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# *A CASTLE IN THE AIR IN CHELTENHAM*: THE REALISATION OF A LANDSCAPE ARCHITECTURE DREAM

**1961. The year the Beatles first appeared in the Cavern Club in Liverpool. It was the year Spurs achieved the double: league title and FA cup. The farthing ceased to be legal tender in the UK. It was also the year that landscape architecture education began in makeshift studios in the Pump Room, Cheltenham, possibly the grandest of the town's Regency buildings.**

**But what were the beginnings of this course? Who were the major players in its creation? Why Cheltenham? What were the early years like? While over some time I have accumulated anecdotal evidence from former staff and students, notably John Simpson and Peter Boswell, it is really thanks to information revealed in Stuart Sutcliffe's letters that I am able to describe the context of the nascent course in landscape architecture in some detail.**

**Stuart Sutcliffe was, from September 1959, a member of staff at the Cheltenham College of Art, responsible with three others for the teaching of architecture there. Times were difficult for non-university-based courses and many, including Cheltenham, were threatened with closure, but the RIBA accreditation panel that year recommended a stay of execution if only the local authority (Gloucestershire) could guarantee a "great deal more in the way of resources". The buck got passed around between RIBA, the college and the authority – there was even a suggestion for a new university to be built at Staverton Airport, but that faded – until the architecture staff themselves decided to grasp the nettle and make a case for developing a course that "did not ape other better endowed schools, but that had a uniqueness that grew from our surroundings and local resources: the art college, the technical college and schools, local skills and offices, and most of all the local environment of the Cotswolds" (1).**

The curriculum was to be restructured and design projects would be focused on the rural (farmland and villages) and urban environments (parks and towns). Previously Stuart Sutcliffe had worked for Crawley Development Corporation where many housing developments involved contributions from landscape architects, sometimes including Bodfan Gruffydd who had arrived at Crawley from Harlow to take over from Derek Lovejoy as chief landscape architect to the new town. "Whereas Derek had had an architectonic approach to landscape, Bodfan's was organic, building on landform and climate, creating place shelter and always providing something for the eye". This new insight into the relationship of architecture and its environment was to inspire Stuart to conclude "Who better to introduce this programme of relating building design to specific environments than Bodfan Gruffydd?"

So Bodfan was initially invited to give two introductory talks on the rural scene and urban landscapes. During his preparatory visits, evening discussions ranged widely and "expanded on the idea of architects learning through landscape to landscape architects sharing the same opportunities. Why not a full-time landscape course?" Realising that the landscape architecture course at Reading was winding down, Bodfan, as the then chairman of the education committee of the ILA under the presidency of Sylvia Crowe, was only too aware of the continuing need for official recognition of the profession through formal educational provision, certainly in a period of obvious expansion. (The employment of landscape architects in local authorities had trebled during the decade.)

Several meetings followed in November 1960, one in particular being held at Stuart's house in Charlton Kings. It was the first meeting of the key protagonists: Messrs Tolson (HMI), Reggie Dent (college principal), Ian Abbott (head of school), Bodfan Gruffydd and Stuart Sutcliffe. Bodfan recalls amusingly being greeted by the principal with "My God, a hooker in the scrum!" – an astonishing comment given that it was the one thing Bodfan excelled at at school. "How on earth did you know that?" "Oh I can pick 'em anywhere". With that the ice was broken, they chatted about rugby over coffee, the meeting progressed, the main agenda item expanded on their castle in the air and the "landscape school was born" (2) with Reggie Dent declaring that such a course "would go like a bomb in Cheltenham" (3).

With the decision confirmed to start a full-time course in landscape architecture in September 1961 ("only ten months away") and to integrate it with the architectural programme, the period that followed was a very active one in terms of further negotiations (with the local authority, the Institute of Landscape Architects and with the College of Horticulture at Pershore) which involved course planning, imperative publicity (there had to be a viable number of applicants, interviewed and places offered) and the appointment of qualified staff.

By good fortune, Bodfan's brother-in-law was director of education for Gloucestershire and it came to light that the local education authorities of Gloucestershire and Worcestershire had a reciprocal sharing arrangement which meant the horticultural facilities at Pershore came under discussion in a mutually advantageous way. "Thus it seemed possible to marry the art of Gloucestershire to the science of Worcestershire" (2). Regarding staffing, Gordon Patterson (ex Stevenage) was approached to see if he would take charge of the landscape course from the second year onwards and John Ingleby, a landscape architect in private practice near Bristol, was appointed part-time.

By September 1961 the idea of a 3-year course had been dropped, replaced with a 4-year diploma. The concept of an integrated first-year for all students (architects, landscape architects and planners) was educationally sound: as Peter Boswell remarks, this was an "exciting vision of cognate subjects being taught side-by-side so that they might carry this interactive experience into their professional lives and hopefully break down perceived barriers". For landscape architects, being educated in an art college also brought the benefits of an ambience of design and creativity (4).

The second year for the landscape students would be spent at Pershore, integrating horticultural aspects into design projects (plant knowledge, soil formation, ecological survey, drainage). The third year would comprise joint projects with the architects back in Pittville and the fourth year, the development of professional skills and a thesis. The upgrading of the architectural course was not forgotten and the equivalent technical input to that which the landscape architects got at Pershore was arranged with Loughborough and the local techical college.

In Stuart Sutcliffe's words, "We launched this fragile craft in September 1961 with three first year architectural and 14 landscape students" and when the RIBA visiting board returned they were "impressed with the developments [and] impressed enough to say there was a great deal of potential in what we were proposing, but not enough evidence to see how it would work out in fact."

Well it did work out in fact as its longevity confirms, and while the course has undergone many changes over the years, subjected to the inevitable vicissitudes of local and national educational policies, landscape architecture at Cheltenham has more than survived; indeed it has flourished, continuing a passion for the subject and vocation which reflects on its origins at the start of the Swinging Sixties and clearly augurs well for another 60 years...

Robert Moore

(1) private communication, Sutcliffe to Aylwin Sampson, 5th May 1982
(2) private communication, Gruffydd to John Simpson, undated
(3) private communication, Sutcliffe to Gruffydd, 11th November 1960
(4) private email, Peter Boswell 14th June 2021
(5) Roger Gill & Ianto Evans (1964) Architects' Journal 15th April vol 139 p 841

# DOES HAVING ACCESS TO LANDSCAPES INFLUENCE CHILDREN'S HEALTH AND DEVELOPMENT?

## Lucy-Ann Brown

Green spaces have been a key element of urban areas since the Industrial Revolution helping to maintain the health and wellbeing of communities (Williams, 2018); this is still the same today. From bringing people together, improving air quality and providing space for leisure activities, there are many benefits of green spaces. In this study, the focus will be on their effects on children in the 8-11 age range, specifically health, development and overall wellbeing when outside in the landscape. Here, the concept of health considers wellbeing in physical, mental and social terms. The term landscape is used to refer to any outdoor space, from open, untouched countryside to town centres and urban parks. Landscapes can be at any scale and can incorporate Green Infrastructure (GI).

### Healthy places

The Landscape Institute (LI) promotes the connection between health, wellbeing and landscapes and has released five principles to ensure 'healthy places' are created, which will also make landscapes a preventative measure for many unwanted health conditions. For example, vegetation, air, soil and water quality can impact on health issues such as asthma, so by improving the quality of these, fewer illnesses would be caused (Landscape Institute, 2013). Vegetation plays a key role in this, reducing urban temperatures through transpiration, particularly in large tree species, leading to green spaces being on average one degree cooler than the surrounding environment (Vardoulakis & Heaviside, 2012; Rolls & Sunderland, 2014).

In economically and socially deprived areas, higher quality landscapes encourage the community to spend time outdoors, reducing crime rates, vandalism and other anti-social behaviours (Glass, nd; Landscape Institute, op cit). Vegetation in the form of high-canopy trees and grass, without restriction to visibility is thought to increase social interactions, leading to residents' greater awareness of what is happening in their community. It also reduces noise pollution as the soft landscape absorbs more sound waves than hard materials, creating a calmer environment.



*Fig 1 Visualisation of communal gardens from the Edward Woods Estate*

The current 'NOURISH' project in the London Borough of Hammersmith and Fulham on the Edward Woods Estate is one example of where the landscapes are benefitting communities. They are using a community kitchen (Fig 1) to allow residents to come together to socialise, as well as promoting healthy eating, SuDS schemes to minimise flooding and GI to increase the air quality of the local area to overall create a 'healthy place' within the capital; this is in line with the guidance issued by the LI on the subject (Groundwork, 2020; LBHF, nd).

Encouraging communities to spend time in the available landscapes benefits mental and physical health by creating opportunities for social interaction and good cycle and footpath connections to nearby places away from roads (Abraham et al, 2009). These landscapes would need to be well-lit, open spaces with good sightlines, so people feel safe using them. This can impact on mental illness by preventing conditions such as depression and loneliness from developing (Peacock, Hine & Pretty, 2007). If individuals feel relaxed and happier each day, they are likely to feel more satisfied with their lives and be less likely to develop chronic stress, depression or anxiety.

Green Infrastructure uses networks of natural and semi-natural elements to protect ecosystems and build sustainable communities, including provision for different habitats, the production and conservation of energy, flood prevention and water management, food production and the management of heat within urban areas (Natural England, 2009; Kirby & Russell, 2015). This naturally includes urban parks and street planting, which helps increase connections between people and nature and covers 'environmental

therapies', encouraging children to explore in nature (UK Government, 2018; Natural England, op cit).

People look for security and a variety of housing types in new developments, as well as cycle and footpath connections that allow residents to not be car dependent and to spend more time outside (Carmona et al, 2020). To help in the design of open spaces, the Greater London Authority (GLA) has created a programme to calculate the area of 'play space' required in housing developments based on the number of children, using data from the 2011 census. In terms of play spaces, the GLA states there should be ten square metres of space per child to provide a large enough area for children to play in groups of varying size (London Datastore: Population Yield Calculator, 2020).

**Children and landscapes**

Discovery, exploration and learning help to create strong neural and social connections, which is particularly important during childhood. Play, imitation and experience are three elements of this and can all be achieved within the landscape (Souter-Brown, 2015). Imitation can, however, lead to negative behaviours and emotions being copied (such as stress), so it is important that influential adults show the correct behaviours for children to copy. This can be seen by parents prioritising schoolwork over time to play; letting the pressures of their own life affect their children's. This shows that designing 'healthy places' is not enough without a change in attitude towards how the landscape should be used. Building such places will help in reconnecting parents and communities to nature, which in turn will allow children to receive the full benefits that nature can have on their wellbeing and allow parents and children to explore nature together, helping families bond (Warden, 2011; Louv, 2013).

To create higher-interest landscapes, community spaces should combine a variety of vegetation and natural street furniture, as well as play equipment. One approach to play uses natural materials (mostly timber) for natural play, creating more ways of playing in nature than on manufactured 'prescribed' play equipment (Land8, 2015). Natural playgrounds are shown to be most beneficial, especially when combined with features including sand, water, interactive planting and tunnels. Using natural equipment also encourages more interaction between children, supporting their social skills (Souter-Brown, op cit). There is concern, however, over the safety of play spaces. Play naturally involves risk taking to allow children to stretch themselves in what they achieve which creates feelings of anticipation (Warden, op cit; Little & Wyver, 2008). Reducing the risk of injury is necessary, but too many precautions can lead to uninspiring landscapes children cannot get the most out of.



*Fig 2 A natural play area in the Shadwell Estate shown close to flats and houses*

Promoting the need for space to play in planning policies allows local organisations and councils to have a focus on what improvements they make and what to prioritise for a minimum standard across the country, regardless of the location, socio-economic status or other local issues. This will help children to be supported in their play rather than limited by what they can access. There are specialist companies working with clients (including local councils and schools) to make natural play more accessible and to ensure the surrounding landscapes in these areas are the best they can be (Timberplay, nd; Fawns Playground Equipment, 2020). The play spaces they help to create offer a variety of experiences to challenge children to understand the world around them, helping them have the best chance in their health and development.

The benefit of natural play features in communities can be seen in the Shadwell Estate (Fig 2). The Tower Hamlets estate's two-year redevelopment features two natural play spaces, providing a place for children to interact with each other, develop their social skills and explore nature, while being able to stay close to home and play with their families (Peabody, 2017). Residents identified this and the allotment planters as their preferred areas of the new site, showing how important community and nature are in deprived areas.

Children's access to nature should continue into the school environment

to help build confidence and develop good social and communication skills, which are essential for them to reach their full potential. The most successful school landscapes provide opportunity for free play, exploration and to support the curriculum, as well as offering children the chance to interact with those of their age (Titman, 1994). Having access to nature during the school day improves attention, learning and encourages good behaviour, as well as a chance to release built-up energy between long periods of concentration. The landscape should also include opportunities to evolve: the outdoor spaces should never be classed as 'finished' in order to allow ongoing development to suit the needs of the school and its pupils (Foster et al, 2006). Formal and informal areas should be included to allow the whole landscape to be used.

The landscape can be used to support the whole curriculum, also known as outdoor learning. To support this, spaces should be included within the landscape for different group sizes and space for a range of activities from writing to acting/movement. Spaces for outdoor learning need to be accessed from the main building, with free-flowing spaces between the landscape and main building to create a seamless transition. Additional features such as sports equipment can be included in the landscape design; however natural wildlife areas can provide 'free' resources to be used across the curriculum. Using the landscape in this way can benefit children with learning difficulties, through both the positive wellbeing of nature and the different learning environments which help with concentration and confidence in the work they produce (Billimore et al, 1990). It can also make topics more memorable giving children positive experiences both at school and in the landscape.

**Forest schools**

There are other uses for the school landscape to support a well-rounded education: forest schools and school allotments. Having a stimulating space to connect with nature can allow children to develop skills that may not be found so easily in the classroom, including responsibility and confidence (Cohen, nd). There is also the option for planting in forest schools and allotments to include sensory qualities (such as colour and texture) which help develop motor skills, language and problem solving (Forest Schools Education, nd; RHS Campaign for School Gardening, nd; Educational Playcare, 2016). They have been shown to improve confidence, teamwork and communication skills in a way that traditional classroom teaching cannot. Space for unstructured activities (such as free play) is also essential to create a well-rounded landscape. This should include open spaces, seating, shelter and 'dirt' areas for investigating the landscape (Jackson, 2017). Play equipment used in these spaces should be suitable for all ages within the school with minimal supervision. Although safety is imperative



*Fig 3 A forest school area (photo: Richard Irvine; Creative Commons Licence)*

within schools, children's imagination and creativity should not be affected by this. The planning of school landscapes is key to their success. They are often last to be planned when developing a school, resulting in limited resources to work with and teachers lacking in confidence to deliver lessons outside. 'Learning through Landscapes' works to solve these issues by developing landscapes and providing training for teachers to become more confident at using the outdoor spaces available to them (Learning through landscapes, 2020). This can allow more children to access the benefits of the outdoor classroom.

Although this is prominent in all ages, being able to play in a natural environment during the formative primary school years can help strengthen areas of development such as social skills and coordination that in turn, help children with all aspects of their current and future life.

**Research intentions**

At the start of this investigation, it was intended for children to be part of a focus group at junior schools in urban and rural areas to provide a comparison of the role landscapes play in rural and urban settings. Due to

the Covid-19 pandemic and the subsequent school closures, this could not take place. For safeguarding reasons, it is not practical to send an online questionnaire out to children, so the focus of the primary research was shifted to look at how those working closely with children view the role that landscape plays on children's health, wellbeing and development. Therefore such a questionnaire was sent to those who work directly with children to show how children access the landscape and the effect this has on their health and development. It was also sent to parents and carers and those who work in other roles with children. The questionnaire was sent out at the beginning of May 2020.

The questions directed at parents and carers focused on how children use landscapes outside of school: how often, who with and what types of spaces they use. Longer questions looked at how parents felt spending time outside affected their child's health and development and what benefits were seen. They were also asked whether there were any reasons their child could not play outside to indicate what prevented children accessing the landscape. The last set of questions focused on their use of landscapes at school and extra-curricular clubs to find out if the child could spend additional time outside (from the earlier question), and if so in what way was this beneficial. Although those working at schools and clubs also participated, the aim was to find out the impact of time outside when a child is at home.

In the planning stage of the original research, contact was made with primary schools in south east England and staff were helpful in providing information in how they measure child development in the school environment. Questions asked what types of landscapes were available at each school to show what spaces children had access to and whether they were well maintained. Staff were asked whether they lead outdoor learning regularly, what subjects they take, and if not, what stops them. These questions provide an insight into whether children are able to benefit from outdoor learning and what those benefits are. When talking to staff about areas of development, the following key areas measured in the school environment were academic progress, physical development, problem-solving, risk taking, resilience and overall attitude. Staff were asked to grade these areas on a scale of one to five, showing the degree the participant felt children were impacted. Social development and confidence were also added to the questionnaire. The last section asked those who work with children in other capacities how they use landscapes. Types of roles that would be asked included but were not limited to sports coaches, guiding/scouting leaders and youth workers. The questions the participants were asked were a combination of the previous sections to identify how landscapes benefit children outside of school but in a way that could be different from the home environment. Questions asked included the types of landscapes used and how often, how spending time in nature affects health and development, and the same areas of development graded by school staff.

The participants mainly work with junior school aged children (8-11 years), although those who work with older or younger children were also asked to participate to provide a holistic view on the role of landscapes in children's health and development. This age group was chosen as this is a foremost period where time to play is valued, particularly outside. A study carried out by Girlguiding UK (2019) revealed 47% of girls aged seven to ten did not have access to a playground within their community, and 30% did not have access to a park, emphasising that a large number of girls cannot safely interact with a green space. It could be predicted that it also reflects similar numbers for boys from a demographic point of view. By focusing the research on this age group, it will show what spaces children regularly use and what may prevent them using their community spaces, which in turn can help designers and planners create 'healthy places' to improve the health and wellbeing of children and young people.

The results collected from the questionnaire survey are analysed below. The reliability of the results is dependent on the ability of the participant to accurately assess areas of children's development. Notably 54% of participants were school staff, who are professionally trained to accurately and quantifiably assess children's development across different areas. It must be acknowledged that parents' views are more subjective when talking about their own child, but this does not negate the comments they make.

| | Parents | School staff | Other roles | TOTAL |
|---|---|---|---|---|
| Inner city | 9 | 14 | 2 | 25 |
| Suburban | 55 | 54 | 5 | 114 |
| Rural | 20 | 8 | 12 | 40 |
| TOTAL | 84 | 76 | 19 | 179 |

*Table: Profile of participants*

**Participant information**

The questionnaire was shared with schools, nurseries, parents and other organisations that work with children including girlguide and scout leaders, and 140 people responded, with many having two roles leading to a balanced split between parents/carers (85 responses) and school staff (76). Other roles accounted for nine responses, giving an insight into how landscapes are used in settings outside of home and school life. (The type of area lived/worked in was also recorded.) The 8-11 age range was the most

common between the three roles, showing that is the group where most of the results will be focused which is the same age range as Key Stage 2 in education. There are sufficient returns from the other age ranges which will allow for a comparison between results.

**Landscapes in the home environment**

Parents were mainly asked about their child's access to landscapes when not at school. The first section asks what spaces are regularly used, how often and who with (as shown in Figs 4, 5 and 6). 8-11 year olds are shown to play more with siblings and friends, which is likely to be due to their age, being able to do more unsupervised play in the garden without the need for parents to be always watching. There are common reasons as to why children could not use outdoor space which did not vary across ages. These were the weather, time (for parents to supervise younger children and with other family commitments), safety and the distance (and money needed) to travel to a suitable landscape for the age range of the child. Parents of the 8-11 years old stated that their child had too much homework and extra-curricular activities to spend much time outdoors, particularly after a day at school. Throughout this age group, children are in their formative school years and start to be given more homework, as well as added pressure of secondary school entrance exams which will limit their time to play outside. It is unclear from the comments made whether the added workload is purely from schools, or whether parents put pressure on prioritising schoolwork over play times as found in the literature review.

