



Reducing and Preventing  
Invasive Alien Species Dispersal

## GOOD PRACTICE MANAGEMENT

Japanese Knotweed (*Fallopia japonica*)





# GOOD PRACTICE MANAGEMENT GUIDE FOR Japanese knotweed (*Fallopia japonica*)

**Other names:** Also known as *Polygonum cuspidatum* by Japanese and American authors but, following Meissner's 1856 classification, as *Fallopia japonica* in Europe

## For ID guides and more information:

<http://www.nonnativespecies.org/factsheet/downloadFactsheet.cfm?speciesId=1495>

<https://www.cabi.org/isc/datasheet/23875>

<https://www.cabi.org/japaneseknotweedalliance/>



Japanese Knotweed (*Fallopia japonica*)

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Version 1: August 2018



# MANAGEMENT SUMMARY



## Ecology and impact of Japanese Knotweed

Japanese Knotweed is the most damaging terrestrial weed in Britain and the IUCN lists it amongst the top 100 invasive species of global concern. This species causes a huge amount of economic and environmental harm, including damaging buildings and infrastructure, increasing the risk of flooding and outcompeting our native species. Japanese Knotweed is thought to cost Britain at least £165m every year (Williams et al. 2010) and has nearly doubled its distribution in the last 20 years.

## Effective management: summary

Japanese Knotweed is not an easy plant to control for several reasons. Firstly, it can proliferate from fragments as small as a little finger nail. In riparian areas, high water flows disperse fragments of the plant downstream where new colonies form. Secondly, it is extremely resilient to a range of conditions and herbicides. Thirdly, it has an extensive underground rhizome system that can sustain the plant in a dormant state for years (observations suggest rhizome can stay alive for more than 20 years.), even when top growth is removed.

The success of the species has been partially attributed to its tolerance of a very wide range of soil types, pH and salinity. Its rhizomes can survive temperatures of  $-35^{\circ}\text{C}$  ( $-31^{\circ}\text{F}$ ) and can extend 7 meters (23 ft) horizontally and 3 meters (9.8 ft) deep, making removal by excavation extremely difficult.

Regeneration from this dormant state can be triggered by a change in site conditions or more often by site disturbance, which is commonly the case on riverbanks. With these issues in mind, often treatment needs to be repeated for long-term control to be achieved and long-term monitoring is essential.

Japanese Knotweed may take two or three years to show significant signs of the control efforts working, although with two or more treatments per year results can be faster. The effectiveness of the control work can be seen in the strength,



## Effective management: summary (cont)

colour and form of the Japanese Knotweed as it regenerates, tending to produce less dense stands, that do not grow very high and have dwarf features. Again, it is important to continue monitoring sites even after apparent success as Japanese Knotweed can lay dormant for several years before regenerating. Where possible, it is useful to disturb sites where Japanese Knotweed has apparently been controlled as the disturbance can activate dormant roots which can then be treated as before to kill off any remnants.

When planning Japanese Knotweed management, it is best to use a multifaceted and adaptive approach. Try to select control methods that reflect the available time, funding, and labour of the participants, the land use goals, as well as the values of the community and landowners. Management will require dedication over a number of years and should allow for flexibility in method as appropriate.

Non-chemical methods for the control of Japanese Knotweed can take up to 10 years to eradicate the weed and often may fail to achieve eradication. Great care needs to be taken with the cut material to avoid further spread. Non-chemical methods are generally suited to low populations in small areas but present problems of disposal of plant fragments. Although there are potentially successful mechanical or manual control options for small patches of Japanese Knotweed, landscape level projects and larger sites will likely require integrating herbicide into the control strategy.

## Mechanical

### *Cutting or Mowing*

Wherever possible Japanese Knotweed should be cut with a single clean cut near the base of the stem. Use a cutting method that prevents fragmentation of the stem. Avoid flail mowing, strimming or similar methods that fragment the stem and rhizomes. Stems can regenerate from nodes, or fragments of nodes. If cut stem is dried until it is crisp and brown it can be burnt or disposed of as an inert waste. If stems have been pulled up, they will have fragments of Knotweed crown still attached at their base. This is highly regenerative and will regrow, even after the stem has dried. Avoid pulling stems. Cutting will need to be done at least 4 times per year or every 2-4 weeks during the growing season if it is the only method of control. Cutting annually may take up to 10 years to achieve death of the plant.

Plant material accumulated by this technique will need appropriate disposal. Disposal of cuttings should be done on site either by composting or burning (a licence is required). Stems should be dried on a layer of polythene to prevent rooting and once they become dark brown in colour they cannot regenerate. Dried cut stems can then be safely composted. Pulled stems, which will include crowns, are not suitable for composting. When burning pulled stems, ensure that the crown is in the centre of the fire and is thoroughly combusted. See the section on "Disposal" for more information.

Method: Manual cutting of canes, using a hook or brush cutter.

Potential equipment requirements (excluding PPE): Brush-cutter, hook, fork. Vehicle & trailer if not disposing at site.

Most suitable situation for method: Generally used to clear an area prior to chemical treatment of regrowth. Not recommended as a sole method of treatment, as it generates potentially infectious waste and would need to be performed annually for many years to provide control. Suitable for volunteer groups.



## Mechanical (cont)

Efficacy: Good, but canes must be disposed of carefully. Cutting is preferably a prelude to spraying.

Constraints: Time-consuming, and requires good access.

Timescale: Cutting between June – Oct, preferably as a prelude to spaying

### When to manage Japanese Knotweed with manual cutting

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec



## Mechanical (cont)

### Grazing

Method: Grazing by horses, donkeys, sheep and goats can keep the Japanese Knotweed in check provided previous dead growth is removed.

