

# Glossary of Forestry Terms



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## H&S/Environment/Quality



*Diffuse pollution on a forestry site*



*Impacts observed downstream*



*Emergency procedures*



*Goal posts*

**Diffuse Pollution:** When water is not properly managed silt and pollutants can be carried into watercourses. This is known as diffuse pollution. When this happens the water quality is reduced, aquatic biodiversity compromised and downstream flooding risks can be increased. The effects of diffuse pollution can be seen from source to sea. Environmental regulators are increasing their activity in Forestry and breaches in the rules can lead to prosecution.

Forestry operations, especially harvesting, mounding and drainage works, need to be carefully managed by operators and during supervision visits to ensure that watercourses are protected and diffuse pollution does not occur.

**Emergency procedures:** Forestry often involves harsh and dangerous environments. Reacting quickly and efficiently to emergencies is important and can save lives. All operators on Tilhill sites receive site specific risk assessments, to highlight potential risks, and emergency response cards providing details of where the nearest medical facilities are located and important numbers to have to hand, including the mountain rescue. All Tilhill employees and contractors are kept up-to-date with first aid training to ensure everyone's safety on site.

**Goal posts:** Goal posts are installed underneath powerlines to help ensure that machinery does not come into contact with the powerline.



*Stand down day*

**Stand down day:** Stand down days are important to ensure that all those on site are aware and understand current environmental and health and safety issues and legislation. They also provide an opportunity for all to improve their technical and operational knowledge. Events such as ‘Insist on Safety days’ give employees and contractors a chance to discuss issues and queries relating to specific issues they may face.



*Standing broadleaf deadwood*

**Standing deadwood:** Standing deadwood is a requirement under certification schemes and is industry good practice to ensure forest biodiversity and forest ecosystem integrity is maintained and enhanced. It is an important part of the forest habitat at all stages in its development.



*Standing conifer deadwood*

Deadwood can also provide perch poles where raptors can sit, hence helping to manage vole and rabbit populations.



*Supervision*

**Supervision:** Supervision by forest managers and harvesting managers ensures that any issues or problems arising during forestry works are promptly identified and proactively resolved to ensure that work standards and legislation are being met and value for money is being maintained for the forest owners.

## Tree Species – Broadleaf



Aspen

**Aspen:** Aspen is a fast growing broadleaf that is well suited to poor, damp soils.



Birch

**Birch:** Birch is a hardy pioneer species that can easily establish itself on poorer and wetter areas, making it particularly suited to wet, upland sites.



Oak

**Oak:** Easily identifiable by its uniquely shaped leaves, oak can be used to enhance broadleaved areas.



Rowan

**Rowan:** Rowan is a fast growing native species and is able to establish itself on exposed and windy sites. Alongside its ability to establish itself on difficult sites it produces flowers and berries at different points throughout the year making it a valuable species for enhancing biodiversity.

## Tree Species – Conifer



Douglas Fir

**Douglas Fir:** Douglas Fir produces redwood (as compared to the whitewood of spruce). It grows fast and produces high quality timber. It needs to be planted on the right site as it is a demanding species. It has a soft foliage which is favoured by browsing animals.



Larch

**Larch:** Larch can thrive in a range of conditions and has historically been incorporated into many commercial schemes. However, due to the threat posed by the disease *phytophthora ramorum* which causes the trees to die, planting Larch is not currently advised.



Lutz spruce

**Lutz spruce:** Lutz spruce is a natural hybrid of white spruce and Sitka spruce. It is thought to have great potential as an alternative to Sitka spruce in areas that are marginally too dry for Sitka.



Norway spruce

**Norway spruce:** Norway spruce is a particularly accommodating species and can grow in almost all parts of the UK, making it a great alternative conifer to Sitka spruce.

## Tree Species – Conifer *(continued)*



Redwood

**Redwoods:** Redwoods are a niche species suited to prime sheltered sites, which are fertile and well drained, for example, some of the Welsh valleys. A high volume tree that can grow to 50m high.