When asked if they saw any benefits to their child spending time in nature, there were only positive comments, with the most common responses being

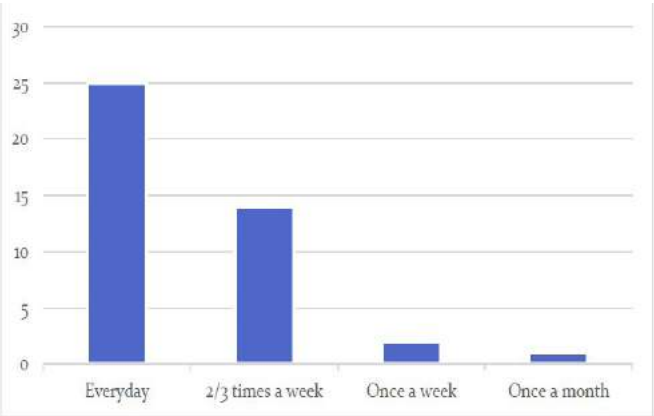


*Fig 4 Frequency of outdoor play for 8-11 year olds in the home environment*

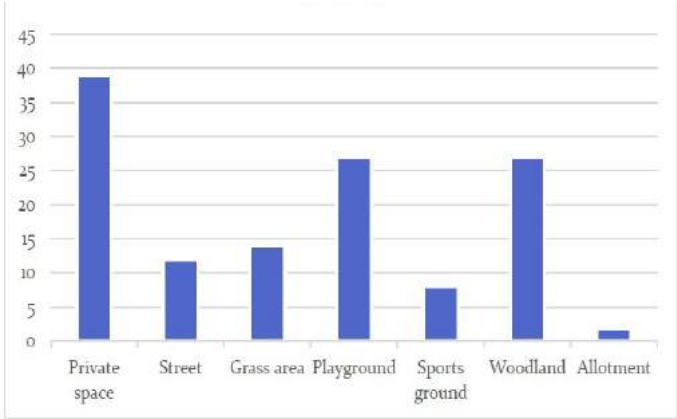


*Fig 5 Types of landscapes used by 8-11 year olds in the home environment*

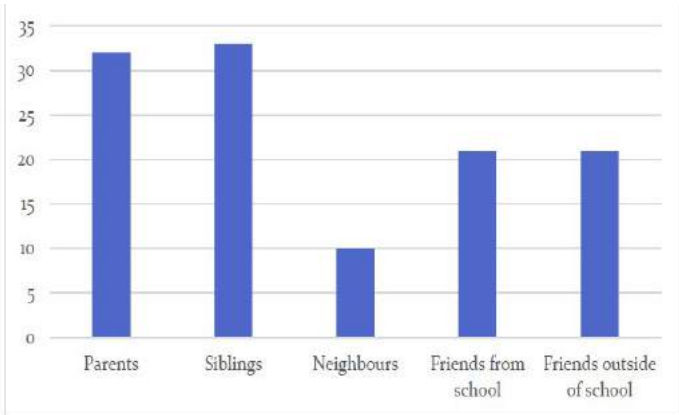


*Fig 6 People sharing with 8-11 year olds in the home environment*

that children received exercise and were stronger and fitter from it; it burnt off energy, particularly after a day at school; and they are happier than if they had been inside. The better mental wellbeing also includes comments such as being calmer, having freedom to do what they want and to make their own choices; and they were able to escape pressure from the school day. This was said to help them sleep better. Parents of younger children also reported that their child was able to explore nature first-hand, seeing and exploring the world in their own way, which would allow them to continue to develop and benefit from time in the landscape while in the 8-11 age group. When asked if parents found them to be more advanced than their peers, there was an even split between those who said 'yes' and 'no'.

This could be due to parents not knowing whether their child's peers spend as much time outside as their own child.

Being able to spend time outside, particularly in public spaces, helps improve cognitive development. Social skills become more developed by interacting with adults and other children. Playing in the landscape has also been shown to help develop imagination, encourage creativity and provides space for role playing (which can help with confidence, communication skills and cooperation with others). Other skills are also shown to have improved, including fine and gross motor skills, core body strength, neural development and problem solving. Children were also said to have a greater appreciation for nature, particularly when compared to their peers.

Regarding whether either the child or parent would like them to spend more time outside, there were mixed responses, with an even split between 'yes' and 'no', although there was a slightly higher proportion of positives among parents whose child plays outside once a week/month. Those who said 'no' supported this with comments such as 'they spend a lot of time outside already', despite their going outside multiple times a week. Some children 'wanted to use electronic devices instead of playing outside' which was more common among the 8-11 age range than other age groups. Extra-curricular clubs were a reason preventing children accessing landscapes. Some of these clubs do use outdoor spaces regularly, including sports clubs (football, cricket, athletics, hockey, rugby and tennis being the most common), horse riding, cycling, forest school and guiding/scouting clubs. At school, parents said their children do use the school landscape, especially areas featuring hard playgrounds, grass space with natural play elements and school allotments. Some children in the 8-11 age range used forest school areas although this was more common with younger children. Parents reported their child enjoyed having time outside to use the spaces for socialising and playing with friends as an 'escape' from the confines of a classroom. Time in the landscape at school and at clubs is looked at later.

When these results are compared by demographic location, there were not many differences. Those living in inner city areas regularly use landscape spaces, with lots of positive connection to nature reported. Some responses did report, however, they had to travel to parks and play areas that were suitable for their child's age and, with 8-11 year olds, spaces are not safe to play in unsupervised. In suburban areas, wildlife spaces and forest schools are very popular at school for 8-11 years. There were lots of benefits observed for their children spending time in nature, mostly from those living in rural areas, and more children took part in outdoor based clubs and more outdoor learning at school which led to better physical and mental wellbeing. This shows that children in all locations do have access to landscapes, although as may be expected, being closer to cities does reduce the number of times they are able to access spaces due to green spaces not being so available.

**School landscapes**

The focus of the questions for school staff was on the types of school landscapes commonly available, whether they were used often and how these affected areas of children's health and development in areas such as academic progress and resilience. This section considers responses from class teachers, teaching assistants, leadership staff, special needs coordinators, tutors and specialist teachers including early years practitioners, music teachers and a school improvement worker. The most common features of the school landscape include a hard landscape space, a grass area, a wildlife area (which includes forest school) and an outdoor learning space. These results were encouraging as inner-city schools did have an equal amount of outdoor space to use when compared to other areas. A total of 94.9% of participants said the spaces were well maintained, which is a positive sign that children were able to use the available landscapes.

All responses said that children did enjoy using the spaces and the staff noticed a difference in behaviour when time outdoors was restricted. It was noticed that junior school children were more disruptive and easily distracted during lessons when they had not been able to go outside during a set playtime. Some staff also reported that children became more argumentative with each other, were likely to fight and not as likely to share resources with each other. In terms of the impact on education, staff said the quality of work was poorer and often lesson plans had to change to be more engaging, to include activities that involved 'hands on' learning. This was particularly important for children with additional needs who might struggle with concentration or be restless even with access to the landscape. These results show that outdoor spaces within the school environment were important in allowing children learn at their best. Without having time outside to release stored up energy, there is an overall negative effect on behaviour which does lead to an impact on their learning and development.

When asked about whether they regularly took learning outside, an overall majority said they did and thought children were more engaged when learning in the landscape. In primary education, the curriculum changes from the early years, to child-led learning which makes outdoor education less accessible. Staff comments said outdoor learning usually occurs when the topic being taught suits the setting. This includes science lessons (particularly when based on nature), art and physical education. Other subjects taken outside were reading, maths and drama. When asked if there was anything that prevented staff using outdoor learning, the most common

responses were weather, space and school policies. Weather and space were linked in some cases as staff said there were no sheltered areas within the school landscape suitable for wet or hot weather. The comments on school policies were surprising and disappointing as (particularly) teachers felt they were expected to have written work in books to document learning, despite there being aspects of children's development that cannot be so recorded (such as resilience). Some staff also said that the school leadership team discouraged working outside, meaning staff did not feel comfortable taking groups outside. There were behaviour issues noted as some staff felt children resorted to playtime behaviour and did not always take the work seriously in such a 'different' environment.

To make outdoor learning more accessible, staff felt more space was needed as most schools could not accommodate more than one class out at one time, particularly in inner city areas. Covered seating areas would be beneficial. Staff also said more equipment was needed, ideally stored outside to reduce the time needed to set up an outdoor lesson. Training was another topic which came up a lot, with staff wanting more information on how to adapt classroom teaching to outdoor learning as well as support on behaviour management outside. It was also said that training would help staff understand the importance of outdoor learning which would help reduce the emphasis on book work, particularly for leadership staff. This links to the work of 'Learning through Landscapes' which should be promoted more within schools to show there are resources available. In terms of space and equipment, this is a more internal school issue as money to develop available space differs between schools.

Differences in behaviour between structured and unstructured time outside were noted for those working with 8-11-year olds, with noticeable advantages of both. Structured time can allow children to be more engaged and remember more about what they are being taught. There are times when staff observe children getting distracted by play elements of the landscape, however others find the novelty can lead children to be better behaved so outdoor learning is more likely to happen again. Staff also said it was a good time for children to interact with others and become more tolerant of other people outside their friendship group. Children with special needs were also said to find this easier as there were fewer social pressures for them to worry about. For unstructured time, responses affirmed the opportunity to release energy between focused lessons, and to develop social skills and confidence. Children can spend time with friends, as being around people they feel safe and are also more likely to express themselves without feeling judged. There were reports on negative effects unstructured time brings as there are times arguments are not resolved before they must come back in, causing lesson time to be interrupted while these are dealt with.



The last part of the questionnaire looked at whether staff felt time in the landscape affected different areas of wellbeing and development. Most responses were positive, showing that the areas were greatly affected by being outside and the results are shown in Fig 7. Access to a landscape does impact on development, providing benefits such as social development more easily than can be found in the classroom setting. Between demographic locations and age groups, this did not change as positive benefits were seen by most participants.

**Other landscape uses**

Those registering as working with children in other capacities mainly included girlguide and scout leaders, but there were also responses from an occupational therapist, a private music teacher and a vicar. The types of landscape and frequency of use for 8-11-year olds are shown in Figs 8 and 9. With most of the participants running after-school activities, to only use landscapes seasonally makes sense as winter weather can be restrictive. Most participants (94.4%) said the spaces they used were well maintained, which shows that most landscapes available can be made use of for extra-curricular activities and all responses said children enjoyed using these spaces. Furthermore 66.7% said they did notice a difference in behaviour when children cannot go outside, with concentration and motivation often affected. Those leading after-school activities also said children often became agitated if they could not go outside, some being hyperactive and finding it harder to express emotions as safely.

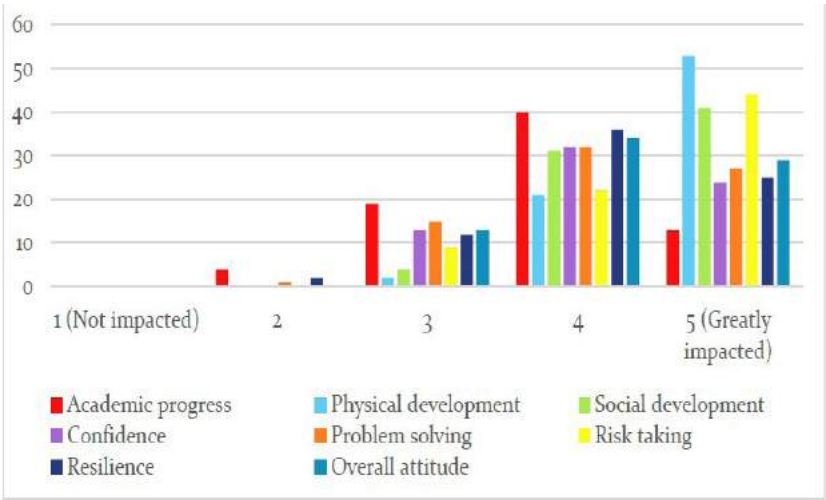


*Fig 7 How different areas of development are affected by time outside was reported by school staff (column order reflects key sequence)*

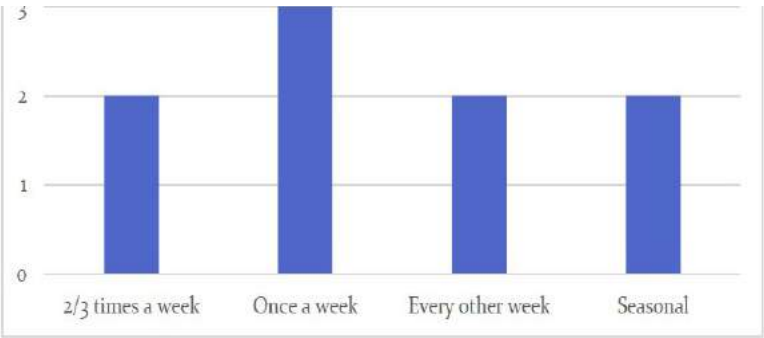


*Fig 8 Frequency of outdoor play for 8-11 year olds with extra-curricular activities*

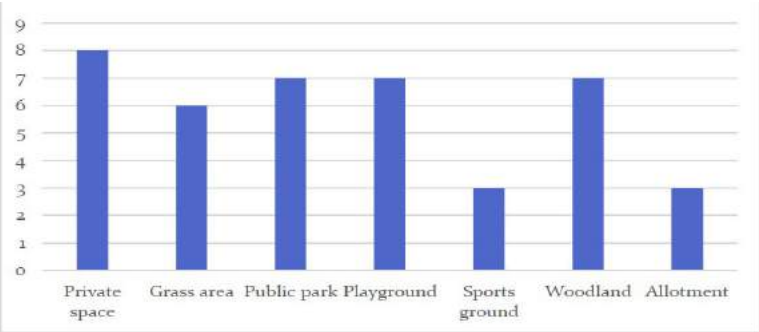


*Fig 9 Types of landscapes used by 8-11 year olds during extra-curricular activities*

Conversely, when they were able to go outside, children were found to be more engaged in the activities. In an extra-curricular setting, structured time was better than unstructured time. As found previously, unstructured time was reported to lead to more arguments and children were said to get bored more easily. Extra-curricular activities are also said to be more structured and set in what the children do. In this case, there is less unstructured time, especially as children are only there for a short period of time. This was also mentioned when asked why participants did not use outdoor spaces, as some activities cannot be done easily outside, such as teaching music (disturbing neighbours and wind blowing sheet music away), and scouting/guiding activities (mainly art and cooking activities). Children are not always suitably dressed, especially in wet/hot weather, compromising safety. So too with nearby spaces being impractical to use, only being available at set times of the year or only having access to public spaces. Some responses also asked for more equipment and storage facilities as many buildings used for clubs do not have enough storage for equipment, stationery and paperwork.



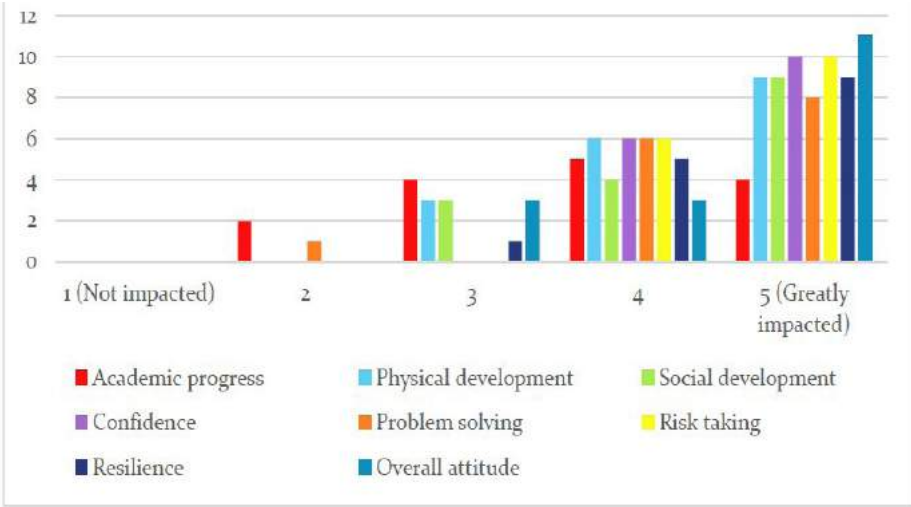


*Fig 10 How different areas of development are affected by time outside for 8-11 year olds specified by adults outside of school (column order reflects key sequence)*

As with school staff, the last part of the questionnaire looked at whether they felt time in the landscape affected different areas of wellbeing and development. More responses were positive in this section, showing that the areas of development were greatly affected by being outside, as shown in Fig 10. The sample size is, however, smaller which makes the result less reliable but it does support the data previously collected. Although participants in this section would not be as qualified to make this judgement as school staff, their experience with children clearly provides them with some understanding on children's development in their own area of expertise. Between locations, there were not many differences, although there were more woodland spaces in rural areas and there were more issues with children not having appropriate clothing for outdoor activities. In suburban areas, participants had less access to private spaces which restricted how they accessed the landscape.

## Conclusion: children and landscapes

Having access to landscapes and nature during childhood does have an impact on health and development, the evidence is clear. In the case of the selected age range in this study, it has a significant impact on mental wellbeing, physical strength, curiosity and creativity.

The results collected in the questionnaire survey suggest that having access to a landscape does positively influence a child's overall health and development. Access to landscapes helps children develop a strong immune

system, build up body strength, be fit and maintain a healthy weight. These are important elements to being 'healthy'. It is also suggested wellbeing is boosted through time outside, with children reported to be happier, calmer and overall more positive, particularly when compared to time spent using electronic devices.

Fine and gross motor skills are improved, as well as coordination, social skills and confidence through time in the landscape. It is also shown to be a good way for children to express themselves and make their own choices, which allows them to grow up to be more independent and secure about themselves. At school, staff commented that unstructured, free play time was essential for their development, as well as an energy release to take a break from classroom learning. Without time outside, children struggled to use up energy, which often resulted in them becoming irritable and finding it harder to interact with others. Time outside was also shown in the research to greatly influence academic progress, physical development and social development. This supports the research advocating that the landscape can give more opportunities for child-led play, exploration, risk-taking and many more activities that aid a child's development.

In terms of planning policies, there are elements which still need to be improved. This is mainly seen in suburban areas as parents have said they do not have a suitable outdoor area for their child's age nearby. This confirms the disconnect some children have to nature as there is not enough time available for travelling to and from these landscapes. The GLA planning policies do include requirements on ensuring adequate green space; however this does not include existing developments, so even if there is enough green space provided for the proposed houses, those living outside the development still miss out on not having an accessible space. This is also the case for those living in inner-city areas despite travel not being flagged as a specific issue. To improve this, the defined area set out in the policy could be updated to include a drawn radius from the centre of the development into the wider community to provide the necessary age-appropriate space for all children to play. This would also allow for the inclusion of more trees and vegetation in local areas which would help build the 'healthy places' previously explored. Safety was also said to be an issue, with parents not wanting their children to use or travel to the spaces alone, but studies have shown that adding more vegetation can help make spaces safer, as well as allowing communities to be more accessible, particularly in deprived areas (Landscape Institute, op cit).

The school landscapes where participants of the study worked were reported to be good, with a range of available spaces that are well maintained. This suggests the planning side to facilitating school landscapes is adequate for the way they are currently used, although more emphasis on providing sheltered spaces and seating to enable outdoor learning is needed. What seems to be preventing more outside learning taking place is the availability of training and equipment. By providing more training, school staff would develop confidence to carry out more lessons outside, helping to improve concentration and provide a change from traditional classroom teaching, making learning more memorable. In terms of unstructured play, the existing school landscape in many schools provides a range of play facilities that enrich both mental and physical wellbeing and provides a suitable place for children to interact, develop social skills, and spend time with friends outside the classroom.

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**Biographical notes**

*Lucy-Ann Brown is currently completing an MA in Landscape Architecture at the University of Gloucestershire. She is particularly interested in how landscapes can impact on health and wellbeing through their design and planning, which has led to this research for her undergraduate dissertation submitted in May 2020. The research evaluates how the access and quality of green spaces can affect the health, wellbeing and development of children in order to inform the planning and design of future developments to ensure they meet the needs of the community.*

# URBAN AGRICULTURE: ITS POTENTIAL TO FEED OUR CITIES AND INFLUENCE THEIR DESIGN

## Emily Mayer

Urban agriculture: I have been intrigued by the rise in popularity this method of food production has seen in recent years and the extensive range of benefits it claims to provide. It has been presented as a panacea to the food crisis, with the potential to make city spaces "stronger and more stable, with higher employment rates, better nutrition, less pollution and enhanced resilience to economic, political and meteorological blows" (Fox, 2011). While there has been substantial research into many of these potential benefits, there remains a lack of clarity over the genuine potential urban agriculture has to meet food demands within the UK. I have also noted that the feasibility of many urban farming methods remains largely unknown or untested, with little guidance as to how landscape architects and designers might help to meet the rising demand for growing space within urban centres.

