

Plant Protection and Biosecurity for Guam and Micronesia

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In lay terms, briefly describe the following: (1) the issue and why it is important, (2) your goal and objectives, (3) the target audiences and how they will benefit, and (4) how your activities lead to the outcomes described in the goal statement or objectives. (8000 character max)

This program includes basic research, applied research and extension activities aimed at sustaining, protecting, and managing the environment and natural resources of Guam and the rest of Micronesia, which includes U.S. affiliated islands within the Republic of Palau, the Commonwealth of the Northern Mariana Islands, the Federated States of Micronesia and the Republic of the Marshall Islands. Agroecosystems and natural ecosystems on these islands are subject to severe biotic and abiotic stresses caused by biological invasions, human induced habitat destruction, typhoons, drought and fire.

The work plan for this program addresses two inter-related and overlapping issues.

1 Issue 1: Invasive species are killing Guam's forests

An important component of ecosystems management is mitigation of damage done by alien invasive species which threatens Guam and Micronesia's native plants and animals in addition to economically important agricultural and ornamental species.

Physical isolation of Guam and other Micronesian islands and their humid tropical environment have created unique ecosystems, extremely susceptible to invasion by undesirable plants, insects, pathogens and other invasive species. Invasive species, especially insects and weeds are considered the greatest threat to Guam and Micronesia's natural environment. On Guam, native forests are particularly impacted by the four invasive species listed below. In addition to these, Guam's forests are being degraded by many

newly introduced insects, plant pathogens, and weeds which are arriving frequently.

Brown treesnake (BTS), detected in the 1940s, has extirpated Guam's forest birds, removing ecosystem services they provided including seed dispersal, insectivory and pollination.

Cycad Aulacaspis scale insect (CAS), detected in 2003, has killed most of Guam's endemic cycads, *Cycas micronesica*. This plant went from being the most abundant tree in Guam's forests in 2002 to being placed on the US endangered species list in 2015. Annual surveys of 12 permanent forest plots indicate that only 4% of the original *C. micronesica* survive and no reproduction is taking place.

Coconut rhinoceros beetle (CRB), detected in 2007, is killing coconut trees and other palms in Guam's forests. In 2002, palms were the second most abundant trees in Guam's forests.

Little fire ant (LFA), detected in 2011, continues to spread on Guam. In addition to being a major nuisance pest, this stinging ant is radically changing biodiversity in forest, urban, and agricultural ecosystems.

1.1 Goals and Objectives

- Setup and maintain island-wide surveillance systems to monitor forest pests and the health of plant populations under attack
- Develop and implement effective integrated pest management systems for BTS, CAS, CRB and LFA. The objective is to get these four key forest pests under control to facilitate restoration of Guam's forests.

1.2 Target audiences and how they will benefit

Target audiences, stakeholders, collaborators and beneficiaries include the people of Guam, GovGuam agencies and Federal agencies. Work on this issue will be done in collaboration with US Forest Service, USDA-APHIS-PPQ,

USDA-APHIS-Wildlife Services, Department of the Interior-Office of Insular Affairs, US Fish and Wildlife Service, Guam Department of Agriculture, Secretariat of the Pacific Community, Guam Invasive Species Advisory Committee, Guam Invasive Species Council, and the Micronesia Regional Invasive Species Council. UOG entities working on this issue include the Western Pacific Research Center, Extension and Outreach, Guam Plant Extinction Prevention Program and Center for Island Sustainability.

1.3 Activities and expected outcomes

Brown treesnake (BTS). UOG has partnered with USDA-APHIS Wildlife Services on projects aimed at BTS population monitoring and suppression of BTS on Guam.

Cycad *Aulacaspis* scale (CAS). Development of methods for monitoring and controlling CAS are currently being done within projects funded to protect *Cycas micronesica* on DOD property. To date, reproduction is occurring only when seeds and seedlings are protected by insecticide application. Restoration of *C. micronesica* on an island-wide basis will require discovery and release of an effective self-sustaining biological control agent for CAS will halt seedling mortality and reduce damage to older plants.

Coconut rhinoceros beetle (CRB). An island-wide surveillance system which monitors CRB damage to coconut palms has been developed and will be maintained. Development of biological control for Guam biotype of CRB is funded by several grants. Focus is on finding an isolate of *Oryctes rhinoceros* nudivirus (OrNV) capable of halting mature palm mortality.

Little fire ant (LFA). Development of methods for monitoring and controlling LFA are currently being done in collaboration with Guam Department of Agriculture Biosecurity Division.

2 Issue 2: Biosecurity and pest identification services within Guam and Micronesia need improvement.

Tropical islands such as those in Micronesia are extremely susceptible to economic and ecological damage from invasive species. In addition to rapid deterioration of Guam's forests, more than 95% of crop pests listed for Micronesia are invasive species. Despite the efforts of local and federal biosecurity services, several new invasive species arrive in Micronesia and establish every year. Early detection, accurate species determination, and rapid response are essential for controlling newly arrived invasive species before they reproduce and spread within and between islands, often causing a huge amount of economic and ecological damage.

2.1 Goals and Objectives

- Increase capacity for early detection and rapid response.
- Develop and maintain a biodiversity inventory listing all terrestrial organisms on Guam classified as endemic, native, introduced and invasive.
- Develop methods to overcome the taxonomic impediment which impedes early detection which may facilitate eradication or effective control of newly arrived invasive species before they cause significant damage.
- Provide plant pest diagnostic services which include identification and control recommendations to a wide variety of clientele.

2.2 Target audiences and how they will benefit

Target audiences, stakeholders, collaborators and beneficiaries include the people of Guam, including commercial growers, homeowners, GovGuam

agencies and Federal agencies. Work on this issue will be done in collaboration with USDA-APHIS-PPQ, Guam Customs and Quarantine Authority, Guam Department of Agriculture, Secretariat of the Pacific Community, Guam Invasive Species Advisory Committee, Guam Invasive Species Council, and the Micronesia Regional Invasive Species Council.

2.3 Activities and expected outcomes

Continuation of annual training workshops for PPQ officers from throughout Micronesia sponsored by the University of Guam, USDA-APHIS and the Secretariat of the Pacific Community will continue to raise the regional capacity for early detection and rapid response to invasive species.

Continued development of the UOG insect collection and online resources will result in a valuable resource for identification of insect species within Micronesia.

Workshops, fact sheets and publications on invasive species problems in Micronesia will keep stakeholders informed of emerging risks and improved control recommendations.