

# Scheduling Tree Works & Management of the Rooting Environment

Chris Widdicombe

TechCert. (Arbor.A), Tech.Arbor.A

**BS 3998 2010**



**TREE SURGEONS  
OR  
TREE CARE PROFESSIONALS?**

# Scheduling Tree Works

## Considerations:

- Risk Control
- Season
- Weather
- Past Damage or Past Management

# BS 3998 2010



## Risk Control

- When scheduling tree works to control risk posed by trees to people or property, the relative priority of the work should be determined by a tree failure risk assessment.

The Local Planning Authority (Council) may want to know how you have assessed or calculated the risk in relation to the work prescription or mitigation measures you have applied to undertake – requirement of British Planning Law.

# BS 3998 2010



Preferably a defensible tree risk management system should be used e.g.:

- **QTRA** – Quantified Tree Risk Assessment - Ellison
- **THREATS** – Tree Hazard Risk Evaluation And Treatment System – Forbes-Laird
- **Evaluation of Hazard Trees in Urban Areas** – ISA – Matheny & Clark

# BS 3998 2010



Is your system defensible?

# BS 3998 2010



## **Scheduling of work affecting the soil.**

The soil can easily be damaged by the passage of machinery or the repeated trampling of soft ground when:

- **Wet / soft ground conditions apply, causing -**
  - **Compaction**
  - **Direct root damage, injury, or severance**

# BS 3998 2010



Avoid works when such conditions prevail or

**Protect vulnerable areas around trees using –**

- **Suitable ground protection as advised in BS5837 (2005) such as a compressible layer of wood chip mulch, possibly covered with boards or scaffold planks.**
- The ground protection used must be suitable for the load anticipated e.g. (Pedestrian or Vehicular activity)

**BS 3998 2010**



# BS 3998 2010



The revised BS3998 standard refers to BS 5837 (2005) Trees in Relation to Construction / recommendations.

It will be important for you to have an understanding of the detail contained within it.

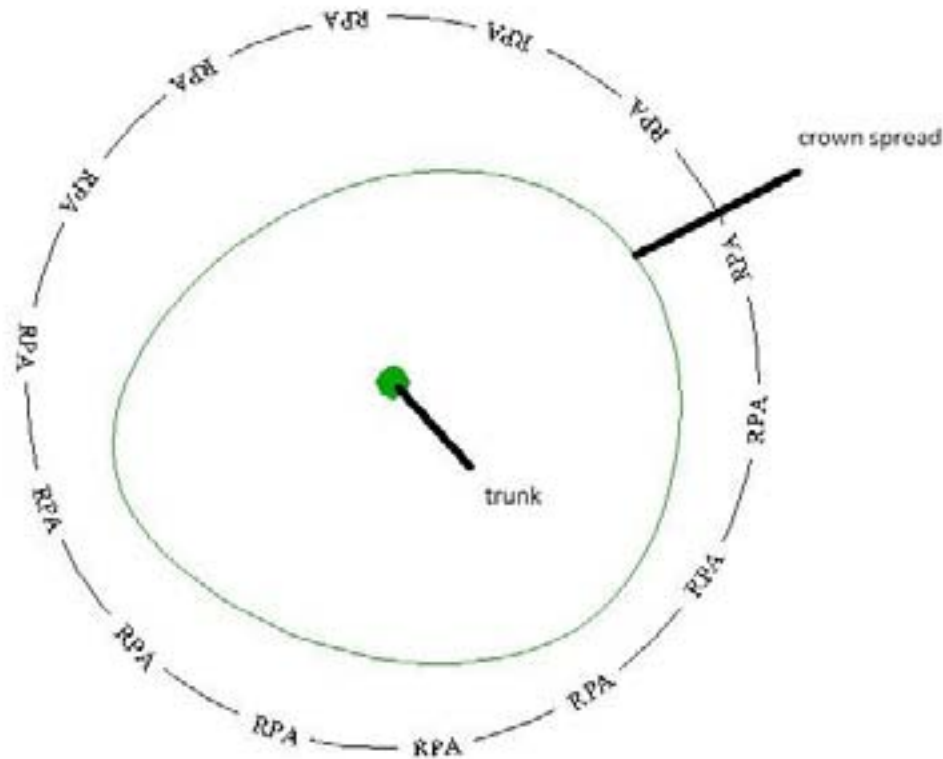
# BS 3998 2010



- BS 5837 states that an area of soil equivalent to 12 x the stem diameter as measured at 1.5m above ground level, circle radius will be protected.
- Or an area equivalent to 10 x basal stem diameter for multi-stemmed trees, measured above root flare.

