

Control of Invasive Weeds – Part 1

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Concern for our environment has never been more ‘in the public eye’ than it is today. Changes brought about by global warming are just one aspect of our concern; however of equal importance are changes caused by mankind to our natural environment in the range of plants, birds, insects and animal species that are found in the UK. There is quite a long list of plants that can be found in Britain today that originated from outside these shores, most of these were introduced in the 18th and 19th century by explorers and botanists who, at the time, had no knowledge of their potential impact on our natural flora and fauna. Today we are seeing the dramatic spread of some of the more aggressive introductions which are displacing our native plant-life and also the insects, birds and animals that live on them.

This training module is designed to raise awareness of the most important non-native invasive weed problems and highlight the scope and methods of control of these species. Many of the potential threats to our natural ecology are posed by aquatic plants so for clarity the subject has been divided into two parts: -

- Non-native ‘Terrestrial’ weeds
- Non-native aquatic weeds.

The first part of this training module will deal with the non-native ‘Terrestrial’ weeds

The following species are giving serious cause for concern: -

Major problem species

- **Japanese Knotweed** *Fallopia japonica*
- **Indian Balsam** (also known as **Himalayan Balsam**) *Impatiens glandulifera*
- **Purple Flowered Rhododendron** *Rhododendron ponticum*
- **Giant Hogweed** *Heracleum mantegazzianum*
- **The Butterfly Bush** *Buddleia davidii*

Also of concern

- **Hottentot Fig** *Carpobrotus edulis*
- **Spanish Bluebell** *Hyacinthoides hispanica*
- **Cotoneaster** *Cotoneaster spp.*

Note: This is not complete list of non-native invasive weeds but includes those giving rise to serious concerns for our natural environment.

Major problem species

1) Japanese Knotweed *Fallopia japonica* (previously named *Polygonum cuspidatum*)

Japanese Knotweed originates from East Asia (Japan, Taiwan, China and parts of Korea) and was first introduced into Britain in the 1850’s when a Dutch nurseryman sent the plant to Kew Gardens. From here it has spread throughout the UK – initially from the sale and distribution of the plant to landscapers and gardeners but in more recent times it has spread in soils contaminated with small fragments of the rhizomes e.g. soil movement during building works and from fly tipping.

Japanese Knotweed is a hairless perennial producing an extensive rhizome system that can reach up to 7 metres from the plant down to a depth of 3 metres beneath the surface. It is this rhizome system that makes this plant so aggressive and difficult to control. The stems rapidly grow to a height of 2 - 3 metres and are hollow, ‘bamboo-like’ and flecked with red pigment. In the winter the stems will die off but remain erect and new shoots will sprout from the rhizomes in the following spring. The large, fresh green leaves are oval-triangular, truncated at the base and pointed with a red leaf stalk. Numerous small greenish/white flowers

approximately 3mm in size are produced late in the season on branched spikes. Once established it can quickly dominate large areas squeezing out all other plant life.



Japanese Knotweed encroaching onto a school sportsfield

Japanese Knotweed is a dioecious plant – it has male and female organs on separate plants. In the UK we have only female plants so propagation by seed is not possible and therefore all our Japanese knotweed specimens are clones that have grown from rhizome fragments or from cuttings. We are now also aware that the rhizome fragments can spread by travelling down rivers and streams. Only a small piece of rhizome (less than 1gram) is needed to generate a new plant.

Japanese Knotweed is an extremely invasive and hardy plant. In its natural habitat in East Asia it can survive in harsh conditions in volcanic regions on poor, thin, acid soils with a pH of less than 4.0 and extremes of temperature, which in mountainous regions can fall below -35°C for long periods during the winter. It is therefore not surprising that it does so well in our comparatively gentle climate. The British Government has been aware of the invasive problems caused by this species for some time; it is one of the weeds listed in Schedule 9 and subject to controls specified in section 14 of the Wildlife and Countryside Act of 1981. Whilst there is no statutory requirement under this act to remove Japanese Knotweed from your land, it is an offence to plant or cause the species to grow in the wild. The plant, prunings and soil contaminated with its rhizomes are classified as controlled waste and must be disposed of at ‘licensed sites’ or rendered safe by burning.



Japanese Knotweed – red leaf stalks



Japanese Knotweed – red flecked stem on young shoot

Control of Japanese Knotweed

This is not an easy weed to control, due to the extensive rhizome system that sustains the plant. Because there is no viable seed from UK plants we need to concentrate our efforts towards killing these underground rhizomes. Chemical control is the best method of eradication, although this may take several years to fulfil. Choosing the most suitable chemical depends on the situation; in sensitive areas near water, trees and shrubs we should use non-residual translocated herbicides such as 2,4-D amine (e.g. ‘Depitox’) or glyphosate (e.g. ‘Roundup Pro-biactive’) taking care to avoid spray-drift onto the foliage of desirable plants nearby. Direct stem injection with ‘Roundup Pro-biactive’, administering 2ml to each stem is approved in the forestry section of the label. Where there is a need to preserve grasses e.g. to prevent soil erosion, then 2,4-D amine is the best option.

