



EMP

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Ants on Plants: Argentine Ants May be Threatening the Endangered Lance-leaf Catchfly at Pōhakuloa Training Area

By Caleb Slemmons

Invasive ant species such as the Argentine ant (*Linepithema humile*) are notorious for the decimation of the local invertebrate fauna when introduced into a new habitat.

Although problematic ants living in Hawai'i are small in stature, they can have surprisingly large impacts on fragile native Hawaiian ecosystems and resources. A horde of other secondary and downstream effects of ant invasions have been documented, including disruption of plant pollinator interactions, impacts to wildlife, crop damage and even public health and safety issues.

Recently, the Argentine ant has been a subject of concern at Pōhakuloa Training Area (PTA). PTA natural resource staff

have observed ants visiting flowers of the endangered lance-leaf catchfly (*Silene lanceolata*). The sticky sap covering the upper stems and flower buds of *S. lanceolata* has even caught ants in the act!

Where infestations of Argentine ants overlap with the range of *S. lanceolata*,

ants can be seen bridging the sticky stem by



Foraging Argentine ants clustered on the inflorescence and bridging the sticky stem of endangered lance-leaf catchfly (*Silene lanceolata*) at PTA. (Photo by Nikhil Narahari, CSU)

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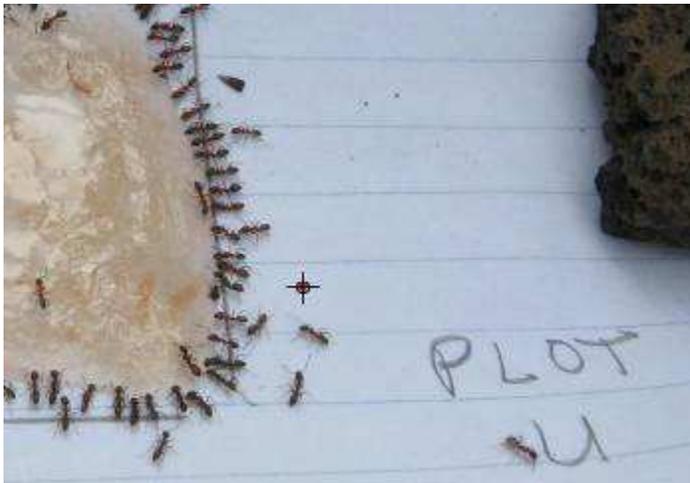
crawling over their imperiled nestmates helplessly glued to the plant (see photo, left). Although their motivations are unclear, it is likely that ants are robbing the sweet nectar from flowers and may be disrupting pollination and seed production as a result.

In response to this emerging threat, the PTA natural resource staff began a pilot program this year to control Argentine ants within annual plant monitoring plots.

In June, the number of foraging ants were assessed using bait cards, and test plots were treated with a granular insecticide containing the active ingredient hydramethylnon. Similar efforts have proven successful at temporarily reducing the number of foraging Argentine ants at Hawai'i Volcanoes and Haleakalā National Parks. For this project, bait cards contained a mixture of canned tuna blended with corn syrup as an attractant. Cards were

photographed after 45 minutes and individual ants were counted in each photo using a computer graphics program (see photo, below).

At PTA, monitoring of ant numbers post-treatment revealed a reduction of foraging ants from an average high of 135 ants visiting each bait card to near zero at fifteen days after treatment.



Trial control plots were monitored for foraging ant density from photos. Individuals were marked with red on the photos during counts that were up to 330 ants on bait cards at untreated plots. (Photo by Caleb Slemmons, PTA, Colorado State Univ.)

Although eradication of invasive ants on a landscape scale has generally proven to be unsuccessful, this project has provided evidence that control efforts can be used to reduce impacts to a targeted resource during a particular time of year. For *S. lanceolata*, if treatment of infested areas could coincide with flowering, plants could be protected during this critical time period.

Argentine ants are also known to care for both aphids and scale insects that serve as a vector for plant pathogens. Since aphids have been documented attacking both *S. lanceolata* and the critically endangered *Tetramalopium arenarium*, future efforts at PTA may include treatment of monitoring plots plagued with aphids. This would be done within selected trial plots where aphid presence has been documented historically, allowing a comparison of aphid presence following treatment. ■

~Caleb Slemmons is a Research Associate with Colorado State University working for the PTA Army Natural Resource Program.

