

Traditional orchards: planting and establishing fruit trees

Traditional orchards, and the trees within them, may be hundreds of years old. They are important for a wide range of wildlife, particularly those birds, mammals and insects that use deadwood. However, only mature trees produce this kind of habitat. Often all the trees in an orchard were planted at the same time, with no more young trees planted as they matured. This means that as the original trees die there are no younger trees maturing to replace them. To create a mixed age structure of trees it is important to maintain habitat continuity by planting new ones. This can be within the existing orchard or by creating a new orchard nearby. For an explanation of terms used in this leaflet see the information note *Orchard glossary*.

Key points

- Trees should be planted at traditional spacings, following and reinforcing the original planting pattern if within an existing orchard.
- The correct planting of a tree is crucial to its long-term survival. Care should be taken to make sure this is done correctly and at the right time of year.
- Trees should be provided with adequate guards to protect them from animal damage and weeds should be controlled to prevent competition until the trees are established.

Pre-planting

Planting pattern

Marking out should be done carefully as trees cannot easily be moved once they are planted! Where an orchard is sited on a slope, the planting pattern may need adjusting to take account of the contours.

In an existing orchard, it is preferable to plant new trees at the original stocking density and follow the original pattern. However, a tree should not be replanted in exactly the same position as the tree it replaces unless more than 20 years has elapsed since the original tree was removed. This is because the roots of the original tree will have left the ground impoverished or infected with replant disease.

To retain the original planting pattern new trees can be planted to one side of the original tree (1 m away should be sufficient) keeping to the same side in each row. If this is not possible the old stump can be removed and fresh soil added. This will help prevent disease and improve the impoverished soil. An alternative is to plant stone fruits where apple/pear trees were and vice versa.

Traditionally, orchard trees have been planted in straight rows on a set (usually square, quincunx or hexagonal) pattern. This is so each tree receives equal amounts of light and to allow easier access for mowing, weed control and fruit collection.

Square The simplest orchard pattern is the square where the distance between rows is the same as the distance between each tree, the four adjacent plants of two rows forming a square. A slight modification of this is the rectangular pattern where larger gaps are left between rows than within rows to improve access for machinery.

Traditional orchards: planting and establishing fruit trees

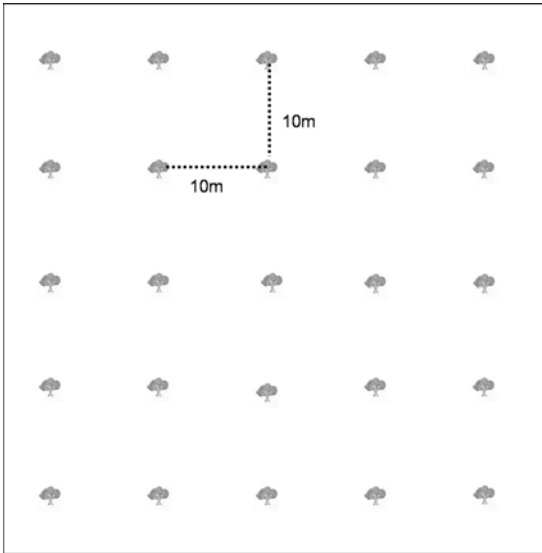


Diagram 1

The advantage of the square or rectangle is that it is easy to lay out and allows machinery to be run across and up through the orchard. The disadvantage is the 'dead' space in the centre of each square. In widely spaced orchards this distance can represent a large amount of the total orchard area, at least until the trees mature. (Diagram 1)

Quincunx Another pattern is the quincunx (an arrangement of five units in the same pattern as the five spots on die or domino). This pattern is similar to the square system but with an additional tree in the centre of each planted 'square'. This results in a staggered arrangement. (Diagram 2)

The central tree is usually a short-lived temporary tree on a dwarfing rootstock, planted to yield some crop before the permanent trees begin bearing. These filler trees can then be removed to leave a square planting pattern as the permanent trees mature and the orchard becomes crowded. The disadvantage is that the fillers can make cross cultivation and grazing difficult until they are removed. Planted like this, the diagonal or quincunx pattern accommodates about 10% more trees than the square pattern.

The quincunx pattern can also be applied to a rectangular system with the centrally planted trees being permanent ones. This effectively

forms a hexagonal system (see below) but with wider spacings between the rows in one direction. The benefit is that it allows better access for machinery.

