** Formative Pruning of New Trees**

**Introduction**

This hand-out will help you to understand why young fruit trees need formative pruning and give you guidance on how to prune them. The main part of the guidance applies to apples and pears, particularly dessert varieties. The final section explains the main differences when pruning other fruit and nut trees.

Formative pruning, or training in the case of restricted growth forms (espaliers, fans etc.), is the early years pruning of a newly planted tree designed to develop a balanced shape. During this time the aim is to create a strong basic branch structure to ensure that a healthy tree is developed that will crop well and be easy to manage in the future. This is far and away the most important period of pruning during the tree's life – and the one most ignored. If done incorrectly, or not at all, the tree will require **lots** of corrective work in later years.

All too often people plant new trees and just walk away, somehow expecting that thereafter the tree will miraculously form itself into a wonderfully shaped and fruitful joy to behold.

It is important to understand that left to their own devices trees tend to grow vertically upwards towards the light – a phenomenon known as apical dominance. This is particularly extreme with pears but also with most apple varieties, some of which are also extreme i.e. Michelin. As the tree continues to grow upwards the lower branches are often shaded out and die to be replaced by a progressively higher and higher canopy. There are some apple varieties with a weeping habit such as Yellow Ingestrie and Golden Spire, but these are few and far between. Quinces and Medlars though, have far less apical dominance and make a more dome shaped form.

Ironically fruit trees are also often not particularly fruitful!

One of the functions of pruning is to increase fruitfulness. So, unpruned trees tend to be tall and with what little fruit there is high up in the canopy and available only to agile children and those possessed of long ladders.

**The importance of horizontal branches**

The value of horizontal (or near horizontal) as opposed to vertical branches cannot be overstated. Horizontal branches are much stronger in relation to bending moments than vertical ones. This means that they are less likely to sustain storm damage and are able to carry heavy loads of fruit – the latter is particularly important for damsons, plums and gages whose branches notoriously fail catastrophically in good fruit years.

Horizontal branches produce more fruiting spurs than vertical branches.

Horizontal branches on a well pruned tree receive more light than vertical branches on an unpruned tree and produce higher quality fruit.

Horizontal branches are easier to pick than vertical branches and are safer and easier to lean ladders against.

**Young trees that are not pruned develop thin, vertical, overcrowded, crossing and badly placed branches.**

**Timing of Formative Pruning**

As a general rule winter pruning promotes strong vegetative growth in the following season whereas summer pruning promotes spur (i.e. fruit) formation at the expense of vegetative growth. As formative pruning is intended to produce a strong vigorous branch architecture it follows that it should be done in the dormant season. The exception to this is stone fruit – plums, cherries etc. – see below.

**Naming of Parts**

Most tree forms can generally be broken down into four main sections. The first is the t**runk**, the initial central leader which forms the main stem of the tree. Radiating out from the trunk are the **framework branches**, major limbs which are usually retained for long periods, if not the entire lifetime of the tree. These in turn support the **lateral branches**, smaller side branches which bear leaves and **fruiting spurs** and are pruned and renewed on a more regular basis. The aim of pruning is to establish all of these correctly in turn.

**How to formatively prune**

When planting trees in gardens or new or existing orchards, whether they are standards or half-standards, the first aim is to begin by developing a framework branch structure. This will eventually support the laterals at a height above the reach of livestock, wild animals, tractors, mowers etc.

The framework branches on trees in horse or cattle-grazed orchards must be formed at a higher height than those in orchards grazed only with sheep. The height of framework branches is a long term decision and needs careful consideration because even if there are no plans to graze with livestock in the short term, it may occur at some point in the future. The need to allow access for machinery also needs to be taken into consideration.

**Forming the trunk**

It is important to understand that the tree does not grow from the bottom up but rather from the top up! Only the girth increases from the bottom up. Therefore the height at which each framework branch develops from the trunk remains the same throughout the tree's life. This means the only way to raise the height of the framework branches (and the lateral branches they support) is by removing or reshaping them to favour higher growth. This is difficult, time-consuming and reduces fruitfulness for a period. As doing this is also likely to compromise the shape and balance of the tree it is important to begin forming the branches so that they attain the right height while the tree is still young.

Depending on whether the end result is a bush, half-standard or standard, initial pruning is designed to produce a trunk of the correct height upon which to produce the framework branches. Until the desired stem height has been reached and the first branches are developed the aim is to establish a leader by removing competing stems. Initially, therefore, the central leader is left unpruned. If the stem or bud becomes damaged, the central leader may grow weakly. In this case it can be cut back to a healthy, well-placed side shoot which will develop into a new leader. The same can be done if it grows too vigorously, to help build up a thick, strong trunk. If necessary the new leader can be staked for the first year to encourage it to grow upright.

In the first winter (usually at planting time) any side shoots (feathers) are cut back to leave 2-3 buds. In second and subsequent winters, new feathers are cut back to 2-3 buds and previously pruned feathers cut back to the trunk. Feathers are progressively shortened and removed from ground level upwards each year to give a clear stem to the desired height (winters 3 and 4 or as long as necessary).

This process encourages the stem to thicken and builds a strong trunk to support the head of the tree. Removing the feathers in their entirety, without cutting them back, produces a thinner, weaker stem. The feathers need to be removed eventually however, or they may grow up and compete with the main branches or grow around and through the tree guard. If browsed by stock they may be torn off to the trunk which could weaken the tree. Any growth from the rootstock (i.e. from below the graft) should be removed ruthlessly as the rootstock is often more vigorous than the grafted variety and will outcompete the variety.

