

Insect Activity 1
Disease Activity 4
Invasive Plants 4
Tropical Storms 5
Contacts & Additional Information 5



Forest Health 2018 highlights

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2018 Summary

- **Cycad aulacaspis scale (CAS)** long term plots on Guam indicate about 15 plants are dying per 2.5 acres (1 ha) per year, with no new seedlings in 2018. Extirpation of threatened native cycads on Guam is estimated in 2030.
- **Coconut rhinoceros beetles (CRB)** continue to threaten coconut palms on Rota (CNMI) and Guam; CRB has killed 25% of Guam's coconut palms.
- **Little fire ant (LFA)** has now been found in American Samoa. Work to combat LFA is now occurring there, on Yap (FSM), and Guam.
- **New pests - Lobate scale** (*Paratachardina pseudolobata*) on Guam and **wax scale** (*Ceroplastes* sp. – likely *C. rubens*) on the Marshall Islands – were detected. Follow up surveys are ongoing.
- **Phellinus noxius** is now present on every one of the US Affiliated Pacific Island groups. Control measures are being evaluated.
- Several Pacific islanders participated in a **Tropical Forest Ecology Field class** in Saipan and Guam to build local capacity throughout the Pacific Islands.
- **Two herbicides have been approved** by American Samoa EPA for control of high priority invasive tree species: albizia and rubber tree.

Forest Resources

The US-affiliated Islands of the western Pacific span 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 Republic of Palau and the Republic of the Marshall Islands (RMI), and the Commonwealth of the Northern Mariana Islands (CNMI). Approximately 325,000 acres are forested.

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 introductions via multiple pathways 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.

Coconut rhinoceros beetle (CRB)

Guam

Coconut rhinoceros beetle (CRB), *Oryctes rhinoceros*, was first detected on Guam in 2007 and has defied containment and eradication efforts since initial detection. The infestation on Guam was the first new infestation on a Pacific island in over 40 years. The coconut rhinoceros beetle poses serious threats to the fragile environments of the scattered islands of Micronesia. There is high risk of transporting CRB to other islands in Micronesia (see page 2 for information on CRB infestation on Rota), and to the Pacific at large, as Guam is a US military and civilian air and sea transportation hub for the Western Pacific Basin. Adult CRB kill palms when they bore into crowns to feed on sap. The coconut tree is known as the tree of life, and many Pacific islanders depend on it for food, shelter and raw materials. Products traditionally provided by the coconut palm include roofing material (from leaves), ropes and strings (coir from husk), beverages (coconut juice, toddy from inflorescences), food (coconut, palm heart), fuel (from husks, nuts and dried leaves),



Figure 1. U.S. Forest Service, Region 5

wood (from the stem) and oil pressed out of copra, the dried kernel of the nut.

Typhoon Dolphin in 2015 triggered the current upsurge in the CRB population on Guam. It was not a very strong typhoon by Guam standards, but it was the first one in more than a decade and caused more damage than expected. Abundant piles of decaying vegetation became CRB breeding sites. Some of these new breeding sites were in villages where they could be managed, but most were inaccessible in jungles and/or on military land. Within a few months, massive numbers of CRB adults were emerging from breeding sites and severely attacking palms which started to die. Prior to Dolphin, some heavily damaged palms were observed, but very few dead ones. It is now estimated that CRB has killed over 25% of Guam's coconut palms, with another 30-40% attacked and damaged. It is possible that up to 80-90% of the palms could be killed.



Figure 2. Piles of coconut palm material covered with tekken netting serve as a CRB surveillance trap. Source: Dr. Ross Miller, University of Guam.

The CRB-G (Guam biotype) is genetically distinct from other populations of CRB in the Pacific, is resistant to all currently available isolates of the *Oryctes rhinoceros* nudivirus (OrNV, biocontrol agent), is highly invasive, and has a very low response to pheromone traps baited with oryctalure aggregation pheromone. CRB-G is involved in all new CRB outbreaks in the Pacific (Guam, Oahu, Palau, Solomon Islands, and Papua New Guinea) and most recently, in 2017, Rota. Work is ongoing to try to find a virus that is effective against CRB-G through a Pacific-wide collaboration of scientists from Guam, New Zealand, Malaysia, Japan, Papua New Guinea and the Solomon Islands. Scientists are united in their efforts to find a virus that can be used to control and kill the coconut rhinoceros beetles before most palms on Guam are killed and to reduce the high potential of transport to other islands.

Commonwealth of the Northern Mariana Islands

The US Forest Service has supported CRB detection and local education efforts on Saipan, Tinian and Rota, in cooperation with Dr. Ross Miller, University of Guam. No CRB were found in any of his traps on Saipan and Tinian in 2018. However, CRB continue to infest coconut palms in a former copra plantation in southern Rota.

