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U.S. DEPARTMENT OF AGRICULTURE

Forest Health
2024 highlights

PACIFIC ISLANDS
APRIL 2025

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Forest Resources

The United States 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, 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.

Insect Activity

Coconut rhinoceros beetle (CRB), *Oryctes rhinoceros*

Republic of the Marshall Islands (RMI)

Following the September 2023 detection of coconut rhinoceros beetle (CRB), *Oryctes rhinoceros*, on Majuro atoll in the Republic of the Marshall Islands (RMI), a national State of Emergency was declared on October 2, 2023 and was extended until April 2024. This allowed for a multi-agency response in compliance with RMI's CRB emergency response plan.

The Ministry of Natural Resources and Commerce (MoNRC), quarantine division, continued to conduct ground surveys, dispose of CRB breeding material, and maintain monitoring traps to contain the infestation on Majuro. The team also set up three artificial breeding sites for CRB treated with a fungal (*Metarhizium*)

Figure 1. Sanitation of coconut palm logs on Majuro atoll. Photo credit: Bruce Allen, Republic of the Marshall Islands, Ministry of Natural Resources and Commerce, Quarantine Division

Figure 2. Outreach event with grade school children. Photo credit: Bruce Allen, Republic of the Marshall Islands, Ministry of Natural Resources and Commerce, Quarantine Division

biological control agent. Education and outreach and monitoring continued in Majuro and neighboring atolls. This year, the MoNRC was able to hire a full-time CRB coordinator and technician to address the infestation. They continue to work with leading experts on CRB management and are working on updating standard operating procedures for containing the infestation.

Commonwealth of the Northern Mariana Islands (CNMI)

The coconut rhinoceros beetle continues to threaten Rota's coconut trees, with the discovery of new infestation sites in 2024 heightening concerns. With support from the Office of Insular Affairs, Technical Assistance Program, the CNMI Department of Lands and Natural Resources (DLNR) has expanded its management efforts by increasing staffing, acquiring equipment, and launching a public equipment loaning program to engage local farmers in containment efforts.

Collaboration with USDA APHIS and the USDA Forest Service has strengthened technical support, leading to significant progress. However, sustained action is crucial. Additional funding will enable DLNR to enhance eradication efforts, expand community involvement, and hire an administrative assistant to streamline operations—allowing field teams to focus on critical control measures. Continued investment is essential to protect Rota's environment and prevent further spread of this destructive pest.

In 2024, the 5-member CRB team remained committed to monitoring and controlling the spread of the CRB across designated areas. Routine trap inspections were conducted daily at multiple locations, with additional nighttime surveillance to ensure comprehensive coverage. Although detections were minimal, isolated cases were reported in Gagani and near the former Rota Resort. To strengthen prevention efforts, new nettings were installed or replaced in high-risk areas.

In parallel, extensive vegetation management was carried out, including bush cutting, mowing, and the regular collection of coconut debris to eliminate potential CRB breeding grounds. These efforts were further supported through collaboration with Forestry personnel, who assisted with the removal of dead trees and overgrown vegetation around trap sites.

The team also invested in training and professional development, participating in a Mental Health Aid session in July and attending the 2024 CRB Science Symposium virtually in September. These opportunities provided valuable insights into current CRB control strategies and emerging research.

Despite occasional disruptions caused by heavy rain, strong winds, and fuel shortages in late July, the team continued operations using available resources. Equipment repairs, particularly for bush cutters, were addressed throughout the year to maintain momentum in the field.

