THIS PAGE (BOTH IMAGES)
A stake was provided for the hornbeam (12) and the pine (12A) but no-one bothered to secure the trees with a tie and they are consequently bent.

What's at stake for newly planted trees?

Dr Terry Mabbett offers some advice on how to maximise success from your tree planting

Trees are an important and integral part of sports and amenity facilities and none more so than golf courses. Trees are positioned and planted for maximum playing and visual aesthetic effect, and to enhance the ecology of the facilities, directly through their presence and indirectly through the wildlife which they harbour and support.

Actual planting material and inputs including the labour required to plant and manage the trees does not come cheap.

Greenkeepers should strive for speedy and sound tree establishment and steady growth thereafter, interrupted only by pruning intervention to ensure mature tree canopies are of appropriate size and shape for their position, with respect to playability and negative impacts on turf such as shading of greens and encouragement of turf diseases like Fusarium patch.

Newly planted trees require a balanced integrated programme of care and maintenance including irrigation, fertilisation and support, the latter supplied by staking and tying.

Stakes and ties for newly planted trees

Newly planted trees lack the inherent stability of those in situ having grown from seed or natural vegetative propagation. As such they may require support and stability from staking and tying while forming a firm root anchorage.

Staking and tying is used to secure and steady trees to avoid undue stem movements and their transmission underground which may disrupt root anchorage and thereby reduce stability. Tree movements can tear newly developed roots from their tenuous anchorage around soil particles, and especially fine microscopic root hairs absorbing life-giving water and mineral nutrients.

The decision whether to stake and tie trees depends on size and condition of planted stock, site conditions, planting practice and maintenance and function of the planting site. It invariably comes down to cost versus benefits because staking and tying trees will significantly raise overall planting and establishment costs. Indeed it is not always worth the trouble and can be more cost

Double staking and tying is more appropriate for this substantial tree in an exposed situation

TOP LEFT: A single stout stake and one secure tie is appropriate for this small exotic oak tree

ABOVE LEFT: Trees tied to short stakes are vulnerable to vandalism like the remains of the silver birch shown here

ABOVE: Secure support and protection is entirely appropriate for this expensive to purchase exotic flowering cherry tree

BELOW: If there is no will or way to monitor staked and tied trees then it is best to invest in a tree restraint like the one fitted to the horse chestnut shown here

ABOVE RIGHT: A triangle of support for this Robinia in a high [public] pressure location

FAR RIGHT: These hornbeams along the fairway could benefit from staking and tying

effective to plant replacement trees in the event of failure.

Trees planted on wind susceptible sites and sloping ground are most likely to benefit from staking and tying especially when planted in shallow sandy soils. Trees planted in locations prone to wind funnelling (eg. between buildings) are particularly at risk, as are those in public places prone to vandalism and incidental impact and damage from maintenance machinery and mowers. Underground guying of root balled trees may be the only practical way to avoid such impact and damage and therefore be justified even at the much higher cost.

The most appropriate method will depend on site condition and the size, structure and value of the tree, but also how it was raised in the nursery (e.g. container or field grown) and whether it was removed as a root-balled or bare-root tree.

The Royal Horticultural Society (RHS) recommends use of an angled stake or a pair of stakes for container-grown and root-balled trees and a single low stake for bare-root trees. Flexible stemmed trees should receive more support during the first year from a long stake which is cut lower in the second year. Large transplanted trees are sometimes secured with guys that can be attached to the lower branches or by using an underground guying system. Angled staking is recommended for trees planted on sloping sites.

Stake length depends on height of tree and proportion buried in the soil, as determined by stake dimensions (length and diameter) and ground condition. Tying a secured stake to a planted tree will create tensions within the stake, the tie and most importantly the tree. Position of the tie in relation to tree height is important because it creates a pivotal point from which leverage is exerted by wind and periodically by vandals.

How long for and how high?

Choosing stakes and ties for planted trees is essentially a 'horses for courses' decision which has generated a wide variety of materials, products and methods for use within the surprisingly broad and innovative mixture of art and science that is the hallmark of tree staking and tying.

Small and low value tree stock rarely justifies the cost of staking and tying. By offering less wind resistance and minimal flexibility small trees are less likely to move. It is even claimed that some wind-caused movement stimulates root growth probably by opening up otherwise compacted soil. Whips whether they be seedlings, transplants or one year hardwood cuttings, typically with a 1 metre high central stem and little or no side branching, are unlikely to require staking.

On average newly planted trees need two to three years of growth before the root-ball becomes securely anchored in the ground. Tree stakes and ties are correspondingly required for three years at least, depending on the tree species and nature of soil in which they root. Wood for stakes and synthetics used to manufacture ties should maintain material integrity throughout this period. Position of stakes in the ground and ties around trees should be checked during regular maintenance and adjusted as appropriate.

Stakes are best made of hardwood but not all 'native' hardwoods withstand wet soils like common alder one of few that can resist extended waterlogged conditions. Given the cost and relatively short working life, compared with fence

posts, tree stakes are generally made of softwood machine rounded from 'roundwood' (wood too thin for sawmill use) and treated with preservative to extend durability. Larch is widely used.

Amenity trees will invariably receive fertiliser to stimulate early growth. Such dressings are known to enhance available food substrates in root zones which stimulates and speeds up wood destroying organisms. It may be worth investing in specially treated and cured stakes to combat this problem. Scots pine which is full of natural preservative resins is particularly appropriate for making stakes which will be exposed to aggressive soil conditions.

