Conserving the world of tropical plants

YHOY REPORT During his travels as Young Horticulturist of the Year 2016 **Lawrence Wright** visited many gardens in the United States and spent a fortnight based at the Fairchild Tropical Botanical Garden in Miami. He reports on his stint with the Conservation Team looking at endangered Florida native plants.

During my time as a horticultural student I was lucky to work in, study and visit some of the great gardens in the UK as well as engaging in many facets of the horticultural industry from around the world, on the lead up to the 2016 CIH YHoY competition. Most of my experience had been in ornamental, retail and to a lesser extent production horticulture. There was something niggling in the back of my mind, a desire to explore and embrace something that was completely new to me.

I chose to spend a portion of my travel time at the Fairchild Tropical Botanical Garden in Miami, Florida. This allowed me to experience tropical and subtropical plants as well as encounter a new branch of the horticultural industry; conservation horticulture.

This slice of tropical heaven is the result of the work, vision and foresight of Robert H Montgomery in 1936. Montgomery named his 33ha garden, which opened to the public in 1938, after his friend and significant plant hunter of the time, David Fairchild. At the heart of the botanic garden is the Fairchild Conservation Team.

Conservation

"Fairchild is dedicated to exploring, explaining and conserving the world of tropical plants."

Conservation at Fairchild is wide-reaching, with projects in more than 20 countries looking to protect natural areas and the flora and fauna that they contain. The Conservation Department looks after some of the rarest plants in Florida, the Caribbean and by extension the whole of the United States. Due to the garden's location and the fact that the southern tip of Key West is only a mere 144km or so north of Cuba, South Florida sits within the Caribbean Floristic Region and as a result the Conservation Department also takes care of many rare plants that have their origin outside of Florida.

The overall goal is to reduce the extinction risk of the rarest plants in the region. Since the 1990s the team has been collecting and storing seed in order to safeguard the genetics of the species most at risk. This goes hand in hand with species reintroduction programmes and working with local land owners and reserve managers to produce site specific management plans to allow for the effective conservation of the species in question.

The major outreach programme that the Conversation Team runs is 'Connect to Protect', a network of home owners, businesses and schools that actively conserve one of the area's most endangered habitats – Pine Rockland – by growing rockland species on their properties.

While most of the plant communities that the team are interested in are offsite, there are a couple of conservation areas in the garden itself and located around the site are individual plants of key interest as they are part of the Centre for Plant Conservation (CPC) list of endangered plants. As well as research, education, collection of seed and cultivation of key plant species, the team also carries

Far left: Pine Rockland, Deering Estate. Young *Pinus elliotti* var *densa* (South Florida slash pine) entering the rocket stage of growth.
Left: The *Eumaeus atala* (atala) butterfly is believed to have once been the most populous flying insect in Miami-Dade County. Following years of over-harvesting, the butterfly larva's food source, *Zamia integrifolia* (coontie), was on the brink of extinction in Florida. Thankfully conservation work between Fairchild, Zoo Miami and Disney has resulted in population recovery.
Above: *Eumaeus atala* (atala) butterfly eggs and a recently vacated pupa on the species larval food plant, *Zamia integrifolia* (coontie).

All photos: Lawrence Wright

out exotic plant removals both in the natural environment and within the garden at Fairchild.

Although the team at Fairchild looks after a vast number of plant species from a wide range of environments, a key area of research and conservation is the Pine Rockland habitat that extends from Miami South West towards the Everglades National Park.

Pine Rockland

Originally there were 2,097sqkm of Pine Rockland which existed primarily on the Miami Rock Ridge, extending from the Miami River, south to the Everglades. Its location in South Florida means that Pine Rockland straddles the southern and northern limits of the temperate and tropical floral ranges and helps explain why the Pine Rocklands are home to a wide variety of plants and animals, many of which are endemic to Florida, Miami-Dade County, or specifically the Pine Rockland itself.

Pine Rockland is characterised by an open canopy of *Pinus elliotti* var *densa* (South Florida slash pine), a patchy subcanopy of palms and shrubs, and an extremely diverse herbaceous layer growing in the shallow Miami oolitic limestone. Historically, the landscape was maintained by frequent, low intensity fires, but urbanisation and fragmentation have led to fire suppression and severe changes within the plant community.

Most of the natural areas in and around Miami are managed by Natural Areas Management (NAM) and Environmentally Endangered Lands (EEL). Both of these organisations work closely with Fairchild to establish action plans that are site specific. Although not directly responsible for the management of these natural areas, as one of the lead research institutions in the area Fairchild carries out presentations every year to identify the areas that will most benefit from prescribed burns as well as carrying out species reintroduction projects.

