Changing our Gardens for a Changing Climate

2007 Fellow's Report

Introduction

This fellowship was primarily concerned with the effects of climate change in California's /New York's botanical and community parks and the part community action can play in mitigating those effects. It aimed to seek practical advice on how a green space strategy or management plan could take account of climate change. By looking at how parks and green spaces could fit into a city's overall environmental policy and by seeking practical advice on water shortage management on park flora and fauna, with particular reference to low tech garden water conservation, it was hoped to learn lessons that could be used in gardens at home. It was also aimed at increasing my knowledge of invasive exotic species, which has been a particular problem in California and is becoming a global biodiversity issue.

This fellowship therefore had two geographically defined aims; Firstly, the community action and community educational aspect of the grant which were largely focussed in the New York State area and secondly, the environmental aspect which was largely focussed in California. There are over 10,000, small community owned green spaces in New York State, many of which were previously derelict and polluted brown field areas in neglected neighbourhoods. The Parks Department has been vociferous in its support of local, community led regeneration and this has been backed up both by hands on and financial support. This report discusses these community gardens in some depth.

The second and largest aspect of this fellowship was the Californian visit. One reason for wishing to visit the botanical gardens in California is that the climate is not dissimilar to South Wales, though drier. Many of the botanical gardens in California have managed to meet stringent water targets by developing innovative watering practices. They have also used techniques such as buffering and extending semi-natural habitat creation in order to increase external impact resilience. Each park has its own unique environmental strategy, which has been developed with natural fire hazard and invasive exotic species control measures in mind. With financial support and an excellent education programme, many of these projects have been used by local schools to teach biodiversity and environmental subjects.

More relevantly to this report, some of the Californian parks have been at the forefront of relearning how to use native species. By reusing and promoting native species, it is possible to reduce the need for water and increase biodiversity. In this way, dramatic plantings can be achieved that requires low maintenance and has minimal moisture demands. Parks visited in California included: Huntington, Descanso, Los Angeles State, County Arboretum, Strybing Botanic gardens and arboretum Berkeley University, Tilden, Santa

Barbara and Rancho Santa Ana. However, to list my entire visit to all these botanical gardens visited would take too long to describe in detail, so for the purposes of clarity I have decided to focus on three of the larger botanical gardens in California: the University of California, the Santa Barbara and the Rancho Santa Ana Botanical Gardens.

The City of New York Department of Parks and Recreation

The City of New York Department of Parks & Recreation is the department of government of the City of New York responsible for maintaining the city's parks system, preserving and maintaining the ecological diversity of the city's natural areas, and furnishing recreational opportunities for city's residents. The total area of the properties maintained by the department is over 28,000 acres (113 km²). The department maintains more than 1,700 parks, playgrounds and recreation facilities across the five boroughs including four botanical gardens. The largest single component of parkland maintained by the department is Pelham Bay Park in the Bronx, with an area of 2,765 acres (11 km²). The department is also responsible for such "flagship" parks facilities as Central Park and Prospect Park.

Community Parks and Gardens

New York has embraced the concept of the community led park and garden. Some influential community parks, such as the Clinton Street Park in the middle of Manhattan in New York City, are inspired by architects and community park visionaries. These are showcases for large and expensive art pieces and are backed by local and very rich benefactors, but others however, are small community led parks and gardens, devoted entirely to creating ecological green space or to growing flowers and bringing useable green space into the heart of a big city. Many of these spaces provide much needed access to outdoor learning for those who otherwise would go without. Like traditional public parks, most community parks and gardens are open to the public, and provide green space in urban areas, along with opportunities for social gatherings, beautification, education and recreation. However, there is a key difference, community parks are managed and maintained with the active participation of the gardeners themselves, rather than tended only by professional staff.

The community gardening movement in New York prides itself on being inclusive, diverse, pro-democracy, and supportive of community involvement. Gardeners may be of any cultural background, young or old, new gardeners or seasoned growers, rich or poor. A garden may have only a few people active or hundreds. Where the New York City Department of Parks & Recreation has been most effective, and where the UK can learn most from its approach, has been in its willingness to embrace the community and use it as a resource for change.

In short, The New York City Department of Parks & Recreation has tried to promote this model of inner city green space management by a three fold approach:

1. Partnerships for Parks - a joint program of Parks & Recreation and the City Parks Foundation - works to create, strengthen and support neighborhood park groups; to link them together, so they can learn from each other and be stronger collectively, and to promote parks in general, so people will join in efforts to restore and preserve them. They provide workshops, small grants, organization development and problem solving to support local efforts to revitalize parks and the neighborhoods that surround them.

