Plant Protection and Conservation for Guam and Micronesia

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Contents

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 consists of four inter-related and overlapping issues.

1 Issue: Invasive species are killing Guam's forests

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

The invasion of new pests and pathogens, including insects, and disease causing organisms, can devastate the expensive niche crops that Guam and Micronesia's farmers produce thereby destroying their limited economic opportunities. All programs must address issues that are relevant to the needs of the region, serve interest of scientific community and are linked to the needs of our stakeholders. Indeed, numerous research projects address environmental issues, integrated plant protection, biocontrol as well as serve ethnic needs of local population. We will continue to work on biological control in pest management systems, plant genetic resources conservation, production of local seeds and tissue-cultured plants, identifying local species for landscape purposes, integrated pest management, genetic structure of the indigenous plants, biological control of pests of endemic plants, trapping systems for monitoring and control of invasive insects, research on diseases of traditional Pacific island plants, their biological properties, and safety of producing tropical and subtropical foods, plants, or herbs.

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. Invasive species sometimes result in the loss of native species, the destruction of native forests and the degradation of the quality of life in general. Despite federal and state quarantine regulations, many species are accidentally imported. Some are harmless but some cause a significant impact on Guam and Micronesia's economy. The population of our most abundant forest plant, Micronesia's endemic *Cycas*

micronesica, has been reduced by 90% as a result of a scale insect infestation. This plant which used to be the most abundant plant in the forest is now on the national endangered species list. The second most abundant plant on Guam is the coconut palm which is under attach by the coconut rhinoceros beetle; we will lose more than 50% of these trees if this insect is not eradicated. As a result of invasive species resulting on Guam, we now have as many as 15 plant species and 8 animal species were placed on the endangered or threatened list in 2015. Little fire ant (LFA) continues to spread throughout the island of Guam primarily through human intervention. LFA has the potential to disrupt ecosystems and human lifestyles throughout the region.

- **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 more than 90% of Guam's endemic cycad plants. 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. Cycad populations continue to decline.
- **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. This stinging ant is radically changing biodiversity in forest, urban, and agricultural ecosystems.

In addition to the four important invasive species listed above, Guam's forests are being degraded by many newly introduced insects, plant pathogens, and weeds and additional invasive species impacting forests arrive frequently.

1.1 Goals and Objectives

- Setup and maintain island wide surveillance systems to monitor forest pests and the health of plants populations under attack
- Develop and implement effective integrated pest management systems for BTS, CAS, CRB and LFA

1.2 Target audiences and how they will benefit

Target audiences, stakeholders and collaborators include the people of Guam, GovGuam agencies and Federal agencies.

1.3 Activities and expected outcomes

1.3.1 BTS

1.3.2 CAS

1.3.3 CRB

1.3.4 LFA

- Several grant funded projects are aimed at discovering and implementing
- Discovery and release of an effective self-sustaining biological control agent for CRB will halt palm mortality and and CAS will halt host plant mortality caused

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

2.1 Goals and Objectives

2.2 Target audiences and how they will benefit

2.3 Activities and expected outcomes

3 Issue: Guam's threatened and endangered species require protection.

3.1 Goals and Objectives

3.2 Target audiences and how they will benefit

3.3 Activities and expected outcomes

4 Issue: Guam's soil erosion problem needs a solution.

4.1 Goals and Objectives

4.2 Target audiences and how they will benefit

4.3 Activities and expected outcomes

5 CRAP

Research and Extension activities will be aimed at the identification of and management of invasive species, and when this is not possible, mitigation of damage using biological control and integrated pest management. We will also work continue to educate policy makers and the general public on the threat that invasive species pose to their island environment and lifestyles.

Bob's stuff. UOG-CES is charged with providing the best possible advice for dealing with current and new immerging pests and diseases. In a 2002 farmer survey report, from the Eggplant, Pepper, and Tomato Production Guide for Guam, 48% of the farmers reported pests as their number one farm problem followed by plant diseases at 22%. There are several steps that can be taken to reduce the impact of pests, weeds, and diseases. The first is identification. There have been no comprehensive insect surveys in Micronesia for many years nor a record of plant diseases on Guam. As a result, pest records do not accurately reflect the fauna, nor describe the animal/plant arthropod relationship existing within Micronesia. UOG-CES most remain vigilant in is pest and disease identification efforts to detect new introductions to the island.

Since all of Guam's new pests are the result of accidental introductions of invasive species, Guam will continue to get new pests as long as people travel to Guam and plants are imported. UOG-CES must cooperative with other agencies with similar goals. The Guam Invasive Species Advisory Committee (GISAC) was formed to provide technical expertise in management of organisms that are already here and prevention of further introductions. The Committee has established a website at http://gisac.guam.net as a repository for information on Guam's invasive species. The University of Guam is also part of the Western Plant Diagnostic Network (WPDN) (http://www.wpdn.org/) which is a part of a larger network: National Plant Diagnostic Network (NPDN). The NPDN enhances United States agricultural security through a functional nationwide network of public agricultural institutions with a cohesive, distributed system to quickly detect deliberately introduced, high consequence, biological pests and pathogens into our agricultural and natural ecosystems by providing means for quick identifications and establishing protocols for immediate reporting to appropriate responders and decision makers.