Scots pine

**Scots pine:** Scots pine is a native conifer and is a fairly adaptable species. A good species for many wildlife species, such as the red squirrel.



Scots pine



Sitka spruce

**Sitka spruce:** Sitka spruce is the most common species used in upland commercial forestry due to its adaptable nature, particularly on wet and exposed sites, and is renowned for high productivity. Its white wood is in high demand by processors.



*Cryptomeria Japonica*

**Cryptomeria Japonica:** Japanese cedar is being used as an alternative on sites with over 1200mm of annual rainfall, are sheltered and have deep, well-drained, sandy loams like Wales and South-West England. It is a strong, durable timber.

## Tree Species – Saw logs



*Douglas fir saw logs*

**Saw logs:** The bottom part of a felled mature tree is sold to the sawmill as a sawlog and is regarded as the most valuable part of the tree, used in the highest grade products. Sawlogs can be any conifer species and depending on the qualities and characteristics of each species have a number of uses, including being used by the construction industry.



*Larch saw logs*



*Sitka spruce saw logs*

## Plant production



Bare root

**Bare root:** Bare root trees arrive with bare, fibrous roots and need to be planted relatively quickly. Roots need to be protected from drying out. Ideally, trees come to the forest direct from a cold store so the trees are dormant when they arrive at the planting site. They are supplied in coextruded bags – black on the inside and white on the outside, and kept in the shade to avoid over-heating.



Cell

**Cell:** Cell trees have a small amount of soil surrounding their roots and thus are better protected. They can be stored on site but need to be kept moist. They are more expensive than bare root trees but can be used to extend the planting season especially in September and October.



Controlled pollination

**Controlled pollination:** Controlled pollination is costly and thus the seed arising is bulked up using vegetative propagation or in some places somatic embryogenesis.

Our understanding of genetics ensure the full sibling material is consistent and of best quality with traits such as straightness vigour and acoustic velocity (stiffness).



Female flower



Immature male flower



Full siblings



Lining out



Somatic embryogenesis

**Sitka spruce flowers:** The female flowers of Sitka spruce usually grow at the top of the tree and develop into cones in the autumn, which contain the seeds. The male flowers produce pollen which is then carried by the wind to pollinate the female flowers.

Each individual Sitka tree has both male and female flowers. You can tell the difference between male and female flowers by their looks; male flowers are red, upright and oval whereas female flowers are blunt, a pale yellowish colour and oval in shape.

**Full siblings:** Full siblings have two identified parents that have desired growth and quality traits. Such desirable traits are hereditary and will be seen in the offspring. Pollination is controlled to ensure the parents are known and recorded.

**Lining out:** Lining out, also referred to as transplanting, is the process of lifting up seedlings and rooted cuttings (part of the vegetative propagation process) from seed beds/rooting beds and replanting them outside in transplant beds. Lining out produces trees which have more fibrous and compact roots creating more robust and stronger trees.

**Somatic embryogenesis:** An artificial process to commercially produce a high number of cloned material from plant tissue in a lab.



**Seed orchard:** Such orchards are made up of circa 40 clones which cross pollinate each other producing a first level of improved stock. The arising seed is sown to create seedlings to be planted directly.



Seed orchard



**Transplant beds:** When trees are lined out they are transported to transplant beds. Trees are usually kept in transplant beds for one growing season.

Transplant beds



**1 + 1 transplant:** The first number indicates the time the tree spent growing in the seed bed and the second how long it spent in the transplant bed. Thus a 1 + 1 transplant has spent one year growing in the seed bed and one year in the transplant bed. So this is a 2 year old plant with significant juvenile vigour to assist early establishment.

Plants such as 2+2 may be more robust but at the expense of juvenile vigour.

1 + 1 transplant

## New planting and restocking



*Continuous mounding*



*Mounding*



*Rotary mounding*

**Continuous mounding:** An alternative to ploughing typically used on new planting schemes to create a raised planting position on certain site types.