# BS 3998 2010

500mm Stem Diameter =  
6m radial Root Protection Area



example

# BS 3998 2010



The protection of the soil environment is now a major consideration when undertaking tree work in accordance with BS 3998 2010 Tree Works – Recommendations. Not just when dealing with trees and construction.

- The standard also recommends the use of method statements (4.1)

Method Statements may now be requested by the LPA, to accompany your tree work applications in certain circumstances.

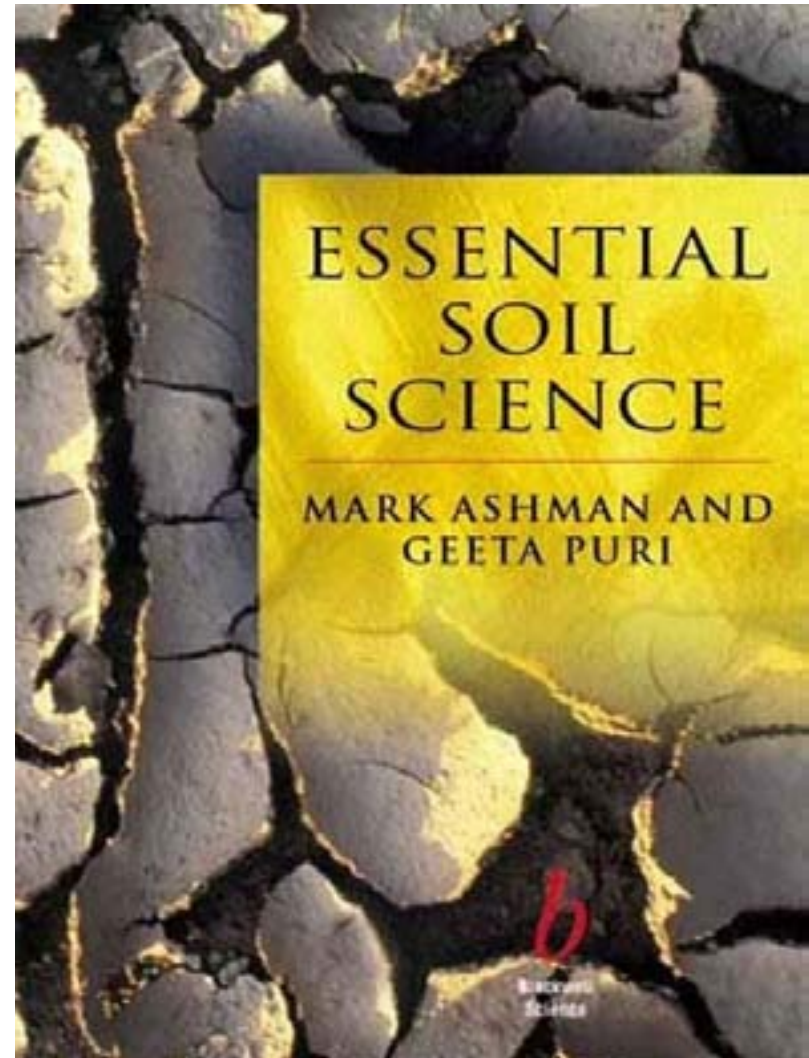
What is a method statement?

## Do you understand Soil?

## Do you consider the soil?

You may find a need to improve your underpinning knowledge of soils and its environment, including soil types, organisms, nutrients, pH, texture and structure.

To have an understanding of soil water, cultural practices and soil amelioration will also be an advantage.



# BS 3998 2010

- You should consider where best to site your equipment in relation to the area of soil to be protected around trees, such as the wood-chipper, MEWP, winch, other vehicles and equipment.
- Not forgetting to safeguard contaminants which could affect the soil if spilt, such as fuel and oil.



# BS 3998 2010



## Scheduling of pruning

- Seasonal factors and weather conditions should be taken into account before pruning is undertaken.
- A good understanding of tree biology and **Phenology** will, therefore, be essential.

