



Our ref: LT RSP 2 RBKC 34.3.59

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Dear Simon

RBKC publication planning policy arboricultural input - March 2014

Proposed planning policy CL7 a

Not exceed a maximum of 50% of each garden or open part of the site. The unaffected garden must be in a single area and where relevant should form a continuous area with other neighbouring gardens. Exceptions may be made on large sites;

Council justifications that could relate to policy CL7 1

34.3.50 A basement development next door has an immediacy which can have a serious impact on the quality of life, whilst the effect of multiple excavations in many streets can be the equivalent of having a permanent inappropriate use in a residential area. There are also concerns over the structural stability of adjacent property, character of rear gardens, sustainable drainage and the impact on carbon emissions. Planning deals with the use of land and it is expedient to deal with these issues proactively and address the long term harm to residents' living conditions rather than rely only on mitigation. For all these reasons the Council considers that careful control is required over the scale, form and extent of basements.

34.3.51 The policy therefore restricts the extent of basement excavation to no more than under half the garden or open part of the site and limits the depth of excavation to a single storey in most cases. The extent of basements will be measured as gross external area (GEA).

34.3.52 'Garden' or 'open part of the site' is the private open area to the front, rear or side of the property. A 'single storey' is one that cannot be subdivided in the future to create additional floors. It is

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generally about 3 to 4 metres floor to ceiling height but a small extra allowance for proposals with a swimming pool may be permitted.

34.3.55 The townscape of the Borough is urban and tightly developed in character. However, rear gardens are often a contrast, with an informal picturesque and tranquil ambience, regardless of their size. Whilst basements can preserve the remaining openness of the townscape compared with other development forms, it can also introduce a degree of artificiality into the garden area and restrict the range of planting. Retaining at least half of each garden will enable natural landscape and character to be maintained, give flexibility in future planting (including major trees), support biodiversity and allow water to drain through to the 'Upper Aquifer'. This policy takes into account the London Plan and the Mayor of London's Housing SPG both of which emphasise the important role of gardens. The National Planning Policy Framework (NPPF) also supports local policies to resist inappropriate development of residential gardens and excludes private gardens from the definition of previously developed land.

34.3.56 Keeping the unexcavated area of a garden in a single area and adjacent to similar areas in other plots allows better drainage, and continuity of larger planting supporting biodiversity. In back gardens this area will usually be the end of the garden furthest from the building.

34.3.59 Trees make a much valued contribution to the character of the Borough, and bring biodiversity and public health benefits. Works to, and in the vicinity of, trees, need to be planned and executed with very close attention to detail. All applications for basements likely to affect trees either on-site or nearby must be accompanied by a full tree survey and tree protection proposal for the construction phase. Core Strategy Policy CR6 Trees and Landscape will also apply.

Council response to my comments to second draft planning policy

If to the rear the unexcavated area of the garden should normally be at the end of the garden, where it will be adjacent to similar areas in other plots, allowing for better drainage and larger planting.

The growing medium available to trees in an urban environment is different from that in open woodland or grassland where there is generally significantly fewer constraints on root growth. This Borough has a very dense urban environment and tree roots, small and large, have been found much deeper than 1 metre, as acknowledged in the response "roots tend to elongate more in poor soils that are often found in urban gardens". The urban environment provides many constraints to root growth and it may not be conducive to the long term growth and survival of trees to limit the depth of available soil to only 1 metre in back gardens. It is not expected that forest scale trees will be planted too close to the building and the policy does require the natural garden area to be at the end of the garden.

The Council endorses the policy 'right place right tree'.

As noted in the response there are other reasons for the restrictions on the extent in addition to planting.

Opinion

I write at your request in response to the latest version of the proposed planning policy CL7 a, the justifications in the proposed planning policy document that seem to relate to this policy and with regard to the comments made in relation to my comments to the second draft planning policy, all of which are shown above, to the Council's latest report Trees and Basements February 2014.

