants were controlled with herbicide, but we noted follow up would be necessary. In 2008, buffel grass was present in the same spot, but the patch had been forgotten about and was now larger. It was also more conspicuous given the new no-mow approach to lawns. Of note, Red-tailed Tropicbirds were able to nest at the base of lone clumps, as were Laysan Albatross chicks. However, continuous patches of this grass seemed to exclude seabirds. Control of buffel grass began again. In 2015, only a few small clumps remained.



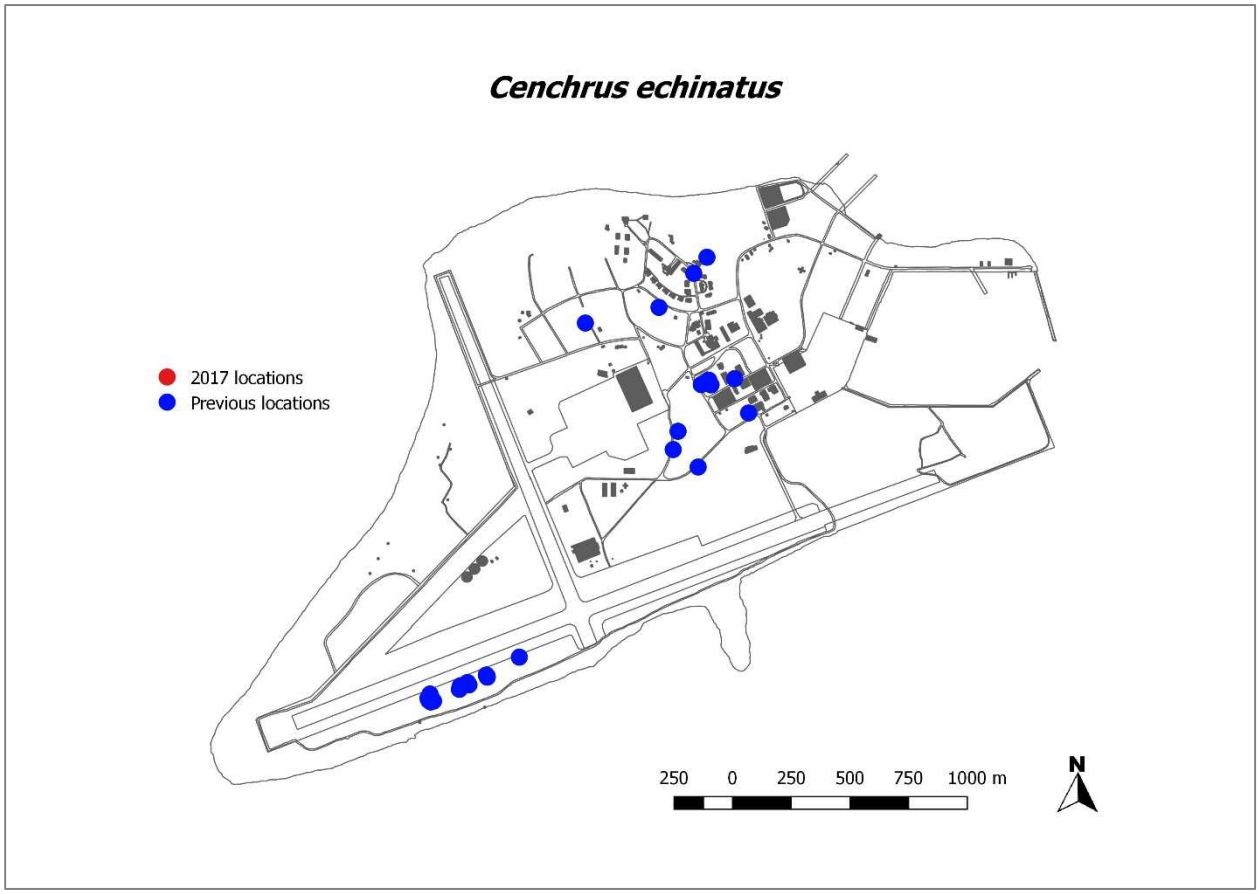
Cenchrus echinatus (Sand bur)

CURRENT

Not observed in 2017. However, folks should be aware of this species, as it has returned to Laysan multiple times after being declared eradicated, perhaps brought in by seabirds, given the locations far from human activity where they seem to first show up in.

HISTORY

Native to the Neotropics and now widely naturalized. Over $1 million dollars was spent on Laysan to get rid of this grass. On Midway, first collected from the interior of Eastern Island in 1923. In 1954 it was mostly along the edges of runways, roads and about larger buildings on Sand and Eastern Islands. In 1980, collected from Sand Island and described as common. In 1995, observed on Sand Island only. In 1999 observed on Sand Island only, mainly in the town area and along the south side of the east-west runway. There were about a dozen distinct localities, none very large in size. In 2008, many of the town plants had disappeared, perhaps as a result of increased herbicide management of the lawns. Sandbur was still present between the runway and the South Beach Trail, and had increased in abundance there. Not observed in 2015.



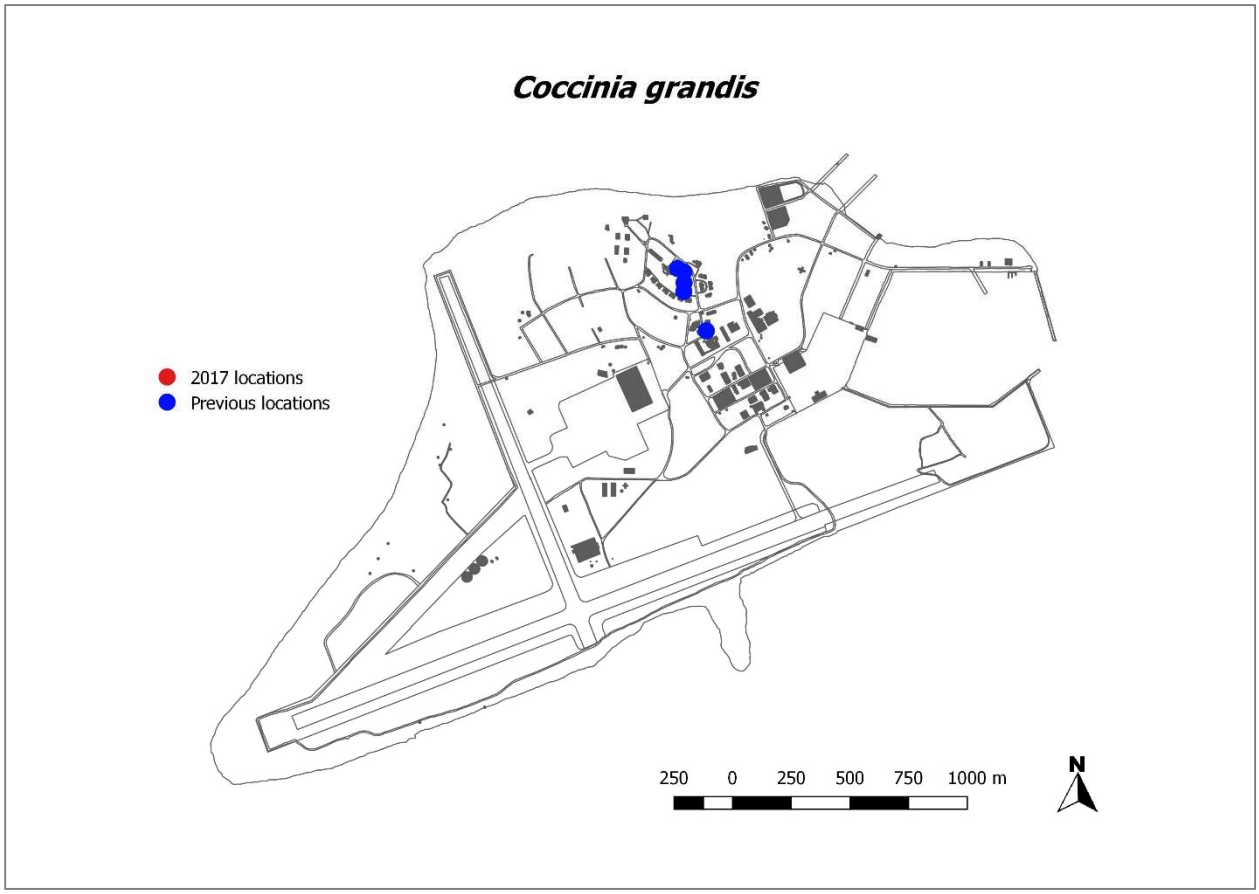
Coccinia grandis (Ivy gourd)

CURRENT

Not observed in 2017. However, if history is any predictor of the future, regular surveys for this invasive edible seem warranted.

HISTORY

Native to Africa, Asia, and Australia. Ivy gourd was first collected on Midway in 1999 from a sprawling plant in the backyard of 4208 Commodore Ave. It was brought to Midway as seeds from Thailand, for use as a vegetable. The plant was controlled mechanically and came back. It was then controlled with herbicide. A quick check of the site in 2001 found no ivy gourd. However, between 2001 and 2008, ivy gourd had been forgotten about and re-introduced to Midway as seed, from Thailand and Hawaii. In 2008, it formed a continuous blanket behind 4208 and 415 Commodore Ave. There was a lone plant crawling on the trellis at 416 Commodore Ave., and there was a large plant covering the small Greenhouse by Chugach Headquarters. In 2008, the FWS began removal of ivy gourd, again. In 2012, it was "still present at one location (SW corner of fence 4208) where 1 small and heavily sprayed stem was still attempting to grow". Not observed in 2015.



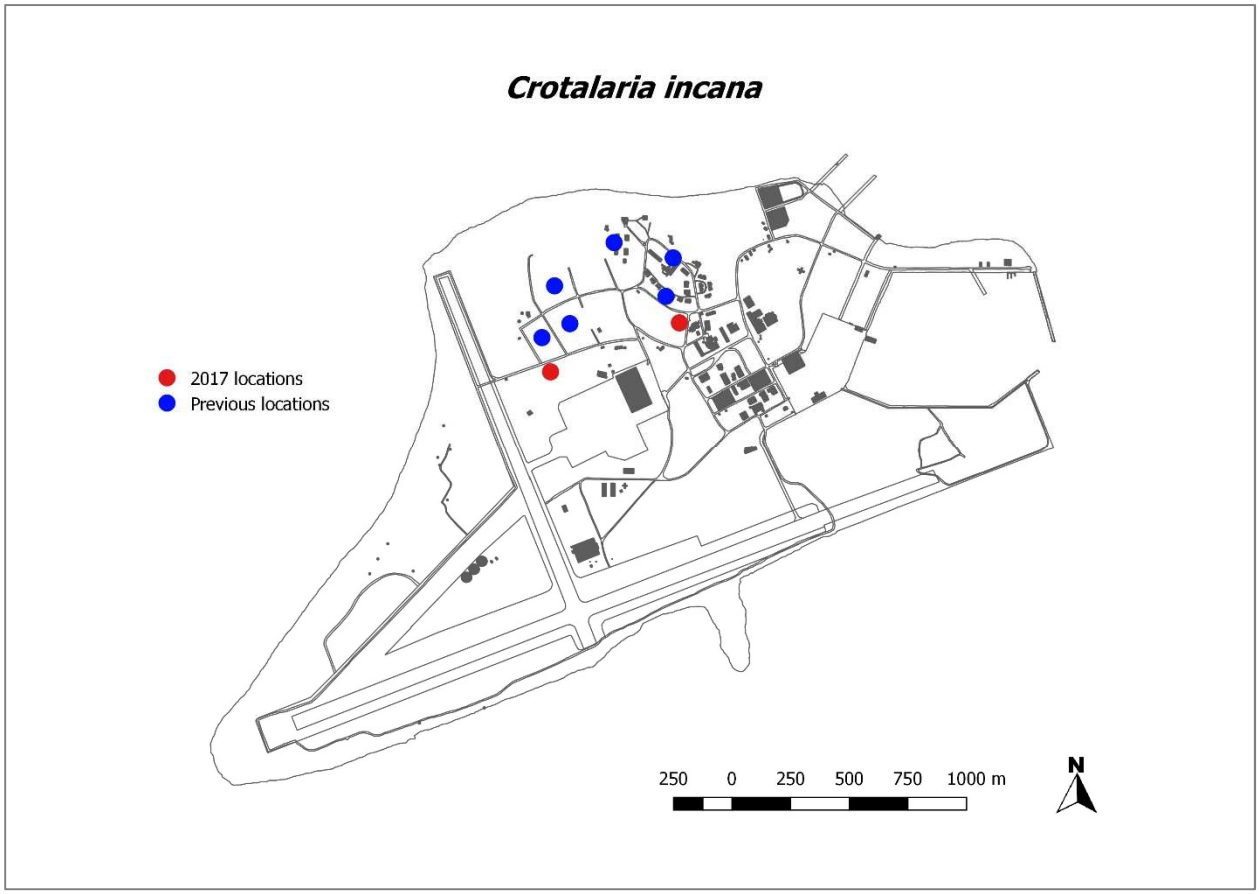
Crotalaria incana (Fuzzy rattlepod)

CURRENT

A few plants were observed near previously known locations at Radar Hill and the Community Garden. Regular control should help exhaust the seedbank for this species.

HISTORY

Widespread in the tropics and subtropics. On Midway, first collected in 1931. In 1954, "Only two or three plants were seen growing on each of the islands.". In 1999, observed in the disturbed, semi-maintained lawn in the Bart Hill area in the north part of Sand Island. It was not common on Sand Island or observed on Eastern or Spit Islands. In 2008, observed near Charlie Barracks, around the 400 housing on Halsey Dr., and by the Cable Company Buildings. Not observed in 2015.



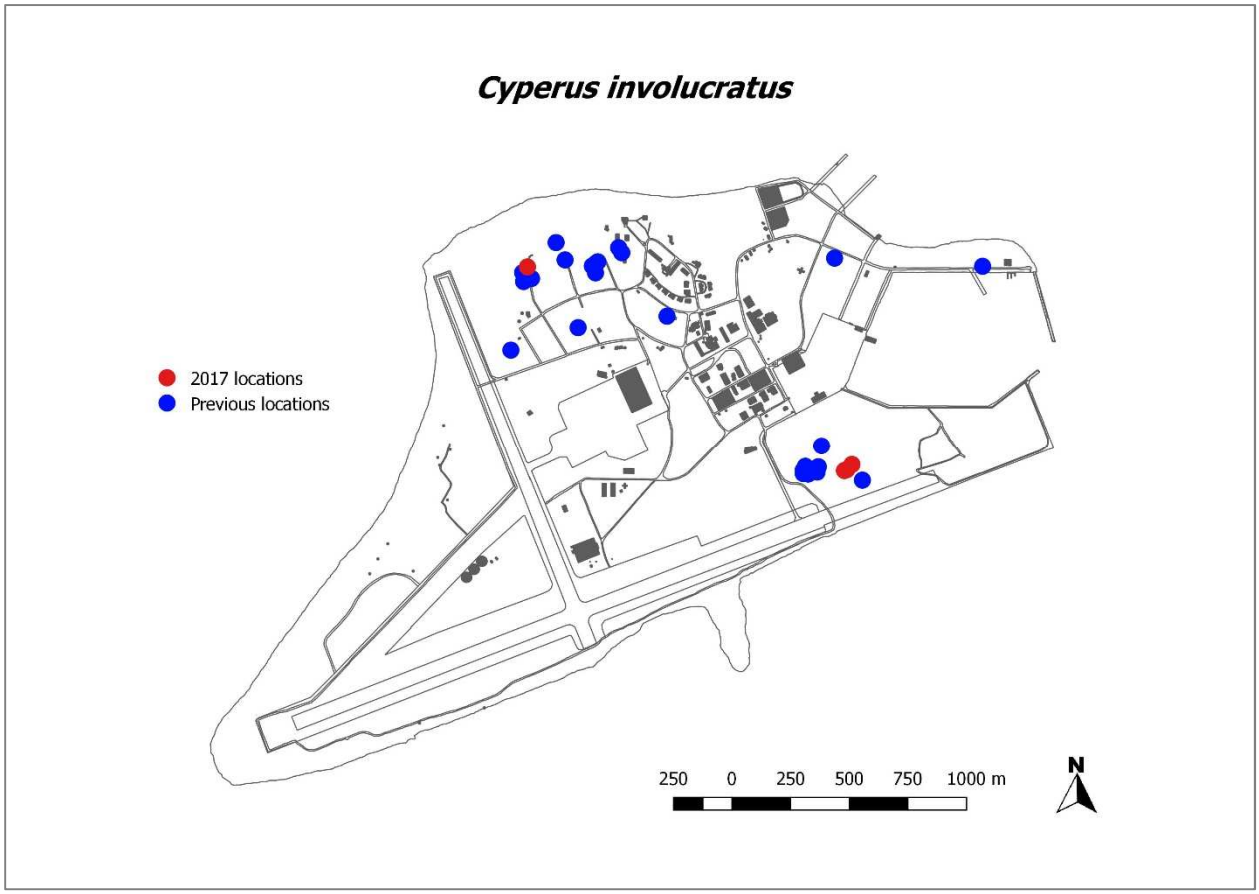
Cyperus involucratus (Umbrella sedge)

CURRENT

Present in a couple of previously known locations, but still greatly reduced in distribution since the peak near 2008, and on track for eventual eradication.

HISTORY

Native to tropical Africa. On Midway, first collected in 1933. Observed again in 1954, when "two or three densely grown clumps were seen under old ironwoods near the Cable Company compound, a few small plantings about residences, on Sand Island only." Collected in 1962 "near boy scout cabin", "in planter at BOQ"; and from Eastern Island "ca. 100 m inland of boat dock, in disturbed area near remains of building, one clump noted from island". Collected in 1979 growing in a rubbish pile on the west end of inner harbor. In 1999, observed in moist areas, occasionally forming monotypic stands. In 1999, the patches were being removed. In 2008, there were even more patches, due to a drop in resources and creation of Laysan Duck seeps. In 2015, this persistent sedge was all but gone from Midway, the result of weed control efforts and filling of many of the wetlands it preferred as habitat. The only place is was found was near the Runway Overrun.