# BS 3998 2010



➤ **Phenology** – Is the timing of natural processes

Humans have five major periods in our day:

- (1) **Wake up,**
- (2) **Get dressed,**
- (3) **Eat,**
- (4) **Work,**
- (5) **Rest.**

SHIGO

# BS 3998 2010



Trees also have five basic periods –

- (1) Onset of growth.**
- (2) Formation of new leaves and needles.**
- (3) High photosynthetic period.**
- (4) Formation of new bark and wood and storage of energy.**
- (5) Dormancy.**

# BS 3998 2010



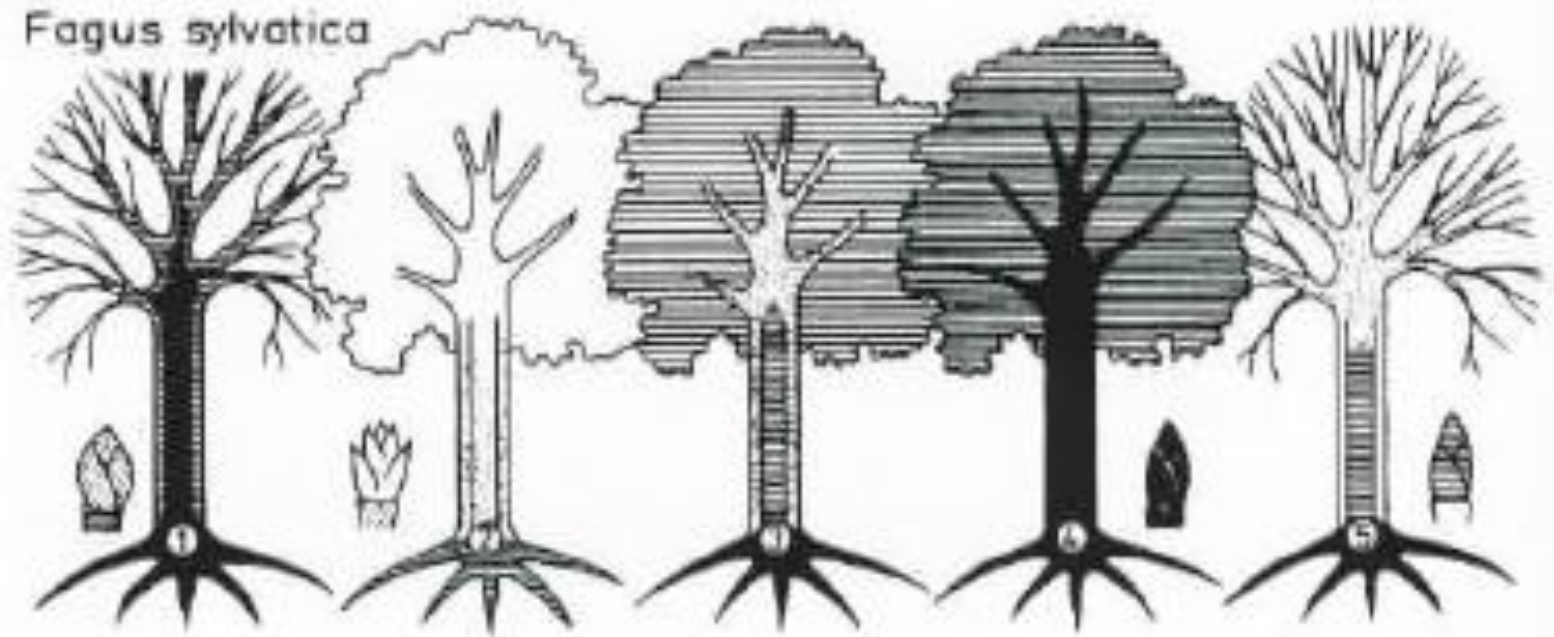
- The variations of the five part theme are almost endless. Every living system must rest, must start again after rest, must take in energy, must grow and defend itself and must reproduce to survive - SHIGO
- Phenology will be influenced by climate – Temperature, Water & Light.

Stored energy reserves are crucial to the trees survival (Growth & Defence).

The trees energy levels are at their lowest  
– during –

- (1) **Bud burst / leaf formation and**
- (2) **Just before dormancy / leaf fall**
  
- When sugar and starch reserves are depleted and or when certain hormones are produced.

