

○ PACIFIC ISLANDS

○ JUNE 2015

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Forest Health 2014 highlights

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Forest Resource Summary

The US-affiliated Islands of the western Pacific cover an area larger than the continental United States, with a total land mass of 965 square miles. The area includes the Territories of American Samoa and Guam, the states of Chuuk, Kosrae, Pohnpei, and Yap in the Federated States of Micronesia (FSM), the Republics of Palau and the Marshall Islands, and the Commonwealth of the Northern Mariana Islands (CNMI). Approximately 325,000 acres are forested.

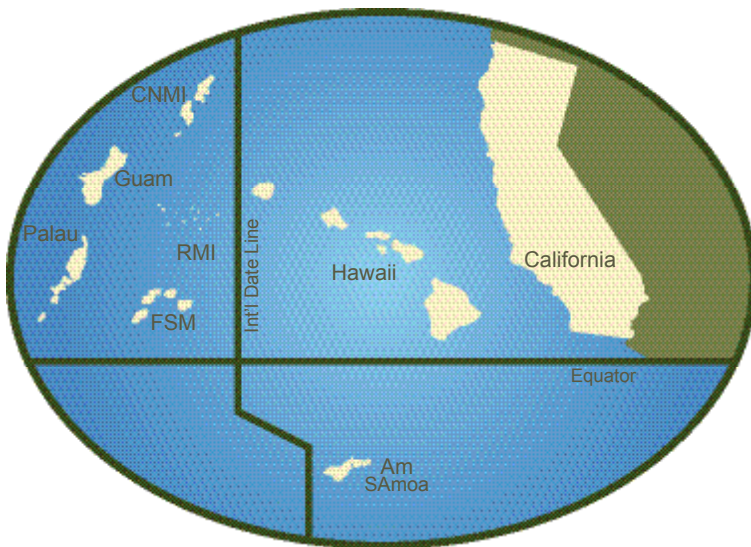


Figure 1. U.S. Affiliated Islands in relation to the United States

Forests in the Pacific are host to a variety of insects and pathogens and are subject to natural and human-caused disturbances which adversely affect forest health. Forest health issues vary widely among islands and most pest issues result from multiple pathways for introduction due to the increase in travel and trade throughout the Pacific.

Invasive plants remain one of the greatest forest health issues on the islands, most of which have active invasive plant survey and control programs. Invasive insect introductions are becoming more frequent, increasing the need for early detection, and novel integrated pest management tools.

Cycad *Aulacaspis* Scale (CAS)

Aulacaspis yasumatsui invaded Guam in 2003. Since initial detection, the scale has been monitored by Dr. Thomas Marler, University of Guam, in part, with funds from the Cooperative Lands Forest Health Management Program (USDA Forest Service, R5). Based on results from the 2014 census of permanent plots on Guam and Rota cycads continue to be impacted by CAS. Since no mortality was documented in 2013 in the Guam plots, it was thought at that time the *Arrhenophagus* sp. (Hymenoptera: Encyrtidae) parasitoid that fortuitously began parasitizing Guam's *Aulacaspis yasumatsui* (CAS) population was beginning to do an effective job controlling CAS. But more plant mortality and a greater incidence of CAS on the live plants occurred during 2014, so the combined parasitoid and *Rhyzobius* predator biocontrol is clearly not fully effective.

The initial 1-2 years following invasion of CAS on Guam and Rota resulted in complete mortality of the seedling population and most of the juvenile plants. The decline in survival was greater on Rota than Guam because a higher percentage of the pre-invasion population consisted of seedlings on Rota. Both cycad populations continue to exhibit a steady rate of mortality, but the Rota population is declining more rapidly. If there are no changes in the coming years, cycads will be extirpated from Rota at an earlier date than from Guam, even though the initial invasion was earlier on Guam. Dr. Marler is also expanding his cycad monitoring efforts to other island through support for the US Forest Service. Plots to monitor cycads in several locations were established on Yap in 2014; follow-up data collection is planned for 2015. In addition, the initial Palau research permit application was submitted in December 2014 and was approved. Secondary permits are being obtained from Koror State and Airai State. The Rock Island portion of the cycad survey is scheduled for March 2015.