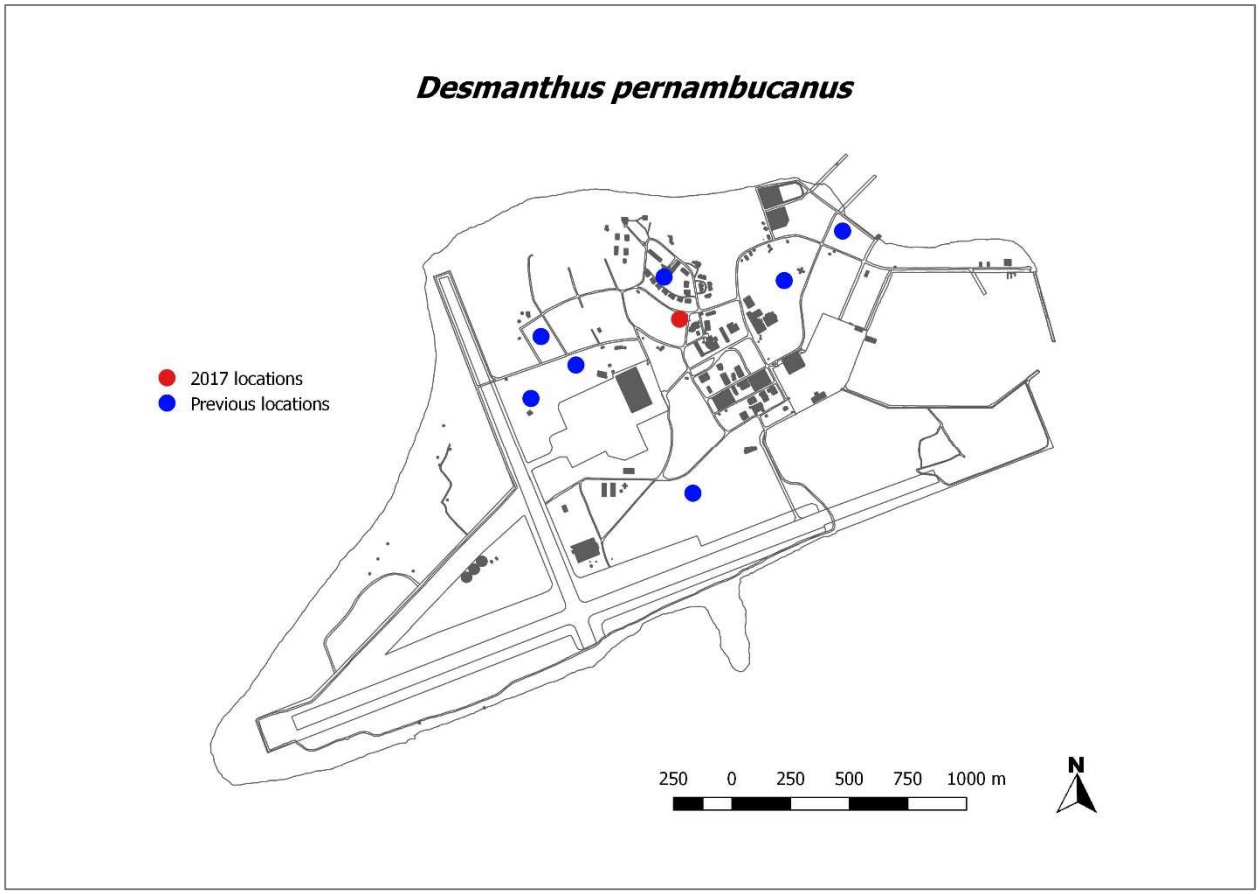
Desmanthus pernambucanas (Slender mimosa)

CURRENT

In 2017, one plant was observed in the Community Garden. It also apparently occasionally germinates in areas it was previously known.

HISTORY

Native to the Neotropics. On Midway, first observed in 1980. Not observed in 1995. In 1999, observed as occasional in weedy areas on Sand Island, especially the northern part of the island. In 2008, occasionally observed on Sand Island, especially near residences and Cargo Pier. Not observed in 2015.



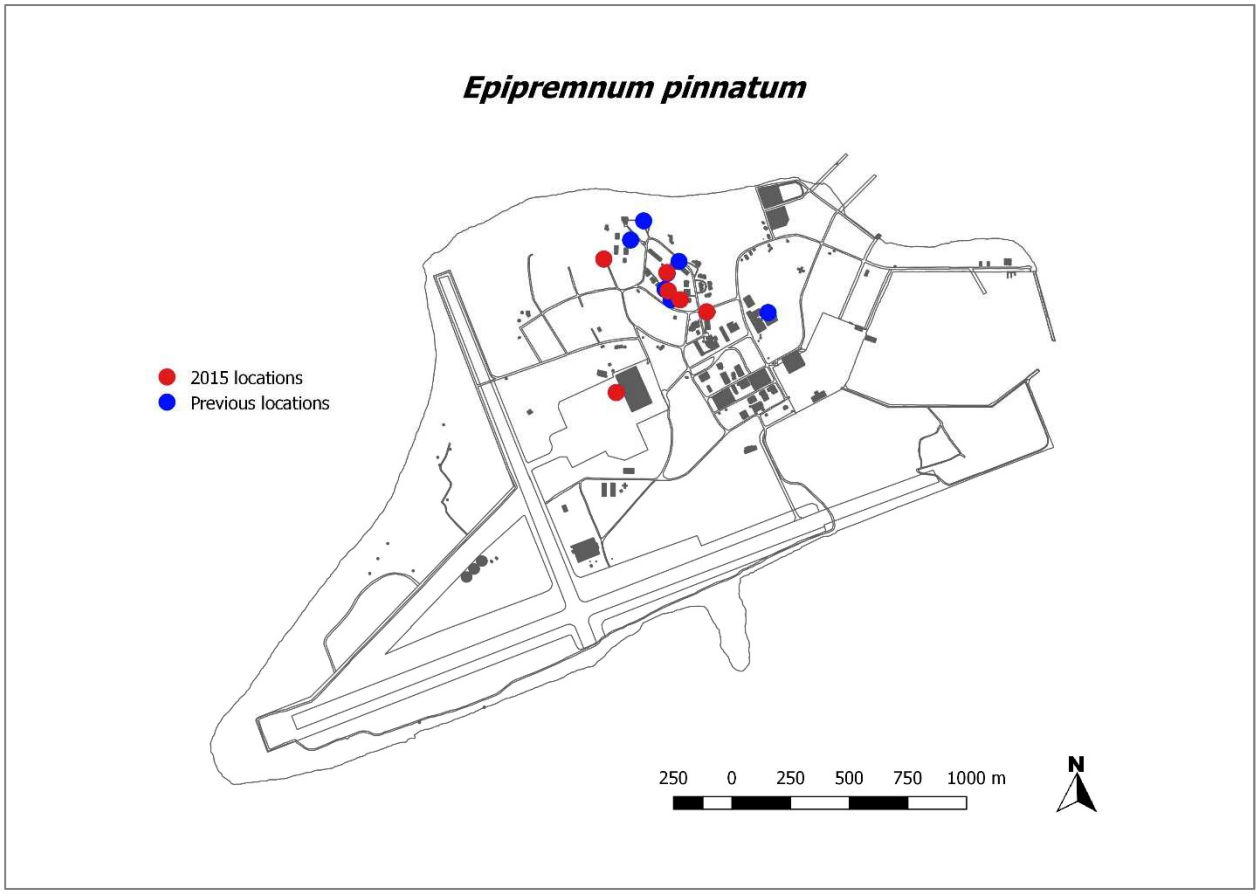
Epipremnum pinnatum (Golden pothos)

CURRENT

Not mapped in 2017, though observed in the same places in the Town area of Sand Island. Control work began shortly after our survey to remove the plants off buildings. It would be good to continue removing the rest of the plants, to prevent future damage to the buildings and infrastructure on Midway. This species was not mapped in 2017. The red points on the map below are from our 2015 survey.

HISTORY

Native to Malaysia. On Midway, first observed in 1979. In 1999, this climbing vine was observed in the housing area, the hanger, and the Cable Company buildings. In 2008, it was still common in the town area, often crawling up buildings. In 2015, there was a lot less of this species, but a few plants were still found around Town. Evidence of previous damage to structures was visible and most of the vines looked untended.



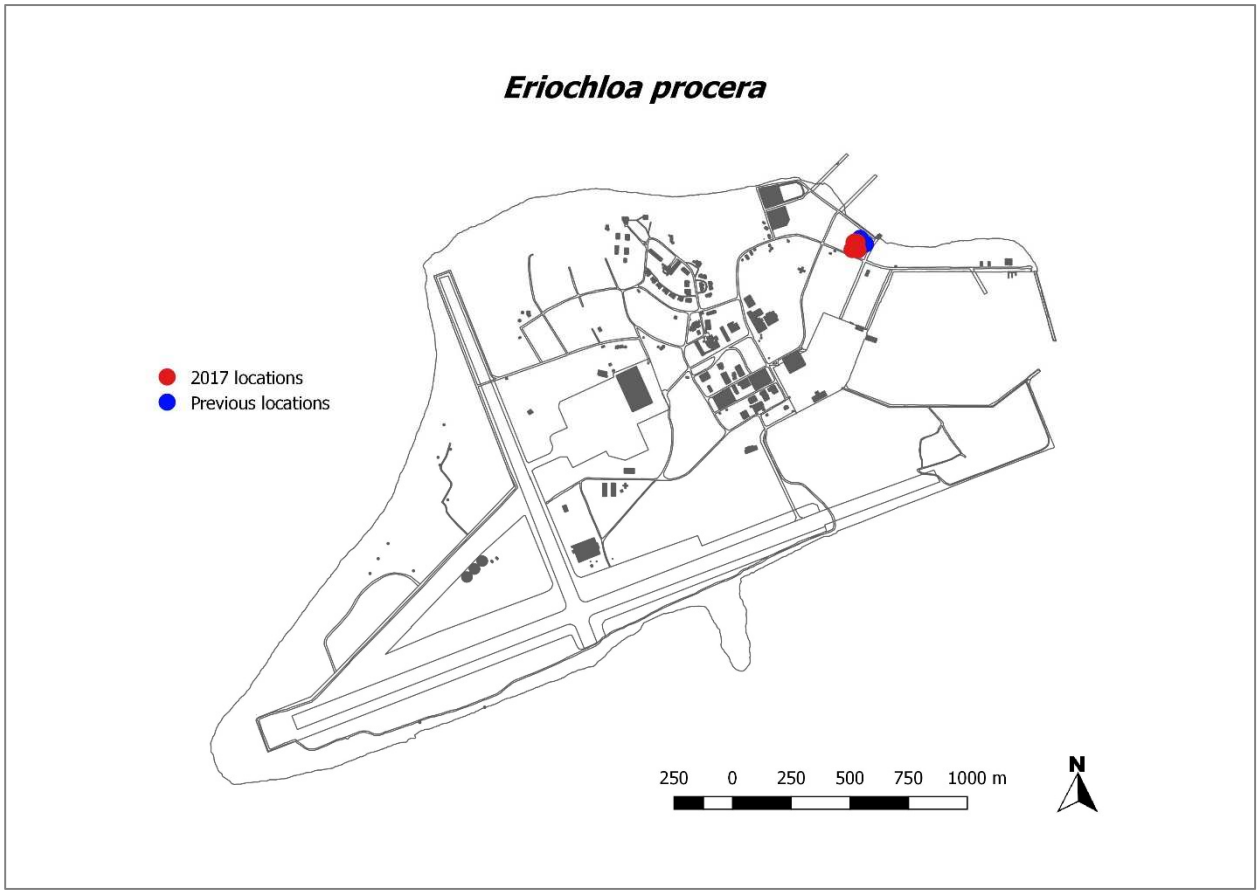
Eriochloa procera (Cupgrass)

CURRENT

Scattered clumps present in the same general location as in 2008 and 2015. Though not currently appearing to be the most worrisome grass, it is restricted to just a very small area, is not known from elsewhere in Hawaii, and could potentially display more invasive tendencies if it was to get to a more preferred habitat on Midway, such as a seep or other moister location. In discussions with FWS staff, a suggestion was to make this area an extension of the Hale Honu restoration site, which would result in a phasing out of this species over time in favor of native plants.

HISTORY

Native to Asia and Australia, where it is common in moist areas such as ditches and rice paddies. First collected in 2008 by the Cargo Pier. This remains the only known location on the atoll and in the state of Hawaii. Several dozen scattered clumps occurred throughout the field. Shortly after the survey, control of this grass was begun. Not observed in 2015.



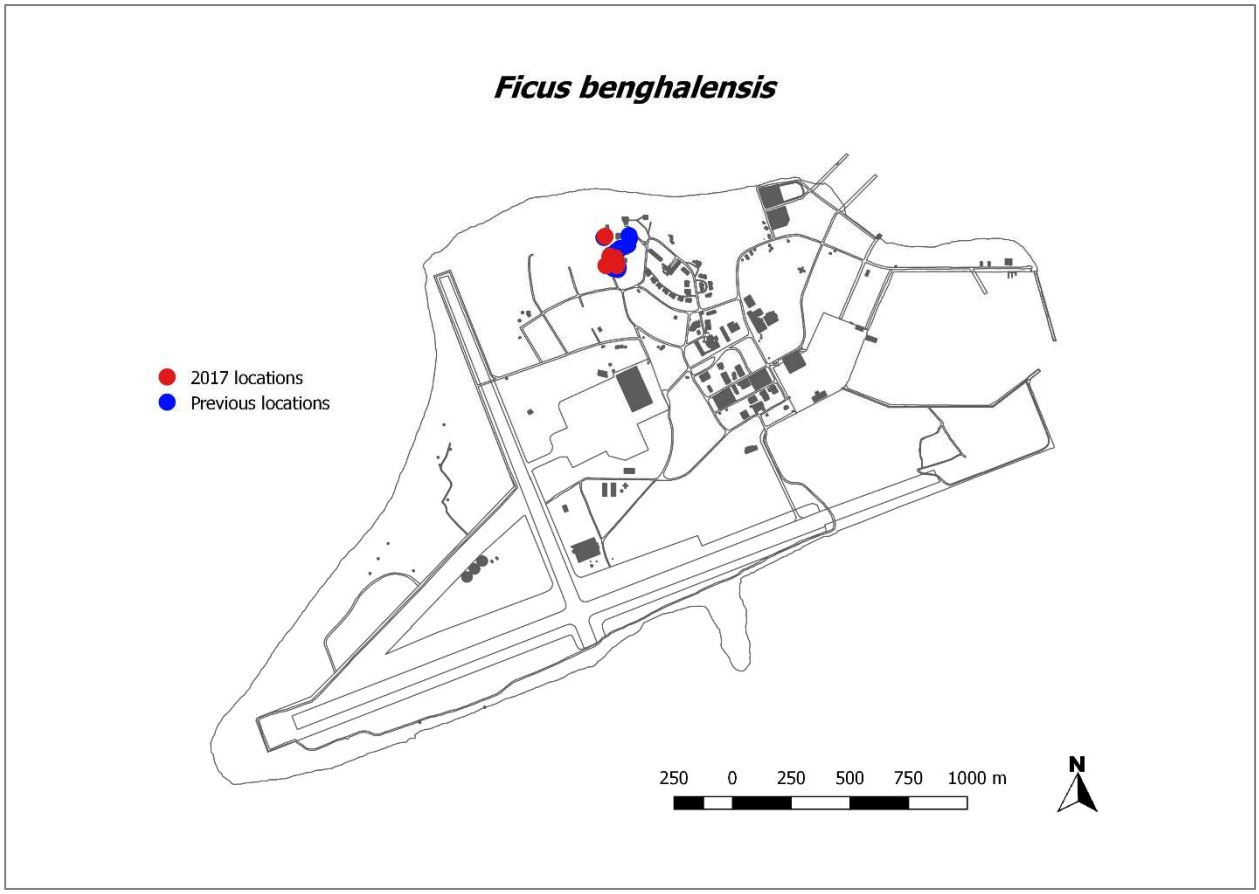
Ficus benghalensis (Indian banyan)

CURRENT

In 2017, the same trees were present. There was no evidence of the pollinator wasp or seedlings. The trees are nice and provide habitat for White Terns and Laysan Albatrosses. However, they have the potential to damage buildings. Suggest keeping away from structures and occasionally monitoring for pollinator wasps and seedlings.

HISTORY

Native to India. The pollinator wasp for this species is not yet present on Midway, therefore, it does not spread by seed. Collected in 1962 from the Cable Company area, the trees were "10 m tall some developing multiple trunks with red fruit". In 1999, the same trees were present, no seedlings were noted. In 2008, the large trees had begun growing into each other and sending down aerial roots. Though the trees had spread vegetatively over time, there was no sign of the pollinator wasp or seedlings. In 2015, many of the trees were gone, having been removed during lead abatement work. No seedlings or evidence of the pollinator wasp were noted, though one of the trees that was dug up and placed in a windrow of logs had re-rooted and was growing.



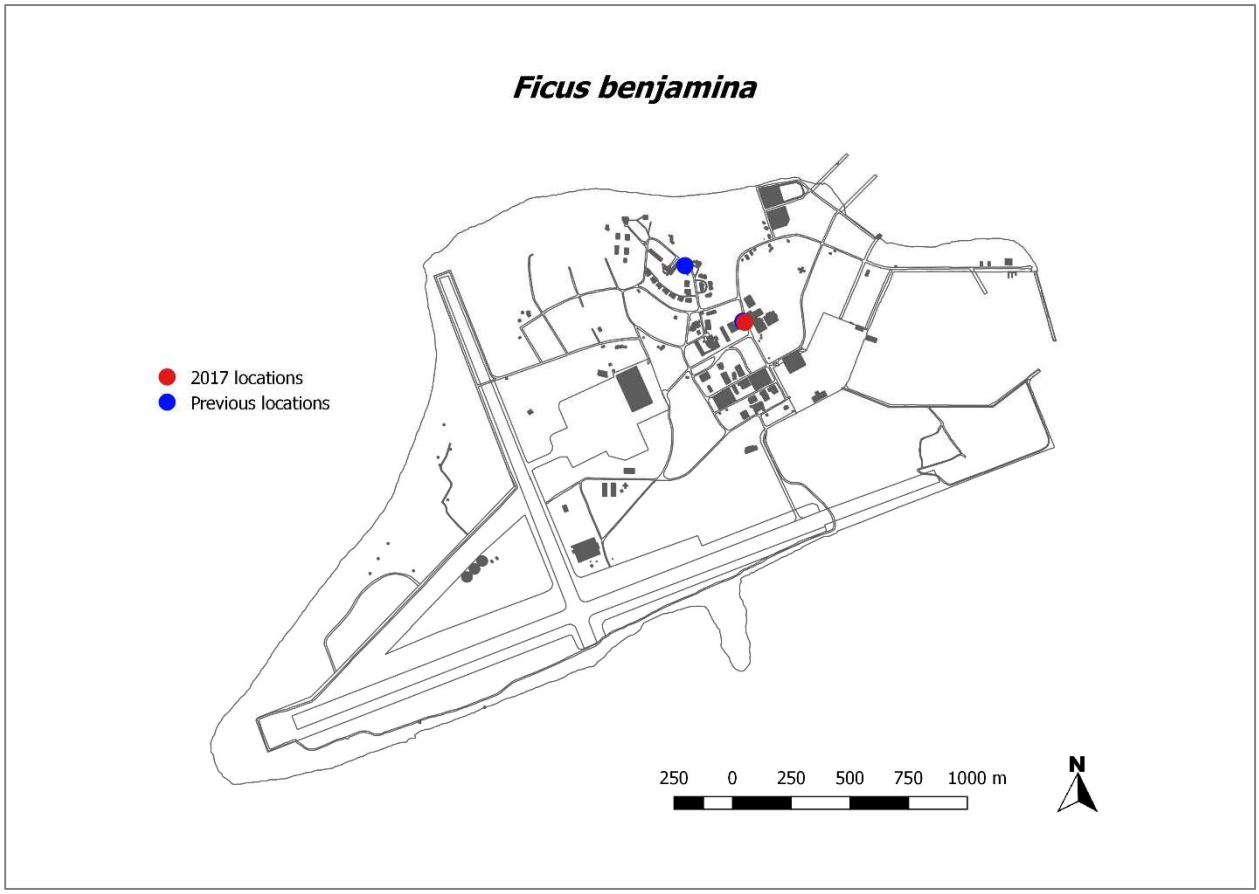
Ficus benjamina (Weeping fig)

CURRENT

In 2017, the status was the same. The lone large tree was present by the Gym. No signs of the pollinator wasp or seedlings were observed.