Potential equipment requirements (excluding PPE): Access to livestock and possibly fencing to restrict their movements.

Most suitable situation for method: In areas where reduction of knotweed, rather than eradication, is the aim. Likely to be used in conjunction with other methods

Efficacy: Grazing is not an eradication tool but is helpful in suppressing the plant and reducing spread.

Constraints: Grazing animals can poach and erode the ground as well as spread plant fragments, so they need to be managed carefully to ensure that they are suppressing the plant and not causing further spread. Disturbance can speed up knotweed regeneration, so lighter animals, such as sheep or goats may be the best livestock option, if they will cause less erosion.

Timescale: Animals prefer the young shoots as they emerge in the spring and after about June the stems become rather woody.

### When to use grazing animals to control Japanese Knotweed

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec



## Mechanical (cont)

### ***Digging***

Stand-alone digging as a management option is included here, as it is a viable management choice, but not suitable for most sites. This option is most commonly used on large, flat development sites where the costs and disturbance caused by the process are mitigated by the potential gains and the expediency of the solution. It involves digging down and removing all root material and all soil including a 2m halo of soil around the furthest extent of the rhizome system using a registered contractor.

### ***Digging (to be done in combination with herbicide spraying)***

Site trials have shown that combining digging and spraying treatment is effective in reducing the time needed for chemical control. Great care is needed with this method to avoid spreading plant material. The aim of the treatment is to break up the rhizome, which stimulates leaf production and therefore makes the plant more vulnerable to herbicide treatment. The rhizome is also stimulated to produce green growth if it is near or on the surface. Therefore the success of the treatment will be determined by the amount of rhizome that is brought to the surface layer.

Method: The majority of Japanese Knotweed rhizome exists in the upper layers of topsoil. An excavator can be used to scrape surface crowns and rhizomes into a pile. Exposed ground can then be cultivated to at least 50cm deep, depending on the depth of the bulk of the rhizome, turning the piled material and respreading it over the cultivated area. This process stimulates the rhizome to produce a higher density of stems, which makes it more vulnerable to herbicide treatment. It has been seen that subsequent herbicide treatment has achieved significantly better rates of control.

Potential equipment requirements (excluding PPE): Excavator, equipment for herbicide treatment





## Mechanical (cont)

Most suitable situation for method: Larger areas that can be accessed with an excavator. In this situation, it would be inappropriate to dispose of treated material under a waste exemption. Soil can be reused on-site, in localised areas that would facilitate herbicide treatment if regrowth were to occur.

Efficacy: Whilst this disturbance technique (in conjunction with chemical control) may have the potential to eradicate Japanese Knotweed infestations, it cannot guarantee it.

Constraints: This technique will only work in when carried out with chemical treatment. Soil can become compacted if driven over or worked when it is wet. This reduces rainwater infiltration, which increases runoff and may spread Japanese Knotweed across the site and into watercourses. Compacted soils are also less likely to encourage the regrowth needed for treatment

Timescale: Dig the soil during the winter, taking care not to compact wet soil, and treat regrowth during the spring and summer.



## Mechanical (cont)

### ***Root Barrier Membranes***

Various root barrier membranes are available which claim to prevent Japanese Knotweed penetrating. A root barrier membrane is only as good as the way in which it has been laid. It is essential that there is expert supervision when the root barrier membrane is supplied. It is important that the suppliers of root barrier membranes can advise the designing architect of potential problems and supervise installation.

Method: Root barrier membranes are currently used in a number of ways:

- ◆ Cell formation
- ◆ Protecting structures and hard surfaces
- ◆ Preventing horizontal spread
- ◆ Protecting services, etc.

The methodology for installing the root barrier membranes will depend which of those 4 functions you are aiming to achieve. This methodology is detailed in Appendix 1

Potential equipment requirements (excluding PPE):

It is essential that a good root barrier membrane is sourced. A root barrier membrane physically protects a structure or clean soil. The root barrier membrane used for this method must be made of a material that is fit for purpose. It should be made of a material that can be:

- a)** used without damage;
- b)** provided in large sizes, to minimise the need for seals;
- c)** sealed securely;
- d)** remain intact for at least 50 years;
- e)** resist UV damage if it is exposed to sunlight.



## Mechanical (cont)

Japanese Knotweed will tend to break through holes or joins in the fabric, so it is essential that the integrity of the root barrier membrane is maintained, and there is a minimum number of seams. Ideally, root barrier membrane material should consist of a single sheet. You must ensure that root barrier membranes containing leachable chemicals do not pollute streams and groundwater.

Given that Japanese Knotweed rhizome may remain dormant for at least 20 years, it is important that a root barrier membrane carries a guarantee well beyond that time. A manufacturer's guarantee of at least 50 years is recommended.

Most suitable situation for method: This type of methodology is normally used on large scale development sites

Efficacy: There is little information available on the efficacy of this approach, but as it is used widely in large scale infrastructure projects, it is presumably quite effective

Constraints: Expensive, time-consuming, requires expert advice and help with installation. This method likely to only be worthwhile carrying out on a large scale.

Timescale: There is little information available on the optimal timescale for this type of management.



## Chemical

**It is essential that a competent and qualified person carries out the herbicide treatment. Contractors must have the appropriate National Proficiency Tests Council (NPTC) certification. They must follow the instructions on the herbicide label and wear appropriate protective equipment. Only certain herbicides are allowed near water, and approval must be obtained from The Environment Agency before using these. Other permissions and health and safety requirements may need to be considered. For more information, please see the “Health and Safety” and “Legislation” sections.**

### *Glyphosate*

Chemical control is the most successful treatment for controlling Japanese Knotweed as it kills the extensive rhizome system. However, complete control will seldom be achieved in one season. It is necessary to repeat herbicide treatment for at least three years before Japanese Knotweed stops regrowing. Herbicide alone is not sufficient to eradicate Japanese Knotweed. Lack of regrowth is **not** evidence that the Japanese Knotweed is no longer alive. Disrupting the rhizome by disturbing the soil is likely to result in substantial regrowth. It is also important to select the appropriate product together with the method of application for the individual situation.