There are hundreds of community-based organizations throughout the city that care for parks in their neighborhoods on a regular basis and the City has a dedicated outreach coordinator. The New York City Department of Parks actively encourages community involvement to revitalize parks and the neighborhoods that surround them. Not only do they run a park-based program during the year, but they provide free advice and start up grants. The New York City Department of Parks believes that green spaces can be shared spaces where people of diverse backgrounds and different ages can come together for recreation, enrichment, and personal growth. By making derelict areas active and by placing vital green spaces at the heart of communities, they hope to encourage healthy communities, drawing together the assets and aspirations of neighborhoods.

2. The Urban Park Ranger Volunteer Program is conducted in all five boroughs and is based out of ten citywide Nature Centres. Volunteers serve as much-needed supplements to the surprisingly small staff numbers, aiding Rangers and Nature Center Coordinators in their many duties. In return, Volunteers gain the opportunity to positively contribute to the development of their community while learning new skills and knowledge in parkland environments. Importantly, and very differently from the UK, volunteers are used in the parks themselves as additional gardeners. This has been the most popular aspect of this programme. A recent survey by the Park's Department shows that this is primarily because people who work in office based occupation want to work in the outdoor environment in their time off.

3. The Green Thumb initiative launched in 1978, is a citywide programme to convert any unused green or brown field space, including paved, vacant traffic islands and medians, into flowering gardens. The *GreenThumb* initiative remains the nation's largest urban gardening program, assisting 700 neighborhood groups in the creation and maintenance of community gardens aimed at increasing civic participation and encouraging neighborhood revitalization.

GreenThumb was started in response to the city's severe financial crisis during the 1970s, which resulted in a serious loss of population and housing in neighborhoods throughout the five boroughs. A tremendous amount of public and private land was left vacant, adding an unattractive and unsafe element to these devastated communities.

Lessons Learnt From New York

The City of New York Department of Parks & Recreation has taken a practical approach to its inner city parks and green spaces. In the 1970s, severe budget cuts during a fiscal crisis, a long-term decline in maintenance, and the revival of the preservation movement prompted a new approach to managing many of the city's green spaces and parks. It was out of this crisis that many of the city's community run parks where born. In 1980, the Central Park Conservancy, a private fundraising body, took charge of restoring the park. By 1990, the private organization of the Central Park Conservancy contributed more than half the public park's budget and exercised almost total influence on decisions about its future. This has not happened in the UK, where Local Authorities have been reticent to relinquish power and give over land tenure without sufficient payment. Instead, we have let land sit dormant and many of our oldest parks have suffered from vandalism and lack of maintenance. Perhaps this practical response in New York has been a very American answer to the problem, driven in many cases by the private sector, but that does not mean we don't have much to learn from the many and varied ways in which it has involved communities to revitalise lost areas of green space. I believe that by embracing the community, whether they are wealthy donors, private businesses, local community representatives or individual volunteers, and acting on these varied agendas, it is possible to breathe life into the most neglected areas of our cities.

The Californian State Botanical Garden and the Native Revival

The California Floristic Province, a geographical area that covers most of California, portions of neighboring Oregon, Nevada, and Baja California, is regarded as a worlds hotspot of biodiversity. According to the Jepson Manual, California is home to 5,862 species, subspecies, and varieties of native plants. This figure is comparable to the species in all the other states combined! Of California's total plant population, 2,153 species, subspecies, and varieties are endemic - they occur nowhere else on earth. This botanical diversity stems not only from the size of the state, but also its diverse topography, climates, and soils. This botanical legacy means that California is has been thrust into the forefront of the native species revival, both in terms of biodiversity and invasive species control, and it was for this reason that I chose this area for my fellowship.

At the forefront of this revival is The University of California Botanical Garden. This 34 acre (13.7 ha) botanical garden is located on the University of California, Berkeley campus. The garden is in the campus's Strawberry Canyon which overlooks the San Francisco Bay. It is one of the most diverse plant collections in the United States and famous for its large number of rare and endangered species. Established in 1890, the Garden now contains more than 20,000 accessions, representing 324 plant families, 12,000 different species and subspecies and 2,885 genera. Outdoor collections are in general arranged geographically and nearly all specimens have been collected from the wild.