# TREE ROOTS IN THE BUILT ENVIRONMENT



Starch deposits & movement

1 = Just before leaf emergence

2 = Leaf unfolding

3 = Midsummer

4 = Just before leaf fall

5 = Winter – conversion of starch to soluble carbs

# BS 3998 2010



- Understanding the Phenology of the tree will help us to understand when is the best time to prune and to fertilize - SHIGO.
- The timing of Pruning should also consider all of the physiological processes and possible adverse effects.

This provides another constraint.

# BS 3998 2010

The weather may also be a factor in our decision making process.

As a general rule, pruning should be timed so as to avoid the exposure of tissues to severe conditions, due to season or weather.



Periods of drought, for example, when the tree may be suffering from water stress leading to –

- Increased vulnerability to physiological dysfunction
- Or increased susceptibility to attack from insect pests or fungal pathogens.

Fungal pathogens should be a consideration during normal conditions also, when the timing of works to certain species of tree such as *Prunus* should be undertaken so as to avoid infection from '*Chondrostereum purpureum*' (Silver Leaf) for example.

# BS 3998 2010

## Past Damage or Past Management

- May determine the future management of a tree or trees, this may need careful consideration in certain situations.



# BS 3998 2010



- **Habitat and Wildlife** must be considered.
- Many species of Flora and Fauna are protected, such as some Bryophytes – Lichens & Mosses, Birds, Bats, invertebrates etc.
- You will need to have an understanding of the relevant pieces of legislation covering Wildlife and Habitats. As ignorance will be no defence should you unknowingly commit an offence.

We cannot ignore the wildlife legislation!

# British Legislation derived from EU Directives



- **Wildlife & Countryside Act 1981 (Wildlife (Northern Ireland) Order 1985)**
- **Countryside & Rights of Way Act 2000**
- **Conservation of Habitats and Species Regulations 2010** – (which replaces the Conservation of Natural Habitats etc Regulations 1994 as amended)  
Further information can be obtained from DEFRA [www.defra.gov.uk](http://www.defra.gov.uk) Or Natural England [www.naturalengland.org.uk](http://www.naturalengland.org.uk) or Scottish Natural Heritage  
**Conservation (Natural Habitats & Conservation) Amendment (No.2) Regulations 2009.**
- **Wildlife and Natural Environment Act (Northern Ireland) 2011.**
- **Northern Ireland – [www.ni-environment.gov.uk/wildlifeandthelawscreen.pdf](http://www.ni-environment.gov.uk/wildlifeandthelawscreen.pdf)**

## Legislation relating to Republic of Ireland (Eire)

- Wildlife Act 1976.
- Wildlife (amendment) 2000.
- European Communities (Natural Habitats) Regs 1997.

Animal species protected under wild life legislation,  
specifically Bats

# BS 3998 2010



## Timing of works

- Works should be timed to take into consideration the seasonal cycles of wildlife such as the nesting habits of birds, the activities of bats and the egg laying habits of insects.

The various pieces of legislation carry significant penalties for breaches, which are written in such a way as to be **practically indefensible**. In other words, there will be little room to manoeuvre if you get it wrong.

Therefore become familiar with the legislation and the procedures that you should follow.

# BS 3998 2010



Care should be taken when working in environments or habitats likely to contain or support protected species, such as

- **Woodlands and old coppice** e.g. (Bats, Dormice, Birds, Badgers, Red Squirrel, Pine marten).
- **Wetlands, Ponds, Lakes or Riparian features** e.g. (Great Crested Newt, Otters, Birds, Bats, Water Voles,).
- **Veteran Trees** e.g. (Birds, Bats, Fungi, Invertebrates, Bryophytes)
- Others see AA Guidance Note 10

# BS 3998 2010



Dormice



Great crested newt



Doubenton's Bat



Otter



Water vole



Noctule Bats – are often found in woodpecker holes.



 ASPECT  
TREE CONSULTANCY



# BS 3998 2010



**Pre-work commencement surveys** should become standard practice to assess for the presence of protected species, not just in the trees, but in the surrounding area likely to be affected by the operations, some of which are subject to season specific legislation.