For the record I state that I am a Registered Consultant and Fellow of the Arboricultural Association, a Chartered Forester, Environmentalist and Surveyor with a Masters Degree in Arboriculture and 25 years experience of the landscape industry - including the Forestry Commission and Agricultural Development

and Advisory Service. I am also Chairman of the UK & I Regional Plant Appraisal Committee, inaugurated to promote international standards of valuation in arboriculture.

I start by reiterating the main points that I have made previously, namely that:

1. The undulation of a garden over a basement is not restricted in any way. A garden over a basement can be as undulating as desired now and at any time into the future.
2. Ground of one metre depth over a concrete basement roof does not restrict the range of planting in any way, including major trees.
3. Any major tree grown in the UK can reach maturity and live for a normal life span in 450-750mm of fertile soil. One metre is more than adequate.
4. One metre of soil is more than adequate to structurally support any major tree grown in the UK.

Further to this, having read the revised policy, the associated reasoned justification, the Council's response to my previous comments to the 2nd draft policy and the February 2014 report Trees and Basements I make the following points:

There is little horticultural justification for any garden basement, which has one metre of well-drained top soil placed over the basement roof to be limited in size in any way with regard to tree planting, horticultural planting, greenification or biodiversity. In fact quite the contrary:

According to Natural England, English soils vary from a few centimetres to a metre or more in depth. Although they are young in a world context, they represent about 10,000 years of ecological processes and human modification. Consequently, soil is regarded as a non-renewable resource because it cannot be re-created except within the context of geological timescales. From my viewpoint, the stipulation of a 1m-soil covering for basements is not only luxurious, but wasteful and contrary to Local Agenda 21 (sustainable use of resources).

Urban soil, as the Council has quite rightly mentioned in their response to my previous comments, is often poor quality and detrimental to healthy tree growth. The soil that would be placed on top of any garden basement would be prime soil, far better indeed than the original soil that it will have replaced in every case that I can think of across the borough. So, far from having a negative impact on tree growth, garden basements, with one metre of soil on top, will be a boon to the leafy, green character of the borough's gardens, promoting healthy tree growth above that which would be found in most gardens with their inherently poorer soils. At any rate, there is no horticultural justification in portraying the impacts of development as unduly negative. Clearly, from a more balanced perspective, there are benefits to be had from basement development; the provision of topsoil and new planting are two of them.

On the subject of taproots and the occurrence of roots at greater than one metre depth, it is well-documented that tree roots are opportunist and will exploit new niches as they become available and attractive to them. Thus, some tree species (mostly of flood plain origin; e.g. oak, elm, poplar, willow and less the ornamental species of which gardeners are fond) growing on shallow soil over heavy clay can exploit deeper fissures that open in the clay in times of severe drought, when the upper horizons are desiccated. As stated above, planning necessitates the provision of luxuriant stores of premium top soil on the site to a greater depth than would normally be expected, rich in organic matter and nutrients and less prone to desiccation at such depths. Thus, the privileged roots need not beguile us with their adaptive ability to exploit tortuous nooks and crannies in their otherwise hardened struggle for existence. Indeed, as previously stated, roots in good soil tend to ramify more and elongate less: their roots become more compact and fibrous. Such a root pattern is generally desirable in urban situations,

where the more erratic and opportunistic rooting patterns are more readily associated with damage to infrastructure (e.g. drains and foundations).

This is evidenced in the Council's Trees and Basements report where it appears that in Case study 2 - Egerton Crescent, damage to the garden wall may well have been caused in part by the tree growing in poor quality soil and exploiting these nooks. It is well documented that the provision of good soil structure can be an effective cultural method of reducing root damage to urban infrastructure, particularly in the case of paving, but depth of clay will also be a factor in subsidence risk. The question must be asked, does this council wish to reserve garden space for the promotion of opportunistic exploitation of soil water reserves at depth by flood plain species (oak, elm, poplar, willow) next to and below vulnerable building foundations? The issue of taproots does not concern arboriculturalists in this country, as these normally wither and die as the sapling grows. I am surprised that anyone has brought the issue up at all. For the benefit of those expressing concern over taproots, I attach a West Sussex County Council¹ primer for its tree wardens on tree roots.