The botanical gardens include 4,000 California natives, including nearly one-half of the state's native vascular plant species and 174 taxa on the California Native Plant Society's list of rare and endangered species. Also *Manzanitas (Arctostaphylos spp.),* California-Lilacs *(Ceanothus spp.),* and an almost complete collection of California bulbous monocots in the Lily and Amaryllis families *(Fritillaria, Calochortus, Lilium, Erythronium, Allium, Brodiaea).*

Conservation Program

California native plants have been in rapid decline in their land of origin due to pressures from urban development, agriculture, overgrazing, recreation, and invasive non-native species. The mission of the conservation program is to save native plant species and their habitats on public and private lands in California by advocating for the maximum protection of native plants (by encouraging community involvement) and promoting science-based and ecologically-sound land management practices. Perhaps the greatest threat to native species is the introduction of non- native, invasive species. California University Botanical Gardens has been at the forefront of that battle.

When plants that evolved in one region of the globe are moved by humans to another region, a few of them flourish, crowding out native vegetation and the wildlife that feeds on it. Some invaders can even change ecosystem processes such as hydrology, fire regimes, and soil chemistry. These invasive plants have a competitive advantage because they are no longer controlled by their natural predators, and can quickly spread out of control. In California, approximately 3% of the plant species growing in the wild are considered invasive, but they inhabit a much greater proportion of the landscape.

Around the globe and in California, invasive plants (usually introduced from other parts of the world) pose serious threats to the environment. The native plants, animals, and other biota that co-evolved and characterise the many natural landscapes on earth, are often unable to survive once invasive species are introduced - whether intentionally or accidentally - into the local land areas. When exotics begin to colonise these places, each ecosystem is subject to changes that threaten the integrity and longevity of that system.

The immediate consequences of these invasions are not readily perceptible, and before it is known, damage has already occurred. Due an incomplete

understanding of how ecosystems function, it is difficult to determine appropriate control measures to eliminate these invasive exotics, let alone curb further spread. Implementation often involves a long-term financial commitment to solve the problem and it is therefore vital that more work is done in this area both at the academic and local level.

The Californian University Botanical Gardens encourages home gardeners and design professionals to become more knowledgeable about invasive plants. To this end, the garden has prepared a list of invasive plants of concern to the area and a list of landscape plants that are suitable alternatives to invasive exotics. In addition, they run detailed workshops for nursery professionals and the public. They have also produced a simple to read and readily available handout which lists common weedy exotic species that have been planted in the Californian area. Several plants native to California are suggested as better alternatives for the designed landscape, and the garden has a show area where it displays these plants in context.

Using Native Species to Reduce Water Consumption

The Rancho Santa Ana Botanic Garden of 86 acres (34.8 ha), is a botanical garden solely dedicated to native Californian plants. It is located at 1500 North College Avenue in Claremont, California, just south of the San Gabriel foothills. The Garden is a non-profit organisation, open to the public with free admission. The Garden now contains some 70,000 native Californian plants, representing 2,000 native species, hybrids and cultivars. It has been a long term advocate of native species use. Indeed, since 1927 Rancho Santa Ana Botanic Garden has been at the forefront of the cultivation, care and maintenance of California native flora, in addition to ongoing research, education and conservation.

This botanical garden more than any other in California, has advocated for the re-evaluation of native plants in our botanical gardens. It is also a strong advocate for environmental awareness and protection. In this vein, they have strived for a zero mains water use and have set a target to reach this by 2020. They intend to do this in three ways. Firstly, by collecting as much rainwater as possible, secondly by introducing a mixture of old fashioned and state of the state-of-the-art watering techniques, and thirdly by removing as much lawn as possible.

The introduction of the computer-controlled irrigation system, enabled the garden to replace the current antiquated system, but also makes it possible to maintain plants whose watering requirements are highly sensitive and beyond the capabilities of the current system. This system is only used at night when watering is at its most efficient. "The new irrigation system represents an extremely important upgrade to the garden's ability to care for our plant collections and provide our visitors with beautiful plant displays," I was told by Andrew Wyatt, the Garden's Director of Horticulture. "We are excited about

the system because of the reduced water use, labor savings, and the innumerable ways it will benefit our plant collections."

A computer-controlled system, utilising data from weather and soil instruments, eliminates the guesswork for watering plants, therefore significantly reducing plant mortality rates. With precise control over the amount, location, and timing of water applied, the botanic garden will conserve more water and keep plants greener and healthier. This exciting new project will enhance the plant collection and help to meet the stringent self imposed water targets. It also enhances the gardens ability to showcase unrepresented taxa that have more fickle watering requirements, such as water sensitive plants for the exhibits, and the water-loving plants of the lush northern California forests.