Figure 3. Adult coconut rhinoceros beetle caught in tekken netting covering a pile of palm fronds. Photo credit: Natashia Tomokane, Invasive Species Coordinator, CNMI Department of Lands and Natural Resources

Guam

Coconut rhinoceros beetle was detected in Guam in 2007 and has spread throughout the island, causing extensive damage to palm trees, especially in the aftermath of typhoons and other tropical storms. CRB are classified into haplotypes based largely on mitochondrial lineage. There are three haplotypes in the Pacific, the haplotype in Guam referred to as CRB-Guam (CRB-G). Distinguishing CRB populations is significant because they can differ in susceptibility to the *Oryctes rhinoceros* nudivirus (OrNV) biological control and can give insight into the invasion history of the beetles. Recent molecular investigation using whole genome sequencing revealed that, along with CRB-G, there is a second, genetically distinct, CRB population/invasion in Guam (Tay and Hoffmann, 2024). Further investigation into the susceptibility of this second population of CRB to biocontrol agents and other management is needed.

Cycad Aulacaspis Scale (CAS), *Aulacaspis yatsumatsui*

Cycad aulacaspis scale (CAS) is an insect native to Southeast Asia that feeds on species of *Cycas*. It is now widespread in Micronesia where it threatens the endemic Micronesian cycad (*Cycas micronesica*), locally referred to as fadang. In 2024, the fadang working group met monthly to discuss CAS management and monitoring in Micronesia. Management options for the scale are limited and not applicable on a landscape level. Biological control remains the most promising way of controlling CAS.

In August 2024, the fadang working group finalized a document outlining methods for assessing fadang plant health and pest infestation. The purpose of the document was to standardize data collection methods and accurately depict the health of fadang in its native range, nurseries and botanical gardens across the world.

The Guam National Wildlife Refuge surveyed and tagged 1,820 fadang. Of the fadang surveyed, 1,771 individuals (97.31%) were infested with CAS. Of those infested fading, 984 (54.07%) had high levels of scale infestation, 431 (23.68%) had moderate levels of infestation, and 237 (13.02%) had low levels of infestation. Predatory beetles were found on 7 CAS-infested fadang (0.38%).

Little Fire Ant (LFA), *Wasmannia auropunctata*

American Samoa

In late 2018 little fire ants (*Wasmannia auropunctata*) were detected in American Samoa for the first time. The infestations were limited in area, therefore eradication was attempted. Subsequently, for approximately two years, little fire ant (LFA) surveys and control work were suspended due to American Samoa Government's COVID-19 precautionary restrictions. When the work resumed, additional infestations were detected both near and far from the previously known infestations.

Post COVID-19, the little fire ant survey and control program has continued, but the personnel and other resources available are not commensurate with the number and extent of the infestations, thus making the original goal of eradication unattainable. Nevertheless, the work continued in 2024. A total of 46 detection surveys were conducted in response to reports from the public. Of these, five were positive for little fire ants, but four of those five were contiguous with already-known infestations. One new site was found in eastern Pago Pago village. The remaining 41 detection surveys found only tropical fire ants (*Solenopsis geminata*), a species that was first detected in American Samoa in 2002 and has since spread throughout all the inhabited islands.

Treatment programs have continued in Amanave and Mesepa villages and started in Nuuuli village. Little fire ants decreased across all three sites. In all three villages, however, control is difficult due to the fact that the infestations have spread into steep, densely forested lands at the backs of the villages—areas that cannot be treated with the ground-based equipment. LFA will continue to reinvade these villages from the forest until a treatment method is found.

In 2024 the American Samoa Community College's (ASCC) entomology program (four staff) was joined on the little fire ant program by the Department of Marine and Wildlife Resources terrestrial field team (five staff). In addition, the entomology program worked with the Governor's Biodiversity Conservation Office (GBCO) on a successful grant proposal that will allow GBCO to take over the little fire ant program and dramatically increase the personnel and other resources devoted to little fire ant control, thus reviving the effort to eradicate little fire ants from American Samoa.