HISTORY

Native to India. The pollinator wasp for this species is not yet known to be present on Midway. Therefore, this species does not develop fertile fruit or spread by seed. First recorded on Midway in 1999, it was found to be occasionally planted in the ground and in pots on Sand Island. In 2008, two trees of this species were noted, a large one with a fine weeping habit just east of the Gym, and a smaller one in front of 4208 Commodore Ave. This species does not spread sexually, so should not be a problem unless it's pollinator wasp shows up, or if planted too close to structures, as the branches and roots of this species can be quite destructive. In 2015, the only location of this species observed was the large tree by the Gym. No signs of reproduction or pollinator wasps were noted.



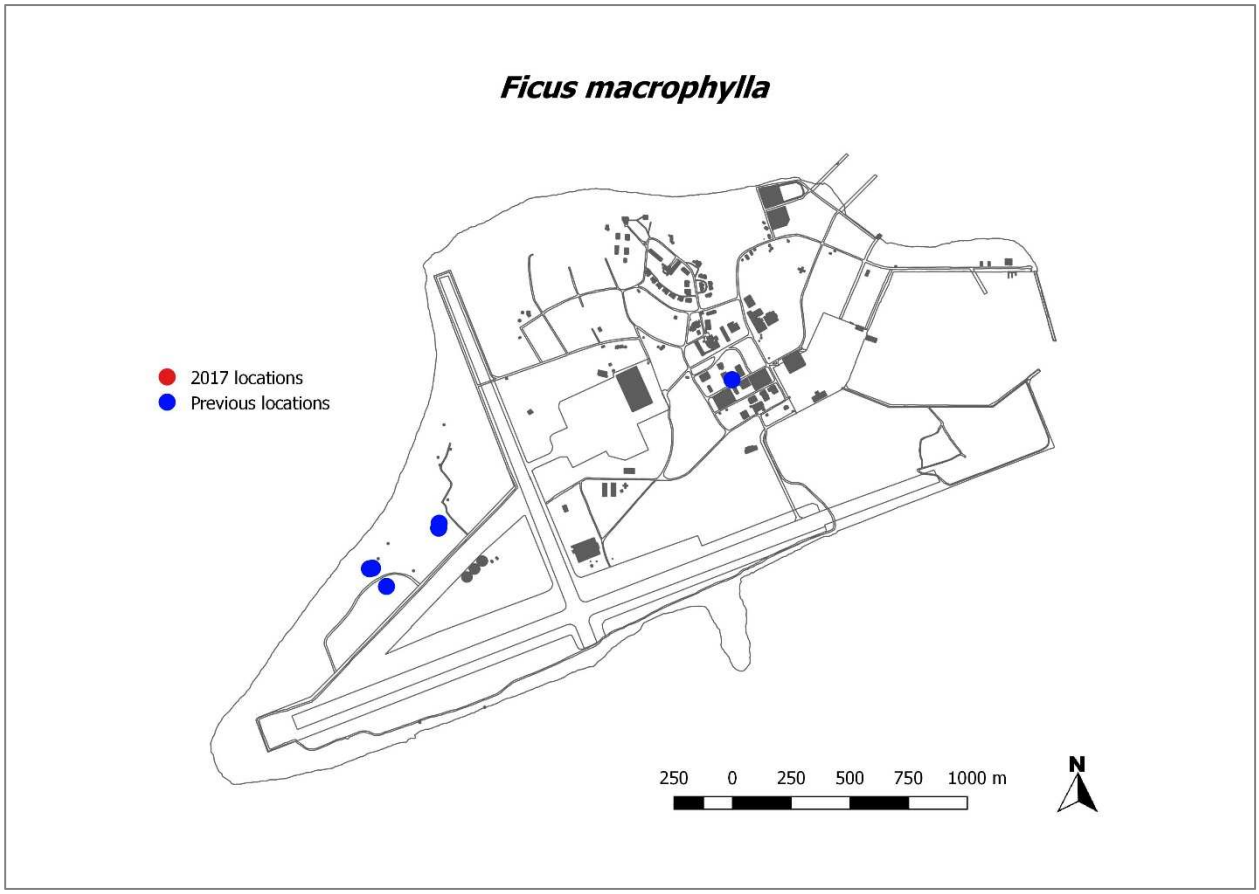
Ficus macrophylla (Moreton Bay fig)

CURRENT

Not observed in 2017. Presumed to be eradicated, though additional searches over time would help confirm this.

HISTORY

Native to Australia. On Midway, this species was first collected in 1980, but was only first identified in 1999, when two large trees were observed near the cart path at West Beach. No reproduction was noted. However, exit holes and live pollinator wasps were visible in ripe fruit. It was noted that with the pollinator present, there was potential for reproduction, and that control of this species before it spreads would be prudent. In 2008, the two large trees were still there, with exit holes and pollinator wasps in ripe fruit. Additionally, this species had begun to spread sexually. A few saplings were observed on dead ironwood logs near the Cart Path on West Beach, and at the Water Plant in Town. In 2015, all the known trees had been controlled, but two more trees were found on West Beach. These were treated. No additional signs of spread or evidence of the pollinator wasp were found.



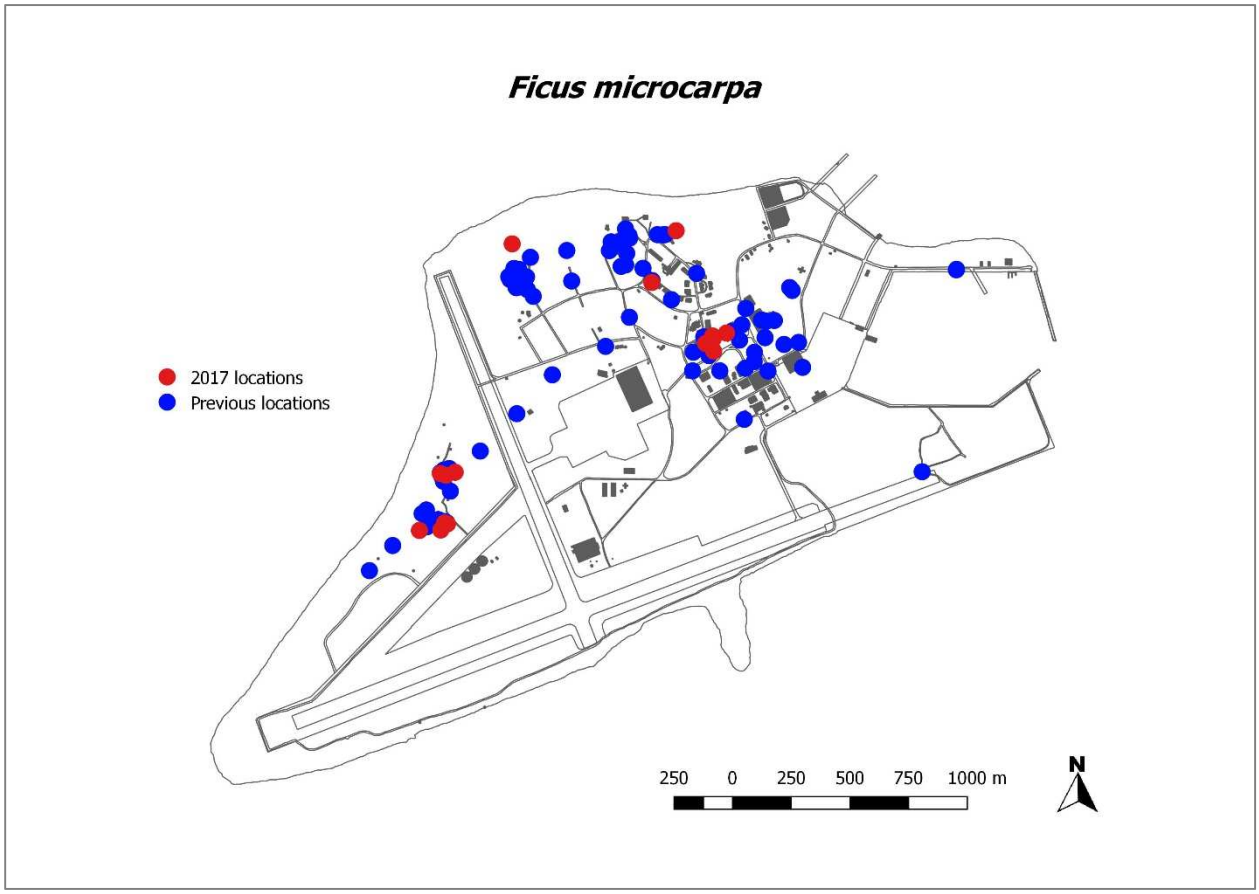
Ficus microcarpa (Chinese banyan)

CURRENT

In 2017, a couple dozen small plants were observed, mostly on buildings and ironwood trees, but also one cultivated at a residence. This species presents the greatest botanical threat to the structures on Midway. Great strides have been made in control of this species, a bit more persistent diligence and that threat could soon be eradicated.

HISTORY

Native to Asia. On Midway, first reported in 1979. In 1995, naturalized and rare. In 1999, along with some large trees, small plants were growing on stumps and buildings, threatening to damage them. In 2008, large trees remained, a few small seedlings from 1999 had grown up to be large trees, and lots of seedlings and saplings had sprouted on stumps and structures over the entire island. The species was growing on and damaging the Cable Company Buildings, Seaplane Hangar, Old Galley, Midway Mall, Power Plant, Harbor Sea Wall, and Gym. In 2015, there were no longer large trees of this species, all having been removed. The remaining plants, all relatively small, were mostly near where previous large trees existed.



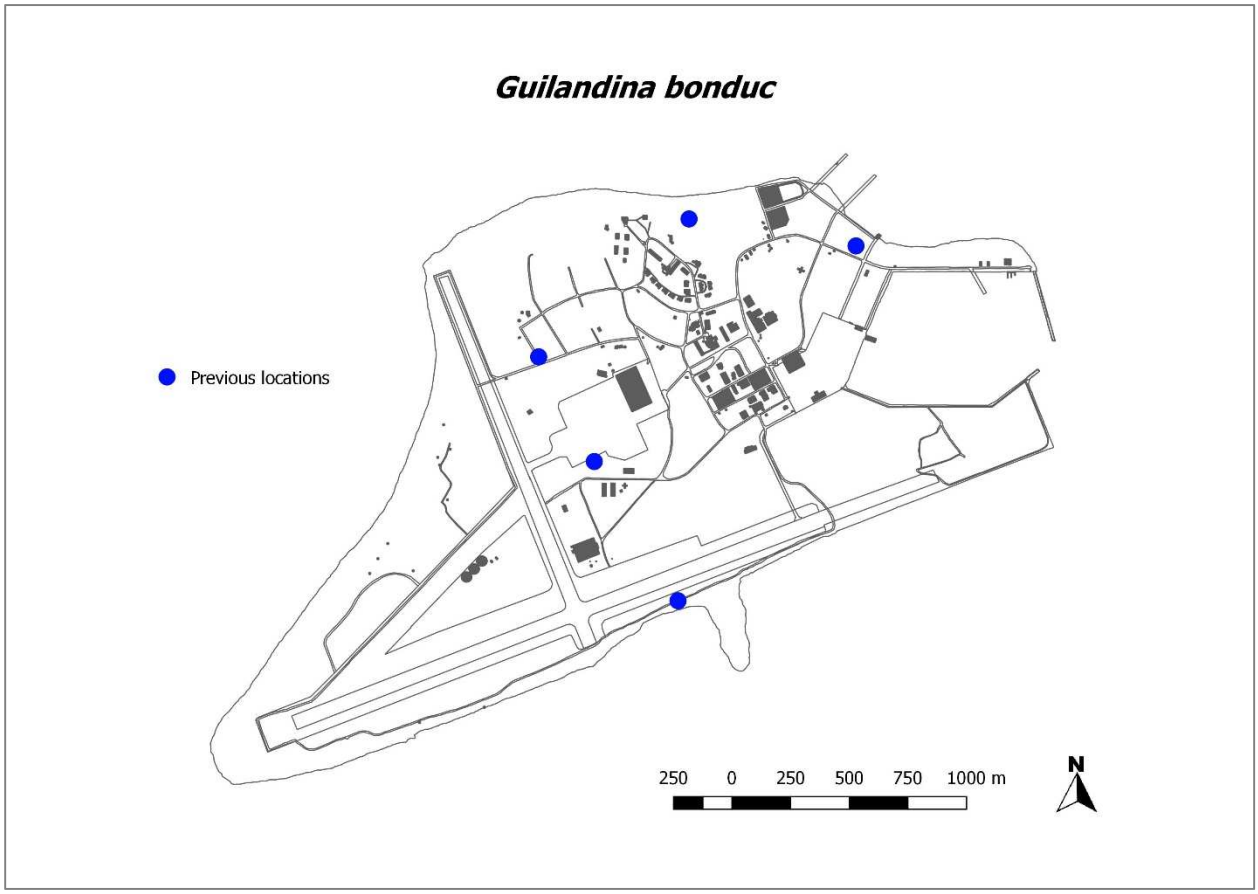
Guilandina [*Caesalpinia*] *bonduc* (Yellow nickers)

CURRENT

Not observed in 2017, but given the potential for reintroduction from seabirds and ocean currents, it seems likely it will return.

HISTORY

Pantropical in distribution, this climbing shrub with recurved prickles has seeds which float long distances. In 2008, a lone plant with a few spiny, vine-like stems about five meters long was found south of the Doctor's Cemetery on Sand Island. It is unknown how the plant got in that location, but it seems likely a floating seed was eaten by a seabird at sea, then brought to Midway where the bird either died or puked up the seed. The seed then grew into the burgeoning plant. The plant is considered native to Hawaii, yet has spines, and can create impenetrable thickets. After much discussion it was decided to remove the plant in the interest of the wildlife. By 2012, four additional locations on Sand Island had been controlled, a seedling by the Cargo Pier, a seedling near Captain Brooks, a sapling near the Marine Barracks, and a small patch along the South Beach Cart Trail near Bulky Dump. It was also reported from near the Eastern Island Pier. Not observed in 2015.



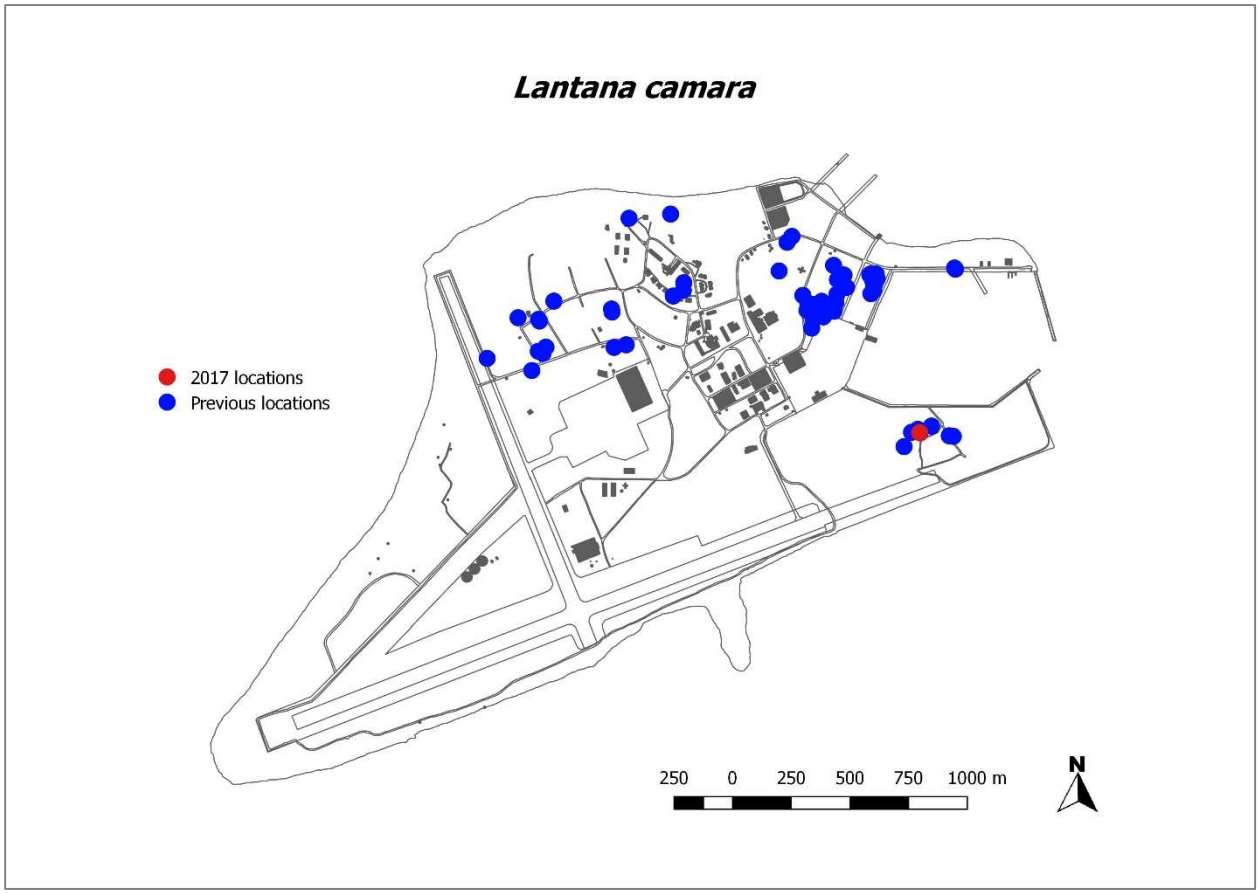
Lantana camara (Lantana)

CURRENT

Not observed by us during our 2017 survey, but a small plant was pulled around that same time near the Brackish Seep. It is not known how long the seedbank of *Lantana* remains viable, but this species is very close to being eradicated.

