

The two situations in which invasive weed management involves dealing with trees are when:

- the weed in question is a tree (both mature and juvenile); and
- weed management, including site access, might damage the tree.

**1. Dealing with invasive tree species**

Invasive non-native species of trees can pose a range of problems necessitating control from containment of the problem to removal or eradication. The problems range from species such as Sitka Spruce and Lodgepole Pine invading into peat bogs to the damage caused by False-acacia and Tree-of-Heaven in urban situations.

The planning and implementation of measures taken to manage an invasive species of tree should be included in an Invasive Species Management Plan.

**Hand pulling**

Seedlings and whips can be hand-pulled, but using an herbicide or a combination of hand-pulling and herbicide can make the job easier for most trees. Newly emerged seedlings of woody plants can usually

be readily identified in sensitive habitats and urban situations. In addition to hand pulling, tools such as the Extractigator and the Weed Wrench are available for purchase on the Internet, and these tools aid in pulling larger seedlings and saplings.

**Stump grinding**

When trees are cut down, the stumps are often ground below the soil surface with a stump-grinding machine. This method removes the stump for aesthetic purposes but adds additional cost to the tree removal. Invasive tree species vary in their ability to sprout following stump grinding, and certain species may re-grow from the ground stump or remaining roots. If sprouts occur, they can be controlled using one of the herbicide application methods listed below.

**Foliar herbicide applications**

Foliar application refers to applying herbicide to the leaves (foliage) of unwanted plants. Seedling trees and saplings can be controlled by foliar application of triclopyr- (amine or ester) or glyphosate-containing products, but triclopyr-containing products are more reliable for killing woody plants. The herbicide solution should be applied so that it

contacts only the unwanted plants because it will kill most plants that it contacts. See *Guidance note on use of herbicides*.

**Cut stump herbicide application**

Stumps of some invasive woody plants will sprout after cutting if not treated with an herbicide. Sprouts can be continually cut off as they appear, but applying herbicide to the stump will kill it and prevent sprouting. Stumps should be cut as close to the ground and as level as possible so that applied herbicide does not run off. Remove sawdust from the stump because it can absorb herbicide and prevent it from moving into the stump. Apply the herbicide to the stump as quickly as possible after cutting. On large stumps, the herbicide should be applied just inside the bark. This is where the living tissue is located and this tissue will carry the herbicide into the roots. Products containing triclopyr (amine or ester) or glyphosate are effective for controlling regrowth of stumps of many invasive plant species, but triclopyr is more reliable. Triclopyr ester-containing products should be applied to the bark of the stump, and exposed roots, as well as to the top of the stump, for more reliable control. See *Guidance note on use of herbicides*.

**Basal bark herbicide application**

Many woody plants can be killed without cutting the tree down by applying oil-soluble herbicides to the bark. This method is only recommended for trees or shrubs with stem diameters of 15cm (6in) or less. It needs to be acceptable to leave dying and dead vegetation standing. An oil-soluble herbicide, triclopyr ester, must be used for basal bark applications to facilitate movement of the herbicide through waxy substances in the bark. See *Guidance note on use of herbicides*.

**Frill or girdle herbicide application**

Basal bark application will not be effective on trees with bark that is too thick for herbicide to penetrate. In this case, some bark must be removed before herbicide application. A sharp implement such as a machete or hatchet is used to make cuts through the bark and herbicide is applied into these cuts. Cuts 7.5 to 10cm (3–4in) apart (frill) are sufficient for some species, while a continuous cut completely around the trunk (girdle) is necessary for hard-to-control species. Either a water-soluble or oil-soluble herbicide may be used. See *Guidance note on use of herbicides*

Invasive non-native trees that might need to be controlled include:

- Tree-of-Heaven *Ailanthus altissima*
- False-acacia *Robinia pseudoacacia*
- Turkey Oak *Quercus cerris*
- Evergreen Oak *Q. ilex*
- Red Oak *Q. robur*
- Grey Alder *Alnus incana*
- Rum Cherry *Prunus serotina*
- Sitka Spruce *Picea sitchensis*
- Lodgepole Pine *Pinus contorta*
- Maritime Pine *Pinus pinaster*
- Corsican Pine *Pinus nigra*
- Mountain Pine *Pinus mugo*
- Leyland Cypress *Chamaecyparis nootkatensis* x *Cupressus macrocarpa* (x *Cupressocyparis leylandii*)
- Lawson’s Cypress *Chamaecyperis lawsoniana*

**2. Avoiding damage to trees**

The two management techniques most likely to damage trees are the use of herbicides and excavation to remove underground parts. Additionally gaining access to a site to undertake works, e.g. excavation might involve a risk of damage to a tree(s) or the

need to cut back above ground parts of a tree or trees.