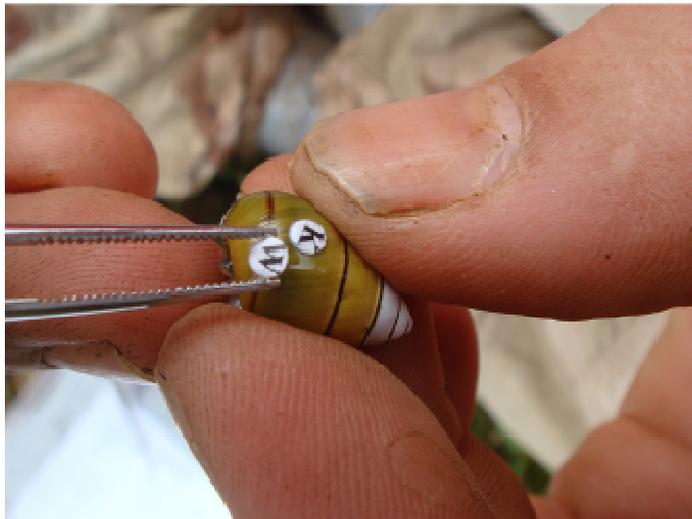
How Many Endangered Snails are Really on Army Land?

By Vince Costello

Part of the work of the O`ahu Army Natural Resource Program (OANRP) is to manage populations of endangered Hawaiian tree snails. Different species of *Achatinella* (the genus of these snails) are found in both the Ko`olau and Wai`anae Mountains. The OANRP has an agreement with the US Fish and Wildlife Service to manage populations of at least 300 snails of each. Some rare populations exceed 300 snails, and other populations are difficult to estimate, as these tiny creatures live in a literal jungle of vegetation.

To help our team with these estimations, the OANRP joined forces with Kevin Hall, a UH doctoral student who utilizes a technique known as capture/mark/recapture (CMR). Using this process, a site is selected and then two days are devoted to finding, marking, and releasing these small snails.

On the first day, snails are collected and given an identifying mark. Small letters and numbers are glued to the snails' shells – the letters to identify the particular tree and numbers to specify how many snails were counted in each tree. Snails are also measured, so their



Markings are carefully glued to the shell of the *Achatinella* tree snail. (Photo by Katie Franklin, OANRP)

growth can be monitored over time.

In the morning of day one, two surveyors locate snails in half of the site, and two other surveyors locate snails in the other half.

All snails located are given markings and returned to the place they were found. After lunch, each surveying team trades places and re-surveys each others' areas. This is done to help eliminate any bias that one team might have over another in locating the snails. On the second day, the process of the first day is repeated, except for the marking.

Four sites were surveyed in this manner - two in the Ko'olau and two in the Wai'anaes. All four sites are very different. At the site near the origin of the 'Ōpae'ula Stream only 50 snails were previously counted; during the two day CMR method, a total of 228 snails were found. This was far more than imagined and demonstrated that with more diligent and repeated surveying, more snails could be located.



Kalā Lindsey-Asing, left, and Michelle Elmore, right, part of an OANRP staff survey-team, search through thick vegetation to find as many *Achatinella* as possible. (Photo by Mike Walker, OANRP)

The other sites yielded fewer snails, but all proved that with follow-up surveys more snails could be found, and no one person can find them all. The snails are small and often challenging to find. Adults are only a little less than an inch long, and immature snails can be miniscule.

The information collected from the CMR method is used to estimate snail population size by comparing the number of snails marked the first day with the number "re-captured" on the second day (snails captured on day 2 that had already been marked on day 1). It is assumed that surveyors are not able to find all of the snails, but with the help of the CMR data and statistical analyses, the total population is estimated to be larger than the total number of snails seen.

For example, a total of 228 snails were actually counted at the 'Ōpae'ula site, but following the CMR method in conjunction with statistical

analyses, a more robust total of 401 snails is estimated.

The principle behind this process is that if you can mark snails, recapture a portion of them, and *continue* to find unmarked snails, then there are more snails there than meets the eye.