**Forming the first framework branches**

The branches of each tier will all join the trunk at slightly different points and radiate out in different directions, having developed from alternating buds. In practice it is best to leave at least 20 cm of trunk between each branch on trees on standard rootstocks (bearing in mind their eventual thickness) because if the branches all start from the same height it will put an increased strain on the trunk at that point as they grow. The height at which the first tier of branches should be developed depends on the type of rootstock and form required. On standards the first tier should be developed at 1.8-2.1 m, on half standards at 1.4m and for bushes at 60 – 75 cm.

Approximately three to six evenly spaced secondary leaders that have formed wide angles with the trunk (which will ensure a stronger branch union with the trunk) should be pruned back by half (two thirds for weak shoots), to an outward and downward facing bud. These will form the first tier of branches. The remaining secondary leaders can be removed.

**Forming subsequent framework branches**

From now on the aim is to develop a balanced branch system with an open habit. This will allow light in and air to circulate – this is important to reduce disease and to promote good ripening of fruit. The eventual aim is to have 4-8 evenly spaced main branches radiating from the trunk like the spokes on a wheel if viewed from above. See Figure 2. These will form the framework from which the fruit-producing side branches and spurs will develop. During the first few years the pruning will be relatively severe in relation to the amount of wood present on the tree. Generally speaking, the leader of each branch should be reduced each year by between a third and a half of the season's growth. To stimulate new vegetative shoot growth, thin shoots should be pruned to short spurs of one or two buds only.

Styles of pruning and final tree shape vary across the country. When creating an open

centred (goblet-shaped) tree which is the predominant form for non-cider trees in the Three Counties, the central leader is removed once it has developed beyond the height of the first tier and several strong branches have begun to form below it. See Figure 3. This encourages the tree to put its energies into these branches which will now form the main framework branches (secondary leaders).

When creating a delayed open-centred tree (not common around here) or centre-leader tree (commonly used for cider), the central leader is left to grow on and the process of branch selection repeated, to form further tiers of branches higher up the trunk. Each tier will therefore have fewer branches, with the consequence that the main branches will be spaced further apart and higher up the trunk. See Figure 4.

As the first branches are formed lower down on the trunk when creating a half-standard tree, they are developed at a more upright angle than the secondary leaders on a standard tree. This raises the laterals and leafy growth to the desired height, effectively forming 'mini-trunks' growing out at different angles. The required number of 'spokes' may then be formed from these branches if necessary. See Figure 5

**Forming the lateral branches**

The basic shape of the tree takes about 8 to 10 years to form. After this the main emphasis of pruning moves towards the development of fruit bearing growth and beginning to shape the crown of the tree as it matures. Pruning is confined to removing diseased wood and selectively thinning, shortening or removing shoots and branches that are weak, crossing or growing back towards the centre of the crown, to maintain its shape. This is the subject of a further hand-out.

**Pruning to different shapes**

Formative pruning is not a regimented process and should be varied according to the growth of the individual tree. Different varieties have different growth habits, which should be allowed for when developing their shape. Some have a bushier habit than others, losing their dominant leader. Pears have a more upright growth than apples. The important objective is forming an open, balanced network of strong, unshaded branches above the height of any grazing livestock and machinery: the method is of secondary importance. The form and shape of tree developed should take into locally distinctive pruning practices and tree forms. The selection of species and varieties should be guided by orchards in the local area.

**Removing fruit**

When your trees first start to fruit it is tempting to leave these on the tree to harvest later. These will use up energy that is best directed into vegetative growth so it is best to remove them straight away – although most people don’t! The weight of the fruit as it develops can also bend young branches out of shape (although this can be helpful on trees with a particularly upright habit).

**Formative pruning of stone fruit trees**

The guidance above applies mainly to dessert apples and pears. Stone fruit trees do not respond as well as pears and apples to continuous pruning, so it is best to try and keep this to a minimum. However the same basic principles still apply; all young fruit trees still have to develop a clear trunk, framework branches and a balanced shape. All fruit trees will benefit from allowing light and air in, and removing branches which are crossing, weak or diseased. To prevent excessive growth it is advisable to cut the end off the leader shoot when the tree is about 2 m tall and to shorten the ends of spreading branches to keep the tree within manageable dimensions. All pruning should be done in the summer months to prevent silver leaf infection.

**Formative pruning of cobnut trees**

The traditional practise for cobnuts is to grow open-centred trees about 2 m high, similar in shape to half-standard fruit trees. This is to maintain the tree at a convenient height for harvesting the nuts straight from the tree while they are still green. From a central stem about 60 cm high, six to eight wide-angled framework branches are developed by pruning and pegging down (festooning). Shoots and wands below this height are removed. If it hasn’t been removed already, the central leader should be shortened once it has reached 1 m. As the tree grows, some of the central branches can be cut away and others shortened to reduce their dominance in favour of more desirable, outward-facing buds or branches. Sometimes cobnuts are developed as a multi-stemmed bush rather than on a single stem, particularly on old plants where the central stem has died away and replaced by wands that have suckered from the roots. After about six years the tree should have developed its goblet shape. After this point the aim is to maintain the framework branches, removing crowded and upright growth and producing an ongoing supply of new cropping wood. The shorter, weaker, horizontal branches can be removed rotationally over the years.



Figure 1

Formative pruning first 4 winters (or often less)



Figure 2

Plan view of open centred tree



Figure 3

Goblet shaped, open centre standard tree



Figure 4

Centre leader tree



Figure 5

Goblet pruned half-standard

This document draws heavily on Natural England’s Technical Information Note 016 to whom acknowledgement is given.

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