

Trip report for site visit to the Ritidian Point unit of Guam National Wildlife Refuge
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During September 19-26 of 2009, Jason Hanley (Pacific Islands NWR), Daniel Clark and I (PIFWO) traveled from Honolulu to Guam to assist the Guam NWR with invasive plant issues. The purpose of the trip was to assist the Guam NWR and the USFWS RI Invasive Species Strike Team managing stands of the invasive plant *Leucaena leucocephala* (tangantangan) in the refuge. The site visit to Guam NWR was supported by the USFWS RI Invasive Species Strike Team.

Guam NWR harbors a large proportion of the island's endangered species and some good examples of native limestone forest. It has been suggested as a potential release site for the endangered and extinct in the wild Guam rail (*Gallirallus owstoni*) once a barrier for brown tree snakes (*Boiga irregularis*) is in place. The refuge supports the remaining Guam population of the endangered tree *Serianthes nelsonii* (hayun lãgu) and one of the populations of the candidate species for listing *Tabernaemontana rotensis* (no common name). Its white sand beaches are nesting sites for the endangered sea turtles. Another plant recently considered endangered by the International Union for Conservation of Nature (IUCN) is the *Cycad micronesica* (fadang) which has many of its populations in the Guam NWR and overlay refuge (Marler *et al.* 2006). There are other endangered animals known from the refuge (*e.g.* fruit bats, birds), but they were not observed or were topics of discussion during this trip.

During our trip we also saw the invasive brown tree snakes (BTS) which is considered the main threat for the avifauna, bats, and other animals on Guam. We met the USGS BRD Research Team base in Guam and they showed us some of their equipment used for detection and research with BTS.

On our first day in the field (Sept 21), Christian Eggleston (NWR Biologist) accompanied by Joseph Schwagerl (new Guam NWR Refuge Manager) showed us the refuge facilities, our working area, and we took a first hand look at some of the invaded areas of *L. leucocephala*. Chris showed us the shadehouse facility where they propagate *Artocarpus mariannensis* (dukduk), and *Pandanus dubeus* (pahong) and other native plants. There were also 17 small plants of *Serianthes nelsonii* protected with a cage until they develop a reintroduction plan for the species. All of the *S. nelsonii* plants originated from the single tree remaining in Guam and the other native plants at the nursery are from adjacent areas on the refuge. Joseph mentioned of his will to restore the shadehouse and start propagating more native plants for reforestation. From our field observations and floristic literature we expect to provide them with a list of common species recommended for reforestation.

We spent the evening of our first day preparing the backpack sprayers, mixing the herbicides (Garlon 4 Ultra @50% with MSC Lucitec @50%) and doing application trials along the refuge building facilities. The recommendations for measurements to use were provided by Dan and Jason, while I was learning from the process. Over the course of the week we applied herbicide basal treatment on *L. leucaena* and the *Triphasia triflora* (limeberry) in an area of ca. five acres

of dense littoral scrubland (Fig. 1). The area selected to apply the basal treatment contains substantial cover of native species with natural regeneration occurring. This site had manageable patches of *L. leucocephala* growing in between the natives. The number of stems treated was uncounted, but it probably was more than 1,000 stems. Point and shot poles were installed to monitor the effects of the treatment in the forest and will be followed by Christian Eggleston. It is worth mentioning that Garlon and other herbicides used for forest applications are not easily found in Guam. The herbicide and all the equipment we used was shipped from Hawaii.

In occasions when it was raining and herbicide applications were not feasible we explored the adjacent littoral limestone forest dominated by native species such as *Neisosperma oppositifolia* (fagot), *Hernandia nymphaeifolia* (nonak), *Mammea odorata* (chopak), *Pisonia grandis* (omumu), and occasionally having *Aglaia mariannensis* (mapunyao), *Guettarda speciosa* (panao), *Ficus* spp., *C. micronesica*, *Pandanus* sp., *Barringtonia asiatica* (puting), among others. The forest understory was typically open as many of the littoral herbs and shrubs in these forests require bright light for germination and growth (Whistler 1992). However, other native plants such as *Eugenia* sp., *Flagellaria indica* (bejuco halum-tano), *Asplenium nidus* (galak), and the introduced *T. triflora*, were noticed growing in the understory. The understory of these forests was noticeably rich in seedlings and juvenile plants of the dominant species. Herbivory from introduced Philippine brown deer (*Cervus mariannus*) is known from the Guam NWR, but signs were not noticed in the areas we walked. The understory seedbank is dominated by *N. oppositifolia* which is a member of the Apocynaceae family and known to have poisonous sap. The sap of Apocynaceae plants often has alkaloids as part of the secondary metabolites of the species. Perhaps this high content of alkaloids is not of easy digestion for deer and they may not often disturb *N. oppositifolia* seedlings.

