NOTES ON ARBORICULTURAL TECHNIQUES FOR VETERAN TREES

Management techniques and practice:

Veteran tree management, as it affects arboricultural techniques, is a recent development and has not in the past been governed by the British Standard for Tree Work (BS3998:1989). British Standard for Tree Work BS3998 (BS) required the removal of deadwood without consideration of its potential habitat value. The revised BS will consider these implications but more detailed advice is offered in this guidance.

The use of arboricultural management techniques for veteran trees is relatively new and as a discipline, it is still in the process of development. Knowledge from experience and monitoring is gradually being incorporated into the range of available practices but these are slow to be fully integrated in training and college curricula programs. This is understandable because they originate from the view that natural processes need careful observation. This means that when dealing with old trees the mimicking of observed processes such as natural breakage in preference to chainsaw use requires a considerable period of time in monitoring the effects of such methods to establish their effectiveness. Nonetheless while such techniques have been in use for up to two decades the opportunity to carry out research into tree response and viability is only now just emerging. These techniques have been used at key veteran tree sites such as Hatfield Forest, Windsor Great Park, Burnham Beeches, Epping Forest and Ashton Court and are considered in preference to methods that might be conventionally employed. This is because the use of the chainsaw to effect conventional pruning may be considered in certain circumstance inimical to the natural processes involved in the growth, damage and recovery that is inevitably part of the survivial process of old tree; such processes being inherently part of wood decomposition, decay and colonization in old trees that leads to their becoming important habitat for a wide range of organisms.

An appreciation of the ageing process in trees has led to considering the following features and treatments associated with veteran trees (Fay 2002):

- The importance of fungi and saproxylic habitat
- The perception of the tree in relation to its biotic zone
- The retention of live stubs
- The retention and shortening of deadwood in safety management
- The acceptance of stem truncation and pollarding and other irregular crown forms
- The employment of natural fracture technique; introduction of tears, fractured ends and coronet cuts
- The value of layering of naturally lowering limbs to encourage rooting and propagate vegetative growth
- The value of hollowing, tree water pools, water pockets and sap runs
- Crown restoration techniques such as retrenchment pruning

This leads to an approach to restoration of trees that appear to be stressed or prone to catastrophic failure. Techniques typically incorporate a combination of techniques and a gradual and metered treatment including:

- End weight reduction: selective thinning or reduction of peripheral growth (as opposed to internal growth)
- Foliar mass reduction: The *minimum* foliar mass necessary to achieve staged reduction should be removed in any operation
- Crown reduction: This is generally favored in comparison to cable bracing and retaining full crown scale
- Crown reduction in pollards: This is generally favored as an the alternative of pole thinning
- Considering long-term management plans: Over the period of a restoration program, there will be a gradual reduction of crown height and extent, modeled on the natural process of crown retrenchment; stimulating rejuvenation growth within the lower portions of the canopy.
- Periods of management: These are planned to take account of cycles of treatment spread over sufficiently long time to be gradual and effective. These typically do not involve only one treatment.

Considering pollard restoration experience indicates that the following is important:

- When restoring a primary pollard, it is generally recognized that the poles, or principal branches be cut no lower than five times the diameter above the bolling (or point to pole origin).
- When restoring to a tiered pollard, the new target level should aim to be approximately 10 times the pole diameter above the bolling (or point of pole origin)
- Final cuts should aim to be no greater than 20 cm stem diameter
- Coronet cuts should be considered on non-crucial structural members and should attempt for maximum depth and acuteness of angle to mimic natural fracture habitat
- Timing of tree work operations should take place in the dormant season, particularly avoiding spring and autumn period.

CONSIDERATION OF AN INDIVIDUAL TREE

Assessing a veteran tree

When addressing the management requirements of a veteran tree, this may involve dealing with specimens that have large areas of decay in the stem or base. Much of the stem may be hollow or desiccated. Old trees often have had a history of pollard or other management that has lapsed typically. The lapsed management may be from thirty to fifty years but can extend to over two centuries in southern England.

In such cases this will give rise to heavy, endloaded crown stems with poles, pollard or scaffold limbs prone to failure. This is because they are mostly supported by weakened or decayed zones of attachment. Environmental pressures, physical damage and changes in the trees physiology may also introduce large areas of dysfunction reducing the trees energy reserves and resilience.

Studies indicate that some large populations of ancient trees are suffering attrition rates of between 1% and 1.7% per year (Read 2000).

Often tree are required to be managed in areas of public access when situated near a footpath, road or building and therefore require to be considered in relation to their potential for structural failure. Conversely the use of areas surrounding veteran trees may impose stresses upon the tree e.g. from root compaction or other damaging influences upon the rhyzosphere (e.g. from impacts that adversely affect soil microbial condition).