The only herbicide recommended to use for the control of Japanese Knotweed in England is glyphosate. This is also the only active herbicidal ingredient allowed to be used near any water body in England, including rivers, streams lakes and ponds. The biactive formulations of glyphosate are generally regarded as the most suitable. Efficacy is greatly increased with use of the adjuvant Codacide Oil (@ 1 l/ha per Glyphosate @ 6 l/ha in 400 litres of water).

Glyphosate is a translocated herbicide, which means the plant carries the herbicide down to its rhizome. Contact herbicides may appear to kill the leaves and shoots of Knotweed, but unless the herbicide is translocated down to the rhizome the plant will regrow. Glyphosate will kill the non-target plants Use of a weed wiper or spot treatment with a hand lance can increase the



## Chemical (cont)

selectivity of this herbicide. Fitting the hand lance with a guard can direct the spray to the target more accurately. Glyphosate can also be directly injected into the stem. Timing is essential for chemical management of Japanese Knotweed as it is an incredibly resilient plant capable of withstanding a significant amount of prolonged herbicide control. The most effective time to apply glyphosate is from July to September (or before cold weather causes leaves to discolour and fall). Spring treatment is acceptable, but less effective. Avoid the flowering period to protect bees and other pollinating insects.

It is important that the Japanese Knotweed is monitored regularly after it has been sprayed for any signs of regeneration following the previous treatment – sometimes Japanese Knotweed will turn black and wither away right down to the base of the stem and other times it will simply wilt slightly before recovering and continuing to grow. Glyphosate is not effective during the winter dormant stage of Japanese Knotweed as it requires living foliage to take up the active ingredient.

### ***Spraying***

Glyphosate is usually sprayed onto the foliage of knotweed. Beware of drift on to non-target plants and lawns. Select the appropriate nozzle (deflector or even flat fan) and pressure (1 bar). If there are concerns about the risk to other plants, use a weed wiper to apply the herbicide. Note that weed wipers are labour intensive. Do not apply herbicide if rain is imminent or if it is windy. The treatments also need time to be transported into the plants, therefore, select a day when the weather is likely to be dry for at least 6 hours after treatment. Spraying both top and underside of leaves improves control.

#### ***1) Spraying Young Growth***

Method: Glyphosate @ 6 l/ha treatment of young (preferably < 1m) growth, either by weed wipe or knapsack sprayer.

Potential equipment requirements (excluding PPE): Knapsack sprayer, preferably with a long-lance



## Chemical (cont)

Efficacy: Moderate

Constraints: In order to use herbicides and spraying equipment, training and certification is required (see Health and Safety section), which can be expensive, or even impractical in a volunteer work setting.

When to manage young growth of Japanese Knotweed with glyphosate

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec

### 2) *Spraying Mature Growth*

Method: Glyphosate @ 6 l/ha treatment of mature growth, either by weed wiper or knapsack sprayer.

Potential equipment requirements (excluding PPE): Knapsack sprayer, preferably with a long-lance

Most suitable situation for method: Large dense infestations, during the initial stages of long-term treatment. Encouraging good sward growth reduces the risk of erosion, so this method is usually replaced by control methods with less non-target damage

Efficacy: Good, particularly just after flowering but before autumn senescence

Constraints: In order to use herbicides and spraying equipment, training and certification is required (see Health and Safety section), which can be expensive, or even impractical in a volunteer work setting

When to manage mature growth of Japanese Knotweed with glyphosate

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec



## Chemical (cont)

### ***Stem Injection***

Method: Glyphosate as a ten to one solution, applied into a stem, freshly cut just beneath a node. Dye or food colouring can be added to indicate treated stems. Herbicide can also be applied to intact stems using stem-injection applicators. Apply to flowering stems for best results. Regrowth will be unsuitable for further stem treatments because of the reduced stem diameter, therefore, follow up injection with spot treat using a knapsack sprayer.

Potential equipment requirements (excluding PPE): Adapted backpack sprayer or stem injection equipment.

Most suitable situation for method: Smaller infestations, or sites that are sensitive to non-target herbicide damage due to organic, water quality, sensitive area constraints, or even prone to wind. Areas in which there is a grass sward in close proximity, such as areas of dispersed Japanese Knotweed colonisation. This method can be also be used to treat small stands, particularly by water, new invasions and to tidy up escapes from eradication control programmes. This is also a useful method where public opinion precludes foliar applications.

Efficacy: In a study by Delbart et al. 2012, injection was found to be the most efficient treatment of managing knotweed infestations when compared to spraying and mechanical control. This view is also backed up by other studies (Ford, 2004; Hagen and Dunwiddie, 2008).

Constraints: In order to use herbicides and spraying equipment, training and certification is required (see Health and Safety section), which can be expensive, or even impractical in a volunteer work setting. Stem injection can be labour intensive. Only larger stems can be injected, which may reduce efficacy. Needle breakage and bending can be commonplace and clean-up time (such as leaky needles, canisters and guns) can be considerable as well, all of which incurs more cost.