Initially reported in October 2017, CRBs are still being caught in pheromone-baited tekken netting traps covering trees and piles of cut tree stems and fronds in the southern part of the island. Periodic surveillance of traps and of damaged trees throughout Rota is conducted by local personnel with assistance from entomologists in USDA-APHIS, University of Guam, and Northern Mariana College. Additional CRB infestations are expected on Rota due to windfall of coconut palms caused by the recent Typhoon Mankhut, a category 3 typhoon that passed directly over Rota. The CRB infestation on Rota coupled with the increased threat posed by typhoon-damaged trees, and the influx of uninspected relief supplies following Typhoon Mangkhut and Typhoon Yutu have combined to heighten awareness among local government officials tasked with protecting the islands from invasive species and among the general public.

Cycad aulacaspis scale

Cycad aulacaspis scale (CAS), *Aulacaspis yasumatsui* invaded Guam in 2003. Since initial detection, the scale - and plant health of the native cycad *Cycas micronesica* - 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). The endemic range for *Cycas micronesica* extends from some islands in the Republic of Palau as the southern boundary through Yap State in the Federated States of Micronesia, Guam, and Rota in the Marianas as the northern boundary. Forest inventories in 2002 revealed *C. micronesica* was the most abundant tree species in Guam's various habitats (Donnegan et al. 2004). In November 2015 *Cycas micronesica* was added to the Threatened list under the Endangered Species Act of 1973.

Consistent funding for the past several years has enabled this project to sustain the important long-term data collection in the monitoring plots on Guam, Rota, and Yap. Those cumulative data have become crucial to understanding mortality and predicting local extirpations. Dr. Marler's monitoring of cycad populations also includes those on Tinian and Palau. His 2018 assessment of survival and health in the permanent plots on Guam indicated about 15 plants are dying per hectare per year. Based on this decline trend, Dr. Marler predicts cycad extirpation from Guam habitats about 2030. Similar to recent years, there were no healthy mature seedlings within his monitoring plots in 2018. The CAS population has increased over the past two years after a decline was observed in 2016. It is likely the *Rhyzobius lophanthae* biological control agent has declined in efficacy.

Little fire ant (LFA)

Guam

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. Management of and surveying for LFA on Guam are being supported by the US Forest Service and local funding. LFA is considered among the top 100 most serious invasive insect pests in the world. Previous LFA infestations in the Pacific Basin include those on the five major islands of Hawaii, New Caledonia, and Northern Queensland, Australia, and most recently Yap (see below) in the Federated States of Micronesia (FSM). These LFA-infested regions all have air and sea connections to Micronesia, many of which pass through Guam. The devastating effects of LFA on agriculture and forest ecosystems observed in LFA infested areas in Hawaii, Australia, and New Caledonia are being repeated on Guam and have the potential to occur on any other Micronesian island infested by LFA. LFA's spread to and throughout Guam is most likely due to human transport of infested plant material.

Since 2011 the University of Guam's Entomology Laboratory has identified more than 30 sites infested by LFA, ranging from small colonies in residential areas to entire watersheds covering hundreds of acres of forest and beachfront. Insecticide treatments continued in 2018 with infested sites being treated with a water-resistant granular formulation of Siesta®, followed a week later by Tango® applied to the upper boles of trees within a gel matrix. A week following the granular applications another detailed delimiting survey is performed. This sequence is repeated every six weeks at each site for at least eight treatment cycles.

Yap, Federated States of Micronesia

Since the detection of LFA on Yap in late August 2017, eradication efforts have been ongoing - in addition to public outreach and education by local officials in an attempt to engage local communities in helping to detect additional infested locations. The US Forest Service is continuing to provide funds to combat the infestations with the assistance of Casper Vanderwoude, Research Director of the Hawaii Ant Lab.

American Samoa

The little fire ant was first detected on American Samoa in October 2018 in a residential area in the western part of Tutuila island in the village of Tefata. The U.S. Forest Service is providing funds to combat the infestation, also with the assistance of Casper Vanderwoude.