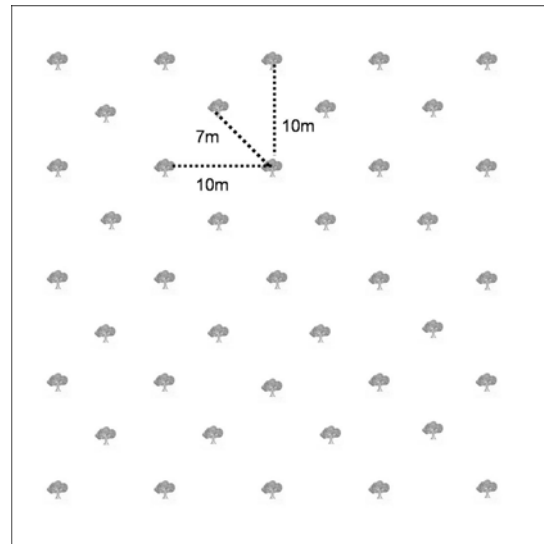


Diagram 2

Hexagonal The triangular or hexagonal system is based on equilateral triangles. Six adjacent plants form a hexagon with a seventh plant in the centre. The trees are equi-distant in all directions.

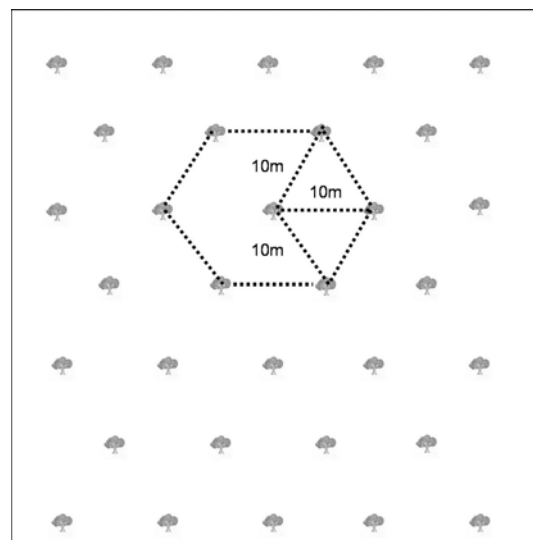


Diagram 3

This pattern allows the maximum density of trees to be planted, approximately 15% more trees (Diagram 3) per unit area than the square

Traditional orchards: planting and establishing fruit trees

system. It also means that agricultural operations can be done in three directions.

Planting density

This depends on the species of tree and also the rootstock.

- Traditional standard dessert and cider apple orchards have a stocking density of between 100-150 trees per ha with 8-10 m between rows and 7-9 m between trees within the rows.
- Dessert and perry pear spacings vary greatly according to the variety planted, usually planted at between 10-20 m apart, at a density of between 25-125 per ha.
- Cherry trees should be planted 10-15 m apart, between 70-125 per ha.
- Plum orchards should be planted 6-8 m apart, between 185-260 per ha.

On poor soils or with slow growing cultivars, trees can be planted slightly closer together.

Pollination requirements

Orchards trees (apart from cobnuts) are insect pollinated and usually require pollen from another variety to set fruit (see Technical Information Note *Traditional orchards: site and tree selection*). Therefore, the arrangement of varieties within the orchard and the planting of specific pollinators should be considered.

At least two or three different but compatible varieties need to be planted to ensure pollination. If varieties are planted in blocks these should be no wider than six to eight rows apart depending on spacing. Alternatively, specific pollinator trees should be positioned at every fifth tree on every fifth row. In a small orchard with a range of varieties this will not be so much of an issue, particularly if there are other orchards nearby.

Time of year for planting

Bare-rooted fruit trees should be planted from November to March before they come into leaf. Container trees can be planted all year round but require regular and heavy watering if planted during the summer. Planting should be avoided during droughts, hard frosts (most likely in

January and February) or particularly cold, windy periods. Generally it is best to plant in late autumn/early winter while the soil still has some warmth, to allow the tree to become established before spring. In wet areas early spring planting may be preferable to minimise the risk of compaction, waterlogging and uprooting in winter gales.