In the initial stages of chemical treatment, the plant may sprout new growth from its rhizomes up to 7 metres away from the original plant so one needs to be ready to re-treat the new shoots as soon as possible after they emerge and before they can extend the rhizome system further.



Stem injection technique



This site in East London was virtually overrun by Japanese Knotweed but was reclaimed by chemical treatment in just three years.

Cultural control of Japanese Knotweed is possible by cutting and burning the aerial growth and carefully excavating the soil to remove all traces of the rhizomes – but remember only one tiny piece left behind can cause the problem to recur. The cost of removing earth to a depth of three metres and replacing it with clean soil, makes this exercise impractical. Where it invades grassed areas, control of Japanese Knotweed can be achieved by regular mowing, which gradually weakens the rhizome system and eventually the shoots will stop emerging through the turf.

2) Indian Balsam (*Impatiens glandulifera*) – also known as Himalayan Balsam

Indian Balsam, a relative of the Busy Lizzie, is the tallest annual growing wild in the UK, often reaching a height of 3 metres. It was first introduced into Britain in 1839 by John Forbes Royle who collected plants from all over India and sent some of them to the Horticultural Society of London. It was originally named '*Impatiens Roylei*' after the collector. It is a very handsome plant with dark green leaves and attractive fragrant flowers that range in colour from dark purple through pink to white.



Indian Balsam

Indian Balsam thrives in damp soils so is mainly found along the banks of rivers (riparian), ponds and lakes although it will survive on drier soils but with a less vigorous growth habit. The main problem with this plant is that, like Japanese Knotweed, it tends to dominate and squeeze out all other vegetation and with a relatively shallow root system there is little to hold the soil together when it dies back in the winter. This makes the riverbanks more prone to erosion and can cause flooding in extreme cases. The plant produces large numbers of seeds in pods that ‘explode’ on touch scattering them over a wide area, which allows the plant to spread quickly. Many of the seeds, which remain viable for 18 to 24 months, will be carried downstream creating new colonies wherever they reach the shore. The large number of flowers providing nectar attracts many bumblebees and wasps from the surrounding area, drawing them away from native species growing nearby and it has been demonstrated that this can result in a lower seed set for these indigenous species.

Control of Indian Balsam

Indian Balsam is somewhat easier to control than Japanese Knotweed as it is only spread by seed. If we can remove the seed bank by carefully cutting down the plant or by chemical spraying before flowering then it can be eradicated from an area within 3 years. However, it is necessary to locate and control the weed upstream first to ensure complete removal of the infestation. Cutting to prevent seed production needs to take place just before the onset of flowering and to be effective it should be as low to the ground as possible, taking the lowest leaves and buds to avoid stimulating rapid re-growth. This will need to be repeated each year until the seed reserves in the soil have been depleted.

Chemical control with glyphosate or 2,4-D can be undertaken in the early spring when the young shoots are emerging. 2,4-D might prove the best choice, as it would leave any grasses behind to stabilise the riverbanks.

Special care should be taken when spraying tall plants with herbicide, as light winds can cause the spray to drift back onto the spray operator or onto other vegetation. Always read the product label before using chemicals and consult the Environment Agency before applying herbicides near water.

3) Purple Flowered Rhododendron *Rhododendron ponticum*

First introduced into Britain in 1763 from Spain when a gardener Conrad Loddiges working at a large estate in Hackney grew the plant from imported seed. It then spread all over Britain as cultivated plants were sold to wealthy landowners. It has been used as a rootstock for grafting more attractive varieties of Rhododendron and this has allowed further spread. It is a large evergreen shrub or tree growing 5 to 10m high at maturity. Leaves are ‘leathery’ oblanceolate to broadly elliptic measuring 10-20cm x 2-6 cm and are dark green above with pale green on the underside. Flowers born in rounded heads are dull violet purple in colour. Large numbers of seed (~ 7000) are produced in dry capsules.



Rhododendron ponticum

Rhododendron spreads both by vegetative means and by seedlings germinating from the many seeds produced by each plant (~ 1 x million per plant in a year). The seedlings quickly develop mycorrhizal associations in the soil facilitating nutrient sourcing from even the poorest soils. This gives the plant a distinct competitive edge over native species. They are particularly suited to acid heathland soils. As the plant develops it rapidly blocks out light to other species and as it spreads nothing else grows. Leaf litter from the rhododendron rots and forms a 'mulch' that prevents most other seeds from germinating, so that even when the plant is cleared from infested areas the soil has to be carefully managed to allow native species to re-establish.