This research project aimed to
1) Investigate the existing applications of urban agriculture and examine whether they have been successful in achieving the stated benefits.
2) Establish the feasibility of various urban agriculture methods and determine the most viable approach to incorporating food production into urban landscapes.
3) Predict how the use of urban agriculture might advance within the UK, in order to inform how this will impact the future of urban design.

**Rising Demand**

Within the past decade there has been an increase in the demand for locally-sourced food which has seen urban agriculture gain significantly in popularity, particularly in the form of allotment gardens and community growing spaces. This is evidenced by the fact that there is currently an unmet demand for allotment spaces in countries as widespread as the UK, US and Canada.

Fox's book (op cit) provides an introduction to concepts of urban agriculture and offers an explanation as to where the rapidly increasing popularity of these methods has come from. He reports that in London those applying to rent a plot within an allotment site can face a potential wait of more than 10 years, and estimates at least 200,000 additional allotment units are required to meet the current demand. He presents the view that this growing trend is largely due to people living within city environments who are looking to reconnect with a sense of place and minimise the impact their lifestyle has on the environment. He adds in justification that modern urban farming practices are making a conscious move towards sustainability.

The National Restaurant Association of the United States published a report which stated "Today's consumers are more interested than ever in what they eat and where their food comes from" (Riehle, 2013). A related study conducted in the same year sought to determine the demand drivers among consumers buying locally-sourced food and found that when asked about their main motivation for embracing this option, 66% of shoppers said they wanted to help the local economy, while 45% believed it would provide them with healthier alternatives and 19% were motivated by the potential to reduce their carbon footprint.

A rising trend in the popularity of buying locally-sourced food in the UK between 1994 and 2013 is further supported by the national count of farmers markets reporting an increase occurring nationally, with numbers rising from 3,137 in 2002 to 7,864 in 2012, followed by a further increase of 3.6% over the next year with 8,144 farmers markets recorded to have occurred nationally in 2013. Following this trend, the growing success of urban agriculture is only set to increase over time. Further, there has been an increase in the percentage of agricultural sales made up by locally-sourced fruit and vegetables. In 1997 it was 4.7% of total agricultural sales, rising to 9.5% within the space of 10 years.

This trend is only set to increase further with the growing population and more people than ever living in and around cities, with Fox (op cit) suggesting that in order to continue feeding the world's growing population sufficiently there will need to be a 50% increase in food production, with many believing that urban agriculture is the most efficient way in which to achieve this goal.

**Potential Benefits**

Urban agriculture has often been presented as a 'fix all' solution capable of producing locally-grown food, but also benefiting community health and wellbeing, the economy and the wider environment. This has led to the idealistic view that the future of our cities will be shaped around a system of locally-produced food.

The SPUR Public Harvest Report (2012) was compiled in an attempt to present the potential benefits which could be achieved through urban agriculture within the city of San Francisco, and it suggests how best to respond to the growing public interest in order to maximise the positive outcomes. The report highlights the main benefits which are expected to be achieved with the addition of new urban farm and garden projects, with such projects providing greenspace, recreation and education, as well as economic and environmental benefits. The report goes on to detail how an increase in urban agriculture systems within the city will help to connect residents to the broader food system, overcoming the current disconnect between the two. This is hoped to be achieved through buying food directly from the producer and gaining a deeper understanding of the natural systems through which food is produced. The report states that "Promoting urban agriculture helps make San Franciscans conscious of the impact that our food system has on our environment, health, and economy" (SPUR, 2012). The report continues with this idealistic approach towards urban agriculture, noting that the potential to increase greenspace and recreational opportunities by "transforming vacant or neglected lots into vibrant spaces" and providing citizens with the chance to cultivate land they would not otherwise have access to.

Environmental benefits are achieved through reducing stormwater runoff and the heat island effect, while also providing habitats for birds and insects. Urban agriculture also holds the potential to build and maintain a sense of community through social cohesion and collaboration, with the food grown within a neighbourhood ensuring that residents have access to healthy and nutritional food at a low cost, benefiting their health and wellbeing.

**Suitability of Methods**

While urban agriculture as a whole may often be presented as the future of sustainable food production within the city, there are in fact a large variety of forms in which the practice of growing produce within an urban environment can take place.

April Philips' 2013 book *Designing Urban Agriculture: A complete guide to the planning, design, construction, maintenance and management of edible landscapes* offers a cohesive overview of modern urban agriculture systems and the many different methods which may be used to produce food within a city. An extensive list is presented including rooftop farming, aquaponics, hydroponics, aeroponics, permaculture, container farming, allotment gardening, edible landscaping and community-supported agriculture to name just a few. The text provides a detailed summary of these methods and suitability.



Aquaponics is a growing method based around a symbiotic relationship between fish and plants, in which the nutrient-rich water is used to supply nitrates to crops to aid their growth. Vertical farming is also popular and involves growing food through the use of freestanding support systems or existing architecture to maximise the potential for urban farmland if there is limited space. Smaller scale initiatives also include incorporating edible plants such as fruits, vegetables or herbs into an existing landscape with the intent of being consumed by people, while food may also be grown in containers or raised planting beds in tight urban areas with little to no soil.

While Philips provides the ways of conducting urban agriculture and implementing them within the city environment, it is still unclear which of these methods are really the most effective in terms of their capacity to feed the growing population of today's cities. Planners and designers need to foresee to what extent the future of our cities can be shaped by methods of urban agriculture, whether in the form of small scale community growing spaces or multi-storey vertical farms, and which are the most feasible in terms of urban design.

**Current Success**

In order to try and determine which methods of urban agriculture might be the most likely to shape the future of our cities and best meet the growing food demand, it is important to study current examples of how it is being applied today and the beneficial outcomes which have been observed as a result.

The March 2019 issue of *Landscape Architecture* had a focus on food production within the city, and an article written by Timothy Schuler titled *Free Markets* presents the Browns-mill Food Forest in Atlanta as an example of how food forests have been used to increase access to locally-grown fruit, vegetables, nuts and herbs, within a low income community. He describes how the food forest takes the form of a vertically layered, publicly accessible edible garden which provides recreational opportunities for residents, with the chance to gather food for free.

Within Fox's book (op cit) he presents a chapter *What is possible?* in which he explores the potential urban agriculture on a large scale. He cites Earthworks in Detroit, Michigan, which is an urban farmstead covering 1.5 acres (0.6 ha) of land producing 3 tons of food per year. A similar project, Gotham Greens, consists of a 0.45 acre hydroponic green house producing 30 tons of fruit and vegetables per year. Fox states that New York has over 14,000 acres (5500 ha) of suitable rooftop surface and 52,000 acres (21000 ha) of backyard, which he believes has the potential to produce 135,000

*Urban Food Jungle by AECOM (Architizer.com)*

tons of fruit and vegetables per year if it was used as productively and amounting to 30 pounds (14 kg) of produce per resident.

The outcomes of this research suggest that current methods of urban agriculture do in fact have the potential to feed the growing population; however it is still unclear just how realistic this is as a development and how landscape architects could help to implement these methods to maximise available growing space.

**Ambitious Design Potential**

As visions of urban agriculture have increased in popularity over recent years, there has been an emergence of ambitious plans and possible scenarios. April Philips' book (op cit), provides such an insight presenting the model of an urban food jungle, described as a "conceptual design that responds to the threat of diminishing food security…interconnecting sustainable food production, education, entertainment and culinary delight". The model has the potential to produce organic fruits and vegetables as well as freshwater fish through a method of aquaponics, in which the nutrient-rich water produced as a by-product of rearing fish is circulated along a number of vertical planting columns and fertilises the produce growing within them as part of a sustainable, high yield system.

The ground level access to the urban jungle allows visitors to navigate and explore the network of pools and planting columns, taking part in culinary demonstrations and sampling the food which has been grown there as part of an enriching educational experience. The designers of the Urban Food Jungle believe their prototype has the potential to be modified and implemented into the existing urban landscape and make it possible to produce large quantities of food within the city environment in a strategic and sustainable manner. In this way the model of an Urban Food Jungle combines the multiple benefits seen within the current small scale applications of urban agriculture in its potential to enhance the health and wellbeing of communities through nutritional education and social cohesion, while promising to produce large enough quantities of food to sustainably meet the food requirements of a city population, in a way which is not currently being seen.

While the Urban Food Jungle is impressive in visualisation, it is unknown how realistic models such as these are and whether or not they will be viable for application within the UK. Determining the true potential of these hypothetical models will help to determine how realistic a future of cities shaped by vertical farms, aquaponics and multi-storey growing spaces are within the UK, and how our cities may be shaped by such developments in the future. However, all current examples focus more on the community benefits of such projects and fail to give an accurate insight into the genuine potential to produce a viable harvest and meet food demands using urban agriculture alone, with the realities of futuristic, high-rise vertical farms being incorporated into cities remaining largely unknown.

**Current Research**

The method of collection of new opinions for this study comprised a structured interview technique, accompanied by an interview schedule in the form of a list of predetermined questions. Research time however was compromised by the Covid-19 pandemic (2020) and, because of logistical issues, conducting face-to-face interviews with multiple participants was no longer possible and the methodology was adapted to an online questionnaire composed of ten open-ended questions centred on participants' personal opinions of urban agriculture within the UK. Two participants of professional status within the field chose to complete the online questionnaire fully and their views represent the major part of the subsequent discussion and appraisal. The principal points that were made include the following:

The limiting factors behind the growth of urban agriculture in the UK may be that planning systems within cities are largely responsible because uses such as housing and open space are generally prioritised over the implementation of agriculture, resulting in very little space being allocated for growing unless land is made available by the council or other public

bodies. Similarly, social benefits are often prioritised over the commercial opportunities, meaning that the level of food production which would otherwise be available is limited.

Participants also denounced the possibility that a city could ever reach a level of complete self-sufficiency in terms of its food production since an excessive amount of food waste is currently observed within the UK and "the only real way forward is to change the way we consume food" signalling the need to throw less food away if we ever hope to meet this demand using urban agriculture alone. It would also be more desirable for a city to form an important strategic and political part of a wider regional food system, "a return to more urban and peri-urban agriculture", whereby "cities can and should be part of a sustainable and coherent national food policy approach".

Urban agriculture is a valuable use of city space; its value comes from its multifunctionality and the potential it has to make a range of contributions towards the creation of a diverse, urban food culture. Community gardens often place more value on their ability to provide users with therapeutic benefits rather than food. Further there is the potential to contribute to sustainable urban environments through the enhancement of existing green spaces and the provision of ecosystem services.

Promoting a locally distinctive food culture and the potential for city councils to have a larger input in shaping sustainable regional food policies and practices were considered important initiatives but there were disagreements over land use and complex social conflicts. A new typology of urban space needs to be conceived: creating new urban spaces and development opportunities.

Vertical farming could have a multitude of benefits, including the reduction of food miles and food insecurity; biowaste purification techniques could be advanced through commercially owned projects and methods such as aquaponics, hydroponics, aeroponics and biophilic buildings.

## Concluding Discussion

After studying the findings from existing literature and the primary research study, it would be reasonable to conclude that urban agriculture does not hold the potential to supply a commercial output capable of meeting the food demand currently seen within the UK. This is not due to an inadequacy of production methods or lack of successful precedents, but more the excessive consumption and unprecedented levels of food waste. If we are ever to become self-reliant through methods of urban agriculture and locally-sourced produce, we would first need to drastically change our relationship with food and attitudes towards its consumption.



Due to its multifunctional nature and diverse range of applications, however, it could be argued that urban agriculture has the potential to reconnect people with the food they consume. This has been observed where small scale community growing spaces have been successful in enhancing the health and wellbeing of its users. Educating consumers about sustainable methods of food production will empower them to make more informed choices about where their food comes from, and the consequences this has. The initial benefits seen from non-commercial agriculture could potentially reduce consumption rates to a level where they are capable of being met by urban agriculture alone. This suggests that the advancement of urban agriculture within the UK will take place through a phased transition of change, with the demand for local food production increasing in line with successful precedents and increased education. While the implementation of futuristic, high-rise vertical farms may still be a long way off, the outcomes of urban agriculture will still be significant, shaping our relationship with food and the way in which we consume it.

For this change to take place, urban agriculture will need to be designed into the fabric of our cities with a combination of functionality and aesthetic qualities, balancing food productivity with aesthetics to create enriching outdoor spaces, which maximise both commercial and non-commercial benefits. With a history of combining artistic sensitivity with scientific appreciation, landscape architects have the capability to design urban spaces which influence how we grow, consume and appreciate food, through the implementation of urban agriculture.

In conclusion, urban agriculture has the potential to form a powerful tool used by landscape architects and designers in their effort to rethink the sustainable city. By incorporating urban agriculture into all scales of urban development in an inclusive and aesthetic way, landscape architects have the potential to achieve a combination of functional and productive outputs, creating landscape spaces which increase connectivity, enhance health and wellbeing, and eventually contribute to a more sustainable food network within cities.

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## Appendix – Online Questionnaire

Question 1. In your opinion, which factors determine the success level of urban agriculture, and what do you believe are the limiting factors for the growth of urban agriculture within the UK today?

Question 2. Where do you believe has seen the most success implementing methods of urban agriculture within cities and do you think the same level of success could be achieved within the UK?

Question 3. How do you expect the implementation of urban agriculture to change in the UK in the future? Eg, do you expect to see an increase in high-rise vertical farms or small-scale community growing spaces?

Question 4. In your opinion, do you think it is possible for a city to become entirely self-sufficient in terms of food production? Is it feasible to imagine a future where cities are shaped around methods of urban agriculture?

Question 5. Do you believe the potential of urban agriculture to have been exaggerated in terms of what can realistically be achieved within the UK? What do you believe the drivers behind this may be?

Question 6. Do you believe that urban agriculture is the most effective solution to maximizing food production within the UK, with the aim of feeding the growing population sufficiently?

Question 7. In your opinion, do you believe urban agriculture to be a valuable use of the limited space within UK cities? Does this depend on the efficiency of food production or should other outcomes such as community, social, and environmental benefits be valued as highly?

Question 8. In your opinion, should Landscape Architects place more importance on incorporating urban agriculture into the design of urban environments? If so, which methods of urban agriculture do you believe to be m ost feasible in terms of urban design?

Question 9. Do you believe their could be potential downsides to increasing areas of growing space within urban environments such as cities? What do you believe these downsides are and how would you suggest they are overcome?

Question 10. Do you believe there is a more viable approach to increasing sustainable food production in the UK? For example, do you believe areas such as green belts could be used for food production as a solution to reducing food miles around cities?

## Biographical notes

*Emily Mayer completed her honours degree in landscape architecture at the University of Gloucestershire in 2020 and has since gone on to further her education at the Manchester School of Architecture. This article is an edited version of her undergraduate dissertation, in which she investigates the true potential urban agriculture has to feed our growing cities and address the growing need for locally sourced food.*

# TREE SPECIES SELECTION IN THE UK TO MEET THE CHALLENGES OF CLIMATE CHANGE

## Benjamin Gibbs

Tree species selection has in recent years been reductive and overly generic, reliant on a small selection of familiar species, rarely reflecting the unique regional and local character found in the British Isles, whilst also failing to deliver on the full potential of trees and the ecosystem services they can provide as a core component of a sustainable, climate-resilient landscape, both in the urban and rural contexts. Alongside this are the threats posed to the British landscape by climate change and the increased spread of pests and diseases which will start to degrade some of our most vulnerable natural landscapes and limit the viability of a number of commonly-used native and non-native species. All of this will force a restructuring of how we value trees and quantify their attributes and benefits. If these changes are not made, then there is a real risk of high levels of tree mortality in the future leading to habitat loss and the potential extinction of a number of vulnerable species.

This paper looks at the most significant risks and the key drivers of change necessary to ensure that future tree species selection is robust, resilient and well-suited to the challenges presented by climate change, responding in a manner that provides conclusive wildlife, environmental and aesthetic benefits. This will then be used to form recommendations on some potential core tree species and a methodology for appropriate tree species selection.

### Climate Change

Climate change is the major overarching risk factor in deciding on appropriate future tree species for the United Kingdom, with direct changes in average temperatures, rainfall, storms, flooding and drought, as well as indirect risks to tree species and biodiversity from the resultant changes in the ranges of pathogens and fauna. This section will review the present estimates for the future UK climate using the Meteorological Office UK Climate Projections of 2018 (UKCP18); it must be noted that the data produced for the headline figures were modelled using the RCP8.5 scenario (Representative Concentration Pathway) which was considered the 'business as usual' scenario and a continuation of the trends in emissions at the time the data set was built. It also represents the worst-case scenario based on the data available at the time, with RCP8.5 closely matching emissions trends from 2005 to 2020 and as such is the RCP closest to current trends continuing. Recent changes in global energy production and new emissions targets have resulted in a slowing of the growth in carbon emissions which indicates that the most likely outcome is midway between the RCP4.5 and RCP8.5 scenarios (Schwalm, Glendon and Duffy, 2020). However as biotic drivers for climate change are not fully considered and a preference for caution is preferred (for the production of a climate resilient landscape) the RCP8.5 scenario will be used as the assumed pathway for this report. In addition to this I will review the global changes in climate from the UN Environmental Report of 2019 (UNEP) and the EURO-CORDEX projections to consider the wider impact of climate change on European countries and the potential implications this will have for the future tree stock of the UK.

The headline results of the Met Office climate prediction study (UKCP18) indicate a trend towards hotter, drier summers and warmer, wetter winters, with an increase in the intensity of storms during the summer. When modelled for the 2070s (approximately 50 years from now) and calculated relative to the 1981-2000 period, this corresponds to summers in England being 41% drier to 9% wetter and winters 3% drier to 22% wetter (in the 10% lower emission scenario) or summers 57% drier to 3% wetter and winters 2% drier to 33% wetter (in the 90% higher emission scenario). Likewise, temperatures show variations between no change and 3.3°C warmer in summer and between 0.1°C cooler to 2.4°C warmer in winter, in

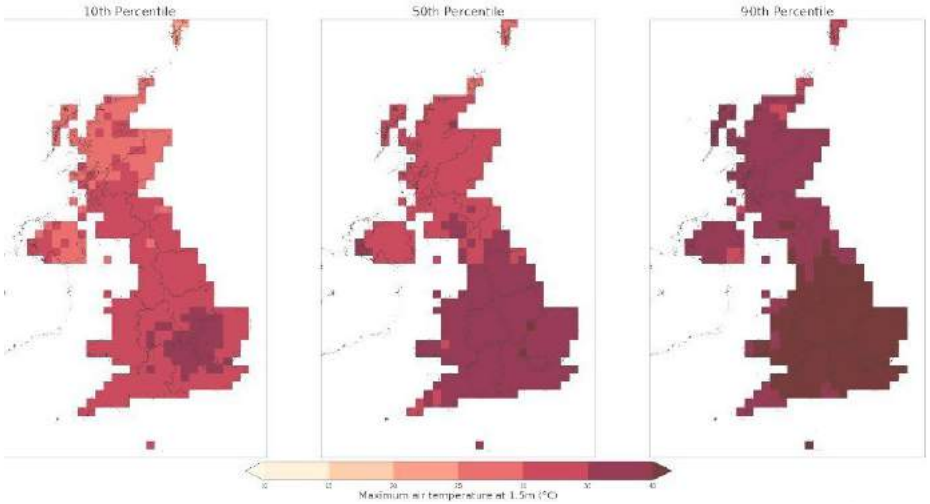



*Fig 1 Average maximum summer temperature in 2070 in the RCP8.5 scenario, produced using UKCP18 Data and Map generation tool (Met Office, 2019a).*

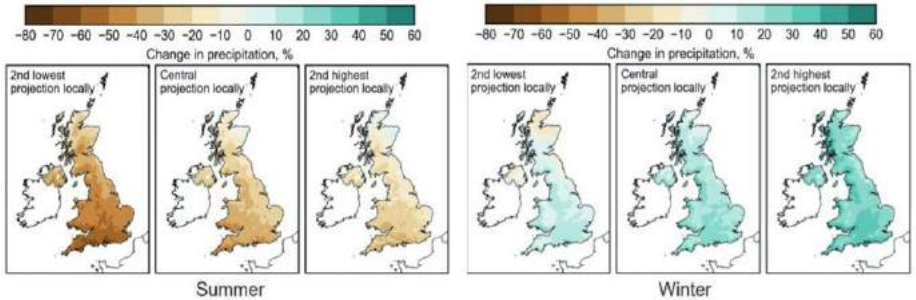



*Fig 2 Change in precipitation in the 10%, 50% and 90% scenarios (Lowe et al, 2019).*

the lower scenario, and +1.1°C to +5.8°C in summer and +0.7°C to +4.2°C in winter (Lowe et al, 2019). To summarise, the average maximum summer temperatures by 2070 are likely to exceed 30°C in all regions of England and Wales, with an area in the south east exceeding 35°C (Fig 1, left), which most closely corresponds to current predictions based on present trends and emission reduction targets made by international governments.