Storing the tree

Once acquired, trees should be kept in a shady place out of sunlight and frost. If they can't be planted straight away, the roots should be watered thoroughly and wrapped with a plastic sheet to prevent them drying out. The fine root fibres must be kept moist at all times as bare roots can be killed by even a few minutes of exposure to air. If trees need to be stored for longer than a couple of days they should be heeled into a trench, where they can be safely left through the dormant period.

If the tree roots are dry they should be pruned by a third and stood in a bucket of water for 15 minutes before planting.

Preparing the ground

Avoid planting in heavily shaded or boggy areas. All grass and weeds should be removed in a 1 m diameter circle around each tree station prior to planting, either by physical stripping or spraying with a suitable, non-residual herbicide.

Planting

Planting larger trees

If planting big trees with larger root systems or if the soil is poor, then pit planting is preferable (Diagram 4).

The hole should be no more than 50 cm deep and just wide enough to accommodate the roots without bending them. It can be dug mechanically but back-filling should be done by hand to avoid root damage. The hole should be dug as soon before planting as possible and covered, if necessary, to prevent it filling with water. If this does happen the hole must be allowed to drain thoroughly and the bottom dug over before planting.

Traditional orchards: planting and establishing fruit trees

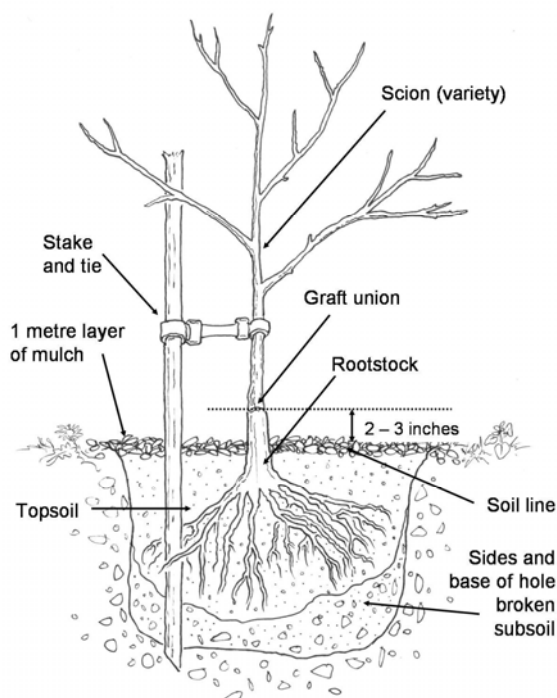


Diagram 4

The removed soil should be put in separate piles, one for the turf, one for the topsoil and one for any subsoil. Removing large stones and breaking up the bottom and sides of the pit will allow better drainage and root penetration.

A stake should be driven vertically into the bottom of the hole before planting so the tree's roots can be arranged around it. To prevent stake and tree rubbing, the stake should be put on the upwind (usually the south-west) side of the tree so the prevailing wind blows the tree away from it. The stake should extend 30 cm above ground level and allow for the stem of the tree to be about 10-15 cm away from it. Some topsoil (not the removed turf) should be placed in the bottom of the hole to bed the roots on.

The tree should be placed in the hole so the root collar (the original soil mark on the trunk) is level with the top of the hole. The tree should be rotated to obtain the best fit ensuring the roots are spread out, at the correct depth and the tips not pointing upwards. Damaged or excessively

long roots should be trimmed to fit the hole rather than twirled round the sides. The hole can then be backfilled with the remaining soil, whilst shaking the tree gently and ensuring it stays vertical.

Organic matter should not be added as this can damage soil structure and create drainage sumps. Slow-release fertiliser should only be added to the topsoil on very poor soils as over-fertilising discourages the roots from spreading beyond the planting pit into the surrounding soil. It may also prevent the young trees establishing a relationship with beneficial mycorrhizal fungi in the soil.

If the site is on recently cultivated or fertilised ground, some leaf mould or soil from land unaffected by agri-chemicals should be added to the planting pit to ensure the tree is inoculated with mycorrhizal fungi.

The soil needs to be gently firmed in as it is added to remove any air pockets and firmly anchor the roots, taking care not to compact it. Overfilling the hole by 3-6 cm will allow for the soil compressing and settling slightly. The final soil level should be at the root collar. Shallow planted trees may dry out or be loosened by the wind while those planted too deeply may rot. The grafting union should be kept a minimum of 75 mm above ground level and clear of any mulching material to avoid disease and prevent the scion from rooting.

