

## **Study Trip to East USA**

2<sup>nd</sup> July – 7<sup>th</sup> September 2017

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## Acknowledgments

Enormous thanks must go to the RHS Coke Trust Bursary Fund, The Merlin Trust, The Christopher Lloyd Bursary for supporting this trip. Also, to Dorothy Holley for her continued support and encouragement in my travels and wider career.

There are so many people that helped to make my trip the joy that it was, I could not begin to list all of them but here is a selection:

All staff at Brooklyn Botanic Garden, in particular: Mark Fisher, Leonard Paul, Rowan Blaik, Uli Lorimer, Karla Chandler, Jenny Blackwell, Laura Powell, Nancy Nieland, Wayken Shaw, Maeve Turner, David Castro and Patrick.

Jeffrey Lynch and Adam Dooling at Chanticleer.

Tony Aiello at the Morris Arboretum.

Vic Piatt at My Cuba Centre.

Tom Reber at Bartram's Garden.

Will Hembree for his generous chauffeuring and photography assistance.

Tracie Jeffries.

Frosty, Elaine and Sollie Levy.

Doug Monroe.

Johnny Randall, Amanda and Heather at North Carolina Botanic Garden.

Molly Marquand and all at the New York Flora Association.

Michael Dosmann at the Arnold Arboretum.

Wolfgang Bopp and David Jewell at The Sir Harold Hillier Gardens.

## Budget

### Travel:

Flights - £537.77

Train - £188.28

Metro - £94.90

Bus - £77.68

Car hire - £183.90

Taxi - £65.72

Uber - £114.34

Total - £1262.59

### Grants:

Own contribution - £2014.30

Dorothy Holley - £500

Christopher Lloyd Bursary - £600

The Merlin Trust - £800

RHS - £1100

### Visa:

£12

### Insurance:

£223

### Subsistence:

Accommodation - £2482.94

Food - £15 x 68 days = £1020

### Garden Entry:

£13.77

### Total:

£5014.30

## Introduction

Having spent a few years working in the horticultural industry, I felt the need to broaden my horizons and seek out knowledge from other gardens and other parts of the world. I had heard a lot about the gardens and wild places of North America and already had a couple of contacts on the east coast, so I was eager to explore this part of the world myself. I had two main areas of interest when putting together this trip. One was to visit as many different gardens as possible to see how they are managed and how the staff deal with perennial horticultural challenges. The other was to see plants growing in their natural habitats and to look at their relationship to their wider plant communities.

By working at Brooklyn Botanic Garden and visiting many other gardens I hoped to: gain a broad understanding of how a botanic garden is managed and how these methods differ to those used in the UK; learn how the garden staff control pests and diseases and how the climate affects this, focusing on organic methods; learn how the gardens display and educate people about native flora and how these plants are managed in an ornamental setting; learn what conservation work the gardens undertake to protect local and global flora and if/how they involve the public in this work.

By meeting with botanists and conservationists to study plants in the wild I hoped to: improve my plant identification skills; learn about different conservation techniques to protect rare plant species and prevent destruction of various habitats and plant communities; see first-hand the difference in growth of certain species when grown at sea level through to mountain level and how the wider flora changes at different altitudes.

I managed to cram a lot into this trip and, in addition to my planned itinerary, I visited many more places that were recommended to me along the way. In order to keep this report to a less-than-ridiculous length I have not included these additional stops in this report (aside from putting them in the itinerary). This is due to the fact that, whilst they had a great influence on my horticultural experience in the States, they did not directly feed into the main areas of interest of my trip. I have, therefore, only related my experiences of my planned visits; these are arranged in chronological order with the exception of Brooklyn Botanic Garden which I have not broken up by the various fieldtrips that took place whilst I was there.

## Itinerary

2<sup>nd</sup> July – Fly to Brooklyn, NY.

3<sup>rd</sup> July – Orientation day.

4<sup>th</sup> July – First visit to BBG.

5<sup>th</sup>-28<sup>th</sup> July – BBG placement.

6<sup>th</sup> July – Chanticleer & Longwood.

7<sup>th</sup> July – Pine Barrens, NJ.

19<sup>th</sup> July – NYBG & HortiHoopla.

22<sup>nd</sup> July – Wavehill & Untermeyer.

27<sup>th</sup> July – Planting Fields & Old Westbury Gardens.

29<sup>th</sup> July – The Highline.

30<sup>th</sup> July – Travel to Philadelphia, PA.

31<sup>st</sup> July – Orientation day.

1<sup>st</sup> August – Morris Arboretum.

2<sup>nd</sup> August – Chanticleer.

3<sup>rd</sup> August – Mt Cuba Centre.

4<sup>th</sup> August – Bartram's Garden.

5<sup>th</sup> August – Travel to Atlanta, GA.

6<sup>th</sup> August – UGA campus tour.

7<sup>th</sup> August – Joyce Kilmer.

8<sup>th</sup> August – Big Ivy.

9<sup>th</sup> August – Roan Mountain.

10<sup>th</sup> August – Grandfather Mountain.

11<sup>th</sup> August – Bluff Mountain.

12<sup>th</sup> August – ‘Speaking of Gardening’ conference, Asheville.

13<sup>th</sup> August – Duke Botanic Garden & JC Raulston Arboretum.

14<sup>th</sup> August – NCBG, Chapel Hill & Picture Creek.

15<sup>th</sup> August – Travel to Richmond, VA.

16<sup>th</sup> August – Visit Lewis Ginter Botanic Garden & Maymont.

17<sup>th</sup> August – Travel to New York City, NY.

18<sup>th</sup> August – Stonecrop Garden.

19<sup>th</sup> August – Travel to Phoenicia, NY.

20<sup>th</sup> August – NYFA meeting and walks.

21<sup>st</sup> August – Rest day.

22<sup>nd</sup> August – Meet with Molly Marquand of NYFA and Catskill Native Plant Society to study the native flora of the Catskill Mountains.

23<sup>rd</sup> August – Travel to Boston, MA.

24<sup>th</sup> August – Arnold Arboretum.

25<sup>th</sup> August – Travel to Stowe, VT.

26<sup>th</sup> August – Local hike.

27<sup>th</sup> & 28<sup>th</sup> August – White Mountain National Forest, NH.

29<sup>th</sup>, 30<sup>th</sup> & 31<sup>st</sup> August – Baxter State Park, ME.

1<sup>st</sup> & 2<sup>nd</sup> September – Mount Desert Island/Acadia National Park, ME.

3<sup>rd</sup> September – Travel to Boston, MA.

4<sup>th</sup> September – Mt Auburn Cemetery.

5<sup>th</sup> September – Arnold Arboretum.

6<sup>th</sup> September – Harvard Museum (glass plants). Fly to LHR.

7<sup>th</sup> September – Arrive in the UK.

## Brooklyn Botanic Garden

Having spent my first day in Brooklyn exploring Prospect Park, acclimatizing to the heat of a New York summer and getting used to my new surroundings, on July 4<sup>th</sup> I made my way to Brooklyn Botanic Garden (BBG) for the first time. It was nice to have a walk around by myself before my placement induction on the following day, when I would be overwhelmed with endless introductions and garden tours.

I spent most of my first day being given a tour of the gardens and meeting so many people I couldn't even begin to remember a single name. A girl from South Korea was also starting a short internship so it was nice to have someone else to be new with. We both spent the rest of the day weeding the orchard in the Herb Garden; I was grateful to be in the shade.

During my time at BBG I learnt of a few challenges facing the gardens in general. I was both comforted and saddened to hear the all too familiar story of the garden needing to make cuts and make more money. It is often at the expense of scientific research and the botanically important plant collection in these situations. At BBG many of the family beds have been scrubbed out to make way for mass plantings and near-monoculture, irrigation is left unfixed, and over-designed, impractical new gardens are built. As I have already said, it seems this kind of thing is happening the world over and it depresses me in its utter short-sightedness. It must be said, however, that I am unfamiliar with the pressures of modern-day garden management, so it is a little too easy for me to criticise.

It would not be practical or useful to write a day by day account of my work experience at BBG so I have picked out a few areas which I found particularly interesting.

## Water Conservation

In the last few years, BBG have started a large water conservation project in the gardens. It has taken the form of a new water garden edged with mass plantings of native perennials and shrubs chosen for their abilities to slow down and filter water. The idea is that fresh water can be collected and recirculated through the garden back up to the Japanese Pond whilst reducing storm runoff into the wider water system. A small dam has been constructed to hold back silt and regulate water flow and a pond has been created to hold more storm water than previously possible. With this new system, water from the onsite well will no longer be needed to fill the ponds but can be used to water plants instead. The whole project should reduce BBG's water consumption from about 21 million gallons to 90,000 gallons per year. Interpretation about the project has been placed in the exhibition space in the glasshouses.



View from dam of new water garden at BBG.



Part of the interpretation for the water conservation project at BBG.

## Magnolias

Brooklyn Botanic Garden is fairly well known for its *Magnolia* breeding programme which ran from the 1950s to the early 1990s. It is particularly known for its yellow *Magnolia* introductions including *Magnolia 'Elizabeth'*. BBG was the first to cross an American species, *M. acuminata*, with an Asian species, *M. liliiflora*, to produce *M. x brooklynensis*. There are surprisingly few of the original introductions still in the gardens so the horticulturist in charge of the Magnolia Plaza is trying to source all of the cultivars registered by the programme and reinstate them in the Plaza. This is a useful project as a lot of these plants are no longer in production and so it is important to keep a living record of the work that was done by those skilled, mostly female, plant breeders. *M. 'Elizabeth'* is a particularly interesting one as it flowers so early. Most yellow flowering types wait until the leaves are out before flowering, thus distracting slightly from the blooms themselves.

## Warm Temperate Glass House

I found it strange to work in Warm Temperate because here were some familiar plants from home; rosemary, heathers, *Echium* among them. In England, these all grow perfectly well outside, however, due to the harsh winters here they must be nurtured under glass. The house itself is almost subterranean and is surrounded by mature trees so it does not get an enormous amount of sunlight but this does at least keep the temperature down a little.



Temperate House at BBG

Plants grown in here are mostly Mediterranean with some subtropical plants thrown in. Unfortunately, they are unable to grow Californian plants here due to the high humidity in summer. The BBG education department uses this space a lot to educate people about plants used by the ancients, plants relating to myths and legends and those with a religious significance e.g. *Pogostemon heyneanus*, Indian patchouli.

The main season of interest is early spring when an impressive collection of potted South African bulbs is plunged into the displays for instant effect. Once over, these are then moved back behind the scenes where they are dried out, sometimes topped up with compost to protect them from the summer heat and divided in autumn ready for the next season. After experimenting with mixing a different growing medium for each bulb according to its natural substrate, it was learnt that the best way of growing these bulbs is to pot them all in the same media (potting compost mixed with granite grit) and simply adapt the watering regime for each species.

There are many other plants kept in the 'work' glasshouse; they are either waiting to be temporarily plunged into the display, being bulked up or simply being kept out of sentimentality. Temperatures

can reach 115F in here, so when it gets too hot many plants are taken outside to the propagation nursery so they don't frazzle.

Whilst in the area, I was also shown the terrace outside the glasshouses. This space is also looked after by the area horticulturist, Karla Chandler, and she explained to me the new planting scheme. Aside from café furniture, the terrace is populated by pots of various sizes. These are usually planted up with annuals, sometimes tying in with the planting in the annual beds around the corner. This year, however, she has chosen to use woody and perennial plants. The new design imitates the street plantings which can be seen throughout Brooklyn of specimen trees under planted with semi-shade loving perennials; all plants must be 'water-wise'. Not only is this rather attractive and a change from a lot of container planting but, if it works, it will dramatically cut down on the maintenance of the area as this new arrangement will be able to stay in place for many years to come. A few pots have been kept aside for annuals and these, as with the annual borders, have been planted with a nod to the Georgia O'Keeffe exhibition at the Brooklyn Museum next door.