### When to manage Japanese Knotweed with stem injection

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec



## Biological

CABI have been researching the possibility of using natural control methods to curb the onslaught of Japanese Knotweed in the UK since 2000. There has been some success with psyllid bugs (*Aphalara itadori*) during past trials, though more limited success getting the psyllids to overwinter in the UK. Research and trials are ongoing (including as part of the RAPID LIFE Project).

During the original survey work a leafspot fungus (*Mycosphaerella* sp.) was observed, with damage on knotweed very commonly seen all over Japan. Its potential as a biocontrol agent was assessed alongside a rust fungus (*Puccinia* sp.).

The rust was rejected after failing the rigorous safety testing procedure, but the leafspot showed promising impact and safety. However, the decision was made to focus research efforts on the psyllid, on which more progress had been made. Thanks to DEFRA funding, the research on the leafspot has resumed and CABI aim to finish the safety testing of this potential agent shortly.

Biocontrol will not cause complete eradication of Japanese Knotweed in Britain. The psyllid will put natural pressure on it if it establishes successfully in Great Britain, but it will not make it disappear altogether. The ultimate aim of CABI's project is to turn the weed from a destructive and expensive environmental burden, into a more manageable plant which poses less of a threat to economic interests and biodiversity.

For more information please see: [www.cabi.org/japaneseknotweedalliance](http://www.cabi.org/japaneseknotweedalliance)





## Disposal

Due to legislation (see “Legislation” section), you care must be taken with disposal of Japanese Knotweed.

More information on this can be found at: <https://www.gov.uk/guidance/prevent-japanese-knotweed-from-spreading#how-to-dispose-of-japanese-knotweed>

### ***Burning***

First, check with the local council that burning Japanese Knotweed onsite is allowed. Controlled burning of stem, rhizome and crown material can be used as part of the programme to control Japanese Knotweed. This means the material is less likely to survive and there is less material to bury or dispose of off-site. Cut and dry Japanese Knotweed canes on-site before burning them. Crowns and surface rhizome raked from the surface with tines can also be burned or taken to landfill. Burning will not reliably kill rhizome or crowns, as in its native area, Japanese Knotweed grows on volcanic ash and around hot fumaroles. There are different rules for businesses (which includes farmers) which can be found at the link listed above.

### ***Bury on Site***

You must inform your local area office Environment Management Team at least one week before the burial.

Soil containing Japanese Knotweed material and burnt remains of Japanese Knotweed may be buried on the site where it is produced to ensure that you completely kill it. It is advisable to apply a non-persistent herbicide such as glyphosate at least once to reduce the growth of infective material. Material cannot be buried during that period of activity. Burying material treated with a persistent herbicide may contaminate groundwater. If you are in doubt whether the herbicide is still active, consult the supplier or the contractor who applied it. Material on-site must be buried at least 5m deep. Cover the Japanese Knotweed material with a root barrier membrane layer before infilling to 5m deep with inert fill or topsoil.



## Disposal (cont)

Where on-site burial is used, it is strongly advised that the location is accurately mapped and recorded to prevent potential disturbance and re-infestation, and that any future land owners are advised of its position. Japanese Knotweed is likely to survive for many years, depending on how effective the treatment was before it was buried. It is essential that it is not buried where landscaping, installing services, erosion from a watercourse or subsequent development will disturb it.

### ***Bund Method***

Where local conditions means burial is not an option, it may be possible to create a bund. Before carrying out this method, it is advisable to consult with the Environment Agency.

A bund is a shallow area of Japanese Knotweed contaminated soil, typically 0.5m deep. The bund can either be raised on top of the ground or placed within an excavation to make the surface flush with the surrounding area. The purpose of the bund is to move the Japanese Knotweed to an area of the site that is not used. This 'buys time' for treatment that would not be possible where the Japanese Knotweed was originally located.

The construction of the bund is critical, especially if it is likely to be deeper than 0.5m. The aim is to concentrate the rhizome into the upper surface of the bund, where it will grow and be controlled by herbicide. If rhizome is buried deeply, it will become dormant inside the bund and regrow when the apparently clean soil is used for landscaping on the site.

There are many factors to consider before building a bund for this purpose, such as location, position and depth, whether a root barrier membrane and/or local planning authority approval is required. All of these questions can be answered by the Environment Agency before carrying out work.



## Disposal (cont)

### ***Disposal to Landfill***

An alternative method is disposal to landfill. Japanese Knotweed is classed as 'controlled waste' and as such must be disposed of safely at a licensed landfill site according to the Environmental Protection Act (Duty of Care) Regulations 1991 (see "Legislation"). Soil containing rhizome material can be regarded as contaminated and, if taken off a site, must be disposed of at a suitably licensed landfill site and buried to a depth of at least 5 m. More information on this can be found at the link at the beginning of the "Disposal" section.

### ***After Disposal***

Once Japanese Knotweed has been successfully eradicated the from the site, the area will be exposed and vulnerable to soil erosion and further invasion. To reduce the likelihood of further invasion, it is recommended that the area be brought into regular use. If the infested area was a natural area, building a strong plant community is recommended.

This can be done in several ways. Firstly, establishing a strong grassland community will protect the land. Secondly, begin with establishing a native grassland community that can be used as a stepping stone community before proceeding to restoration with tree and shrub species. This may be a preferred option as some invasive plants, such as giant hogweed, are intolerant of shade. Establishing wooded areas may prevent invasion from such species. Thirdly, bring the land into crop rotation.

Rudenko and Hulting (2010) recommend the following:

- ◆ Grass mixtures should be sown at high densities.
- ◆ Mixtures should be competitive, create dense swards and have good growth following cutting.
- ◆ Some recommended mixtures include: *Dactylis glomerata*, *Festuca rubra* (50:50), *Lolium perenne*, *Festuca rubra*, *Poa pratensis* (12:35:53)

Note that it can take several years to a restore a site and prevent it from being re-infested with Japanese Knotweed, Skinner et al. (2012) details some of the challenges associated with this kind of restoration.