Figure 4. Niela Leifi of American Samoa Community College (ASCC) Agriculture, Community and Natural Resources Division (ACNR) applying gel bait to control little fire ants. Photo Credit: Mark Schmaedick, ASCC ACNR

Figure 5. Metotagivale Pitoitua of American Samoa Community College (ASCC) Agriculture, Community and Natural Resources Division (ACNR) delivering presentation on little fire ants and tropical fire ants for American Samoa Department of Agriculture staff. Photo Credit: Mark Schmaedick, ASCC ACNR

Figure 6. A pile of raw green waste material staged along the forest boundary at a designated green waste site located in the village of Asan, Guam (June 2023). Photo Credit: Christopher Rosario, Guam Dept. of Agriculture, Biosecurity Division

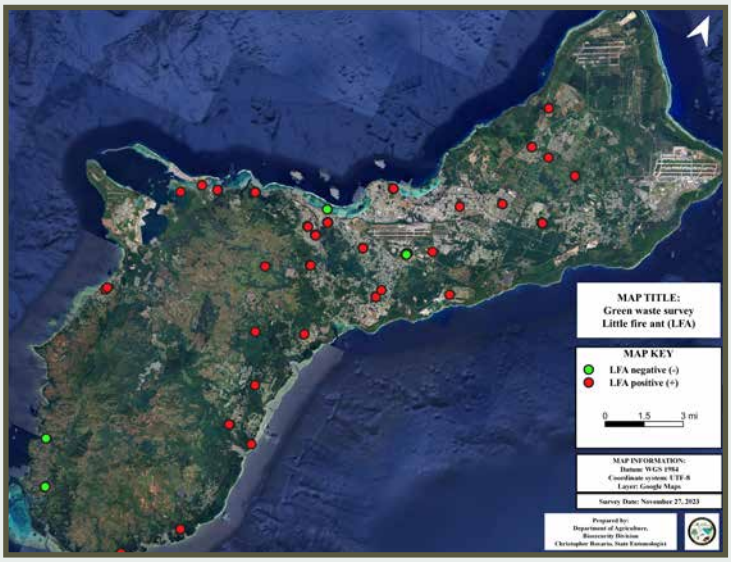

Figure 7. A map of Guam indicating presence (red dots) and absence (green dots) of little fire ants at designated green waste disposal sites (November 2023). Map Credit: Chris Rosario, Guam Dept. of Agriculture, Biosecurity Division

Guam

On May 24, 2023, super typhoon Mawar, a category 4 typhoon passed through Guam causing major damage. The typhoon uprooted and defoliated trees, generating a large amount of green waste across the island. Green waste was then staged at 21 sites distributed throughout the island villages. The massive piles of green waste not only became an eye-sore to the community but enabled the spread of LFA throughout the island. In addition, piles of raw green waste did not include a buffer of non-vegetated land and green waste piles were sometimes pushed up against trees on adjacent properties (Figure 6). The Guam Department of Agriculture, Biosecurity Division surveyed all 21 distribution sites for presence of LFA. Of the 21 sites surveyed, 18 were identified as LFA-infested. Several of these infested sites had their green waste ground to mulch to kill any active LFA colonies. The material was then retested for the presence of LFA. Mulch piles that continued to have live LFA were then treated using ant bait such as Tango™ and Siesta® and/or taken to a green waste processing facility where they were rotated into active compost. The mulch and compost was then given out to local farmers to use on their farms.

By November 20th, 2023, nearly six months after typhoon Mawar struck the island, green waste debris piles were cleared at all sites. On November 27, 2023, an additional survey was conducted at all designated green waste disposal sites. Of the 21 sites that were surveyed, 17 sites tested positive for LFA. Of those 17 sites, the sites adjacent to them were also tested positive for LFA (Figure 5). Ongoing treatment efforts are being conducted by Guam Department of Agriculture Biosecurity Division to control LFA from spreading into larger areas adjacent to those infested designated green waste sites. Follow up efforts consist of collaborating with the mayors offices in those affected villages and train their staff to treat for LFA.