HISTORY

Probably native to the West Indies. On Midway, first collected in 1933. Recorded in 1955 "only as a hedge and ornamental plant in the residential and administrative area of Sand Island." In 1995, listed as occasional and naturalized. In 1999, this thorny shrub was found scattered in several areas, but nowhere in high densities. In 2008, it had increased in distribution and density, becoming locally common and creating thickets, especially south of the Cemetery and northeast of the Seaplane Hangar. In 2015, there was amazingly only one *Lantana* plant noted, near the Tugboat Pier. The massive reduction in distribution was due to a concerted control effort.



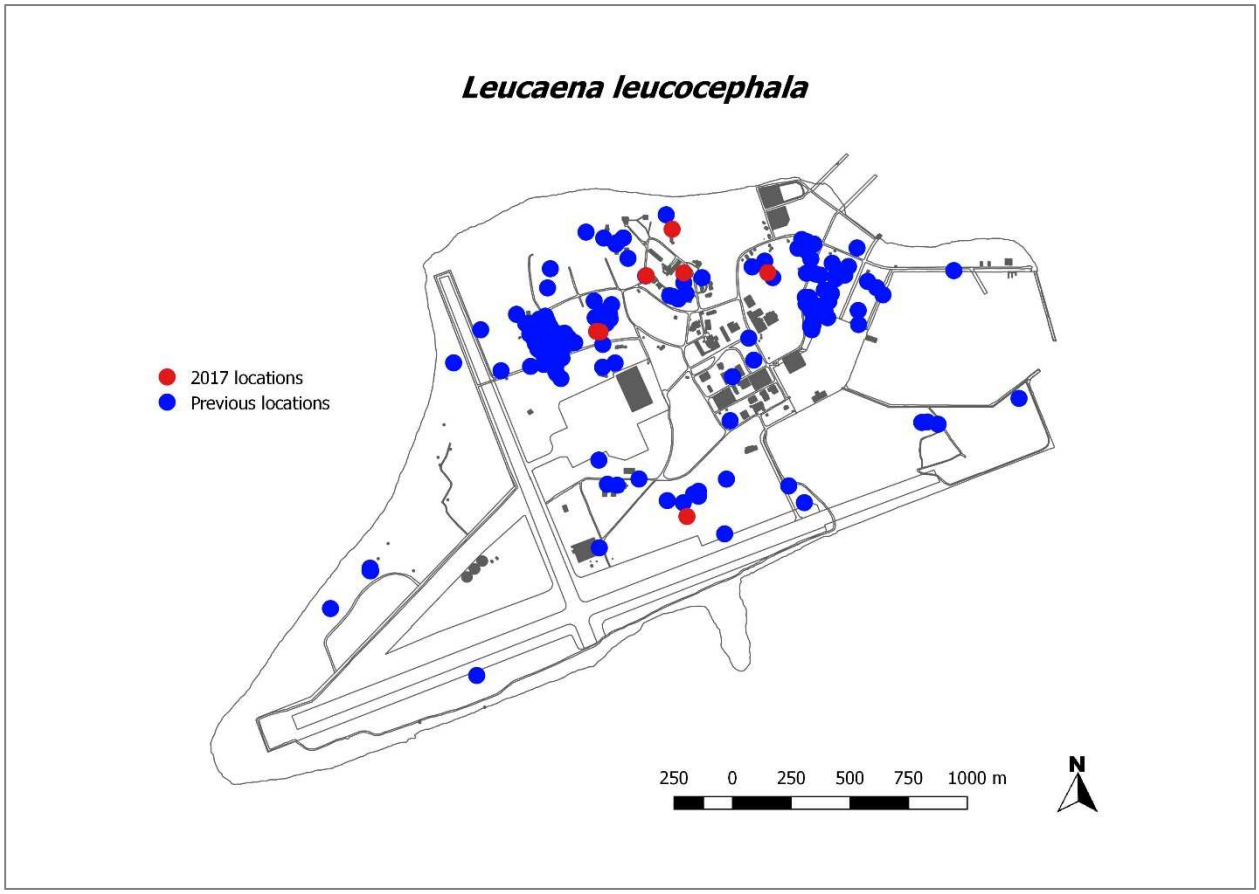
Leucaena leucocephala (Haole koa)

CURRENT

Only a few plants were observed in 2017, in areas it was previously known. We would have never anticipated the level of control that has been achieved, given how entrenched the species was on Midway. It is uncertain how long the seed bank will last, but if the current level of control can be maintained, eradication seems attainable.

HISTORY

Native to the Neotropics. On Midway, first collected in 1933. In 1954, "The only plant seen was growing on the lawn of the Administration Building on Sand Island." In 1999, it was occasionally found in waste and urban areas on Sand Island, where it was established, but did not appear to have come close to filling its potential range. In 2008, it was still widely dispersed, but there were now large patches. An area of note was between the Cemetery and Henderson Rd., with a just above head height canopy of *Leucaena* forming a dog hair thicket. In 2015, the distribution of *Leucaena* on Midway was way down, due to control efforts. We were only able to locate a few small plants, all near previously known patches.



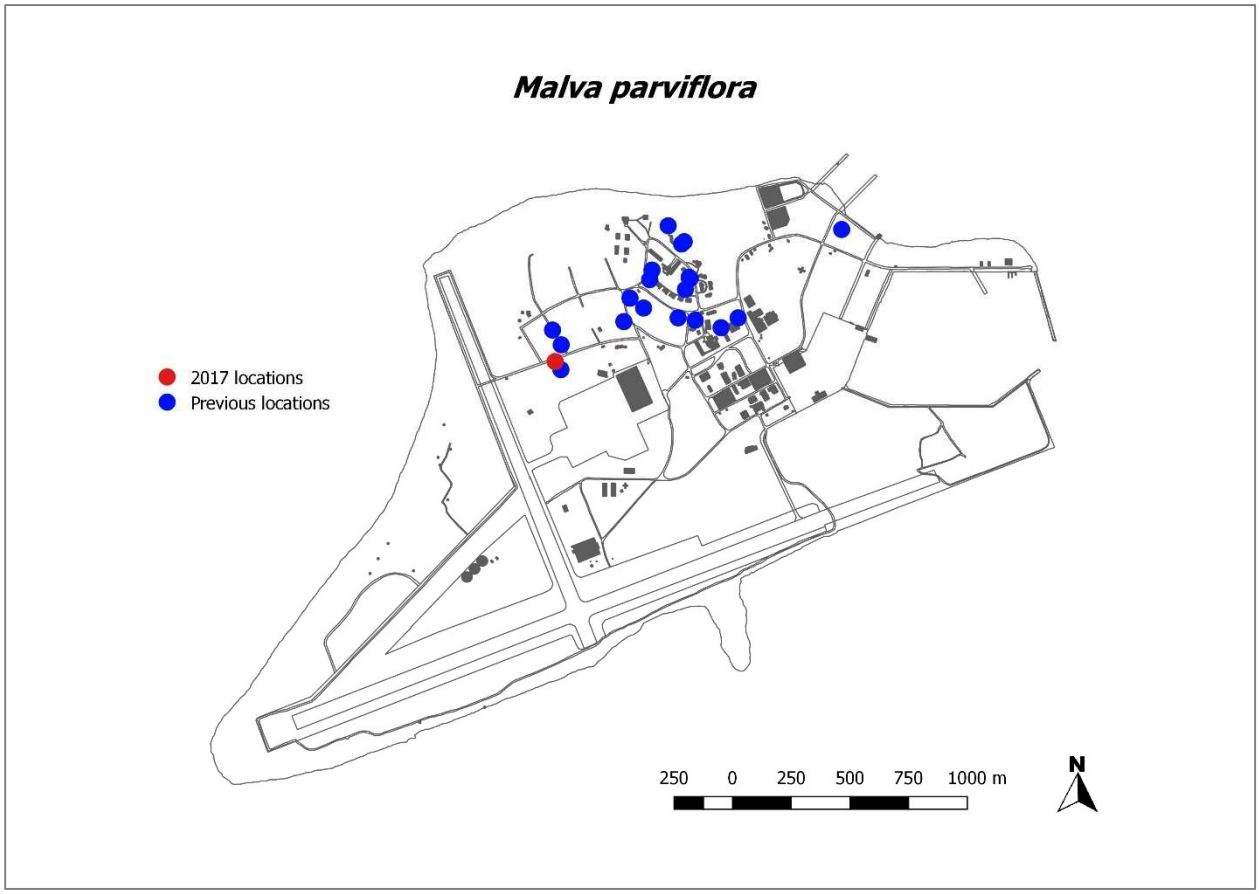
Malva parviflora (Cheese weed)

CURRENT

In 2017, only one small plant was observed and pulled, in the same area this species was observed in 2015, between the Doctor's Cemetery and the Taxiway. Though a seedbank exists, as it apparently still germinates in many areas it was previously known from, this species is much more under control than in the past, and could potentially be eradicated if control continues.

HISTORY

Native to the Mediterranean region through Asia. Reported from Midway in 1983. In 1999, found to be occasional in areas north of the Midway House on Sand Island. Apparently in the years just prior to 2008, after mowing stopped, cheese weed had gotten out of control, getting up to chest height in areas like the field north of the Midway House. Cheese weed was then brought back under control. In 2008, it was only occasionally found scattered about the lawn areas of Sand Island, including near Charlie barracks and the field at the Ave Maria. In 2015, only one small patch was observed, near the Underground Hospital between Radar Hill and the Taxiway.



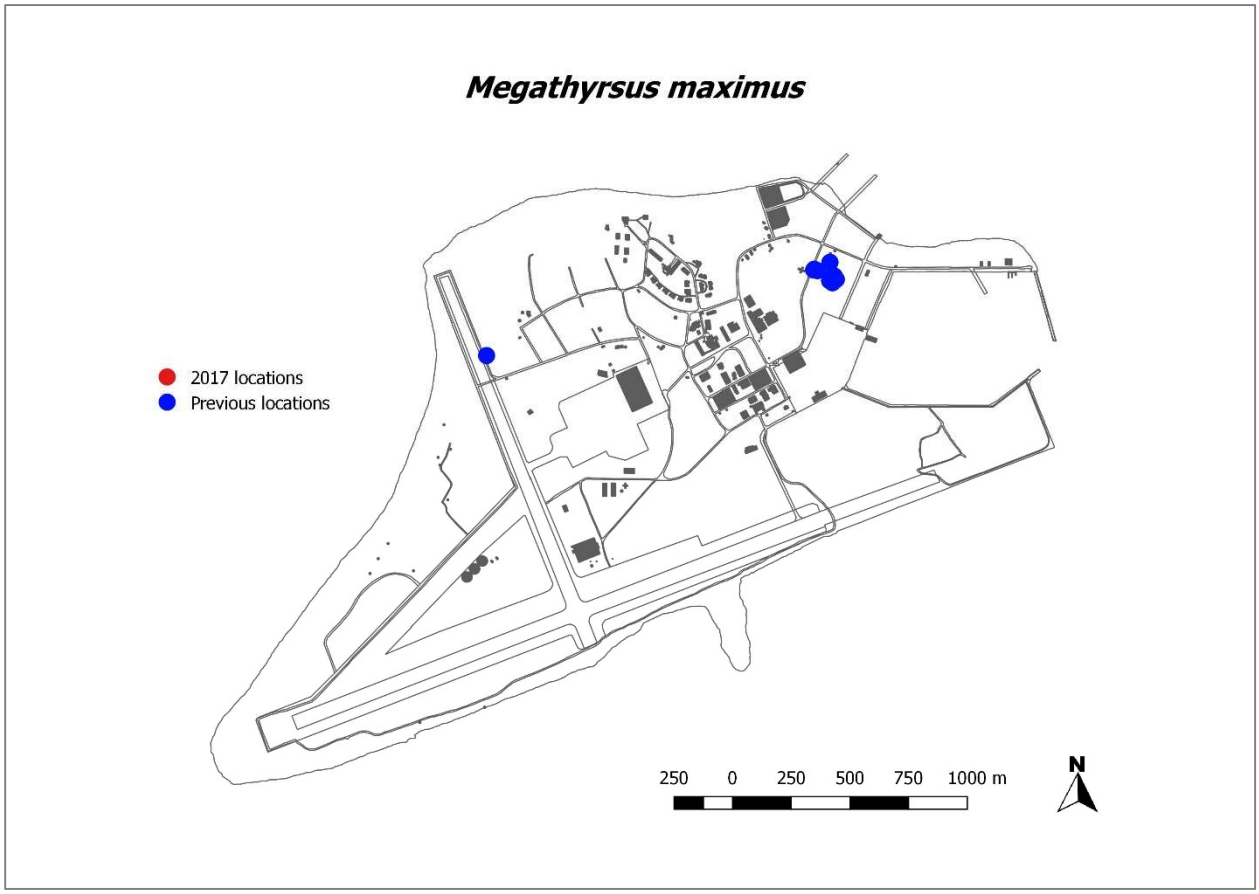
Megathyrsus maximus (Guinea grass)

CURRENT

Not observed in 2017. Presumed to be eradicated or restricted to seed bank. Occasional surveys in the previously known locations would be prudent.

HISTORY

Native to Africa. First observed on Midway in 1995. In 1999, one patch was observed on Sand Island, west of the northwest corner of the harbor. It was noted this aggressive grass was currently restricted to one patch, but had the potential to expand its range. Control efforts were made by FWS. In 2008, this robust grass was found in the same spot by the harbor, but the patch had become smaller and more dispersed. Another patch about 5m x 5m was found along the N/S runway near Rusty Bucket. Both sites were retreated annually through at least 2013. In 2015, this grass was not observed, despite searches in the previously known locations.



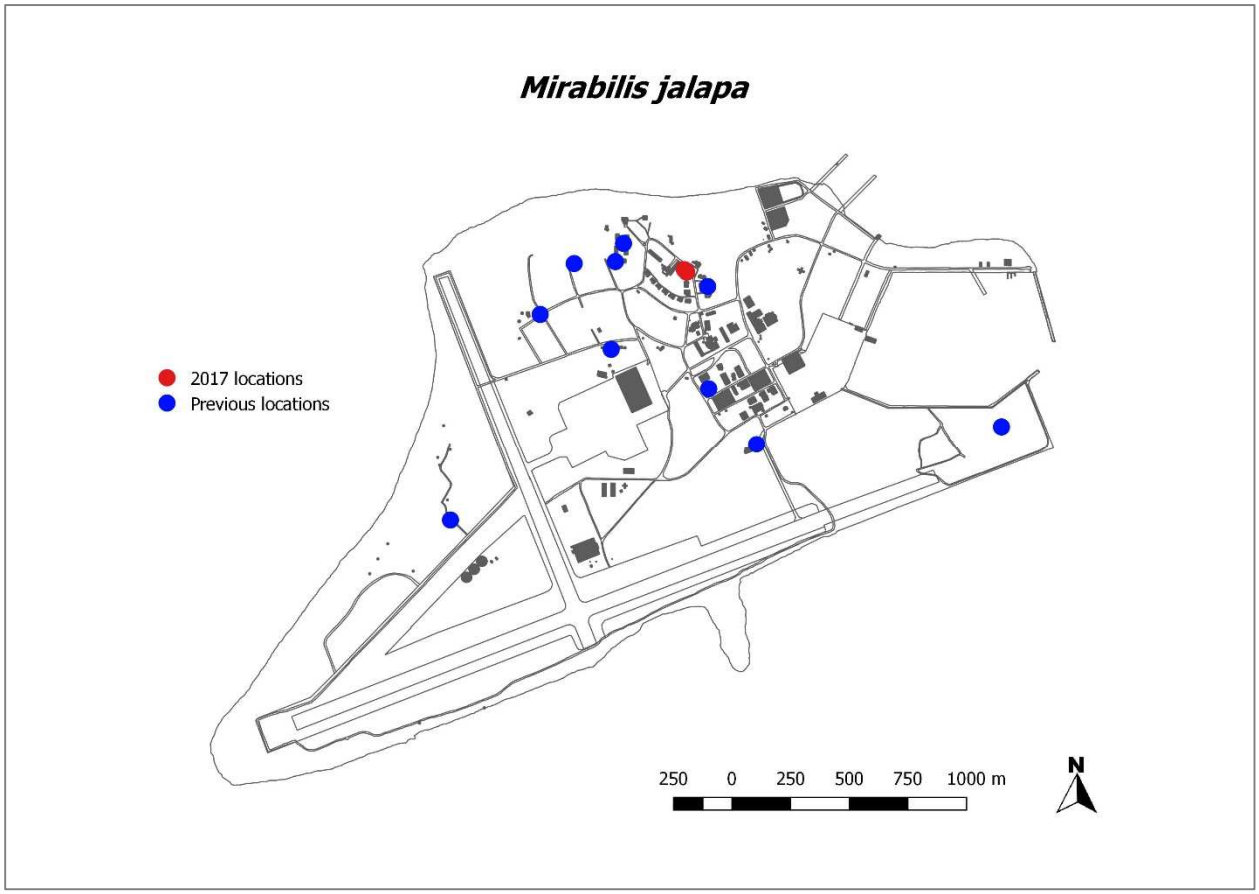
Mirabilis jalapa (Four o'clock)

CURRENT

About 20 plants in front yard of house 4208, where it has been since at least 1999, despite repeated control efforts. Not observed in other locations, but likely has a persistent seed bank. Most effective control method is carefully handpulling the tuber, which can be quite large and deep in the soil. If the tuber is not removed, the plant will grow back.

HISTORY

Native to tropical America. First collected on Midway in 1980 from the northeast part of Sand Island near the dump. In 1999, it was persisting in the lawn areas near the north part of Sand Island. In 2008, *Mirabilis* was around the residences, despite attempts to kill it by cutting it to the ground. Also at the Cable Company Buildings and the cart path to Aviary Seep. In 2015, present at the 4208 house, even after repeated control efforts. A young group of seedlings were observed and pulled under the ironwoods on the road to the now abandoned Aviary Seep. Also reported occasionally germinating and growing in front of the Doctor's Cemetery, and during larger outbreaks, on the northwest corner of Ballfield and across the road.