We also noticed over 100 *Cycad micronesica* plants and not many of them showed signs of the Cycad Aulacaspis Scale (CAS, *Aulacaspis yasumatsui*). However, about 30 to 80% of the *C. micronesica* plants on Guam have been killed since the CAS was reported on the island in 2003 (Smith 2007). A black lady beetle (*Rhyzobius lophanthae*) arriving from Hawaii was released as a biological control for CAS (Moore *et al.* 2005).

Cari Eggleston showed us the *Tabernaemontana rotensis* growing in a native limestone forest plateau, just off the road of the hill coming down to Ritidian Point. Cari knew of only a single adult tree and a few seedlings but remarkably, when we checked them out there were a dozen seedlings, 2-3 dozens of saplings growing in a cluster. We did a quick assessment of the area and found more adult trees growing adjacent to this population. Overall, about 50 plants were observed growing in all life stages. A detailed survey or quantitative measurements were not performed due to time constraints.

We also observed half a dozen eclosed sea turtle eggs (likely *Chelonia mydas*) were apparently the turtles just came out days before typhoon waves washed the sand in the northern coast of Guam.

A total of 69 plant species (10 Mariana Islands endemic, one Guam endemic, 43 indigenous to the region, 14 non-natives, and one of unknown origin) were observed in the areas we visited. Few more species were observed and photographed, but their identification remains to be investigated. A list of the species observed along with a digital photographic brochure will be sent to the

Guam NWR. Recent observations of Guam's flora, Ritidian Pt., and overlay refuge are further discussed by Hess and Pratt (2006).

Recommendations:

- ❖ The 17 *Serianthes nelsonii* nursery-grown plants should be planted and fenced in a similar habitat of where the wild *S. nelsonii* grows. The reintroduced subpopulations should be planted apart from the wild *S. nelsonii* and augmented with individuals from the Rota populations to encourage genetic mixing of the species. It is important that the number of founders is taken in consideration and an equal number of plants per founder should be used.
- ❖ As we saw in our visit, there are other invasive plant species with potential to invade native habitats and should be controlled. *T. triflora* has invaded the understory of many ruderal areas and has the potential to spread in the understory of native species. The fruits are usually dispersed by birds in other places, but given attenuating situation of Guam's avifauna, this may decrease the dispersal potential of the species. Other plants we saw that should be on the watch for control are *Vitex parviflora*, *Passiflora suberosa*, and *Mikania scandes*. A comprehensive list of invasive plants in Guam was reported by Meyer (2000).
- ❖ *Tabernaemontana rotensis* – there is potential habitat to survey close to the tree that Cari showed us. The habitat is close from a limestone hill, so safety precautions should be used when conducting additional surveys. Because the fruit opens when is ripe and throws out the seeds, it is important for seed collection that the fruits are bagged before ripening. According to Tuquero (2005), the fruits of *T. rotensis* contain several small seeds that are easily propagated in peat most. Germination could be increased if media is not over-watered and covered by clear plastic.
- ❖ The taxonomy of *T. rotensis* should also be clarified using molecular markers to sequence the ITS genes. RAPD's and ISSR's are also quick and provide more variation. For a molecular analysis it is important to look at a closely related congener known from other Pacific islands along with populations of *T. rotensis*. If the populations of *T. rotensis* are different enough from its congeners to be considered separate species, this study should tell. A similar study was conducted on *Chamaesyce skottbergii* (from Hawaii) and more details on the methodology are discussed by Morden and Gregoritz (2005).
- ❖ Two different species of large butterflies (Lepidoptera) were plentiful in all type of forests we observed and they were visiting almost every plant species flowering. These butterflies may be playing a significant role in the pollination of large tubular flowers such as *Guettarda speciosa*, all members of the Apocynaceae family, and other plants with white fragrant flowers. Nevertheless, butterflies could also be affecting the pollination of other species due to their extremely high population numbers and frequency of visitation. Support to researchers investigating pollination webs or species specific pollination studies should be encouraged to better understand the role that the butterflies may be playing in a landscape where bird niches will not be easily filled.