However, interestingly the garden has been enhanced by reintroducing the oldest and most old fashioned method of watering imaginable, hand-watering. This may sound rather old fashioned as many gardens have long since abandoned the practice, for less time consuming methods such as sprinklers. Yet, hand watering practice means that water amounts can be adjusted on a plant-by-plant basis. The time spent watering the garden allows you to examine your plants often and closely. Other low-volume systems were also being used and many of them were well signposted for attention to the public. Easy and inexpensive methods such pieced plastic tubing and low-volume sprayers were evident, and well explained with good signage. Such methods are still useful because they can be connected to an outside spigot or a sprinkler system, and can be run on a timer. It is possible to design these systems to provide water to small areas, as needed. For example, they can be set up to water new plants during the establishment period without over-watering nearby low-water use plants. Furthermore, they are easy to check since the spray heads are clearly visible.

One of the biggest advantages of using California native plants is that you can select plants whose water needs match our climate. Once your plants are established, they only need to water them occasionally during dry winters and once a month or less during the dry season - late spring through to fall – to keep them looking good.

Lawns use a lot of water, generate green waste, require fertiliser and pesticides, and must be mowed and edged. For this reason a lot of thought has gone into removing them from the gardens. Where lawns have been kept a mix of Gramma and Buffalo grass is used, partly because it is interesting, and partially because it is native turf. It has fine blades of dark green, which refract light and cut down on water usage. Herbicide controls are also less of an issue as it’s dense enough to crowd out the weeds. For summer use, Gramma grass, *Bouteloua gracilis*, is planted by seed June/July because it grows when it is very hot. After seeding, this only requires water 2-3 x/day for about two weeks. Only misting is needed to keep the germinated seeds wet. Buffalo grass, *Buchloe dactyloides* (native to western prairies, not CA) is then used to fill in. Yarrow, *Achillea millefolium ‘Rosea’*, is also used as a turf substitute (see Lummis House in Los Angeles). As is clustered field sedge,

Carex praegracilus. This requires water, though probably less than traditional turf grasses. It can be mowed occasionally or left un-mowed to create a meadow garden. This attention to detail over such an issue as lawn turf was indicative of the garden's approach and I learnt more from this garden about the practical reality of gardening in a changing climate than at any other.

Education the Public toward the Use of Native Species

The Santa Barbara Botanic Garden is a 26 ha (65 acre) garden, containing over 1,000 species of rare and indigenous plants. It is located in Mission Canyon, Santa Barbara, California. The purpose of the garden is to display California native plants in natural settings. There are approximately 9.2 km (5.5 miles) of hiking trails within the garden. Mission Creek flows through the premises, and includes a rock dam which was constructed in 1806 by Native Americans (mainly Canaliños) under the direction of the Spanish padres of the adjacent Mission Santa Barbara. The garden was founded in 1926 and its focus had narrowed to plants native to the California Floristic Province (which includes a bit of southwestern Oregon and part of Baja California, as well as most of the state of California).

The garden's living collections, including more than 1,000 taxa of plants, are featured throughout 40 acres accessible by public trails. The strength of the collection lies in its diversity, composed of over 140,000 specimens of plants, representing the region's largest scientific collection of preserved central coast plants. Collectively, the specimens document the ecology and geography of the region's plant diversity. However, more than this, I was impressed by the way in which the garden strove to educate the public.

Education

The garden provides successful conservation education programmes at a local level and in doing so, increases environmental knowledge within the community and develops the skills, expertise and commitment needed to address local and global environmental challenges. The Santa Barbara Botanic Garden's educational mission is to increase an understanding of the role of plant life in the natural world. Through increased knowledge of fascinating and complex biological and physical interactions, programme participants gain a deeper understanding of nature and the importance of environmental stewardship.

The garden has an array of education programming that engage adults and children of all interests, backgrounds, and levels of knowledge, in the form of;

- Classes
- Lectures
- Field Trips & Courses
- Certificate Programs
- Workshops in Gardening & Horticulture
- Workshops in Botanical Arts & Culture Programs

- Workshops in Botany & Natural History
- Workshops for Families
- Family Nature Camps
- Weekend and Evening Educational Events for Families

Information about currently scheduled classes, lectures, and programmes is available in the garden's Calendar of Classes brochure and on their website.

On top of this, the garden provides many valuable services for schools. The popular school programmes are aligned with current Science Content Standards for California Public Schools, and include interactive tour and school outreach programs, classroom kits, teacher resource guides and teacher training workshops.