At the two Wai'anae sites it seemed that there just weren't as many places for the snails to hide, and not that many more snails were found after the initial survey. In contrast, in Ko'olau sites the habitat is different and the vegetation provides many more hiding places for the snails.

The OANRP's future plan is to continue to monitor these snail sites every six months to better calculate how many snails comprise these populations, and also to observe changes in population size that might be harbingers of predation that would warrant further management action to preserve these threatened jewels of the forest. ■

~Vince Costello is a Rare Snail Conservation Specialist with the Research Corporation of the University of Hawai'i, Pacific Cooperative Studies Unit, working for the O'ahu Army Natural Resource Program



An endangered Hawaiian tree snail, *Achatinella sowerbyana*. (Photo by Mike Walker, OANRP)

Invasive Species Notification: Cane Tibouchina Discovered at the Ko'olau Summit.

By Jane Beachy

In early August, staff from the O'ahu Army Natural Resource Program (OANRP) discovered the highly invasive *Tibouchina herbacea* on the Ko'olau summit in the Poamoho region. This aggressive weed is not known to be naturalized on O'ahu, although it is widespread on both the Big Island and Maui. Only one plant was found at Poamoho, and it was removed by OANRP staff.



Cane tibouchina with identifying features. (Photo by Hank Oppenheimer)

How bad is it? Tibouchina poses a major threat to Ko'olau forests, especially the near-pristine summit regions. Not only does it thrive in wet forest conditions, it also produces hundreds of tiny seeds and can spread vegetatively.

Broken pieces—even small ones—can root and form new plants. The seeds are easily transported via wind, birds, pigs, and even hikers who unwittingly carry them on shoes, clothes and backpacks.

A paper about Tibouchina prepared by The Nature Conservancy notes that it has taken less than a decade for Tibouchina to spread across almost all appropriate habitats in the west Maui mountains, an impressive feat.

Tibouchina is a member of the Melastoma family, as are both *Miconia* and *Clidemia*, two "superweeds." Many melastomes are highly aggressive in Hawai'i.



Cane tibouchina colonizes mesic forests in both sunny and shady locations. It has an upright growth form and can even grow through thick uluhe fern, as seen in this photo. (Photo by Forest & Kim Starr)

Where does it like to grow? Cane tibouchina prefers wet and mesic forest, where it thrives in areas with open understory. It grows in both sun and shade, although it prefers sunny gaps. It can grow through uluhe ferns, but truly thrives in disturbed areas, particularly sites damaged by pigs or landslides.

What does it look like? Tibouchina is a shrub reaching up to four meters; one plant may have many upright canes. Leaves are very hairy, with parallel veins (5-7). Flowers are 4-petaled, purplish-pink. Stems are covered with tiny gland-tipped hairs, visible with a hand lens.

Is there anything it could be confused with? Yes! There is another common melastome which does look similar to Tibouchina. *Arthrostemma ciliatum*, or pinkfringe, has a similar 4-petaled flower, although it is larger and has pink, rather than purple petals. The young stems are reddish, while the older canes have

red ridges. Tibouchina canes are green. Pinkfringe leaves are only sparsely hairy. Pinkfringe canes tend to fall over, forming large brambles. Please see photos to the right for a comparison.

Your kokua is needed!

When hiking in the Ko`olau, please keep your eyes peeled for Tibouchina. If you think you see it, please:

- take a close-up photo of the leaves and the flowers if there are any, as well as a photo of the entire plant
- note with as much detail as you can where you found it
- send the information to: oisc@hawaii.edu.

(If you have a GPS device and can take a point, please do.)

Do not try to remove the plant, as it grows easily from broken pieces and your gear may become infested with seeds.

What else is happening? In conjunction with other agencies, including the O`ahu Invasive Species Committee, Department of Fish and Wildlife and others, OANRP plans to conduct both ground and aerial surveys in a 2km buffer around the known Tibouchina site at Poamoho. This will be the first step in management. Future management efforts will hinge on the results of these surveys. OANRP hopes to prevent Tibouchina from becoming established in the Ko`olau range. ■

~Jane Beachy is an Ecosystem Restoration Program Manager with the Research Corporation of the University of Hawai`i, Pacific Cooperative Studies Unit, working for the O`ahu Army Natural Resource Program.