I provide again the figure 1 from Harris² which had been omitted from display on the Council's Consultation Responses on Second Draft Basements Policy July 2013. I enclose it for completeness and hope that it will see the light of day this time around. NB this diagram has been produced for a book of Arboriculture, which generally presumes the management of trees in an urban environment. The diagram was produced to promote a better understanding of a tree's typical root pattern (not ideal one).

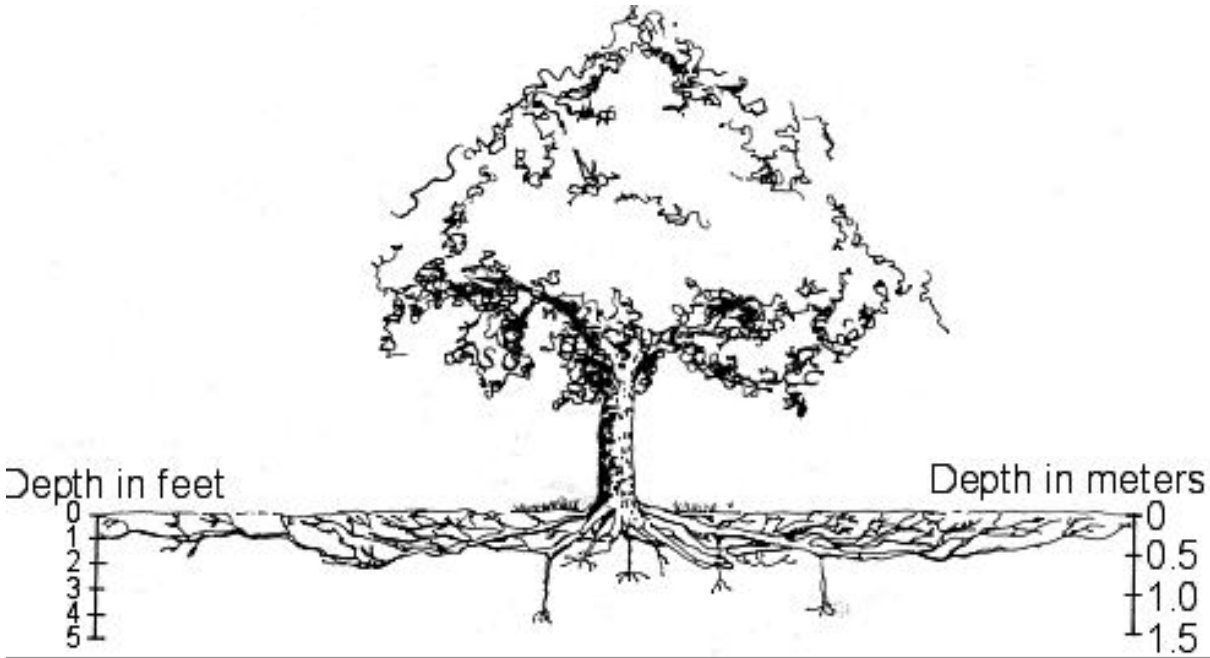


Fig.1: in mature trees the tap root is either lost or reduced in size. The vast majority of the root system is composed of horizontally oriented lateral roots²

I will now turn to the recent Trees and Basements report February 2014.

The report:

- Uses two studies (Gasson and Cutler 1990 and Dobson 1995) whose findings have been superseded by the findings of more recent studies including the Harris RW et al 2004 study from which the Fig 1 diagram above is taken. The thinking that trees need or require deep rooting in normal conditions is outdated and discredited. I provide below a second diagram from more recent work³ that makes the point in as straight forward a manner as is possible. There are numerous further studies stating the same case.