I didn't get to spend much time in the display house (only about fifteen minutes watering and tidying), as it was far too hot to be working under glass (or outside; we were called in at lunch time as the temperature became too high, 95F, and therefore dangerous to work in). We spent most of the morning repotting some of the citrus collection in the nursery. These were bought with a future citrus exhibition in mind so will not be displayed in the gardens until then. It was not necessarily the correct time to be repotting citrus, however, with the spring taken up with tending to the terrace and autumn monopolised by the potting up of bulbs, summer was the only time left in which to do it. It is a fairly standard procedure: chose a larger pot than the one the plant is currently in (ours was rather too large so a false base was made using small plastic pots with a layer of fleece on top which also improves drainage); put a thin layer of compost on the bottom; remove plant from pot by any means necessary (sledge hammer in our case); trim roots; place in the new pot; back fill with fresh compost to halfway; drop in some magnesium citrus feed pellets; fill in remaining space with compost; water. As in the UK the citrus trees are kept outside in the summer but are moved into a polytunnel for the winter.



*Root pruning citrus.*



*Magnesium citrus feed pellets.*



*Re-potted citrus.*

## Discovery Garden

The Discovery Garden is a relatively new section of the garden being only two years old. It is roughly split into different habitats (woodland, meadow, marsh) with a small orchard, productive garden and 'four seasons'. The aim of this area is to promote science and get children excited about plants and nature. It is an area where kids can really get stuck in: there are magnifying glasses all over the place encouraging people to look closely at the plants around them and at different dried specimens in bottles and jars displayed on tables; there is an area where children can play in the dirt (it is quite simply a bare bit of earth with trowels and forks and whatnot provided - brilliant!); signs ask people to touch the plants to release different smells; there are pots of sticks and leaves for children to make their own bird nests; pond dipping equipment is provided to examine the wildlife in the marsh area; a grassy slope provides the perfect space for hill rolling. This place is just crammed with activities for children of all ages; everything has been thought of. I have never seen a garden successfully engage with children to such an extent. It is truly excellent. Its popularity is fantastic for the gardens of course, however, it made it challenging to work there during opening hours.



*Activity tables in the Discovery Garden.*

There were a few practical issues with the garden. There was no irrigation. At all. In a new garden this is particularly tricky in the summer as it is peak watering time. However, there is access to a few sprinklers which are put on overnight and there is a tap not too far off for spot watering. It was not ideal but the area horticulturist, Jenny Blackwell, seemed to manage. There were also a few problems with the planting. The most obvious issue was that the lovely understory plants chosen for the woodland (*Helleborus*, *Camelia*, *Tiarella*) did not yet have adequate tree cover to protect them from the harsh summer sun. This led to a lot of yellow, poorly looking plants. Once the young trees have grown up to provide enough shade these plants will thrive but that will take time. The best solution seemed to be to plant some sun loving species until the trees are large enough to create a decent woodland habitat. There is, however, a large planting of *Carex pensylvanica* that seems to do equally well in the sun and shade.

A raised boardwalk winds through two large trees (the only remaining specimens from the original order beds) to an oversized birds nest giving the feeling of walking through the tree tops. These trees provided the only bit of shade in the garden, meaning that the underplanting of *Aquilegia canadensis* and *Dicentra sp* are perhaps a little too successful. The seed heads of both are left to provide winter interest and to demonstrate the full reproductive cycle of plants; this results in a lot of seedlings that have to be removed.



*Raised walkway through woodland section of the Discovery Garden.*

It is interesting to note that the majority of plants used are native to North America. This means that the plants are incredibly happy growing in this appropriate environment. However, it does raise issues regarding the control of spreading species. Surprisingly, this isn't as much of a problem as expected. Certain species do seed themselves about but this is an area where it only needs a limited amount of control; these plants are also often easy to just pull out of the ground so they are not tricky to keep on top of. As the nutrient levels of the soil decrease, these species will be checked and allow others to put on a better display



*A section of the small prairie bed in the Discovery Garden.*

A small but beautiful prairie showed off some stunning grasses. Despite the reasonably rich soil nothing was flopping or needed staking. Everything is left standing well into winter to provide food for birds and shelter other wildlife. The whole garden seemed to be left as natural as is reasonable, reinforcing the science focus of the space. Whilst the area isn't supposed to be ultra-ornamental, I still think this garden was beautiful in its own wild way.

Whilst working in this area I learnt about Hydroseeding. It was used to sow a wildflower mix onto a slope on the perimeter of the garden. Seed, cellulose, paper mulch and water are mixed together and sprayed onto the desired surface. This technique stops the seed being washed down the slope and reduces the amount of watering needed for the area. It is an interesting alternative to turf. *Rudbeckia*, *Echinacea*, *Chamaecrista fasciculata* (partridge pea), *Penstemon*, *Solidago* and *Coreopsis* were among the many species that spilled through the perimeter railings and out onto the street, cheering up the grey sidewalk.

### Propagation Unit

I was pleased to be able to spend a day working in the propagation unit. Most of the morning was spent watering and potting on chillies for the autumn chilly festival. However, due to the heat wave we were forced to work indoors in the afternoon so we headed up to the tropical nursery to take some cuttings of a few failing specimens: *Jatropha integerrima*, *Cerbera odollam*, *Tipuana tipu*, *Jatropha multifida*, *Myrcianthes fragrans*. I was not familiar with these plants but was told that they respond to a fairly standard propagating technique. We took semi-ripe cuttings and plunged them into a free-draining medium (3:1:1, perlite, vermiculite, milled sphagnum moss), putting a little hormone on the base (Hormodin no.1 - weak).



*Taking semi-ripe cuttings in the propagation unit.*

I learnt that to kill off weeds, pests and disease in the production houses, they are emptied and sealed up over the summer to naturally heat up to the required, lethal temperature. To control red spider mite, they use a bio-control which comes in a powder form. It doesn't eradicate the population but keeps it under control.

Very little propagation of woody plants is done here due to a lack of space to expand the collection within the grounds.

## Rock Garden

When I think of rock gardens I generally think of alpine plants; this seems to be the tradition in the UK. However, due to the climate in Brooklyn, growing alpines outside is out of the question, it is simply too humid in the summers and they tend to rot. I am told at BBG, a rock garden means a garden with rocks, the planting can vary. There was definitely a focus on growing drought tolerant plants, so it had a similar look to other rock gardens I've seen. A lot of the plants were small and scrubby in open areas contrasting with lush looking plants in the shade.



*The sunny section of the Rock Garden.*

The curator of this area, Laura Powell, is very much focused on sustainable gardening practices. This explains the use of drought tolerant plants so irrigation can be kept to a minimum; new annuals are only watered for the first month, perennials for the first year, except in extreme drought. This is also influenced by the fact that the abundance of large trees makes the ground very dry. Self-seeding annuals are encouraged which reduces the amount of glasshouse grown annuals used, thereby reducing plastic waste and water consumption. These annuals provide a bit of summer interest to a garden which looks its best in spring and autumn. I felt the annuals seem to be a little out of scale with the rest of the planting and because they often come from different habitats in the wild, it looked a little strange in areas. Nonetheless, the general public appreciate the added colour.

Laura didn't use a vehicle to transport tools and compost; this reduced fuel consumption. Instead, a small tool shed had been erected behind some trees close by and small compost piles are secreted

throughout the garden. Quite what happens to these in the long run I do not know as no compost is put on the rock garden; this is to keep nutrient levels to a minimum.

### Native Flora Garden

The Native Flora Garden is one of the main reasons I decided to volunteer at BBG so I was thrilled to able to work in this section for a couple of days.

What sparked my interest was the new section imitating a coastal meadow, upland pine barrens, lowland pine barrens and pond, serpentine outcrop and woodland edges. The original area dates back to 1911 when it was planted with beds of wildflowers arranged by plant family and groves of trees and shrubs to imitate a woodland. Only species found in New York City were to be used so as to conserve the local flora.

There has been a recent obsession with planting wildflower 'meadows' (this word is almost always incorrectly applied) and recreating natural areas which I am in favour of, if done correctly. It could be easy, then, to take this idea of a native garden for granted. However, at a time when there were thousands of plants being brought back from collecting trips all over the world, I think it took great foresight to design a space where the local flora could be protected. Given the rapid expansion of the city and destruction of important habitats, it was an invaluable space to conserve these special plants.



*New section of Native Flora Garden including prairie and pond.*

In 1931 the Local Flora Section, as it was then known, was redesigned. This was to realise another pioneering idea that plants should be considered not as individuals but in the context of the surrounding flora. This meant that the schematic beds were scrubbed out to be replaced by a naturalistic style of planting. Plants were grouped into plant communities that imitated, as closely as

possible, their natural habitat. This new design recognised the importance of observing how plants react with each other in terms of nutrient uptake, seed dispersal, soil improvement etc. It is encouraging to see people coming back to this idea of plant ‘communities’ and imitating natural landscapes, as we have seen in the garden design sphere the last few years, as it was being done over eighty years ago in a botanic garden in Brooklyn.

I was keen learn how one manages a native garden. Inevitably, some plants will outcompete others. It is extremely difficult to replicate those delicate ecosystems found in the wild and in a country as large as the US, I wondered how one would go about limiting the palette of plants used. Here, the plants are all wild collected from within a 150-mile radius of BBG. This includes plants from pine barrens, meadows, deciduous woodlands, coastal and inland wetlands and everything in between.

On my first day working in the Native Flora Garden we started to work in the Meadow, clearing the paths from overhanging foliage and weeds. Originally, the paths were seeded with *Juncus tenuis*, which is very hard-wearing, to keep the weeds down and cover the gravel; unfortunately, the seed was all washed away in one storm so only small patches remain. This year the gardens have had the problem of having too much rain. Combined with the heat, this made the plants grow extremely quickly then proceed to flop all over the place. This was also due to the fact that many of the plants have reached maturity and have therefore sent their roots deep enough to find a layer of nutrient rich soil. I learn that, when this section was put in, three or four feet of rich topsoil was excavated and replaced with poorer soil; this still left a decent layer of nutritious soil underneath, which many plants have now found. In a meadow habitat, a lack of water and nutrients keeps the plants slightly stunted and more compact, ideal for a garden where many different species need to be shown off. This year, plants are big enough to shade out more choice plants and generally make a bit of a mess. The solution was to cut many of the plants down by half, allowing the fresh growth to shoot from the now upright stems and form a more compact plant. This mostly applied to the grasses, as they responded well to the prune.



*Cutting back plants from the path in the Native Flora Garden.*

The management of the meadow mainly consisted of controlling certain species. *Solidago altissima*, for example, can be very aggressive and seed itself everywhere, therefore, plants are either cut before they have a chance to seed or the population is thinned by pulling certain plants. There are also non-natives that seed themselves in from other areas. These are not always aggressive but, being a native garden, shouldn't be there.

The meadow is left over winter for aesthetic interest and to feed the wildlife. It is then cut down with a strimmer with a metal blade in February/March. The plant material is raked off to keep the nutrient levels of the soil to a minimum. Ideally, a controlled burn would be used to clear the meadow but, for many reasons (including the garden being in the middle of a city), this is not allowed.



*Asclepias tuberosa* was a standout species in the meadow in July.

One of the trickiest areas to manage was the pine barrens. Here, the soil used was 90% sand, 2% organic matter, 8% other materials. Even 2% organic matter was too rich for the barrens habitat, .5% would have been more appropriate. The pine barrens in the wild are a habitat like no other and near impossible to replicate. In a garden surrounded by other ecosystems it is incredibly difficult to keep patches of sand free of plants, especially with such a rich soil. It was unclear how this area would be taken forward.

The pond was an interesting area. It was clay lined and only filled by rain water. This meant that after a period of little rain, the water level dropped to expose different communities and all sorts of plants began to pop up along the margins. There was also a healthy population of invasive turtle but apparently there is not much that can be done about that. They, along with the raccoons, were responsible for destroying an area of bog plants. Uli, the Curator of the Native Flora Garden, was hoping to create floating bog gardens on the pond, which would be inaccessible to the raccoons at least.