Tree 1

Case study: Tree 1 has a bole of approximately 3m height, which is hollow with 30% of the circumference missing from 1m height to the top of the bole.

The old pollard stems reach 16m height and compete for light with semi-and early-mature woodland trees. The crown limbs are end-loaded and have only sparse, weak, leaf baring growth about the lower and mid crown. The vitality of the tree is presently moderate but appears to be declining. There is some epicormic growth about the base and the stem of the tree.

The assessment indicates that there is a strong likelihood of major collapse possibly leading to the decline and failure of the entire tree. It is known that the tree is to be retained, having veteran value with dead wood features that is acknowledge to provides special habitat. How is this to be achieved?

Observations of veteran trees that appear to have successfully survived without recent intervention may give some idea of the trees 'strategies' that have contributed to their long-lived status. It is noted that different species seem to demonstrate different survival strategies with varying degrees of success where the following conditions apply:

- A relatively undisrupted rhizosphere.
- Little competition for light allowing the crown to retrenchment naturally reducing the sail area and leverage on weakening attachments.
- A tendency to respond with epicormic growth around areas of the base, stem and crown.
- Layering of fallen limbs or even the entire tree.
- Formation of discrete xylem channels between roots and branches. As major sections of the tree collapse and decay, these may take the form of young stems.

- Aerial roots that can often be observed arising from the area of historic wound wood about the old pollard points and may act as extra support, as well as exploiting the decayed wood in the center of the stem to supply nutrients to the crown.
- Stem hollowing that gradually recycles the non-functional woody tissue while retaining a structurally robust cylindrical bole.

Studies of veteran tree management that has not produced significant rates of success should help us to identify poor and damaging practices. Example include:

- Rapid change to the tree or its surroundings has been shown to be risky in terms of the tree's continued health.
- Extensive crown reductions and other tree surgery that may lead to physiological stress and subsequent decline.
- Disruption to the rhizosphere from heavy machinery, livestock, public access, chemicals or changes in the water table.
- Poor timing of operations.
- Weather patterns in the year prior to intervention with management operations may have a significant bearing on their success or failure.

Determining the management objective

The prevention of the tree's disintegration by reducing the scale of the crown, and restoring the tree to a scale closer to that at which it was originally managed is a typical key objective is

While this may be a reasonable intention this can seldom be achieved in a single operation as this would be likely to result in the rapid decline or death of the tree as a result of extensive reduction of vital stored energy reserves. Such treatment at the same time would have the effect of producing large wounds that place demands on energy resources for callus development and the compartmentalization processes.
In this weakened state fungal colonization many of which may have up to this time resided in a dormant or relatively inactive state within the tree, may become subject to accelerated growth and competing for resources and space within the tree, which can place significant demands on the trees remaining energy resources.

To address these concerns the restoration process is staged, typically attempting to mimic the trees own ageing process when retrenching in the post-mature state in the form of treatments such as retrenchment pruning (Fay 2002).

Preparatory operations

Release from competition
An assessment might indicate that tree appears to have relatively low resilience with few sufficiently foliated branches about the mid and lower crown to reduce back to. It may be necessary to attempt to bolster the trees viability by improving the rooting environment. This might be achieved in the short term by restricting access to the tree with fences or dead hedging (for either the public or livestock), and the application of soil improving agents such as decomposed wood mulch preferably of the same species and in gradual 'doses' to a shallow depth (up to 75mm) .

If live aerial roots are present these might be nurtured by applying a rooting mixture. These are important as they may eventually provide crucial channels for the uptake of nutrients while recycling the trees own decaying matter from within the trunk.

To address the lack of viable foliar growth about the crown it is usual to consider improving light penetration to the stem and crown by thinning and or reducing surrounding competitive growth ('releasing' or 'haloing' the tree).

Two main detrimental effects might arise from such action if exposure is too quick or too extensive. This can lead to *rapid drying out from e*xposure to sun and wind resulting in leaf scorch, susceptibility to drought, cracking of woody tissue around hollow stems. This can undermine the tree's stability. Bark scorch can result in necrotic areas of where cambium dies off and vasculars tissue becomes dysfunctional. This in turn can lead to accelerated fungal growth and pathogenicity.

To rapid releasing from competition can also lead to *wind-throw* from rapid exposure to unaccustomed wind stresses without the tree having time to respond with adaptive growth this may result in the collapse of major branches or the whole tree.

Thus the thinning of competitive growth may need to be staged and a balance may need to be achieved between the extent of reduction undertaken to the tree and the extent of the thinning of competition about the tree in any one operation

Promotion of internal shoot growth
This may be considered where it is intended to influence the growth and energy of the tree by pruning that might to redirect growth to different parts of the crown. This is generally attempted through the stimulation of dormant buds so that they to flush on the branches and lower parts of the crown. A method involves pruning out apical buds in a similar manner to fruit tree renewal pruning, This *tip pruning* is intended to redistribute suppressant hormones so that dormant and adventitious buds may be stimulated as a result.