For more information, please contact the O`ahu Invasive Species Committee (OISC):

Email: oisc@hawaii.edu

Phone: 453-6113

PHOTO CREDITS FOR "COMPARISON" (right):

- Cane tibouchina stem - Forest & Kim Starr
- Pinkfringe stem - OANRP staff
- Cane tibouchina flowers - Forest & Kim Starr
- Pinkfringe flower - OANRP staff
- Cane tibouchina habit - Hank Oppenheimer
- Pinkfringe habit - OANRP staff

Cane Tibouchina & Pinkfringe COMPARISON:

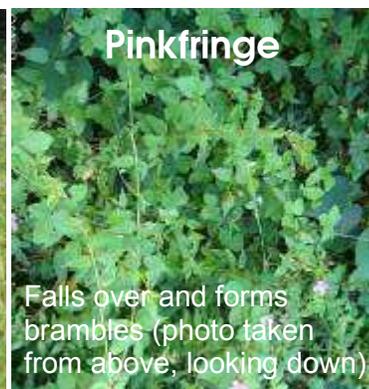
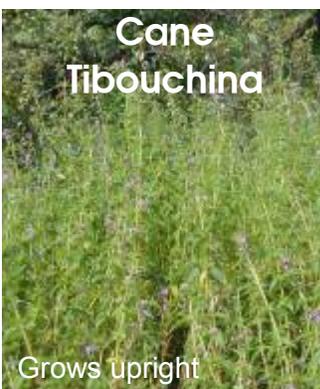
STEMS -



FLOWERS -



GROWTH HABIT -



Despite Threats, Rare Plants can Thrive

By Andrew Marshall

What began as a routine survey of a roadside led to a botanical breakthrough for Pōhakuloa Training Area (PTA) biologists. An endangered plant, *Solanum incompletum*, was discovered only a few meters from a minor road, in an area not previously known to contain any rare plants.



Solanum incompletum, also known as Pōpolo. (Photo by PTA staff)

Subsequent surveys in the area found 72 additional *S. incompletum*, more than doubling the known population of naturally occurring plants.

The discoveries took place in a'ā and pāhoehoe substrates in an area unprotected from ungulates, weeds and rodents. Despite the threats from browsing goats, and dense *Pennisetum setaceum* grass in the area, the newly discovered *Solanum* are all in remarkably good condition. Upon discovery, many adult plants were bearing fruit and flowers, and

several juvenile plants were present.

PTA staff constructed fences around the six plant locations and cleared the immediate area of weeds. Further surveys are scheduled in the area to make new discoveries and determine the future route of a large scale fence.

Not only is the *S. incompletum* at PTA more numerous than previously thought, it may also be much more genetically diverse. The plants at Pōhakuloa show a variety of different traits, like thorned and unthorned sepals (structures found at the base of the flowers), and white and purple flowers.

PTA's plants have also caught the attention of researchers from the New York Botanical Garden, who are revising the taxonomy of Pacific *Solanum* and collaborating on a genetic study of *S. incompletum*.

S. incompletum was first discovered by science in 1779 by members of Captain Cook's crew. It was thought to be extinct until rediscovered in 1996.

Currently there are 138 known, naturally occurring individuals at PTA and adjacent state land. Pōhakuloa staff are working to protect and propagate *S. incompletum* on and off base and have established an additional three outplanted populations on the Island of Hawai'i, *S. incompletum*'s only habitat. ■

~Andrew Marshall is a Natural Resource Field Technician with Colorado State University, working for the PTA Army Natural Resource Program

O'ahu Army Cultural Resource Staff Volunteer their Time and Talents

By Carly Antone and Moana Lee

Over the past 15 years, the Wai`anae High School Hawaiian Studies Program has transformed from a class of difficult-to-teach kids at the Alternative Learning Center into a much pinned-for course focused on all aspects of environmental study. Thanks to the program's first teacher, Linda Gallano, who knew places in Wai`anae where archaeological sites existed in abundance, an inspiring science/cultural curriculum was established.