**Herbicidal control and avoiding risk to trees**

See *Guidance note on use of herbicides*

The planning and implementation of measures taken to avoid or reduce any damage to a tree or trees should be included in the Invasive Species Management Plan and described in the Final Report.

Particular measures to take to avoid damage or death of a tree through herbicide include:

- check on the sensitivity of the tree to the herbicide it is proposed to use, e.g. trees are generally more sensitive to drift from picloram than they are to glyphosate;
- determine the persistence of the herbicide in soil which will indicate how long to wait before planting trees in a treated area;
- check up to what distance a trees roots might extend from a tree (Table 1);
- applying herbicide by spraying only when conditions are suitable, e.g. with respect to wind;

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Table 1. Minimum and maximum distances tree roots may extend from a tree

Common name	Scientific name	Suggested minimum distance from property (metres)	Maximum root spread recorded (metres)
Cypress	<i>Cupressus</i>	3.5	20.0
Cypress	<i>Chamaecyparis</i>	3.5	20.0
Birch	<i>Betula</i>	4.0	10.0
Apple	<i>Malus</i>	5.0	10.0
Pear	<i>Pyrus</i>	5.0	10.0
Cherry, Plum and Peach	<i>Prunus</i>	6.0	11.0
Hawthorn	<i>Crataegus</i>	7.0	11.5
Rowan & Mountain Ash	<i>Sorbus</i>	7.0	11.0
Plane	<i>Platanus</i>	7.5	15.0
Lime	<i>Tilia</i>	8.0	20.0
Black-Locust	<i>Robinia</i>	8.5	12.4
Beech	<i>Fagus</i>	9.0	15.0
Ash	<i>Fraxinus</i>	10.0	21.0
Horse Chestnut	<i>Aesculus</i>	10.0	23.0
Elm	<i>Ulmus</i>	12.0	25.0
Maple & Sycamore	<i>Acer</i>	12.0	20.0
Oak	<i>Quercus</i>	18.0	30.0
Willow	<i>Salix</i>	18.0	40.0
Poplar	<i>Populus</i>	20.0	30.0

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### Dealing with herbicide damaged trees

Trees usually recover from light herbicide injury.

Irrigating the plant during dry periods will minimize moisture stress, which may hinder recovery.

Irrigation will also help leach root active herbicides from the root zone of the plant.

Fertilization should be avoided for a minimum of one growing season following injury, because stimulating excess growth can compound injury from certain herbicides.

Similarly, if branch dieback

results, pruning should be delayed for a least a year to fully assess the extent of the injury. This will avoid additional pruning of dead branches that may result from continued decline. However, immediate pruning is necessary if dead branches pose a danger to life or property.

If root active chemicals such as picloram or triclopyr are applied near trees, activated charcoal may help tie-up herbicide residues and minimize injury. Activated charcoal

must be applied immediately following the mis-application of the herbicide, preferably before the onset of symptoms. If tree roots absorb the herbicide and damage becomes evident, activated charcoal will be of little value in ensuring survival of the affected plant. Activated charcoal is applied at 150 times the amount of the active ingredient per unit area of the applied herbicide. For example, if 2 kg active ingredient of an herbicide were applied per hectare, then 2 x 150 or 300 kg of

activated charcoal per hectare would be necessary to deactivate the residue. For best results, charcoal should be soil incorporated by tilling it into the upper three to 10cm (4 inches) of soil, or by mixing with water and injecting it as slurry using a high volume sprayer.

Trees, which are seriously declining from herbicides generally, do not recover and removal usually is required. Trees should be left standing for at least one growing season after the damage has occurred to fully assess the potential for recovery. Replanting the site should be attempted only after herbicide residues have degraded.

**Excavation and avoiding damage to tree roots**

Before undertaking any excavation works in the vicinity of a tree or trees, you will need to consider the following:

- Are there any trees on the site at which excavation is proposed within 15m of the proposal?
- Are there any trees overhanging the development site within 15m of the proposal?

If the answer to either of the above questions is 'yes' you should follow appropriate guidance including BS 5837: 2012,

This guidance note is based on information available at the time of writing, notably BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations. Standards and other guidance can change at any time: check for any updates.

As the extent of the roots cannot be determined exactly, unless ground penetrating radar is used, it is recommended that as a precaution the standards used in BS5837 for calculating root protection areas (RPAs) are applied. These standards should be used as a general rule but it is essential that the excavation area be marked out with the consulting or project engineer and an arboriculturalist to minimise risk to a tree or trees and identify where RPAs can be avoided altogether. This will be dependent on the size and position of the tree and local constraints found. The majority of tree roots can be found in the top 1m below the ground surface.