**Mounding:** Mounding is a process which uses excavators to create small mounds of soil to plant trees on and can be used for new planting or restocking. Mounding ensures that the correct stocking density (number of trees planted in each hectare) is maintained and can improve growing conditions for the trees; including improved soil aeration, moisture availability and reduced weed competition to name a few. Mounding provides faster establishment and even crop spacing on restock ground.

**Rotary mounding:** Also an alternative to ploughing typically used on new planting schemes to create a raised planting position on certain site types.



*Helicopter leadout*



*Planters and Planting*

**Helicopter leadout:** Some areas of the forest, particularly in upland areas, can be difficult to access for essential maintenance works, such as fencing distant boundaries. In such instances, helicopters can be used to deliver materials, in a very cost effective manner, to that part of the forest before works begin.

**Planters:** Planters use a small spade to create a notch in the mound/plough ribbon to plant the tree into, ensuring that all roots are in the ground and the tree is left standing straight as they do so. The average number of trees one planter can plant a day is around 1000-1500.

**Planting:** Planting usually takes place between October to May, but this is dependent on weather conditions. The planting season can be extended due to the changing weather. This is facilitated by using cold storage and cell grown trees.



*Ploughing*



*Tractor and plough*



*Plotting*



*Quad bike*

**Ploughing:** Ploughing is used on new planting schemes to create raised planting positions, soil cultivation and enhance drainage on site. The ploughs are towed by tractors, fitted with special tyres to reduce the amount of pressure they place on the ground.

**Plotting:** Plots are taken at randomised points across compartments to ensure that mounding and planting is being undertaken at the correct density for the required stocking.

**Quad bike:** Quad bikes are a useful way to get people and materials, including trees during planting and fencing materials for boundary repairs, across compartments. They are able to access areas which others vehicles would be unable to get to and have a small impact to the ground with regards to damage.



Scarifier

**Scarifier:** A scarifier is generally used on restock sites with light brush and, like ploughing, creates a slightly raised plating position. Due to Sitka brush retaining its elasticity for long periods scarification is generally not used on sites that have had Sitka on them and is more generally used on pine and larch sites. Good friable soils such as brown earths are best suited to scarification.



Walking excavator

**Walking excavator:** Walking excavators are used to mound very steep sites that are beyond the safe working limits of tracked excavators. They can work on new planting sites and restock areas.

## Establishment and protection



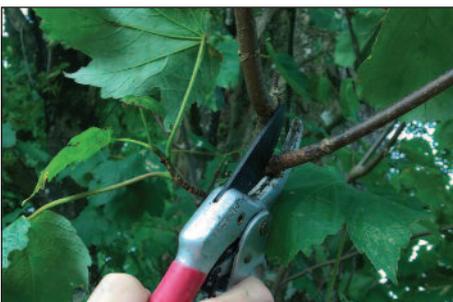
Deer fence

**Deer fence:** To prevent browsing damage, particularly of soft conifers and broadleaf species, deer fencing can be installed to prevent deer accessing the trees. Although deer fencing is effective it can be expensive meaning it is only cost effective in some instances when a larger area is in need of protection.



Deer damage to sapling

**Deer Management:** Today's forests create a favourable habitat for a wide spectrum of wildlife. Some can harm trees by browsing, such as deer. To protect vulnerable crops it is important to control deer numbers. Damage assessments are carried out to estimate populations so managers can take informed decisions.



Pruning

**Pruning:** Pruning trees whilst they are young can result in better form (straightness and branching and avoiding double stems) at the end of the rotation, increasing their quality and subsequently their value.



Tree shelters

**Tree shelters:** Tree shelters are plastic tubes that are used to protect individual trees from browsing damage. They also promote rapid growth in young trees because they shelter the tree from the elements creating a favourable microclimate.



Band Weeding



Spot Weeding



Weevil

**Weeding:** Weeds surrounding young trees can be controlled by spraying them with herbicides or removing them mechanically or by hand. Weeds compete with the tree for moisture, light and nutrients. Thus by removing them, there is less competition for such resources enabling the tree to grow and establish itself quickly. Depending on the site, weeding a band or an individual spot is used.