These changes in temperature and precipitation, however, are not even across the British Isles with more significant changes occurring in England, particularly in the south with reductions in summer rainfall being greatest in the (wetter) south west, potentially indicating an area of greatest increase in stress on trees, particularly given the distribution of temperate rainforest in the UK. Alongside this is an increase in the intensity of rainfall in the median and higher scenarios, which is of particular concern as periods of drought followed by periods of intense rainfall will render trees more susceptible to disease (exacerbated in an urban environment). Further, these cycles of drought and heavy rainfall during the summer can result in greater risk of flash flooding and increased soil erosion (ADHB, 2018) when rainfall exceeds the infiltration rate of soils. These effects are likely to be more severe in the north, Midlands and east of England where loamy and clayey soils suffer from impeded drainage (Cranfield Soil and Agrifood Institute, 2019).

The changes in summer precipitation are particularly concerning in the south and south-west with parts of southern Devon and Cornwall seeing an 80% reduction in the 90% worst-case scenario. This is of particular significance here owing to the prevalence of the (globally rare) temperate (Atlantic broadleaf) rainforests, which are amongst the most biodiverse habitats in the British Isles and are particularly vulnerable to the predicted changes in precipitation.

Compounding the issues of drought and inundation is a general reduction in soil moisture availability across England and Wales caused by longer



and drier seasons (summer and early autumn) leading to lower infiltration and increased evaporation (Pirret et al, 2020). This suboptimal water availability is likely to result in the stunting of growth of numerous native species, particularly those less tolerant of drought. Further problems are the increased water demands of vegetation responding to the longer growing seasons associated with progressing periods of warm weather and higher concentrations of atmospheric carbon dioxide (Mankin et al, 2019).

The moderating impact of ocean currents on climate in the UK will continue in the future (though diminished), and will reduce the more extreme weather variations expected in Europe in the event of a maximum 2°C increase set in the Paris Climate Accord being met. The more likely increase of 3.2°C by the end of this century roughly corresponds to the lowest percentiles of the RCP8.5 scenario; it is a figure derived from the unconditional nationally-determined emission reduction targets (NDCs) as currently noted (UN Environment Programme, 2019). Modelling trends indicate that Europe is

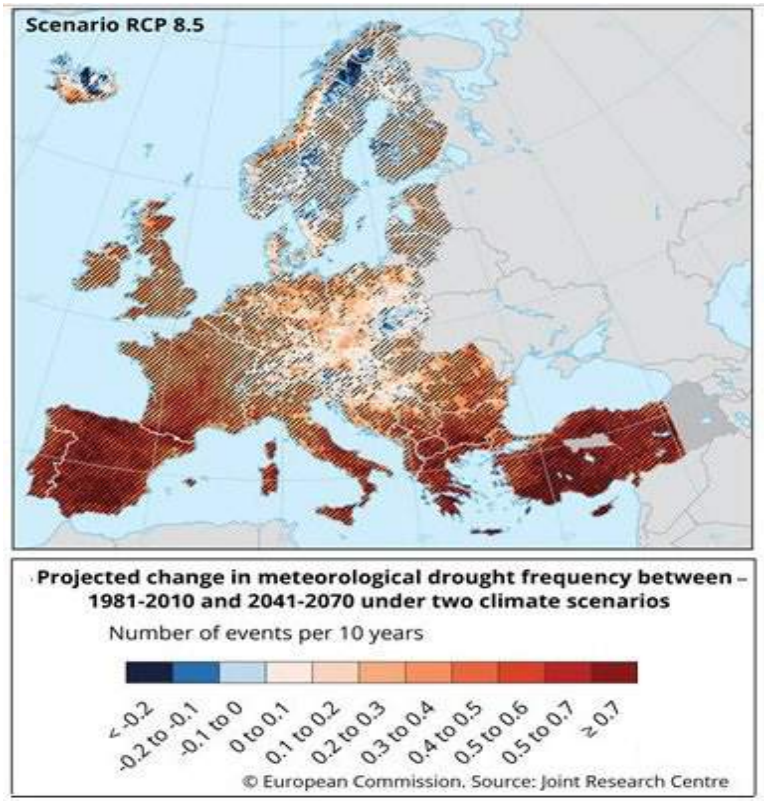



*Fig 3 Projected change in drought frequency across Europe in the RCP8.5 scenario (European Environment Agency Joint Research Centre, 2021)*

continuing to warm at a faster rate than the global average, with a mean annual temperature for the last decade around 1.8°C higher than pre-industrial levels. Some areas within Europe have seen significant increases including Iberia, Scandinavia and central Europe, with the trend being projected to continue through 2070-2100 up to 6.2°C above the 1971-2000 levels in the RCP8.5 scenario.

The frequency of droughts projected to occur in Europe have been modelled and mapped to show areas of greatest threat in the south (Iberia, Sicily, Greece and Turkey) and are reflective of current trends in both summer temperatures and the number of hot spells. (In the UK this is defined as consecutive days above 30°C.) Whilst these trends are concerning it does however afford opportunities and potential responsibilities for the UK to plant and conserve a number of species that are at risk of displacement in continental (particularly southern) Europe, such as *Alnus cordata* which is predicted to be almost entirely absent in Italy in the UNEP NDC scenario (Price et al, 2018). To consider the consequences these changes will have on the composition of trees in the British landscape we must look to current climates that closely match the prospective climate modelled in the UKCP18 findings.

**Climate Comparison**

To appraise which trees will potentially be well suited to the future climate of the UK we must consider which regions have a current climate that is comparable to the projected future UK climate. To do this the Forestry Commission climate matching tool (Forestry Commission, 2020) was used to find the 2051-79 climate equivalent to the UK climate stations across the NUTS regions with sites selected to minimise microclimate variations. (The Nomenclature of Territorial Units for Statistics is a Eurostat standard for referencing UK subdivisions.) The comparisons (fig 4) show clear clusters in Brittany and central France that are close matches to the predicted temperatures, precipitation and diurnal temperatures (where a lower score indicates a closer match). Using the 5000 closest matches, the trends cover much larger areas with southern UK regions clustered through northern and central France with high concentrations along the entire western coast. The Midlands and eastern regions follow a similar distribution with the concentration of highest similarity within northern France. A distinct difference can be seen between the southern and the northern regions of the UK which show greater variation. Yorkshire and the north east shows clusters in East Anglia, the south east of the UK, northern France and eastern Germany, suggesting less significant climatic differences. Whilst the north west and Wales show clusters comparable to Ireland and the south west of the UK, indicating levels of precipitation remaining higher than the rest of England. Northern Ireland shows similarities to the channel and North Sea coastlines as well as the south of England. Scotland shows similarities with the west coast of Ireland, Wales and western England, again indicative of high levels of precipitation continuing. This would suggest that native and common UK tree species that are less drought tolerant such as *Betula pubescens* and *Populus nigra* may struggle in the south and parts of the Midlands of England and should be planted in greater numbers in the north west, Wales and Scotland in anticipation of populations of the trees in the south shrinking alongside the woodland habitats that depend on high levels of precipitation.

| NUTS region | Climate Station (1991-2020) | Closest climate match (2051-79) | Climate difference score |
|---|---|---|---|
| UKN NIreland | Armagh | Pirou-Plage, Manche, France | 0.241 |
| UKM Scotland | Drummond Castle | Blaenavon, Wales | 0.298 |
| UKL Wales | Tredegar | Le Croisty, Morbihan | 0.282 |
| UKK south west | RNAS Yeovilton | Marais de St Mars du Desert | 0.423 |
| UKJ south east | East Malling | St Mars du Desert, Loire Atlantique | 0.414 |
| UKI London | Kew Gardens | Ile Nouvelle, Bordeaux | 0.994 |
| UKH east England | RAF Marham | Broons, Cote d'Armor | 0.547 |
| UKG west Midlands | Coleshill | Comblessac, Ile-et-Vilaine | 0.727 |
| UKF east Midlands | RAF Cranford | Manchecourt, Loiret | 0.805 |
| UKE Yorkshire & Humber | Bramham | Yevre-la-Ville, Loiret | 0.896 |
| UKD north west | Rochdale | La Roche-Maurice, Finisterre | 0.370 |
| UKC north east | Durham | Greenwich | 0.601 |

*Fig 4 Met Office Climate stations within the UK NUTS 1 Regions, their climate equivalent and similarity score (lower = more comparable)*

## Pests, Diseases and Provenance

A direct consequence of climate change and growing globalisation is an increase in the frequency of outbreaks of disease and the spread of pests, aided by the transport of plants and materials. This emphasises the importance of biosecurity and provenance. Of general relevance is the rule of 10 proposed by Williamson & Fitter (1996) which postulates that around 10% of introduced species will appear in the wild. Of those, 10% will become established in the wild, and of these established species 10% will become pests or 1/1000 of introduced species becoming pests.

The primary factors driving an increase in the risk of pests and diseases are an increase in the trade and movement of plant materials alongside climate change and the susceptibility of boreal forests (located between latitudes 45° and 70°) to pests (Berg et al, 2006). Greater tree mortality was noted in the early 2000s (Soja et al, 2007). In these regions a rise in temperatures has been associated with the increased range and spread of multiple pests such as *Dendroctonus rufipennis* (spruce beetle) in Alaska as noted by Berg et al (2006), where historically low temperatures and precipitation controlled its spread. This can be extrapolated to other areas within the northern latitudes where beetles in particular will benefit

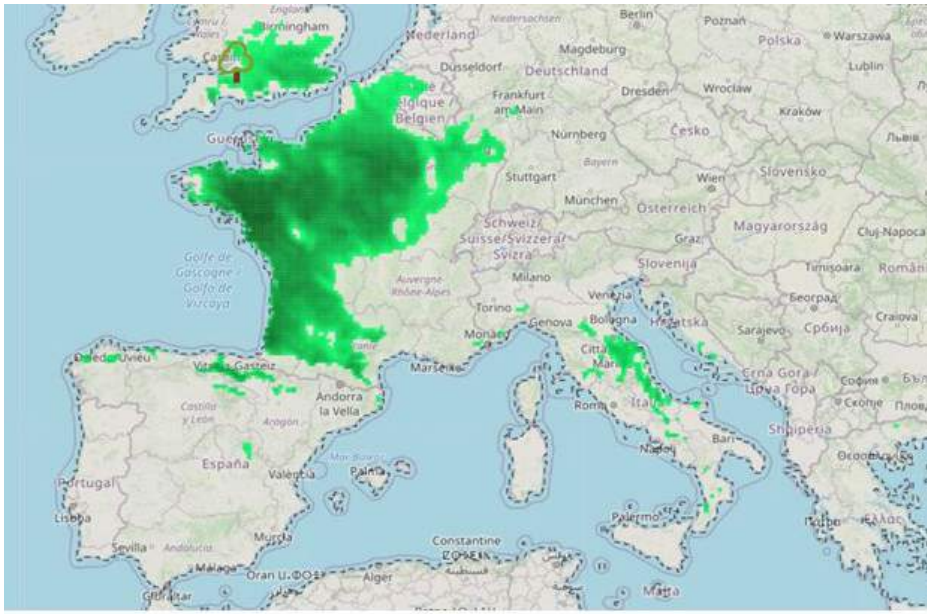



*Fig 5 Climate difference scores compared to the projected climate at RNAS Yeovilton, 2051-79. Darker shade indicates a lower climate difference score (Forestry Commission, 2020).*

from increased temperatures, particularly during the spring and autumn (Broadmeadow, 2002). These changes are likely to be highly propitious to many fungal species as well, particularly those reliant on insects as a vector for transmission, such as *Ophiostoma novo-ulmi* (Dutch elm disease), as well as fungal and algal diseases that require humid winds to aid spore dispersal, notably for the western regions of the UK. More recent fungal and algal disease outbreaks have confirmed the impacts of increased winter temperatures and rainfall on disease spread, with *Phytophthora ramorum* outbreaks being particularly prevalent in coastal areas of the western UK. This pattern of spread is clear (fig 6) with the earliest outbreaks occurring in Devon and Cornwall, which are noted for milder winter temperatures (Forest Research, 2020).

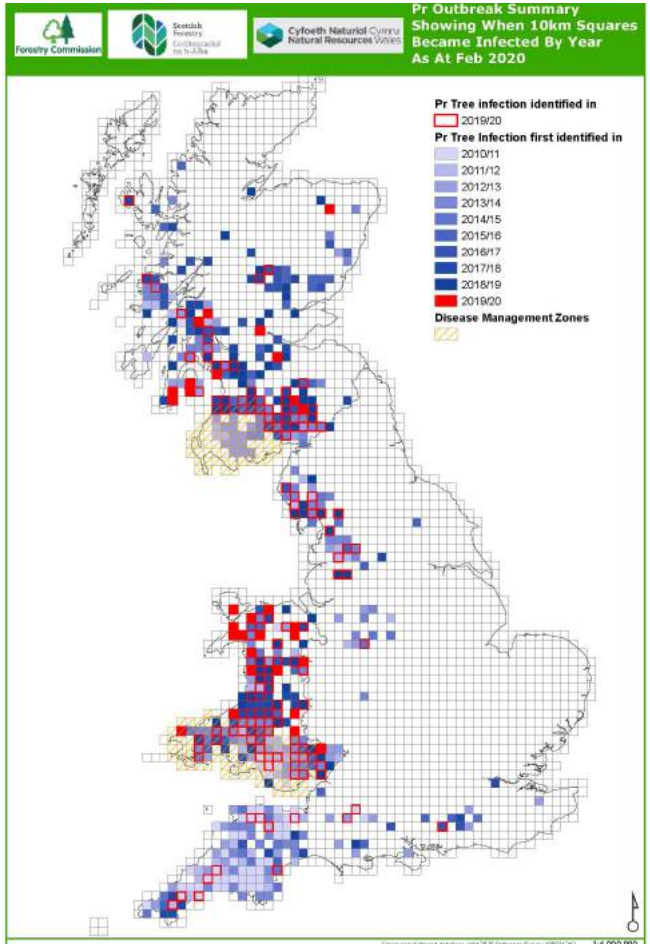



*Fig 6 Outbreaks of* Phytophthora ramorum *by year of identification (Forest Research, 2020)*

The Woodland Trust has identified 24 key pests and diseases, including those already present and those that have the potential to establish in the UK and cause significant damage, particularly these four: *Phytophthora ramorum, Ophiostoma novo-ulmi, Hymenoscyphus fraxineus* (Ash dieback) and *Dothistroma septosporum* (Dothistroma needle blight). Also included is acute oak decline, which is not a true pest or disease but a sudden decline in the health of mature oaks caused by a combination of scourges particularly drought, waterlogging and pollution, all of which are exacerbated by climate change. As well as these established pests and diseases, there are a number of potentially devastating pathogens that are at a high risk of introduction into the UK via direct human interventions, such as the import of diseased materials or via changes in climate aiding the spread. Some of these pathogens include *Ceratocystis platani* (plane wilt), *Ips typhographus* (eight toothed spruce bark beetle), *Agrilus anxius* (bronze birch borer), *Anoplophora glabripennis* (Asian longhorn beetle) and *Anoplophora chinensis* (citrus longhorn beetle).

| Pathogen | Tree species affected | Primary threatened habitat |
|---|---|---|
| *Phytophthora ramorum* | multiple, principal UK hosts: *Larix spp* | woodland & agroforestry plantations |
| *Ophiostoma novo-ulmi* | *Ulmus spp* | historic habitat lost: former hedgerows and field margins |
| *Hymenoscyphus fraxineus* | *Fraxinus spp* | mixed species woodland |
| *Dothistroma septosporum* | coniferous trees, principal UK hosts: *Pinus spp* | Caledonian pine forests |
| *Ceratocystis platani* | *Platanus spp* | urban street trees |
| *Agrilus anxius* | *Betula spp* | urban street trees |
| *Ips typhographus* | *Picea spp* | agroforestry plantations |
| *Anoplophra glabripennis* | numerous broadleaf species | broadleaf woodland |
| *Anoplophra chinensis* | numerous broadleaf species | broadleaf woodland |

*Fig 7 Selected high-risk pathogens and their hosts, alongside the principal habitats likely to be threatened by the introduction or increased spread of said pathogens.*



The consequences of these diseases can be significant with an average predicted mortality of between 50% and 75% in woodland ash trees infected by *Hymenoscyphus fraxineus,* revealed in a meta-study by Coker et al (2018). As such significant changes in woodland composition are predicted as a direct result of *Hymenoscyphus fraxineus*, habitat loss along with many of the 44 obligate and 62 highly reliant species associated with it will result.

Without intervention, it is predicted that *Acer pseudoplatanus* will be the principal tree to replace *Fraxinus excelsior* where the canopy isn't closed by extant species, with *Betula spp* replacing in uplands and *Fagus sylvatica* in Wales and in calcareous environments (Mitchell et al, 2014). In the same report it was noted the *Populus tremula* and *Alnus glutinosa* were the most similar in a trait analysis with a similarity index of 0.7, whilst the native oaks *Quercus robur* and *Quercus petraea* supported the greatest number of associated species at 69%. As such it is important the tree planting responses to the loss of *Fraxinus excelsior* consist of a palette of varied species that cover and respond to the multitude of niches and habitats created by ash, so as to best replicate them and minimise ecological damage. This 'active' response can be extrapolated across to other at-risk tree species to ensure the ecological niches are being replaced as best they can, preferably before natural regeneration occurs and the gaps in the canopy are filled thus allowing for the healthy establishment of replacement trees. In the example of *Fraxinus excelsior*, selective breeding of disease resistant specimens must be encouraged to ensure and sustain the long-term prospects of the species in the UK, with a higher population of disease resistant specimens now more significant than the heritability of disease resistance in the population numbers at 100 years (Evans, 2019).

To help prevent and control outbreaks of pests and diseases, a greater focus on provenance and disease-resistant planting is necessary, particularly in regard to *Ophiostoma novo-ulmi* and *Hymenoscyphus fraxineus*, which will continue to have devastating impacts on two of the key landscape trees of Britain, further changing the character of the British landscape. To counter this, a change in attitudes to tree planting and the provenance of the trees used in the landscape profession is necessary to drive the demand for new disease-resistant (and climate-change resilient) strains of elm and ash as well as for the necessary investigations into the provenance of the seeds and cuttings used to establish nursery stock that such efforts would entail. The specific provenance of the materials used in the nursery trade is a clear knowledge gap with only 37% of respondents able to provide any information on the geographic source of the genetic material of the trees they were growing, whilst none were able to establish the ecotype origin of the surveyed species (Sjöman & Watkins, 2020). This is concerning as such lack of knowledge creates greater opportunities for the spread of

pests and diseases through a highly centralised supply chain, whilst also eliminating the ability to select for beneficial intraspecies traits that may become a necessity in the future, such as increased drought tolerance. The second aspect necessary to be considered for appropriate ecotype matching is a robust knowledge of stress-tolerant phenotypes of common street trees. To enable this, more research into intraspecies variation (outside of ornamental and aesthetic traits) is necessary to establish the viability of sourcing nursery stock of climate-resilient specimens of key tree species used in the UK, such as *Fagus sylvatica* from southern and eastern Europe which show greater drought resistance than their northern European counterparts (Cavin & Jump, 2016).