# Ineffective control

## ***Mechanical***

### ***Pulling***

Pulling up individual plants by hand is only useful in a minority of cases, such as when treating small or new infestations where only a few stems have established. This is only an effective method of control if it is carried out continually over a number of years on small or newly established stands. This is not an effective type of management in most situations. In particular, if pulled, the highly fecund crown will likely be attached to the base of the cane and could result in the spread of the plant. As this method is labour intensive, could easily fragment the plant and cause spread, this method is not recommended.

### ***Covering Using Tarpaulin/Geotextile***

This method has been used in the past, with the thought that blocking out the light will reduce growth of Japanese Knotweed. There is little empirical evidence available on the efficacy of this method. Anecdotally, it has been said that using tarpaulin can produce worthwhile results on the condition that the sites are subjected to regular and relatively time-consuming monitoring and upkeep. It is also stressed that the maintenance work on the tarpaulin must be accompanied by additional management efforts.

As there is little empirical evidence available on the efficacy of this method, Japanese Knotweed is known to grow through tarpaulin and covering would have little effect on the plant's rhizome, this method is not recommended.

## ***Environmental***

### ***Saline Shock Treatments***

Following field trials (Rouified et al., 2012), saline shock treatments are thought not to be a feasible management technique in natural environments for Japanese Knotweed, as this plant can tolerate fairly high salinity and the method was not sufficient to prevent plant regeneration.



# Ineffective control

## ***Chemical***

### ***Other Herbicides***

Several other herbicides have been used historically to control Japanese knotweed such as 2,4-D amine. Apart from glyphosate, at present no other herbicides are recommended due the effects they on the surrounding environment and new legislation reflects this, making it very difficult to use these chemicals.

### ***Composting as a form of disposal***

Japanese knotweed will survive composting and therefore this method of disposal is not advisable. Japanese knotweed must only be buried, burnt or disposed of in accordance with Environment Agency advice.

More information on this can be found at: <https://www.gov.uk/guidance/prevent-japanese-knotweed-from-spreading#how-to-dispose-of-japanese-knotweed>



## Preventing spread

Once escaped in the wild, fragmentation and dispersal of Japanese Knotweed, (*Fallopia japonica*) can result from a variety of management and recreational activities. As this species is difficult to eradicate, raising awareness and practicing good biosecurity is key to effective management and preventing further spread. For guidance on this, please follow the Check, Clean, Dry guidance in the link below:

<http://www.nonnativespecies.org/checkcleandry/index.cfm>

In order to manage Japanese Knotweed successfully at a landscape level, conducting outreach to private landowners and the broader community, as well as recruiting volunteers, is important. Educating people in your community about what Japanese Knotweed looks like and the devastating effects that it can have will help to increase reports of new infestations, which are easier to manage when they first occur.

If possible, (particularly if it is a publically used site), it is best to cordon off the infested area and put up a restricted access sign to avoid dispersing the plant. As a general rule, the area of infestation is 7m horizontally from the nearest growth of Japanese Knotweed that can be seen. To determine exactly how far the rhizomes have spread, a series of test pits should be dug and examined.

Ideally, a Japanese Knotweed management plan can be developed and tailored for the site.

The following document gives advice on biosecurity to prevent the spread of Japanese Knotweed offsite and around the site. This document is aimed at the property industry, but is relevant for a variety of settings and other invasive species as well:

[https://www.property-care.org/wp-content/uploads/2015/04/Code-of-Practice-for-the-Management-of-Japanese-knotweed\\_v2.7.pdf](https://www.property-care.org/wp-content/uploads/2015/04/Code-of-Practice-for-the-Management-of-Japanese-knotweed_v2.7.pdf)



## Legislation

Appendix 2 discusses the legislation covering the handling and disposal of Japanese Knotweed in detail. It also includes legal definitions, such as the definition of “in or near water”. This section broadly covers the most important concepts and is not exhaustive. If you are in any doubt, contact the Environment Agency or SEPA **before** carrying out any activities. You could be fined up to £5,000 or be sent to prison for up to 2 years if you allow contaminated soil or plant material from any waste you transfer to spread into the wild.

The Environment Agency or SEPA can be contacted for advice on the disposal of waste containing Japanese Knotweed and the use of herbicides near water. In England and Wales, for carrying out herbicide operations near watercourses (<5 m from the water’s edge) or where you think it may impact water quality, there is a requirement to obtain written approval from the Environment Agency, (in Scotland it is SEPA).

Japanese Knotweed is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such, it is a prosecutable offence to plant or otherwise cause this species to grow or spread into the wild.

Japanese Knotweed is also covered by the Environmental Protection Act (Duty of Care) Regulations 1991. Under this legislation, any plant material of these species, and any soil contaminated with them, is classed as “controlled waste”. This means that it must be disposed of safely at a licensed landfill site according to the Environmental Protection Act (Duty of Care) Regulations 1991.

Japanese Knotweed is *not*, as often thought, a notifiable weed. SEPA/ The Environment Agency does not have an obligation to control it. Furthermore, if it is present on your land, you are not legally obliged to remove/control it, but you should try to ensure it does not spread.