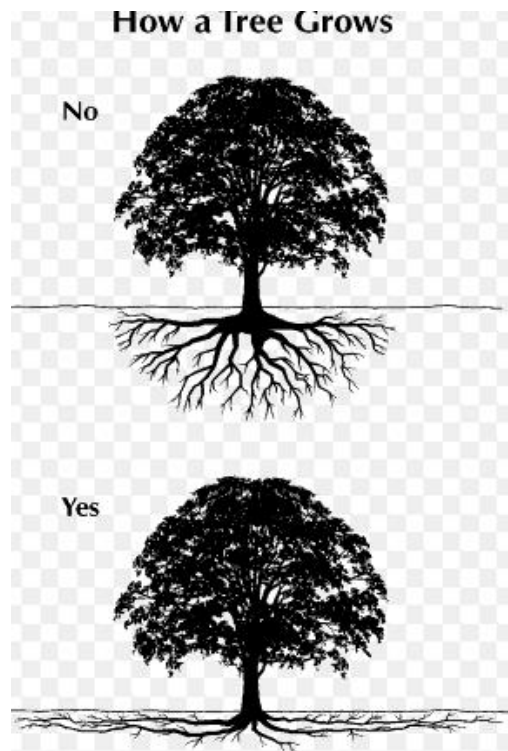


Fig.2: The lower diagram shows actual healthy root growth and spread (title from source document³)

I will state again tree roots will grow where the conditions are best for root growth; in most cases, that is near the soil surface. Oxygen, nutrients, and moisture are usually best near the surface, so the roots of trees, turf, and other plants share this space. One metre of soil is a significantly greater soil depth than is normal and within this trees and other plants will thrive without their root systems needing to extend.

- Seems to make the flawed deduction that the presence of roots at greater depths than one metre in two case examples somehow demonstrates that roots need to have soil of this depth. This is not the case. It is more likely that the presence of these roots at depth indicates that the existing available soil is shallow, low in nutrients and poorly aerated and that moist fissures opened up in the clay subsoil that the species were able to exploit during a drought. As a consequence, the opportunist roots are extending down and out in search of sustenance. In gardens with one metre of topsoil this will not be the case. The presence of roots on temples at Angkor Wat in Cambodia, does not mean trees need temples to support them. Trees are remarkably adaptive organisms that can adapt to their environments. Similarly, a tomato can be grown in solution without soil at all. What is at stake is not what depths tree roots can achieve, but what they require to thrive: man can fly to the moon or walk to the north pole, but he does not need to live there to survive and can thrive perfectly well in his own sphere. The UK's forestry industry frequently operates commercially on soils of shallower depths, generally relegated to the poorer soils, not wanted by agriculture. A farmer would give his high teeth for 1m of topsoil, let alone a forester. The 'Bible' of forestry, 'Practical Forestry for Agent and Surveyor' (Hart, C 1991) states that 'Trees that will grow in shallow soil, say 30-45cm, include Norway spruce, beech and birch; those requiring deeper soils, 75cm or more, include oak, ash, sweet chestnut, lime and the larches'. NB those recommended above for soils of 30-45cm depths are by no means small trees, but capable of reaching 25-30m in height.

- Seems to make a link between root barriers around gardens and some supposed growth restriction caused by having one metre of soil over a basement in a garden; (para 4.1), "the physical root barriers, such as boundary walls, building foundations etc, typically found in this borough may restrict certain species from utilising soil beyond these constraints, which could greatly affect the health and vigour of many trees." The first response to this statement is that, if true, it applies to existing gardens without development just as well: all trees in the borough or capital are then at threat. This does not appear to be the case, and has not been identified in research (e.g. Trees in Towns 2). Secondly basement structures do not need to create horizontal barriers to root growth; below ground access pockets for future root growth can easily be built if horizontal root growth is considered an advantage. In my view, the council's statement advances the case for development: if all trees in gardens are cut-off by infrastructure and foundations, then providing them with a metre of quality soil may be their best bet. One metre depth of soil should always provide sufficient volume for a suitable sized tree in any area garden, bearing in mind the Council's policy of 'Right place, Right tree'. I give a table below that demonstrates the point⁴. The table gives the guide line soil volumes for unrestricted growth of trees of different sizes, the garden area required for this volume given a one metre soil depth and an example of the garden dimensions that give this area.