Various genetic conservation efforts for *Cycas micronesica* are underway on Guam, Tinian, Thailand, and in Florida. Past attempts to grow this species in CA, even as far south as San Diego, were unsuccessful, likely due to the cool night temperatures. Seeds are being scouted for in parts of Rota and Guam that are not well-represented in off-site collections. Hand-pollination and prophylactic seed protection to ensure

production of new seeds from selected individuals is also occurring in high priority regions. Three off-site ex situ collections have been established (Tinian, Thailand, Miami). The Miami collection is at Montgomery Botanical Center and the Thailand collection is at Nong Nooch Tropical Botanical Garden. The Miami collection has individuals that date to first seed shipments in 1996 and 1999. These individuals cone every year now, and Guam forest managers will use them in 2015 and 2016 to provide seeds to expand the gene pool for the Tinian collection. The main genetic contributions to all three ex situ collections were initiated with 2005 and 2006 seed collections. The three nurseries were set up in 2006, and the field planting occurred in 2008. In addition, there are five one acre permanent conservation plots being established on Guam inside Andersen Air Force Base. Department of Defense is funding this work, and the construction of the plots will be completed in March 2015. About 550 individual trees reside in these northern Guam plots that are fully protected with ungulate exclusion fencing.

Coconut rhinoceros beetle (CRB), *Oryctes rhinoceros*, was first detected on Guam in September, 2007. It is native to Southeast Asia and now occurs throughout much of the Western Pacific. It is a serious pest of coconut palm, *Cocos nucifera*, but many other hosts are also reported. What was started as an eradication program in 2007 has now transitioned into a management program. Sanitation of infested sites and trees continues, as does further development of integrated pest management tools.

US Forest Service is supporting CRB detection efforts on Saipan, Tinian and Rota after Farm Bill funds were expended. A research associate was hired and posted on Saipan to coordinate CRB surveillance. Contact was made with the directors of the airport and seaport on Saipan, with key personnel in DLNR that direct PPQ activities on the three islands, and with National Park personnel to place CRB bucket and barrel traps at the American Memorial Park (Figures 2 and 3; CRB panel and barrel traps). No CRB were detected on these islands in 2014. Efforts are being made to expand detection to the RMI in 2015. New detection traps have been developed by University of Guam entomologists; these new low cost and low maintenance traps will facilitate an increase in detection efforts across many other Micronesian islands.

The **little fire ant (LFA)**, *Wasmannia auropunctata* was detected on Guam in late 2011 by staff of the Guam Coconut Rhinoceros Beetle Eradication Project as they were being bitten by the ants while unloading plant material at the dump. LFA attend mealybugs, scales and other insects which can protect them from natural enemies and move them from leaf to leaf and plant to plant. This can result in stunting of growth, premature fruit excision, and fruit spoilage. LFA is an arboreal ant species that loves shade and moisture; walking through the forest, enjoying outdoor activities and gardening is almost impossible in ant-infested areas. The National Park Service closed a section of the War in the Pacific National Historical Park in June 2014 due to the health risk to the public due to LFA.

Management of and surveying for LFA on Guam are being supported by the US Forest Service. Over 29 sites were surveyed during 2014. Chopsticks smeared with peanut butter are used to detect LFA (Figure 4 photo of chopstick with LFAs). Four LFA infested sites were treated using protocols developed by the University of Hawaii-Hilo Ant Laboratory. Following an initial delimiting survey to determine the boundaries of the LFA infestation, sites were treated with a granular formulation of Amdro® (in subsequent applications the more water resistant granular formulation of Siesta®), followed a week later by Tango® applied to the upper boles of trees within a gel matrix. This was in turn followed a week later by another detailed delimiting survey. This sequence is repeated every six weeks for eight treatment cycles.

An LFA working group was established on Guam during 2014 consisting of the Project Director, Dr. Ross Miller (Research Entomologist, University of Guam), two extension personnel, and representatives from the National



Figure 2. Coconut rhinoceros beetle bucket trap installed at the Rota airport. (Source: Dr. Ross Miller, University of Guam)



Figure 3. Coconut rhinoceros beetle barrel trap installed at American Memorial Park, Saipan. (Source: Dr. Ross Miller, University of Guam)

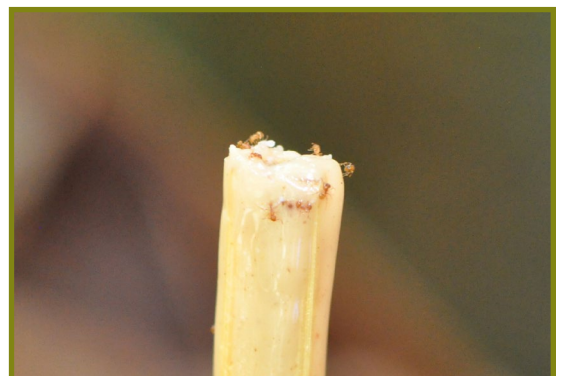


Figure 4. Little fire ants captured in peanut butter on the end of a chopstick. (Source: Dr. Ross Miller, University of Guam)

Park Service, Guam's Department of Agriculture, and the Department of Defense. In the initial meeting, consensus was achieved on LFA management strategies to be adopted island wide, on projected research and extension needs, and the need for additional funding to adequately address the LFA problem on Guam and the threat it poses to adjacent islands in Micronesia. A comprehensive strategy for LFA management on Guam and Micronesia will be developed by the LFA working group and will be implemented as funds allow.