**Range Shift and Species Loss**

One of the most significant impacts of climate change for habitats is in species displacement, where climatic changes force a shift in the range of species that are able to migrate, alongside the potential loss of those that cannot. The scale of this issue is significant for tree species, which are often less able to adapt to changes and have significant knock-on effects on ecosystem health with 58% of Europe's endemic tree species considered threatened by the IUCN (Rivers et al, 2019), with the highest density of threatened species occurring around the Bristol Channel, from north Devon through Gloucestershire and into eastern Wales (*Sorbus spp* being at greatest risk). Significant changes in ranges are predicted across Europe with boreal and temperate rainforest species at greatest risk; in the UK this can be seen in *Betula pendula, Betula pubescens* and *Quercus petraea* which will shift northward as the south becomes hotter and drier. It is the knock-on effects on local, vulnerable and rare habitats that are most concerning, such as the temperate rainforests of the south west, or the wet woodland and fen habitats of East Anglia.

**Ecosystem Services**

Proper species selection must not be solely driven by the constraints of climate, disease and judgements based on whether it is native or not. It should look to the potential ecosystem services that trees could provide and to make a value judgement based on which are of the greatest importance within the context of the development site.

Ecosystem services is an umbrella term that encompasses all the benefits or services that landscapes and their constituent parts provide, ranging from environmental to social and economic benefits. They exist on a spectrum from material functions such as food production in agricultural landscapes through to spiritual, emotional and mental health benefits such as hospital gardens and memorial spaces. For many people these benefits are viewed through the prism of the urban environment where interactions between humans and the environment are constrained, and where trees form the primary structure from which these benefits are disseminated. There are seven key urban ecosystems, many defined by apex vegetation often in the form of trees: street trees; lawns and parkland; urban forests; cultivated land; lakes:sea; wetlands; and streams (Bolund & Hunhammar, 1999). These urban ecosystems provide a number of key services including carbon sequestration, air filtration, noise abatement, water management, micro-climate regulation and phytoremediation, alongside ecological, cultural, aesthetic and recreational values. Of these key services the most relevant to current global issues is carbon sequestration, whereby trees can be used as carbon stores to reduce atmospheric $CO_2$. Alongside this is the potential for trees to act as phytoremediators and to intercept and capture airborne pollutants in the urban environment, improving air quality. Presently there is a strong argument to be made that carbon sequestration should be a key focus in all landscape projects to provide a sufficient volume of trees to have a material impact on emissions so avoiding the levels of climate change predicted in UKCP18. In urban environments air filtration should also be considered as a primary factor in species selection with between 28,000 and 36,000 deaths a year in the UK attributable to airborne pollution (Bradley et al, 2019). This clearly illustrates the potential that trees possess as key providers of ecosystem services to remedy many of the issues that have arisen in the modern landscape, particularly in the urban environment such as pollution, heat island and the fundamental disconnect between humans and nature.

**Carbon Sequestration and Air Quality**

Carbon sequestration should be a key factor considered in all tree planting decisions owing to the importance of reducing atmospheric greenhouse gases and their cumulative impact on the global climate. Alongside this is the importance of air filtration in urban forestry and around areas of significant infrastructure such as motorways. To achieve the greatest air filtration and carbon sequestration benefits planting should comprise mixed species groupings including both broadleaved and coniferous. This is due to coniferous species having a greater filtration capacity, whilst broadleaf species are more capable of absorbing gases. In both cases, evergreen species are valuable since air quality is at its worst during winter when deciduous species are out of leaf (Bolund & Hunhammar, op cit). This view of the value of mixed species groupings can be seen in data specific to ozone removal, where deciduous broadleaf species provide no benefit during winter, but have significantly increased ozone capture rates during the summer, corresponding to the optimum growth months (Manes et al, 2012).

| Species | Lifetime Carbon stored (Kg) |
|---|---|
| *Eucalyptus gunnii* | 7570 |
| *Eucalyptus niphophila* | 7570 |
| *Acer platanoides* 'Deborah' | 7500 |
| *Acer psuedoplatanus* | 7500 |
| *Acer psuedoplatanus* 'negenia' | 7500 |
| *Carya illinoinensis* | 7500 |
| *Fagus sylvatica* | 7500 |
| *Fagus sylvatica* 'Asplenifolia' | 7500 |
| *Fagus sylvatica* 'Pendula' | 7500 |
| *Fagus sylvatica* 'Purpurea' | 7500 |
| *Quercus castaneifolia* | 7500 |
| *Quercus cerris* | 7500 |
| *Quercus frainetto* | 7500 |
| *Quercus hispanica* 'Waginengen' | 7500 |
| *Quercus ilex* | 7500 |
| *Quercus petraea* | 7500 |
| *Quercus robur* | 7500 |
| *Quercus robur* 'Fastigiata' | 7500 |
| *Quercus robur* 'Fastigiata Koster' | 7500 |
| *Quercus robur* x *bicolour* 'Regal Prince' | 7500 |
| *Quercus rubra* | 7500 |
| *Quercus suber* | 7500 |
| *Aesculus hippocastanum* | 7440 |
| *Platanus* x *acerifolia* | 7423 |
| *Quercus* x *turneri* 'Pseudoturneri' | 7282 |
| *Acer platanoids* | 7250 |
| *Acer platanoids* 'Emerald Queen' | 7250 |
| *Acer platanoids* 'Fairlakes Green' | 7250 |
| *Quercus imbricaria* | 7250 |
| *Celtis occidentalis* | 7115 |

*Fig 8 The 30 trees with highest carbon sequestration and storage potentials available (data sourced from Barcham Trees Top Trunks Table, Barcham Trees, nd).*

The most effective method for reducing pollution exposure to the users of public spaces is a physical barrier between the source of the pollution and the users, with a vegetative barrier being effective in both isolating the users and in intercepting pollutants, with peak pollutant absorption occurring with small leaves and dense canopies, and with a slight bias towards complex leaf shapes and needles (Barwise & Kumar, 2020). It was also noted that larger trees with dense canopies can have a detrimental effect on the exposure of pedestrians to pollution in urban canyons, with pollutants being trapped and unable to disperse effectively, whilst in more open environments high level shrub vegetation alongside dense tree canopy cover was preferable in direct pollution away from pedestrian areas and in intercepting particulates. As such it can be surmised that open canopied trees of small to medium height such as *Betula pendula* represent the best compromise in urban canyons, whilst more traditional, larger street trees with denser canopies with known pollutant absorption qualities such as *Platanus x acerifolia* should be used.

In a study of the impact of trees on air quality in Birmingham it was found that *Pinus nigra, Larix decidua* and *Betula pendula* caused the greatest

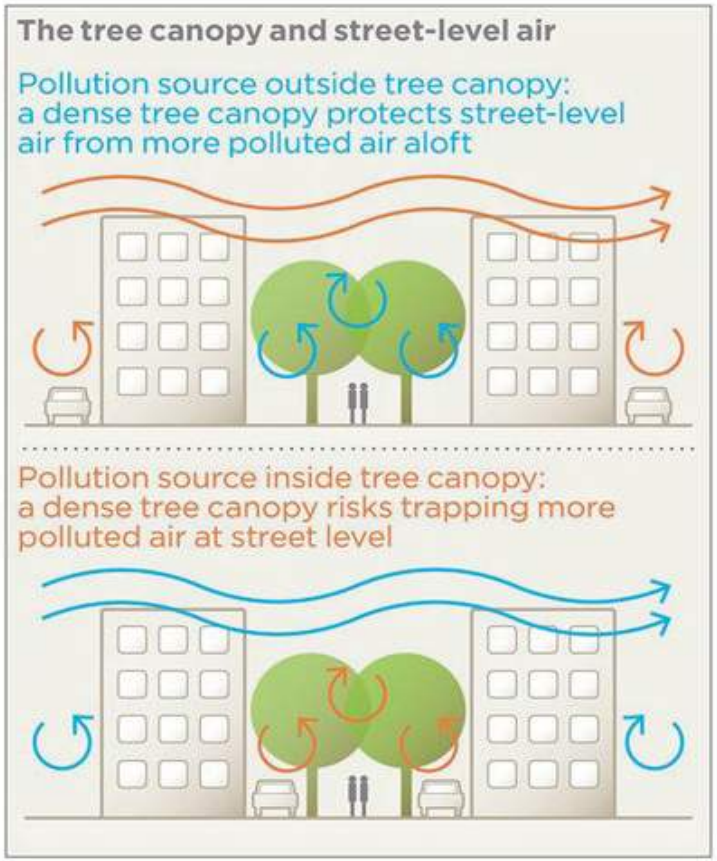



*Fig 9 The urban canyon and the impacts closed canopy planting has on the circulation of air and airborne pollutants (Ferranti et al, 2017).*

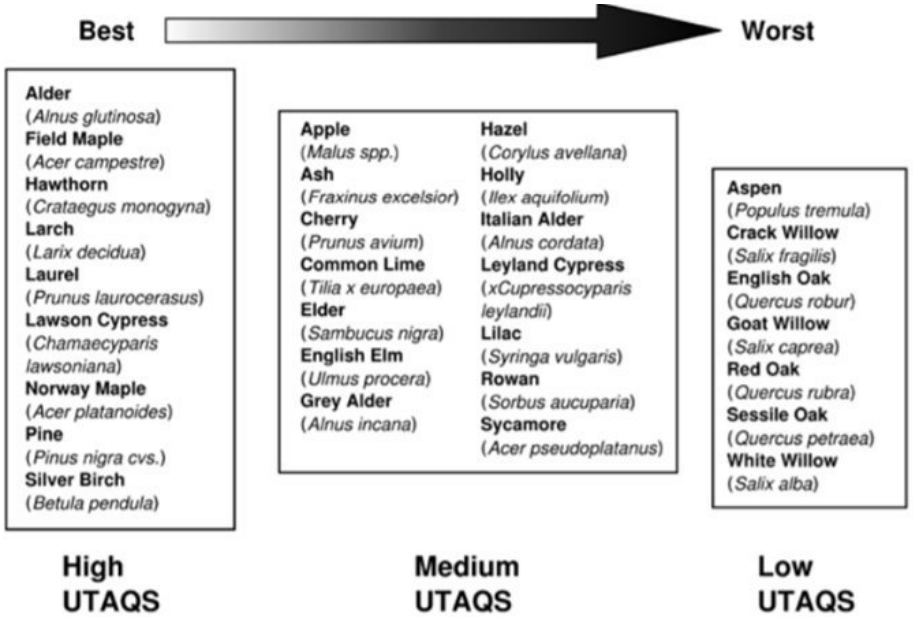



*Fig 10 The 30 most common urban trees in the UK arranged by Urban Tree Air Quality Score (Donovan et al, 2005)*

reduction in air pollution, whilst those with low scores such as *Quercus spp, Salix spp* and *Populus tremula* could cause a reduction in air quality downwind of areas of dense planting (Donovan et al, 2005). This study looked at the 30 most common urban trees in the UK so almost certainly missed some less commonly planted trees that would have high Urban Tree Air Quality Scores (UTAQS) such as *Betula pubescens*.

Using these scores for carbon sequestration and air quality impacts we can recommend that, in urban forestry schemes where reducing the impacts of pollution and climate change are the key focus, large species in the genus *Acer* should form the core of the planting palette with *Acer platanoides* scoring very highly in carbon sequestration and high in UTAQS, with *Acer pseudoplatanus* scoring very highly in carbon sequestration and medium in UTAQS.

**Ecological Value**

Quantifying the ecological value of individual tree species can be difficult, with much of the ecological value of a tree tied to plant communities and the habitats and ecological niches they create. As such the focus on tree species selection should be to create diverse and healthy plant communities that create conditions that are suitable for the widest variety of wildlife. This is achievable in most scenarios and should be the default in ecologically focused schemes. This approach is not inherently limited to rural or larger planting schemes, being possible on a smaller scale in urban and streetscape scenarios with a greater focus on the benefits of individual tree species and smaller plant communities that can thrive within the constraints of the urban environment. To achieve this, a priority on designing wider verges into the streetscape would be highly beneficial, affording greater space for larger, longer-lived trees, alongside the shrub and herbaceous layers that form a healthy plant community. This can be integrated with Sustainable Drainage Systems (SuDS) and pollutant amelioration schemes to further enhance the streetscape and maximise the ecosystem services provided by the urban forest. To achieve the maximum value within the confines of the designed environment it is important to understand the wildlife and ecological values of some of the core species likely to be used for these purposes, with species composition weighted towards those that provide the greatest benefits. These trees and plant communities are extremely important in providing key ecological resources that attract keystone species that help to further enhance diversity (Brown & Fisher, 2012) which is of particular importance in urban environments where habitat if present is often degraded. It has been observed that tree size and species have a far greater impact on habitat quality than the abundance of tree species (Yasuda & Koike, 2009), lending weight to the argument for planting trees that support high levels of biodiversity individually, particularly those that can attain significant mature sizes with greater leaf area.

Detailed studies into the full range of species associations with specific trees in the UK is limited, with the primary focus on particularly notable species such as the native oak and ash, as a response to the threat of *Hymenoscyphus fraxineus*, with figures of 3200 associated species with oak (Environmental Information Data Centre, 2019) and 1058 species associated with ash (Mitchell et al, 2014). Fig 11 collates some of the data available on species association with common UK trees. However, it should only be viewed as an outline due to limitations in the availability of data which leads to an underestimation of the ecological value of certain species such as *Castanea sativa* which has significant value in its pollen production that isn't reflected in the table, as well as differences in the number of species in a genus favouring those that are larger such as *Salix spp*. In urban environments less weight should be afforded to the number of lichen (and bryophyte) species supported by the trees due to the high sensitivity of many lichen to pollution which makes their presence in the urban environment unlikely.

| Species | Invertebrates | Vascular plants n/a | Lichen | Bryo-phytes | Fungi | Birds & mammals | TOTAL |
|---|---|---|---|---|---|---|---|
| *Quercus spp* | 1178 | | 716 | 229 | 209 | 10 | 3200 |
| *Fraxinus excelsior* | 239 | | 548 | 58 | 68 | 67 | 1058 |
| *Salix spp* | 450 | | 160 | | | | 610 |
| *Betula spp* | 334 | 14 | 126 | | 103 | 28 | 605 |
| *Ulmus spp* | 124 | | 187 | | | | 311 |
| *Fagus sylvatica* | 98 | | 206 | | | | 304 |
| *Corylus avellana* | 106 | | 160 | | | | 266 |
| *Alnus glutinosa* | 141 | | 105 | | | | 246 |
| *Acer pseudoplatanus* | 43 | | 183 | | | | 226 |
| *Pinus sylvestris* | 91 | | 132 | | | | 223 |
| *Sorbus aucuparia* | 28 | | 125 | | | | 153 |
| *Cretaegus monogyna* | 149 | | | | | | 149 |
| *Acer campestre* | 51 | | 93 | | | | 144 |
| *Tilia spp* | 57 | | 83 | | | | 140 |
| *Prunus spinosa* | 109 | | | | | | 109 |
| *Ilex aquifolium* | 10 | | 96 | | | | 106 |
| *Populus spp* | 97 | | | | | | 97 |
| *Carpinus betulus* | 51 | | 44 | | | | 95 |
| *Juniperus communis* | 20 | | | | | | 20 |
| *Larix spp* | 17 | | | | | | 17 |
| *Picea abies* | 16 | | | | | | 16 |
| *Castanea sativa* | 5 | | | | | | 5 |
| *Aesculus hippocastanum* | 4 | | | | | | 4 |
| *Taxus baccata* | 4 | | | | | | 4 |
| *Juglans spp* | 4 | | | | | | 4 |
| *Platanus spp* | 1 | | | | | | 1 |

*Fig 11 Species number associated with common trees in Great Britain, compiled using data and information from Environmental Information Data Centre, 2019; Mitchell et al, 2014; Alexander, Butler & Green, 2006; Leslie, 2005; Patterson, 1993; Harding & Rose,1986 and Kennedy & Southwood, 1984.*

## Discussion

Reviewing the climate forecasts and primary disease threats as well as models on the future ranges of trees indicates that the main threat to trees in the UK comes from changes in the levels and patterns of rainfall with more frequent periods of drought, leaving trees vulnerable to secondary attacks from disease or external stressors such as pollution or heat. This is very clear in the phenomenon of acute oak decline where the cause of mortality is often bacterial infection that only becomes fatal as a result of climatic factors such as drought and nitrogen pollution. This constrains responses to the projected climatic conditions, focusing on more drought-resistant planting, or perhaps more radically in ways to use planting and the micro-climates that woodlands create in order to retain water availability in the soil to allow less drought-tolerant species to thrive.

This approach is certainly one worthy of more detailed study to establish whether it is a viable response in maintaining and protecting the internationally scarce temperate rainforests found in the western UK, particularly the oakwoods of Devon and Cornwall which face the greatest threats from climate change of all the key UK habitats. Whilst these threats are significant, they are largely regional, with analysis of the climate forecasts for the UK and the regulatory impacts of an oceanic climate as well as the pattern of (island) disease spread indicating that the threats to trees in the UK are more limited than in continental Europe: many of the current core tree species of the UK are present in warmer and drier climates within Europe. This is reinforced by the current structure of French woodlands with *Quercus spp* being the dominant canopy species across much of the country with *Fagus sylvatica* dominant over shallow soils and calcareous rock, as can be seen in the UK.

These patterns of distribution over northern France in particular indicate that changes in the range of most British species in the north of the UK will be largely unchanged, with a greater diversity of species in the north a likely outcome of climate change as trees that are traditionally associated with the south shift range northward. Of greater concern is the south of England where changes in climate, particularly in precipitation, are predicted to be greater, significantly reducing the viability of a number of tree species intolerant of periods of drought, this being particularly noticeable with the native at-risk tree species (see appendix) which show a greater sensitivity to changes in climate (almost entirely due to reduced precipitation), many of them being associated with watercourses and upland areas that experience greater rainfall. The consequences of all this is the loss of certain trees in southern regions, either via drought-induced mortality (of particular concern in urban environments) or through displacement by more drought-tolerant species. This raises questions over the future of some key native species in the south of England which suggests a more nuanced view is required with regards to the native : non-native question.

Disease represents a lesser threat for the majority of species, but one that is more difficult to respond to with the potential for outbreaks of most diseases

in the UK to occur anywhere exhibiting suitable host species. Combatting this will require a biosecurity-led approach of preventing pest and diseases from entering the UK, leveraging the benefits of being an island nation, alongside rapid identification and containment of outbreaks as they occur. Closer links between designers and nurseries are necessary to support this: understanding the provenance of propagation materials and the supply chains used to transport said materials critical in minimising risks. The second prong of the approach is to design our landscape to be resilient to pests and diseases in the same way we would for climate change. Mixing important but pathogen-prone species with a diverse range of disease-resistant species might help break potential chains of infection and mitigate against possible species loss at a site.

The species selection decisions also need to be made with clear ecosystem service benefits in mind, and on the basis of unambiguous design objectives. In the selected ecosystem services, it is clear that in general there is a strong bias towards larger and longer-lived trees, with native and long-naturalised trees performing better ecologically for UK wildlife as would be expected, supporting the general species selection decisions made in rural areas. It is in urban environments that the findings are more interesting, with the data showing the picture to be more complex. It is to be expected that trees with smaller leaves and dense canopies would perform well in air pollution reduction given their greater surface area for particulate interception and chemical reactions to occur. But it is evident that the impacts of street morphology and Biogenic Volatile Organic Compounds (BVOCs) on air quality are significant enough to outweigh the benefits provided by larger and more voluminous canopies. As such a reversal of street planting might be advisable with traditional city centre street trees such as *Platanus x acerifolia* and *Tilia x europaea* being planted in suburban areas where the urban canyon effect is not as prevalent allowing BVOCs and high concentrations of air pollution to dissipate. Coniferous and diffuse canopy trees could be more commonly used in residential areas such as *Betula spp* and while *Pinus spp* being used in city and urban centres where their diffuse canopies and ability to reduce air pollution is arguably more valuable.

## Conclusions

The literature indicates that minor changes in attitude to species selection will be insufficient to achieve significant ecosystem-service-led planting schemes and woefully inadequate both in climate-resilient design and in tree planting for carbon sequestration. A renewed focus on the foundations of decision making with regards to tree species selection is imperative, with an understanding of diversity of species and age as an insurance against pests, diseases and changes in micro and macro climate. A greater awareness of the provenance of the trees selected will also be highly beneficial in ensuring high establishment rates and healthy trees that are equipped to deal with the stresses of climate change, particularly in the confines of the urban environment.

