

Early Detection:

Information gathering and development
of methodology to address newly
emergent alien plant species on Maui



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Maui is a special place with vast tracts of natural areas stretching from sea level here at Kanaha Beach...



...to over 10,000 ft. at Haleakala National Park. These natural areas harbor many unique native Hawaiian plants and animals found no where else on Earth,...



...such as this endemic hina hina, *Geranium cuneatum* subsp. *tridens*, which can be found only in the sub-alpine shrubland of East Maui.



However, these natural resources are threatened by the invasion of non-native plants. This slide shows the boundary along Haleakala National Park. The native geranium lives in the shrubland on the right side of the photo. On the left side of the photo, is a stand of non-native pines planted in the middle of the last century. Park employees and volunteers vigilantly walk the boundary and control the pines, as can be seen in the foreground. If they didn't, the pines would march right up the mountain, displacing the native plants and animals.

Weed Control Strategies

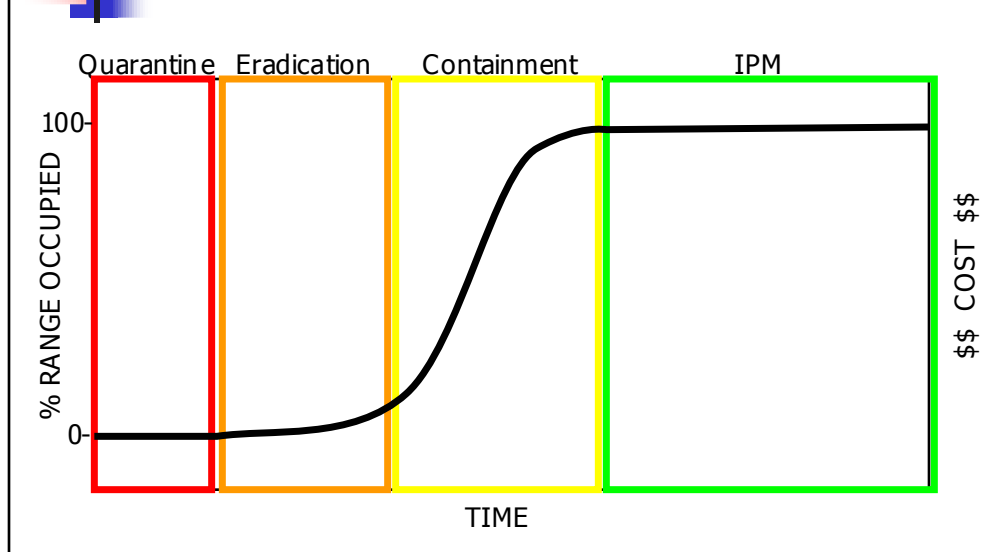
- SITE LED
 - Protecting high value conservation areas
 - ex. Haleakala National Park

- WEED LED
 - Eradicating or containing a species at an early stage of establishment
 - ex. *Miconia calvescens*




There are two main strategies for controlling unwanted plants, "site led" and "weed led", both of which are necessary for effective resource management. A "site led" control strategy focuses on protecting high value conservation areas such as Haleakala National Park. Like a fortress, any unwanted plant crossing the park's border is controlled, regardless of the plants distribution outside the park. On the other hand, a "weed led" control strategy focuses on detecting plants early and eradicating or containing a species while the invader is at an early stage of establishment, regardless of where it is found. The most well known example in Hawaii is the control campaign against *Miconia calvescens*.

Phases of Weed Invasion and associated control strategies



Invasion and range expansion of many introduced organisms have often been observed to follow a pattern of slow initial spread followed by exponential growth. Different control strategies will have different priorities at different points of the invasion process. Control strategies include quarantine, eradication, containment, and integrated pest management. In general, ease of control decreases over time and cost of control increases over time.



“The easiest, least expensive,
and most successful control
programs are those that have
detected the invader early.”



Anonymous

The easiest, least expensive, and most successful control programs are those that have detected the invader early. Managers and agencies are increasingly realizing that although active vigilance is essential on park lands, long-term protection of park resources also depends on looking beyond park boundaries for invasive species before they get to the park.