# BS 3998 2010



- Out of the 17 species of Bats in the UK at least 12 are known to regularly use trees for roost sites.
- And it's highly possible that the remaining five species also use trees.
- If you encounter Bats, or other protected species, advice should be sought from an ecologist or the statutory nature conservation organisation 'Natural England' for England & Wales. [www.naturalengland.org.uk](http://www.naturalengland.org.uk)
- Northern Ireland – [www.ni-environment.gov.uk](http://www.ni-environment.gov.uk)

# BS 3998 2010



## Seasonal problems:

- The Oak Processionary Moth is a defoliator, whose caterpillars can strip an oak tree bare in a relatively short period of time.
- The caterpillars of the Oak Processionary moth along with those of the Brown Tail moth (*Euproctis chrysorrhoea*), have urticating hairs, which if contacted with the skin, eyes or bronchial tubes cause severe irritation, rash or allergic reaction usually requiring medical treatment.
- When dealing with these species of moth, advice and information relating to appropriate Personal Protective Equipment (PPE) should be sought and considered as part of your risk assessment.

# BS 3998 2010



Brown tail moth



# BS 3998 2010



Oak Processionary moth

# BS 3998 2010



## Phased work.

- If it is determined that undertaking tree works in a single operation would lead to significant adverse impact relating to any or all of the above factors discussed so far. The works should be phased where practicable.
- For example, managing only a proportion of the relevant tree population in any one year, or phasing the management of an individual tree over a number of years.

Another potential constraint!

# BS 3998 2010



Phased works may also be particularly appropriate for:

- **habitat management,**
- or where **visual impact** will be an issue,
- or the **provision of shade** must be considered (Release of veteran trees – School playgrounds or Play areas),
- **Coppice rotation or Pollard cycles** and or
- **Risk management.**

# BS 3998 2010



- **Veteran trees** need careful consideration, as their management must consider both the tree it-self in relation to its condition, the risks posed (if any) and the pruning required, but also the habitat that it provides or may provide in future.



Veteran tree in  
pasture, high habitat  
potential.

Consider  
management  
requirements  
carefully.

Retain dead wood  
where possible and  
following a risk  
assessment if  
necessary.



Veteran tree in  
woodland.

Release by Halo  
Pruning over a  
period of time to  
prevent sudden  
exposure to  
potentially  
damaging  
sunlight.

# BS 3998 2010



Old Knobbly!

Action was needed to prevent overcrowding and shading from nearby trees.

Estimated at 800 years old located in an area of woodland at Furze Hill, Mistley, Essex