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Appendix:

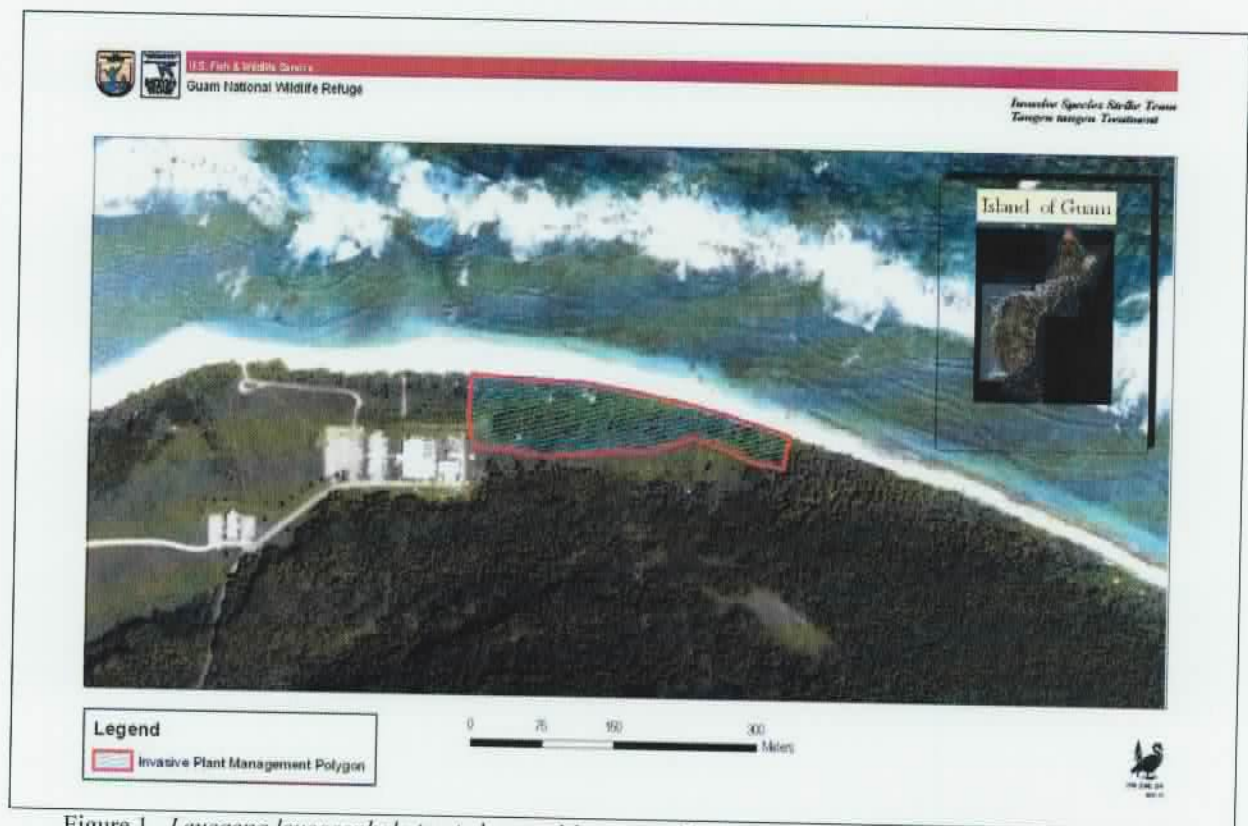


Figure 1. *Leucaena leucocephala* treated areas. Map created by Jason Hanley (USFWS – PINWR).



Serianthes nelsonii plants growing at Guam NWR.



Elatostema calcareum discovered growing in limestone cliff.



Cycad Aulacaspis Scale in *Cycad micronica* (left); Cycad impacted by the CAS (right).



Tabernaemontana rotensis, left mature tree; right dehisce fruit.