Figure 8. (Top) A load of raw green waste material being dumped into a designated green waste dump site in Tiyan. Photo Credit: Chris Rosario, Guam Dept. of Agriculture, Biosecurity Division; (Bottom) Raw green waste material is placed into a mulcher where it is turned into mulch material for farmers to use Photo Credit: Roland Quitugua, University of Guam.

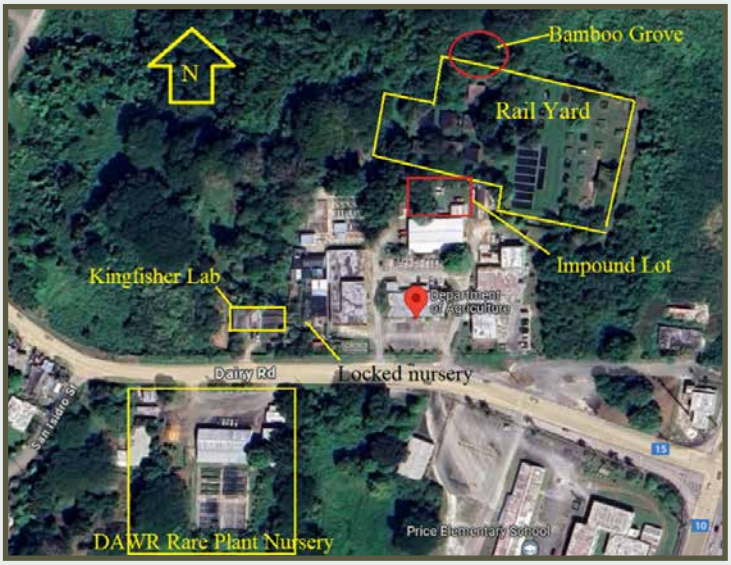

Figure 9. Little fire ant eradication project at the Guam Department of Agriculture, Division of Aquatics and Wildlife Resources (DAWR) Guam Rail, Gallirallus owstoni and Guam Kingfisher, Todiramphus cinnamominus, rearing facility. Map credit: Mike Richardson, US Fish and Wildlife Service

Guam Dept. of Agriculture, Biosecurity Divison and US Fish and Wildlife Service staff spent the week of November 13-27, 2023, surveying and treating three Guam Department of Agriculture and Forestry properties including the rail captive rearing facility (rail yard), the Guam kingfisher (Sihek) 'lab' facility, and Division of Aquatics and Wildlife Resources, Division of Forestry rare plant nursery and grounds. All three areas were heavily infested with LFA. The main focus was to survey the Guam rail yard due to the high abundance of LFA in and around the cages containing the 68 captive, ground-dwelling Guam Rails, *Gallirallus owstoni*. Surveys for LFA were conducted around the cages to ascertain baseline LFA abundance and extensive surveys were conducted in and around the entire 2.6-hectare property. Treatment of the rail yard began on the first day and continued through the second and third days. The entire 2.6-hectare property including a 10-15 foot buffer area was treated by a mix of three granular baits. Additionally, all structures and trees over six feet in height on the property and adjacent to or overhanging the buffer were treated with a Tango liquid spray. Preliminary results from the treatment were very promising even by the third day. By the 4th day, we observed a 95%+ reduction in LFA around the rail cages and during random sampling around the property.