During my second day in the area the task was to pull weeds (as always) and to deal with various perennials that had got a little too big for their boots and so were being cut to the ground to check them and reduce their eventual flowering height. We also checked the pine trees for pine sawfly. The control for this is to simply cut off infected branches and drown the sawfly in the pond; a much-preferred method to donning a spray suit and using chemicals. These trees are also at risk of the

southern pine beetle which bores into the wood. It tends to only affect older trees, so the young specimens in the garden are safe for the time being but the horticulture staff have to remain vigilant.

I was interested to learn about the development of the Native Flora Garden; it is definitely a slow game. Initially, the mistake was made of trying to replicate a mature habitat from the start. This cannot be done. A lot of plants were squeezed out by young pioneer species making the most of freshly cultivated soil. A lot of species don't come into an ecosystem until nutrient levels are sufficiently depleted, the pioneer species are stunted, the soil is settled and undisturbed and there is room to grow. This means that when planting a meadow, for example, in addition to the initial planting list, a list needs to be made for 3, 5, 10 years down the line, when the conditions are right for mature habitat species. This is not a garden style for the impatient.

In the afternoon, we had the opportunity to take a quick walk through the woodland section of the garden. The area is over one hundred years old so it was fantastic to see giant tree species, including *Liquidambar*, *Liriodenron* and multiple *Quercus*. Poison ivy is grown in this section on purpose (!), it is a native after all. Despite its maturity, the area still needed to be watered in extreme drought to help the understory planting as the trees suck up all the moisture. There was a small limestone area where a nice stand of *Euonymus americanus*, hearts-a-bustin', is planted. The fact that this half of the garden is established means Uli can get away with a more hands-off approach. However, this is not out of choice but due to a lack of staff; a common problem. The area has great potential but at least another pair of hands would be required to put the many plans into action.



*Lobelia cardinalis* growing in a boggy part of the native woodland.



*Goodyera pubescens* successfully established at the base of a tree in the native woodland.

## Chanticleer

On my second day at BBG I joined the students on a field trip to Chanticleer and Longwood Gardens.

Our first stop was Chanticleer. Due to the mediocre weather we had the place to ourselves and were given a tour by the grounds manager, Jeffrey Lynch. Unfortunately, we didn't have enough time to see everything but we got the highlights. We started in the Teacup Garden which was mostly populated by pots and tropical looking plants. Apparently, this was the first year they have used aquatic plants in this area; I thought it was rather effective. There was definitely a focus on texture rather than colour. There was a myriad of different foliage types in every shade of green; coupled with the water, it was extremely calming.



*Pot display in the Teacup Garden.*

The whole garden had an incredibly relaxed feel. There was an informality to the planting and even a playfulness and humour in some places; I'm thinking in particular of the staghorn fern mounted on the outside of the main house like a pair of real stag horns. This atmosphere can be attributed, I think, to the fact that the gardeners who work there have a great amount of freedom. They each have a substantial say in the design of their areas, they order their own plants, they design and make their own hard landscaping features (furniture, railings etc.) They are allowed to experiment, make mistakes and take risks. This all leaves one with the sense of a garden that never stands still, that is always pushing forward and that certainly doesn't look the same from one year to the next.

In most areas the style was surprisingly naturalistic. Thinking forward to the formality we would see at Longwood, I was pleased to find softened edges, drift planting, self-seeding. It felt incredibly English. This may have something to do with the fact that there was a fine drizzle persisting throughout the duration of our tour. I imagine it was also to do with the garden's origins; the person brought in to turn the place into a public garden was English.

We made our way through the various areas around the house and then down into the valley where plantings took another turn for the wild. There was a lot of meadow style planting which could have felt a little stale, given the extensive use of this style in recent years, but it was done so well that it still felt fresh. The amount of these kinds of areas is a hint towards the large sums of money this garden has to play with. Letting plants self-seed and mingle creates all sorts of maintenance challenges that require a lot of time and skill to overcome.



*One of the meadow-style areas at Chanticleer in July.*



*Meadow area on sunny slope in August.*

As well as being creative with the aesthetics of the garden, Chanticleer is also looking at ways they can adapt their garden practices to ease pressures on the environment. For three years the garden has been organic. They do not make this fact public, however, which gives them the freedom to occasionally use chemicals if they think it is necessary; for example, the lawns around the house are still sprayed for weeds. Three years isn't a long time but it was fascinating to hear that since they stopped using pesticides and synthetic fertilisers there has been a big increase in the amount of 'soil biology'. By 'soil biology' I mean microorganisms, fungi, insects, bacteria and the like. They have also seen a reduction in runoff from the frequent downpours they get, easing the pressures on the river that runs through the garden. They perform regular tests to see what difference their new practices are making to the soil. In addition, the majority of lawns are left long for most of the season to encourage wild flowers and cultivated bulbs to thrive. Their current mowing regime is to mow once in the spring before the bulbs emerge and once again in late summer, when the spring bulbs have died down and the autumn bulbs have not yet emerged.

Other things to note: they collect as much rainwater as possible, including runoff from the car park. This is then stored in large tanks to be used throughout the year. They use a low nutrient mulch, made mostly from leaves collected from the local streets in autumn, to dress the beds and keep weeds to a minimum where they don't want self-seeding. The paths are made from a permeable material called Porous Pave which contains recycled tyres; this, again, reduces runoff. Limited changes are made to

the soil. Plants that need low nutrient and water levels are chosen to reduce watering and the need for fertilisers. Airspade is used to break up compacted areas without the need for digging; particularly valuable around the roots of mature trees where they have planted new beds to stop root damage by foot traffic.



*View of the dry garden.*

In August I was able to return to Chanticleer to better explore the garden, which I did not have time to do during my first visit. This time, I was shown around by one of the students, Adam Dooling. We focused on looking around the lower end of the garden which I had not seen. This area was mostly woodland which had not had much attention in the past. Now, they are trying to rejuvenate the area and add more interest. One way in which they are doing this is to ‘improve’ the topography of the area by creating artificial mounds. This is done by arranging found logs and branches into raised beds and back filling with topsoil. This is then planted with classic woodlanders and covered in moss harvested onsite. Over time they are hoping the logs will rot, leaving a stabilised mound which will grow with the build-up of organic matter.



*Artificial mound in woodland garden.*

We touched on the subject of native plants, which are used here to a certain extent (there is *Lobelia cardinalis* growing along the stream, for example); however, the soil is not right for growing more local piedmont species. First and foremost, this is an ornamental garden and they do not see their role to be one of conservation. Nevertheless, it was encouraging to see that efforts were being made to reduce the garden's impact on the local and global environment.



*Lobelia cardinalis* growing along the bank of a stream at Chanticleer.



View of the stream running through the Asian woodland.

## Longwood Gardens

I was intrigued to see Longwood, a garden I had heard so much about. Having already been broadly acquainted with the style of horticulture practiced there, I was hoping to gain a better understanding of the sustainability of their gardening methods. Unfortunately, our tour guide was trained to talk mostly about the history of the gardens and did not have the knowledge to answer many of our group's horticultural questions. However, I did manage to get a glimpse at some positive projects.

After being shown the fountains and extreme (and in my opinion, wasteful) bedding displays which Longwood is famous for, we found ourselves in a beautiful wooded area planted in a naturalistic style, packed full of spring interest plants. I was surprised and thrilled to discover that all the herbaceous plants in this woodland had been rescued from the sites of road building in the Appalachian Mountains. It was fantastic to hear that Longwood has used its vast resources to do a project like this; unfortunately, as far as I could see, there was no interpretation to communicate the story of the woodland to the visitors.

We were then taken to an 86-acre meadow. This was another large project put in action in 2011 when the whole area was plug-planted with native and naturalised plants. It was unclear what was meant by the word 'native'. It could mean plants growing in the local piedmont/coastal plain areas or it could mean anything that grows east of the Mississippi. Equally, 'naturalised plants' essentially means non-natives; hopefully ones that have proven not to be at all invasive. I was surprised that an effort had not been made to focus on local species and to use locally collected seed, as some research has shown this to be the most beneficial to wildlife. However, I can understand that on such a scale, to use wild collected seed could be time consuming and have a negative impact on local plant populations. It being Longwood, there has to be a balance between conservation and providing enough variety and colour to please the public; maybe the powers-that-be did not think this could be achieved with local species.



*View of the meadow at Longwood.*



*Meadow bird box complete with green roof.*

The meadow has provided a home for many different animals due to the variety of habitats present. It is surrounded by woodland and, within the meadow itself, there is a mixture of dry upland and boggy lowland areas. There is an active bluebird monitoring programme which is helped by the presence of bird boxes complete with their own green roofs. The meadow is managed by a controlled burn; one third of the meadow is burnt in March, the rest is left alone.

Another interesting project was the 'green wall'. This was managed without the use of pesticides. Instead, sachets or cards containing bio-control were hung throughout the wall. The bio-control hatches and provides effective control of pests for about 4 months. In some cases, Longwood is able to breed bio-control on site, mostly in tanks in the IPM office.



*Green wall in the conservatory at Longwood.*

Upon asking questions about plant conservation and water usage, I was directed to Longwood's website. There, I found information on the conservation of native and non-native orchids and the garden's water recycling systems, all of which can be read about online so I will not regurgitate that information here.

## The Pine Barrens of New Jersey

On the first day of my placement at BBG I was introduced to the curator of the Native Flora Garden, Uli Lorimer. Moments afterward he invited me and another student to join him on a trip to the Pine Barrens, a part of the world I had never heard of but, upon enquiring, sounded like a place that simply must be seen! On the third day on my placement therefore, I left the gardens once again to visit somewhere I had not planned to go but would turn out to be one of the highlights of my entire trip.

The Pine Barrens are an incredibly unique habitat, populated by, as one might expect, an awful lot of pines but also home to some truly spectacular acid bogs. Whilst you would struggle to find a place like this anywhere else in the world it just so happens that Dartmoor, my actual and spiritual home, is groaning with acid bogs and I saw a lot of plants that were familiar: sundews, blueberries and bog asphodel to name but a few. This place was a little different though. For one thing, the surroundings were slightly cosier than Dartmoor; it's enveloped by forest, the temperature is higher (I imagine for most of the year) and, due in part to the beavers, the rivers run slower. This all results in a much greater number of species to be found.

The aim of the day was to survey a few populations of *Narthecium americanum*, American bog asphodel. This species is endemic to a few states on the east coast and is endangered in two of these, North Carolina and New Jersey. Uli is part of a project to monitor endangered species in the New York/New Jersey area; this mainly involves monitoring the size of plant populations. So, we set off to count some plants!



*West Branch Wading River in the Parker Reserve.*

The day got off to a very promising start when, not ten minutes into the journey, we stopped to buy coffee and doughnuts (a custom I grew very fond of during my time in the US) and after a couple of hours we entered an area called the Parker Reserve. In order to stretch our legs a little before the last bit of the journey, we pulled off the road just beyond a small bridge over the West Branch Wading river. This gave us a taster of what was to come. The river was wide and slow moving, so much so that there was a healthy population of water lilies flowering merrily. On the bank there was *Osmunda*

*regalis* (royal fern), *Schoenoplectus americanus* (chairmaker's rush) and *Ludwigia alternifolia* (seedbox) amongst others. After taking in this wonderful sight we took a little stroll along the verge. The grass is intentionally left long to protect a population of *Platanthera blephariglottis* (white-fringed bog-orchid). We did find some but they were still in bud; exciting to see none the less. We also found an individual of *Asclepias rubra* (red milkweed), a rare sight in this area.

Refreshed from our quick break we continued to our destination. This was down a small, unsurfaced track about a mile off the main road. As we headed deeper into the forest the understory plants of blueberries and huckleberries suddenly disappeared to be replaced by endless *Carex pensylvanica*. This indicated we had arrived at Martha, a long-disused bog-iron furnace. It is interesting that this sedge only grew on the site of the old town, at least in this area. The only other indication that there was ever human habitation here (besides the fenced off ruin of the furnace) was a stand of old black walnut trees planted by the early settlers. After another couple of hundred yards the track petered out so we got out of the car, donned our welly boots and a large amount of bug spray and headed off in search of the bog.