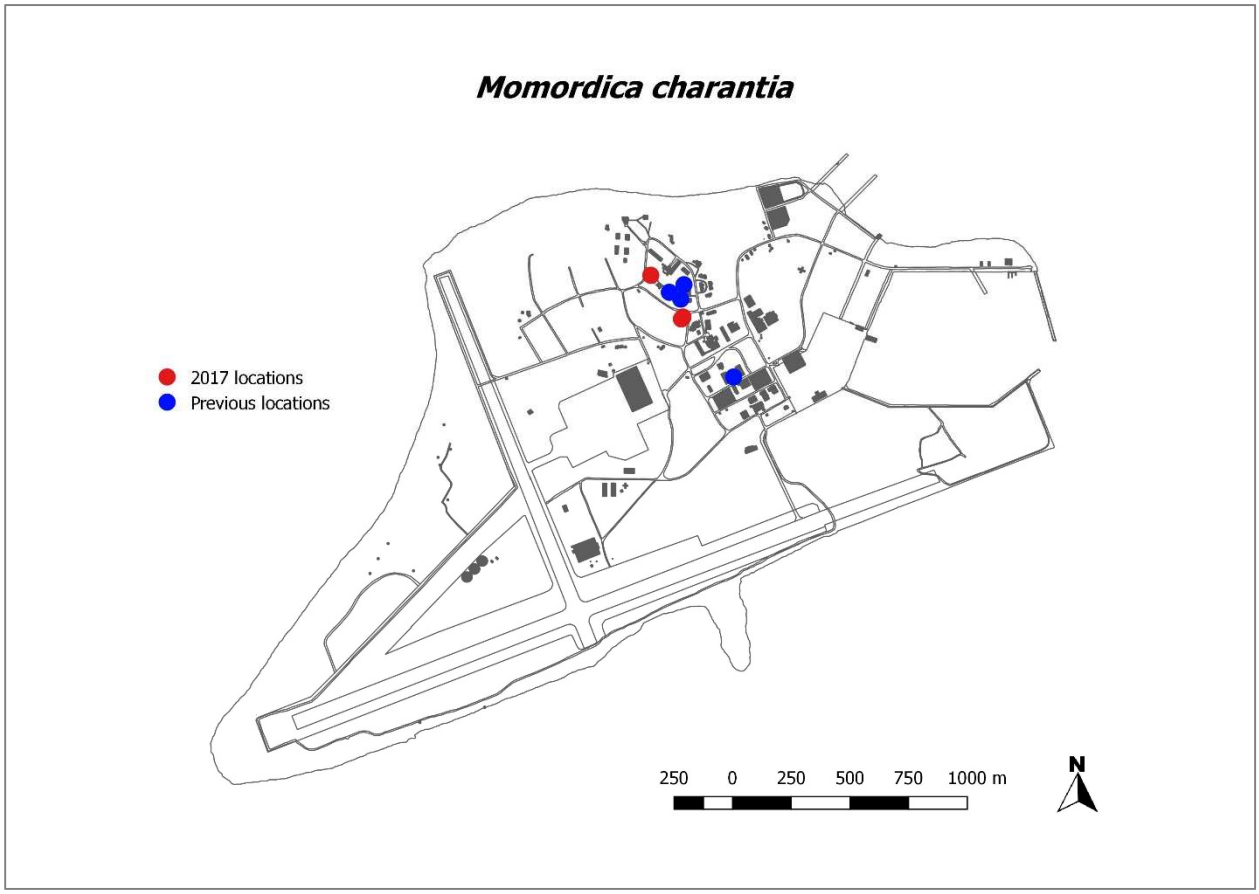
Momordica charantia (Balsam pear, bitter melon)

CURRENT

In 2017, vines were growing in the Community Garden and at a residence. This species has the potential to spread beyond cultivation. If folks feel they must grow this species on Midway, we suggest growing it in the Hydroponics Greenhouse, to minimize potential for spread.

HISTORY

Native from tropical Africa to Australia. First recorded from Midway in 1999, where it was cultivated in the residential area and escaping into nearby lawns and waste areas. In 2008, there were only two locations of this vine found on Sand Island, one at 415 Commodore Ave. growing on a chain link fence. The other at the Water Plant, where a single vigorous fruiting specimen was climbing up a nearby papaya tree. In June 2012, Google Street View showed a sprawling vine was still present at the Water Plant. In 2015, the vine at the Water Plant was gone, the only plant observed was one growing in the Residences at house 418. No seedlings were observed, though we have observed seedlings in the lawn in the same general area back in 1999.



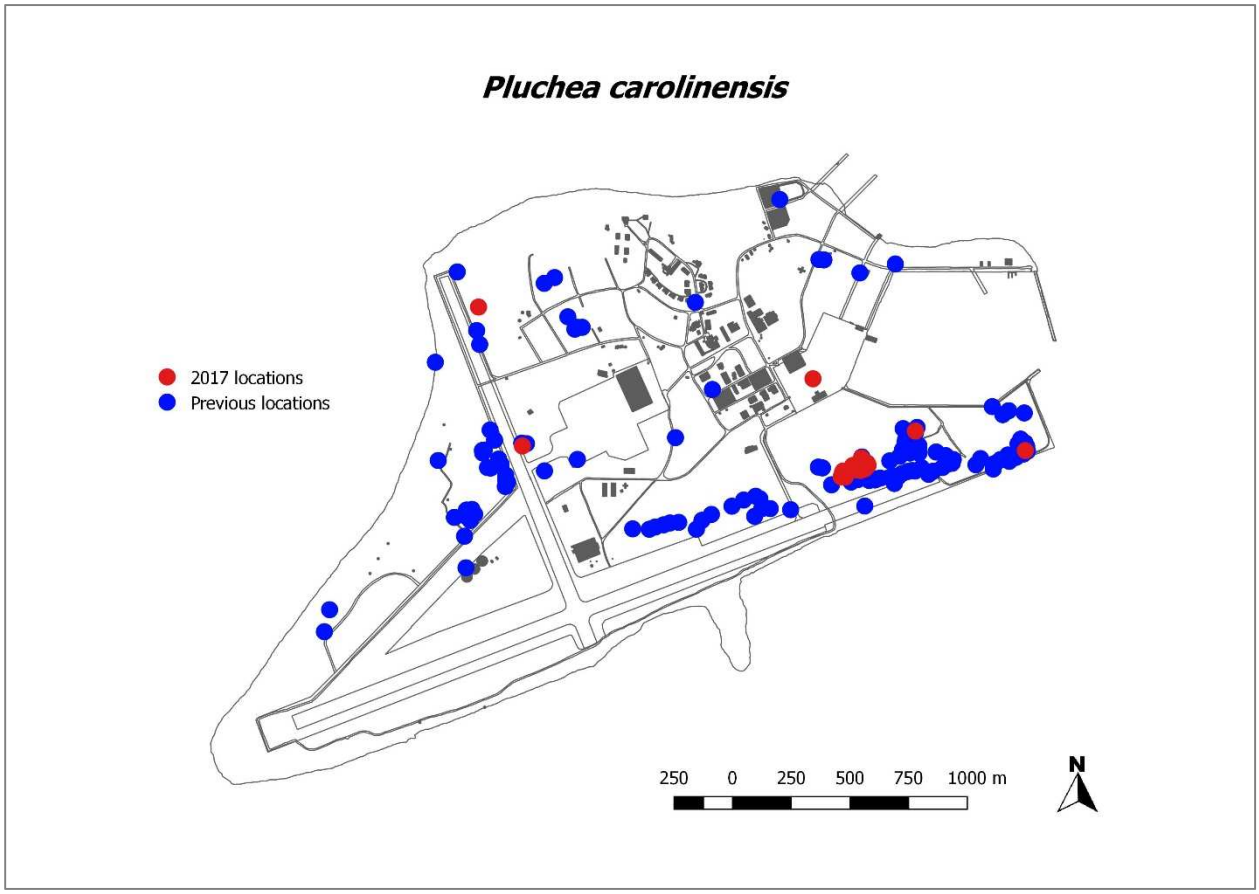
Pluchea carolinensis (Sour bush)

CURRENT

In 2017, the recently cleared Gash area at the east end of the Runway had a diffuse patch of quite a few seedlings and young plants. There were also scattered individuals elsewhere on Sand Island. Continued control should help dwindle down the seedbank.

HISTORY

Native to Central America. In 1995, this species was "More widespread on Eastern Island than on Sand Island, but abundant on both. This weed species has taken over many open areas where the soil was disturbed by construction work, such as along the margins of runways, and now forms an almost impenetrable barrier to heights of four to five feet." The situation did not seem so bleak in 1999, when scattered individuals and small patches were observed on Sand, Eastern, and Spit Islands. In 2008, it was not observed on Eastern or Spit Islands, but increased in distribution on Sand Island, most notably near the Dump and Runway. In 2015, control efforts had removed all the large individuals, the only plants of this species found were small seedlings, mostly in the low moist areas along the northern boundary of the east end of the Runway.



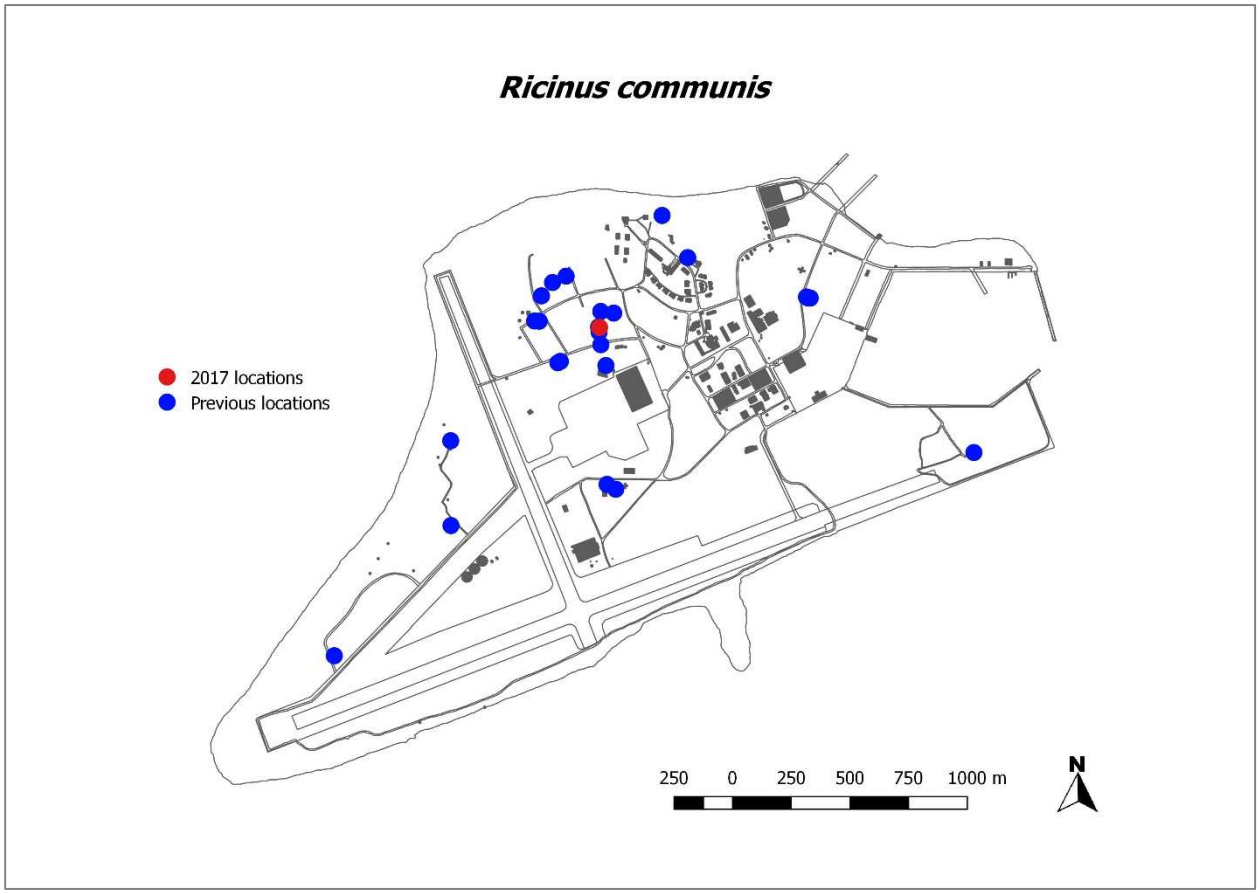
Ricinus communis (Castor bean)

CURRENT

In 2017, a single plant was observed at Radar Hill, growing out of the old radar facility. A collection was made, as no previous collections with fertile material had been made from Midway. Though this species has a potentially long-lived seed bank, it has been greatly reduced in distribution and continued control should keep it in check and eventually eradicate it.

HISTORY

Native to Africa. On Midway, in 1954 it was reported "An occasional small plant was seen on Eastern Island. On Sand Island, there are several fairly large patches, some of them far distant from the residential area." In 1999, castor bean was found to be naturalized, including some large patches near the cart path. Control efforts were underway by the FWS. In 2008, castor bean was still present, and though it had spread to new areas, it was gone from some other areas it had been in. Areas that had patches in 2008 were the Marine Barracks, Dump Pond, Boneyard, West Beach, and most notably the area around Radar Hill and the Cemetery. In 2015, after much control work, only two small seedlings were observed and pulled, at Radar Hill.



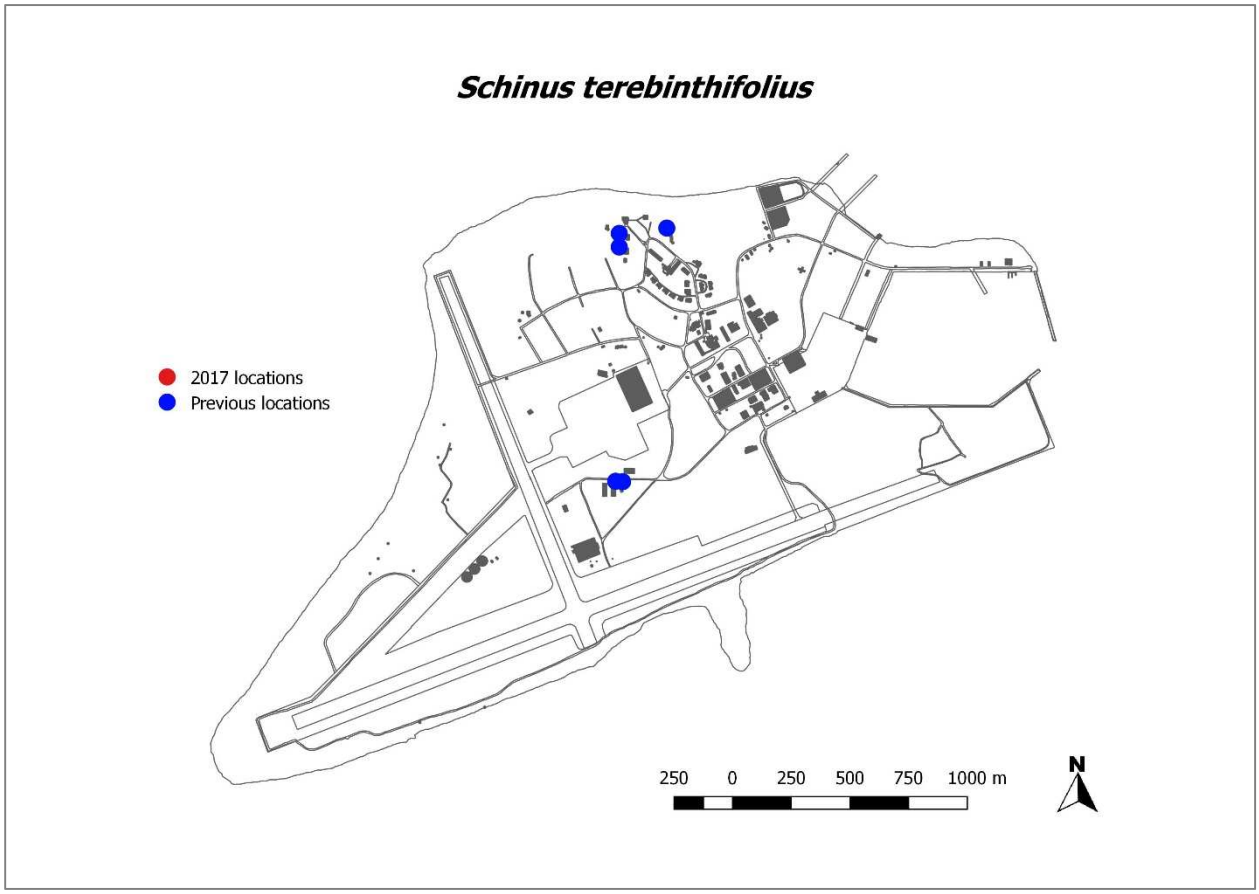
Schinus terebinthifolius (Christmas berry)

CURRENT

This species was again not observed in 2017, despite searches in the previously known locations. For now it appears this infamous species has been eradicated from Midway, again.

HISTORY

Native to Brazil. On Midway, first collected in 1954 on Sand Island as an ornamental. In 1995 noted to be naturalized. In 1999, four trees were observed on Sand Island, two trees by Pacific Cable Company buildings and two trees at Marine barracks. As of July 2000, three had been removed, and only one tree remained, being slated for removal in the near future. This species was not observed in 2008 and was considered eradicated or restricted to a seed bank. In 2015, there were again none observed. However, FWS relayed that in 2014 a fruiting *Schinus* was poking out of an Oleander hedge southeast of Captain Brooks, and that it had been controlled. No seedlings were observed nearby.