## Legislation (cont)

Document by SEPA that covers general knotweed management and specifically legislation in Scotland:

[https://www.sepa.org.uk/media/154142/onsite\\_mangaement\\_of\\_japanese\\_knotweed\\_associated\\_soils.pdf](https://www.sepa.org.uk/media/154142/onsite_mangaement_of_japanese_knotweed_associated_soils.pdf)

Links to other resources on legislation of INNS:

<https://www.property-care.org/wp-content/uploads/2015/04/Guidance-Note-on-Legislation-for-Invasive-Non-native-Plant-Species-v5.pdf>

<http://www.nonnativespecies.org/index.cfm?sectionid=23>

## Health and Safety

Consider the following when using chemicals:

- ◆ make sure anyone spraying holds a certificate of competence for herbicide use or works under direct supervision of a certificate holder
- ◆ Take all reasonable precautions to protect the health of people and wildlife.
- ◆ carry out a Control of Substances Hazardous to Health assessment
- ◆ get permission from Natural England if the area is protected, for example sites of special scientific interest
- ◆ get permission from the Environment Agency if the plants are near water

The reality of control work for Japanese Knotweed means that it is necessary to use herbicides and spraying equipment. Anyone carrying out this work must be trained and certified to do so. Please note that a certificate of competence is required to buy and use professional herbicides and to apply such treatments to commercial, agricultural and horticultural premises.





## Health and Safety (cont)

Use of glyphosate requires AqHerb01 approval and NPTC PA1 & PA6 qualifications.

[Application to use herbicides in or near water](#)

[City & Guilds Level 2 Principles of Safe Handling and Application of Pesticides \(PA1\)](#)

[City & Guilds Level 2 Award in the Safe Application of Pesticides using Pedestrian Hand Held Equipment](#)

[Health and Safety Executive Code of Practice for Plant Protection Products](#)

Useful resources and guidance on health and safety when planning a project working with invasive species is available on the GBNNSS website:

<http://www.nonnativespecies.org/index.cfm?pageid=266>



## References

### **Scientific Papers and Reviews**

Delbart, E., Mahy, G., Weickmans, B., Henriët, F., Crémer, S., Pieret, N., Vanderhoeven, S. and Monty, A., 2012. Can land managers control Japanese Knotweed? Lessons from control tests in Belgium. *Environmental management*, 50(6), pp.1089-1097.

Ford, S., 2004. Cut and inject herbicide control of Japanese Knotweed *Fallopia japonica* at Rocky Valley, Cornwall, England. *Conservation Evidence*, 1, pp.1-2.

Hagen, E.N. and Dunwiddie, P.W., 2008. Does stem injection of glyphosate control invasive knotweeds (*Polygonum* spp.)? A comparison of four methods. *Invasive Plant Science and Management*, 1(1), pp.31-35.

Kabat, T.J., Stewart, G.B., and Pullin, A.S. (2006). Are Japanese Knotweed (*Fallopia japonica*) control and eradication interventions effective? Systematic Review No. 21. Centre for Evidence-Based Conservation, Birmingham, UK.

Rouifed, S., Byczek, C., Laffray, D. and Piola, F., 2012. Invasive Knotweeds are highly tolerant to salt stress. *Environmental management*, 50(6), pp.1027-1034.

Rudenko, M. and Hulting, A., 2010. Integration of chemical control with restoration techniques for management of *Fallopia japonica* populations. *Management of Biological Invasions*, (1), pp.37-49.

Skinner, R.H., Van Der Grinten, M. and Gover, A.E., 2012. Planting native species to control site reinfestation by Japanese Knotweed (*Fallopia japonica*). *Ecological Restoration*, 30(3), pp.192-199.

Williams, F., Eschen, R., Harris, A., Djeddour, D., Pratt, C., Shaw, R.S., Varia, S., Lamontagne-Godwin, J., Thomas, S.E. and Murphy, S.T., 2010. The economic cost of invasive non-native species on Great Britain. *CABI Proj No VM10066*, pp.1-99.



## References (cont)

### **Other Documents**

Brook Lyndhurst (2015) Local Action Groups for Managing Invasive Non-Native Species: A research review for Defra. <http://www.nonnativespecies.org/downloadDocument.cfm?id=1417>

CABI (2017) Progress with Weed Biocontrol projects: CABI in the UK. <https://www.cabi.org/Uploads/CABI/about-us/CABI%20centres/WFD%20report.pdf>

Control of freshwater invasive species. SERIES, S.O.C.E. ONEMA. The National Agency for Water and Aquatic Environments. <https://www.conservationevidence.com/synopsis/download/18>

Environment Agency (2006) The Knotweed Code of Practice: managing Japanese knotweed on development sites. Environment Agency. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/536762/LIT\\_2695.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/536762/LIT_2695.pdf)

Environment Agency (2010) Managing invasive non-native plants in or near fresh water, <http://www.nonnativespecies.org/downloadDocument.cfm?id=1010>

Integrated Pest Management in Nature Conservation Handbook, Scottish Natural Heritage, 2014. <https://www.nature.scot/integrated-pest-management-nature-conservation-handbook>

Property Care Association (2014) Code of Practice for the Management of Japanese Knotweed. Version 2.7. [https://www.property-care.org/wp-content/uploads/2015/04/Code-of-Practice-for-the-Management-of-Japanese-knotweed\\_v2.7.pdf](https://www.property-care.org/wp-content/uploads/2015/04/Code-of-Practice-for-the-Management-of-Japanese-knotweed_v2.7.pdf)

SEPA (2008) Technical Guidance Note: On-site management of Japanese Knotweed and associated contaminated soils. Version 1.5. [https://www.sepa.org.uk/media/154142/onsite\\_mangaement\\_of\\_-japanese\\_knotweed\\_associated\\_soils.pdf](https://www.sepa.org.uk/media/154142/onsite_mangaement_of_-japanese_knotweed_associated_soils.pdf)