Early Detection

- Information gathering and development of methodology to address newly emergent alien plant species on Maui



Images



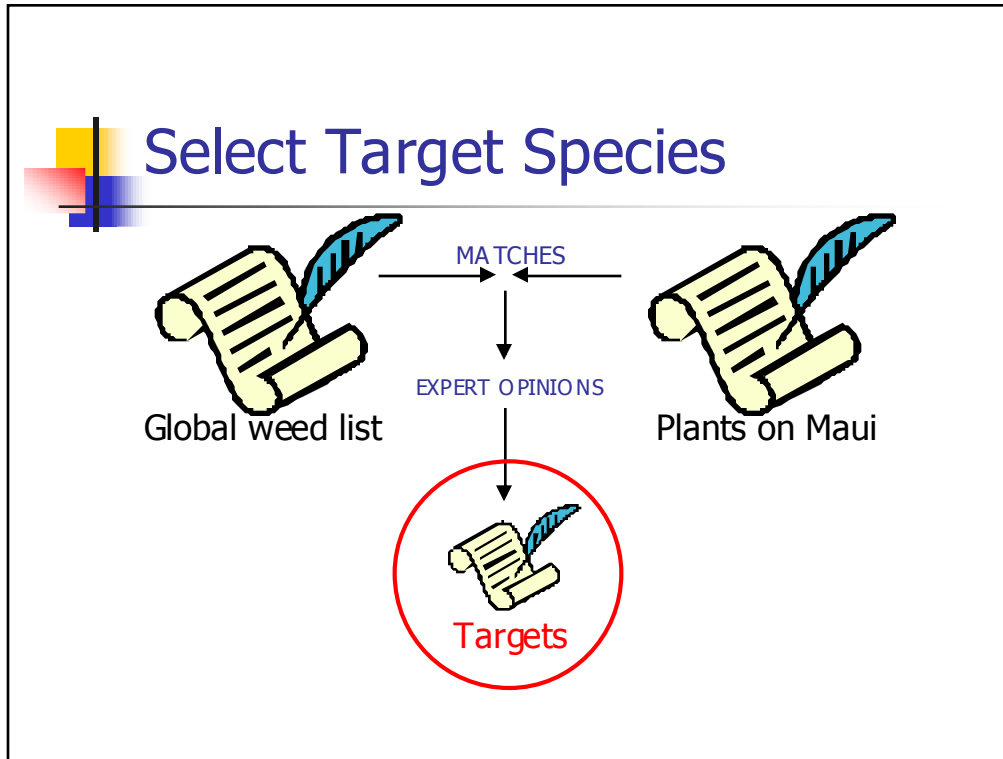
Maps



Reports

www.hear.org/starr/hiplants

For the past three years, we have been gathering information and developing methodology to aid managers in detecting and addressing newly emergent alien plant species on Maui. This project explored the process of invasion on Maui and obtained baseline data on incipient alien plant invaders which may pose threats to Haleakala National Park and other important reserves of Hawaiian biodiversity.



To begin our project, we drew from results of an earlier study in which we compiled a global weed list of plants known to be invasive elsewhere. We then compared that list to a list of plants known to be cultivated on Maui. Combining the two lists and highlighting the matches resulted in a list of plants known to be on Maui and known to be invasive elsewhere. A few modifications by local expert botanists gave us our final list of about 100 target species.

Gather Information

- **Become familiar with survey targets**
- Acquire “search images”
- Create reports for target species



Once the targets were chosen, we began to gather information for each species. We became familiar with them by reviewing existing literature and investigating known populations in the field.

Gather Information

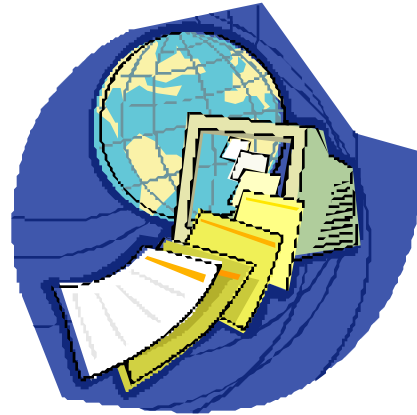
- Become familiar with survey targets
- **Acquire “search images”**
- Create reports for target species



Search images were acquired in order to better recognize each species. Digital images were taken and put on a website for future reference.

Gather Information

- Become familiar with survey targets
- Acquire “search images”
- **Create reports for target species**



The information gathered was used to create reports discussing items such as history of invasiveness elsewhere, distinguishing characteristics, and preferred habitat.



Survey Methods

- **Drive the roads at 5-10 mph**
- Record GPS locations
- Interview botanists
- Review Museum collections



To create island wide distribution maps for each target, we drove all the publicly accessible roads on Maui at about 5-10 mph.

Survey Methods

- Drive the roads at 5-10 mph
- **Record GPS locations**
- Interview botanists
- Review Museum collections



We recorded gps locations, naturalized status, and notes for each plant location.