Planting small trees (maidens and whips)

If the soil has a suitable structure, and bare-rooted maiden trees are used, disturbance during planting can be restricted to relieving compaction and removing large stones. A 'T' or 'X'-shaped notch cut into the ground with a spade and firmed back around the roots once the tree is inserted should be sufficient.

Planting container trees

These should be pit planted and well watered beforehand. As much compost as possible should be knocked away from the rootball and mixed in with the backfilled soil. Any roots circling the pot need to be teased out and spread out into the hole.

Traditional orchards: planting and establishing fruit trees

Initial management

Staking

Maidens can be established successfully without staking but standards require a low stake. This protects the root collar and grafting union from excessive shaking until the root system becomes established.

A low stake, no more than 30 cm high, allows the whole tree to sway in the wind. This stimulates the entire stem to thicken from the root collar upwards and encourages the roots to spread out and anchor the tree. Over time this will create a stout trunk that tapers evenly from base to crown and can flex under the force of wind or vandalism.

Trees staked just beneath the crown that cannot move develop thin, weak stems, which may actually thicken above the tie in response to the crown swaying. Trees with a stem-builder may need a tall stake initially however, to prevent the tree splitting at the higher grafting union.

The stake should be fastened to the tree above the grafting union with a suitably flexible tie that holds the tree firmly upright but allows some movement. If the tie does not have a separate piece to prevent rubbing, it can be passed around the tree to form a 'figure of eight'.

Guards

Most livestock will browse the leaves and twigs of fruit trees and rub against them. Horses, sheep and goats will also strip and eat the bark. When creating a new orchard it may be preferable to cut the orchard rather than graze it for the first few years until vulnerable young growth and shoot tips are beyond the reach of stock. However, if trees are adequately protected new orchards can be grazed from the outset. Cutting may not be a viable option when planting within established orchards anyway.

Even if grazing is not introduced young trees may still be damaged by wild animals. Deer may visit orchards if there is woodland nearby and will eat young leaves and shoots. Males may also break the branches of young trees when trying to rub the velvet from their newly

developing antlers. Rabbits and hares can also eat shoots and strip bark. Consequently, tree guards are usually necessary from the outset to protect newly planted trees from damage. They can also protect from machinery and vandalism and prevent poaching around the base.

Guards should not be fastened to the tree or rub against, constrict or damage it in any way. They must be durable and of the correct height and width to prevent damage. The specification will vary depending on the stock type. Neighbouring stock should be considered if boundary fences are not stock-proof (ie there is little point erecting sheep-proof guards if the neighbouring cattle can get into the orchard).

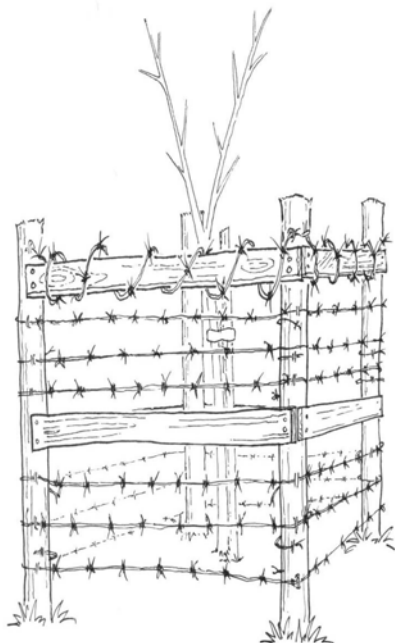
If the tree threatens to rub against the top of the guard as it moves in the wind, flexible rubber strips (bicycle inner tubes are ideal) can be tied round the top of the trunk and fixed to each side of the top of the stake. These should allow the trunk to move, but not enough to touch the side of the guard. The same method can be used to support trees with a stem-builder. Alternatively, on narrow guards a rubber strip can be fastened around the top edge of the guard.

Guards should allow access to the tree to carry out formative pruning, apply mulch or clear vegetation around the base. Depending on the type of guard it may be possible to allow access by attaching one side of the netting or barbed wire using hooks rather than nailing down, so that it can be unfastened when necessary.