Significant carbon sequestration benefits are possible within the urban forest if tree planting occurs on a significant scale, with a clear preference for larger and longer-lived tree species (Sunderland, Rogers & Coish, 2012) including *Quercus robur*, which performs exceptionally across almost all the criteria evaluated in this investigation. In addition to this it is important to be aware of the cost-benefit ratio of potential tree species, particularly in scenarios where increased tree planting must be justified or where conflicts between people and trees are likely to occur such as the impact on pollution of large trees in urban canyons. Comparisons with the current climate of France and its present tree stock indicates that current UK native species will in general remain viable across much of the country and should remain the core of most tree planting schemes, with native species and long-established naturalised species providing greater wildlife benefit; however the benefits of species diversity including exotics should be encouraged to mitigate the effects of climate change and disease.

The planting of exotic species will need to be more extensive in southern regions of England due to the greater degree of likely change in climate resulting in more significant changes in woodland composition, and subsequently changes to the character of distinctive British landscapes (noted by Broadmeadow et al, 2003). Alternative species selection will therefore be strongly linked to the varying conditions of the different regions of the UK. As such, tree planting should be considerate of these conditions and local character, as well as the objectives of the scheme, with greater weight being afforded to factors such as air pollution in urban environments, and even greater weight to ecological factors in rural environments. With a review of the potential future climate in the area being the preferred start point, the species selection methodology herein can then be appraised and applied in the context of the development site, with additional regionally appropriate tree species completing the palette to be used. A table of core tree species established using the selection methodology for the projected UK average climatic conditions has been produced and is available in the appendix. These species are capable of providing significant benefits alongside high levels of climate resilience and are likely to be suitable across the UK. In addition to this is a table of species at an elevated risk of localised extinction or significant reductions in range, alongside a table of suitable alternatives that provide similar aesthetic, ecological or ecosystem services, derived using the same methodology outlined.

## Appendix

### A methodology for tree selection

*The core foundation of the methodology is a multifaceted approach built on understanding the desired traits and ecosystem services for the designated site, alongside understanding the constraints imposed on the species selection by climate change. To this, locally significant trees are added to the selection to help in integrating the design into the existing tree stock and the local/regional character. The species list generated must then be checked against potential outbreaks of disease that are close enough to allow for transmission to the development site. With the final step being to identify a commercial source for the selected species and its availability.*

### Recommended Core Species Table

| Species | Carbon sequestration score | UTAQS Score | Ecological Value* | Future climate resilience | Risk of Disease |
|---|---|---|---|---|---|
| *Acer campestre* | High | High | Medium | High | Low |
| *Acer platanoides* | Very High | High | | Medium | Low |
| *Acer pseudoplatanus* | Very High | Medium | High | Very High | Low |
| *Alnus cordata* | High | Medium | | Very High | Low |
| *Alnus glutinosa* | High | High | High | High | Low |
| *Betula nigra* | High | High | | High | Low |
| *Castanea sativa* | Very High | | Very Low | High | Medium |
| *Cretageous mon.* | High | High | High | High | Low |
| *Corylus avellana* | High | Medium | High | High | Low |
| *Fagus sylvatica* | Very High | | High | High | Low |
| *Ginkgo biloba* | High | | | Very High | Low |
| *Pinus pinaster* | High | | | Very High | Low |
| *Populus alba* | High | Low | Low | High | Low |
| *Quercus robur* | Very High | Low | Very High | High | Medium |
| *Quercus petraea* | Very High | Low | Very High | Medium | Medium |
| *Salix alba* | High | Low | Very High | High | Low |
| *Taxodium distichum* | High | | | Very High | Low |
| *Tilia cordata* | Very High | Medium | High | High | Low |
| *Tilia tomentosa* | Very High | Medium | High | High | Low |
| *Ulmus* 'Lutece' | Very High | Medium | High | High | Medium |

*Recommended core species based on provision of ecosystem services and suitability to the projected future climate of the UK. *Ecological value should be used as a rough guide only due to gaps in the availability of data and importance of plant communities.*

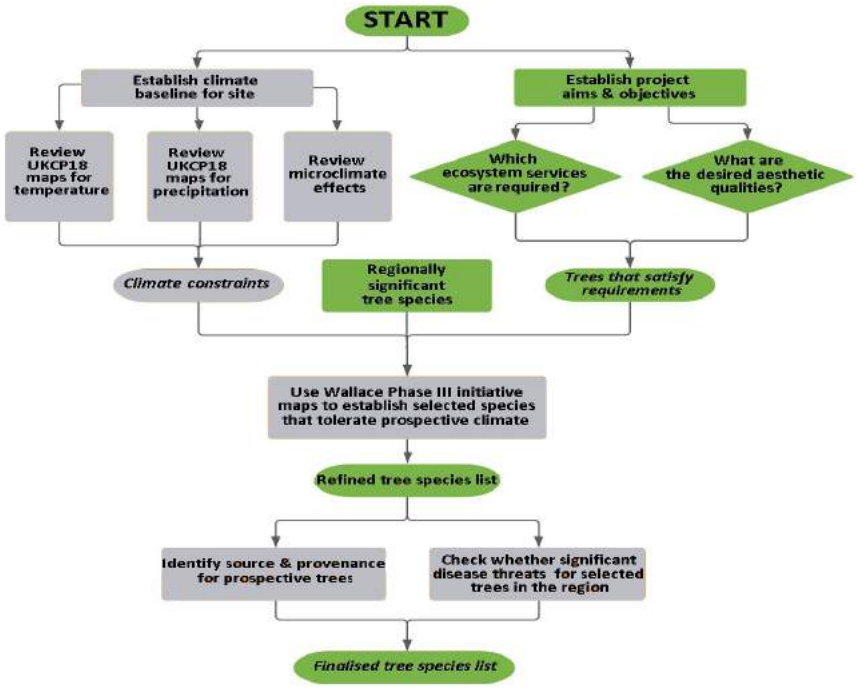
### Additional core species suitable for northern England & Scotland

| Species | Carbon sequest. score | UTAQS Score | Ecological Value* | Future Climate resilience | Risk of Disease |
|---|---|---|---|---|---|
| *Betula pendula* | High | High | Very High | Medium | Low |
| *Betula pubescens* | High | High | Very High | Medium | Low |
| *Pinus sylvestris* | High | High | High | Medium | Medium |
| *Populus nigra* subsp.betulifolia | High | Low | Low | Medium | Low |
| *Populus tremula* | High | Low | Low | Medium | Low |

### At-risk major UK tree species

| Species (1) | Threat/s (2) | NUTS Region/s of potential loss (3) |
|---|---|---|
| *Aesculus x carnea* | **Climate Change** & Disease | UKD1-UKD4-UKL2, (UK) |
| *Aesculus hippocastanum* | **Disease** & ClimateChange | F-G-H-I-J-K, (UK) |
| *Araucaria araucana* | Climate Change | I-J |
| *Acer platanoides* | Climate Change | I-UKJ2-UKJ3-UKK3 |
| *Acer rubrum* | Climate Change | UKJ2-UKJ4 |
| *Acer saccharinum* | Climate Change | I |
| *Betula nana* | Climate Change | D-L-M |
| *Betula papyrifera* | Climate Change | E-F-G-H-I-J-K-UKD3-UKD6-UKD7-UKL1 |
| *Betula pendula* | **Climate Change** (Possible future risk of disease) | F-H-I-J-K |
| *Betula pubescens* | **Climate Change** (Possible future risk of disease) | E-F-G-H-I-J-K-UKD3-UKD6-UKD7-UKL2 |
| *Carpinus betulus* | Climate Change | I-UKM63 |
| *Castanea sativa* | Disease | (D-K-L-UKM3) |
| *Cornus mas* | Climate Change | G-I-J-K |
| *Crataegus lavigeata* | Climate Change | I-UKK3 |
| *Chamaecyparis lawsoniana* | Disease | (UK) |
| *Fagus sylvatica* | Climate Change | I-J-UKH2 |
| ***Fraxinus angustifolia*** | Disease | (UK) |
| ***Fraxinus excelsior*** | **Disease** & ClimateChange | I-J-K (UK) |
| *Hippophae rhamnoides* | Climate Change | I-UKM3 |
| ***Juniperus communis*** | Disease | (C-D-E-M) |
| ***Karpatiosorbus spp (4)*** | Critically low population | K-UKL2 |
| ***Larix decidua*** | **Climate Change** &Disease | C-D-E-F-G-H-I-J-K-L, (K-L-UKM3) |
| *Malus sylvestris* | Climate Change | UKK3 |

| | | |
|---|---|---|
| *Picea abies* | **Climate Change** &Disease | F-G-H-I-J-K-UKD3-UKD6-UKE1-UKE3 |
| *Picea sitchensis* | **Climate Change** &Disease | F-G-H-I-J-K-UKD3-UKD6-UKE1-UKE3 |
| *Pinus nigra* | Disease | (UK) |
| *Pinus sylvestris* | **Climate Change** &Disease | F-H-I-J-UKK3-UKK4, (M) |
| *Platanus x acerifolia* | Disease | (UK) |
| *Platanus orientalis* | Disease | (UK) |
| *Populus alba* | Climate Change | UKM27-UKM63 |
| ***Populus nigra* subsp.betulifolia** | Low Population | UK |
| *Populus tremula* | Climate Change | F-H-I-J-K |
| *Prunus cerasus* | Climate Change | I-UKJ3-UKK3 |
| *Prunus padus* | Climate Change | D-E-F-G-H-I-J-K-UKL2 |
| *Prunus serrulata 'Kanzan'* | Disease | (UK) |
| *Pyrus cordata* | Low Population | UKK4 |
| *Quercus robur* | Disease | (UK) |




*Tree species selection Flow Chart, with constraints shown in light grey.*

| | | |
|---|---|---|
| *Quercus petraea* | **Disease** & Climate | Localised in regions H-I-J UK |
| *Rhus typhina* | Climate | UKK3-UKK4 |
| *Salix caprea* | Climate | E-F-G-H-I-J-UKD6-UKK1-UKK3-UKK4 |
| *Salix cinerea* | Climate | I-UKJ1-UKJ3-UKK3 |
| *Salix daphnoides* | Climate | E-F-G-H-I-J-K-UKC1-UKD3-UKD4-UKD6-UKD7 |
| *Salix fragilis* | Climate | UKM63 |
| *Salix viminalis* | Climate | E-F-G-H-I-J-K-UKD3-UKD6 |
| *Sorbus aucuparia* | **Climate** & Disease | F-G-H-I-J-K-UKD3-UKD6-UKE1-UKE3 |
| ***Sorbus spp (5)*** | Critically Low Population | D-G-K-UKL2-UKM6 |
| *Tilia cordata* | Climate | I-UKK3 |
| *Tsuga heterophylla* | Climate | F-H-I-J |
| ***Ulmus spp*** | Disease | (UK) |
| *Viburnum opulus* | Climate | I |

*(1) Species listed are those on the Woodland Trust A-Z of British trees, including native, naturalised and commonly planted non-natives (Woodland Trust, 2019). In addition to this are trees used broadly in urban forestry available from Barcham Trees (but not listed in the A-Z). Trees at highest risk of significant loss are highlighted in bold. All trees listed are considered at risk of range reduction or loss, with the primary risk highlighted in bold.*
*(2) Where both disease and climate change are listed as threats the regions given will reflect those shown in the Wallace Initiative Phase III maps using climate change variables, with disease hotspots indicated by brackets (see wallaceinitiative.org).*
*(3) Regions are specified using letter codes defined under the NUTS 1 Statistical regions of the UK, unless species loss is highly localised in which case region may be given as the NUTS 2 code. Regions are recorded if a tree is listed as having the potential to become absent in a significant proportion of the region.*
*(4)* Karpatiosorbus spp *includes numerous small populations of UK endemic whitebeams found in the south-west and Wye Valley such as* Karpatiosorbus parviloba *of which there are four recorded specimens and* Karpatiosorbus houstoniae *of which there is a sole known specimen.*
*(5)* Sorbus spp *includes numerous populations of UK endemic whitebeam that have not been reclassified into* Karpatiosorbus. *Mostly concentrated in the north of England and the Scottish isles.*

## Tree Species Alternatives

| Threatened Species | Potential Substitution species/Species management |
|---|---|
| *Aesculus x carnea* | Threat from climate change is limited to the north Welsh and north-west coast. Limited planting in these areas at present |
| *Aesculus hippocastanum* | Manage disease risk through biosecurity measures |
| *Araucaria araucana* | Unique aesthetic qualities of this species are irreplaceable in the high-risk regions. Other high visual impact conifers include *Cedrus libani*, *Cedrus deodara* and *Metasequoia glyptostroboides* |

| | | | |
|---|---|---|---|
| *Acer platanoides* | Risk is highly localised, urban trees should be sourced from central/southern European provenance | | |
| *Acer rubrum* | Risk limited to areas in the south-east and London. In urban areas *Acer cappadocicum* | | |
| *Acer saccharinum* | | | |
| *Betula papyrifera* | *Betula nigra* | *Betula albosinensis* | *Acer griseum* |
| *Betula nana* | Highly specialised species of montane and palearctic regions. *Betula humilis* is the closest comparison and will experience less range shrinkage. | | |
| *Betula pendula* | Lower risk than the other natives birches; where ecological values are prioritised then *Alnus glutinosa, Alnus cordata* & *Populus alba* can be used as pioneers. | | |
| *Betula pubescens* | *Betula albosinensis* | *Betula pendula* | *Betula utilis* |
| *Carpinus betulus* | Trees should be sourced from central/southern European provenance | | |
| *Castanea sativa* | Manage disease risk through biosecurity measures | | |
| *Cornus mas* | *Cornus controversa* | *Cornus kousa* | *Cornus florida* |
| *Crataegus lavigeata* | Risk limited to London and Cornwall. Species has a high association with the Midlands where it not at risk. *Crataegus monogyna* suitable alternative in these regions | | |
| *Chamaecyparis lawsoniana* | Most commonly used as a mono-species hedgerow, should be replaced with mixed species hedgerow. Where an evergreen mono-species hedgerow is required *Taxus baccata* is recommended for its ability to regrow from old wood | | |
| *Fagus sylvatica* | Trees should be sourced from central/southern European provenance | | |
| *Fraxinus angustifolia* | Identify disease resistant populations to establish new disease resistant cultivars. Where viable *Quercus spp* and *Populus tremula* most closely replicate the ash habitat. | | |
| *Fraxinus excelsior* | | | |
| *Hippophae* | Risk is limited to London and parts of Scotland, outside its natural coastline habitat. In urban environments *Pyracantha spp* are visually similar. | | |
| *Juniperus communis* | Manage disease risk through biosecurity measures | | |
| *Karpatiosorbus spp (4)* | Increased planting of endemic species and subspecies | | |

| | | | |
|---|---|---|---|
| *Larix decidua* | *Taxodium distichum* | *Metasequoia glyptostrboides* | *Pseudotsuga menziesii* |
| *Malus sylvestris* | Risk to species is highly localised in the south-west | | |
| *Picea abies* | *Pseudotsuga menziesii* and *Abies nordmanniana* suitable replacement in plantations. *Thuja plicata* and *Metasequoia glyptostroboides* are suitable for ornamental purposes | | |
| *Picea sitchensis* | | | |
| *Pinus nigra* | Manage disease risk. Where disease is established *Pinus radiata* and *Pinus pinaster* are suitable | | |
| *Pinus sylvestris* | Manage disease risk in Scotland | | |
| *Platanus x acerifolia* | Manage disease risk through biosecurity measures | | |
| *Platanus orientalis* | Manage disease risk through biosecurity measures | | |



| | | | |
|---|---|---|---|
| *Populus alba* | Risk to species is very localised in areas with low extantpopulations | | |
| *Populus nigra* subsp. betulifolia | Increased planting of subspecies | | |
| *Populus tremula* | Source trees from southern & central Europe. *Populus alba* & *Populus deltoides* can substitute if species isunviable | | |
| *Prunus cerasus* | In woodland environments *Prunus avium* remains viable with expanded planting of *Sorbus torminalis* encouraged | | |
| *Prunus padus* | | | |
| *Prunus serrulata 'Kanzan'* | Risk limited to specific cultivar previously used as a street tree. Other cultivars are suitable, replacements with similaraesthetics provided by *Amelanchier lamarckii* | | |
| *Pyrus cordata* | Increased planting of species | | |
| *Quercus robur* | Manage disease risk through biosecurity measures | | |
| *Quercus petraea* | Source trees from southern and central Europe. *Quercus robur* works very well as an alternative | | |
| *Rhus typhina* | Threatened range is limited to extreme southwest. Potential alternatives include *Euonymus elatus* and *Aralia elata* | | |
| *Salix caprea* | Risk to *Salix cinerea* limited to small portions of regions alongside London. As such it is a viable alternative to other willows alongside *Salix alba* | | |
| *Salix cinerea* | | | |
| *Salix daphnoides* | | | |
| *Salix fragilis* | At risk range limited in Scotland where other native willowsremain suitable | | |
| *Salix viminalis* | *Salix cinerea* and *Salix alba* | | |
| *Sorbus aucuparia* | *Crataegus monogyna* | *Prunus spinosa* | *Betula pubescens* |
| ***Sorbus spp* | Increased planting of endemic species and subspecies | | |
| *Tilia cordata* | Risk limited to London and southern Cornwall, *Acer campestre* 'Streetwise' provides a similarly architectural (smaller) street tree to *Tilia cordata* 'Greenspire'. *Tilia tormentosa* is a good alternative in parkland and large avenues | | |
| *Tsuga heterophylla* | *Taxodium distichum* | *Thuja plicata* | *Sequoia sempervirens* |
| *Ulmus spp* | *Ulmus laevis* | *Ulmus New Horizon* | *Ulmus lutece* |
| *Viburnum opulus* | Risk limited to London; other *Viburnum* species suitable | | |

*Species vulnerable to predicted climate change and disease in the UK and potential alternatives or management decisions to support the species and provide similar aesthetic qualities or ecosystem service values.*

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## Biographical notes

*Ben Gibbs is a third year student in landscape architecture at the University of Gloucestershire. He has a keen interest in arboriculture, the character of the landscape, vernacular architecture and the way in which these interact to tell the story of the landscape. This article is an edited version of his final year dissertation which explores the challenges presented by climate change and the constraints it might place on species selection, alongside the potential benefits of trees and how together these factors might shape the palette of trees we use in building the green spine of our landscapes.*

# THE IMPORTANCE OF TRAVEL TO A LANDSCAPE ARCHITECT: A EUROPEAN PERSPECTIVE

## Bodfan Gruffydd

*Bodfan Gruffydd was an advocate of 'learning through landscapes' not only for aspiring landscape architects but students generally. His own life and career was characterised by extensive travelling and observing the world, initially to New Zealand, later his 'tour' of Europe (recounted in this article) and subsequently, when the Cheltenham course was established, a journey across the USA to research landscape 'education' sponsored as a Harvard Rhodes scholar. The first 'foreign' field trip he planned as part of the nascent landscape architecture course took place in 1964, visiting Vienna and led by Gordon Patterson, Tom Wright and Bodfan himself. The following article derives from typescript intended with others* for publication as chapters in an autobiography and while the original is undated I infer that the main text is a 1990's collation and expansion of various notes and diary entries from the time of the visits (late 50s – early 60s) [Editor].*

In the early 1950s, following recovery from World War II, and while it will be remembered that rationing continued in the United Kingdom, it became more feasible to travel in mainland Europe. The first escape was to Switzerland with my sister to look for alpine flowers. The currency allowance then was £25; there were no package tours in those days but thanks to good advice from the professor of botany in Zurich, who not only told us where to go, when and even which pensions to stay at, we managed very comfortably, exploring Crans and the slopes of Monte Rosa and then to Chateau d'Oex. I will never forget travelling up from Montreux in the railway train at dusk, leaning out of the window thinking there was still snow on the ground before smelling the white *Narcissus poeticus* carpeting the fields; it was here at Chateau d'Oex I first discovered the magical beauty of alpine meadows.

The following year we were allowed £75 and ventured to Sienna and Florence to study not flowers but paintings, mostly primitives, the beginning of a lifelong passion for all forms of paintings, sculpture and artifacts.