Survey Methods

- Drive the roads at 5-10 mph
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- **Interview botanists**
- Review Museum collections



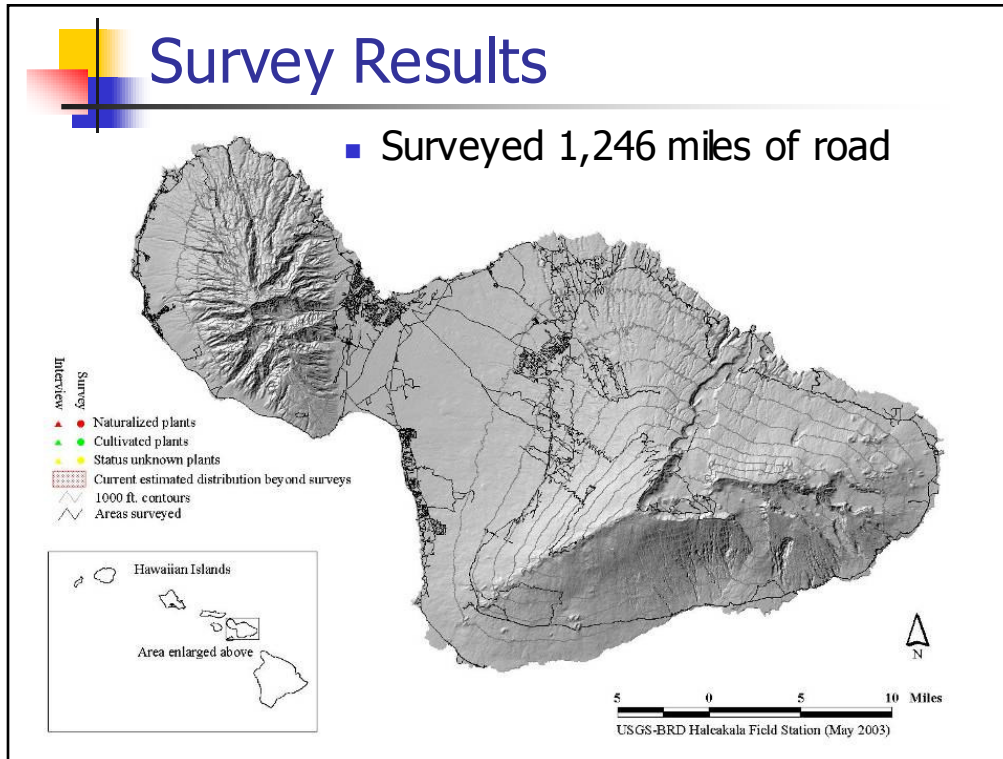
We then refined the maps by interviewing about a dozen expert field botanists on Maui.

Survey Methods

- Drive the roads at 5-10 mph
- Record GPS locations
- Interview botanists
- **Review Museum collections**



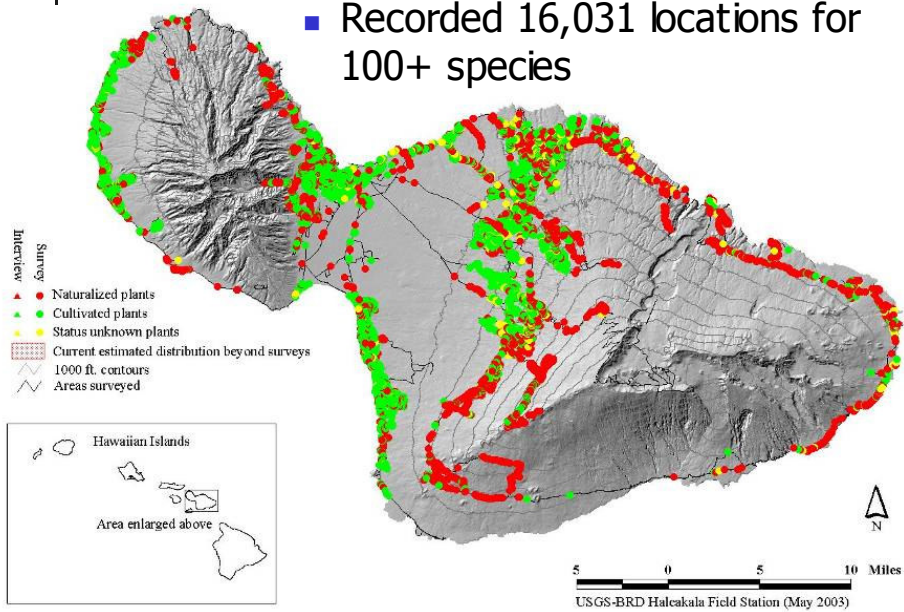
Finally, we reviewed the Bishop Museum herbarium collections for any additional locations.