A stretch of bog at Martha.

A short path took us down to the water's edge and with the forest behind us, we looked out onto a stunning sight (that unfortunately could not be captured with my substandard camera). Islands of stunted pitch pine and Atlantic white cedar were peppered through drifts of sphagnum which in turn were intersected by rivulets of the Oswego River. There were carnivorous plants everywhere! We spent a merry time being introduced to the area's flora, trying to avoid being sucked in by the bog, before we started work. This consisted of finding a population of *Narthecium americanum*, recording its coordinates, its size and the number of flowering individuals. All of this information was recorded using a website/mobile app called EpiCollect, a system that allows the user to generate a form for collecting data (including GPS and images) from multiple devices. It was fantastic to be able to record all the necessary data on site, rather than taking notes and inputting the data back at BBG, saving time and keeping many different types of information in one place.



[Add Plant monitoring ...](#) Total: 15, 1/1 < >

View	Delete	Edit	Title	Created At	Monitor name	Plant name	Visit date	Site name
			<i>Narthecium americanum</i>	7th Jul, 2017	AYG, EH, UL	<i>Narthecium americanum</i>	07/07/2017	Martha 1.4
			<i>Narthecium americanum</i>	7th Jul, 2017	AYG, EH, UL	<i>Narthecium americanum</i>	07/07/2017	Martha 1.3
			<i>Narthecium americanum</i>	7th Jul, 2017	AYG, EH, UL	<i>Narthecium americanum</i>	07/07/2017	Martha 1.2
			<i>Narthecium americanum</i>	7th Jul, 2017	AYG, EH, UL	<i>Narthecium americanum</i>	07/07/2017	Martha 1.1
			<i>Narthecium americanum</i>	7th Jul, 2017	Ah Young Gong, Eve Halliday, ...	<i>Narthecium americanum</i>	07/07/2017	Martha 1.0
			<i>Narthecium americanum</i>	27th Jun, 2017	UL	<i>Narthecium americanum</i>	06/27/2017	Webb's Mill
			<i>Narthecium americanum</i>	27th Jun, 2017	UL RA	<i>Narthecium americanum</i>	06/27/2017	Forked River 2.8
			<i>Narthecium americanum</i>	27th Jun, 2017	UL RA	<i>Narthecium americanum</i>	06/27/2017	Forked River 2.7
			<i>Narthecium americanum</i>	27th Jun, 2017	UL RA	<i>Narthecium americanum</i>	06/27/2017	Forked River 2.6
			<i>Narthecium americanum</i>	27th Jun, 2017	UL RA	<i>Narthecium americanum</i>	06/27/2017	Forked River 2.5

Screen-print of EpiCollect form used to record fieldwork data (viewed online).

BBG fieldwork v2 Plant monitoring data form

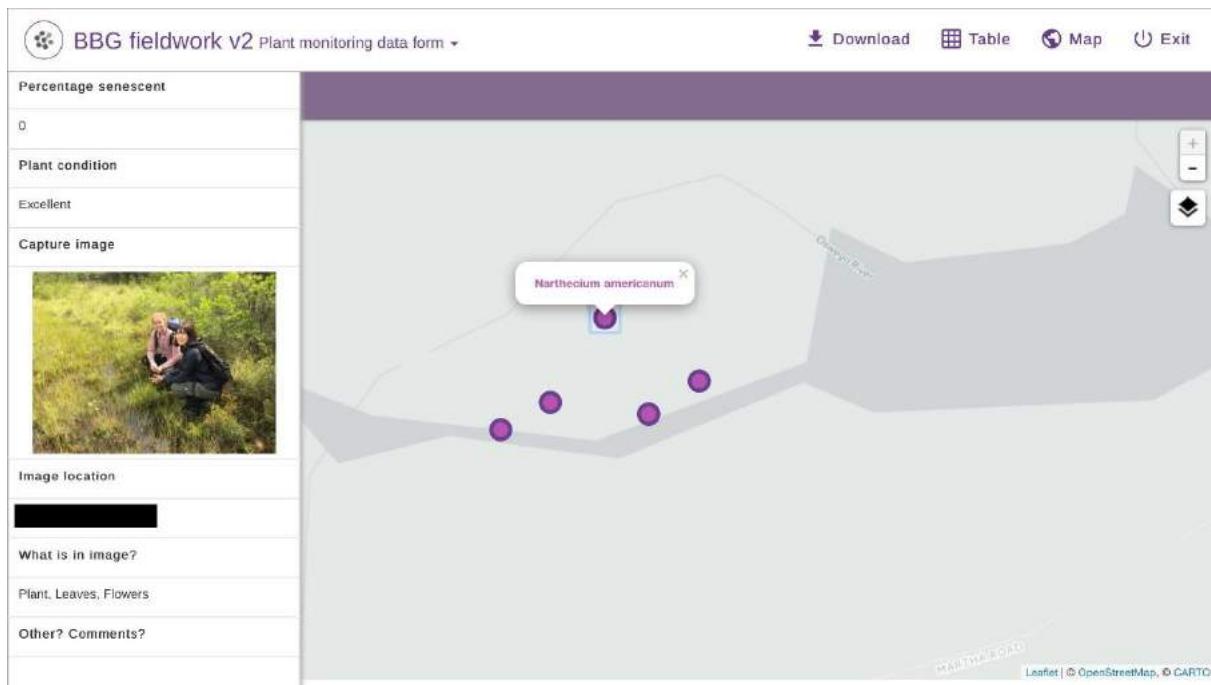
Plant found?	Yes
Area covered	100
Area unit	m <sup>2</sup>
Count unit	stem
Plant count (under 250)	
Estimated count (over 250)	250-500
Minutes counted	10
Percentage cover	6-25
Percentage vegetative	6-25
Percentage flowering	6-25
Percentage fruiting	0
Percentage senescent	0
Plant condition	Excellent
Capture image	
Image location	[REDACTED]

Table Map Exit

monitoring ... Total: 15, 1/1 < >

date	Site name
2017	Martha 1.4
2017	Martha 1.3
2017	Martha 1.2
2017	Martha 1.1
2017	Martha 1.0
2017	Webb's Mill
2017	Forked River 2.8
2017	Forked River 2.7
2017	Forked River 2.6
2017	Forked River 2.5

Screen-print of expanded EpiCollect form showing detailed data.



Screen-print of EpiCollect map showing locations of plant populations, images of the site and other data.

After we had recorded the required number of sites we headed back to the car, snacking on high-bush blueberries as we went.

Over lunch, Uli spoke a bit more about the ecology of the area and other conservation work. I learnt that where fire has swept through an area, pines will be the dominant species as the seed needs open ground to germinate. Whereas, in areas which have not seen wild fires for a long time, oaks dominate as their seed prefers a layer of leaf litter in which to germinate. There have been fires recorded in the Barrens every 100 years or so. Old cranberry bogs have been left to regenerate naturally, restoring the natural flow of the water which is vital for many species. The Pine Barrens are also unique in their amount of disjunct species. Populations of plants can be found growing here that cannot be seen until one gets to Maine in the north or the Carolinas heading south, depending on the species. This is a phenomenon I had not come across before and would like to research further in the future.



Agricultural cranberry bog.

As well as *Narthecium americanum*, Uli also records populations of *Aeschynomene virginica*, *Pyxidanthera barbulata*, *Schwalbea americana*, *Rhynchospora knieskernii* and *Claytonia virginica* var. *hammondiae*. These are just a handful of endangered species that are monitored in the Pine Barrens and across the States. Recording populations of vulnerable species seems to be the main conservation effort in the Barrens at the moment, as much of the area is left to its own devices without much interference (good or bad) from human activity. Its remote location and inaccessibility is helping to keep certain species safe; however, close proximity to large cranberry farms must threaten to upset water flow and nutrient levels. There is obviously a general awareness of the special flora that grows in the Barrens as some areas have been annexed from human activity and steps are being taken to protect species e.g. leaving verges to grow long in the summer.



*Seriously healthy population of Narthecium americanum observed in the Parker Preserve.*

After lunch we headed to another population of *Narthecium*. This one had already been recorded this year so this visit was just for us to see what a really healthy colony looked like. Again, we just pull into a layby at the side of the road, walk a few hundred yards through some woods and are suddenly confronted by a bog packed with *Narthecium*. The flowers were just slightly going over but it was still quite a sight. This was obviously an area of conservation as a raised walkway had been put in so people could walk through the bog without getting their feet wet and, more importantly, without treading on any precious plants. Uli's presence allowed us to step off the boardwalk to get a better look, making sure to keep to the open stream where plants didn't grow. There were similar species here to the other site but the number of asphodel individuals was staggering. After exploring this area for a little while we reluctantly dragged ourselves back to the car and returned to the city.

## New York Botanic Garden

My visit to New York Botanic Garden (NYBG) with the BBG students was another unexpected trip. The purpose of the visit was for the students to attend the 'Horti Hoopla', a conference for horticulture interns. I had not intended to attend this conference and the content was not related to my travel aims so I will not record any details here. Luckily, we had time to explore the garden before and after the main speaker events.

A few of us were given a tour of the production and collection houses. They were vast. Half were dedicated to propagating plants for the glass house displays. At the time of our visit, they were training *Chrysanthemum* for the big autumn festival. The other half housed their astounding collection of mostly tropical and desert plants. NYBG is a botanic garden that still has the luxury of having a science department, so a lot of the plants were there for research purposes only and will never go on display. Our guide explained that, like all botanic gardens, they are struggling against the financial pressure to limit their scientific research and focus on display horticulture that brings in the visitors and the money. I am relieved to see that this is one institution that can still, just about, afford to keep their botanically significant collections going. Interestingly, there is next to no work being done on hardy or woody plants at NYBG. I suppose they've got to draw the line somewhere.



Prairie section of the Native Garden at NYBG.

In the afternoon I got the chance to look at the Native Garden. The Native Garden is an odd one. It is not very old but looks pretty well established; the bonus of using native plants is that they soon fill a space. Peculiarly though, they have mixed species and cultivated plants. I learnt that this is to 'improve and expand' the colour palette to make it more attractive for visitors. I am slightly puzzled by this as there are so many beautiful species plants, I can see no reason why cultivars needed to be used, but that is just my opinion. 'Native', in this context, means any plant from north eastern North America. The area is split into different habitats; woodland, marginals, meadow, desert. Each area had an interesting interpretation board explaining the geography and flora of the different habitats, providing the essential education element to the garden. The prairie area, I felt, was done really well. The

attention to detail in making it as authentic as possible was very effective. For example, rocks had been placed throughout the planting where *Opuntia sp.* grow happily, as would happen in the wild. Other areas felt a little artificial; for example, the bog area consisted of a uniform strip along the two edges of the pond. Again, as at Longwood, there is the desire to strike a balance between a natural looking native plant area and a showy display garden for the public, which is perfectly understandable given the financial pressures botanic gardens face.



*Authentic Opuntia outcrop in the Native Garden prairie.*

Unfortunately, I was unable to talk to a member of staff about other conservation and sustainability issues at NYBG.

## Planting Fields and Old Westbury Gardens

Visiting Planting Fields (an extensive and historical collection of cultivated trees and shrubs) and Old Westbury Gardens was another BBG student field trip I was able to piggyback on to. Visiting two gardens in one day did not give us much time to explore but I will try to relate here the information gathered that is applicable to my travel focus.

Our tour of Planting Fields began in the carpark. There we learnt that a new, porous surface had been used to limit water runoff. New beds had been planted with cultivars of native (not local) plants, e.g. *Echinacea* and bluestem grasses. These had been planted in monocultures, making the areas easier to maintain in terms of weeding but less effective as wildlife habitats.

The arboretum is, like a lot of gardens, understaffed. This means large jobs such as tree work, hedge cutting and pesticide spraying is contracted out. They try to keep chemical use to a minimum, choosing to spray with oils and soaps or introducing bio-control to the greenhouses to cope with pest problems. The team tries to use mechanical controls to cope with invasive weed problems where they can.