We determined that on the way home we would attend the opera at La Scala. Italy like England was only beginning to recover from the war and

* See contributions in *Landscape Issues* volumes 17 (2018) and 18 (2019)



I remember the friend who was in command of the Welsh Guards who, having fought their way through Italy had come to rest in Milano, telling us of his worry on account of quite phenomenal pilfering amongst his men – not just packets of cigarettes or tins of coffee or petrol or tyres but whole jeeps were disappearing. He discovered that his Welsh troops, enamoured of singing, had fallen for opera and would do anything to get hold of a ticket for the opera. In distress, he went to explain his embarrassment to the Scala management who were so tickled by the compliment that they put a block of seats at the disposal of his regiment, and the pilfering immediately stopped!

When we arrived in Milano, however, there was no opera on the day booked – they were not sufficiently rehearsed: "Oh it might be some days before the show would go on." Of course by that time our money allowance had run out, but the kind Italy agent arranged for an extended stay in our hotel and we had three more days to enjoy the Leonardo paintings. When the show finally came on we boarded a tram, as we thought in good time for the opera. As soon as we asked the conductor for tickets to La Scala there were exclamations: "La Scala, they are going to La Scala!" We were hustled up the length of the tramcar, which gathered speed and never stopped until it reached the Opera House. We were thrust out, taken up by black attendants with white ruffs and gold chains around their necks, and rushed down the corridors: "Presto, presto…presto, presto…presto, presto" to our seats and immediately the curtain went up, twenty minutes before time. Then I began to understand about prima donna temperaments – they will not start till they feel rehearsed and then will not wait, and I think they have their priorities right, for which all good Milanese make due allowance. It was Verdi's *La Forza del Destino* and I fell for opera too.

There then followed, fairly regularly year by year, work trips or busman's holidays to investigate landscape problems and achievements in most parts of mainland Europe. Some years later in the summer interlude between terms at Harvard in 1962, I drove through France, Switzerland and Italy to Greece to search for examples to illustrate the studies I had started in New Towns on the influence human behaviour must exercise on urban landscape design if it is to be successful in surviving the test of time and use (1). I found but few and came to the conclusion that this was because people and dwellings are so closely packed together around the Mediterranean, with few organic elements in the hard paved streets and squares of their towns and villages; whereas in cooler more northern parts of Europe the climate favours softer, more organic, grass or planted surfaces, which wear out more easily. In Taranto in Italy, however, I did discover near the promenade a splendid miniature castle, complete with ramparts, motte-and-bailey, beautifully built of stone and concrete – an Italian version of the one Prince Albert built for his children at Osborne in the Isle of Wight for young people to play in away from the promenaders.

Back again in England in 1964 restarting private practice, there was

the research project investigating the landscape requirements for new hospitals (2). I had firm ideas of what was needed but insufficient examples to prove the concepts; hospitals up to that time in England having 'grow'd like Topsy' from mostly Victorian beginnings. New hospitals were being built but without knowledge of appropriate landscape requirements – no one seemed to know about the therapeutic benefits of landscape design; so I went to Switzerland, which had escaped the war, and West Germany where new hospitals had already been built, with recognition of the importance of appropriate landscape provision. Here, in these countries, I did find splendid examples. On repeated visits to Switzerland since 1955, I found examples of just how well the environment can be improved by the application of good landscape ideas. Cultivable land being so scarce among the mountains and steep valley slopes, the Swiss people are adamant in their determination to keep it free of unnecessary buildings. They have a very simple planning constraint: if anyone wants to build, he must erect a framework of scaffolding to outline the actual shape, size and height of the proposed building on the ground; the local community then comes to have a look; to decide and finally to vote. No further discussion, appeals or inquiries. They may even say 'yes' to the building, but 'no' to a sizeable garden, preferring their flowery meadows.

In Great Britain, admittedly, development proposals are put out to public consultation for comment and there is some sanction on developers to regard them; but decision rests ultimately, after prolonged public enquiries, with the Secretary of State – all a very cumbersome business and subject to political pressures.

The Swiss take democratic decision-making even further by submitting all new public development to national, or at least cantonal, competition, first, for approval of the idea, then for the actual design. This gives young practitioners the opportunity to show their mettle and free range for new ideas. Very interesting developments result: a school on top of a knoll in Zurich, to replace a Victorian villa, for example, but built entirely on piles to avoid destroying magnificent trees growing on the site; a swimming park in Basel to contain several swimming pools with pedestrian movement funnelled through footbaths by prickly shrubs and sunbathing areas planted with shrubs which are associated with more southerly climates – for bathers to feel warmer, just looking at them and inhaling the fragrance.

The Swiss, I found, in spite of their sophisticated way of life and high standards of living, are very close to the land, which they understand and cherish while, in a strange way, take for granted. Their pragmatism extends to their educational system, whereby a child's potential is assessed from an early age, leading to sandwich/apprenticeship courses for those inclined to crafts and manual work or high school leading to university courses for those leaning towards more academic turns of mind. The result is that everyone has appropriate training for <u>whatever</u> he or she takes up (even a dustman has a certificate to show that he understands the basic concepts of hygiene in his work); while those going on to university borrow money from the bank to finance their course, paying it back later when they earn their living. The interesting thing is that for the most part manual workers earn about the same amount in wages, whatever their job, which usually means that they have chosen to do what interests them and so take a pride in doing it well, though there must inevitably be some square pegs in round holes; while those who have paid for their professional training earn somewhat higher salaries to repay their investment.

Because of, you might call, specialisation in all forms of work, the Swiss automatically go to the expert for advice and service. With architecture, engineering and surveying, for example, landscape expertise is also acknowledged and I have observed that whenever and whatever of a development is being considered in the community all these professions get together to see what contribution each can make to enhance that development as an improvement for the visual, human and social environment.

In Basel for example, Richard Arioli, the doyen of civic landscape architects in Switzerland, was adapting an old cemetery within the city as a recreation park for various quiet activities and for local children's play. He commissioned delightful sculptures, some spouting water, with sandpits as play features along the central avenue for very small children; provided for quiet activities further inside the park, where office workers could read poetry in the lunch hour; an open air theatre and other delights. Then the telephone engineers muscled in and begged for space for a telephone exchange. So Arioli said: "Certainly you can build one here, but it must be on pillars, to provide covered space for the children to play in wet weather." So there it is, a bonus, with a sculpture climbing frame in the wall and free of cost to the community budget.

Beside the Rhine, high above the river, a research laboratory was desperate for parking space, so the engineer and landscape architect got together to excavate little-used space between the laboratory complex and housing accommodation, to provide for parking in the hole and create a charming garden on top for everyone's benefit and, again, at no cost to the community.

Elsewhere in the city, it was difficult to find space for all the needs of a new hospital. The buildings were planned on either side of a small natural valley, already regarded as what one would call an SSSI and which everyone wanted to to preserve. The solution was to put the car parking spaces <u>under</u> the valley floor, build labs and x-ray rooms etc into to the sides and restore the valley vegetation and its SSSI in front on top of the car park.

Nearer the centre of the city, Geigy built a considerable office complex and, because there was little space for reasonable gardens to provide health and vigorous surroundings for the personnel, the buildings were arranged at at three levels, with gardens covering the roofs of each. It is all most ingeniously arranged and stimulatingly beautiful with water flowing from

level to level, with cascades and fountains intermingling with vegetation and providing irrigation on the way.

At an earlier date a large hydro-electricity generating station was built lower down the Rhine, using the great flow of the river running through it. Vast excavation was involved and the resulting surplus excavated material was used by Mr Arioli to make playing fields and attractive open spaces round blocks of flats, built contemporaneously. It saved the engineering budget a lot of money which would have been involved by removing the excavated material in barges and is an immense gain for the community.

**Zurich**

The landscape architects to Zurich City Council, Mr Zbinden and his colleagues, working closely with the allied professions, have effected amazing environmental improvements. The city authority has adopted a policy to create a public right-of-way for walkers around the lake shore. Whenever a property is sold, every effort is made to secure this access. Sometimes the owners are selfish – they do not want to see other people enjoying the view and amenity – so then a catwalk is constructed over the water, which is in view of the householder, even when there are no walkers on it, to circumvent the lack of powers of compulsory purchase. The real brilliance of this idea is shown along the lakeside in the centre of the city. The existing lakeshore road was considered inadequate for the traffic using it, but it was lined with beautiful trees which the citizens insisted on preserving. So the design engineers proposed a new length of road on piles, over the water; but, again, the citizens stepped in saying they liked this new promenade as well – it was much too nice to use a road. So, somehow the traffic was routed elsewhere and the citizens kept their old road and won a delightfully landscaped promenade, with boat moorings.

Periodically the Swiss hold garden exhibitions as Britons are now starting to do, but the Swiss insist that such exhibitions be the nucleus of a new park or open space, so that the garden thus created remain a benefit to the community. (In principle this idea has now been accepted in Britain, but at that time it was not thought of.) In Zurich the linear lakeside park has been considerably extended in this way. Further along this lake shore a quay for onloading city garbage and for offloading ballast, cement, etc onto barges, coming and going across the lake, with appropriate storage facilities, has been developed beside a yacht marina. All this is part of the lakeshore improvement so that promenaders have the added interest of a beautifully designed industrial artifact with popular aquatic activities and yacht marina.

The city authority more recently created a new cemetery higher up a hillside overlooking the lake. They thought it would be nice to design it to be used as a public park as well; much as the first public park in the United States of America started as a cemetery at Cambridge, Massachusetts. Consequently



architect, landscape architect, engineer and sculptor worked together. The approach is over a magnificent design of granite setts of various colours – one of the sculptor's contributions – there are play areas for children and a special area set aside for the burial of unknown persons, with a chapel to compete with Coventry Cathedral for its works of art and artifacts. One feels it would be quite nice to be buried there.

Incidentally, a very interesting form of management pertains to Swiss cemeteries, whereby the same piece of land can be used over and over (or perhaps under and under) again, that is burial is on a 60-year rotation:

1st burial is at 1800mm deep – year 0
2nd burial on top at 1600mm deep – year 20
3rd burial above again at 1300mm deep – year 40
start again at – year 60

At the end of year 60 the headstones are offered to the surviving families, if any; if there are no takers, the headstones are broken up for hardcore for new paths and driveways.

All the bones are carefully excavated and buried still more deeply. The area is then cleared to form a new compartment for a new rotation of burials. The policy is sound and works very well because it does not involve the destruction of corpses, as does cremation, which may not be acceptable on religious grounds. The cemeteries are run by the municipalities and designed by landscape architects. There are public sections, providing for free burials, and family sections where plots are hired for successive family burials; there are niches (in walls) for ashes or special areas, requiring extra-special under-drainage for free scattering of crematorium remains. Headstones in the public sections are controlled for height etc but more latitude is allowed in the family plots.

The whole cemetery is maintained by the municipality, which exercises control over the planting, including annual bedding-out of flowers and provides reasonable visual harmony over all. The lessee pays an appropriate share of the cost of the maintenance of family graves. Slowly, as areas are cleared, the cemeteries can be redesigned to later contemporary ideas. High standards of maintenance keep them looking trim, if not gay.

**Berne**

The university needed additional laboratories, the post office needed better sorting facilities, road-users needed a new bypass. Where to put them? All these facilities, including a motorway exchange, were fitted in on top of the railway station which is in the bottom of a valley, while in front of the old university building a splendid plateau garden was created partly on top of new laboratories. It is yet another staggering illustration of the contribution the allied design professions can make to the improvement of urban environment by the coordination of the required developments.

On the outer edge of the city a new motorway was to be built, but its disruption and noise was considered unacceptable to adjoining educational institutions and housing. There was also a shortage of accompanying playing fields. A scheme was worked out between the road design engineers and the landscape architects whereby, through the moving of vast quantities of earth – literally mountains – the road was put, in effect, at the bottom of a deep cutting, which enabled a large playing field, with several play pitches to be created at the higher level of the schools. And dog lavatories were provided to keep the playing areas clean.

**Conservation of the River Ruhr**

Over the border, in Germany, may be seen a truly remarkable work of conservation comparable in scale with but preceding that of the Tennessee Valley Authority in the USA. In 1912 the River Ruhr was so polluted by industrial contamination that the steel industry was threatened by the filthiest of its water. Drastic action was needed and central government responded. It set up the Ruhr River Association to represent all water users

1 to conserve and regulate supplies of water to control flooding,
2 to control pollution and
3 to purify the river water.

Flooding has been controlled by building dams to store and regulate the flow of the river which generates electricity as it passes through built-in turbines. Pollution is controlled by the neutralisation of the chemical pollutants at source and proper treatment of domestic sewage, centrally or at source; with the introduction of compressed air wherever necessary to keep down the biological oxygen demand (BOD) in the river (to make sure there is sufficient oxygen in the water for healthy organic life – it is a negative definition). Purification of the water was very cleverly arranged by taking advantage of deep beds of gravel beneath the valley floor and arranging lazy beds from which the river water filters through to underground reservoirs lower down in the gravel.

Conservation has been so successful that a new and bigger lake at the Bigge Dam has been been created even higher up the river (there are now some 10 dams to control the flow and flood); recreation facilities have been developed handy for those in the larger towns of the Ruhr, while the upper stretches of the river and its tributaries provide country park amenities.

The treatment of the dams is among the most successful landscape features of this scheme. This was the development of a method of construction which allows trees to be planted – and to grow – on the exposed, lower, side of the earth dams so that these large-scale artificial features can be fitted more sympathetically into the topography. A concrete kernel, with clay backing on the reservoir side, prevents the penetration of tree roots which might prejudice the viability of the dam, allowing natural planting to spread across its downstream surface.



Finally, to cap it all, there is a surplus of potable water to sell to authorities outside the river basin, making a viable financial success of pollution control, combined with very considerable recreation and environmental improvements for this populous district of the Ruhr.

**Munich**

Another excellent example of professional collaboration may be seen in Munich, which was devastated by wartime bombing. To clear the site and to provide for an underground railway, the vast quantities of rubble were carted to the outskirts of the city to create the hills and dales of a new park, further developed with lakes and woods as the site for the 1972 Olympics. The central part of the city was then restored to pedestrian use in a most attractive way.

**Holland**

The kingdom of the Netherlands by its very flatness – so much of the country being below sea level – has developed specialised solutions to its landscape problems. The extremely high water table, on which the land and its growing crops appear to float – like the Aztec gardens of old Mexico City – determines plant and crop rotation; tree seedlings, for example, having to be sent to the 'mountains' only a few feet high and further inland where root growth is not prejudiced by groundwater. Hydrological and landscape engineers are, in consequence, internationally famed for their expertise in reclamation and drainage. With their specialist knowledge and in spite of these watery handicaps, their landscape architects have created excellent leisure and recreation parks simply by building up land form (much as developers to the mangrove swamps of Florida in the USA are still doing).

**Denmark**

In Denmark one wonders whether the Danes made Hans Andersen, or whether Hans Andersen made the Danes for, with the Norwegians across the water, they seem to share the wonderful childlike fantasy of that great fairy tale writer. It is a children's paradise with rocking horses in shopping centre forecourts and the home of adventure playgrounds. With the Swiss, they share a knowledge of understanding children's problems – their inconsequence – and how to cater for the behaviour. At Tivoli – that fabulous pleasure garden in the centre of Copenhagen – every feature is designed to delight adults and children alike; exquisite fountains and flowers can be savoured to a background of ecstatic shrieks of pretty girls being whirled in a merry-go-round or giant racer, to the more muted strains of hurdy-gurdy music; though there is also a concert hall for more recherché entertainment. Like the US parks,Tivoli is designed and, in this case, continuously redesigned by the landscape architects in order to ensure freshness of appeal.

## Mediterranean countries

Further south, towards the Mediterranean, in warmer climes, one is more aware of the classical influence on landscape design. One is reminded of the early saying: "Whereas in England God made the landscape, in Italy it is made by man." In the moister more equable climate of the British Isles, grass grows spontaneously and, if it is not grazed or mown, grass gives way to shrubs and trees, wherever trees will grow, so we have the two climax crops which can be manipulated – ie disposed – to form naturally attractive landscape designs whose picturesqueness may be enhanced by any naturally-occurring topographical features – rivers, streams, woods, meadows, hills and any mountains which can be brought into the view.

Such conditions do not obtain further south, however, in lower latitudes and altitudes, where plant growth depends on the availability of water and irrigation which, in other than exceptional circumstances, limits the size and scale of designed landscapes. Gardens, in consequence, are more limited in extent, more closely related to the dwelling and introverted. In that they are 100% man-made (or adapted) and share the formality of the associated built artifacts – terraces around the house forming podia, formal staircases and pools etc, they form an important element in domestic living.

## Al-Ándalus – Moorish Spain

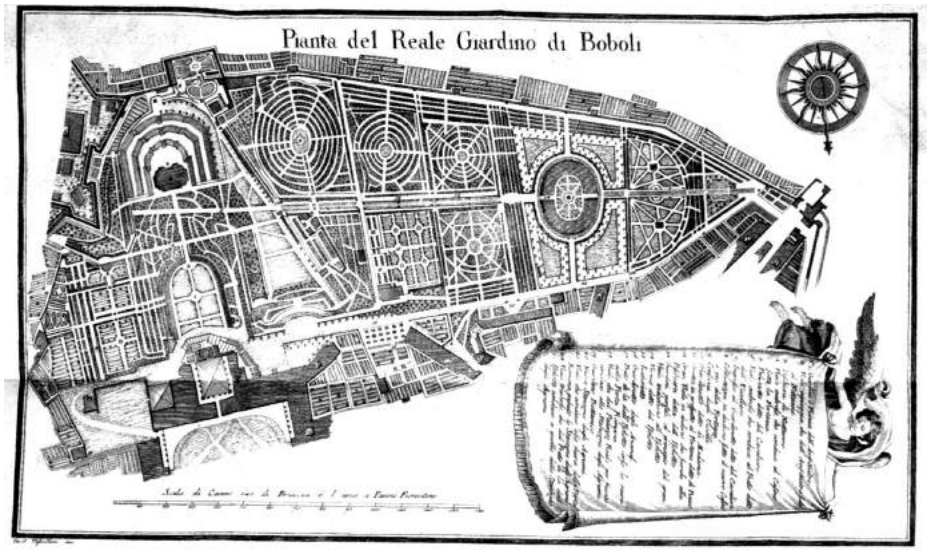
Water is, in fact, the key to human comfort in arid places, as the Moors well understood when they created their magnificent gardens in southern Spain, using Roman columns to build a mosque at Cordova and projecting the columns' grid in orange trees, irrigated by a complementary pattern of water channels, through the courtyard beyond, down to the gardens of the Alcazar beside the Guadalquivir river below. The refreshing qualities of water are carried to even cooler depths at the Alhambra and nearby Generalife of Grenada. On a more intimate scale than that of the grand gardens of the Italian Renaissance, one is, nevertheless, aware of the influence these earlier Moorish gardens had on garden design in Italy, noticeably in the rills down the balustrades of staircases, in which to cool one's hands in passing; the placid canals, enlivened by jets and falling water and bubble fountains in the small courtyards; with the fabulous avenues of cypresses, frothing with Banksian roses and paulownias and orange trees in the streets of houses with projecting balconies, latticed for privacy in accordance with Moorish custom.

This fascinating manifestation of Middle Eastern art came to Spain via North Africa before turning back eastwards to influence the design of the Renaissance gardens of Italy. Like factors exploited the same climatic advantages of elevated sites, with cool breezes and views over the campagna, which, early on, at the Villa Medici, Florence, actually anticipated the English picturesque, by manipulating topographical features beyond the garden boundary, to enhance the extended views over Florence. The influences which inspired Salvator Rosa, Poussin, Claude and others to paint scenes of classical ruins in idealised landscapes, were then translated to the picturesque landscape ideals of 18th century England.

Meanwhile, the archaeological discoveries of Hadrian's villa at Tivoli and those at Herculaneum and Pompeii inspired the design of the gardens of the Italian Renaissance; the magnificence of the water gardens of the Villa d'Este and the Villa Lante being complemented by gardens of the period all over Italy in which the Moorish influences of Spain can still be discerned.

There is a marvellous cool and simplified harmony, a domestic cosiness, in these charming Italian gardens which is in accord with the Renaissance way of living, sharpened by the developing art of painting, sculpture, music and artefacts which has never deserted the Italian genius. It still goes on today. Only when one comes to the overblown extravaganza at Caserta with its 80m high cascade, feeding the canal, in all 3km long, does Italian good taste falter.