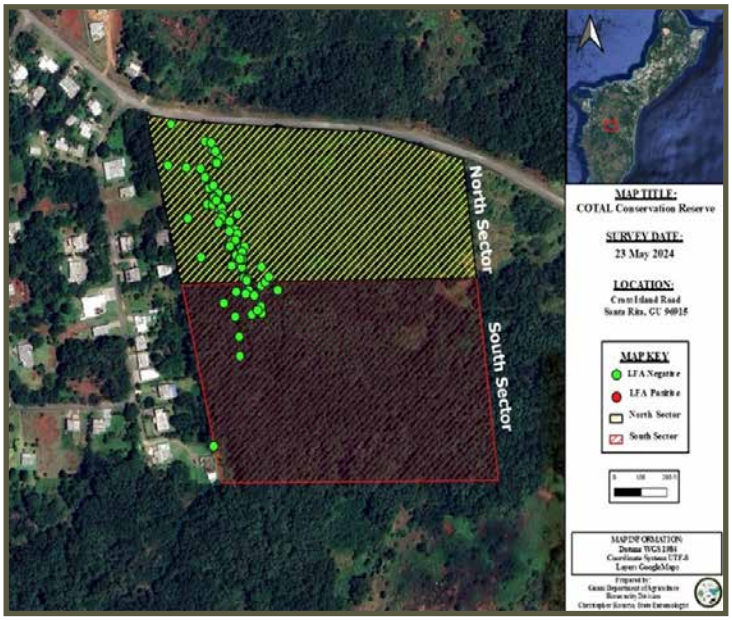

Figure 10. A survey map depicting the absence of LFA (green dots) between the residential housing and the COTAL Conservation Forest in May 2024. Data was collected by the Guam Department of Agriculture Biosecurity Division. Map Credit: Christopher Rosario, Guam Dept. of Agriculture, Biosecurity Division

LFA Management at the COTAL Conservation Forest (CCF)

Continued monitoring for LFA presence in the CCF was performed in May 2024 by Dept of Agriculture, Biosecurity Division (Figure 8). No LFA were detected. However, surveillance of the south sector could not be performed due to dead or broken branches caught high in the treetops within the site. The Guam Dept of Agriculture Forestry Division is currently working on felling trees within the south sector to allow Biosecurity Division to continue surveillance of LFA within the area. Once cleared of widowmakers, surveillance and treatment will be conducted for the south sector.

Citrus blackfly, *Aleurocanthus woglumi*

Citrus trees in the Republic of the Marshall Islands (RMI) continue to be impacted by heavy infestations of citrus blackfly, *Aleurocanthus woglumi*. Citrus blackfly is native to Southeast Asia and has a wide host range that includes citrus and other urban forest and agroforestry plants. The RMI Ministry of Natural Resources and Commerce (MoNRC), quarantine division, is conducting insecticide trials to control citrus blackfly infestations on individual citrus trees, undertaking surveillance and monitoring to gauge the effectiveness of their treatments, and growing lime tree seedlings in their nurseries to distribute across Majuro. The MoNRC is also engaged in an awareness and outreach campaign for citrus blackfly. They have developed presentations for schools, community members, and established a weekly radio broadcast about pest activities.

Disease Activity

Brown root rot, *Pyrrhoderma noxium*

Pyrrhoderma noxium, formerly *Phellinus noxius*, has now been found on every U.S.-affiliated island in the Pacific (Hattori et al., 2022). It is an aggressive pathogen of over 200 tropical tree species causing the disease, brown root rot. A resource was written on how to recognize this fungus and manage it within the Pacific Islands (Cannon et al., 2022). Over the last two years, workshops on brown root rot identification and management have been provided to foresters and conservationists in every U.S.-affiliated Island group in the Pacific. This fungus is also being studied extensively and in collaboration with several other island groups in the Pacific, especially Japan, Taiwan and Australia.

Wilt of *Manilkara udoido*, *Ceratocystis* sp.

Massive dieback of Palau's udeuid or *Manilkara udiodo* trees has been occurring on Babeldaob, the largest island of Palau, since 2021. Symptoms include rapid death and wilting of leaves in the crown. Udeuid trees are dominant to co-dominant canopy trees and culturally significant. The Forest Service and Iowa State University scientists have tentatively identified the causal agent as *Ceratocystis manginecans*. This fungus is native to Brazil but is spreading through south and southeast Asia (Harrington et al. 2023). It has a wide host range including acacia, eucalyptus, coffee, and mango (Harrington et al. 2023; Al Adawi et al. 2013; Tarigan et al. 2011). The host range of *C. manginecans* is broad and unpredictable and is therefore a major threat to biosecurity.