Now lead by Kumu Mike Kurose, not only does the program include study in water quality

monitoring, reforestation, and botany, but also archaeology. And what better way to expose the students to archaeological techniques and principles than from cultural resource professionals?

Each Thursday, Moana Lee, Alton Exzabe, and Carly Antone, all archaeologists with the O`ahu Army Cultural Resources Program, meet eager juniors and seniors at locations on the Wai`anae Coast. They teach them how archaeologists analyze material culture in the context of traditional oral history. By the conclusion of the semester, the students will have learned rudimentary skills of archaeological field work including pedestrian survey, mapping, and excavation.



Wai`anae High School students learn about archeology from Army Cultural Resources staff at Kāne`āki heiau in Mākaha Valley. (Photo by Carly Antone, ACRP)

So far, following several weeks of lessons, the students have had an orientation and learned feature type recognition and other reconnaissance tasks. In the coming weeks, they will continue to work in small groups with the archaeologists who volunteer their time to share their passion.

Lee, who has volunteered with Wai`anae High's Hawaiian Studies class for over a decade, admits that her involvement is personal. When nudged she confides, "Coming back each year to work with these students is an undeniably strong incentive for me. I want to see these kids, many with ancestral ties to this area, get excited and passionate enough to pursue education and build careers that benefit them and their community to boot."

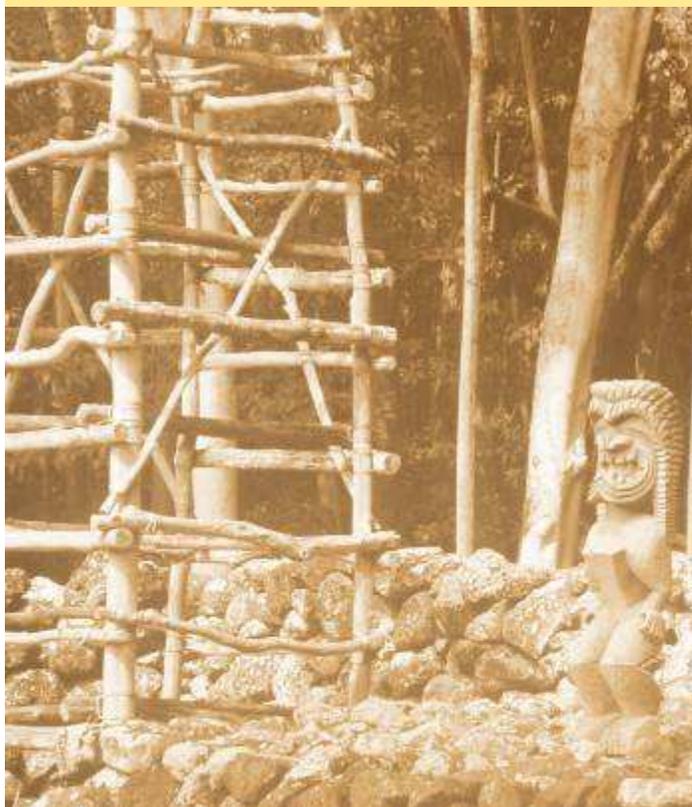
This year Lee has initiated a "passing of the

torch" by adding more volunteers to the mix, including Antone and Exzabe, both 1997 Wai`anae High graduates.

Their service hasn't gone unappreciated by the students. On one recent occasion, Exzabe recalls, "One of the kids came up quietly afterward and asked me how we know a house platform from another kind of platform." Exzabe told the student about the different ways archaeologists use their knowledge to obtain data. "The student heard what I had to say, and I know it registered because he looked me in the eye and concluded that archaeologists 'make an educated guess about what happened there.'"

As a program, the Hawaiian Studies course looks to provide opportunities to its students as they progress toward graduation. The hope is that the students will be prompted to attain a higher education. Three dedicated Army archaeologists are helping to make that a reality for students on the Wai`anae Coast. ■

~Carly Antone and Moana Lee are Archaeologists with the Research Corporation of the University of Hawai'i, Pacific Cooperative Studies Unit, working for the O`ahu Army Cultural Resource Program.