## References (cont)

Sarat, E., Mazaubert, E., Dutartre, A., Poulet, N. and Soubeyran, Y. (Eds). (2015) Invasive alien species in aquatic environments. Practical information and management insights. Vol. 2 Management Insights. <https://pipap.sprep.org/content/invasive-alien-species-aquatic-environments-practical-information-and-management-insights>

Soll, J. (2004) Controlling Knotweed in the Pacific Northwest, The Nature Conservancy. <https://www.invasive.org/gist/moredocs/pol spp01.pdf>

Tweed Forum (n.d.) Tweed Invasives Project The long-term control of Giant Hogweed and Japanese Knotweed: A case study of the Tweed and practical steps to establishing and delivering a successful, long-term control strategy. <http://www.tweedforum.org/publications/tweed-invasives>

### Websites

<https://www.cabi.org/japaneseknotweedalliance/>

<http://www.cornwall.gov.uk/environment-and-planning/trees-hedges-and-woodland/invasive-plants/japanese-knotweed/guidance-for-control/herbicide-treatment-for-japanese-knotweed/>

<https://evansbros.co.uk/>

<https://www.gov.gg/CHttpHandler.ashx?id=102055&p=0>

[www.gov.uk/guidance/prevent-japanese-knotweed-from-spreading](http://www.gov.uk/guidance/prevent-japanese-knotweed-from-spreading)

<https://www.kingcounty.gov/services/environment/animals-and-plants/noxious-weeds/weed-identification/invasive-knotweeds/japanese-knotweed.aspx>



## References (cont)

### **Websites (cont)**

<https://www.naturaldevon.org.uk/home/devon-invasive-species-initiative/japanese-knotweed/>

<http://www.invasivespeciesscotland.org.uk/japanese-knotweed-fallopia-japonica/>

<https://www.property-care.org/homeowners/invasive-weed-control>

## Acknowledgments

Thanks to the GB NNSS, the Environment Agency and Local Action Groups. For advice and input



## Where To Go For More Information

- ◆ <http://www.anglingtrust.net/>
- ◆ <http://www.invasive-species.org/>
- ◆ <http://www.europe-aliens.org/>
- ◆ <http://www.nonnativespecies.org/beplantwise>
- ◆ <http://www.nonnativespecies.org/home>
- ◆ <https://www.cabi.org/>

## RAPID

RAPID is a three year EU funded LIFE project led by the Animal and Plant Health Agency (APHA), with Natural England and Bristol Zoological Society as key partners that piloting innovative approaches to Invasive Alien Species (IAS) management in freshwater aquatic, riparian and coastal environments across England. The project is supported by a number of further Technical Partners.

# Appendix 1: Methodology for Different Root Barrier Membrane Functions

## ***A) Cell Formation: Putting the Root Barrier Membrane in Place***

In some situations where burial is the preferred disposal method but it is not possible to bury Japanese knotweed to 5m (see section 5.4), it may be completely encapsulated into a root barrier membrane cell. These cells may be placed under buildings, within cellar voids or in places that will not be disturbed. It is important that the deeds of the property show where these cells are located, to avoid damage in the future that could be caused, for example, by trenching to lay services. To avoid damage after it has been installed, the upper 'cell' surface must be covered with a capping layer, at least 2m deep. Depending where it is located, the cell is quite often used in the landscape and trees planted within the capping layer.

How to do it:

- ◆ Calculate volume required and excavate site, allowing for 2m depth of burial
- ◆ Protect the integrity of the root barrier membrane with a layer of sand and provide shutter ply supports for the edge of the cell.
- ◆ Put root barrier membrane in place, allowing enough material along the edges to eventually provide a seal.
- ◆ Protect the root barrier membrane from tyre damage with a layer of sand.
- ◆ Fill the cell with the knotweed infested soil. No other material, contaminants, or wastes should be included.
- ◆ Make sure that dedicated vehicles are used and cleaned properly after they have been used. Haulage routes must be protected.



## ***B) Protecting structures and hard surfaces***

Where there is a chance that Japanese knotweed rhizome is still living within the soil and there are plans to construct buildings in these areas, there are a number of ways root barrier membranes are used: 1. Before development, infested areas are sealed horizontally with the root barrier membrane. Care must be taken that laying the root barrier membrane does not affect the condition of the building or structure, especially on sloping ground. 2. Root barrier membranes are built into the structures to prevent Japanese knotweed entering the building or laid horizontally underneath the paved surface, road or car park.

As Japanese knotweed could create 'heave' and cause initial fractures to concrete floors or a paved surface, it is important that a pliable surface is laid between the concrete and the root barrier membrane. This would allow the Japanese knotweed to grow without stressing the concrete. Care must also be taken to protect the services entering the building. When doing surface sealing, it is important to think about peripheral protection. Make sure the root barrier membrane is sealed properly around pillars and other structures.

How to do it:

- ◆ Protect the integrity of the root barrier membrane and prevent damage from 'heave' with a layer of sand.
- ◆ Put the root barrier membrane in place.
- ◆ Apply another layer of sand over the surface of the root barrier membrane.
- ◆ Lay final floor surface.



### **C) Preventing horizontal spread**

Carefully using a vertical root barrier membrane has been used to prevent the horizontal growth of Japanese knotweed. This is usually used against uncontrolled infestations from neighbouring properties. Vertical root barrier membranes are also often used around the edge of cuts, as a precaution against regrowth from any residual rhizome. Vertical root barrier membranes can often be most conveniently used when reinforced by a plywood frame. If it is not known how deep the rhizome has spread, vertical root barrier membranes should be used to 3m deep as a standard.