With Pine Rockland being a fire-maintained community, species have developed strategies to deal with fire. Slash pine do this by adapting their growth when compared to that of non-fire dependant species. The life stages of *Pinus elliotti* var *densa* are 'Grass stage', 'Rocket stage' and 'Mature growth'

Grass stage is the first part of the trees life and can last for upwards of 20 years. The tree survives as a small tussock of very densely packed needles close to the ground. The needles are dense and clustered around the growing point and prevent fire from damaging the apical bud. In the event of fire, the tight 'puff' of needles is singed but the growing point buried deep within the cluster of needles remains intact. The Grass stage lasts as long as it takes for the plant to put down a deep strong tap root and build up a reserve of energy to be able to fuel the Rocket stage.

The Rocket stage begins following a fire. The tree, only a foot or so tall but possibly 20 years old puts on rapid extension growth. The growth is often described as 'candling' with the leader growing long before sending out lateral shoots. The tree's aim is to get the growing point as high as possible. This is the stage in which the tree is at its most vulnerable. Should another fire sweep through the Rockland, any plants in the Rocket stage would be destroyed. The tree is only safe when the growing point is above the heat of the flames. Historically the Pine Rockland would have experienced fire every two to seven years. As a result, the growth of the slash pine explodes when in the Rocket stage.

When the growing point of the pine is above the height of the flames the tree enters mature growth. The tree is now relatively safe and passing fires will not cause them any lasting damage. In the modern world, the reduction in the frequency of fire within the Rockland puts the mature trees at increased risk. The longer the gap between burns, the more biomass that builds up in the environment. When fire does occur it burns with

Left: A recent wild fire at Nixon Smiley Reserve revealed the prostrate habit of *Serenoa repens* (saw palmetto) in the sandy substrate.
Clockwise from right: *Pseudophoenix sargentii* (Sargent's cherry palm) seed processing requires the removal of the outer red portion of the fruit; Propagation trial that I conducted of *Calyptranthes thomasiana* (Thomas' lidflower), a rare CPC species endemic to just a handful of Caribbean islands; *Consolea corallicola* (Florida semaphore cactus), endemic to the Florida Keys and considered to be the most endangered plant in the whole of the US, is one of the CPC species that Fairchild works with; and a CPC species, *Banara vanderbiltii*, an evergreen shrub first discovered in 1899 and endemic to Puerto Rico. By 1987 this species was listed as endangered with only six specimens surviving in the wild. There are now thought to be 18 individuals left in the wild.

Places visited

Fairchild Tropical Botanical Garden
Coral Gables, Florida
Seminole Wayside Reserve
Homestead, Florida
Hattie Bauer Hammock
Homestead, Florida
Fakahatchee Strand Swamp
Copeland, Florida
Redland agricultural district
South Miami, Florida
Vizcaya Garden and Museum
Miami, Florida
Coconut Grove
Miami, Florida
Deering Estate
Miami, Florida
Nixon Smiley Pineland Reserve
Miami, Florida
West Biscayne Preserve
Homestead, Florida
Goulds Pineland Reserve
Goulds, Florida
Navy Wells Pineland Reserve
Homestead, Florida
Atlanta Botanic Garden, Gainesville
Gainesville, Georgia
Atlanta Botanic Garden
Atlanta, Georgia
Arabia Mountain
Stonecrest, Georgia
Marie Selby Botanical Garden
Sarasota, Florida
Naples Botanical Garden
Naples, Florida
Everglades National Park
Homestead, Florida

much greater intensity and for a longer period. This can carry the fire higher up into the trees and can kill mature pines. Conservation of individual species alone is not enough to save the Pine Rockland habitat. Species reintroduction and reducing fire suppression need to be carried out simultaneously.

Connect to protect

'Connect to Protect' is an outreach project which began in 2007. With 98% of the Rockland environment outside of the Everglades having already been destroyed, this project aims to reconnect the remaining fragments of the Rockland habitat.

The project distributes native Pine Rockland species out into the community. This not only encourages people to garden and be responsible with the natural environment around them but also conserves endangered species.

The scheme provides education to the wider community of the plight of the critically imperilled Pine Rockland habitat and the plants that are found there. Many people in Miami do not realise that the natural areas in and around the city and wider areas are unique to South Florida. Miami has a large migrant community from overseas and from elsewhere within the US. They are automatically disconnected from the native species as they have not grown up living with them. Engagement with them and particularly school children is key to developing a deep and profound connection with the natural world.

Key species

Of the several hundred species that the Conservation Team at Fairchild works with, there are a few that I would like to highlight as keystone species of research and set out the environmental protection that their conservation needs.

Coontie

The first industry in Miami was the production of arrowroot flour that can be made by processing several tropical plant species around the world including the taproot of the Florida native cycad *Zamia integrifolia* (coontie). So many coontie were harvested from the wild that by the early 1930s the population of the *Eumaeus atala* (atala) butterfly had crashed. Native to Southwest Florida, the Bahamas and some of the Caribbean islands, this species depends on cycads as a larval food source. The coontie is the only Florida native cycad so when the species was over-harvested for arrowroot flour production, the atala was left with very few host plants on which to lay its eggs. At one point the species was believed to be extinct in Florida with no confirmed sightings between 1937 and 1959. Until recently the species was a rare sight, the atala still being cited as one of the rarest species of butterfly in the US. Just a handful of caterpillars can completely strip the foliage of the coontie so a large plant population is required to maintain the atala's numbers.