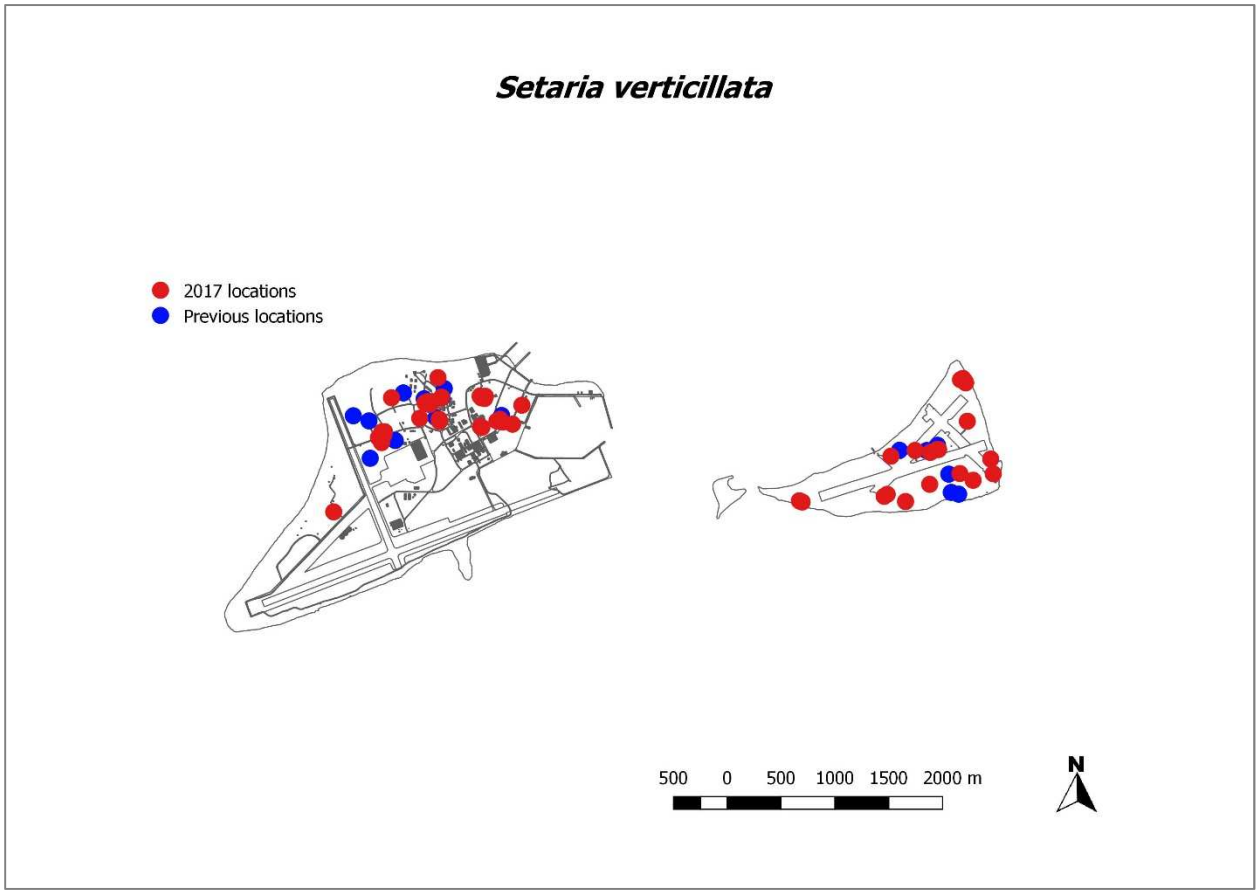
Setaria verticillata (Bristly foxtail)

CURRENT

In 2017, this species was scattered over much of Sand and Eastern Islands. Continued control efforts seem like they will be necessary to keep this pesky grass from further increasing in distribution.

HISTORY

Native to Europe. The bristly seeds stick to passersby and can be transported between islands. In 1954 it was locally abundant in open spaces on both Sand and Eastern Islands. In 1999, found to be occasional to common on Sand Island in lawns and waste places. On Eastern Island, occurring over most of the island, especially near revetments. Two small patches were found on Spit Island and pulled. In 2008, this grass was still present on Sand and Eastern Islands. On Sand Island, it was found in lawns, mostly in Town. On Eastern Island, it was observed in hard packed open areas. In 2015, there was less bristly foxtail, likely due to ongoing control. On Sand Island, a few plants were found around the Residences and in Town. On Eastern, a plant was found just inland and east of the Pier.



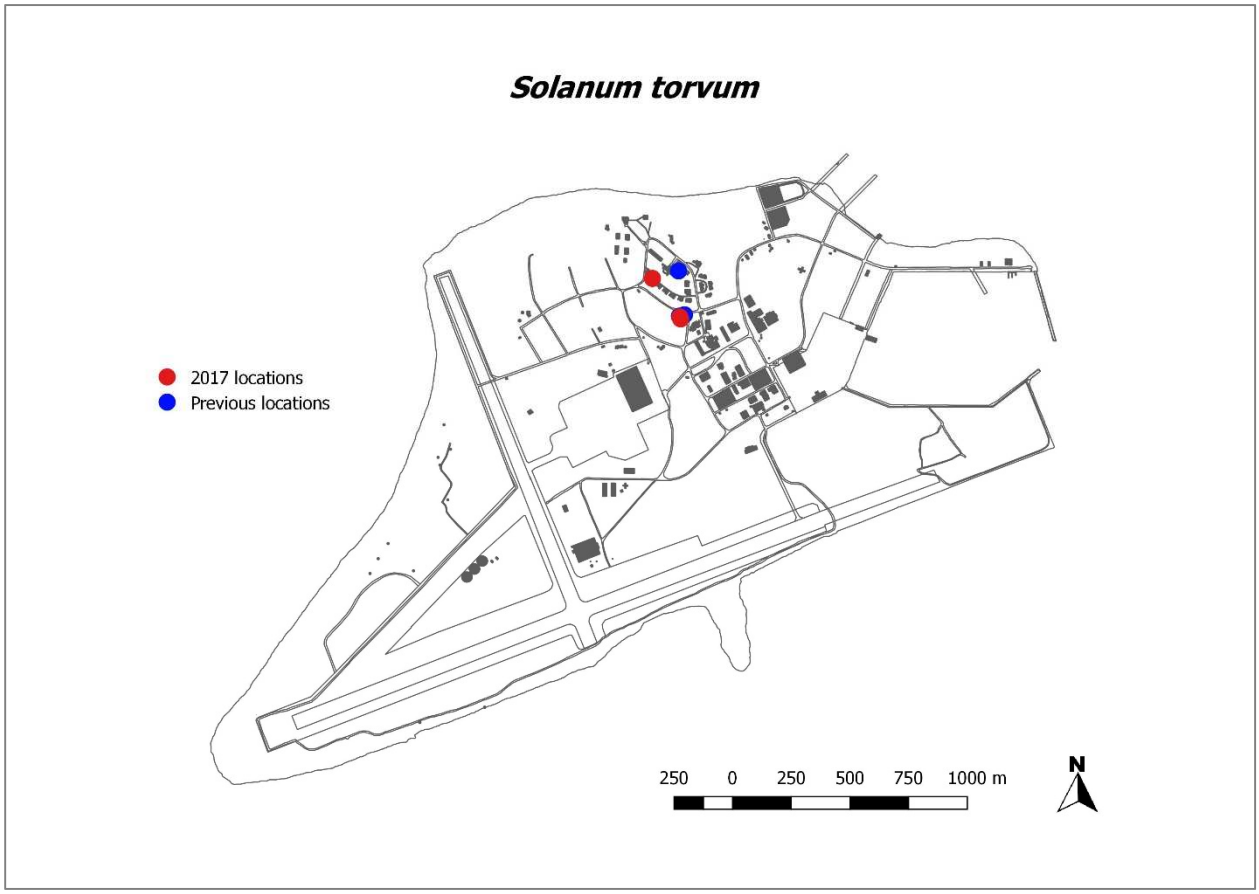
Solanum torvum (Turkeyberry)

CURRENT

In 2017, this species was again observed in the Community Garden and at a residence. In order to prevent this species from establishing further on Midway, it would make sense to remove all the known plants and regularly monitor the sites for regrowth. If folks feel they must grow this species on Midway, we suggest growing it inside the Hydroponics Greenhouse, to minimize potential for spread.

HISTORY

Native to the Antilles. Though the green fruits of this species can be used in a bitter green curry, it is listed as both a Federal Noxious Weed and a Hawaii State Noxious Weed. First observed on Midway in 2008, where a few large, spiny, bushes and some nearby seedlings were observed in the Community Garden. There were also a couple small plants and seedlings in the garden of 4208 Commodore Ave. In 2015, all the plants had been controlled, except for one next to the Community Garden that appeared to have grown back from a very large stump. It was treated while we were there, but it had gone to fruit, so a seedbank likely existed.



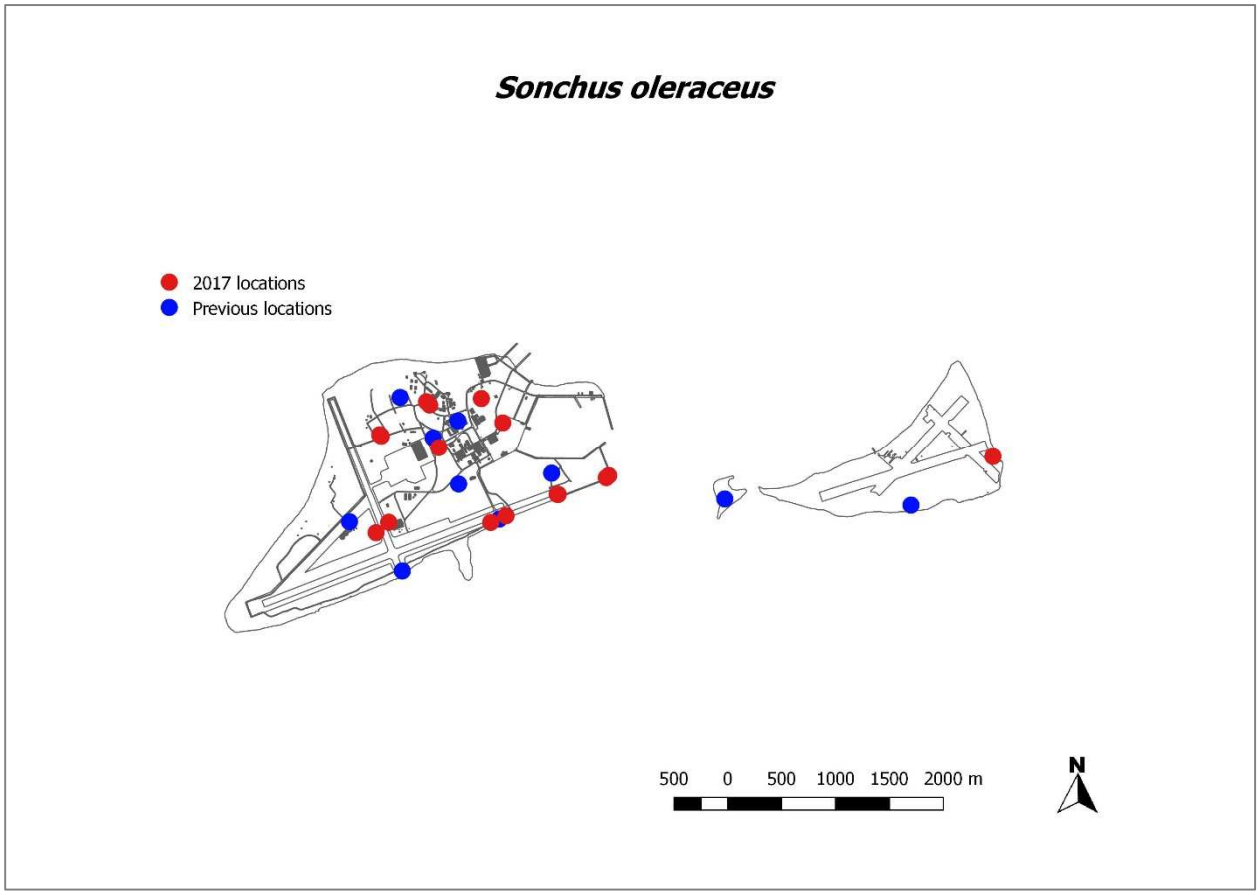
Sonchus oleraceus (Sow thistle)

CURRENT

Lone plants observed over much of Sand Island, often near the coast. Observed at hot spot by concrete structure near coast on east side of Eastern Island. This doesn't seem the most worrisome species to us, as it's short-lived and doesn't get too tall. However, others who have seen it during outbreaks on Midway say it can be invasive, and it is a current control target.

HISTORY

Native to Europe. First collected on Midway in 1933. In 1955 "An occasional plant was seen growing along utility roads and in service areas on both Sand and Eastern Islands." In 1999, found to be occasional on Sand, Eastern, and Spit Islands. In 2008, still found to be occasional on Sand, Eastern, and Spit Islands, generally growing in open disturbed areas. In 2015, occasionally found on both Sand and Eastern Islands, often near the coast.



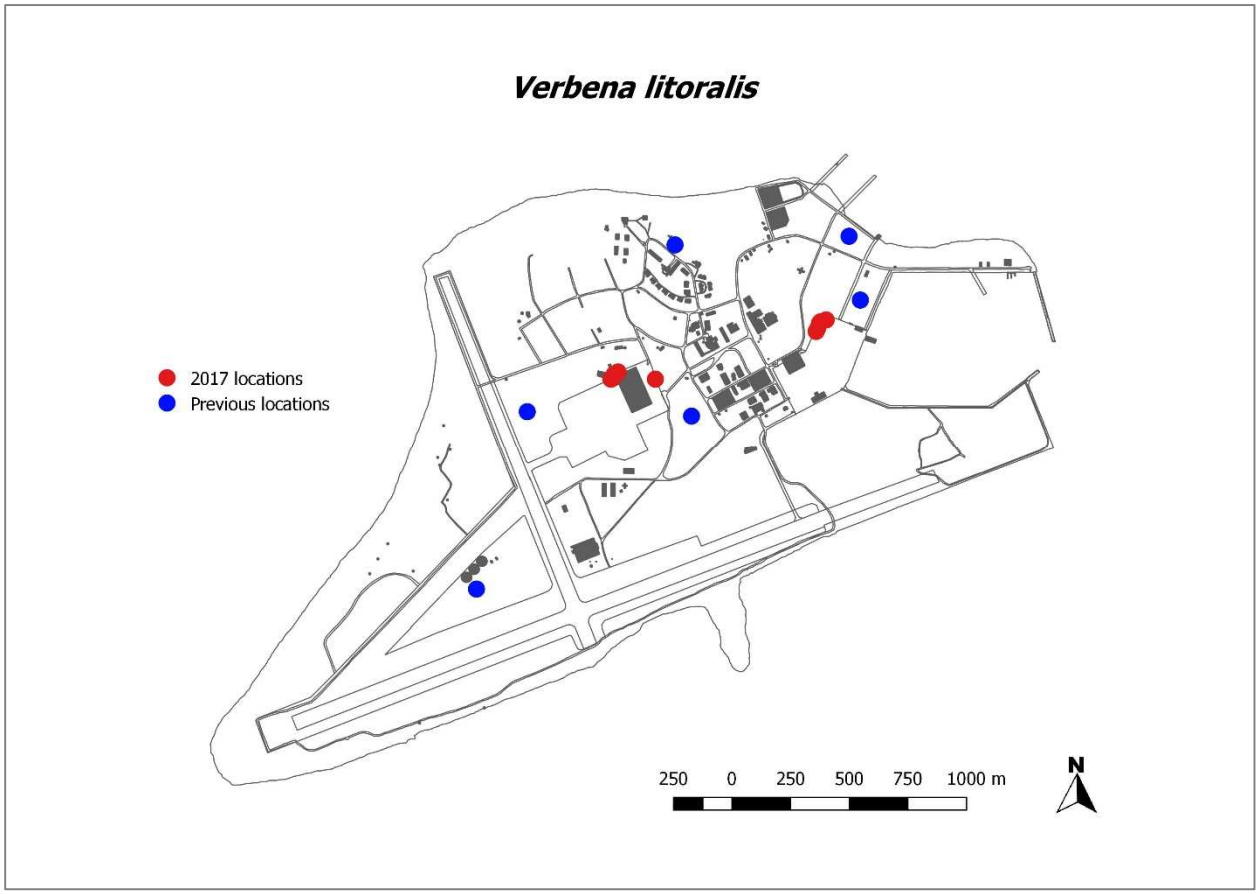
Verbena littoralis (Vervain)

CURRENT

In 2017, this species was found in previously known hot spots, in the northwest corner of the Seaplane Hangar and around the NAF Hangar, where it was growing in cracks in concrete and other hard packed ground. Apparently occasionally pops up in other areas around Sand Island, but is no where abundant.

HISTORY

Native from Mexico through Central America to South America. First collected on Midway in 1933. In 1999, observed as occasional on Sand Island. In 2008, found scattered about Sand Island. Though nowhere abundant, this non-descript plant with purple flowers was found to be patchy in the field between Turtle Beach and the Cargo Pier. In 2015, only a few plants were observed, in the Parade Field and the field by Charlie Barracks.



PLANT CHECKLIST

The following is a checklist of all plant species ever reported from Midway Atoll, checklists from recent Midway surveys, relative abundance for each island during this survey, and nativity status in Hawaii. During the 2017 survey, there were 194 plant taxa found, of these, 27 (14%) were native and 167 (86%) were non-native.

ISLAND DISTRIBUTION / ABUNDANCE
Distribution during 2017 survey.
R = Rare
O = Occasional
C = Common
D = Dominant

STATUS
Nativity in Hawaii.
Native = Naturally occurring in Hawaii
Non-Native = Introduced by humans to Hawaii

HISTORICAL OBSERVATIONS / COLLECTIONS
Reports of observations or collections of plant on Midway.
X = Observed
X = Collected
Y = Reported, does not indicate presence or absence

Surveying plants near the Community Garden on Sand Island.