Tree ties and tying

High ties on tall stakes are claimed to create weak points just below the crown causing trees to snap off more readily at the tie. Risk may be reduced by using short stakes and correspondingly low-positioned ties, so that the lower stem remains rigid to give root stability while allowing top of the tree to sway in the breeze. This may offer long term benefits but where vandalism is a problem trees are more frequently snapped off at low ties on short stakes.

Tree ties should be sufficiently tight but not too tight and display the right blend of plastic and elastic stretching in response to the fast increasing girth of young trees. Ties with insufficient 'give' soon give in, rupturing under the force of increasing tree girth. Alternatively they may slacken and fail to secure the tree to its stake and at worst leading to rubbing and chaffing of the soft bark with movement.

Best compromise is adjustable/releasable tree ties. These are straps or belts fitted with buckles and spacers for release and readjustment with increasing tree girth during routine maintenance.

For such a seemingly simple task there is a huge range of materials and products on the market. 'Home-made' ties can be generated quickly and cheaply using strapping cut to length and simply stapled, pinned or nailed to the stake. Three basic choices are plastic, rubber and hessian. The main disadvantage is no practical way of adjusting ties to accommodate growth. Unless untied loss of restraint when no longer required relies on degradation, weakening of the tie and subsequent rupture through forces created by increasing tree girth. Biodegradable ties overcome this problem.

Custom-made ties come in a range of types including cable ties (releasable and non-releasable), plastic buckled belts and highly popular plastic buckled ties custom made with hoop collar and spacer. Spacers are small but vital components of the tying process to prevent contact and damage between tree and stake. Several spacers are frequently used or collar spacers which are equivalent in length to three or four individual spacers. Super-soft ties made of very soft plastic which acts as a cushion between tree and stake eliminate the need for spacers.

Biodegradable ties made entirely of natural plant materials avoid the problem of removing and disposing synthetic plastic and rubber ties after they have performed their function. Material stability is maintained for two years, begins to breakdown after three and biodegrades soon after.

Tree restraints

Tree restraints offer an engineered solution to securing trees and a generally maintenance-free option throughout their required working life. They are double-wire devices with one end secured by stapling to the top cut surface of the stake. The other end opens out into a plastic-cushioned and flexible double wire placed around but not in contact with the tree stem about half way up its height.

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Manufacturers claim clearance between restraint ring and tree promotes natural growth responses to wind movement. They are essentially maintenance free and dispense with re-visits to release, re-adjust and sometimes refit straps. Restraints are designed to last throughout tree establishment and will continue to restrain and support trees with stem girth (circumference) up to 20 to 24 cm.

Tree-tying methods

A single low stake usually driven into the ground prior to planting is standard for bare-root trees. Stake height above ground should be a maximum one third of the height of the tree with a gap of 2.5-3cm separating tree stem and wooden stake. The single low-stake provides sufficient stability and root anchorage at the base while allowing the stem to sway and become thicker from wind-induced, growth-promotion movement.

For root-balled trees two stakes are inserted opposite each other on either side of the tree or three stakes spaced equally around the tree each secured to the tree by a tie. Sometimes a horizontal cross bar is nailed across the two stakes to provide added stability for the structure, and the tree which is tied to the horizontal bar. All stakes must be inserted outside of the root-ball. This 'belt and braces' option is particularly useful for planting trees on windy sites.

Guying and angled stakes offer specialist options for securing large transplanted trees on difficult sites. Low stakes inserted at a 45 degree angle away from the tree and used to attach secure strong wire (the guys). A rubber hosepipe or other suitable cushion must be used where the wire is in contact with the tree stem or branches, to prevent rubbing, abrasion and cutting.

Angled stakes can also be used with tree ties. They are driven into the ground before or after planting at a 45 degree angle and always leaning into the prevailing wind. Trees are secured to the stake using flexible tree ties which should be monitored during the growing season and adjusted accordingly.

Innovations and practical problems

Innovation risks trial and error and the latter is sometimes evident. One observed innovation for a group of maple trees involved a buckled belt around two opposite stakes and the centrally positioned tree in helical style, so the tree was restrained by the crossed over straps. It was clearly quicker than securing each stake to the tree with separate ties, but if one stake dislodged it tended to take the other one with it and deprive the tree of what was only tenuous support in the first place.

Tree staking and tying is 'bread and butter' stuff but not as basic as the need to frequently water newly planted trees. I recently observed some sensible proactive replacement planting of young trees adjacent to 50 year old red flowering horse chestnuts in terminal decline from bacterial bleeding canker. Choice of species was sensible and pleasing. No more horse chestnuts to become infected with bacterial bleeding canker but beech trees three metres high and healthy.

Each was secured by plastic buckled tie to wooden stake and protected for good measure from vandals with black painted iron/steel guard two metre high and stapled to the stake for stability. Each planting represented well in excess of £100 for each tree and its 'tackle' but no-one bothered to water the trees. The diseased horse chestnuts have since been felled to leave a line of dead beech trees and a lot of wasted time and money.

TOP LEFT: A field maple literally breaks free from its tie
LEFT: Narrow plastic cable ties are particularly appropriate for bushy conifers with low situated branches
ABOVE: Small native tree planting material sited close together in a drift pattern to produce a thicket does not need staking and tying
BELOW: The string is of no consequence to the support of this hornbeam or the English oak and moreover poses a real hazard to wildlife