Similarly, at Old Westbury Gardens, large invasive weed problems are dealt with by hand as it is believed to be more effective means of control in the long run. Fungicides are used to treat the roses but in the case of rose rosette, plants must be removed and burnt to stop the disease spreading. They also spray for mildew on new *Cornus* plants and to remove weeds from the lawns. In most cases, however, pesticides are used only to treat problems truly damaging to a plant. They will not spray for aesthetic reasons; for example, late season mildew on *Syringa* is left untreated as it is seen to be merely a cosmetic problem. They have also tried using vinegar as an herbicide to spray weedy paths, however, this has only been effective when used on very hot days.



*English-style borders at Old Westbury Gardens.*

Regarding water usage, the herbaceous borders do have an overhead sprinkler system, however, most of the area is spot watered to reduce the wastage of blanket watering and provide better care for each individual plant. This technique is time consuming but is considered to be worth the effort.

## Morris Arboretum

Morris has some stunning trees... truly, truly fantastic specimens. I wish I had had the time to stand and stare at each one individually and take them all in but I only had one day. I met with the curator, Tony Aiello, who was kind enough to show me around. I asked him about sustainable garden practices, pesticide use, water management etc. I think it's fair to say they are sensible about all these things but have not made a dramatic change to the management of the arboretum as a whole, yet. Each gardener has their own way of dealing with things. Like many other gardens they are taking into consideration the heat tolerance of new plantings. This reflects the change in weather they have seen in recent years and in an effort to reduce watering are looking at planting more drought tolerant species.

A remnant woodland (last felled in the 1700s) contained mostly natives with the occasional invasive hanging on including Japanese maples, *Tetradium daniellii* and *Phelodendron* (*Phelodendron* are dioecious so they have been taking out the females first to control their numbers). A lot of the non-natives were taken out to make room for a rather impressive treetop walk way. Here they take 'natives' to be plants from the Pennsylvania piedmont, pretty local in comparison to other gardens.

There was a rose garden. I know it was the wrong season for roses but I did not see a happy rose garden in my entire trip. The plants just hate the climate and so looked rather tired and stressed. At Morris they use non-organic gardening methods until June when there is a big gala held in the garden. After that, they revert to organic methods (when the appearance of the garden matters less, essentially). They do at least keep species diversity in the grass paths, so don't spray for clover etc., which is encouraging.

I fell in love with their partly subterranean fernery. It is small but perfectly formed and packed with between 75 and 100 species (they have lost count on the exact number). And they are mostly species, only a few cultivars have been used. They propagate a lot of the material on site and leave many things to seed, well, spore themselves about.



The fernery at the Morris Arboretum.

We popped in to the propagation department where I met the delightfully friendly and enthusiastic prop team. They mostly focus on propagating woody species (they are an arboretum after all) but do have a few herbaceous and exotics. They tend to focus on plants that cannot be bought in the trade, so a lot of what they are propagating is from wild collected material or is from plants that are failing in the arboretum. They also propagate species from other gardens and arboreta that do not have the facilities to do it themselves.

The arboretum is lucky enough to have a fund dedicated to wild collecting. The focus of the trips is to collect plants from similar climates to Philadelphia which means north China, Japan, Korea, Caucasus and eastern North America. As well as geographical areas, they also target particular species including, *Acer*, *Quercus*, *Ilex*, *Prunus* (flowering cherries), *Rosa* and conifers. The collection material is propagated and, if numbers allow, the young plants are distributed to other botanic gardens and private collections with only a couple kept in the arboretum.



*Outrageously large Cercidiphyllum japonicum at Morris.*

Morris has the luxury of having two botanists on staff. They focus on describing the flora of Pennsylvania, publish books and papers on the subject and manage a database of the flora. There is an effort to combine the horticulture and botanical team to do more ex-situ conservation as the two areas work independently at the moment. As well as local flora, staff at the arboretum conduct research on specific species. Most recently they have been working on a project to discover and record the genetic diversity of *Acer griseum* individuals in cultivation. They have taken samples from gardens all over the world and compared them to wild populations, which are in decline. The results of this research will be published next year. At the moment, this is the extent of the botanical research they are able to do due to the facilities they currently have, however, there are plans to expand their science department which will allow them to conduct more research. This is very encouraging as most institutions seem to be doing the opposite.

After my tour I spent another merry hour gawping at the collection before reluctantly returning to the city.

## Mt Cuba Centre

My visit to Mt Cuba Centre was the time I realised that 'native' is simply a word used by marketing departments to put forward a fluffy image of a garden, it is not necessarily an accurate description of the plant collection.

This does not entirely apply to the Mt Cuba Centre. Historically, it was planted with species native to the Pennsylvania piedmont. However, the collection has now been expanded to include plants from the area between the Mississippi river and the Atlantic Ocean, which is about the same size as western Europe, a rather large area. Of course, if one were to stick to the flora of the PA piedmont, for example, it would limit the plant palette. Not all gardens should be native gardens, it would make for a slightly uninspiring visitor experience if that was always the case. However, I really do have an issue with gardens claiming to grow only natives and find that, not only is the area they are taking plants from not in the least bit local, but also that they include cultivars! I kept hearing this term 'cultivated native'; to me this term feels a little oxymoronic.

I did find Mt Cuba to be utterly lovely. I was given another very informative tour of the grounds by Vic Piatt, Gardens Manager, before I had a wander by myself. There was a small formal garden next to the house. It was planted in the English style (which I was always disappointed to see; it's like going to eat at a local restaurant abroad and finding that all they serve is roast beef and fish and chips). Needless to say, I had not travelled thousands of miles to visit 'English gardens'... nor eat fish and chips.

Moving on, we proceeded to the trial grounds. Now we come back to the 'cultivated native' issue. Here they trial plants for three years, much like the RHS do in the UK. There is a mix of cultivars and species plants here but their focus is on the former. Something that I do find interesting is that the University of Delaware have used this site to study pollinator behaviour. They have been looking to see if various pollinators prefer/benefit more from cultivated natives or species natives. They have not come to any conclusions yet but it will be extremely interesting to read the results of this study.



*The trial garden at Mt Cuba Centre.*

Beyond the trial area is the Natural Garden. This consists mostly of a woodland with sinuous paths leading to glassy ponds and hidden glades. I believe it is best visited in the spring, to catch the spring ephemerals and flowering *Cornus*, or autumn, for the colour. It was, however, still beautiful at the time of my visit. There is also a meadow which is propagated from seed collected onsite. They do also buy in a lot of plugs to replace plants that have failed. The meadow is mown once in spring.



A view of the lower woodland garden and ponds.

A few technical notes: fertilizers are not used, except in the formal pot displays. They are trying to reduce the amount of pesticide they use, preferring to manually remove invasive plants (e.g. pulling poison ivy) or to use a natural product called BurnOut, which they have found reasonably effective. The water in the ponds and rills is recirculated. The water for the whole of the property comes from six wells dotted across their land. Watering is generally kept to a minimum. The beds are mulched with leaf mould, the paths with home-made compost/wood chip.



Pond margin planted with native bog plants.

Unfortunately, the garden no longer makes any wild seed collections; this they are hoping to change in the near future. Hence, all of the plants for the garden are bought in. The outcrop/scree area is the exception, containing mostly wild collected plants from Alabama and Georgia. This is a legacy from the previous director who would go on multiple trips a year to collect plant material. The garden has an impressive collection of *Trillium*; these are also mostly wild collected and will become a collection focus for staff on future trips. There is a drive to start wild collecting again and two members of staff are currently being trained to do so.



*Meadow area at Mt Cuba Centre.*

## Bartram's Garden

When visiting Bartram's Garden, I was lucky enough to take to the water with the PA Botanical Society. We set off in canoes and kayaks from Bartram's Garden to look at the post-industrial habitat on the river bank. This place is unusual simply because it is so diverse. The plants themselves aren't particularly unusual and many are non-native, but there is a great variety of species. One would expect to find a monoculture of Japanese knotweed or similar along the banks, instead, the space was populated by a multitude of different trees, shrubs and a few herbaceous. Despite being on the water we only saw one aquatic plant, *Nuphar lutea*.



*Canoe-top botanizing from Bartram's Garden.*

Returning to dry land I got a tour of Bartram's Garden by Tom Reber, Director of Landscapes and Facilities. Again, I asked questions regarding pesticide use and water consumption. Like most gardens, they are trying to reduce pesticide use and water consumption. The diversity of plants grown keeps pests and disease down but where they do occur, cultural methods are used to deal with the problems, chemicals are a very targeted last resort. If a problem is purely aesthetic, they tend not to take any action.

They no longer collect from the wild but would like to do more in the future. They would also like to reinstate the nursery aspect of the gardens and propagate from the historic collection they have on the property. There is the oldest *Ginkgo* in America on the property and a stunning *Franklinia*.



*Historically significant* *Franklinia alatamaha*.

Unfortunately, the gardens have been neglected in the past and are still looking a little rough around the edges. They have also struggled with finding an identity, which is also apparent when walking around. It sounds as though there are some exciting plans in the pipeline however, so I think in a number of years' time this will be much more of a destination spot.

## The Southern Appalachian Mountains

Throughout my travels through the Southern Appalachians and wider North Carolina I was joined by good friend Will Hembree, a Horticulture Masters student at NCSU and keen plant nerd. He was kind enough to act as my part-time chauffeur and botanising buddy and enabled me to visit gardens and mountains I would otherwise have missed out on without his local knowledge.

### Joyce Kilmer

A trip to the Southern Appalachians would be complete without a visit to Joyce Kilmer, one of the few areas of first growth forest. The main attraction here is the population of ancient *Liriodendron tulipifera*. There is no missing these trees. After walking less than a mile up the trail we saw our first. One would need at least six people holding hands to circle the trunks of these specimens and they *are* mostly trunk; there was very little top growth due to the proximity to other species.



*Me standing between two Liriodendron tulipifera at Joyce Kilmer.*

We saw numerous other interesting species we had a stab at identifying (at this point we did not have a human guide to aid us) including, *Tipularia discolor*, my first sighting of a cranefly orchid. We also saw some familiar species I'd seen cultivated in the UK including *Galax urceolata*, *Hydrangea arborescens* and *Mitchella repens*.

## Big Ivy

Big Ivy is a large area of old-growth forest in Pisgah National Forest, known for its biodiversity and natural beauty. We were joined by Tracie Jeffries, coordinator of the Western NC chapter of the North Carolina Wildflower Society, in Asheville where we piled into her car and drove up to Barnardsville. At some point, the paved road gave way to a dirt track which wound its way through a stunningly lush mesic cove to a small carpark. Despite our pleas, Tracie assured us that if we stopped the car to look at plants on the way we may never reach our destination, so we tried to be patient.



*Forest floor diversity at Big Ivy.*

Our aim of the day was to take a small trail which leads to a wonderful waterfall, taking our time to scrutinise the local flora as we went. August is considered a quiet month in terms of flora here, the drama mostly taking place in the spring with carpets of woodland ephemerals flowering, or autumn, as the leaves change. I was not disappointed however. As a fan of small, green, un-showy plants, I was enthralled by the diversity we encountered. Dozens of different species could be counted in one square foot and as almost everyone single one was new to me, we made slow progress. Personal highlights included *Goodyera pubescens*, *Monotropa uniflora* and *Conopholis americana*.



*Observing spray-cliff community under waterfall in Big Ivy.*

We did eventually make it to the waterfall, where sprayed rocks were host to *Umbilicaria sp*, *Heuchera villosa* and a darling *Cardamine sp*, amongst many other ferns and mosses.

On our drive out of the forest, we stopped at a few other waterfalls and pull-ins. It was hoped that we would be able to find some *Castilleja coccinea*, however, we were out of luck this time. Instead, we happened upon a surprise patch of meadow in a glade, home to *Helianthus sp*, *Lobelia inflata* and *Monarda clinopodia*.