Local Capacity Building

Participants from Guam, the CNMI, the FSM states of Kosrae, Pohnpei, Chuuk, and Yap, and from the RMI convened on Saipan from 20 -28 May 2018 then traveled to Guam on 28 May through 8 June 2018 to participate in a USDA-US Forest Service sponsored course in Tropical Forest Ecology of the Mariana Islands. The course was conceived and organized by Dr. Ross Miller of the University of Guam who handled logistics of the course - as well as taught sections on invasive species and supervised group research projects - and by Dr. Haldre Rogers of Iowa State University, who developed course content, presented lectures on seed dispersal, and also supervised research projects. These individuals were assisted on Saipan by Dr. Evan Fricke, a postdoc at Iowa State University working with Dr. Rogers, and on Guam by Ms. Ann Marie Gawel, a PhD candidate in Dr. Roger's laboratory at Iowa State. The course covered fundamentals of forest ecology with emphasis on the unique environmental characteristics of Micronesian islands - with the intent to increase knowledge regarding these fragile systems and build local capacity of people interested in and working on island environmental issues. The course format emphasized intense field work under the close supervision of a faculty mentor and was designed to allow students to immerse themselves in the subject matter - and to gain hands-on experience in scientific inquiry from project inception, to data collection and analysis, and presentation of results. Participants conceived, conducted, and reported on independent research projects comparing forest habitats on Saipan to those on Guam. Plans are in development to hold a similar course during the summer of 2020 on Pohnpei.



Figure 3. Student participants of the course in Tropical Forest Ecology of the Mariana Islands. Front row from left to right: Joe Tuquero (field trip instructor), Eugene Eperiam, Alisha Gill, Ann Marie Gawel (instructor), Peter Carbullido, Basiende Atan, Wendoly Marquez. Second row from left to right: Bruno Cases, Marie Ayong, Tricia Magallano, Victoria Matsunaga, Atanacio Naputi, Levani Shiro, Valentino Orhaitil, Dianne Pablo, Haldre Rogers (course coordinator and instructor), Joel Bujen, Maxson Nithan. Not pictured: Ross Miller (course coordinator and instructor) and Evan Fricke (instructor). Source: Dr. Ross Miller, University of Guam.

New Pest Detections

Lobat lac scale (*Paratachardina pseudolobata*), a pest of woody trees, was found in July 2018 on hibiscus and joga trees at the University of Guam's Yigo Experiment Station. Follow-up surveys did not result in this pest being found beyond the Experiment Station. This pest was newly detected in Hawaii in 2012, causing damage to *Ficus* spp. in an urban setting. Subsequent surveys in Hawaii found the scale on approximately 20 native plant species.

A newly detected **wax scale** (*Ceroplastes* sp. most likely *C. rubens*) was reported from the Marshall Islands in June 2018. Follow-up surveys are ongoing.



Figure 4. Lobate lac scale on a tree branch on Guam.

Source: Guam Department of Agriculture, Biosecurity Division

Disease Activity

Phellinus noxius, an exceptionally aggressive root rotting basidiomycete with a host list of over 300 tree species has now been found in every one of the US Affiliated island groups in the Pacific. Isolates have been made from over 100 distinct infection foci, and molecular genetics analyses have been used to show the genetic relationship of all of these isolates as well as isolates from neighboring islands and continents. A comprehensive publication on this topic is now in press.

Monitoring for the presence of this fungus continues on all major Pacific Islands.

In addition, numerous control measures have been tried and are being evaluated. Presentations and field demonstrations have been given, and material is being prepared for the publication of a small book that will help land managers recognize and contend with this fungus.

Invasive Plants

New Invasive Plant Herbicides Approved for Use in American Samoa

American Samoa EPA, with assistance from the Forest Service working with Dow AgroSciences and the US Environmental Protection Agency (US EPA), has approved local registrations for two herbicides necessary for management of two high priority invasive tree species: tamaligi or albizia (*Falcataria moluccana*); and pulumamoe or rubber tree (*Castilla elastica*). The herbicide Garlon 4 Ultra (EPA Reg. Number 62719-527 with the active ingredient triclopyr) now has a local Section 2(ee) recommendation from Dow AgroSciences and will be used on pulumamoe, applied as a basal bark spray to avoid cutting into the bark, which stimulates sap flow. The herbicide Milestone (EPA Reg. Number 62719-519 with the active ingredient aminopyralid) now has a local 24(c) Special Local Need registration from Dow AgroSciences and will be used on tamaligi, using the precision point application method. This method is very effective in Hawaii.

Typhoon Mangkut greatly impacted the island of Rota in September 2018 with 150 mile per hour winds and over 10 inches of rain. A month later in October, Super Typhoon Yutu resulted in major damage to the northern Mariana Islands after a direct hit to Saipan and Tinian. Many homes were destroyed, numerous people were injured, power and water delivery was compromised and the ports were inaccessible. Impacts to forests and urban trees were also substantial.

Additional Information

Data Sources

The data sources used for this report include data gathered by US Forest Service, Pacific Southwest Region, Forest Health Protection staff, the Territorial Foresters of the US-affiliated islands (funded in part by Forest Service's Forest Health Programs), and staff at the Institute of Pacific Islands Forestry, US Forest Service, the University of Guam, and American Samoa Community College.

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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