Lessons Learnt from California

Natural landscaping, also called native gardening, is used widely within the botanical gardens of California. The use of plants, including trees, shrubs, groundcover and grass, which are indigenous to the geographical area in which the garden is located, as well as rocks and boulders in place of groomed lawns and planned planting beds to blend the natural surroundings of the particular area, are widely practiced. Although there may be some pockets of such use in the UK, it is by no means as pervasive. This may have come about in California because of climactic necessities, or it may be a result of its unique environment, but whatever the reason we have much to learn from this type of plant ecology. Importantly, the Californian attempt to reintroduce natural species has been driven by the parks and gardens that people respect and cherish, and it is therefore vital that such measures are vigorously introduced into our own botanical gardens.

In theory, natural landscaping is adapted to climate, geography and hydrology, and should require no pesticides, fertilisers and watering to maintain, given that native plants have adapted and evolved to local conditions over thousands of years. Native plants suit today's interest in ‘low-maintenance’ gardening and landscaping, with many species vigorous and hardy and able to survive winter cold and summer heat. Once established, they can flourish without irrigation or fertilisation, and are resistant to most pests and diseases.

Native plants provide suitable habitat for native species of butterflies, birds, and other wildlife. They provide more variety in gardens by offering a myriad of alternatives to the over-planted cultivars and aliens. These plants have co-evolved with animals, fungi and microbes to form a complex network of relationships. They are the foundation of their native ecosystems. Many of the botanic gardens in California have quickly recognised the benefits of natural landscaping due to municipal budget constraints and reductions, but the general public is now benefiting from the implementation of natural landscaping techniques because it has helped to route them within their own

unique environment. Elsewhere in the world this is considered a very modern approach, in California however, many of these gardens have been advocating their use for almost a century.

There was one aspect that all these gardens had in common. They had all learnt that any attempt at re-introducing native species must be accompanied with local education. Invasive species are usually the result of imported plants. These plants become invasive because there are no natural controls such as disease, weather or fauna in their new environment. They take over native habitats, reducing shelter and food for local fauna. Using local provenance plants increases the biodiversity of and is important for the health of a region's overall ecology. Much of our wild areas have been destroyed to make room for development and local people as well as gardeners have to understand the importance of keeping wild areas and green spaces filled with native species on their lots and in their communities. It is through this duel approach of enlightened planting and educating the public that California has succeeded in giving its oldest parks new meaning in the 21st Century.

Conclusion

I feel deeply honoured to have been given the opportunity to tour some of the great parks of New York and California. I feel even more honoured to have been shown these gardens by some of the hard working, day-to-day gardeners that keep them modern, alive and beautiful. New York is a hotbed of radical ideas and offers almost limitless possibilities to learn about community led green space regeneration. California on the other hand, is at the cutting edge of native species reintroduction and the importance of informing the public about global warming.

In the UK, the use of parks will be affected by the general warming expected under climate change, which will mean hotter summers, warmer winters and longer growing seasons. Changes in rainfall distribution, with wetter winters and more frequent summer droughts, will also affect plant use. The trend of climate change means that native species are far more likely to dominate our parks in the future. Moisture loving plantings that are the jewels in many of our parks' crowns - rhododendrons (including azaleas) and hydrangeas - will be increasingly difficult to sustain without heavy irrigation. Choosing more robust herbaceous native plants that can form self-sustaining collections are more likely to be the way forward and should be sustainable under climate change. Turf, especially fine turf, will be hard to grow in the hotter summers of the future and will be less able to resist wear when the increasingly frequent flooding events occur in winter. Considerable capital input will be needed to store water for summer use and to remove excess winter water to ensure that fine turf, including sports turf, will be available. Replacing turf with more resilient vegetation such as wild flower meadows may be unpopular however, parks must have a central role in helping people become accustomed to the hard realities of using plants as the climate becomes drier and more extreme. Once the purpose of these plantings is understood, there will be greater

acceptance of the less formal nature of these plantings. It is at this educational level that we have most to learn from the Californian model.

Parks must help local people understand the horticultural responses to climate change that are applicable in their own gardens. The importance of shade and water features in hot summers and the use of raised beds and water-logging tolerant plants. Permeable hard surfaces to reduce flooding, rainwater storage and use of native species, green roofs, low tech watering systems, are all ways in which parks can provide relevant local models for horticultural practices. Parks in the UK need to ready themselves for this change just as the Californian parks have adjusted to their unique climate, and the New York parks have adjusted to their own communities' very different and changing needs.