<u>Tree size</u>	<u>Crown diameter</u>	<u>Soil volume required for full, unrestricted growth</u>	<u>Garden area required given one metre depth of soil</u>	<u>Typical dimensions of garden to give this garden area</u>
Small	3 metres	4.3 m ³	4.3 m ³	5 m x 0.9 m
Medium	6 metres	17.2 m ³	17.2 m ³	5 m x 3.5 m
Large	10 metres	47.9 m ³	47.9 m ³	5 m x 9.6 m

Table 1: Soil and garden size requirements for unrestricted mature tree growth⁴

The table demonstrates that the largest of appropriate sized trees grow without restriction in any garden with one metre depth of soil. Indeed for a garden that is 10 metres long and 5 metres wide a large tree with a 10 metre crown radius will be supported. This tree will have branches that hang over each side of the garden by 2.5 metres; so the entirety of the rear garden spaces could be fully treed with no ground not covered by the crown of interlocking trees. This would obviously not be desirable but goes to show that the soil volumes will support dense tree cover, indeed a tree coverage greater than exists or would be desired.

- For some reason uses the example of two trees in the brick courtyard outside Kensington Town Hall in planters in less than a metre of soil above the basement car park. This might be a correct example to use if the policy were seeking to limit soil depth to less than one metre and to limit tree positions and root spread to smaller planters but this is not the case.

On this point, in passing, I have looked for the two trees from the report. I include below pictures of the planted areas that I could find in the courtyard outside Kensington Town Hall. My initial impression is that the trees that I found appear to be in reasonable health given that we are at the end of winter and the season's new growth and blossom are just appearing.



Fig.3: Trees in the courtyard at Kensington Town Hall



Fig.4: Trees and shrubs in planters at Kensington Town Hall

I would like to consider two matters further: natural rooting in shallow soils and tree growth in planters.

Trees have an impressive ability to grow and indeed thrive in very shallow soils. Two examples of this, close to London, are in areas of chalk where the soils are very thin, often no more than several 100mm thick. I give two examples:



Fig 5: Mature beech trees on ground with minimal soil over chalk at Avebury Stone Circle



Fig 6: Mature beech trees on very thin soil on chalk hill - Round Hill, one of the Wittenham Clumps, Oxfordshire

These two examples show beyond question that large, mature trees grow naturally on well drained ground with very thin soils. The topsoil at each of these locations is no more than a few 100mm. It clearly cannot be argued that 1,000mm depth of top soil has any limitation on tree growth.

Mature tree growth in planters is entirely possible. Growth in planters is far more restrictive than the one metre allowed across the full area of a garden, thus if healthy mature tree growth in small planters can be demonstrated, then healthy tree growth in gardens of any size with one metre of soil must be practical. I include below pictures of two oak trees in planters of c. 0.5m³ volume that I planted 10 years

ago in flower containers offered by a council for the purpose. As can be seen even in this very low volume, both trees are healthy and sizeable. I repeat, the trees are grown in 0.5m³ containers, only! My understanding is that trees can be grown like this for hundreds of years: the ultimate example is the pomegranate tree at Slot Herrenhausen in Hanover. This plant came to North Germany from Venice in 1653, and has survived the turbulent history of this region right down to the present. The tree is in perfect health thanks to 350 years of optimal care and attention.