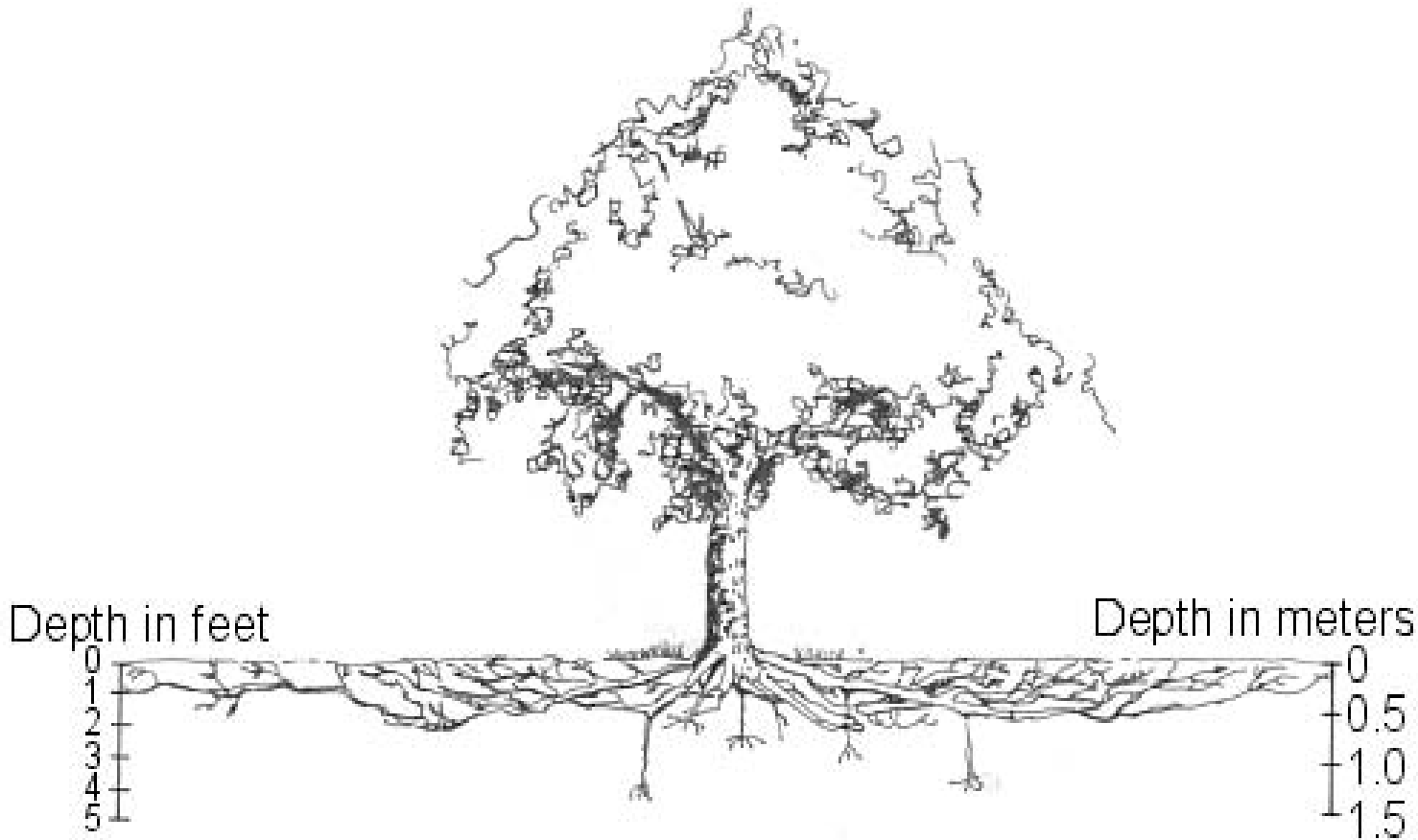
# BS 3998 2010



- The Bearded Tooth Fungus  
*Hericiaceae*
- *Protected CROW 2000*
- Red data list – RARE
- Found mainly on wounds of old living trees usually high up.
- Hosts include mainly Beech, occasionally Oak and Hornbeam.

Its not just bats & birds!

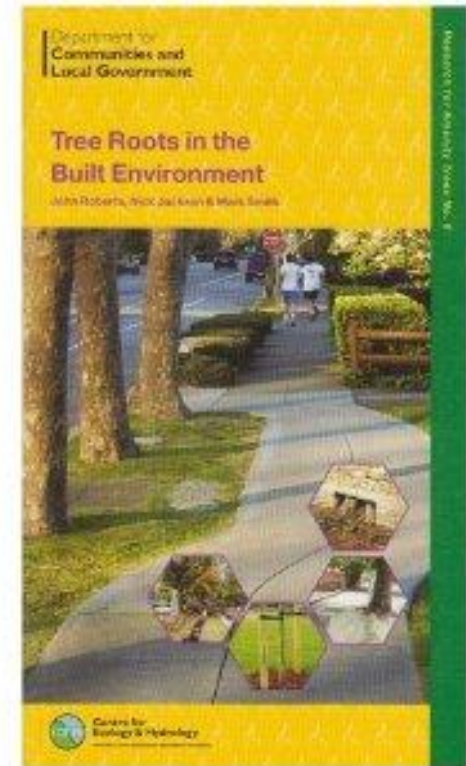
# Management of the Rooting Environment



**An opportunity!**

# BS 3998 2010

- The health of the soil and rooting environment is important as we tend to forget that half of the tree is located below ground (**out of sight out of mind**).
- Careful consideration should be given to the soil and how we manage it in relation to trees. Especially when prescribing treatments.



# BS 3998 2010



- Adverse changes in the soil and damage to a tree's roots can lead to decline or, in extreme cases, instability or death.
- **Find the cause of the problem** (where possible) before you decide on a solution.

Soil sampling / analysis should be considered (for example):

- Declining trees with symptoms of physiological dysfunction and or those associated with nutrient deficiency or toxic substances  
and particularly where spillage or foul play is suspected.

# BS 3998 2010

**Mulching** – consider where necessary.

## **Benefits:**

- Moisture Retention
- Weed Suppression
- Encourage beneficial soil flora & fauna
- Relief from or the prevention of Compaction (especially by encouraging earthworm activity)
- Mitigation of extremes of soil temperature
- Absorption of toxic materials
- Release of nutrients into the soil

Mulch material should be

- well composted organic matter such as woodchip,
- although it may also contain other plant derived materials and well rotted animal manure or horticultural grit.
- **The reason for mulching should be established and considered thoroughly**



BS 3998 2010



The Major Oak in Sherwood Forest

# BS 3998 2010



- Avoid the use of plant materials which have naturally occurring toxicity unless they have been composted at a high temperature (60°C) in order to make them innocuous.
- Mulching should extend over as much of the rooting area as possible, as long as ground constraints allow.
- The mulch should be no more than 80mm – 100mm deep and periodically replenished as it decomposes, making sure there is no build up of material around the stem/trunk.