### Roan Mountain

To explore Roan Mountain, we met with one of the foremost authorities on its flora and Professor Emeritus of Biology at East Tennessee State University, Frosty Levy, along with his wife Elaine and his dog Sollie. We started by taking a walk onto the bald where Frosty identified some of the prominent species and spoke a bit about the management of this area.

*Alnus veridis*, a disjunct species, has become a target for removal from the bald. It is suggested that those who manage this area have little experience in dealing with grassland. Trees and shrubs are taking over. The loss of herbivores such as bison and elk by the 1950s has had a big impact on the area, allowing trees to grow without the fear of being eaten. Now, the Forest Service mow the bald once a year in summer in an attempt to eradicate an increasing *Rubus canadensis* population. There is a fear that this treatment may reduce populations of certain desirable species over time, as mowing does not accurately replicate grazing. For example, Roan Mountain is one of the few places one can

see *Lilium grayi* growing. This species is endangered and can only be found in a few sites along the Southern Appalachians through Tennessee, North Carolina and Virginia. The timing of the yearly mow on the bald means there is the potential for the seed heads of *Lilium grayi* to be cut off before they have a chance to ripen and disperse their seed. This could prove to be disastrous for the continuation of this species on Roan. *L. grayi* also suffers from a fungal disease, *Pseudocercospora inconspicua*, which causes the plant material above ground to wilt, preventing the maturing of the flower and seed heads. This species needs all the help it can get but I am unaware of any conservation programme, in- or ex-situ at this time.



*Typically poor specimen of Lilium grayi on Roan Mountain bald.*



*Evidence of fungal leaf spot on Lilium grayi.*

In addition to mowing, there has been a project to graze goats on the bald to check the *Rubus canadensis* problem. This has been running for seven years but no data has yet been collated and it is uncertain whether the project will continue. There has been no grazing on Roan this season. There hasn't been any data collected on the impact of the mowing regime on the bald either.



*The botanizing team on Roan Mountain bald.*

There is a significant problem with *Phytophthora cinnamomi* in *Abies fraseri*, a Southern Appalachian endemic. Some growers in the region are trying to graft *Abies fraseri* on to the rootstock of the more resistant *Abies bornmuelleriana*. There is not much that can be done, however, for the wild populations of the Fraser fir.



*Roan Mountain bald overlooking Fraser fir forest.*

*Angelica triquinata* is another target for removal on the bald, however, it is uncertain of its negative effects on the local ecology but on the face of it, is an excellent plant for pollinators.

We then moved to a different site near the famous ‘Rhododendron Gardens’. In fact, we spent most of the afternoon exploring the edges of the carpark and the verges of a circular gravel track that runs through the area. Because of the popularity of this area when the *Rhododendron* are flowering, the carpark is sprayed with herbicide to kill the weeds during this season but left alone in the quieter months. It was in the corner of the carpark in a fenced off section that I first came across the federally endangered *Houstonia montana*. If it weren’t for the fact it was roped off it would be easy to miss this diminutive plant, therefore, it is fantastic that steps have been made to protect it from the threat of the annual spray and the heavy boots of hikers. This is not the only endangered species we came across on our verge walk. We also saw a surprising number of *Geum radiatum* populations, which, unlike the *Houstonia*, was flowering merrily. Whilst I do not know the details of the species’ protection in this area, there was evidence of coloured flags marking the whereabouts of the populations, suggesting they are monitored. Luckily, these site of *G. radiatum* are growing out of harm’s way on a sloping bank, out of reach of the road or a footpath but easily visible.



*Roadside population of Geum radiatum at the Rhododendron Gardens, Roan Mountain.*

After saying goodbye to Frosty and co, Will and I set off to explore some of the pathways through the surrounding woodland. One such path led us to a viewing point on a rocky outcrop. Taking a slight diversion off the trail we were thrilled to discover a healthy population of *Solidago spithamea* clinging to the side of the rocks, another endangered species only to be found in this tiny portion of the planet. This turned out to be quite the floral hotspot with another population of *Geum radiatum* also present alongside many plants of *Kalmia buxifolia*, another new one for me.



*Geum radiatum and Solidago spithamea growing on rock ledge at Roan Mountain.*

## Bluff Mountain

After one of my contacts unfortunately cancelled at the last minute, I was unsure of whether I would be able to visit the natural wonder that is Bluff Mountain. However, after a few frantic phone calls and broken email exchanges (making contact with people when in the mountains proved tricky) I was able to secure a guided walk of the mountain with Doug Munroe, a self-taught naturalist and long-serving volunteer at Bluff Mountain Nature Conservancy.

We met in the car park of a McDonald's somewhere in Ashe County, piled into the front of his battered, white pickup and headed for the Mountain. During the drive he filled us in on his incredible life history and also a little on the history of Bluff. Between 1914 and 1928, much of Ashe County was clear felled. However, at higher elevations the trees, which had grown gnarly and stunted, were not seen to be worth the effort and so were mercifully left alone. Much of Bluff Mountain escaped the logging and so remains a fantastic forest ecology of over two-hundred years of age; however, many other forests in the county are only just beginning to recover.

Bluff Mountain is home to some eleven ecosystems, ranging from oak-hickory heath to high elevation fen. For the most part, there seems to be a hands-off approach to conserving this area as it is deemed to be a climax forest where nature has reached an equilibrium. However, some intervention is needed. For example, traps have been put up to control populations of the emerald ash borer which is working its way south. Also, controlled burns are carried out in certain areas such as around the fen margins and in sections of oak woodland where maple is beginning to take over. In the areas around the fen, oak saplings are cut down with a strimmer to keep the space open and light to preserve the species diversity.



*Me in front of Bluff Mountain fen.*

Because Bluff Mountain is a site of such ecological importance, there is no public access and it can only be explored with the assistance of a trained guide. Doug was one such guide, and so after unlocking the padlocked gate we made our slow ascent up the very steep, very gravelly track to our starting point. We started our tour on the south-east side of the mountain which is populated by fairly open *Acer saccharum* forest. The leaf litter from the sugar maples makes the pH quite high and so keeps the ericaceous plants at bay further up the mountain. The understory species are mostly *Acer pennsylvanicum* and *Ilex decidua*. The combination of a base of nutrient rich rock (amphibolite) and the 40-60 inches of rainfall a year makes this area particularly lush with a thriving herbaceous layer.

We wound our way up out of the *Acer* ecology to an area dominated by numerous *Quercus sp.*, *Rhododendron* and *Crataegus*. Here the soil was shallower and with a much lower pH. As we moved further up the mountain more ericaceous species began to appear; there were four or five different *Vaccinium* species along with healthy populations of *Kalmia latifolia*. These areas had not been logged and so were home to some wonderful older specimens.

The next ecology we came across, and the one I was most excited to see, was the fen. Bluff fen is one of the rarest ecologies in the Southern Appalachians with 150 species per acre. It is so rare in fact that, at the time we were there, the fen could only be enjoyed from the woodland edge or from a tiny steppingstone trail which stretched only twenty feet into the fen. From there we could still see *Drosera* species, *Eriophorum virginicum*, *Xyris torta*, not to mention the dozens of *Veratrum virginicum* hugging the fen edge.

Dragging ourselves away, we continued on to explore the other ecologies including the fen edge community, oak community, mixed hardwoods, ridge ecology, Perkin's outcrop and, of course, the bluff. There we came across the stunning little *Polygala curtissii* and, tucked behind a scrub of *Rhododendron*, a population of *Liatris helleri*, a federally endangered species we had surprisingly come across the day before on Grandfather Mountain.



*Liatris helleri* found in a rocky clearing of the ericaceous woodland community.

Other ecologies to add to the list were a small grassland in a clearing next to a lake where we saw *Houstonia montana* and *Hypoxis sp.* Also, an old-growth Carolina hemlock forest, *Tsuga caroliniana*; a rare sight after the arrival of the woolly adelgid.

## North Carolina Botanic Garden, Chapel Hill

After leaving the Southern Appalachians we headed towards ‘the triangle’. This is a group of three gardens within an hour’s drive of each other, all associated with the universities of the area: Duke Botanic Garden, JC Raulston Arboretum, and North Carolina Botanic Garden (NCBG). Of the three, NCBG is considered the conservation garden with a strong focus on studying and protecting the native flora of the south-east States and educating the public. I’d arranged to meet Johnny Randall, the garden’s Assistant Director for Conservation, who was kind enough to give us a little introduction to the garden before handing us over to the lovely Amanda and Heather who work in the conservation team.

The garden is split into different habitats which are planted with (mostly) native species including 45 rare plants grown for ex-situ conservation; seeds of these rare species are also held in the seed bank. It is hoped that the collection will be 100% SE USA native in the next 5-10 years. The mountain habitat is the oldest part of the garden having been built in the 1970s. Other areas include a sandhills habitat, piedmont roadside, coastal plain meadow, bog garden, plant families garden and an education garden used to demonstrate how cultivars of native plants can be grown in a domestic garden setting. The garden as a whole is managed using sustainable gardening methods as much as possible. An exception to this is the use of Andro to control fire ant populations. No other pesticide is used in the garden, however, herbicide is occasionally used in NCBG’s conservation areas (1200 acres of local, naturalised land) to control invasive species. In addition to hand-weeding, a blowtorch is used to burn off weeds in areas such as the carpark. A controlled burn of the sandhills habitat and coastal meadow takes place in March to imitate the occurrence of wildfires. Other sustainable practices include the collection of rainwater to irrigate the garden, the installation of a permeable surface in the carpark to reduce runoff and the use of building timber harvested on site to reduce the garden’s carbon footprint and make use of local, natural resources.



*The bog garden at NCBG.*

NCBG is a member of a network of 45 institutions that make up the Centre for Plant Conservation. The focus of the project is on plant reintroductions to the natural landscape. The garden also participates in the Millennium Seed Bank Project. The team conducts research into germinating rare plants including germination trials and creating a propagation protocol for native species; there is a focus on fire-adapted ecosystems and rare plants. Seed collections are made from wild populations, partly to add to the seed bank, partly to grow plants on site to increase the amount of seed available and to use that to increase wild populations. An example of this is *Lilium pyrophilum* (sandhills lily), a species which grows in sand bogs which are subject to wild fires; *pyrophilum* means fire-loving.

The staff in the garden also help with Seeds of Success, a national native seed collection programme. This project has mostly been in the west of the country but since hurricane Sandy in 2012, more money has been given to eastern states to restore destroyed habitats along the coast and in parts of the piedmont. The collection of seed for this project is purely for restoration work and there isn't a focus on rare plants. The seed is collected in bulk and mostly from the coastal regions but some piedmont species are also collected. This is not necessarily a long-term project, however, with the increasing number of extreme storms hitting the US, it may need to continue for a significant time if full restoration of natural areas is to be achieved. When planting out restoration areas, plants are marked with flags to aid with monitoring in the future and GPS coordinates are taken for the plot (not individual plants).



*The seed processing room in the conservation department.*

To raise awareness of native species NCBG chooses a 'Wildflower of the Year'. Free seed packets of the chosen species are distributed across the state, about 4000 packets in total. The criteria for choosing a species are as follows: plants must be showy/attractive, easy to propagate from seed, native to North Carolina and ideally widespread; the seed must be easily collected in bulk and easily mailable (light and not too bulky). NCBG also has a separate seed list from which garden members can choose eight packets of seed to receive for free. Fifty species are chosen to go on the list each year following the same criteria as outlined above. The garden produces 2500-2700 packets of seed a year with the help of a team of volunteers. Most of the seed is collected either from the garden itself or from roadsides. NCBG also holds regular native plant sales throughout the year. Occasionally, the garden teams up with local native plant nurseries to hold larger sales or festivals. For these events, a mixture of species and cultivars of south east US plants are sold.

NCBG does not charge admission which gives them the freedom to focus on conservation projects instead of installing cafés and children's play areas; however, it leaves the garden with limited resources to improve interpretation throughout the garden and to increase their outreach programmes.