Fig 7: Oak trees showing healthy growth in 0.5m³ planters after ten years

The ability of large trees to grow in planters of limited size is the basis of the nursery industry. Semi-mature trees are now grown in planters on a commercial basis. The example below shows large trees, 80-90cm trunk girth and approximately 10 metres height, that have been grown in restrictive planters in England for sale commercially. The vehicle and the man give an idea of scale.



Fig 8: Mature tree growth in planters

It is my opinion that garden basements with one metre of good quality topsoil placed on their roofs, from an arboricultural and horticultural perspective will:

1. Have no detrimental effect on the character of rear gardens.
2. Have no intrinsic reason to cause an appearance of artificiality or restrict the range of planting.
3. Have no negative effect on the natural landscape or character of a rear garden or decrease the extent to which these can be maintained.
4. Not decrease the flexibility in future planting including of major trees.
5. Not decrease herbivorous biodiversity
6. Not decrease the continuity of larger planting.

Existing trees are, quite rightly, fully protected by extant regulation, namely by Tree Protection Orders and automatic protection in Conservation Areas. The size of garden basement allowed by policy will have no effect on the trees so protected. They will continue to enjoy full protection and will be unaffected by policy that allows larger garden basements.

In summary, I conclude that there is no arboricultural or horticultural reason to restrict the size of garden basements at a planning policy level, provided that a healthy covering of good quality topsoil is a requirement.

Please let me know, if I can be of further assistance in the matter.

Yours sincerely



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1. West Sussex County Council
2. Harris RW et al 2004; Arboriculture Fourth Edition, Prentice Hall, NJ, America
3. Professor Douglas L. Airhart, Ph.D., Professor of Horticulture, Certified Arborist; Guy Zimmerman III, Area Forester, Tennessee Division of Forestry. 2003. Protecting Trees.
4. Trees in the Urban Landscape: Site Assessment, Design and Installation. Trowbridge J & Bassuk N (2004) Publisher J Wiley & Sons Inc. NJ USA.

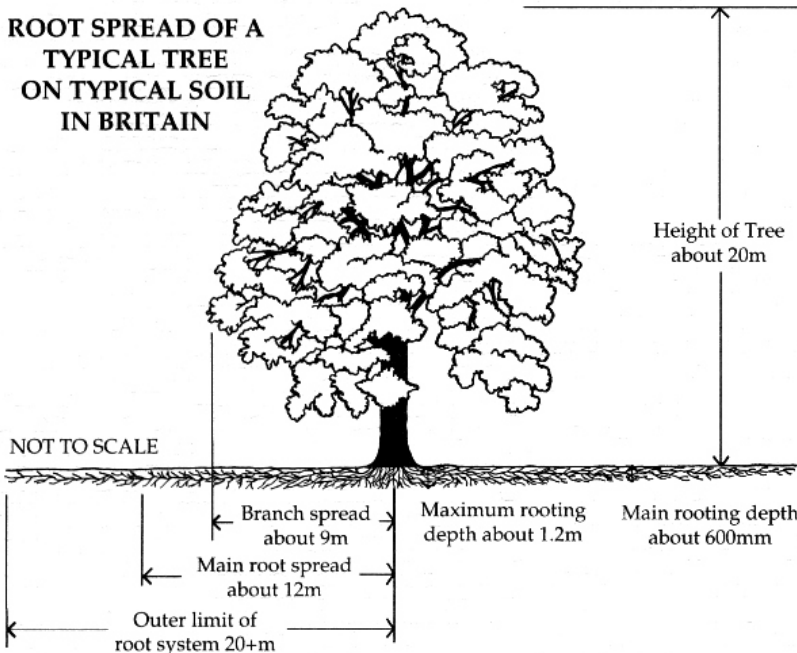
TREE ROOTS

In the Broadleaf we seem to talk extensively about the physiology of trees above ground so we thought it was about time to go underground and have a look at root systems.

Popular belief seems to be that the roots of large trees penetrate to a dept of several metres and that the deep roots are referred to as 'tap roots' or 'anchor roots'.