Control measures:

The plant can be physically removed using chainsaws, flail mowers and diggers etc., which can be difficult in some hard-to-reach areas and is very costly. The renovation of the soil to allow natural plants back is an additional cost.

Chemical control is difficult due to the leathery nature of the leaves and requires the use of penetrants and adjuvants to facilitate the uptake of herbicides such as glyphosate and 2,4-D amine. Spraying mature plants is made difficult due to the size and density of the foliage. Some work has been done on direct injection of glyphosate into the stems.

4) Giant Hogweed *Heracleum mantegazzianum*

A member of the parsley family Apiaceae (Umbelliferae) Giant Hogweed was introduced into Britain in 1893 as an ornamental plant but has since escaped and colonised many areas of wasteland and riverbanks. It can form dense colonies that dominate and suppress native species. It is one of the two non-aquatic weeds that are listed in schedule 9 of The Wildlife and Countryside Act of 1981 that makes it an offence to plant or to cause it to grow in the wild. Apart from the damage caused to the environment by infestation with Giant Hogweed, the sap from the large stems and from hairs borne on the underside of the leaves is poisonous, causing severe skin irritation leading to blistering and subsequent pigmentation of the skin that can persist for many years after contact.

Giant Hogweed is a perennial plant that grows to maturity in 4 years when it flowers and subsequently dies. It can grow to a height of 15 to 20 feet with stout green stems that have dark red or purple blotches. The dark green leaves are borne in a rosette – the lower leaves up to 1.5m long! The numerous flowers are borne in heads (umbels) up to 50cm across in June/July. Each flower head can produce up to 50,000 seeds that are dispersed easily by water – hence its ease of spread by this means. The seeds can remain viable in the soil for up to 15 years.



Giant Hogweed *Heracleum mantegazzianum*

Control Measures: Any contact with this plant is hazardous so protective clothing is strongly advised.

Chemical control using glyphosate or 2,4-D amine should start as soon as the plant is 1m high – usually in March. More than one treatment may be necessary and follow-up spraying should be carried out to remove any seedlings germinating in subsequent years. Stem injection has also been tried with some success.

Cultural control is best carried out by cutting the plant down before it reaches the flowering stage. Great care needs to be taken to avoid contact with the sap. The crown can be dug out below ground level to prevent re-growth. All plant materials should be disposed off properly by burying in licensed landfill site or by composting on site.

5) The Butterfly Bush, *Buddleia davidii* was introduced to the UK from China in 1896. It is loved by many gardeners throughout the world for the abundance of beautiful, scented and nectar-rich flowers that attract butterflies, bees and other insects. It is easy to propagate and has few natural enemies, so once it is established in a garden it will probably remain there in perpetuity. However, without very careful management, it is likely to escape and spread over large distances.



The genus *Buddleia* comprises over 100 species that originate in Asia, Africa and the Americas. The genus was named by the Swedish botanist Carl Linnaeus as a posthumous honour to the Reverend Adam Buddle (1662–1715), a rector and botanist from North Fambridge in Essex, who was the foremost authority on British bryophytes of his era - just imagine what his Sunday sermons were like! This honour was bestowed on Buddle in recognition for his contributions to botany and the suggestion to name these plants after him came from Dr. William Houston, the Scottish surgeon and botanist who had been responsible for sending the first Buddleia plants back to England from the Caribbean. The most common of the buddleias is *B. davidii*, which gets its species name from a French missionary and naturalist Père Armand David. Buddleias are now classified in the *Scrophulariaceae* family, a large group of plants that includes; figworts, mullein, toadflax and speedwells. Prior to this they were classified in their own family, the *Buddlejaceae*.

The Butterfly Bush grows to a height of up to 5 metres with lanceolate to ovate shaped leaves that are usually toothed, sage green with downy white hairs on the under surface. Flowers are borne in dense, spiked panicles that are mauve-purple with an orange centre. A white flowering variety can also be seen growing in the wild but is less common than the purple flowered species. Originally introduced as a garden bush it has escaped and can be extremely invasive given the right conditions.

The potential for spread of this species is due to the large number of seeds produced by each of the tightly packed flower spikes. It is estimated that a single flower spike can produce as many as 40,000 seeds so a full sized bush could generate as many as 3 million in a year. These lightweight, winged seeds are easily dispersed by the wind and are often caught in the slipstream of lorries and railway trains that can carry them onwards for a considerable distance. The seeds can remain viable in the soil for 3 to 5 years, requiring very little in the way of soil or moisture to germinate and hence they can easily establish in barren ground.