Midway Plant Checklist

Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Abelmoschus esculentus				Okra	Malvaceae	Non-Native				X	
Abutilon grandifolium	R			Hairy abutilon	Malvaceae	Non-Native	X	X	X	X	X
Acacia farnesiana				Klu	Fabaceae	Non-Native			X	X	
Acalypha wilkesiana	R			Beefsteak plant	Euphorbiaceae	Non-Native	X	X	X	X	X
Achyranthes atollensis				Achyranthes	Amaranthaceae	Native					
Adansonia digitata				Baobab tree	Bombaceae	Non-Native					
Adonidia merilii	R			Manilla palm	Arecaceae	Non-Native	X	X	X	X	X
Agave attenuata				Agave	Agavaceae	Non-Native				X	X
Agave sisalana				Sisal	Agavaceae	Non-Native				X	X
Aira caryophyllea				Silver hairgrass	Poaceae	Non-Native					
Albizia lebbeck	R			Siris tree	Fabaceae	Non-Native	X	X	X	X	X
Aleurites moluccanus				Kukui nut tree	Euphorbiaceae	Non-Native					
Allamanda cathartica				Allamanda	Apocynaceae	Non-Native					
Allium cepa				Onion	Liliaceae	Non-Native					
Allium fistulosum	R			Green onion	Liliaceae	Non-Native	X	X		X	X
Allium porrum				Leek	Liliaceae	Non-Native					X
Allium sativum				Garlic	Liliaceae	Non-Native					X
Allium schoenoprasum				Chive	Liliaceae	Non-Native					X
Allium tuberosum	R			Garlic chive	Liliaceae	Non-Native	X	X		X	
Alocasia cucullata				Chinese taro	Araceae	Non-Native					
Alocasia macrorrhizos				Ape	Araceae	Non-Native					X
Aloe vera	R			Aloe	Xanthorrhoeaceae	Non-Native	X	X	X	X	X
Alpinia galanga	R			Galangal	Zingiberaceae	Non-Native	X				X
Alpinia zerumbet				Shell ginger	Zingiberaceae	Non-Native					
Alternanthera tenella				Joyweed	Amaranthaceae	Non-Native					
Amaranthus blitum				Slender amaranth	Amaranthaceae	Non-Native					
Amaranthus dubius				Pakai	Amaranthaceae	Non-Native					
Amaranthus hybridus				Green amaranth	Amaranthaceae	Non-Native					
Amaranthus spinosus	R			Spiny pigweed	Amaranthaceae	Non-Native	X	X	X	X	X
Amaranthus viridis	O/C			Slender amaranth	Amaranthaceae	Non-Native	X	X	X	X	X
Ammophila arenaria				European beachgrass	Poaceae	Non-Native					
Anagallis arvensis	O	R/O		Scarlet pimpernel	Primulaceae	Non-Native	X	X	X	X	X
Ananas comosus				Pineapple	Bromeliaceae	Non-Native					X
Andropogon glomeratus var. pumilus	R/O			Broomsedge	Poaceae	Non-Native	X	X	X	X	X

Midway Plant Checklist

Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Anethum graveolens				Dill	Apiaceae	Non-Native				X	X
Annona muricata	R			Soursop	Annonaceae	Non-Native	X	X	X	X	
Anthurium andraeanum				Anthurium	Araceae	Non-Native					
Antigonon leptopus				Mexican creeper	Polygonaceae	Non-Native					X
Apium graveolens				Chinese celery, Khuen chai	Apiaceae	Non-Native		X		X	
Apium graveolens var. dulce				Celery	Apiaceae	Non-Native		X			
Araucaria columnaris	O			Cook pine	Araucariaceae	Non-Native	X	X		X	X
Araucaria heterophylla				Norfolk island pine	Araucariaceae	Non-Native			X		
Arctium lappa				Gobo, burdock	Asteraceae	Non-Native					
Asparagus densiflorus	R			Asparagus fern	Liliaceae	Non-Native	X	X	X	X	
Asparagus setaceus				Asparagus fern	Liliaceae	Non-Native					X
Asystasia gangetica				Chinese violet	Acanthaceae	Non-Native					
Atriplex suberecta				Saltbush	Amaranthaceae	Non-Native			X		
Averrhoa carambola				Star fruit	Oxalidaceae	Non-Native				X	
Bacopa monnieri				Aeae	Schrophulariaceae	Native					
Basella alba				Ceylon spinach	Basellaceae	Non-Native					X
Bidens alba var. radiata	C			Beggartick	Asteraceae	Non-Native	X	X	X	X	
Bidens pilosa				Spanish needle	Asteraceae	Non-Native					
Bidens sp.				not sure which one	Asteraceae	Non-Native					X
Boerhavia coccinea	R/O			Scarlet boerhavia	Nyctaginaceae	Non-Native	X				
Boerhavia repens	C	C/D	C	Alena	Nyctaginaceae	Native	X	X	X	X	X
Bothriochloa pertusa	O			Pitted beard grass	Poaceae	Non-Native	X	X	X	X	X
Bougainvillea spectabilis	R			Bougainvillea	Nyctaginaceae	Non-Native	X	X	X	X	X
Brassica juncea		R		Mustard	Brassicaceae	Non-Native	X	X	X		
Brassica napus				Rutabaga	Brassicaceae	Non-Native					
Brassica nigra				Black mustard	Brassicaceae	Non-Native				X	X
Brassica oleracea	R			Cabbage, Kale	Brassicaceae	Non-Native	X	X			X
Brassica oleracea var. botrytis				Broccoli, Cauliflower	Brassicaceae	Non-Native					X
Brassica oleracea var. gongylodes				Kohlrabi	Brassicaceae	Non-Native					X
Brassica rapa	R			Pak-choi, Chinese cabbage	Brassicaceae	Non-Native	X	X		X	X
Brassica sp.	R			Mustard	Brassicaceae	Non-Native	X	X	X	X	
Breynia disticha				Snow bush	Euphorbiaceae	Non-Native					
Bromus catharticus	R			Prairie grass	Poaceae	Non-Native	X	X	X	X	X
Cajanus cajan				Pigeon pea	Fabaceae	Non-Native				X	

Midway Plant Checklist

Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Caladium bicolor				Caladium	Araceae	Non-Native			X	X	
Calendula officinalis				English marigold	Asteraceae	Non-Native					X
Calophyllum inophyllum	R			Kamani	Clusiaceae	Non-Native	X	X	X	X	X
Calyptocarpus vialis	R			Calyptocarpus	Asteraceae	Non-Native	X	X	X	X	X
Canna indica				Canna	Cannaceae	Non-Native					X
Canna x generalis	R/O			Canna	Cannaceae	Non-Native	X	X	X	X	
Capparis sandwichiana	R			Maia pilo, pua pilo	Capparaceae	Native	X				
Capsella bursa-pastoris				Shepard's purse	Brassicaceae	Non-Native		X	X		X
Capsicum annuum	O			Red pepper, Bell Pepper	Solanaceae	Non-Native	X	X	X	X	X
Carica papaya	O			Papaya	Caricaceae	Non-Native	X	X	X	X	X
Carissa macrocarpa				Natal plum	Apocynaceae	Non-Native					
Casuarina equisetifolia	D		R	Ironwood	Casuarinaceae	Non-Native	X	X	X	X	X
Casuarina glauca	O/C			Longleaf ironwood	Casuarinaceae	Non-Native	X	X	X	X	X
Catharanthus roseus				Rosy periwinkle	Apocynaceae	Non-Native					
Cenchrus agrimonioides var. laysanensis				Native bur grass	Poaceae	Native					
Cenchrus ciliaris	R/O			Buffel grass	Poaceae	Non-Native	X	X	X	X	X
Cenchrus echinatus				Sand bur	Poaceae	Non-Native			X	X	X
Centaurium erythraea ssp. erythraea	R/O			Bitter herb	Gentianaceae	Non-Native	X	X	X	X	X
Cerastium fontanum ssp. vulgare				Common mouse ear chickweed	Caryophyllaceae	Non-Native					X
Cerastium glomeratum				Sticky mouse ear chickweed	Caryophyllaceae	Non-Native		X	X		
Cestrum nocturnum				Night cestrum	Solanaceae	Non-Native			X	X	X
Chenopodium murale	O	R		Goosefoot	Chenopodiaceae	Non-Native	X	X	X	X	X
Chenopodium oahuense	O/C	R		Aweoweo	Chenopodiaceae	Native	X	X	X	X	
Chloris barbata	R			Swollen finger grass	Poaceae	Non-Native	X		X	X	X
Chloris divaricata var. divaricata				Star grass	Poaceae	Non-Native					X
Chloris virgata				Feather finger grass	Poaceae	Non-Native			X		X
Chlorophytum comosum				Spider plant	Liliaceae	Non-Native				X	X
Chrysanthemum sp.				Chrysanthemum	Asteraceae	Non-Native					X
Cibotium sp.				Tree fern	Dicksoniaceae	Non-Native					
Citrullus lanatus				Watermelon	Cucurbitaceae	Non-Native			X	X	X
Citrus aurantifolia	R			Lime	Rutaceae	Non-Native	X	X	X	X	
Citrus hystrix	O			Kaffir lime	Rutaceae	Non-Native	X	X	X	X	
Citrus jambhiri	R			Rough or bumpy lemon	Rutaceae	Non-Native	X	X			
Citrus sp.	R			Unknown citrus	Rutaceae	Non-Native	X	X	X	X	X

Midway Plant Checklist

Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Citrus x limon	R			Meyer lemon	Rutaceae	Non-Native	X	X	X		X
Citrus x paradisi	R			Grapefruit, star-ruby, white	Rutaceae	Non-Native	X	X	X		X
Citrus x sinensis	R			Orange, valencia, navel, blood	Rutaceae	Non-Native	X	X	X		X
Cleome gynandra				Wild spider flower	Brassicaceae	Non-Native					X
Clusia rosea				Autograph tree	Clusiaceae	Non-Native					
Coccinia grandis				Ivy gourd	Cucurbitaceae	Non-Native			X	X	X
Coccoloba uvifera	C	O		Sea grape	Polygonaceae	Non-Native	X	X	X	X	X
Cocos nucifera	O/C			Coconut	Arecaceae	Non-Native	X	X	X	X	X
Codiaeum variegatum	R			Croton	Euphorbiaceae	Non-Native	X	X	X	X	X
Colocasia esculenta				Taro	Araceae	Non-Native					
Commelina diffusa				Honohono	Commelinaceae	Non-Native					
Conocarpus erectus				Buttonwood	Combretaceae	Non-Native					X
Conyza bonariensis	O			Hairy horseweed	Asteraceae	Non-Native	X	X	X	X	X
Conyza canadensis var. pusilla	C	R	R	Horseweed	Asteraceae	Non-Native	X	X	X	X	X
Cordia sebestena	R			Kou haole	Boraginaceae	Non-Native	X	X	X	X	X
Cordyline fruticosa	R			Ti leaf	Agavaceae	Non-Native	X	X	X	X	X
Cordyline sp.				Cordyline	Agavaceae	Non-Native			X		
Coreopsis grandiflora				Coreopsis	Asteraceae	Non-Native					X
Coreopsis tinctoria				Golden tickseed	Asteraceae	Non-Native					
Coriandrum sativum	R			Cilantro	Apiaceae	Non-Native	X	X		X	X
Coronopus didymus	O	R		Swine cress	Brassicaceae	Non-Native	X	X	X	X	X
Cosmos bipinnatus				Cosmos	Asteraceae	Non-Native					X
Crassula sp.				Stonecrop	Crassulaceae	Non-Native					X
Crinum asiaticum	O	R		Crinum lily	Liliaceae	Non-Native	X	X	X	X	X
Crotalaria incana	R			Fuzzy rattle pod	Fabaceae	Non-Native	X			X	X
Crotalaria pallida				Rattle pod	Fabaceae	Non-Native					X
Cucumis melo				Cantaloupe, Canary melon	Cucurbitaceae	Non-Native					X
Cucumis sativus	R			Cucumber	Cucurbitaceae	Non-Native	X	X			X
Cucurbita maxima	R			Pumpkin	Cucurbitaceae	Non-Native	X				
Cucurbita pepo				Squash, zucchini	Cucurbitaceae	Non-Native			X	X	X
Cycas circinalis	R/O			Sago palm	Cycadaceae	Non-Native	X	X	X	X	X
Cycas revoluta				Sago palm	Cycadaceae	Non-Native					
Cyclospermum leptophyllum	O			Fir-leaved celery	Apiaceae	Non-Native	X	X	X	X	X
Cymbopogon citratus	O			Lemon grass	Poaceae	Non-Native	X	X	X	X	X

Midway Plant Checklist

Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Cynara scolymus				Artichoke	Asteraceae	Non-Native					X
Cynodon dactylon	D	C		Bermuda grass	Poaceae	Non-Native	X	X	X	X	X
Cyperus involucratus	R			Umbrella plant	Cyperaceae	Non-Native	X	X	X	X	X
Cyperus javanicus				Ahu'awa	Cyperaceae	Native					
Cyperus laevigatus	R	R		Makaloa	Cyperaceae	Native	X	X	X	X	
Cyperus papyrus				Papyrus	Cyperaceae	Non-Native					
Cyperus pennatiformis var. bryanii				Cyperus	Cyperaceae	Native				Y	
Cyperus polystachyos	C/D			Pycreus	Cyperaceae	Native	X	X	X	X	X
Cyperus rotundus	O/C	R		Purple nut sedge	Cyperaceae	Non-Native	X	X	X	X	X
Dactyloctenium aegyptium	O	C		Beach wire grass	Poaceae	Non-Native	X	X	X	X	X
Daucus carota				Carrot	Apiaceae	Non-Native					X
Delonix regia	R			Royal poinciana	Fabaceae	Non-Native	X	X	X	X	X
Desmanthus pernambucanus	R			Slender mimosa	Fabaceae	Non-Native	X		X	X	X
Desmodium sandwicense				Spanish clover	Fabaceae	Non-Native					
Dianthus caryophyllus				Carnation	Caryophyllaceae	Non-Native					X
Dianthus chinensis				Carnation	Caryophyllaceae	Non-Native					X
Dichorisandra thysiflora				Blue ginger	Commelinaceae	Non-Native					
Dieffenbachia sp.				Dumb cane	Araceae	Non-Native					X
Digitaria ciliaris	R/O	C		Henry's crab grass	Poaceae	Non-Native	X	X	X	X	X
Digitaria insularis				Sour grass	Poaceae	Non-Native		X	X	X	X
Dracaena fragrans	O			Dracaena	Agavaceae	Non-Native	X	X		X	X
Dracaena marginata	O			Money tree	Agavaceae	Non-Native	X	X	X	X	X
Dracaena reflexa				Pineapple dracaena	Agavaceae	Non-Native					X
Dracaena sp.				Unknown dracaena	Agavaceae	Non-Native					
Duranta erecta				Golden dewdrop	Verbenaceae	Non-Native					
Echinochloa crus-galli				Barnyard grass	Poaceae	Non-Native					X
Eleusine indica	C/D	O		Goose grass	Poaceae	Non-Native	X	X	X	X	X
Epiphyllum oxypetalum				Gooseneck cactus	Cactaceae	Non-Native					X
Epipremnum pinnatum	R/O			Golden pothos	Araceae	Non-Native	X	X	X	X	X
Eragrostis paupera	Y			Native bunch grass	Poaceae	Native	X	X	X	X	X
Eragrostis tenella	O/C			Love grass	Poaceae	Non-Native	X	X	X	X	X
Eragrostis variabilis	C	O	O/C	Emaloa, Kawelu	Poaceae	Native	X	X	X	X	X
Eriochloa procera	R/O			Cupgrass	Poaceae	Non-Native	X		X	X	
Eryngium foetidum	R			Long coriander	Apiaceae	Non-Native	X	X		X	

Midway Plant Checklist

Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Erythrina variegata	R			Tiger's claw	Fabaceae	Non-Native	X	X	X	X	X
Eugenia uniflora				Suriname cherry	Myrtaceae	Non-Native				X	X
Euphorbia cyathophora	C			Wild poinsettia	Euphorbiaceae	Non-Native	X	X	X	X	X
Euphorbia heterophylla				Fire plant	Euphorbiaceae	Non-Native					
Euphorbia hirta	O/C			Hairy spurge	Euphorbiaceae	Non-Native	X	X	X	X	X
Euphorbia hypericifolia	O			Graceful spurge	Euphorbiaceae	Non-Native	X	X	X	X	X
Euphorbia hyssopifolia				Spurge	Euphorbiaceae	Non-Native			X		
Euphorbia maculata	O/C	O		Spurge	Euphorbiaceae	Non-Native	X	X	X	X	X
Euphorbia milii	R			Crown of thorns	Euphorbiaceae	Non-Native	X	X	X	X	
Euphorbia peplus	C			Petty spurge	Euphorbiaceae	Non-Native	X	X	X	X	X
Euphorbia prostrata	O	R		Small ground fig	Euphorbiaceae	Non-Native	X	X	X	X	X
Euphorbia pulcherrima				Poinsettia	Euphorbiaceae	Non-Native			X	X	X
Euphorbia serpens	O			Matted sandmat	Euphorbiaceae	Non-Native	X	X		X	
Euploca procumbens	C	R	R	Heliotropium	Boraginaceae	Non-Native	X	X	X	X	X
Eustachys petraea	C	O/C	O/C	Eustachys	Poaceae	Non-Native	X	X	X	X	X
Ficus benghalensis	R			Indian banyan	Moraceae	Non-Native	X	X	X	X	X
Ficus benjamina	R			Benjamin tree	Moraceae	Non-Native	X	X	X	X	X
Ficus elastica				Indian Rubber Tree	Moraceae	Non-Native					
Ficus macrophylla				Moreton Bay Fig	Moraceae	Non-Native		X		X	X
Ficus microcarpa	O			Chinese banyan	Moraceae	Non-Native	X	X	X	X	X
Ficus sp.				Unknown ficus	Moraceae	Non-Native					
Fimbristylis cymosa	O/C	R	O	Button sedge	Cyperaceae	Native	X	X	X	X	X
Fimbristylis cymosa spp. umbellato-capitata				Button sedge	Cyperaceae	Native					
Fimbristylis cymosa ssp. spathacea				Button sedge	Cyperaceae	Native					
Fragaria x ananassa				Strawberry	Rosaceae	Non-Native			X		X
Fragaria x ananassa 'Quinault'				Strawberry	Rosaceae	Non-Native					X
Gamochaeta purpurea				Purple cudweed	Asteraceae	Non-Native					
Gardenia sp.				Gardenia	Rubiaceae	Non-Native					
Glycine max				Soy bean	Fabaceae	Non-Native					
Gomphrena globosa				Globe amaranth	Amaranthaceae	Non-Native					X
Guilandina bonduc				Yellow knickers	Fabaceae	Native			X	X	
Gynura bicolor	R			Asian spinach	Asteraceae	Non-Native	X	X	X	X	
Hedychium gardnerianum				Kahili ginger	Zingiberaceae	Non-Native					
Helianthus annuus				Sunflower	Asteraceae	Non-Native				X	