After our visit to the NCBG we went off in search of an area of remnant piedmont prairie where we had been told the largest population of the federally endangered *Echinacea laevigata* can be seen. After bushwhacking our way to a pylon clearing we were greeted by a sea of black seed heads left by the very-much-gone-over *Echinacea*. Whilst it was a shame not to have seen this extraordinary population in flower it was still a wonderfully diverse site to visit.



*Population of Echinacea laevigata at Picture Creek.*

## Lewis Ginter Botanical Garden & Maymont

On my way back north, I stopped in Richmond, VA, to visit two recommended gardens: Lewis Ginter Botanical Garden & Maymont. Unfortunately, I was unable to meet any staff from either garden but I feel I managed to get a sense of how the sites are managed from walking around by myself.

Lewis Ginter Botanical Garden (LGBG) is a relatively new public garden, only being opened in 1987. My initial reaction was that it is a garden that focuses on the ornamental, not the botanical; however, when exploring the grounds, there were signs that the gardens are not simply a pleasure ground.

One of the first areas of the garden I came to was the Healing Garden. The area looked a little rundown but the interpretation was informative and it was interesting to see a space that harked back to one of the original purposes of a botanical garden, growing medicinal plants.



The Healing Garden at LGBG.



Interpretation in the Healing Garden.

Other areas of interest were the Asian Valley and Flagler Garden, woodland gardens which, unlike other areas of LGBG, displayed species plants, all clearly labelled, in a naturalistic style. At the Japanese Pond I was drawn to a sign informing the visitor that an experiment was being conducted in chemical-free methods of controlling algae. It was encouraging to see that steps were being taken to reduce the use of chemicals on site.

I also enjoyed wandering the West Island Garden, an area dedicated to native flora, *Sarracenia* species in particular.



*West Island Garden planted with native bog plants.*

An element of the garden I was most struck by was the interpretation. There is a large focus on water conservation, consumption and quality which I was surprised and pleased to see. Not only did signs explain what the garden is doing to conserve water but it also explained how the visitor can do their bit to better manage their water usage.



*Interpretation about water conservation at LGBG.*

Due to the lack of a guide, my visit to Maymont was more an exercise in seeing some excellent old specimen trees rather than studying the management of the site. I did notice a similar attention to water usage and wetlands as I saw at LGBG. A new 'rain garden' was being constructed to display ways of controlling runoff and growing native marginal plants. There was also an area along a stream which had been restored into a wetland site with interpretation on the role wetlands play in the natural world.



*Wetland habitat at Maymont.*

## The Catskill Mountains

My trip to the Catskill Mountains was not as productive as I had hoped due to a lack of transport and limited access to my guide, Molly Marquand, who was, understandably, ruled by the needs of her infant son. However, I was invited to join Molly at the annual meet of the New York Flora Association. This was a brilliant opportunity to meet botanists from all over New York State and learn a little about the local natural history.



*Members of the NYFA inspecting a *Fraxinus* for emerald ash borer damage.*

The day began and finished with botanising walks from the Catskill Interpretive Centre near Phoenicia. It was on these walks I realised I had possibly chosen the least pristine part of the Catskills to explore. Non-native plants abounded but we did get to see a broad range of *Solidago* species and some particularly lovely native shrubs such as *Viburnum acerifolium*.



*Viburnum acerifolium spotted on a botanizing walk with the NYFA.*

I was struck by the lack of plant diversity in comparison to the mountains of North Carolina. I was told that it is because the North East was heavily glaciated in the last ice age resulting in a lot of species being dragged away from this area to southern states such as Florida. Very slowly, species are creeping their way back up the east coast and repopulating old habitats.



A section of the Tanbark Trail.

I had arranged to go on a botanical walk with Molly to look at the local flora, however, a combination of hot weather and the company of a very grouchy toddler meant our walk was cut short. I carried on a little further by myself but the area did not offer much botanical interest. The trail we had chosen was an area used for harvesting *Tsuga canadensis* bark for the tanning of leather. Due to its relatively recent cultivation therefore, the forest had not had much time to restore itself and there was an obvious lack of diversity.



A remaining *Tsuga canadensis* on the Tanbark Trail.

Plans have been made to return to the Catskills to explore some of the more pristine areas at higher elevation.

## New England

Keen to explore some more northerly mountain ranges, I set off for New England.

I started in Vermont where I was able to get above the tree line for the first time on my trip. On my first hike I came across some familiar faces such as *Solidago bicolor*, *Prenanthes* sp, *Monotropa uniflora* and *Actaea pachypoda* among many others. I was also pleased to see my first wild *Cornus canadensis* which was in fruit at the time. It was on this trek that I saw the largest population of *Epifagus virginiana* I have ever seen; unfortunately, this slender, brownish plant does not come out well in photographs.

From Vermont I moved on to the White Mountains of New Hampshire. Here I did two hikes, one taking in Lonesome Lake and the nearby acid bog, the other, a large stretch above the tree line, Franconia Ridge. I was interested to see how the flora changed at different altitudes. Most of my walks started off in valleys of deciduous forest with a common collection of species including *Viburnum lantanaoides*, *Oclemena acuminata*, *Sympyotrichum cordifolium*, *Clintonia borealis* and *Medeola virginiana*. This then transitioned in to coniferous forest where the understory flora reduced in diversity. Common plants in this ecology included *Cornus canadensis*, *Monotropa uniflora*, *Coptis trifolia* and many many bryophytes.



Lonesome Lake.

Common along the lakeside were *Spirea alba* and *Ilex mucronata*. In the bog there were sightings of *Drosera rotundifolia*, *Utricularia cornuta*, *Eriophorum vaginatum*, *Glyceria canadensis* and *Rhynchospora alba*.



Bog community at Lonesome Lake.



Utricularia cornuta.



Eriophorum vaginatum.



Drosera rotundifolia.

Getting above the treeline on Franconia Ridge, the habitat became very rocky and exposed. Small tufts of *Minuartia groenlandica* peppered the landscape along with healthy populations of *Sibbaldiopsis tridentata*. Growing in gaps between rocks were what I believe to be a dwarf alpine form of *Prenanthes trifoliolatus*, also, *Solidago simplex*. A species of *Geum* was spotted along the ridge which may have been *Geum peckii*, a threatened species endemic to the White Mountains. *Huperzia appalaciana* could also be seen in this area.



Alpine communities on Franconia Ridge.



In Baxter State Park, Maine, I climbed Mount Katahdin where there is a rare sedge meadow community. As at Bluff Mountain fen, I was unable to really explore this ecology as the meadow was roped off from the path to protect it from foot traffic. The trail I was following was the final/first few miles of the Appalachian Trail which is incredibly popular and attracts thousands of hikers a year; this results in path erosion and demonstrates the need for such conservation measures. Reasonably unobtrusive signs dotted the path urging walkers to keep off the grasslands and as the path fencing was made of string, it did not detract from the beauty of the surrounding landscape. The effects of this relatively recent conservation project (the string barriers were put up in 2006) were published in the 2017 visitor guide to Baxter State Park, 'Wildnotes', to help draw attention to this extraordinary habitat and its importance to local species of flora and fauna alike.



*Sedge community towards the summit of Mount Katahdin.*

From Baxter State Park I travelled down to Mount Desert Island and, more specifically, Acadia National Park. This was my first visit to an American national park (as opposed to a national forest or a state park). I was struck by the amount of infrastructure that was in place to cope with the visitor numbers, in comparison to national forests for example. There was an extensive network of paved roads, a plush visitor centre complete with interpretation film running in its own little theatre, regular buses and viewpoint car parks everywhere, so one can see from the top of a mountain or a beautiful bit of coastline without having to leave the comforts of your vehicle. It was a bit of a shock to the system having just left Baxter State Park which doesn't even have running water let alone paved roads.

I was here to see how the flora on the coast compared to the inland montane flora. Armed with a copy of 'The Plants of Acadia National Park' by Mittelhauser, Gregory, Rooney and Weber, I set off on a few walks to acquaint myself with the local flora.

My first hike took me along the coastline from Sandy Beach to the north. Due to the geography of Mount Desert Island, it felt very similar to the mountainous areas I had just visited. The coastline is very rocky and populated by coniferous woodland. Instead of plants being battered by high elevation winds

in the alpine regions, here, they are checked by salt spray and Atlantic storms. I came across familiar sights of dwarf *Picea* and *Pinus*, thickets of *Vaccinium* and herbaceous plants such as *Oclemena acuminate* and *Cornus canadensis*. Due to the lower elevation of the island however, I did come across significantly more herbaceous plants than I encountered in the mountains. The standout genus was *Solidago*. The sheer number of species I saw meant I could not begin to identify them without a key; I rarely came across one growing to a height of more than two feet however, which is perhaps a result of the habitat's coastal location. It was also nice to see species of *Symphyotrichum* including *S. novi-belgii*, flowering in situ, as well as *Doellingeria umbellata*.



The rocky, coniferous coastline of Mount Desert Island.

My second walk took me along the North Ridge Trail to the top of Cadillac Mountain. This route took in deciduous rather than coniferous forest and also a fair number of rocky outcrops. In addition to the usual I saw *Diervilla lonicera*, the alien *Hylotelephium telephium*, and species of *Sorbus* and *Amelanchier*. Towards the end of the trail I saw a sign stating that the scrub I was walking past was a restoration area, though there was little other evidence of what the restoration was all about.



Ambiguous restoration area on Cadillac Mountain.

Again, I feel this section of my trip suffered from the lack of a professional guide but I was pleased to have the chance to see some coastal communities whilst in the States.

## Arnold Arboretum

To round off my trip, I paid a visit to the Arnold Arboretum. I was able to have a meeting with the Keeper of the Living Collections, Michael Dosmann, to talk about how the collection is curated and managed.

When the Arboretum was founded in 1872, the collection focus was simply any plants hardy in Boston. In the 1900s the focus shifted from North American species to new plants coming in from East Asia. Now, the Arboretum has a detailed 'Living Collection Policy' which sets out how the collections should be developed, managed and enhanced.

As the Arboretum is a finite space, plants must be removed as well as planted in order to develop the collection. On average, 450 specimens per year are deaccessioned, 10-15% less than the number of specimens planted (350-400). The deaccessioned plants are either specimens which have died naturally or ones that are no longer considered 'valuable' in the context of the Living Collections Policy. For example, some specimens of cultivated origin (often planted as 'place-holders') may be replaced by ones of wild-collected origin. Also, if a specimen comes into the collection but there is no room for it, a tree of lesser value will be removed to create space for the new acquisition. It is clear that one cannot be too sentimental when working within a finite space.



*One of an extraordinarily mature collection of Phellodendron amurense var. lavallei.*

In terms of research being done on site, about 100 projects a year are conducted in the Arboretum. These are not only plant-focused projects but also include research areas such as psycho-sociology, archaeology and ecology among others. Michael is keen that the site is actively opened up to researchers of any subject. To facilitate this research, sometimes a temporary collection of plants is

added to the site for anything from five to ten years. Due to the limited size of the Arboretum however, these types of project cannot be too numerous as there is simply not enough space. There is also a citizen science project being run in the Arboretum to look at plant phenology.



*A bizarre but beautiful multistemmed Metasequoia glyptostroboides.*

The Arboretum is minimally managed with greater attention being placed on the health of the plants rather than aesthetics. For example, plants are not chemically treated for problems which are merely visual, however, chemical treatments will be applied to specimens with serious pest or disease problems. Fire blight has been a big problem in the last four years and 30-40% of the *Fraxinus* collection has had to be deaccessioned due to the emerald ash borer. Again, because of the limited space, it is difficult to separate collections to limit the spread of pest and disease.



*The fruit of Hemiptelea davidii, a new genus to me.*

After the meeting I spent the rest of the day wandering around the collection completely awestruck at the diversity and maturity of the specimens here. It was certainly one of my favourite sites on my trip and I am grateful I managed to fit in more than one visit.