In more recent years, efforts to cultivate the coontie in ornamental settings have increased dramatically and as a result the atala is making a strong recovery. Fairchild Conservation Team are actively propagating coontie to distribute through Connect to Protect as well as monitoring wild populations and it is hoped that the critically imperilled atala will bounce back to its historic population size.

Sargent's cherry palm

One of 11 palm species native to Florida *Pseudophoenix sargentii* (sargent's cherry palm) is the rarest of them all. Endemic to the northern half of the Caribbean Floristic Region, the palm is native only to the extreme south east of Florida on Elliott Key, Long Key, and Sands Key. Within Florida the



species is considered critically endangered.

In the early 1900s a large population was destroyed on Long Key when the plants were dug up for use as ornamentals in landscaping. Now the only natural population remaining in Florida comprises 50 individuals on Elliott Key.

The palm fruits need to be processed before they can germinate. The red skin is removed to reveal a bright orange flesh. This flesh has a tough, waxy texture and is full of germination inhibitors. The seeds are soaked in a beaker of pectinase solution (15 drops from a pipette to 4.5L of water) for seven days.

After soaking the seeds have to be rubbed between your hands to peel the flesh away from the seed. This is a very long process and requires multiple rounds of rubbing and rinsing until all the flesh has been removed.

The seed is then allowed to slightly dehydrate. This allows the seed coat to be cracked with a pair of pliers and removed. The clean dried seed is then soaked for 48 hours in water and then sown and placed on a mist bench. Germination takes 6-8 weeks on average and requires bottom heat. As palm seed does not store well, trials are being conducted to determine actual seed longevity and viability on short to medium term storage.

Centre for Plant Conservation

The Centre for Plant Conservation (CPC) is a not-for-profit organisation that co-ordinates over 50 institutions that have a mission to conserve and restore rare, native plants of the US and Canada. Collectively these institutions look after some of the rarest plants in North America and by extension the world.

The scheme works with each institution conserving species that are local to them and by holding *ex situ* collections to conserve the plant material. Fairchild deals with plants that are native to south east Florida, the Florida Keys and the Caribbean Floristic Region. Fairchild currently work with 66 CPC species, the rarest being *Consolea corallicola* (Florida semaphore cactus), endemic to the Florida Keys and considered to be the most endangered plant in the whole of the US.

Calyptranthes thomasiana (Thomas' lidflower) is found on three islands in the Caribbean. There are fewer than 250 individuals divided amongst the islands of Vieques in Puerto Rico, St John in the United States Virgin Islands, and Virgin Gorda in the British Virgin Islands. It has been extirpated from the wild on Saint Thomas, US Virgin Islands, where it was first described in 1855 and now only grows there in cultivation.

It seems to be a particularly tricky species to work with. By early 2020 no propagation attempts on the species had been successful at Fairchild. I conducted a trial to see if any would root. Four different cutting types were produced; softwood, semi-ripe, semi-ripe heel and hardwood and divided into three groups. Some of the cuttings were treated with 'Dip N Grow' rooting hormone, some with a 1:5 IBA/NNA rooting hormone solution and some had no treatment at all. The cuttings were placed under mist. This was the most extensive trial into the rooting of *Calyptranthes* undertaken at the garden. Almost six months after my trip I received word that two of the cuttings, a hardwood and a semi-ripe heel, both with 'Dip N Grow' had rooted. With luck, the future of this species in the collection at Fairchild has been secured.

Conclusion

My time in South Florida exposed me to a huge range of species and environments, more than I could have wished for. The work that the institutions of South Florida do is outstanding. From world class ornamental and botanical horticulture to the conservation work that is carried out to protect some of the world's rarest plants and by association animal species, is remarkable. The care, consideration and attention to detail that I witnessed firsthand over those three weeks highlighted for me that, with support from industry, the people and most importantly those in power globally, the future of our natural environment is in safe hands.

Before I sign off, I'd like to share something that summed up my experience in Florida perfectly: "Miami Dade County's nature reserves host an ecologically important group of rare species. Just as important, wildflowers are beautiful and can bring enjoyment to those people who stop to appreciate them. After all, when he stopped in the spring of 1513, Juan Ponce de Leon named this area the Land of the Flowers, 'La Florida'."

Thanks

I am forever grateful to the CIH and the Percy Thrower Trust and all the sponsors of the Young Horticulturist of the Year, who not only allow this competition to run for the good of horticulture in the UK but also afforded me the experiences that they did.

Lawrence Wright

My horticultural career began in my local garden centre at the age of 16. Since then I completed a diploma in horticulture at Brooksby Melton College in Leicestershire before moving to Chatsworth House in Derbyshire for a year as a HBGBS student. On leaving Chatsworth I moved to RHS Garden Wisley, Surrey for two years to undertake the Wisley Diploma in Practical Horticulture. Since graduating from Wisley I have been based in Cornwall, working as Head Plantsman at Tregothnan.