**Weevil:** Weevils are insects which feed on the phloem of the tree and can cause significant damage to young trees. When feeding is severe and a significant proportion of the bark is removed (or ringbarked) the tree is unable to transport nutrients and water up from the roots and subsequently dies.

Spraying an insecticide containing Acetamiprid is currently the most common and economically viable way of controlling their populations and reducing sapling losses.

Weevils are responsible for circa 25% of restocking costs. Currently, significant research is being carried out to establish viable Integrated Pest Management systems. Our weevil populations are approximately 7 times higher than those in Scandinavia and Central Europe.



Full wax coating



Clip stop

**Weevil control trials:** Alternatives to chemical spraying to control weevil populations have and are being explored through trials by Tilhill, under encouragement by the UK Woodland Assurance Scheme (UKWAS) to minimise the amount of chemical use in forestry.

The trials have explored many different control measures, some of which have been effective in Scandinavia where weevil populations are lower. Some examples of physical barriers trialled to prevent weevil damage have included wax coatings on the stems, paper sleeves, clip stops and tights to name a few!

However, despite these efforts, to date insecticide spraying remains the most effective and economically viable way to control weevils.

Tilhill Forestry, together with industry partners are researching an Integrated Pest Management System that will protect our crops irrespective of weevil numbers in a sustainable manner.

## Thinning



*Thinning*

**Thinning:** Thinning is a silvicultural operation where certain poorer quality trees (in terms of growth or form) are identified in a stand and removed mid-way through the rotation. Removing a proportion of the trees enables more resources to become available for the remaining trees. The remaining trees have access to more nutrients and grow faster, resulting in improved quality and growth. This focuses the potential volume the site can support on fewer, larger trees.

## Timber Felling



*Brush mat*

**Brush mat:** The branch wood is placed in front of the harvester to form a mat protecting the underlying soil.



*Brush recovery with a forwarder*

**Brush recovery with a forwarder:** On some sites the timber and brush can be recovered to help feed biomass markets. Forwarders pick up the brush and take it to forest roads where it can be chipped. Care must be taken to ensure that by removing this material the underlying soils and site are protected.



*Clear fell*

**Clear fell:** When the tree crop is mature areas of the forests are felled and cleared and then restocked. This is also called 'clear cut'. All the trees are felled over an area according to a pre determined plan and approval.



*Forwarder*

**Forwarder:** The forwarder collects the timber cut by the harvester from the harvesting coupe and stacks it by the roadside ready to be picked up by timber haulage lorries. Each different type of timber product picked up by the forwarder is stacked in individual stacks.



Harvester (on steep ground)



Harvester head



Hill Climber



T-Winch

**Harvester (on steep ground):** Harvesters grasp, cut and process trees to specific predetermined lengths of timber felling the tree in the process. Computer optimisation helps ensure maximum value is achieved.

**Harvester head:** The harvester head is situated on the end of the boom in front of the harvester's cab. The heads have curved blades that grasp the tree. Its chainsaw severs the tree. Rollers then move the tree through the head with the blades trimming the branches off. The chainsaw cuts the tree to the required length. The head also contains sophisticated sensors which measure diameter, length and form.

**Hill Climber:** A specialist harvester specifically designed to operate on steep ground. They have good traction and the ability to have the cab level despite the gradient.

**T-Winch:** A recent innovation. The winch is designed to assist forwarders and harvesters to safely work on terrain with steep gradients that they would otherwise be unable to access.



*Windblow*

**Windblow:** Windblow occurs when the tree is unable to withstand the force of the wind and is blown over at the rootplate. As windblown timber is more expensive to harvest than standing timber it is important to try and reduce the amount of windblow that occurs in a forest. This can be achieved by careful forest management and strategic planning of the timing and pattern of felling phases.



*Windsnap*

**Windsnap:** Windsnap occurs when the stem is unable to withstand the force of the wind but the roots remain anchored but the stem snaps/breaks. This reduces the value and yield of the crop significantly.