## Summary

I could not anticipate how positive my experiences on this trip could have been. I had the most incredible time and was so lucky to have met such kind and generous people along the way. Everyone I met was keen share their knowledge and I really fed off their enthusiasm for plants, gardens and the work they do.

Despite the diversity of the places I visited, I didn't come across a great variety of management techniques to deal with pest and disease, the change in climate etc. However, it was so encouraging to see every garden I went to taking steps to improve the sustainability of their management methods be it going organic or reducing their water usage. It was also fascinating to see the relationship these gardens had to the native flora. It is easy to be cynical about this recent fad/obsession with native plants and I began to be so myself when I was in the States. However, looking back, I think it is really important to be engaging the public with the plants that grow around them, by any means, and I hope it is a trend that continues into the distant future and is something we may see more of in the UK.

The part of my trip that affected me the most was seeing plants growing in their natural habitat. Studying the native flora is something I love to do when at home but the diversity of species and the range of plant communities I saw in the US was staggering. It has opened up a whole new avenue of exploration for me and I hope this trip will be the first of many to look at plants in the wild. I am already making mental plans to return to the Southern Appalachians to study different bog communities and would love to see places such as Roan Mountain at different times of the year. Nothing can compare to seeing the plants I love growing in their natural environment and I believe it will have a big impact on the way I garden these plants in my future career.



*Inspecting Cardamine clematitis on Roan Mountain.*

## Appendices

### Appendix 1 – Plant list from Pine Barrens trip.

<i>Acer rubrum</i>	<i>Polygala brevifolia</i>
<i>Andropogon glomeratus</i>	<i>Quercus alba</i>
<i>Asclepias rubra</i>	<i>Quercus bicolor</i>
<i>Calopogon tuberosus</i>	<i>Quercus falcata</i>
<i>Carex pensylvanica</i>	<i>Quercus ilicifolia</i>
<i>Chamaecyparis thyoides</i>	<i>Quercus montana</i>
<i>Cladonia sp.</i>	<i>Quercus marilandica</i>
<i>Dichanthelium sp.</i>	<i>Quercus phellos</i>
<i>Drosera filiformis</i>	<i>Quercus prinus</i>
<i>Drosera rotundifolia</i>	<i>Quercus rubra</i>
<i>Eriocaulon aquaticum</i>	<i>Quercus stellata</i>
<i>Gaylussacia baccata</i>	<i>Rhexia virginica</i>
<i>Kalmia latifolia</i>	<i>Rhododendron viscosum</i>
<i>Lophiola aurea</i>	<i>Rhynchospora fusca</i>
<i>Ludwigia alternifolia</i>	<i>Sabatia difformis</i>
<i>Lycopodium adpressum</i> - THREATENED	<i>Sagittaria englemani</i>
<i>Lycopodium alopecuroides</i> - ENDANGERED	<i>Sarracenia purpurea</i>
<i>Lysimachia terrestris</i>	<i>Schizaea pusilla</i>
<i>Magnolia virginiana</i>	<i>Schoenoplectus americanus</i>
<i>Narthecium americanum</i> - ENDANGERED	<i>Toxicodendron vernix</i>
<i>Nymphaea odorata</i>	<i>Utricularia cornuta</i>
<i>Nyssa sylvatica</i>	<i>Vaccinium angustifolium</i>
<i>Osmunda regalis</i>	<i>Vaccinium corymbosum</i>
<i>Pinus rigida</i> - rare dwarf forms present	<i>Vaccinium fuscum</i>
<i>Pinus echinata</i>	<i>Utricularia striata</i>
<i>Platanthera blephariglottis</i>	

Appendix 2 – Plant list from Big Ivy trip.

<i>Acer pensylvanicum</i>	<i>Impatiens capensis</i>
<i>Acer rubrum</i>	<i>Impatiens pallida</i>
<i>Acer saccharum</i>	<i>Liriodendron tulipifera</i>
<i>Actaea racemosa</i>	<i>Magnolia fraseri</i>
<i>Aesculus flava</i>	<i>Maianthemum canadense</i>
<i>Arisaema triphyllum</i>	<i>Medeola virginiana</i>
<i>Aristolochia macrophylla</i>	<i>Micranthes micranthidifolia</i>
<i>Aruncus dioicus</i>	<i>Monarda clinopodia</i>
<i>Asarum canadense</i>	<i>Monarda didyma</i>
<i>Asclepias exaltata</i>	<i>Monotropa uniflora</i>
<i>Aureolaria sp.</i>	<i>Myrrhis odorata</i>
<i>Betula lenta</i>	<i>Pedicularis canadensis</i>
<i>Botrychium virginianum</i>	<i>Podophyllum peltatum</i>
<i>Cardamine sp.</i>	<i>Polygonatum biflorum</i>
<i>Castanea dentata</i>	<i>Polygonatum pubescens</i>
<i>Caulophyllum thalictroides</i>	<i>Prosartes lanuginosa</i>
<i>Collinsonia canadensis</i>	<i>Pyrularia pubera</i>
<i>Conopholis americana</i>	<i>Rudbeckia laciniata</i>
<i>Dennstaedtia punctiloba</i>	<i>Sanguinaria canadensis</i>
<i>Eupatorium purpureum</i>	<i>Thelypteris noveboracensis</i>
<i>Euphorbia corollata</i>	<i>Tipularia discolor</i>
<i>Euphorbia marginata</i>	<i>Tsuga canadensis</i>
<i>Galax urceolata</i>	<i>Umbilicaria sp.</i>
<i>Galearis spectabilis</i>	<i>Uvularia perfoliata</i>
<i>Heuchera villosa</i>	<i>Viburnum acerifolium</i>
<i>Huperzia lucidula</i>	<i>Viburnum lantanoides</i>
<i>Hydatica petiolaris</i>	<i>Viola canadensis</i>

Appendix 3 – Plant list from Roan Mountain trip.

Woodland and bald:

<i>Abies fraseri</i>	<i>Monarda didyma</i>
<i>Achillea millefolium</i>	<i>Picea rubens</i>
<i>Agrostis perennans</i>	<i>Prenanthes roanensis</i>
<i>Alnus viridis (disjunct)</i>	<i>Rhododendron catawbiensis</i>
<i>Angelica triquinata</i>	<i>Sibbaldiopsis tridentata</i>
<i>Danthonia compressa</i>	<i>Solidago roanensis</i>
<i>Deschampsia flexuosa</i>	<i>Sorbus americana</i>
<i>Dianthus armeria</i>	<i>Tragopogon sp</i>
<i>Houstonia serpyllifolia</i>	<i>Urtica dioica ssp. gracilis</i>
<i>Hypericum graveolens</i>	<i>Vaccinium pallidum (altomontanum)</i>
<i>Lilium grayi</i>	<i>Veronica peregrine</i>

Spruce forest:

<i>Acer spicatum</i>	<i>Eurybia divaricata</i>
<i>Aesculus flava (octandra)</i>	<i>Heuchera villosa</i>
<i>Betula alleghaniensis</i>	<i>Juncus tenuis</i>
<i>Cardamine clematitis</i>	<i>Maianthemum canadense</i>
<i>Chelone glabra</i>	<i>Oxalis montana</i>
<i>Dennstaedtia punctiloba</i>	<i>Polypodium virginianum</i>
<i>Dryopteris carthusiana</i>	<i>Solidago glomerata</i>
<i>Eurybia chlorolepis</i>	

Rhododendron garden roadside:

<i>Agrostis scabra</i>	<i>Gentiana clausa</i>
<i>Bromus sp.</i>	<i>Geum radiatum</i>
<i>Carex scoparia</i>	<i>Helenium autumnale</i>
<i>Clematis virginiana</i>	<i>Houstonia purpurea var. montana</i>
<i>Eupterium album</i>	<i>Kalmia buxifolia</i>

<i>Lysimachia ciliata</i>	<i>Solidago arguta</i> var. <i>caroliniana</i>
<i>Packera aurea</i>	<i>Solidago bicolor</i>
<i>Phalaris arundinacea</i>	<i>Solidago curtisii</i>
<i>Rudbeckia hirta</i>	<i>Solidago gigantea</i>
<i>Rumex crispus</i>	<i>Solidago lancifolia</i>
<i>Sagina</i> sp.	<i>Solidago patula</i>
<i>Sambucus racemosa</i> var. <i>racemosa</i> ( <i>pubens</i> )	<i>Solidago rugosa</i> var. <i>cronquistiana</i>
<i>Scleranthus annuus</i>	<i>Stellaria graminea</i>
<i>Solidago altissima</i>	<i>Symphyotrichum puniceum</i> var. <i>puniceum</i>

Rocky outcrop:

<i>Geum radiatum</i>	<i>Solidago spithamea</i>
<i>Kalmia buxifolia</i>	

Appendix 4 – Plant list from Bluff Mountain trip.

<i>Acer pensylvanicum</i>	<i>Liatris sp</i>
<i>Acer saccharum</i>	<i>Liatris spicata</i>
<i>Aconitum uncinatum</i>	<i>Lilium grayi</i>
<i>Actaea racemosa</i>	<i>Lysimachia quadrifolia</i>
<i>Actaea sp</i>	<i>Magnolia acuminata</i>
<i>Ageratina altissima</i>	<i>Monarda clinopodia</i>
<i>Agrimonia rostellata</i>	<i>Parnassia grandifolia</i>
<i>Allium cernuum</i>	<i>Parnassia palustris</i>
<i>Alnus serrulata</i>	<i>Pedicularis canadensis</i>
<i>Amelanchier arborea</i>	<i>Phlox sp</i>
<i>Amianthium muscitoxicum</i>	<i>Phlox subulata</i>
<i>Amphicarpaea bracteata</i>	<i>Physocarpus opulifolius</i>
<i>Aralia nudicaulis</i>	<i>Physostegia virginiana</i>
<i>Aristolochia macrophylla</i>	<i>Podophyllum peltatum</i>
<i>Asclepias syriaca</i>	<i>Polygala curtissii</i>
<i>Asclepias sp</i>	<i>Quercus alba</i>
<i>Aureolaria virginica</i>	<i>Quercus rubra</i>
<i>Campanula americana</i>	<i>Rhododendron sp</i>
<i>Campanula divaricata</i>	<i>Ribes rotundifolium</i>
<i>Castanea dentata</i>	<i>Rubus odoratus</i>
<i>Clethra tomentosa</i>	<i>Salix humilis</i>
<i>Commelina communis</i>	<i>Sanguisorba canadensis</i>
<i>Conopholis americana</i>	<i>Sibbaldiopsis tridentata</i>
<i>Convallaria majalis var. montana</i>	<i>Silene stellata</i>
<i>Cornus alternifolia</i>	<i>Solidago bicolor</i>
<i>Crataegus sp</i>	<i>Solidago sp</i>
<i>Cuscuta rostrata</i>	<i>Sorbus sp</i>
<i>Cypripedium sp</i>	<i>Spigelia marilandica</i>
<i>Drosera sp</i>	<i>Thalictrum sp</i>
<i>Epigaea repens</i>	<i>Trillium sp</i>
<i>Eriophorum virginicum</i>	<i>Tsuga caroliniana</i>
<i>Eubotrys recurva</i>	<i>Vaccinium corymbosum</i>
<i>Eupatorium sp</i>	<i>Vaccinium sp</i>
<i>Euphorbia corollata</i>	<i>Vaccinium stamineum</i>
<i>Eurybia divaricata</i>	<i>Veratrum virginicum</i>
<i>Galax aphylla</i>	<i>Xyris torta</i>
<i>Gaultheria procumbens</i>	
<i>Gentiana austromontana/saponaria</i>	
<i>Goodyera pubescens</i>	
<i>Hamamelis virginiana</i>	
<i>Houstonia caerulea</i>	
<i>Houstonia purpurea (var montana)</i>	
<i>Hydrangea arborescens</i>	
<i>Hypericum sp</i>	
<i>Hypoxis hirsuta</i>	
<i>Ilex verticillata</i>	
<i>Kalmia latifolia</i>	
<i>Laportea canadensis</i>	
<i>Liatris helleri</i>	