Whiteflies, *Aleurotrachelus trachoides*, have been causing problems on the islands of the Federated States of Micronesia for several years. Officials on Kosrae are attempting to secure proven biocontrol agents for release.

Coconut termites, *Neotermes rainbowi*, were found infesting mature coconut palms at six sites on Kosrae in June 2013 (Figure 5 coconut termites). The termite infestations caused weakening and failure of the trees during a wind event. Coconut palm is the predominant host and termite colonies are usually found infesting live trees. Staff from the Plant Health Team with the Secretariat of the Pacific Community plan to conduct delimiting surveys for coconut termites in Kosrae in May 2015.

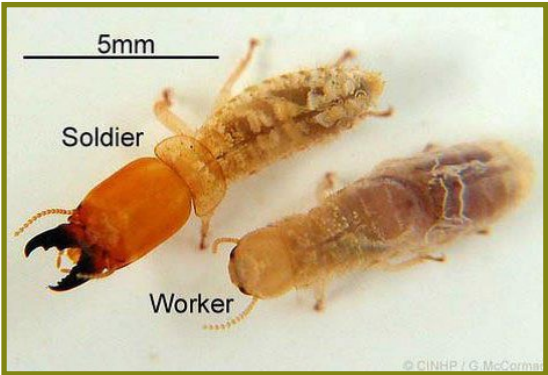


Figure 5. Soldier and worker termites. (Source: G. McCormack)

NEW DETECTIONS

Camphor scale, *Pseudaulnecia duplex*, was detected on Guam in September 2014. This armored scale was found infesting seedlings of the endangered tree *Serianthes nelsonii* growing in a nursery at the University of Guam. This is the first record for this insect from Guam and the rest of Micronesia and the first report of it attacking this host. The scale likely originates from Asia and was reported from Hawaii and California in 1908.

Disease Activity

A few species of root rotting fungi have demonstrated that they are capable of causing massive amounts of damage to trees growing on the Pacific Islands. The most commonly found butt rotting fungi in this region seem to be species of *Ganoderma*, but *Phellinus noxius*, which appears to have arrived much more recently, has also been showing that it is capable of causing spectacular epidemics.

Phellinus noxius has now been located on every island in the Pacific where it has been looked for (Palau, Yap, Guam, Saipan, Kosrae, Pohnpei and American Samoa), and over 100 isolations have been made in order to collect DNA from each isolate. In most cases analyses indicate that there is just one genotype colonizing trees on any given island, strongly suggesting that the fungus has recently arrived, probably subsequent to WWII.



Figure 6. Drs. Ndeme Atibalentja and Fred Brooks discussing optimal methodology for making isolates of *Phellinus noxius* in the Plant Pathology Laboratory of American Samoa. (Source: E. Ilaoa)



Figure 7. Dr. Brooks showing unbridled astonishment at seeing the tell-tail sign (white-margined fungal mat) creeping up the outside a kapok tree on American Samoa. Dr. Brooks has been following the development of this *Phellinus noxius* foci for almost 16 years now, and, as a result of this study it was determined that the fungus has been growing underground via root to root contact at a rate of 15 feet per year (Source: E. Ilaoa)

Developing Typhoon-Resistant Casuarina Trees for Guam.

Casuarina equisetifolia is a very tough tree, but occasionally very powerful typhoons hit the island and can cause a lot of damage (wind speeds of 170 mph have been recorded). Sometimes they blow *Casuarina* trees right over, especially where soils are shallow and roots were not able to get a good purchase. But sometimes, also, these strong winds break the tops out of the trees or cause the trees to twist about a vertical axis to the point where they get long vertical cracks up their bark. When either of these kinds of breaks occurs, butt rotting fungi have easy access to the heartwood of the *Casuarina* trees and, in a few years, can rot out the inside of the affected tree and even spread, via the root system, to neighboring trees. To determine if there were sources of *Casuarina* that could stand up to wind without breaking, a large provenance test was established at the Bernard Watson farm near Yigo. Seed for this test came from 26 different sources from 11 different countries, including Guam. After one year, seedlings from some sources were growing up to 7 times faster than seedlings from local sources, but the test still had not been affected by a typhoon. The photo shows the farm manager, Bernard Watson standing in front of a row of a fast growing provenance from Chandipur, India while Phil Cannon is in front of a slower-growing provenance from Melville Island, Australia.