By the end of our project, we had surveyed 1,246 miles of road, ...

Survey Results

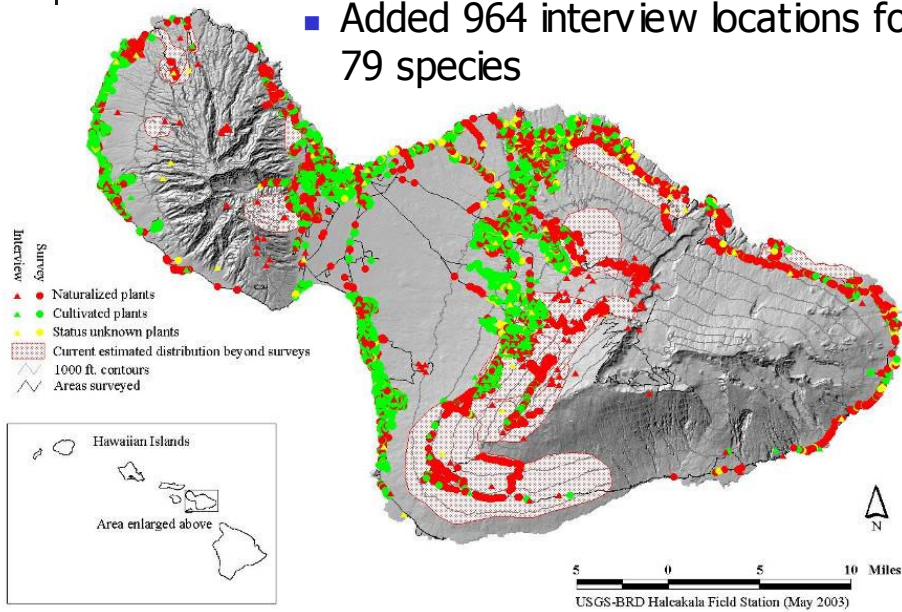
- Recorded 16,031 locations for 100+ species



... recorded 16,031 plant locations for over 100 species, ...

Survey Results

- Added 964 interview locations for 79 species



... and interviewed about a dozen expert field botanists who added 964 plant locations for 79 species.

Survey Case Studies

3 of 100+ targets

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



- *Cotoneaster pannosus*
(Cotoneaster) Rosaceae



- *Parkinsonia aculeata*
(Jerusalem thorn) Fabaceae



Here we highlight three of our 100+ target species: *Ficus cf. platypoda*, *Cotoneaster pannosus*, and *Parkinsonia aculeata*.

