



Limestone Forests – Botanical Gems (Guam)

Description: Limestone forests are a unique feature of Guam and occur primarily on the northern half of the island. In general, the southern half of the island is dominated by savanna grasslands on a volcanic clay substrate, although Mariana and Alifan Limestone outcrops support limestone forests. It is in this southern portion of the island that remnant limestone forests persist in portions of each of the War in the Pacific National Historical Park's (WAPA) seven separate management units. Most of these limestone forests are relatively intact and support myriad native shrubs, lianas, ferns, and trees including several species that are found only in the Mariana Islands.

Cultural Significance: The limestone forests found within the park are comprised of many native plant species that are still used by Chamorro people today. For example, pahong (*Pandanus dubius*), known for its waxy coated leaves, is useful for waterproof matting and its edible seeds. Lumot moss (pictured below) is a common moss that grows on limestone and is part of a unique local tradition of decorating nativity scenes during the Christmas season. Based on local legend, the jungles of Guam are occupied by taotaomona, (literally, "people before recorded time") or ancestral spirits. These taotaomona can take on many forms and are sometimes described as mischievous beings that pester or harm people who enter the forests. Therefore, those entering the jungle ask permission to both prevent the wrath of taotaomona and out of respect to ancestors.

Inventories: The vegetation of Guam has been extensively documented by various botanists and researchers, and is recorded in floral references and popular books. A botanical survey of WAPA completed in 2005 identified the plants encountered in the park, including its limestone forests. Although no endangered species were observed, a single plant of an endangered species, *Serianthes nelsonii*, was found on limestone substrates elsewhere on Guam. Through additional surveys it may also be found in the park.

Monitoring: Monitoring of the limestone



Limestone forest on Mt. Alifan.

forests of Guam will be addressed in I&M's focal terrestrial plant communities protocols to be developed in the near future. Other associated monitoring at WAPA will include the status and trends of established invasive plants, landscape dynamics, climate, and water quality, which may include the analysis of water in the park's perennial streams.

Data: At present, the vegetation inventory findings at WAPA are provided in the NPS database, NPSpecies. The images taken during the vegetation survey are archived in ThumbsPlus (photo database) and available by contacting I&M's Data Manager. The inventory report will soon be available on-line.

Status & Trends: WAPA's limestone forests did not escape the impact of World War II maneuvers, and as a result are highly disturbed. Tangentangen (*Leucaena leucocephala*), a small tree likely introduced to address extensive erosion after the war, has spread widely through-

out Guam, including into limestone forests. Other plant threats continue to plague this unique plant community. Another impact is the decimation of bird life by introduced brown tree snakes (*Boiga irregularis*) on Guam. Birds once served as important plant pollinators and seed dispersers. The impact of their demise is presumed to be significant to plant communities. Other impacts include erosion, encroachment from adjacent land use, and human-set wildfires that burn into limestone forests.

Management: Management of WAPA's limestone forests includes initial studies to understand the impacts of fire and erosion. The park is still in need of detailed vegetation maps to plan management projects. Once the vegetation maps are completed, the NPS will be poised to implement terrestrial natural resource management programs that protect, enhance, and interpret this unique resource.

—Joan Yoshioka

For Questions or Comments Contact
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Where to see limestone forest:

The most accessible place to see limestone forests in WAPA is the south-facing slope of Fonte Plateau Unit, down slope from the quarry. Another site is in the Asan Beach Unit, where a visitor trail accesses the top of the limestone ridge. Despite its degraded nature, many native species are still present on the ridge line.



From left to right: Lumot moss, fedange (*Cycas circinalis*), paipai (*Guamia mariannae*)

Photos by J. Yoshioka