The Forest Service is working closely with Palau's Division of Forest, Land, and Water Management (DFLW) to conduct disease survey and monitoring to understand how the disease spreads in order to contain it.

This work includes inoculation experiments to complete Koch's postulates and confirm that *C. manginecans* is the causal agent. Similar to other *Ceratocystis* pathogens, spread is hypothesized to be associated with wood-boring insects and their frass. Several species of wood-boring insects have been isolated from diseased udeuid trees and their role is under investigation. Frass commonly contains viable *Ceratocystis* propagules and fruiting *Ceratocystis* fungal bodies are commonly observed in beetle galleries. Major weather events such as typhoons may be associated with spread of frass and subsequent episodes of disease outbreaks.

Current management strategies include public awareness, limiting the movement of wood, limit wounding of trees, and sanitation.

Figure 11. An aerial photograph of a south-central portion of Babeldaob Island in Palau where thousands of Manilkara udiodo trees have been killed. Photo credit: Belau National Museum

Figure 12. Large amounts of bark and ambrosia beetle frass were observed on wilted udeuid trees. Photo credit: Kylle Roy, Forest Service

Invasive Plants

Supporting Forest Health and Forest Stewardship in the Pacific Islands

The American Samoa Community College – Agriculture, Community and Natural Resources (ASCC-ACNR) Forestry Program conducted multiple control activities at different project sites (Pago Pago, Fagasa, Auto, A'asu, Vatia and Nu'uuli). The Forestry Program staff and interns collaborated closely with the American Samoa National Park Service (AS-NPS) in controlling and maintaining the Pago Pago and Fagasa project sites. A total of 1.1 acres of Fue Lautele (*Merremia peltata*) was controlled at these sites. In addition, a total of 36 *Miconia cre-*

Figure 13. Forest Health Specialist Uiki Isaako removing the Merremia peltata vine from the Nu'uuli Project Site. Photo credit: Forestry Intern Koloi Ioane

nata, 12 *Psidium guajava*, 19 *Clerodendrum quadriloculare*, and 782 crêpe ginger (*Cheilocostus speciosus*) invasive plants were removed within the two sites. ASCC-ACNR controlled and maintained 19.6 acres containing Fue Lautele at the Vatia, A'asu, Nu'uuli, and Auto sites. ASCC-ACNR also eradicated 84 seedlings, 28 saplings, and 14 trees of the invasive *Castilla elastica* species at the Nu'uuli site.

Regional Invasive Species Council Support

The University of Guam's Regional Invasive Species Council (RISC) serves as an advisory body to the Micronesian Islands Forum on policy and actions related to invasive alien species. The RISC presented at the Micronesian Islands Forum to the leaders of the U.S. Territory of Guam, the Federated States of Micronesia, the Republic of Palau, the Republic of the Marshall Islands, the Republic of Nauru, the U.S. Commonwealth of the Northern Mariana Islands, and the States of the FSM, Chuuk, Kosrae, Pohnpei and Yap. RISC presented on invasive species management accomplishments as well as the creation of the Pacific Biosecurity Collaborative and updating the Regional Biosecurity Plan. The RISC has been coordinating with the Pacific Islands to collect Invasive Alien Species related materials from the RISC jurisdictions.