The owner can insure vulnerable crops against windblow/windsnap through Growing Timber Insurance schemes.

## Timber Haulage



Central Tyre Inflation



Landing Craft



Low ground pressure (LGP) haulage



LGP tyres

**Central Tyre Inflation (CTI):** In order to protect fragile roads and sometimes to increase traction, some timber lorries have the ability to lower and increase the vehicles tyre pressures from within the cab.

**Landing Craft:** This is a specialised ship that has been developed with a flat hull which enables timber to be shipped from remote areas. Some limited on-shore infrastructure is required to allow the ship to sit on the shore. The ship is loaded with up to 100t of timber from the nearby fell site and floated off at high tide.

**Low Ground Pressure (LGP) haulage:** Forest roads and public roads are an expensive investment and not all roads are designed and built to take the heavy haulage especially with timber haulage. Some sub-optimum roads can be used by specialist vehicles. For example, increasing the number of axles and/or adding additional wheels across the axle can reduce their footprint to a point where they can haul economic loads on these sub-optimal roads.

The LGP haulage units are designed to have the largest possible surface area touching the road surface in order to reduce the amount of pressure being placed on the road. The LGP unit will usually transport the timber to a storage area where it will then be collected by conventional timber lorries.

Such systems are particularly useful on soft roads or over particularly long haulage routes and, although slightly more expensive than conventional haulage using timber lorries, can reduce maintenance costs to the road over time.



Shipping container and floating pier

**Shipping and floating pier:** In some locations transporting timber by ship can be cost effective. The timber is taken from the harvesting site to a pier or floating pier and then loaded into ships. The west coast of Scotland has a number of piers of varying design to facilitate this.



Skyline

**Skyline:** On particularly steep sites skylining is used to move trees down to roadside for processing and stacking. The skylining system uses a stationary winch and a series of pulleys and wire cables to carry the cut trees and logs to the roadside over obstacles, including stumps and brash.



Timber haulage

**Timber haulage:** Specially designed lorries with a boom and grab arm are used to collect the cut timber from roadside in the forest and transport it to the sawmill for further processing.

Different axle and tyre configurations allow timber lorries to be matched to the forest and local road conditions and geometry.



Timber lorry loading timber

In bad weather snow chains can be fitted to ensure the timber dispatch can continue allowing mills to continuously process.

## Tracks, roads and access



Track

**Access tracks:** The creation of tracks through compartments are important for operations during the planting and establishment phases. They can be used to gain access into the crop during site visits to check on the crops process and by contractors during establishment works, such as weed control and weevil spraying, alongside providing easier access for the deer controllers.



Blasting

**Blasting:** Blasting is a process which uses explosives to break up hard rock in-situ, so that it can be used to build infrastructure onsite, including roads and turning circles. By blasting rock onsite, material does not have to be brought in, significantly reducing the costs of building necessary forest infrastructure. Using hard stone which requires blasting leads to a more durable road.



Bridge

**Bridge:** Bridges are necessary for ensuring that water quality in the forest is not compromised by vehicles travelling through watercourses. Bridges need to be carefully engineered so that they can support the weight of machinery and timber lorries during establishment, maintenance and harvesting operations.



Culvert

**Culvert:** Culverts enable water to flow underneath roads, ensuring that both the structural integrity of the road and quality of water travelling through the forest are not compromised.



*Quarry and crusher*



*Road Building*



*Forest road*

**Quarry and crusher:** After rock has been blasted it is crushed using a crusher to make it small enough to be used for road building. It is usually stored in-situ in the newly created quarry where it was blasted from. A surface layer of finer material is laid to allow regular maintenance and grading to ensure the road surface sheds rainwater and is suitable for heavy traffic.

**Road Building:** Roads throughout the forest are essential to enable all aspects of forestry operations and management during establishment, maintenance and harvesting to be undertaken. They have to be carefully engineered to maintain their structural integrity against machinery and have suitable drainage to ensure water quality on site is maintained.