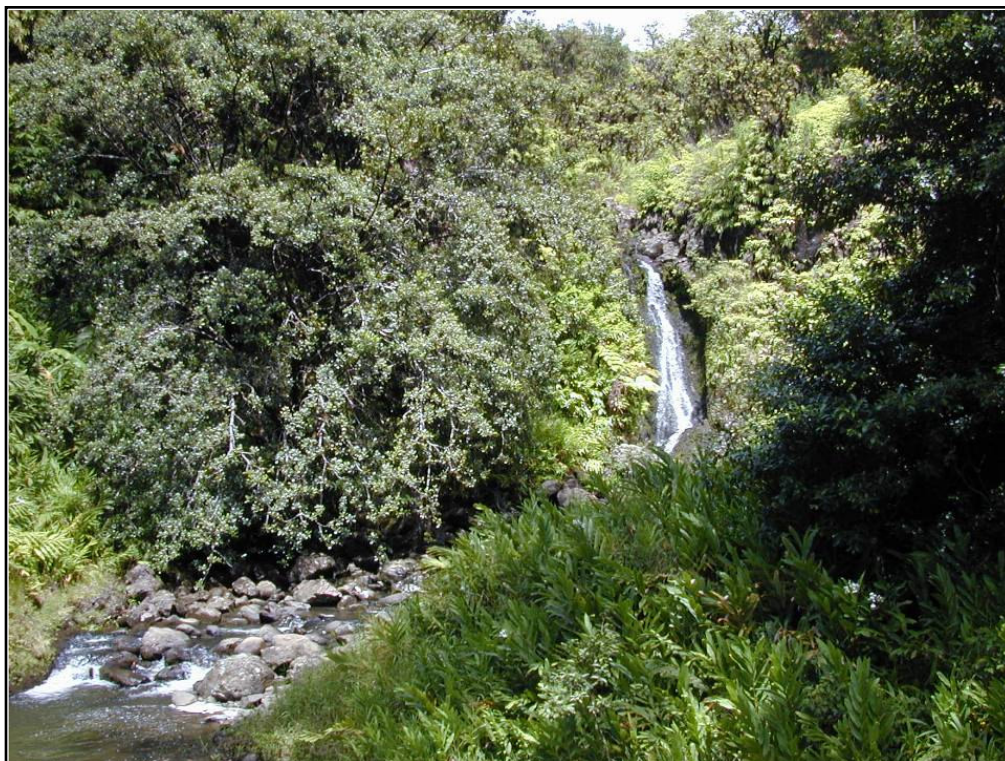


Ficus cf. platypoda (Port Jackson fig) Moraceae

- Weed elsewhere:
New Zealand
- Germinates on and kills
canopy trees
- Can destroy structures
- Bird dispersed fruit
- Assists invasion of other
non-native species



Ficus cf. platypoda is a weed in New Zealand. It can germinate on and kill canopy trees such as koa and ohia. It can destroy structures such as bridges and buildings, it produces lots of bird dispersed fruit, and it can assist the invasion of other non-native species by providing a keystone resource otherwise absent in disharmonic Hawaiian forests.



This photo shows a large *Ficus cf. platypoda* growing on a steep wall near Honomanu Valley. *Ficus cf. platypoda* was planted by the tens of thousands in forestry efforts in the early 1900's.



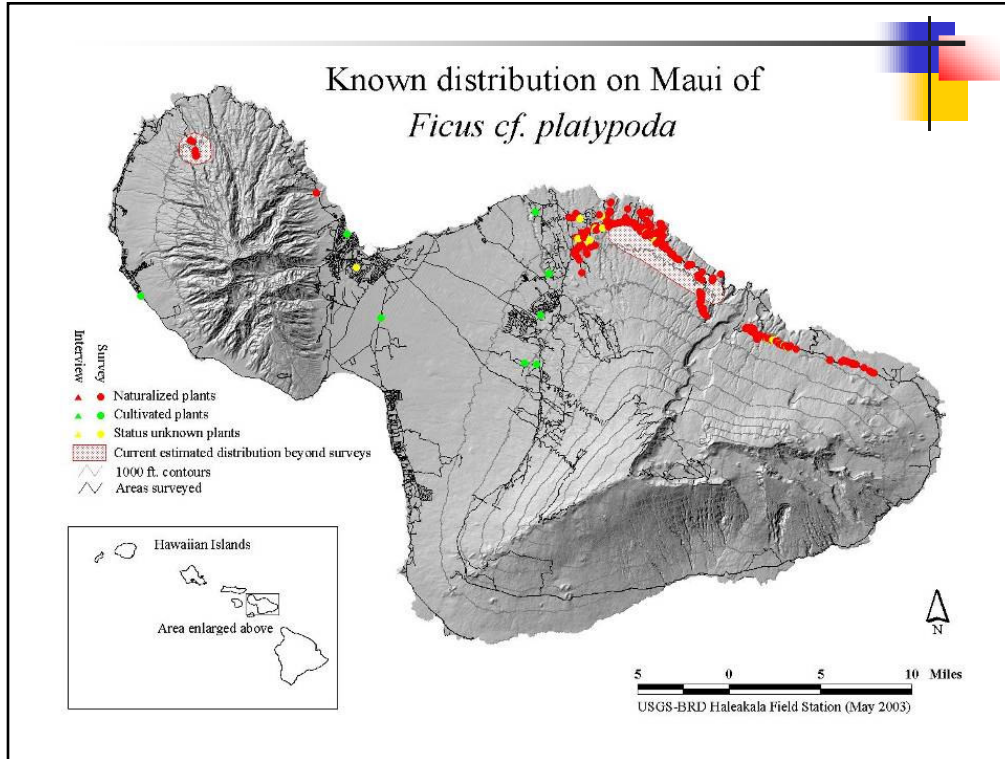
In 1922, the associated pollinator wasp, *Pleistodontes imperialis*, was introduced to facilitate its spread.



Today, Ficus trees fruit prolifically, providing an abundant food source for introduced birds, which in turn disperse the viable seeds over long distances.



Shown here is a *Ficus* cf. *platypoda* that has germinated on and will likely destroy a native *Acacia koa* tree.



This map shows what we found to be the current distribution of *Ficus cf. platypoda* on Maui. The bulk of the infestation occurs near forestry plantings along the Hana Highway on the north shore of East Maui. It is also spreading from Fleming Arboretum on West Maui. At this time island wide control does not seem likely, but local control is occurring on West Maui and near water delivery systems on East Maui.