Kāne`āki heiau in Mākaha Valley. (Photo by Kim Welch, OANRP)

Averting Strawberry Guava Domination

By Candace Russo

Tasty fruit aside, strawberry guava (*Psidium cattleianum*) is one of the most invasive species threatening O`ahu's forests. If you've ever seen the transformation of a beautiful native Hawaiian forest into a single-species stand of strawberry guava, you know the relatively rapid, devastating effects this invasive tree has on our valuable native flora.

Outcompeting native plants and inhibiting their growth, this wonder-weed can depress the functions of a healthy forest.



A dense stand of strawberry guava on O`ahu. Strawberry guava outcompetes all native vegetation, depleting the forest of its natural functions. (Photo by OANRP staff)



A native forest on O`ahu dominated by large Koa and `Ōhi`a. This intact forest functions as a healthy watershed, and provides valuable natural and cultural resources (Photo by OANRP staff)

One of the most important natural resource management tools is to control weeds like strawberry guava in areas where rare or endangered plants and animals live. In fact, tens of thousands of hours are spent each year using manual and chemical methods to control invasive weeds.

In an effort to improve strawberry guava weed control, the US Forest Service (USFS) has spent the last 15 years researching an insect that holds promise as a biocontrol for this weed.

If the word "biocontrol" makes you cringe, please read on! Biocontrol unfortunately holds a stigma from well-known attempts that were unsuccessful (think rats and the mongoose). However, mongooses were introduced without any regulations in the 1880's. Much has been learned since then.

Today, extensive research and testing are required prior to the release of any biocontrol agents. This includes testing potential biocontrols to see if they will switch "targets," or their intended host species.

A common misconception is that biocontrols are used to eliminate a specific plant or animal. This is a tall order and not a goal of most biocontrol efforts.

"Since 1975, a total of 51 biocontrol species have been introduced to Hawai'i after thorough testing – none have switched hosts to non-target species, and none have resulted in the eradication of their host" (Coordinating Group on Alien Pest Species (CGAPS), 2008).

A scale insect has been the focus of the USFS 15-year study to aid in the control of strawberry guava.

Nymphs, or young life-stages, of the scale insect *Tectococcus ovatus* "crawl to young strawberry guava leaves, triggering the plant to form tissue around the nymph. These tissue lumps are called galls" (CGAPS, 2008). When the trees form galls, their health is compromised because the energy they would normally put into growth is now being directed toward forming these galls. This compromise in the health of a plant is referred to as decreased plant vigor.

A decrease in plant vigor will slow the spread of strawberry guava, allowing native plants to better compete for sun, water, and space. "Decreased plant vigor will also decrease the number of seeds produced. This will allow land managers to achieve better control with chemical and mechanical (weed control) techniques" (CGAPS, 2008).

Based on a thorough study of the biology of this scale insect, it has been determined that *T. ovatus* feeds and makes galls solely on strawberry guava. In the 15-year testing process, "it has not killed strawberry guava plants and has never attacked non-target plants of concern in Hawaii" (CGAPS, 2008).

In addition to conducting a federal Environmental Assessment, the tests have been reviewed and accepted by panels of scientists from the Hawaii Department of Agriculture (HDOA).

Public comments were also accepted, and with the reviews, permits for the release of this insect were issued by the HDOA and the US Department of Agriculture Animal and Plant

Health Inspection Service.

From the natural resource management perspective, this progress is invaluable. The help provided by these scale insects is welcome as the struggle continues to stay ahead of the vigorous roots of the strawberry guava, before they dominate our Hawaiian landscape.

What this biocontrol effort WON'T do:

- The *T. ovatus* scale insect will not attack common guava.
- Decreased plant vigor resulting from insect damage will not eliminate fruit production – strawberry guava fruit will continue to be produced, there will just be less of it.
- Strawberry guava will not be eradicated – the scale insect does not kill the trees, it impacts them to slow the spread of this noxious weed. There will still be plenty of strawberry guava wood for smoking meat. ■

~Candace Russo is an Environmental Outreach Specialist with the Research Corporation of the University of Hawai'i, Pacific Cooperative Studies Unit, working for the O'ahu Army Natural Resource Program.

FOR MORE INFORMATION...