# BS 3998 2010



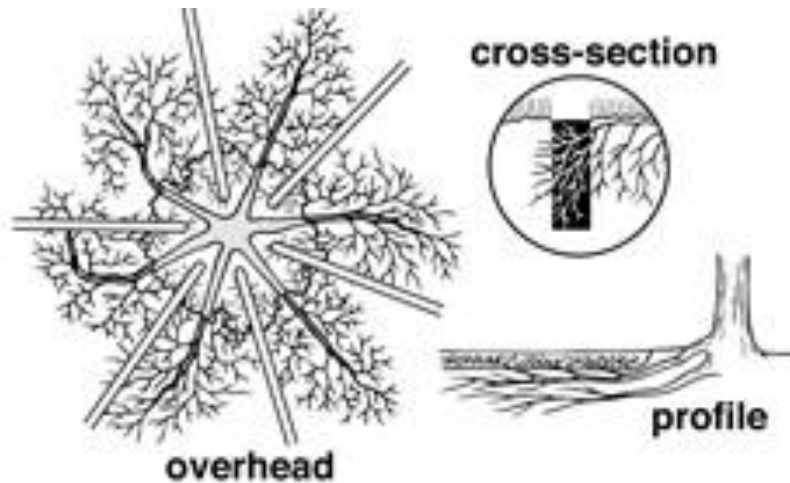
## **Aeration / de-compaction**

- Where soil compaction is suspected, investigation should be carried out. There are a number of ways to do this, including excavation, percolation tests and measuring the soil bulk density.

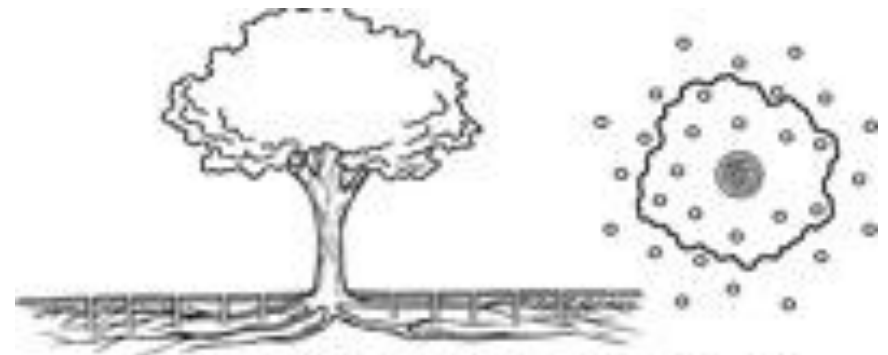
Once soil **compaction** has been confirmed there are a number of options that may be used to de-compact the soil, provided that care is taken to avoid severance of woody roots; these include the following:

- Use of a soil auger, puncturing the soil throughout the root system to improve soil aeration.
- Localised cultivation, e.g. By hand tools or air lance (Air Spade) involving backfilling with suitable loose material.
- Injecting bursts of compressed air into the soil to alleviate compaction. (Terravent)

# Aeration / decompaction



Narrow trenches are dug in a spoke pattern around the tree, then backfilled with topsoil or compost. Root growth in the trenches will exceed root growth in the surrounding soil. A 2- to 4-inch layer of wood chips may also be added over the top of the backfilled trenches.



Holes drilled through the root system to improve aeration.

BS 3998 2010

ASPECT  
TREE CONSULTANCY



# BS 3998 2010





# BS 3998 2010



## Removal / replacement of Soil

- Should be carefully considered, where soil levels have been raised or lowered around the stem/trunks of trees or over the rooting area(s).
- The age, condition and species of tree and its tolerance to soil level changes must be considered.
- How long have the altered soil level been in place?

# BS 3998 2010



- Prior to removing soil - investigation with hand tools
  - has a healthy root system has extended into any of the added material? if so the material should be left in tact.
- **Low oxygen levels** - you may need mechanical de-compaction and / or mulching with organic matter.