In most climatic and soil conditions in the British Isles this is far from true. Tree roots need to obtain water, nutrients and oxygen from the soil and these elements are usually most readily available near to the ground surface. For this reason a trees roots are normally found in the top 600mm of soil.

ROOT SPREAD OF A TYPICAL TREE ON TYPICAL SOIL IN BRITAIN



However, on poorly drained clay soils where rainfall is higher than average, the entire root system can be in the upper 300mm of soil. Correspondingly, where the weather is drier, roots will occasionally penetrate as far as four or five metres into the ground in order to gain moisture from a low water table although this is not a common occurrence.

All roots contribute to both the stability and moisture of trees although the uptake of water and nutrients takes place mainly through very fine **root hairs** (or rootlets) at the ends of the smallest woody roots. Every Spring roots grow millions of these tiny hairs, each of which is a single cell. They only last one or two months and are then replaced, and every Autumn they all die.

Tap roots are a feature of some tree seedlings (eg. oaks) which tend to send down a single

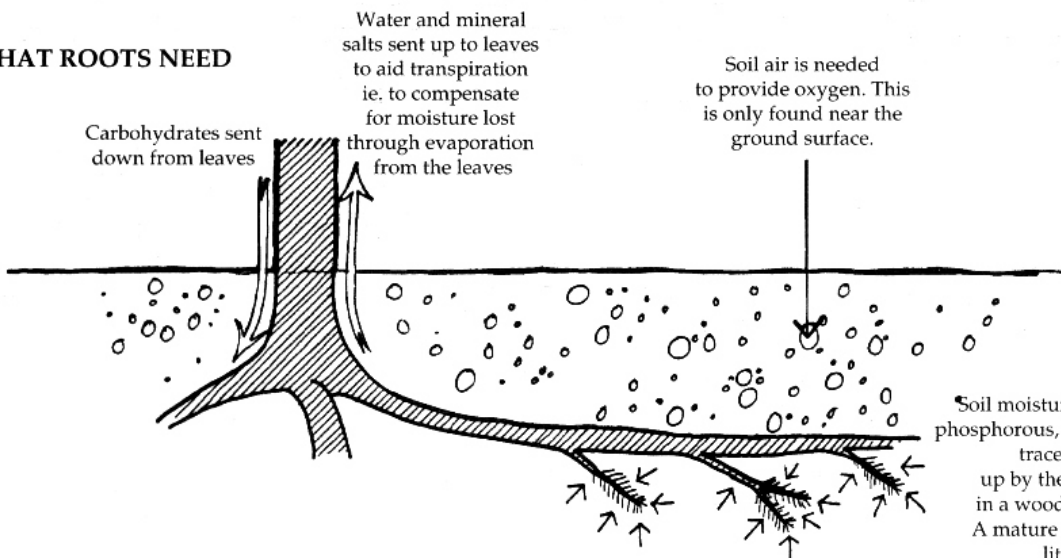
main root. As the tree grows, however, the tap root does not continue to develop – the main direction of root growth is lateral. A mature oak tree will therefore not be a scaled up version of an oak seedling, but will have a differently shaped root system.

The roots of most tree species develop rapidly, sub-dividing, and most of the roots are relatively thin (25mm or less) until they are within two or three metres of the main stem.

Very few investigations seem to have been done into the extent of **root spread** although it is clear that this varies depending on climate, soil, tree species etc. It is generally though that roots usually extend further than a trees' branches and that root spread is roughly the same as the height of the tree.

The largest root system ever recorded was on a Finnish Pine tree with a total root length of 50km and over five million tips!

WHAT ROOTS NEED



Soil moisture and nutrients (potassium, phosphorous, iron, calcium, magnesium and trace elements) are picked up by the roots - 85% of rain water in a wood is absorbed by tree roots. A mature tree can soak up over 1400 litres of water / day!