Cotoneaster pannosus (Cotoneaster) Rosaceae

- Weed elsewhere:
California, Australia
- Forms monotypic thickets
- Fruit dispersed by birds and pigs
- Germinates in dense shade and full sun
- Tolerates high elevation



Cotoneaster pannosus is a weed in California and Australia. It is capable of forming monotypic thickets, producing abundant fruit dispersed by birds and pigs, germinating in dense shade and full sun, and surviving at high elevations.



This photo shows *Cotoneaster pannosus* in the native sub-alpine shrubland at Polipoli State Park.



These plants spread to the shrubland from this hedge in the nearby campground, where they were planted just a couple decades ago.



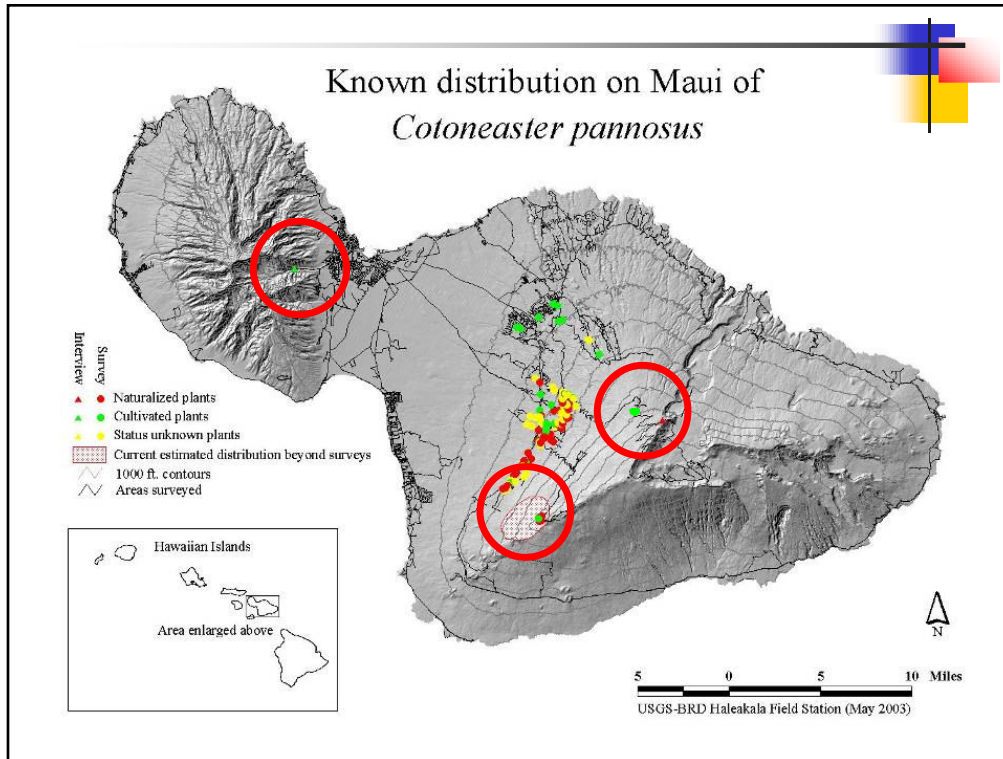
The bright red fruits of Cotoneaster make it a popular ornamental and are attractive to birds which disperse the seeds long distances.



Pigs also seem to like the fruits, consuming vast quantities of them.



These seeds have no problem germinating in dense shade under pines, where few other plants can survive.



This map shows the known distribution of *Cotoneaster pannosus* on Maui. We found *Cotoneaster* to be widely cultivated and naturalized in mid-elevation residential areas of East Maui. A few outliers are of note, including the Polipoli location, a couple plants in Haleakala National Park, and a lone cultivated location on West Maui. The park plants have been controlled, and other outlier plants could also be controlled to avoid further infestations elsewhere.