Raising of soil  
levels

## Lowering of soil levels:

- If the tree is stable, restore the soil levels to cover the exposed roots, without compacting the soil.
- If the tree is unstable it may need to be felled.
- Damaged or severed roots may require pruning, for example in accordance with recommendations given in section 11.3.5 BS 5837 (2005) or those in NJUG Volume 4.

Very little advice in the standard about root pruning.

The size of the cuts should be as small as possible and remove ragged or torn ends.



Courtesy of the Arboricultural Association

# Nutrient deficiencies

Nutrient deficiencies and the associated symptoms can easily be confused with certain other problems.

Nitrogen deficiency can produce the following **symptoms**;

- Leaves become pale green / yellow
- Shoots become short and thin
- Stunted growth
- Spring growth delayed
- Premature defoliation

# BS 3998 2010



Poor growth in trees is often attributed to a deficiency of available nutrients in the soil. However other causes can produce similar symptoms.

- Fungal pathogen activity killing roots;
- Physical damage to roots, particularly during construction or engineering works.
- Toxic chemicals in the soil.
- Tree species unsuitable for the site.
- Shortage of water.
- Poor soil – physical characteristics.

**BEWARE!**

## Nutrient Deficiency

If symptoms of poor growth or decline prevail, thorough investigation should be undertaken to find out if the soil conditions are inhibiting root activity.

If this is the case, the addition of nutrients would probably fail to provide any lasting benefit.

### Investigation should consider:

Water logging, compaction, anaerobic conditions, the presence of toxins, and adequate soil volume.



# BS 3998 2010



## Other Treatments

- **Soil Additives**
- Organisms should only be added to a soil if there has been rigorous investigation of conditions for root development and function, showing that this action could be beneficial.
- Earth Worms, (pH)
- Mycorrhizal fungi - ? – Beware!

# BS 3998 2010



Mycorrhizal fungi - many of which only form symbiotic relationships with specific species of tree. For example 'Fly agaric' and Birch.

# BS 3998 2010

If the conditions are unfavourable for root development and function, they should be **ameliorated**.

e.g. The addition of -

- Organic matter (to any soil)
- Seaweed
- Animal derivatives
- Fish
- Sugar or Sugar beet washings
- Lime
- Farm yard Manure (well rotted)
- Etc, Etc, Etc,

# BS 3998 2010



## Treatment of contaminated soil

- Where soil has been contaminated, expert advice on diagnosis and treatment should be obtained and appropriate action taken.
- In certain cases simply flushing the soil with fresh water may be appropriate. (Salt)
- In more extreme cases soil may need replacing, when care must be taken to avoid damage to roots.

Table B.2 Root and soil problems: options for amelioration or remediation

Problem <sup>A)</sup>	Options for amelioration or remediation						
	Mulching (see 6.2)	Aeration/ decompaction (see 6.3)	Removal/ replacement of soil (see 6.4)	Irrigation (see 6.5)	Drainage (see 6.5)	Fertilizer application (see 6.6)	Other treatments (see 6.7)
<b>Contamination of the soil</b>							
Pesticides	**	**	*	**	—	—	*
Pollutants	**	**	**	**	—	*	**
Excess fertilizers	**	—	*	**	—	—	*
<b>Soil–water relations</b>							
Flooding	—	**	—	—	**	—	—
Drought	**	—	—	**	—	—	—
<b>Alteration of soil level</b>							
Compaction of the soil	**	**	—	—	—	—	—
Raised soil levels	—	**	**	—	—	—	—
Erosion of the soil	*	—	** <sup>B)</sup>	—	**	—	—
Impermeable sealing of the soil	—	**	*	—	—	—	—
Localized fire	*	—	—	*	—	—	—
Pests and diseases	*	*	—	*	*	*	—
Nutrient deficiency	*	*	*	—	—	**	*

**Key**

- \*\* Established practice
- \* Less well proven treatment that might provide benefit
- Not applicable

<sup>A)</sup> Root severance is not covered in this table. Guidance is given in 8.6.

<sup>B)</sup> Replacement only.

Use the standard – keep reading it.

# BS 3998 2010



**Tree Surgeons or Tree Care Professionals?**

# Summary:

Consider & Control the risk

Scheduling of works –

- When do you prune?
- Habitat & Wildlife – will you harm it?
- Do you need to phase work?
- Have you considered the soil?