Whenever people cultivate plants they disturb the environment: soil, plant and animal species. Through proper management practices many pests, weeds, and plant disease problems can be eliminated or reduced. If proper management practices are not followed soil will be washed away, plant pathogens will multiply, and insects will become resistant to insecticides. The Cooperative Extension Service through education awareness programs needs to get the farmers and homeowners to adopt low environmental impact plant cultivation practices.

5.1 Goal and objectives

The goal of this program is to sustain, protect, manage and conserve environmental and natural resources of Guam and the rest of Micronesia.

Objectives include basic research, applied research and extension activities leading to improvement in the following areas:

5.1.1 Biosecurity and Invasive Species Management

- GISC, GISAC, RISC
- BTS
- CRB
- CAS
- LFA

5.1.2 Plant Pest Diagnostic Services

- WPDN, NPDN
- Plant pathology diagnistics
- Insect pest diagnostics
- UOG Insect Collection
- Guam terrestrial biodiversity inventory

5.1.3 Pest Management and Biological Control

UOG/APHIS Biological Control Facility

5.1.4 Conservation and ecological restoration

- GPEPP
- UOG Center for Island Sustainability
- Guam Soil and Water Conservation Districts

5.2 Target audiences and how they will benefit

5.3 How activities lead to outcomes

6 Brief Summary about Planned Program

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.

Bob's stuff. The Plant Health and Pest Management Program is an outreach education program that informs clientele of issues that deal with plants and pests. The information and its delivery are designed to reduce the environmental and economic impact of plant cultivation, plant importation, and pest control activities. This is accomplished through education and research projects conducted by Guam Cooperative Extension and other federal and local agencies.

7 Situation and Priorities

Agroecosystems and natural ecosystems on these islands are subject to severe abiotic and biotic stresses caused by invasive plants and animals, human induced habitat destruction, typhoons, drought and fire.

The planned research program addresses ornamental plants in our landscapes, as well as protects a diversified flora in natural environments. Through basic and applied research, host-pathogen interactions can be identified; control measures can be developed and researched. An important component of ecosystems management is mitigation of alien invasive species. Invasive species threaten Guam and Micronesia's native plants and damage economically important ornamental species.

The invasion of new pests and pathogens, including insects, and disease causing organisms, can devastate the expensive niche crops that Guam and Micronesia's farmers produce thereby destroying their limited economic opportunities. All programs must address issues that are relevant to the needs of the region, serve interest of scientific community and are linked to the needs of our stakeholders. Indeed, numerous research projects address environmental issues, integrated plant protection, biocontrol as well as serve ethnic needs of local population. We will continue to work on biological control in pest management systems, plant genetic resources conservation, production of local seeds and tissue-cultured plants, identifying local species for landscape purposes, integrated pest management, genetic structure of the indigenous plants, biological control of pests of endemic plants, trapping systems for monitoring and control of invasive insects, research on diseases of traditional Pacific island plants, their biological properties, and safety of producing tropical and subtropical foods, plants, or herbs.

The physical isolation of the island and its humid tropical environment have created unique ecosystems, extremely susceptible to invasion by undesirable plants, insects,

microbes, and other invasive species. Invasive species, especially insects and weeds are considered the greatest threat to Guam and Micronesia's natural environment. Invasive species sometimes result in the loss of native species, the destruction of native forests and the degradation of the quality of life in general. Despite federal and state quarantine regulations, many species are accidentally imported. Some are harmless but some cause a significant impact on Guam and Micronesia's economy. The population of our most abundant forest plant, Micronesia's endemic Cycas micronesica, has been reduced by 90% as a result of a scale insect infestation. This plant which used to be the most abundant plant in the forest is now on the national endangered species list. The second most abundant plant on Guam is the coconut palm which is under attach by the coconut rhinoceros beetle; we will lose more than 50% of these trees if this insect is not eradicated. As a result of invasive species resulting on Guam, we now have as many as 15 plant species and 8 animal species were placed on the endangered or threatened list in 2015. Little fire ant (LFA) continues to spread throughout the island of Guam primarily through human intervention. LFA has the potential to disrupt ecosystems and human lifestyles throughout the region.

Research and Extension activities will be aimed at the identification of and management of invasive species, and when this is not possible, mitigation of damage using biological control and integrated pest management. We will also work continue to educate policy makers and the general public on the threat that invasive species pose to their island environment and lifestyles.

Bob's stuff. UOG-CES is charged with providing the best possible advice for dealing with current and new immerging pests and diseases. In a 2002 farmer survey report, from the Eggplant, Pepper, and Tomato Production Guide for Guam, 48% of the farmers reported pests as their number one farm problem followed by plant diseases at 22%. There are several steps that can be taken to reduce the impact of pests, weeds, and diseases. The first is identification. There have been no comprehensive insect surveys in Micronesia for many years nor a record of plant diseases on Guam. As a result, pest records do not accurately reflect the fauna, nor describe the animal/plant arthropod relationship existing within Micronesia. UOG-CES most remain vigilant in is pest and disease identification efforts to detect new introductions to the island.

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