Purple flower spikes



White flowered variety

The butterfly bush occurs in a variety of habitats, growing well on poor soils with a preference for disturbed ground and areas recently damaged by fire. It seems to like chalky and lime soils, waste ground and will also proliferate on riverbanks. Another favourite habitat is railway property; where it easily establishes in the ballast of the cess and any mortar filled brickwork is a definite invitation to put down Buddleia roots! It is believed that the lime in the mortar provides the right conditions for the plant to establish, so the seeds just need to find a tiny opening in the brickwork to take hold. Damage to railway property by this plant runs into many millions of pounds per year; there is also the additional cost of spraying to control its spread.



Cultural control measures

The initial approach to curb the spread of this plant using non-chemical means is to control the seeds. Dead-heading plants as soon as the flowers have died back is recommended for garden specimens but on larger bushes this may not be practical. Landscapers and gardeners should be encouraged to choose new dwarf varieties of Buddleia that do not produce fertile seeds; such as ‘Blue Chip’, which is equally attractive to butterflies but does not present any risk of spread by wind dispersal.

Chemical Control Measures

‘Pistol’, a formulation of 250g/L glyphosate and 40g/L diflufenican, gives excellent control of buddleia seedlings. The diflufenican in this product helps to prevent germination of seeds long after the spray has been applied. For young plants, where the stems remain green, glyphosate formulations such as ‘Roundup Pro Biactive’ will provide good control. Chemical manufacturers have recently introduced some new residual products containing low concentrations of triclopyr mixed with suitable co-formulants; e.g. aminopyralid, clopyralid, fluroxypyr, dicamba and 2,4-D, to provide a useful level of weed control for woody species. Products that have been found particularly suitable for controlling the butterfly bush in amenity situations are mixtures of aminopyralid and triclopyr, developed by Dow AgroSciences and launched under the brand names ‘Icade’ and ‘Speedline’

Other invasive species of concern

6) Hottentot Fig *Carpobrotus edulis* (A.K.A. Ice Plant / Sour Fig)

A succulent plant introduced into Britain in 1886 from South Africa. It is found in coastal areas of the UK – mostly in the South West – where it can form dense mats on cliffs and dunes. It was introduced as an ornamental plant and also as a means of stabilising sand dunes. It reproduces vegetatively as well as by seed. Fruits are brown, edible, sour tasting and often made into jam. Bright pink or yellow flowers up to 15cm diameter are produced from May to July – opening in the afternoon.



The competitive nature of this plant squeezes out native species by competing for water nutrients and light. A single plant can form a mat 1m diameter in 12 months by vegetative means alone.

Control Measures:

Mechanical: Removal by grazing or up rooting where access permits – must remove all parts of the plant to avoid regeneration.

Chemical Control: Glyphosate.

Note: Any control measures resulting in the removal of this species may result in weakening the cliffs, rocks or dunes where it is situated, so careful re-planting programmes should be implemented to stabilise such areas.

7) Spanish Bluebell *Hyacinthoides hispanica*

Introduced into Britain from the Iberian peninsula, this species has become invasive and a threat to our native Bluebell *Hyacinthoides non-scripta*. Spanish Bluebell is able to hybridise with our native plant producing a third species *Hyacinthoides massartiana*. Both the Spanish bluebell and the hybrid produce highly fertile seeds that swamp and squeeze out our native plant. Spanish bluebell has paler blue, larger flowers with blue anthers that are borne on a more erect stem and has broader leaves. The Spanish Bluebell has little or no scent compared to the Northern Species.



Native Bluebell



Spanish Bluebell



Hybrid

Control measures are directed towards preventing further spread of the species by restricting sales of the Spanish Variety and by increasing public awareness of the problem. Chemical control is not a practical option.

8) Cotoneaster *Cotoneaster spp.*

A number of non-native Cotoneaster species have been introduced into Britain and used widely in gardens and, more recently, in municipal landscaping; where the prostrate varieties have proved valuable for low maintenance groundcover planting. These can be very competitive with native species where they escape into the wild, being easily spread by birds who feast on the abundant supply of berries produced by the plant. It is believed by ecologists that such introductions have been a factor leading to the dramatic decline of the native *Cotoneaster integerrimus* which is now an endangered species that is present in only one locality in Wales.



Native plant *Cotoneaster integerrimus*

Control Measures:

Restrict planting of non-native Cotoneaster in the one region of the UK where it can still be found.

The following strategies are being pursued in an attempt to halt the spread of non-native weeds in the UK:

- Update to Schedule 9 of the Wildlife & Countryside Act 1981 to include a wider range of species to be covered by this legislation.
- A ban on the sale of non-native plant species that threaten our natural environment.
- Improvements in product labelling on plants offered for sale in nurseries, garden and aquatic plant centres, designed to show clearly and accurately the species being sold.
- Lobby for change in the law to prevent or reduce plant escapes.