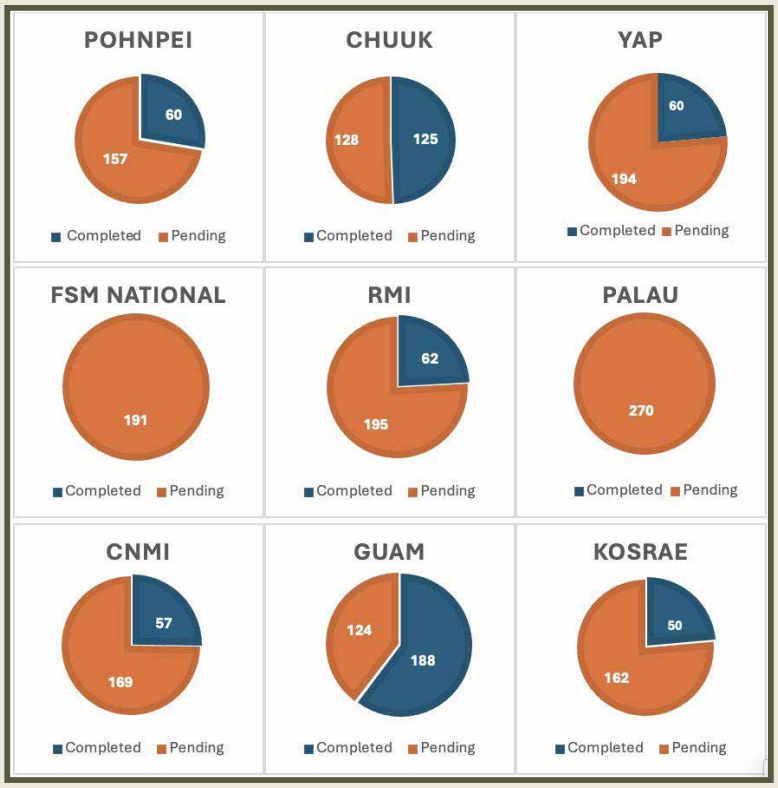

Figure 14. A summary of completed action items for the Regional Biosecurity Plan

Capacity Building

A course on tropical forest ecology was held in Pohnpei (Federated States of Micronesia), from July 14-August 3,2024. Course instructors, research mentors, and organizers included Roseo Marquez (Micronesian Conservation Trust), Dr. Viann Marie Harmony Yomai (Virginia Tech University), Dr. Ann Marie Gawel (State University of New York Environmental Science and Forestry), Dr. Ross Miller (University of Guam), Dr. Haldre Rogers (Virginia Tech University), Dr. Andrea Blas (University of Guam), and Dr. Rachel Jolly (University of Guam). Guest lecturers and other supporting staff included Micha Solomon (Forest Service), Michael Jordan (Forest Service), Katie Friday (Forest Service), Dana Lee Ling (College of Micronesia), Mark Kostka (Pohnpei State), and Augustine Kohler (FSM National Archives). There were 17 course participants from the following locations: Guam (2), Commonwealth of the Northern Mariana Islands (2), Federated States of Micronesia (10), Republic of Palau (1), and Republic of the Marshall Islands (2).

Instructors provided participants with tools necessary to grow their careers in natural resources management. Course goals included: exploring tropical forest ecology, introducing students to the scientific process through a research project, providing a background in forestry skillsets and tools introducing career opportunities, and developing a network of early-career professionals and mentors interested in ecology and forestry.

Figure 15. Ecology course participants and instructors in Pohnpei, Federated States of Micronesia. Photo credit: Ross Miller, University of Guam

Figure 16. Ecology course introductory field trip to Sokehs Ridge, Pohnpei. Photo credit: Ross Miller, University of Guam

Figure 17. Ecology course participants identifying invasive ants (left) and laying down a quadrat sample frame for vegetation measurements (right) for course research projects. Photo credits: Ross Miller, University of Guam

Participants formed six research groups for invasive species-focused projects. The course concluded with a public symposium where students presented their research findings. Notable attendees at the symposium included the US Ambassador to the FSM, representatives from The Pacific Community (SPC), the College of Micronesia-FSM, and the Conservation Society of Pohnpei. Nearly 100 individuals attended the event, both in-person and online. This symposium marked a significant achievement, showcasing the skills and knowledge participants gained during the course and strengthened the network of future conservation leaders across Micronesia. The student presentations and engagement with the audience generated interest amongst some of the partners to explore how to support efforts like the Tropical Island Ecology Course in the future.

Data Sources

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

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

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