These and other facts can be found in the following article: "Fact and Fiction about Waiawi Control" by Patricia Tummons, Environment Hawai'i. Reprinted with permission from Environment Hawai'i by the Hawai'i Ecosystems at Risk project:

http://www.hear.org/species/psidium_cattleianum/

Another interesting article from Environment Hawai'i: "Controversy Flares over Proposal to Control Waiawi with Scale Insect" by Patricia Tummons, Environment Hawai'i. Also reprinted with permission from Environment Hawai'i by the Hawai'i Ecosystems at Risk project:

http://www.hear.org/species/psidium_cattleianum/

The **Hawaii Conservation Alliance** has also released a strawberry guava biocontrol position statement, supported by their members. This can be found at: <http://hawaiiconservation.org/strawberryguava.asp>

Other information in this article provided by:

http://www.fs.fed.us/psw/topics/ecosystem_processes/tropical/invasive/

Coordinating Group on Alien Pest Species (CGAPS), State of Hawaii - DLNR, and DOFAW, 2008, Biological Control Release of *Tectococcus ovatus*, a Gall-forming Scale Insect to Aid in the Control of Strawberry Guava (*Psidium cattleianum*).



Strawberry guava domination. (Photo by OANRP staff)

A *Tis the Season...*

U

Some native Hawaiian plants can flower and fruit throughout the year, but most form their fruits as autumn begins.

T

Like a handful of shells, native plant fruits come in all shapes, sizes and colors. Their role is important as they provide a safe house for the seeds of future generations of plants.

U

M

Many of these fruits are not often seen because they belong to our long list of endangered and rare plants.

N

Enjoy this cornucopia of fruit photos representing Hawaii's rare treasures...and see if you can identify any of them!

(Species names can be found on the next page)



VOLUNTEER OPPORTUNITIES

DECEMBER 2008

- ▶ **Event:** Volunteer Service Project, Kahanahāiki Gulch (O`ahu)
- Date:** Monday Dec. 15, 2008
- Purpose:** To maintain a section of the Kahanahāiki trail.
- Terrain:** ~1.5 hours of hiking on a moderately difficult trail, with some steep sections.
- Participants:** Open to the public (trip currently FULL).

JANUARY 2009

- ▶ **Event:** Volunteer Service Project, Kahanahāiki Gulch (O`ahu)
- Date:** Saturday, Jan. 17, 2009
- Purpose:** To remove invasive weeds, and/or outplant common native plants, if available.
- Terrain:** ~1.5 hours of hiking on a moderately difficult trail, with some steep sections.
- Participants:** Open to the public (max. 12 volunteers).

For more information about O`ahu Army Natural Resource Program volunteer opportunities, or to be added to our monthly email posting of all public events, please contact Kim Welch or Candace Russo:
 kmwelch@hawaii.edu
 candace.r.russo@us.army.mil

Plant species in fruit photos:

Delissea Subcordata
(Hāhā)

Schiedea trinervis

Chamaesyce celastroides
var. *kaenana*

Smilax Melastomifolia
(Hoi kuahiwi)

Cenchrus agrimonioides
var. *agrimonioides*

Chamaesyce rockii

Flueggea Neowawraea
(Mehamehame)

Cyanea acuminata
(Hāhā)

Alectryon macrococcus
var. *macrococcus*

Sanicula mariversa

Hibiscus brackenridgei
ssp. *Mokuleianus*
(Ma`o hau hele)

Cyrtandra subumbellata

Chamaesyce herbstii

Dianella sandwicensis
(`Uki`uki)

Pritchardia kaalae
(Loulu)

EMP *Bulletin*

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The success of this newsletter depends on article contributions from the staff of the O`ahu Army Natural Resources Program, O`ahu Army Cultural Resources Program, PTA Army Natural Resources Program, and PTA Army Cultural Resources Program. Mahalo to all staff who have contributed to this issue.

*We will be sending out a call for articles to compile next quarter's issue shortly. If you already have an article or idea in mind, please feel free to contact us! The deadline for articles for the next issue will be **December 15, 2008**.*



A handwritten signature in black ink, which appears to read 'Alan Goo', is written over a horizontal line.

Alan Goo
Director of Public Works
US Army Garrison, Hawai'i