Cattle-proof guards These should have four corner posts, be at least 2 m high with 5 cm diameter top and middle rails, and placed wide enough apart to protect a minimum of 1 m radius around the trunk. The posts should be driven firmly into the ground to keep the guards stable and may be canted slightly outwards, to allow stock to graze closer to the base of the tree.

At least three strands of barbed wire should be strung between the middle and top rails, and again between the middle rail and the ground, pulled taut and securely fastened to the corner posts. Barbed wire should also be put along the top rail to stop cattle rubbing against the guard.

Traditional orchards: planting and establishing fruit trees

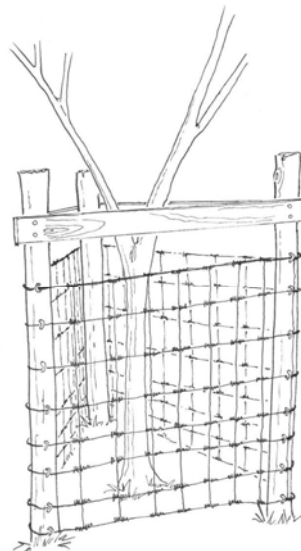


Cattle-proof guard

Sheep netting can be hung between the middle rail and the ground in place of the barbed wire so that sheep can also graze the orchard. A gap may be left at the bottom to allow stock to graze under the guard up to the tree (but not so they can reach the trunk). A bottom rail may also be needed in this case though, to prevent stock pushing the sheep netting in.

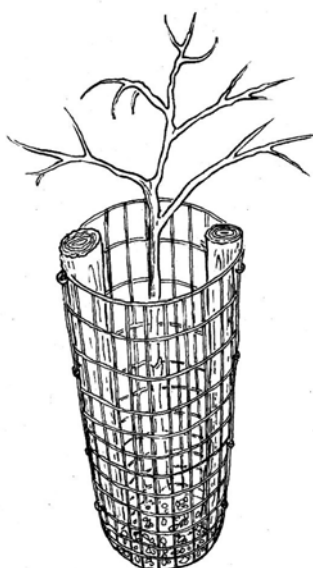
Sheep netting may also be substituted for the barbed wire between the top and middle rails if guards will need to be increased in height and width, to prevent the horses damaging the trees.

Sheep-proof guards Due to their smaller size and weight, these are smaller, cheaper and less robust. However, they limit the choice of grazing animals to sheep. A smaller square or triangular version of the cattle proof guard should be used, without a middle rail.



Sheep-proof guard

Alternatively, a guard consisting of two stakes, at least 1.5 m high and placed at least 50 cm apart, may be used. Strong wire mesh netting should be wrapped around and securely fastened to both stakes in a rough circle to maintain a distance of at least 25 cm between fencing and trunk. Two strands of barbed wire can be wrapped spirally around the guard to prevent the sheep rubbing against it.



Smaller sheep-proof guard

Traditional orchards: planting and establishing fruit trees

Deer. Either style of guard will also be adequate to exclude deer, but will need to be at least 2 m high.

Rabbits/hares Trees can be protected from these by securely fixing rabbit fencing around the base of the guard or placing a spiral sleeve guard around the tree trunk, ensuring the base is gently bedded into the soil.

Weed control

A 1 m diameter circle should be kept clear of all vegetation and maintained for at least the first 3 years after planting to reduce competition for water and nutrients while the tree is establishing itself. This can be achieved by careful use of an appropriate herbicide (making sure to avoid the trunk), by hoeing (taking care not to damage the roots), by using weed-suppressing membranes or mats, or by mulching.

Mulching (again avoiding the trunk) is preferable. As well as suppressing weeds it helps retain soil moisture, raises soil temperature in the spring and breaks down to provide a slow release of nutrients. Straw, wood chippings or well-rotted farm yard manure can be used. Previously composted mulch is preferable as fresh wood chippings or straw will temporarily lock up nitrogen as they start to decay. Applying the mulch in the autumn so it begins to break down while the tree is dormant will help to alleviate this. The mulch should be replenished as necessary maintaining a layer 5 cm deep.

Watering

Newly planted trees require watering when planted and regularly in the first weeks after, with the ground thoroughly wetted to ensure the water reaches the roots. Depending on soil and weather conditions, further watering may be necessary during the first few summers. Failure to water may lead to poor growth, smaller and fewer fruit or even the death of the tree.