Parkinsonia aculeata (Jerusalem thorn) Fabaceae

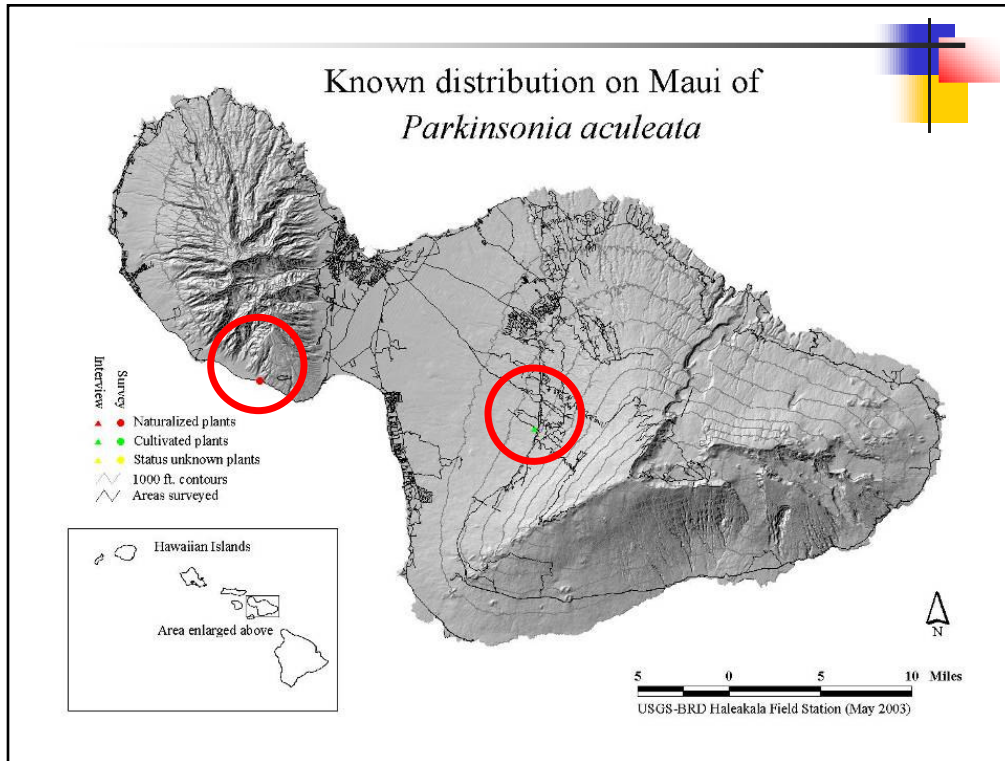
- Weed elsewhere:
Florida, California, West
Indies, Australia,
Micronesia
- Forms dense, thorny,
impenetrable thickets
- Long lived, water
dispersed seeds
- Extremely drought and
heat tolerant



Parkinsonia aculeata is a weed in Florida, California, the West Indies, Australia, and Micronesia. It forms dense, thorny, impenetrable thickets; has long lived, water dispersed seeds; and is extremely drought and heat tolerant.



Parkinsonia aculeata is cultivated as an ornamental tree for its showy flowers and drought tolerant properties.



This map illustrates the limited distribution of Parkinsonia on Maui. During our surveys, we came across just two locations, making Parkinsonia a good candidate for eradication.



Here, the Maui Invasive Species Committee is removing one of the only known populations of *Parkinsonia* on Maui. Other species that were also found to have very limited distributions on Maui and that have had most of the known individuals controlled include,



Rhodomyrtus tomentosa,



Rubus ellipticus,



and Melastoma.



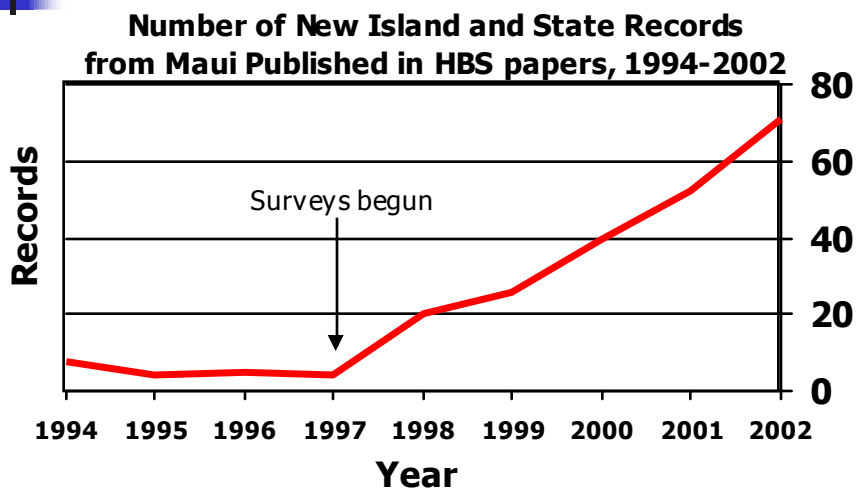
Collect Unknown & New Species

- 33 New State Records
- 60 New Island Records
- 21 Range Extensions



In addition to searching for our target species, we also collected plants that we did not recognize or were new to Maui. In doing so, we collected and published 33 new state records, 60 new island records, and 21 range extensions for Maui.