As apical buds release hormones that suppress the growth of lateral buds lower down the shoot, their removal may be used to decrease the level of suppressive effect of auxins, encouraging dormant buds to develop into shoots. It is generally advised that a maximum of 8 buds be left on the reduced shoot to flush.

Tip pruning generally involves work with secateurs or small turbo-saws systematically progressing throughout the canopy, selecting between 3 and 8 buds for retention to provide the source for future redirected growth. As intervention in the dynamics of epicormic growth may have variable result if undertaken without sensitivity and consistency, this procedure requires a selective approach taking care to avoid indiscriminate removal and should be monitored to document areas of success.

The technique of scoring and abrading of surface tissue can be used by scribing bark to introduce small areas of localised damage intended to encourage callus tissue later forming wound wood[1], eventually with adventitious shoot flushing from this tissue. This is targeted and selective in order to avoid severance of vital channels between the roots and existing growth.

Proposed guidance objectives for veteran tree management

The general objectives of veteran tree management include:

(i) Promote longevity
(ii) Avoid rapid depletion of the trees stored energy causing *stress*.
(iii) Encourage growth in lower regions of the tree.
(iv) Promote habitat
(v) Manage succession
(vi) Public safety

Guidance for Practical Veteran Tree Management (i) to (ii)

Where proposed works are to be phased, the extent and nature of the initial operation should be considered carefully and specified in addition to setting subsequent return-period. It is intended that extent each return treatment should be approximately equal in degree. Continual re-appraisal of management operations in the light of tree response and condition is essential.

[1] Wound wood is composed of *undifferentiated tissue* (this is *cambial meristematic tissue* that comprises cells that have not yet taken the form of root or branch cells and have the potential to form a range of anatomical functions. There is often wound wood present about the bolling of old pollards. Similarly wound wood may be encouraged to produce roots when scored and covered in a rooting medium or with hydrogel and rooting hormone, (honey has been used to stimulate root growth in preparations for organic propagation).

The management of dead trees are intended to allow for their retention as standing trees where practicable, but suitably modified to reduce the likelihood of structural failure. This includes the retention of trunks as monoliths by removing crown where they are structurally unstable.

Arboricultural techniques appropriate to veteran tree management objectives include:

•(i) (ii) Where height or weight reduction is needed wounds arising from this need to be kept to the minimum diameter necessary to achieve the objective

•(i) (iv) Flush cutting of deadwood when needed to be reduced from within the crown to alleviate risk of breakage should be left with a natural jagged appearance (natural fracture technique).

•(i) (iii) (iv) Significant live limbs requiring cutting should be retained with stub ends with fractured appearance wherever feasible

•(i) (iii) (iv) Where occasional major stems require truncation the final cut is made with a jagged *coronet* finish

• Fallen and cut heavy limb wood are treated as follows:

•(iv) - Bulk material should be separated from brushwood and stacked compactly close to the parent tree to allow for undergrowth to provide potential shade or moved to a suitable dead wood area.

•(iv) - The brushwood should be retained on site, stacked, scattered or chipped according to site requirements

•(iv) - Chipped brash can be used to reduce desiccation, buffer extreme changes in soil moisture levels, and relieve compaction around vulnerable old trees but this should be applied cyclically in relatively shallow depths and preferably applied radially rather than circumferentially nor in blanket layers.

General site management should take account of:

•(ii) Use of vehicles over root zones should be restricted

•(iv) Chain saw and 2-stroke oil should be vegetable based, biodegradable

•(ii) (iv) No fires or storage of materials around trees should be permitted

•(ii) Pruning work should avoid the Autumn and May / June. Summer work should not occur during drought periods, avoiding spring and autumn. Work should be avoided in the year following a drought.

Treatment of areas where collapse has occurred:

•(v) Regeneration should be selected and protected or controlled as necessary

•(ii) (v) Competitive growth should be controlled manually to favour selected regeneration

•(iv) Where major trees have collapsed, these should be made safe and left in situ, uncut

•(iv) Hawthorn regeneration and that of other rosaceous species should be selected for retention where feasible and protected to provide invertebrate nectar source

The management of areas surrounding veteran trees in wood pasture should provide a minimum radial separation distance (from the center of the trunk) of 15 times the trunk diameter, and where feasible deadwood should be left in situ. This may be used to restrict access and public activity beneath the canopy. Where this is not feasible a suitable area for placing dead wood within the site should be identified.

References

Fay, N. (2002), *Environmental Arboriculture, Tree Ecology & Veteran Tree Management.*. The Arboricultural Journal 26 (3). 213 – 238.

Read, H. (2000) *Burnham Beeches Pollard Work Programme 2000 - 2006*. Corporation of London.