

Overview of Invasive Species Issues on Guam

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<https://github.com/aubreymoore/PESC-OIA-overview/raw/main/guam-overview.pdf>

Hafa Adai



How bad is Guam's invasive species problem?

- Guam has 33 species listed in **100 of the World's Worst Invasive Species**
- Guam has 5 species listed in the **Top 10 World's Most Costly Invasive Species**.
- Guam's natural ecosystems, especially Guam's forests, are rapidly being destroyed by invasive species.

How bad is Guam's invasive species problem?

Dominant Trees in Guam's Forests are Threatened by Asian Cycad Scale (ACS) and Coconut Rhinoceros Beetle (CRB)

Threat	Species	Status	Tree count ¹	% of total tree count
ACS	<i>Cycas micronesica</i>	endemic	1,571,556	16%
CRB	<i>Cocos nucifera</i>	native	1,162,494	12%
CRB	<i>Heterospathe elata</i>	introduced	1,075,552	11%
	<i>Vitex parviflora</i>	introduced	902,990	9%
	<i>Leucaena leucocephala</i>	introduced	890,217	9%

Tree census data source: J. A. Donnegan et al. 2004. Guam's Forest Resources, 2002. Available from:

http://www.fs.fed.us/pnw/pubs/pnw_rb243.pdf

Priority Issue 1: Brown treesnake



Courtesy of USGS

Forest Birds before BTS



Forest Birds after BTS



Priority Issue 1: Brown treesnake - Impacts

- Following predation by BTS, Guam's forest bird species are either extinct or on the endangered species list.
- Forest health is severely impacted by the ecosystem services that these birds provided: seed dispersal, insect control, pollination, etc.
- Restoration of Guam's avifauna is unlikely without control of BTS populations.

Priority Issue 1: Brown treesnake - Current status

- Arrived on Guam in the late 1940s.
- Guam is the only place in the world where BTS has established as an invasive species
- Millions of dollars per year are spent on preventing BTS from leaving Guam.
- Some funds are being used for control methods development: snake-proof barriers and "pinkies on parachutes".
- Attempts at eradicating BTS from Cocos Island have not yet succeeded.

Priority Issue 2: Asian Cycad Scale



Priority Issue 2: Asian Cycad Scale



Priority Issue 2: Cycad aulacaspis scale - Impacts

- Cycad aulacaspis scale, and other invasive species, have killed about 90% of Guam's endemic *Cycas micronesica* plants and the population is not recovering because natural reproduction is not occurring.
- *C. micronesica* went from being the most numerous tree in Guam's forests in 2002 to being placed on the National Endangered Species list in 2016

Priority Issue 2: Cycad aulacaspis scale - Current status

- Detected on Guam in 2003; Also in Hawaii, Guam, CNMI, Palau; Endemic cycad population on Yap at great risk.
- Cycad aulacaspis scale is partially controlled by introduced predators and parasites on Guam, but almost all seeds and seedlings are being killed by the scale insect.

Priority Issue 3: Coconut rhinoceros beetle



Priority Issue 3: Coconut rhinoceros beetle - Impacts



Priority Issue 3: Coconut rhinoceros beetle - Impacts

- A severe, uncontrolled outbreak of coconut rhinoceros beetle (CRB) on Guam is damaging and killing coconut palms and other palms.
- Island-wide, roadside damage surveys indicate that about 20% of coconut palms show visible CRB damage.
- Pheromone trap data and damage surveys have shown no significant upward or downward trend in the past 2 years and trees continue to be killed.

Priority Issue 3: Coconut rhinoceros beetle - Current status

- First detected on Guam in 2007; also established in American Samoa, Palau, Guam, Hawaii (Oahu), and the CNMI (Rota)
- Palau, Guam, Hawaii, and CNMI have a virus-resistant strain, CRB-G, which does not respond to *Oryctes rhinoceros* nudivirus which was previously a highly effective self-sustaining biological control agent
- Much of the current effort on Guam is directed at reducing risk of accidental exporting CRB by attempts to reduce populations in proximity of ports and to increase outgoing biosecurity
- CRB-G is killing coconut palms throughout Guam. In some areas coconut palm mortality is almost 100%

Priority Issue 4: Little fire ant



Priority Issue 4: Little fire ant - Impacts

- **Human health.** LFA stings cause painful welts and produce varying allergic reactions.
- **Animal health.** stings to animal eyes cause a clouding or keratopathy leading to blindness
- **Ecological impacts.** LFA is highly competitive and displaces other invertebrates and vertebrates in infested areas. Mutualisms between LFA and Hemiptera causes explosions of plant pests, dramatically decreasing plant health and productivity.
- **Economic impacts.** Heavily infested structures and properties become uninhabitable without treatment. Guam's tourist industry is expected to be impacted.

Priority Issue 4: Little fire ant - Current status

- First detected on Guam in 2011. Also in Hawaii and Yap (FSM)
- LFA has been documented to be in every village on Guam
- LFA identified at Guam ports, some in critical loading areas with direct transport to neighboring islands
- Availability of pesticides remain limited and preferred chemicals can be cost prohibited
- Spread of LFA enhanced by lack of public green waste management system
- Current ecological studies on Guam are measuring LFA impacts on invertebrate diversity on conservation and public lands
- Social and economic impact are present on Guam, but are not being tracked or quantified in any meaningful way
- Short-term federal funding cover focused management in conservation areas and ports
- Almost no funding input from local government

Challenges

Human Resources

- Professional scientific/technical capacity is low
- Guam suffers from the *taxonomic impediment*
- Guam does not have a terrestrial biodiversity inventory

Funding

- Invasive species projects on Guam are funded by many relatively small short-term competitive grants. Project management overhead (proposal writing and report writing) is very high, leaving little time to actually do the work.

Funding sources

- Department of Interior - Office of Insular Affairs
- USDA - Forest Service
- USDA - APHIS
- DOD
- Government of Guam - Invasive Species Tarrif

National/Territorial Invasive Species Plans

- Guam Invasive Species Management Plan <https://www.sprep.org/attachments/VirLib/Guam/nissap-2017-2019.pdf>
- Regional Biosecurity Plan for Micronesia and Hawaii
<https://pacific.navfac.navy.mil/About-Us/Regional-Biosecurity-Plan-for-Micronesia-and-Hawaii/>

Next steps

- Update and implement action items in the **Guam Invasive Species Management Plan** and the **Regional Biosecurity Plan for Micronesia and Hawaii**
- **Brown treesnake.** Eradicate BTS from Cocos Island?
- **Cycad aulacaspis scale.** Implement an effective island-wide biocontrol program which will allow natural reproduction of surviving cycads (as per recommendations by Dr. Ronald Cave)
- **Coconut rhinoceros beetle.** Find and release an effective self-sustaining biological control agent for CRB-G which will suppress populations, reduce damage and halt palm mortality.
- **Little fire ant.** ????

The End - Thanks for listening.

**Invasive species aren't all bad.
They provide job security for biologists.**