Collect Unknown & New Species



This graph shows that after surveys by ourselves and Hank Oppenheimer began in 1997, the average number of new collections published per year on Maui went from 4 to 40. This highlights the fact that early detection is possible if sufficient time and resources are dedicated.



Lessons Learned

- The more you look the more you find
- Plants can be detected early
- The earlier the species is detected, the greater the chance for successful control

In summary, we learned that the more you look the more you find; that plants can be detected early; and that the earlier the species is detected, the greater the chance for successful control.



Suggestions

- Start looking for weeds
- Drive your roads
- Interview local experts
- Collect unknown and new plants

Some suggestions we have are to start looking for weeds; to drive your roads; to interview local experts; and to collect unknown and new plants.



“If you’re not outraged,
you’re not paying attention.”




Anonymous

We must admit we were consistently dismayed by what we found. Many of the species we initially expected to occur in low numbers on Maui actually turned out to be quite widespread. We also found many species that weren't yet known to occur on Maui, that were not only present, but were actually well beyond the point of realistic eradication. Some might say why even bother to look for new problems when the Hawaii conservation community already has more threats than it knows what to do with.



“Be joyful even though
you know the facts.”



Wendell Berry, as quoted by Jason Van
Driesche at MISC meeting, January 1999

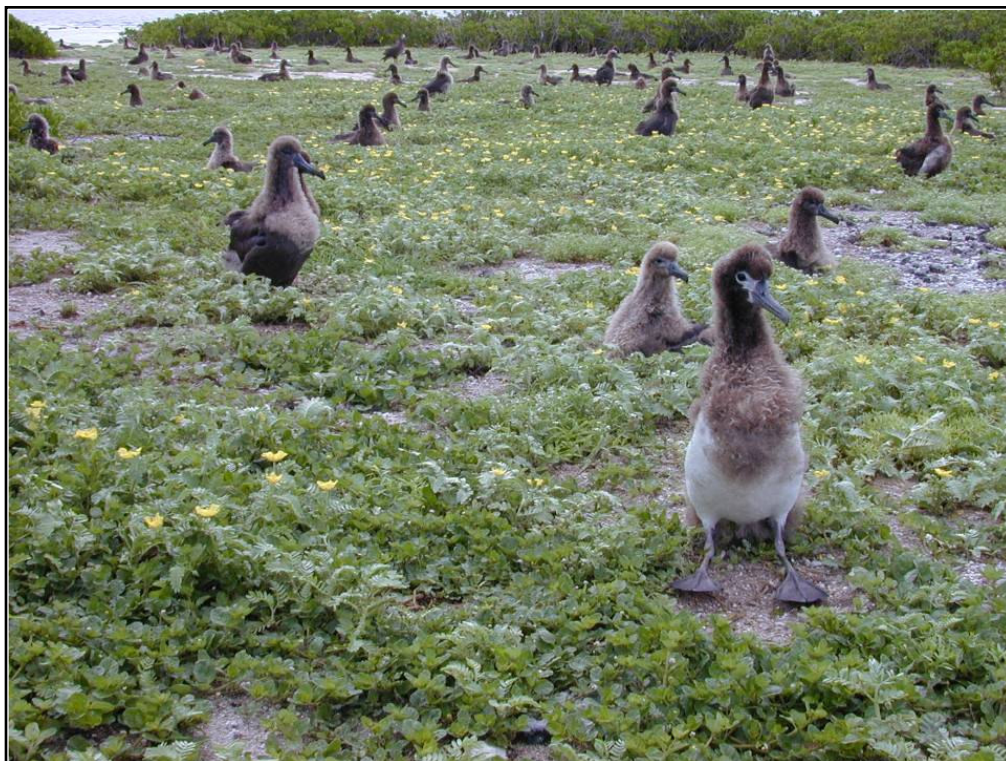
We take the upbeat view that an optimistic mindset and gathering all the relevant facts is what is needed to keep options open. Hiding our heads in the sand is not acceptable. Keeping out new invaders through screening and active monitoring for those that get through does matter and is possible.



Whether it's the native beach morning glory, pohuehue, *Ipomoea pes-caprae*...



...or the ohia lehua, *Metrosideros polymorpha*.



From the albatross and the fields of Tribulus on the shores of Kure Atoll...



...to the silverswords on the summit of Haleakala.

More Information

www.hear.org/starr/hiplants



Images



Maps



Reports

PAU

We believe there are many opportunities to protect the native plants and animals of these islands by finding the weeds before the weeds find them.