10 years of conservation in Upper Limahuli Preserve

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Upper Limahuli Preserve

The National Tropical Botanical Garden's conservation program in Upper Limahuli Preserve is a case study in long-term ecological conservation in a remote wet montane forest. This 400-acre hanging valley contains naturally occurring populations of 254 native plant taxa, 213 of which are Hawaiian endemics. Upper Limahuli is also home to Hawaiian forest birds and breeding colonies of endangered ground-nesting seabirds `A`o (Newell's Shearwater, *Puffinus newelli*) and `Ua`u (Hawaiian Petrel, *Pterodroma sandwichensis*).

Despite the rugged topography and sheer cliffs, which provide some protection against many environmental pressures, the Preserve has changed over the roughly 25 years of management. It is vulnerable to encroachment by invasive plants such as Australian Tree Fern (*Cyathea cooperi*) and Himalayan Ginger (*Hedychium gardnerianum*) and depredation pressure by feral cats (*Felis catus*), rodents (*Rattus spp.*), and Barn Owls (*Tyto alba*). Natural disturbances such as Hurricane Iniki and recent landslides create more canopy openings and opportunities for further ecosystem change.

In the past ten years, the conservation program in Upper Limahuli Preserve has grown from small, intermittent camping trips for invasive removal and seed collection to a multi-agency collaboration with a year-round dedicated conservation team. A variety of projects have focused on rare plant collection and propagation, invasive plant removal, and predator control. By taking advantage of new technologies and continually tailoring techniques to the needs of the landscape, the overall conservation program has advanced significantly over the course of a decade.

Restoring Habitat

Time lapse of weed control areas from 2009 to 2019

Dedicating more staff time to weed control activities is necessary to minimize invasions of new species.

We assessed the effectiveness of weed control efforts in randomly selected "hotspots" of Himalayan ginger in the ULP that had been visited more than once in the past 10 years. After the first treatment, most areas had much lower ginger density by the second visit.

Controlling Predators

Investing in remote equipment is key for managing predators in hard-to-reach locations. The predator control team has become more responsive to feral cat pressure, greatly reducing the amount of time it takes to capture a cat.

Protecting Seabirds

Predator and weed control efforts have lasting impacts on native seabird populations. This work is both necessary and effective. These management activities have coincided with improving reproductive success rates as well as a decline in the number of failures due to predation. (Data provided by the Kaua`i Endangered Seabird Recovery Project -- KESRP)

Figure 1: Number of endangered seabird burrows located at Upper Limahuli Preserve 2011-2018

Figure 2: Reproductive success rates for Newell's Shearwater (NESH) and Hawaiian Petrel (HAPE) in Upper Limahuli Preserve between 2010 and 2018.

Figure 3: Percentage of all burrows monitored which failed due to rat predation in Upper Limahuli Preserve from 2011 - 2018. Note this does not include burrows from which chicks disappeared despite these likely being rat predations as rats will often roll chicks out of burrows.

Preserving Rare Plants


Cyanea habenata
Upper Limahuli is home to many rare and endangered plants, some of which are critically endangered, with remaining populations only occurring within Limahuli Valley.

Lysymachia ovoidea
Through a combination of funded projects and opportunistic activities, NTBG staff:
• Preserve existing populations, and document new discoveries
• Collect seed to store and/or propagate for living collections
• Outplant new individuals in managed restoration areas

Through the Limahuli Preserve Rare Plant Restoration Project (funded through the US Fish and Wildlife Service), NTBG staff mapped, collected from, and outplanted critically endangered species in Upper Limahuli Preserve.


Labordia lydgatei
Discoveries, mapping and monitoring:
Following the discovery of Kaua`i's largest population of the PEPP species *Labordia lydgatei* in the ULP, LPRPRP funded the collection, mapping, and tagging of these plants. Formerly known from ~ 13 plants, over 96 plants have been found, with germ plasm collection made from over 10 pistillate individuals.


Melicope quadrangularis: In 2010, Natalia Tangalin rediscovered *Melicope quadrangularis* in the ULP. It was formerly only known from the Wahiawa mountains of southern Kaua`i. Further surveys yielded ~ 15 indivduals. In addition, a single novel individual in the Rutaceae family (*Melicope* sp.) was discovered in 2015 in a floristically diverse area of the ULP.

Melicope quadrangularis
Other rare population discoveries in the past ten years include:
Euphorbia remyi, Lysimachia ovoidea, Liparis hawaiiensis, Joinvillea ascendens var. ascendens, and *Arachnoides insularis*

Rare Plant Restoration: Collection and outplanting of Critially Endangered PEPP species *Melicope degeneri* and *Cyanea rivularis*. All known populations of each species were visited to ensure genetic diversity.

Melicope degeneri


Cyanea rivularis
In collaboration with Kauai PEPP, 39 Lysimachia sp. nov from Pohakea and 3 Lysimachia ovoidea were outplanted in ULP in February 2018.

Through a Mohammed bin-Zayed grant, Natalia Tangalin and other NTBG staff have collected, propagated, and with the help of Limahuli Preserve staff, out-planted 200 *Polyscias bisattenuata* seedlings in the Limahuli Lower Preserve and 200 in the Upper Preserve.

Collections:
Gardenia remyi: Through collaboration between Natalia Tangalin, Mike DeMotta, and Limahuli Preserve staff, air-layers were set out on previously known and a newly discovered *Gardenia remyi* in early 2017. Two cuttings were successfully rooted and taken to the NTBG Horticulture Center. Air layers continue to be monitored and cultivated.

Rare plant seeds and cuttings are collected opportunistically from outplantings and wild populations, for either immediate propagation in living collections or long-term storage in NTBG's seed bank. Highlights of seed collections in the past ten years include:
Cyanea rivularis
Cyanea habenata
Hibiscus waimea subsp. hannerae
Melicope degeneri
Viola wailenalenae
Prichardia napaliensis
Pritchardia perlmanii
Stronglyodon ruber
Phyllostegia renovans
Trematolobelia kauaiensis
Dubautia knudsenii subsp. knudsenii
Cyanea fissa
Joinvillea ascendens subsp. ascendens
Melicope paniculata
Cyrtandra kealiae subsp. kealiae
Cyrtandra wainihaensis
Pteralyxia kauaiensis
Stenogyne purpurea

ULP Timeline

Timeline of Conservation activities in Upper Limahuli Preserve

Throughout this time, many people and organizations have contributed to conservation in Upper Limahuli Preserve. In addition to current staff, we wish to acknowledge:

NTBG Staff

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- **Natalia Tangalin**
- **Steve Perelman**
- **Clay Trauernicht**
- **Seana Walsh**

Partner Organizations

- **Kaua`i Endangered Seabird Recovery Project (KESRP),**
- **Kaua`i Forest Bird Recovery Project (KFBRP),**
- **Kaua`i Plant Extinction Prevention Project (PEPP),**

Past and Present Funders

- **Kaua`i Island Utility Cooperative**
- **US Fish and Wildlife Service**
- **NRCS**

as well as other NTBG staff, partner organisations, contractors, researchers, interns, cultural practitioners and volunteers.