## Wildlife



*Black grouse (male)*

**Black grouse:** Black grouse are typically seen in the transitional habitat between forests and moorland. However, due to declines in such habitat type their numbers have significantly dropped and are now regarded as a red list species and a priority species in the UK biodiversity action plan.

Sympathetic forest design, including creating a feathered edge to forest boundaries with shrub species, can help to increase populations and aid their conservation.



*Buzzard*

**Buzzard:** Buzzards are large birds of prey, also known as raptors, which can commonly be seen across the UK. Part of their diet consists of small mammals, including species that pose threats to saplings like voles.

Maintaining healthy populations of buzzards, and other birds of prey, in forests is important as they provide a natural form of pest control. The predation of pest species can be enhanced by providing places for such birds to perch whilst they hunt, such as standing dead wood being retained on restock sites referred to as raptor poles.



*Raptor poles*



Red squirrel feeding signs



Red deer track



Fox



Red squirrel

**Field signs:** In order to determine whether a certain species is on site the animal in question does not always need to be physically seen as it leaves behind field signs, such as tracks, droppings and residues from feeding. Such field signs can be used to determine if protected species are on site. For example, we can know if red squirrels are on site by observing the patterns and way a cone left on a stump has been eaten or what species of deer are on site based on the size and pattern of the tracks it leaves behind.

**Fox:** Maintaining a healthy fox population in forests can help control certain pest species, such as voles, which they predate on. Though a level of management is often required when the forests are in prime sheep country, and/or when they are adjacent to protected areas known for hen harriers for example.

**Red squirrel:** The native mammal's population is under threat from a reduction in their favoured habitat, competition from the non-native grey squirrel for food and habitat and the squirrel pox virus which has resulted in them becoming a priority species under the Species Action Framework. They feed primarily on pine, spruce and larch cones, making conifer plantations a prime habitat for them.



*Red deer*

**Red deer:** Red deer are native to Britain and are the UK's largest land mammal. Like other deer species they live in forests and cause damage to saplings through browsing, alongside stripping the bark of mature trees. Again management is often required to manage populations and to protect habitats and crops.



*Bark stripping on a mature tree*



*Roe deer*

**Roe deer:** Roe deer are native to Britain and can commonly be seen in forests but when numbers are high they will browse saplings causing significant damage and sometimes death, which have serious economic consequences.

Given that large areas of our forest are first rotation plantations at restructuring the forest habitat significantly improves and as a consequence roe deer populations will increase rapidly. Deer management is critical to ensure crops and habitats are protected.



*Sika deer*

**Sika deer:** Sika deer were introduced into Britain during the 1800s and their favoured habitats are coniferous forest and acidic soil heathland. Like Roe deer they cause significant damage to saplings through browsing. They are a secretive and shy species and thus difficult to manage.



*Vole*

**Vole:** Voles are small mammals which will eat the bark around the base of saplings. When they feed on a large proportion of the sapling they can cause ring barking which prevents the tree from carrying water and nutrients up from the roots and results in the trees death.

Such feeding damage can be reduced by installing vole guards around the base of saplings, which create a physical barrier, spraying or cutting surrounding vegetation and encouraging strong populations of natural predators, including foxes and raptors.



*Vole guard*

## Diseases



*Phytophthora ramorum*

**Phytophthora ramorum:** The disease is spread through air and water and is particularly prolific in Larch. Phytophthora causes the crown and branches to die back, ultimately resulting in death.

In infected stands the Forestry Commission may issue a statutory plant health notice which requires the infected trees to be felled, in an effort to reduce the diseases spread.



*Chalara*

**Chalara:** Commonly known as Ash dieback, Chalara causes Ash tree branches and crowns to dieback before the tree dies.



**Dendroctonus micans:** A bark beetle that came into the UK in the 80s/90s and is slowly spreading. The beetle lays its eggs in the bark of spruce trees, sometimes causing the tree to die. A natural predator *Rhizophagus grandis* can be released to control outbreaks to a manageable level.



*Dendroctonus*