The functional aspects of landscape design, however, continued to be in evidence. At the Boboli Gardens of the Pitti Palace in Florence, it is interesting to trace the way in which the whole park with its gardens served the practical requirements of the palace. Those parts of the park not designed for entertainment or pleasure were devoted to fruit gardens, orchards, the walls sheltering peaches and citrus fruits. The bosques, enclosed by hedges of cypress and bay, were managed in rotation of Portugal laurel and sweet bay coppice with live oak standards to provide fuel to heat the palace stoves; it being understood so long ago that the secret of success in the art of landscape design depends fundamentally on built-in provision for satisfactory management to ensure the survival of its frail organic parts. As



long as the palace was lived in, the park and gardens where automatically maintained; now they look abandoned; but could be restored as an open-air museum.

The Romans started a tradition for landscape design which was still developing in the villa gardens of the 19th century and those of today. The design emphasis has changed as it becomes more organic in its manifestations, in moving towards the ideas of the wild garden in the United Kingdom. In Rome, da Vico Fellani, earlier this century, was responsible for many public gardens, notably in the vicinity of the baths of Caracalla, somewhat inspired by the ideas of Thomas H Mawson whose work he admired.

In this century the ravishingly lovely garden at Ninfa, south of Rome, has been created in the ruins of a town which the Romans abandoned because of malaria (mosquitoes). The water source is a gushing stream issuing from the foot of high limestone cliffs, which then meanders between the ruins of the old town, sprawling with flowering climbers, amid forests of giant bamboo, and shaggy lawns for the pleasure of species roses, widely dispersed to display their free beauty, to end in a valley of solid arum lilies – a most remarkable sight.

Unfortunately many Italian Renaissance gardens are shockingly neglected and rapidly decaying, chiefly one feels, for lack of suitable management regimes, which obviously would include entrance charges sufficient to finance capital works needed to protect the organic artefacts from the vast crowds of people, including tourist, who come to enjoy them. Many northern gardens, in particular, suffer in this way. Though Isola Bella on Lake Maggiore fortunately is better off in this respect, partly one suspects because it is a money-making concern, helped by its architectural character incorporating hard surfaces better able to withstand human erosion. But at Villa Balbianello on a headland on the western shore of Lake Como a special treat awaits those lucky enough to visit. Created in the late 18th century and successfully restored by Americans and recently by Conte Guido Monzino, it is one of the most romantically beautiful gardens with ravishing views up Lake Como.

**Sardinia**

On the Costa Smeralda, developed by the Aga Khan as a series of holiday villages on the lines of Portmeirion in Wales, gardens as ecologically successful as those of the Mission San Xavier del Bac in New Mexico have been established with startling success. Water is scarce, for periods its supply depends on tankers from the mainland. All the buildings – the hotel and outlying chalets – in one of the bays are built of the local tufa-like rock with the roofs covered with the local 'soil' for the growth of arid loving plants. This keeps the buildings cool and blends them with the landscape as to be almost invisible – another remarkable achievement. In towns and cities also, you may come across interesting landscape designs, notably around the Rome Hilton Hotel with its characteristic stone pines and typical Mediterranean flora.

**Greece and Turkey**

Further east in Greece there has been some good 20th century work at Delphi and notably the restoration of the agora gardens below the Acropolis, based on careful archaeological investigation. The Makarias memorial in Cyprus has been well conceived to cope with the vast pilgrimages invading the landscape. One discerns the US influence also in Turkey where the authorities are trying hard and successfully to care for their monuments. Their open-air museums notably Antalya being among the best design of their kind I have seen, making a tour of their classical remains a very rewarding experience.

**Conservation and restoration**

Field or landscape archaeology is now assuming its rightful importance in the restoration of relict landscapes, more recently assisted by reference to contemporary drawings and paintings. Colonial Williamsburg in the USA is the classic example. The early baroque gardens at Painswick and those at Westbury-on-Severn in Gloucestershire, England, have been beautifully restored in this way and similar work goes on in many gardens in the care of English Heritage and the National Trust and other owners. Important work in this field also goes on in France and Germany and many other countries on the European mainland. Versailles is about to receive much-needed rehabilitation; while at St Germain-en-Laye a truly impressive restoration has been carried out. Here le Nôtre has designed the gardens as a prelude to the long impressive terrace overlooking the Seine. Later, when the railways came along, part of the garden beside the chateau was devastated in quite a scandalous way. The restoration has involved moving away the railway, with its accompanying station, in order to reinstate the garden at its original level – a remarkable achievement. There is a spectacular example at Giverny west of Paris which has been brilliantly restored by reference to its creator Monet's paintings, in this case down to the actual colours of the flowers grown by the artist. In Germany, the vast formal gardens at Schwetzingen among others are being restored on archival evidence; while the Villa Balbianello on Lake Como is now restored to its Renaissance loveliness. Similar work goes on in Russia, notably at Tsarskoye Selo following wartime damage. The list is is happily a long one.

**Management and maintenance**

With the break-up of estates and the scarcity of skilled gardeners and maintenance workers the problems of management have become acute, as those responsible try to maintain the unique character of individual gardens which are under pressure from an increasingly leisured and demanding

public. It is, of course, much easier to keep the larger formal gardens in good trim – they were designed to accommodate courtly crowds, with wide stairways and hard surfaces of stone and gravel to cushion the erosion of countless feet. For example, Vaux-le-Vicomte, south east of Paris, the first of le Nôtre's great gardens, is very well maintained as a result of government policy to share responsibility, and ownership with the estate, by acquiring shares in the property.

It is the smaller gardens which are so difficult to manage without destroying the intimate and delicate character, in order to accommodate the excessive number of visitors who want to see them. An obvious solution would be board walks, like those provided in nature reserves in England and in the Everglades National Park in Florida. The Japanese have for long understood how elevating the spectator above the object of his contemplation sharpens perception and appreciation by the very act of separation (in this case vertical) – like standing back to look at a painting or, as Claude Lorraine recommended, looking at landscape reflected in a smoked mirror backwards, which has the effect of simplifying the elements of the scene. But how to fit such a secondary circulation into the intimate scale of a small garden already established is hard to conceive – the Japanese gardens after all were already designed that way.

The National Trust in the United Kingdom successfully manages and even restores a great number of gardens left to its care. In the absence of government funding it relies on the subscriptions of 2 million odd members (1992) and bequests and endowment which may accompany many of its properties.

**Conclusion**

I have examined landscape and its design in several parts of the world especially in Europe and North America and have been struck by the differences which have motivated those responsible for its protection, design and management. The differences, I think, spring directly from the facts which have led to the creation of the *genius loci* of the various and different environments, the ground factors, so to speak, which have led to mankind's first awareness of the potentialities for the creation of art in landscape. What I have seen has made me aware of the underlying culture from the near East, through the countries bordering the Mediterranean and northwards across Europe. By the time Columbus was seeking patronage in Spain for his Atlantic expedition, the landscapes of Europe had already been partly tamed; parkland had been impaled for half a millennium and the art of gardening had already reached and sophisticated stage.

In Europe continuing acts concerned with the further development of landscape and gardening were influenced by the work and ideas of preceding generations and formed constraints to influence decision in the design process; they had the effect of insuring continuation of the evolutionary ethos. On the other hand, the main exploitation of North



American landscape did not begin in earnest until the conclusion of the War of Independence and the opening up of the vast lands to the west of the Appalachian mountain range. It then had to await the railway crossing of the continent a century later to gain its full impetus. By this time the eastern seaboard had been settled; but awareness of the landscape wonders of the West were not suspected before the expeditions of Lewis and Clark in the early 19th century. It was only with the coming of the railways in mid-century that people became aware of the need to control wholesale exploitation of the natural resource and the National Park movement got under way. From this it will be appreciated that the opening up and design of the North American landscape was deliberately decided primarily to protect its best elements.

In 1864 the first American landscape architect, Frederick Law Olmsted, was commissioned to go west to California to make proposals for protecting the big trees (Wellingtonias) in the Yosemite Valley. In due course his recommendations led to the formation of the first national parks. Olmsted was concerned for the health and recreation of the American people as well as for the landscape beauty which should be protected. And so the approach to landscape design was rather different from that which earlier evolved in Europe. Basically it was to provide for public enjoyment of the solitudes without destroying them. In consequence the movement of people and traffic (origin and destination) was properly assessed right from the beginning, the popular spots – roads with viewpoints, footpaths etc – were positively catered for. In order to obviate human erosion, local materials were used in construction and were in harmony with the surrounding landscape. These measures made for a largely self-managing environment and much simplified maintenance. It also insured respect for the *genius loci*.

Exactly the opposite set of circumstances existed in Europe, where the form of the landscape had already evolved as a result of intensive human occupation. The only freedom of movement had been along roads and rivers, over commons and along footpaths, which had developed as shortcuts for the convenience of pedestrians between farms and villages. As living conditions improved however people had leisure to enjoy the open countryside and recreational pressures built up, for which the landscape was not prepared. It had been developed for food production, farming and hunting, shooting and fishing, and at the same time to look beautiful. So this new recreational use has to be catered for and this is inevitably a slow process in a countryside of individual landowners.

It is noticeable that in many of the earlier developed countries of Europe and the near East, the authorities have instituted ameliorative measures and that where comparatively recent archaeological discoveries with artefacts to display are unearthed, the needed landscape design emulates that of North America.

There is another important lesson to be learnt from these comparisons; that is that wherever you may go in mainland Europe where the landscape

profession has the recognition and support it deserves, you will find close collaboration between the sister professions of architecture, engineering and landscape architecture, working closely together for the greater benefit of the community first, and for the realisation of their own individual design ideas only in so far as these can contribute positively to the benefits of the scheme as a whole. One does not have the feeling that the professions are working in watertight compartments, blinkered within their own sights. The shortcoming in Britain would appear to lie in the narrow concepts of the further and higher education system. This would be eased if architecture, engineering and landscape architecture were taught, first, as an art form, to which the individual disciplines of those professions were then brought to bear.

It will be realised that landscape architects must have an understanding and appreciation of architectural, engineering and horticultural principles to enable them to do their job; but architects and engineers, for example can do those by no more than insuring the soundness of their foundations and structure or the suitability of the substrata of geology. It is an arrogance for those professions to assume an attitude of completeness in any of their executed designs, unless they have also considered the visual and topographical aspects of the ambience in which that work is put. Therefore it is necessary for them to have a developed appreciation of the components and art forms of nature and landscape design, or else with humility to go to the expert who, by training, has such understanding. Actually this principle should to advantage be applied also to the planning profession, whose training also lacks general visual appreciation or, indeed, pragmatic finesse in the consideration of formulated designs submitted for consideration by its practitioners.

***Notes***

*(1) Specifically drawing on examples from Harlow New Town, where he was chief landscape architect*

*(2) Landscape Architecture for New Hospitals (1967) pub. King's Fund*

*The illustration on p 81 is an 18th century engraved map of Boboli Gardens, Florence (public domain copyright)*

# THE COMMON SCENTS OF LANDSCAPE

## Martin Spray

It is thought that the typical British adult spends about 5% of his or her life outdoors. In this context, it is worth asking the question: What is landscape for?

Clearly not, for most of us, for living our lives in. For a lot of us it seems to be important not 'for real' but as backdrop, behind our fairly thoroughly staged lives. It has, of course, been real for all of us at some time: we all revisit landscapes in the virtuality of memory and dreaming. But from day to day it is something that is, as much as 'for real', likely to impinge on our lives as television film scene or advert location, perhaps as a glance at the souvenir calendar – at best in a nod at the garden on the way to the car. It is more likely to be 'image' than the park with us walking the dog in it, or the allotment with us digging in it – hardly at all likely to be the hillside with us backpacking across it, come sun, come rain.

We may pretend that much of our life is spent out there; indeed we fool ourselves into believing it – but we are still within doors. The doors are to boxes on wheels, and the landscape is a sort of moving wallpaper seen through a sheet of glass. Not a new observation: as Robert M Pirsig points out,

> in a car you're always in a compartment, and because you're used to it you don't realize that through the car window everything you see is just more TV. You're a passive observer and it is all moving by you boringly in a frame.

This was his 1974 'Inquiry into values', Zen and the art of motorcycle maintenance, a book which is usefully being rediscovered; but he was perhaps a little over-enthusiastic:

> On a cycle the frame is gone. You're completely in contact with it all. You're in the scene ...

But still the sound of the i.c.e. and of the tyres on tarmac grabs the ears before the more subtle sounds of the land. Moreover, we are so constantly saturated – from birth – with artificial smells that most of those of the rest of Nature fail to reach our consciences. (Do they reach our unconsciousness: can you recognise your partner, or your child, or your own clothing, by smell?)

Some of us, of course, are parts of the scene, living or working on the land. That is for real. Yet that is only a few percent of the population. The rest of us usually have to remember things like where most of our food and fibre comes from. We are not, in the ache-in-the-back, soil-in-the-pores sense, part of the land (even though we cannot yet escape being so ecologically!). Nor for most of us – as adults – is the land an important aspect of any play that we make. That's for kids ...

Nor are most of us part of the landscape that we are so concerned to make and manage. If landscape is not part of your life – I mean part of your work, part of your play – if it is not the places you have helped make, what concern will you have for those called landscape architects who strive to make places for you? Probably little. You may not even know they exist.

Why are we surrounded by such poor landscape architecture? Is it because landscape architects – along with most of the rest of us – do not belong: do not dwell, as Heidegger wants it? They have not gained the ache-in-the-back or soil-in-the-pores by the making of it. Theirs is not an outdoors task!

Ours is an indoor culture. Not, of course, entirely, but predominantly. It is an urban-oriented culture – again, not entirely, but predominantly, and increasingly so; and our cities are most important to us because of the boxes they contain, and the boxes that travel from box to box, in which we contain over nine tenths of our lives. The bits in between – the landscape – when given any serious attention are secondary.

Need it be so? With interest in 'sustainability' developing, one might hope that more emphasis will come to the outdoors. Landscape, when given serious attention, could cease to be either just functional or just cosmetic, as we realise that it is made of land that still sustains us (or 'holds us up', to use the vernacular).

Perhaps things will change. Perhaps landscape architecture will not be so strongly an indoors activity. There will perhaps be a change in education. We may need courses (modules) with such titles as 'Wind and rain; snow and sun', 'Turning the soil', 'The landscape after dark' and 'Smells of the land'.

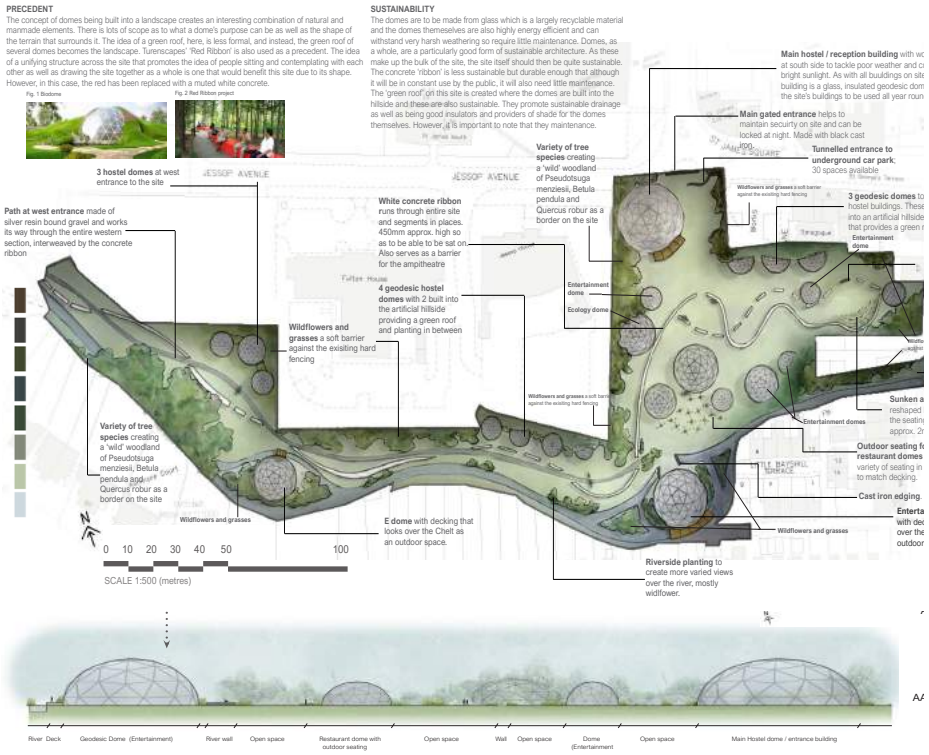
*This short editorial piece is taken from* Landscape Issues *vol 13 (1996) pp2-3. Martin submitted regularly to this journal and to many other publications (notably co-editing Ecos). This reprint is to honour both his contribution to landscape research generally and his particularly long association with the landscape architecture course at Cheltenham (see p91).*

# CHELTENHAM COURSE NEWS

## Elizabeth Rimmer wins the 2021 National Women in Property Award

Elizabeth Rimmer, currently in the her second year on the landscape architecture course at Cheltenham, has won an award for the best Built Environment degree student in the South West region for "giving excellent, unique answers to questions, being a confident individual, with a strong self-awareness and a good sense of how to engage with people" and for her two design projects: the design of Magnolia Court at the University of Gloucestershire's Francis Close Hall campus and her sustainable public space design of St James Square in Cheltenham.

The Magnolia Court project focused on creating a space for reflection and communication by using the element of water that would bring people together on campus. The concept for St James Square was on a larger scale, producing a network of multifunctional dome spaces (reflecting the ever-changing nature of the 'youth culture' as outlined in the brief) set into a landscape of mounds and dense vegetation to create a place that is both an experience to walk through and to use. [*Drawing: "The Glass Park"*]






## Allan Mitchell renounces academia and returns to practice

Allan Mitchell first came to the landscape architecture course in the mid 1980s to enrol as a student, having accepted its attractions over the farmwork he was at that time undertaking in the Cotswolds. John Simpson, former colleague of the department, admissions tutor and practising engineer, was fortuitously visiting the farm on consultancy business and in conversation with Allan did the recruitment sales pitch! We are eternally grateful because Allan came good in so many ways for both the course and the profession. He completed the degree and diploma and was immediately snapped up by Cheltenham Landscape Design, a 'practice office' housed on campus and responsible for many projects nationally but perhaps more notably connected with the college estate. Working in CLD, Allan thus benefited from a wide experience of projects, developing his practical skills. His installation of the landscape at the 'new' Oxstalls campus is an excellent case in point, a design which achieved a national sustainability award. But this was not his only legacy. Allan, thereafter a partner in an environmental consultancy also based in Cheltenham, was increasingly invited to give talks to our postgraduate students on 'professional practice', ultimately becoming the nominated module tutor. His foot was in the door of pedagogy! The rest as they say is history. Subsequently appointed full-time, Allan was involved with various course modules for ten years and, rising to academic course leader in 2013, he was able to influence the curriculum in no small way. Furthermore and significantly, by taking personal control of student recruitment he succeeded in raising Cheltenham's standing in national statistics, building a considerable reputation in the field of landscape education. And now, before his due retirement date, he has decided to re-engage with practice whence he came. We shall all miss him, students and colleagues alike, but wish him well on his return to 'real' work. [*photo: teaching at Lightmoor, Forest of Dean*]

**Martin Spray: former staff member dies May 2021**

In 1972, when he arrived in Cheltenham to teach ecology, the subject was little known, even in landscape architecture. An ecologist taking up a job in what was then an art college was even more remarkable. This says much about the character of Martin Spray. Many will remember that he always wore sandals – though he never set himself up as a prophet. Some will recall that he did not drive a car or that he went to live 'in the Forest'. Fewer, perhaps, will reflect upon his interest in Chinese poetry. Although those keynotes might suggest someone set apart from the mainstream, Martin's commitment, engagement and interest in people ensured that he became a valued member of the landscape community over many years.

At one time, in those earlier days, the full-time staff could number as many as ten, from a variety of backgrounds. In this unusual and sometimes chaotic habitat, Martin established a niche which ensured that his subject, his specialism, was not simply a narrow academic self-contained field but was essentially interconnected, not just with design but with places and with what in those days was called 'quality of life'. During his time on the course, the significance of ecology in our lives became much more widely understood. Martin's interactions and conversations with students – and with other staff members – made an invaluable contribution to this ongoing process.

He retired from the department in 2004 and died in the Forest of Dean on 13th May 2021. [*Words: Will Cretney; photo © Rowan Spray*]