Figure 8. Fast growing (left), and slower-growing (right) *Casuarina* provenance. (Source: N. Klopfenstein)

Invasive Plants

In American Samoa, management is focused on a few species, including Panama rubber tree or pulu mamoe (*Castilla elastica*), red bead or lopa (*Adenanthera pavonina*), albizia or tamaligi (*Falcataria moluccana*), and merremia or fue lautetele (*Merremia peltata*). The first three are trees, while the forth is a climbing and smothering vine. Articles were written in the Samoa News concerning the rubber tree and red bead, encouraging people not to plant them and to remove them if on their property. In 2014, efforts continued to develop an understanding of the biology and ecology of Panama rubber tree and to develop effective treatment methods. A new herbicide and application method was tried in late 2014; results are not yet in, but it is hoped that this may result in more consistent results when treating these Panama rubber trees. Plots were established to monitor rubber tree seedling recruitment once the overstory trees were removed; the picture included in this report shows the density of new seedlings that develop in some areas (Figure 9 *castilla elastica* seedlings). Understanding the length of time the existing seedbank is viable is an important step in understanding the biology of this species. Albizia control continued in 2014, using both herbicides and girdling. The management of lopa, because it is so widespread in American Samoa, is focused on public education at this point.

Merremia is one of the more widespread invasive plants throughout the Pacific (Figure 10 FSP project in Auto), and in most places is only locally managed. It is one of several problematic invasive, smothering vines found



Figure 10. Forest Stewardship project in Auto, American Samoa. (Source: D. Bakke)



Figure 9. *Castilla elastica* seedling response to canopy opening. (Source: D. Bakke)



Figure 11. *Merremia peltata* in landscape, Kosrae, FSM. (Source: D. Bakke)

throughout the Pacific. *Merremia* is typically not managed to any great extent, but is often managed on a small scale by farmers who try to keep it away from their agroforestry crop trees (e.g., banana, coconut, breadfruit) to prevent smothering of the trees. Figure 11 is an example of a farm plot in American Samoa that had become overgrown with *merremia* and was treated in 2014. As can be seen, there is evidence of dead coconut trees likely killed by being overgrown by *merremia*. Because of the widespread distribution of *merremia* in the Pacific, the best long-term management is to develop and distribute effective biocontrol organisms. In 2014, most of our Pacific partners became directly involved in an on-going international genetic mapping project lead by Landcare Research in New Zealand to determine the world locations where *merremia* is native. This has been a long-standing question; some information suggests it might be native in parts of the Western Pacific. The answer to that question is a necessary prelude to widespread distribution of biocontrols against this important invasive species. Collections of local *merremia* samples were made and the samples shipped to New Zealand for analysis. Preliminary results should be available in 2015.

In Yap, one of the states of the Federated States of Micronesia, they are very close to a successful eradication of cogon or *imperata* grass (*Imperata cylindrica*) after a continued control and rehabilitation effort begun quite a few years ago. Restoration planting of treated sites with native species is a key step to long-term suppression of cogon grass. In Palau, this same species is also under management, but eradication is not as close; a renewed effort may begin in 2015. Although a small occurrence was found on Saipan (in CNMI) a few years ago, site visits in 2014 indicated no presence of *imperata* grass.

Regional Biosecurity Plan for Micronesia and Hawai'i

The *Regional Biosecurity Plan for Micronesia and Hawaii* was completed by the US navy in late 2014 and released in early 2015. This document, initially begun as the *Micronesia Biosecurity Plan*, was completed by the University of Guam and the Secretariat of the Pacific Community under a contract with the US Navy. Its intent is to address risks of spreading invasive species due to increased movement of personnel and equipment associated with the relocation of military forces from their current location in Okinawa to Guam, as well as the expansion of military training in CNMI. This is intended to be a guidance document for the potentially affected areas (FSM, Guam, CNMI, Palau, RMI, and Hawaii) as well as the U.S. Federal Government. The next step in this process is for each jurisdiction to implement this plan. It will be up to each jurisdiction to determine how, and to what extent, to implement the described biosecurity strategies. The goal of the plan is to provide recommendations that, if appropriately implemented, will minimize the harmful ecological, social, cultural, and economic impacts of invasive species through the prevention and management of their introduction, expansion, and dispersal into, within, and from the region and the jurisdictions of the region.

Data Sources

The data sources used for this report include data gathered by USDA Forest Service, Pacific Southwest Region, Forest Health Protection staff and the Territorial Foresters of the US-affiliated islands (funded in part by Forest Service's Forest Health Programs).

The USDA Forest Service's Forest Health Aerial Survey Program is not currently active in the Islands.

For more information visit:

USDA Forest Service, Pacific Southwest Region - www.fs.usda.gov/main/r5/forest-grasslandhealth

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