The RPA of a tree or trees should be determined to determine whether the proposed excavation could harm the trees. The RPA radius can be calculated as follows:

For single stem trees the RPA is 12 times the stem diameter measured at breast height. If this is measured in millimetres (mm) then it should be divided by 1,000 to give the RPA in metres. For centimetres (cm) divide by 100.

For trees with 2-5 stems the combined stem diameter (mm) should be calculated as follows:

1. Measure the diameter of the first stem and multiply by 2.
2. Repeat for the second stem and so on.
3. Add up the scores for all the stems. This is the combined stem diameter.
4. Multiply the combined stem diameter by 12 to give the RPA in whatever units you used to measure the diameter. If this were measured in millimetres (mm) then it should be divided by 1,000 to give the RPA in metres. For centimetres (cm) divide by 100.

Mathematically this is:  $\sqrt{(stem\ diameter\ 1)^2 + (stem\ diameter\ 2)^2 + \dots + (stem\ diameter\ 5)^2}$

For trees with more than 5 stems, the combined stem diameter (mm) should be calculated as follows:

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1. Measure the diameter of each stem.

2. Add up all these diameters and divide by the number of stems to give a mean stem diameter.

3. Multiply the mean stem diameter by 2 and multiply the result also by 2. This will give the RPA in whatever units you used to measure the diameter. If this were measured in millimetres (mm) then it should be divided by 1,000 to give the RPA in metres. For centimetres (cm) divide by 100.

Mathematically this is:  $(\text{mean stem diameter})^2 \times \text{number of stems}$

These calculations give the radius of the RPA, which is the distance in metres in any direction from the centre of the trunk where special consideration will be required for any development.

All approved excavation work within the RPAs must be confined to smallest practical area and must be carried out from an existing hard surface or from outside of the RPA, unless suitable approved ground protection is used. Reinstatement must be carried out as soon as possible. It is intended that the final route of the electrical ducts is to be discussed and agreed and

marked out on site prior to installation with an arboriculturalist, the project engineer and the Local Planning Authority (LPA) to ensure that the health of the retained trees is not impacted upon. All tree protection measures must be fully discussed and agreed so that all aspects of the required type of excavation, methodology, implementation and sequencing are understood by all the parties. Any clarification or modifications must be recorded and circulated to all parties in writing. Any trees that are required to be cut back in order to facilitate the work must be identified and a schedule of tree works drawn up.

Arrange for an arboriculturalist to carry out a tree survey before the design stage.

Use the following checklist to make sure all aspects are dealt with:

- check if the local planning authority has any policies or guidelines for trees and their management;
- exclude protection zones from the worksite using appropriate protective fencing;
- do not operate any vehicles or plant within a tree's protection zone;

- do not carry out any excavations or alter soil levels within a tree's protection zone without the input from an arboriculturalist and/or agreement with the local planning authority before works begin;
- if tree surgery is necessary, arrange for an approved arboricultural contractor to carry out recommended before work begins;
- follow all appropriate codes of practice and specific recommendations when
  - working within protection zones.
  - carry out appropriate measures after work has finished to reinstate and improve the site (for example, soil aeration and mulching) and avoid practices such as cultivation and fertilising.
- do not store any construction materials or toxic substances (including road salt) or light fires within a tree's protection zone;
- install permeable surfaces over disturbed ground within a tree's protection zone.

The planning and implementation of measures taken to avoid

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or reduce any damage to a tree or trees should be included in the Invasive Species Management Plan and in the Final Report.

### Access to sites for weed removal and avoiding damage to trees

Gaining access into a property or site to undertake weed control might involve damaging a tree or trees from the machinery or plant being brought into and exiting from the site. For example bring an excavator into a site to dig out soil contaminated with Japanese Knotweed rhizome or Giant Hogweed seeds or to remove Floating Pennywort along a river.

Careful planning should be undertaken to avoid the risk of damaging any trees either by using smaller machinery or plant and/or by using different entry/exit routes. Liaison with the property owner and/or consulting or project engineer can be useful in determining alternative routes.

Where damage is unavoidable, a risk assessment should be undertaken to determine the scale of the impact. Unless the damage is obviously only light, advice should be sought from an arboriculturalist. Factors to take into consideration are:

- Is the tree protected under a Tree Preservation Order?
- Can the damage be avoided by pruning back branches?

The planning and implementation of measures taken to avoid or reduce any damage to a tree or trees should be included in the Invasive Species Management Plan and in the Final Report.

**This guidance note is written and produced by the Property Care Association**

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