How to do it:

- ◆ Excavate a trench, making sure that all the knotweed is contained.
- ◆ Put the root barrier membrane in place.
- ◆ Support the root barrier membrane with shutter ply and backfill the trench.
- ◆ Make sure that the presence of the root barrier membrane is recorded and is not disrupted by future developments and landscaping.

### **D) Protecting services, etc.**

If services or other small-scale structures need to be constructed in areas infested with Japanese knotweed, it is often more cost effective to protect the integrity of the structure within a root barrier membrane rather than subject the entire area to a full scale Japanese knotweed management plan. It is essential that any soil contained by the root barrier membrane, in proximity to the drain or structure, is free from knotweed. The surrounding infestation can then be controlled using herbicides over a period of time.



## Appendix 2: Managing Japanese Knotweed - Legislation

Legislation covering the handling and disposal of knotweed includes the following:

### **The Control of Pesticides Regulations 1986**

Requires any person who uses a pesticide to take all reasonable precautions to protect the health of human beings, creatures and plants, safeguard the environment and in particular avoid the pollution of water. For application of pesticides in or near water approval from the Environment Agency should be sought before use.

### **Section 14(2) of the Wildlife and Countryside Act 1981 (WCA 1981)**

This document states that "...if any person plants or otherwise causes to grow in the wild any plant which is included in Part II of Schedule 9, he shall be guilty of an offence." Japanese knotweed is one of the plants listed in Schedule 9. Anyone convicted of an offence under Section 14 of the WCA 1981 may face a fine of £5,000 and/or 6 months imprisonment, or 2 years and/or an unlimited fine on indictment.

### **The Environmental Protection Act 1990 (EPA 1990)**

This contains a number of legal provisions concerning "controlled waste", which are set out in Part II. Any soil or plant material contaminated with Japanese knotweed that you discard, intend to discard or are required to discard is likely to be classified as controlled waste. The most relevant provisions in the EPA are in section 33 (1a) and (1b). These create offences to do with the deposit, treating, keeping or disposing of controlled waste without a permit. Section 33 (1)(c) makes it an offence to keep, treat or dispose of controlled waste in a manner likely to cause pollution of the environment or harm to human health. Section 34 places duties on any person who imports, produces, carries, keeps, treats or disposes of controlled waste. Waste must be handled responsibly and in accordance with the law at all stages between its production and final recovery or disposal.



Waste must be transferred to an authorised person, in other words a person who is either a registered carrier or exempted from registration by the **Waste (England and Wales) Regulations 2011** (Waste Regulations). A waste transfer note must be completed and signed giving a written description of the waste as per regulation 35 of the Waste Regulations. This must be sufficient to enable the receiver of the waste to handle it in accordance with their own duty of care. Failure to comply with these provisions is an offence.

### **The Hazardous Waste Regulations 2005 (HWR 2005)**

These contain provisions about the handling and movement of hazardous waste. Hazardous wastes are defined by reference to regulation 6 of the HWR 2005. A waste is a hazardous waste if it is listed as a hazardous waste in the List of Wastes Decision as well as the **List of Waste (England) Regulations 2005**. The Secretary of State is also able to decide if a particular batch of waste is to be determined as hazardous.

Schedule 3 of the HWR 2005 includes a list of properties that render waste hazardous. Annex I, II and III of the **Hazardous Waste Directive** also provides further guidance on what constitutes hazardous waste. Consignment notes must be completed when any hazardous waste is transferred. They must include details about the hazardous properties and any special handling requirements. If a consignment note is completed, a waste transfer note is not necessary. Untreated Japanese knotweed is not classed as hazardous waste, but material containing knotweed which has been treated with certain herbicides, may be classified as hazardous waste.

The **Environmental Permitting (England and Wales) Regulations 2010** (EPR) includes reference to the 'Exercise of relevant functions' in Schedule 9, paragraph 4. These objectives are derived from Article 13 of the **European Waste Framework Directive**. These objectives state that necessary measures shall be taken to ensure that *"...waste management is carried out without Endangering human health, without harming the environment and, in particular without risk to water, air, soil, plants or animals; without causing a nuisance through noise or odours; and without adversely affecting the countryside or places of special interest."*



Exemptions from the need for a permit are available in some circumstances, and are set out in Schedule 2 and 3 of the EPR. Exempt waste operations must comply with the general rules governing operations and must register with the relevant authority.

The above legal provisions have consequences for a range of people, including anybody involved in the management or disposal of knotweed. For example knotweed which is cut down or excavated and removed from a development site must be transferred to an authorized person, and correctly described. It must be disposed of appropriately, as advised by the Environment Agency. If you are going to bury knotweed on a development site you will need to consult the Environment Agency first to make sure that the material does not contain any other contaminant that may affect the quality of groundwater. If you pollute the environment or cause harm to human health you may be prosecuted.

Anyone who uses a herbicide must ensure that they do not pollute the water environment and the use of herbicides in or near water requires approval from the Environment Agency. If any waste soil or knotweed is sent for landfill either before or after any treatment, it must go to a landfill that is authorized to receive it. It is not an offence to have Japanese knotweed to grow onto other people's property, it may be regarded as a private nuisance under common law, but this would be a civil matter.

'In or near water' includes 'drainage channels, streams, rivers ponds, lakes, reservoirs, canals and dry ditches'. It also covers control of vegetation growing on banks or areas immediately adjacent to water bodies. If you intend to use a herbicide within 5m of water, or if your treatment may impact water quality, you should contact us beforehand.

Wherever there is a risk of contaminating a watercourse, choice of herbicides is limited to formulations of glyphosate that are approved for use near water. Not all herbicides that contain these active ingredients are suitable to use in or near water. You must refer to the label to make sure that the product you intend to use is approved for use in or near water.