Ongoing management

The level of care in the first five years after planting is important in helping the tree become established. Most problems with establishing young fruit trees are caused by neglect and lack

of management. Regular attention early on will help identify any problems as soon as they arise when they will be easier to address.

Stakes

After 1-2 years, provided soil and weather conditions have not impeded them, the roots should have grown enough to anchor the tree and the stem strengthened sufficiently for the stake to be removed. If the site has shallow or sandy soil or the tree has developed poorly, the stake may need to be left in place for longer.

While in place the stake should be checked at least every six months and the tie loosened if it starts digging into the tree bark. To check if a stake is still needed, the tie should be released and the tree pushed gently to one side. If it does not return to an upright position, the tie can be refastened and the same tried again the next year. If it does, the stake should be removed carefully without being shaken as this may damage the tree roots. The resulting hole should be filled in with soil.

Guards

When stock are present, guards should be checked every few weeks to make sure the animals have not moved them to reach the tree. Guards should protect the trees from grazing animals for a minimum of 10 years, after which it may be safe to remove them. However, even mature trees can be pushed over or have their lower branches stripped by cattle or horses and may need long-term protection.

Management of orchard grassland

Once the trees are well established the sward can be allowed to grow up to the trunk if desired, although tall weeds, bramble and ivy should be removed from around the trees. Care must be taken to avoid damaging trees if using strimmers or mowers. Traditionally, most orchards would have been grazed to provide food for livestock and to control grass and weeds. Mature trees also provide shelter for livestock, although this can lead to problems with poaching and compaction.

Traditional orchards: planting and establishing fruit trees

It is easier to protect young trees from sheep than it is to protect them from cattle or horses. Mature trees may require protecting from sheep, as they can strip the bark. This is a particular problem in late winter as the sap begins to rise. It may be more practical to exclude sheep from mature orchards at this time. Alternatively, mineral blocks or supplementary feed can be provided to discourage bark-stripping.

Cattle require stronger and more extensive guards. As they can browse at a greater height, they should be introduced to traditionally sheep grazed orchards with caution, as the lower branches may not have been established high enough to be out of their reach.

Horse grazing should be avoided, as their height and reach makes it extremely hard to prevent them browsing trees. It may be possible to graze them in mature orchards where the branches are high enough, but they may still strip bark.

Pigs (particularly Gloucester Old Spots) have sometimes been grazed in orchards on smallholdings in Autumn to clear up the fallen fruit. This practice should be avoided as pigs can damage the sward and tree roots and push over young trees.

Poultry and geese are sometimes grazed in orchards and may be suitable in new orchards with young trees. Their use should be avoided where there is any botanical interest in the sward.

Stocking densities will depend on the fertility of the site, weather conditions and the stock used to graze it. Generally, the sward should be grazed down to remove each year's growth while leaving a varied, tussocky sward structure. Where there is any botanical or wildlife interest the grazing should be tailored accordingly (see *Traditional orchards: orchards and wildlife*).

Grazing cobnut plats can harm the spring flowering woodland ground flora and nut trees. Traditionally, cobnut plats were dug over or hoed annually to get rid of weeds although this practise ceased as labour became more

expensive. Any grazing should be limited to autumn and to short sheep, such as Southdowns, to reduce damage to the low-growing trees.

Fertilising

Most existing orchards and new sites will be fertile enough not to require fertiliser, either when planting or to maintain average fruit yields. On sites with impoverished soil, a mulch of farmyard manure will act as a slow-release fertiliser. These sites are likely to have the greatest diversity of plants in the sward so any applications should be confined to within 1 m of the tree.

Further information

This note is aimed at managers of traditional orchards and agri-environment scheme land management advisers. Other Natural England Technical Information Notes include:

- *Traditional orchards: a summary*
- *Traditional orchards: site and tree selection*
- *Traditional orchards: an introduction to pruning*
- *Traditional orchards: formative pruning of young trees*
- *Traditional orchards: maintenance pruning*
- *Traditional orchards: restoration and management of mature and neglected orchards*
- *Traditional orchards: fruit tree health*
- *Traditional orchards: orchards and wildlife*
- *Traditional orchards : glossary*

This leaflet was written by Chris Wedge, Natural England, Burghill Road, Westbury-on-Trym, Bristol, BS10 6NJ, tel: 0117 959 1000. Illustrations by Paul Lacey.

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