Midway Plant Checklist

Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Heliconia psittacorum				Heliconia	Musaceae	Non-Native					
Heliotropium curasavicum				Nena	Boraginaceae	Native					
Hemerocallis sp.				Day lily	Liliaceae	Non-Native					
Hibiscus rosa-sinensis	O			Red hibiscus	Malvaceae	Non-Native	X	X	X	X	X
Hibiscus sp.				Unknown hibiscus	Malvaceae	Non-Native					
Hibiscus tiliaceus	O/C			Hau	Malvaceae	Native	X	X	X	X	X
Hibiscus waimeae	R			Kokio kea	Malvaceae	Native	X	X	X	X	
Hippeastrum sp.				Amaryllis	Liliaceae	Non-Native					
Hordeum murinum ssp. leporinum				Barley	Poaceae	Non-Native					
Hylocereus undatus				Night blooming cereus	Cactaceae	Non-Native					
Impatiens balsamina				Balsam, candlestick plant	Balsaminaceae	Non-Native					X
Indigofera spicata	R			Creeping indigo	Fabaceae	Non-Native	X		X	X	
Ipomoea aquatica	R			Swamp cabbage	Convolvulaceae	Non-Native	X	X	X	X	X
Ipomoea batatas				Sweet potato	Convolvulaceae	Non-Native			X	X	X
Ipomoea indica	O			Koali awa	Convolvulaceae	Native	X	X	X	X	X
Ipomoea pes-caprae ssp. brasiliensis	O/C	R		Beach morning glory	Convolvulaceae	Native	X	X	X	X	X
Ipomoea triloba				Little bell	Convolvulaceae	Non-Native					
Jasminum sambac				Pikake	Oleaceae	Non-Native					
Juniperus bermudiana	R			Bermuda cedar	Cupressaceae	Non-Native	X	X	X	X	
Kalanchoe daigremontiana x tubiflora				Kalanchoe hybrid	Crassulaceae	Non-Native					
Kalanchoe delagoensis	R			Chandelier plant	Crassulaceae	Non-Native	X	X	X	X	X
Kalanchoe fedtschenkoi				Lavender scallops	Crassulaceae	Non-Native			X	X	X
Kalanchoe pinnata				Air plant	Crassulaceae	Non-Native		X	X	X	X
Lactuca sativa	R			Lettuce	Asteraceae	Non-Native	X	X	X		X
Lantana camara				Lantana	Verbenaceae	Non-Native		X	X	X	X
Lathyrus odoratus				Sweet pea	Fabaceae	Non-Native					X
Lepidium bidentatum var. o-wahiense	R			Anaunau	Brassicaceae	Native	X			Y	
Lepidium virginicum	C			Pepper grass	Brassicaceae	Non-Native	X	X	X	X	X
Leptochloa fusca ssp. uninervia	R			Sprangletop	Poaceae	Non-Native	X				X
Lepturus repens	O	R	O	Lepturus	Poaceae	Native	X	X	X	X	X
Leucaena leucocephala	R			Koa haole	Fabaceae	Non-Native	X	X	X	X	X
Lobularia maritima	D	C/D	R	Sweet alyssum	Brassicaceae	Non-Native	X	X	X	X	X
Luffa acutangula	R			Ridged gourd	Cucurbitaceae	Non-Native	X				
Macroptilium lathyroides				Cow pea	Fabaceae	Non-Native			X		

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Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Malva parviflora	R			Cheese weed	Malvaceae	Non-Native	X	X	X	X	X
Malvastrum coromandelianum spp. coromandelianum	R			False mallow	Malvaceae	Non-Native	X	X	X	X	X
Malvaviscus arboreus				Erect Turk's cap	Malvaceae	Non-Native					
Malvaviscus penduliflorus	R			Turks cap hibiscus	Malvaceae	Non-Native	X	X	X	X	X
Mangifera indica				Mango	Anacardiaceae	Non-Native				X	
Medicago lupulina	C			Black medic	Fabaceae	Non-Native	X	X	X	X	X
Medicago orbicularis				Blackdisk medic	Fabaceae	Non-Native					
Medicago polymorpha	O			Bur clover	Fabaceae	Non-Native	X	X	X		X
Medicago sativa				Alfalfa	Fabaceae	Non-Native					
Megathyrsus maximus				Guinea grass	Poaceae	Non-Native			X	X	X
Melilotus albus				White sweet clover	Fabaceae	Non-Native					X
Melilotus indicus	O			Yellow sweet clover	Fabaceae	Non-Native	X	X	X	X	X
Melinis repens				Natal red top	Poaceae	Non-Native					X
Mentha spicata	O			Mint	Lamiaceae	Non-Native	X	X	X	X	X
Merremia tuberosa				Wood rose	Convolvulaceae	Non-Native					
Mirabilis jalapa	O			Four o'clock	Nyctaginaceae	Non-Native	X	X	X	X	X
Momordica charantia	R			Bitter melon, Balsam pear	Cucurbitaceae	Non-Native	X	X	X	X	X
Monstera deliciosa				Monstera	Araceae	Non-Native					X
Moringa oleifera	R			Drumstick tree	Moringanaceae	Non-Native	X	X	X	X	X
Morus alba	R			White mulberry	Moraceae	Non-Native	X	X	X	X	X
Murraya paniculata				Mock orange	Rutaceae	Non-Native					
Musa x paradisiaca	O			Banana	Musaceae	Non-Native	X	X	X	X	X
Nama sandwicensis				Nama	Boraginaceae	Native				X	
Nephrolepis hirsutula				Sword fern	Nephrolepiadaceae	Non-Native					
Nephrolepis multiflora	R			Sword fern	Nephrolepiadaceae	Non-Native	X			X	X
Nerium oleander	O/C			Oleander	Apocynaceae	Non-Native	X	X	X	X	X
Noronhia emarginata	R			Madagascar olive	Oleaceae	Non-Native	X	X	X	X	X
Ocimum basilicum	R			Basil	Lamiaceae	Non-Native	X		X	X	X
Ocimum tenuiflorum	R			Thai holy basil	Lamiaceae	Non-Native	X	X			
Odontonema tubiforme				Odontonema	Acanthaceae	Non-Native					
Oenothera laciniata	C			Evening primrose	Onagraceae	Non-Native	X	X	X	X	X
Olea europaea ssp. cuspidata	R			African olive	Oleaceae	Non-Native	X	X	X	X	X
Opuntia cochenillifera				Cochineal cactus	Cactaceae	Non-Native				X	X

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Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Origanum majorana				Sweet marjoram	Lamiaceae	Non-Native					X
Oryza sp.				Rice	Poaceae	Non-Native				X	
Oxalis corniculata	O			Yellow wood sorrel	Oxalidaceae	Non-Native	X	X	X	X	X
Oxalis debilis var. corymbosa	O			Shamrock	Oxalidaceae	Non-Native	X	X	X	X	X
Pancratium littorale				Spider lily	Liliaceae	Non-Native					
Pandanus amaryllifolius	R			Tea Pandanus	Pandanaceae	Non-Native	X	X		X	
Pandanus tectorius	R			Hala, screwpine	Pandanaceae	Non-Native	X	X	X	X	X
Paspalum setaceum	C			Paspalum	Poaceae	Non-Native	X	X	X	X	X
Paspalum urvillei	O/C			Vasey grass	Poaceae	Non-Native	X	X	X	X	X
Passiflora edulis				Lilikoi, passion vine	Passifloraceae	Non-Native				X	
Pedilanthus tithymaloides	R			Slipper flower	Euphorbiaceae	Non-Native	X	X	X	X	X
Pelargonium x hortorum				Fish geranium	Geraniaceae	Non-Native		X		X	X
Peperomia obtusifolia				Alien peperomia	Piperaceae	Non-Native					X
Persea americana				Avocado	Lauraceae	Non-Native					X
Persicaria odorata	R			Vietnamese coriander	Polygonaceae	Non-Native	X				
Petroselinum crispum				Parsley	Apiaceae	Non-Native					X
Phaseolus vulgaris				Common bush bean	Fabaceae	Non-Native					X
Philodendron sp.				Philodendron	Araceae	Non-Native					
Phoenix sp.				Date palm	Arecaceae	Non-Native					
Phyla nodiflora	C			Phyla	Verbenaceae	Non-Native	X	X	X	X	X
Phyllostegia variabilis				Native mint	Lamiaceae	Native					
Phymatosorus grossus				Lauae	Polypodiaceae	Non-Native					
Pilea microphylla	O/C			Artillery plant	Urticaceae	Non-Native	X	X	X	X	X
Piper sarmentosum	R			Thai Piper	Piperaceae	Non-Native	X	X		X	
Pithecellobium dulce				Opiuma, Manila tamarind	Fabaceae	Non-Native				X	X
Plantago lanceolata	C			Narrow leaved plantian	Plantaginaceae	Non-Native	X	X	X	X	X
Plantago major				Common plantain	Plantaginaceae	Non-Native			X		X
Plectranthus amboinicus				Mexican oregano	Lamiaceae	Non-Native			X	X	
Plectranthus scutellarioides				Coleus	Lamiaceae	Non-Native					
Pluchea carolinensis	O/C			Sour bush	Asteraceae	Non-Native	X	X	X	X	X
Pluchea indica				Indian pluchea	Asteraceae	Non-Native					
Pluchea x fosbergii				Hybrid pluchea	Asteraceae	Non-Native					
Plumbago auriculata				Plumbago	Plumbaginaceae	Non-Native					
Plumeria obtusa	R			Singapore plumeria	Apocynaceae	Non-Native	X	X	X	X	X

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Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Plumeria rubra	O			Red plumeria, frangipani	Apocynaceae	Non-Native	X	X	X	X	X
Poa annua				Blue grass	Poaceae	Non-Native		X	X	X	X
Polypogon interruptus				Perrenial ditch beard grass	Poaceae	Non-Native				X	X
Polypogon monspeliensis	O/C			Annual ditch beard grass	Poaceae	Non-Native	X	X	X	X	X
Polyscias guilfoylei	R			Panax	Araliaceae	Non-Native	X	X	X	X	X
Portulaca lutea				Ihi	Portulacaceae	Native					
Portulaca oleracea	O	O		Common purslane	Portulacaceae	Non-Native	X	X	X	X	
Portulacaria afra				Jade tree	Portulacaceae	Non-Native			X	X	X
Pritchardia hillebrandii	R			Loulu lelo	Arecaceae	Native	X	X		X	X
Pritchardia pacifica				Fiji fan palm	Arecaceae	Non-Native		X		X	X
Pritchardia remota	R	R		Nihoa loulu palm	Arecaceae	Native	X	X			
Pritchardia spp.				Loulu palm	Arecaceae	?			X		
Prosopis pallida				Kiawe	Fabaceae	Non-Native					
Pseudognaphalium sandwicensium var. sandwicensium	C			Enaena	Asteraceae	Native	X	X	X	X	X
Psidium guajava				Guava	Myrtaceae	Non-Native			X	X	X
Psilotum nudum				Moa	Psilotaceae	Native					
Psophocarpus tetragonolobus				Wing bean	Fabaceae	Non-Native		X	X	X	
Punica granatum				Pomegranite	Myrtaceae	Non-Native					
Raphanus sativus				Radish	Brassicaceae	Non-Native					X
Ricinus communis	R			Castor bean	Euphorbiaceae	Non-Native	X	X	X	X	X
Rosa sp.	R			Rose	Rosaceae	Non-Native	X	X	X	X	X
Rosmarinus officinalis	R			Rosemary	Lamiaceae	Non-Native	X	X			
Roystonea sp.				Royal palm	Arecaceae	Non-Native					
Ruellia simplex	R/O			Ruellia	Acanthaceae	Non-Native	X	X	X	X	X
Russelia equisetiformis				Coral / firecracker plant	Schrophulariaceae	Non-Native			X	X	X
Saccharum sp.	R			Sugar cane	Poaceae	Non-Native	X	X	X		
Sagina japonica				Japanese pearlwort	Caryophyllaceae	Non-Native		X	?		X
Sagina procumbens				Birdseye pearlwort	Caryophyllaceae	Non-Native		X	?		
Salvia officinalis	R			Sage	Lamiaceae	Non-Native	X	X			
Samanea saman				Monkey pod	Fabaceae	Non-Native			X	X	
Sansevieria trifasciata	R/O			Mother in law tongue	Agavaceae	Non-Native	X	X	X	X	X
Santalum ellipticum				Iliahi aloe, coast sandalwood	Santalaceae	Native			Y		
Scaevola taccada	D	C/D	D	Naupaka kahakai	Goodeniaceae	Native	X	X	X	X	X

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Species	Sand	Eastern	Spit	Common name	Family	Nativity	2017	2015	2012	2008	1999
Schefflera actinophylla	R			Octopus tree	Araliaceae	Non-Native	X	X	X	X	X
Schinus terebinthifolius				Christmas berry	Anacardiaceae	Non-Native					X
Senna siamea				Pheasant wood	Fabaceae	Non-Native				X	
Senna surattensis				Kolomona	Fabaceae	Non-Native					
Sesbania grandiflora	R			Sesban	Fabaceae	Non-Native	X	X	X	X	X
Sesuvium portulacastrum	R/O	O	C	Akulikuli	Aizoaceae	Native	X	X	X	X	X
Setaria verticillata	C	O/C		Bristly foxtail	Poaceae	Non-Native	X	X	X	X	X
Sicyos pachycarpus				Anunu	Cucurbitaceae	Native				Y	
Sida fallax	R/O			Ilima	Malvaceae	Native	X	X	X	X	
Sida rhombifolia				Cuba jewt	Malvaceae	Non-Native					X
Solanum americanum	O/C	R		Popolo	Solanaceae	Native	X	X	X	X	X
Solanum lycopersicum	R/O			Tomato	Solanaceae	Non-Native	X	X	X	X	X
Solanum melongena	O			Eggplant	Solanaceae	Non-Native	X	X	X	X	X
Solanum nelsonii	O		R	Popolo	Solanaceae	Native	X	X	X	X	X
Solanum torvum	R			Turkey berry	Solanaceae	Non-Native	X	X	X	X	
Sonchus oleraceus	O	R		Sow thistle	Asteraceae	Non-Native	X	X	X	X	X
Spathodea campanulata				African tulip tree	Bignonaceae	Non-Native				X	X
Spergularia marina	O	R	R	Saltmarsh sand spurry	Caryophyllaceae	Non-Native	X	X	X	X	X
Sphagneticola trilobata				Wedelia	Asteraceae	Non-Native					
Spinacia oleracea				Spinach	Chenopodiaceae	Non-Native					X
Spondias sp.				Makok	Anacardiaceae	Non-Native			X	X	
Sporobolus africanus				African dropseed	Poaceae	Non-Native					
Sporobolus indicus	C			Indian dropseed	Poaceae	Non-Native	X	X	X	X	X
Sporobolus pyramidatus	O/C	O/C		Sporobolus	Poaceae	Non-Native	X	X	X	X	
Sporobolus virginicus	R			Akiaki, Beach dropseed	Poaceae	Native	X	X	X		
Stachys arvensis				Staggerweed	Lamiaceae	Non-Native		X	X		
Stachytarpheta cayennensis				Oi	Verbenaceae	Non-Native					
Stachytarpheta jamaicensis				Owi	Verbenaceae	Non-Native			X	X	X
Stellaria media				Chickweed	Caryophyllaceae	Non-Native			X		X
Stenotaphrum secundatum	C			St. Augustine grass	Poaceae	Non-Native	X	X	X	X	X
Strelitzia reginae				Bird of paradise	Musaceae	Non-Native					X
Syngonium podophyllum	R			Syngonium	Araceae	Non-Native	X	X	X	X	X
Tabebuia heterophylla	R			Tabebuia	Bignonaceae	Non-Native	X	X	X	X	X
Tabernaemontana sp.				Crape jasmine	Apocynaceae	Non-Native					

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Tagetes erecta				Marigold	Asteraceae	Non-Native					X
Tamarindus indica	R			Tamarind	Fabaceae	Non-Native	X	X	X	X	X
Tamarix sp.				Tamarix	Tamaricaceae	Non-Native					
Terminalia catappa	O/C			False kamani	Combretaceae	Non-Native	X	X	X	X	X
Tetragonia tetragonioides				New Zealand spinach	Aizoaceae	Non-Native					X
Thespesia populnea	R			Milo	Malvaceae	Native	X	X	X	X	X
Thevetia peruviana				Be still tree	Apocynaceae	Non-Native				X	X
Thymus vulgaris	R			Thyme	Lamiaceae	Non-Native	X				
Tournefortia argentea	C/D	C	C	Tree heliotrope	Boraginaceae	Non-Native	X	X	X	X	X
Tradescantia pallida	R			Purple heart, Day flower	Commelinaceae	Non-Native	X	X	X	X	X
Tradescantia spathacea	R			Oyster plant	Commelinaceae	Non-Native	X	X	X	X	X
Tradescantia zebrina				Wandering jew	Commelinaceae	Non-Native					X
Tribulus cistoides	O	D	O	Nohu	Zygophyllaceae	Native	X	X	X	X	X
Trichosanthes cucumerina				Gourd	Cucurbitaceae	Non-Native					X
Tridax procumbens				Coat buttons	Asteraceae	Non-Native			X	X	X
Tropaeolum majus				Nasturtium	Tropaeolaceae	Non-Native					X
Unknown Apiaceae				Apiaceae	Apiaceae	Non-Native				X	
Unknown Cupressaceae				Cypress tree	Cupressaceae	Non-Native					X
Unknown Liliaceae				Unknown liliaceae	Liliaceae	Non-Native					X
Unknown Orchidaceae	R			Unknown orchids	Orchidaceae	Non-Native	X			X	
Unknown Poaceae				Unknown grass	Poaceae	Non-Native			X		
Unknown sp.				Unknown	Aloeaceae	Non-Native					X
Unknown sp.				Vigna or Canavalia ?	Fabaceae	?					X
Unknown sp.	R			Pencil like cactus	Cactaceae	Non-Native	X				X
Unknown sp.				Unknown pea ?	Fabaceae	Non-Native					X
Urochloa mutica				California grass	Poaceae	Non-Native					X
Verbena litoralis	O			Vervain	Verbenaceae	Non-Native	X	X	X	X	X
Verbesina encelioides	O	R/O		Golden crown-beard	Asteraceae	Non-Native	X	X	X	X	X
Vigna unguiculata ssp. sesquipedalis	R			Long bean	Fabaceae	Non-Native	X			X	
Viola odorata				Sweet violet	Violaceae	Non-Native					
Viola x wittrockiana				Violet, pansy	Violaceae	Non-Native					X
Vitex rotundifolia	R			Pohinahina	Verbenaceae	Native	X	X		X	
Vitex trifolia				Pohinahina	Verbenaceae	Non-Native			X	X	X
Vitis vinifera				Grape	Vitaceae	Non-Native			X	X	X

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Vulpia myuros				Fox/rat tail fescue	Poaceae	Non-Native					
Waltheria indica	R/O			Uhaloa	Sterculiaceae	Native	X				X
Wikstroemia uva-ursi				Akia	Thymelaeaceae	Native				X	
Xanthium stumarium var. canadense				Cocklebur	Asteraceae	Non-Native					
Xanthosoma robustum	R			Ape	Araceae	Non-Native	X	X	X	X	
Xanthosoma sp.				Ape	Araceae	Non-Native					
Zea mays	R			Corn	Poaceae	Non-Native	X				X
Zinnia violacea				Zinnia	Asteraceae	Non-Native					X
Ziziphus sp.				Jujube	Rhamnaceae	Non-Native				X	

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