



Alien invasive weeds

Dr Terry Mabbett looks at some of the weeds which were brought to this country many many years ago and have caused problems ever since

Weeds are simply plants in the wrong place at the wrong time but some grow so quickly they can smother, swamp and oust virtually all other plants. They are by definition invasive weeds colonising a wide range of ecosystems and environments. Those invading most methodically and with the worst effects are invariably alien (exotic) plant species, now with a 'free hand' in a new environment, because all closely matched natural enemies and diseases were left behind in the country of origin.

Three classic examples of alien invasive weeds in the United King-

ABOVE: Himalayan balsam growing in damp places can develop into huge patches

dom (UK) are Japanese knotweed (*Fallopia* sp), Himalayan balsam (*Impatiens glandulifera*) and giant hogweed (*Heracleum mantegazzianum*) introduced by plant collectors, horticulturalists and gardeners several hundred years ago in what must have seemed like a good idea at the time. They have since graduated into invasive weeds and now occupy significant areas of ecologically sensitive environments and ecosystems causing massive amounts of economic damage and equally costly to manage.

All three weeds have several things in common. They are of Asian origin and prefer damp and wet places. They have no natural predator insects or diseases in the

UK which can exert any meaningful level of natural control. All three require dedicated herbicide application techniques for control using herbicides.

Even herbicide treatment will only manage rather than eradicate these weeds from the environment at large.

The pervading nature of invasive weeds makes it difficult to easily and safely access treatment using standard herbicide application equipment. At risk are water-courses near to where these three species most frequently grow and valued plants including turf grasses near to and below these tall invasive weeds. Custom-designed herbicide applicators are required.



Research into discovery and development of insect pests and plant pathogens for commercial control are on-going. This involves identification and collection of specimens in the weed plants' centre of origin and developing formulations and application techniques for delivery as commercial biological control agents. That is the easy part. Obtaining permission to introduce these additionally alien organisms into the UK environment, where they could become pests or diseases in their own right, is a long drawn out process with relatively low success rates.

Getting to the 'root' of the Japanese knotweed problem

An invasive label means a weed is automatically damaging and

difficult to control but Japanese knotweed which covers a number of species belonging to the genus *Fallopia* (family Polygonaceae) and native to Japan and parts of China stands 'head and shoulders' above the rest.

In their native Asian countries and environments these species are primary volcanic colonisers and generally much less vigorous, being kept in check by co-evolving species including insect natural enemies and pathogenic diseases.

The species usually found in the UK is *Fallopia japonica* var. *japonica*, introduced from Japan two centuries ago.

Japanese knotweed continues to destroy ecosystems and urban infrastructure and is one of few herbaceous weeds demanding direct placement of herbicide inside the

Seed from this single Himalayan balsam plant will be carried along the stream

plant to ensure fast lasting control.

Introduction of Japanese knotweed as an ornamental plant for early Victorian gardens must have seemed like a good idea at the time, but the contemporary weed legacy for UK is huge and growing. Weed success is due to ability for rapid spread in situ through enormous, super active and resilient rhizomes, and efficient dynamic spread assisted by the nature of its favoured riparian and urban environments.

Dense growth of Japanese knotweed restricts access for riverbank inspection and increases flood risk through large quantities of dead stems and leaves washed into rivers and streams. Attempts to remove established stands from riparian areas may cause instability in river banks and increase the risk of soil erosion.

Urban infestations cause considerable damage to hard surfaces. Tarmac is no problem for a weed that can force its stems through concrete.

Factors favouring and assisting dissemination of propagules is moving water on the one hand and human activity including soil excavation, movement into landfill and fly-tipping, on the other.

Severity and seriousness of Japanese knotweed is clear to see from the UK legislation used to try and limit its spread.

Japanese knotweed is on the list of Schedule 9 alien invasive species under the Wildlife and Countryside Act 1981, making it an offence to plant or cause it to grow in the wild. It is additionally classified as 'Controlled Waste' under the Environment Protection Act 1990 and can be disposed only at a licensed landfill site in accordance with the Environment Protection Act (Duty of Care) Regulations 1991.

Japanese knotweed is multi-faceted weed species

Red-coloured and spear-like aerial shoots emerge in spring, reaching 30 cm by April and proceeding to form a massive foliar canopy 2 to 3 metres tall by summer's end. Plants produce large numbers of white flowers in summer but hardly any viable seed, probably due to UK climate limitations on normal sexual reproductive development.

Above ground stems die back and dry out in autumn, but overwintering rootstock and rhizomes (underground stems) are so fast growing, all pervading and consuming that nothing else stands a chance, even

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during the only 'knotweed-free window' which is late autumn and winter. Dead stems and leaves decompose very slowly to form a deep litter that prevents germination of other seeds.

Failure to produce viable seed is more than compensated for by a fast growing and robust system of rhizomes, which provides this and other invasive weeds with the means to exploit and dominate environments and vegetative propagation for efficient spread.

Rhizome systems may extend up to seven metres from the parent plant and to a depth of three metres. Rhizome fragments down to 0.7g can generate new plants and pieces of fresh aerial stem will grow shoots and roots in soil or water. Plants can achieve up to three metres of aerial and six metres of rhizome growth in a single growing season.

New shoots arise from the tiniest pieces of rhizome and cut stem-sections root at the nodes, while crowns will survive drying or composting and produce new canes once in contact with water. Attempts to mechanically control



ABOVE: *Rhododendron ponticum* is another well-established alien invasive weed

RIGHT: Creeping water primrose/willow-leaved primrose is an alien weed already in the UK and with potential to become invasive

LEFT, and BELOW: Japanese knotweed may appear almost anywhere including near buildings



Japanese knotweed using trimmers, flails or diggers will invariably aggravate its spread.

Application of herbicide is the only safe way to manage Japanese knotweed but this is easier said than done due to the sheer size and resilience of its rhizomes. A number of herbicides notably glyphosate are effective but how much and for how long will depend on the application method used, which is the factor determining ultimate success of any chemical control programme against Japanese knotweed. Spraying with contact herbicide will burn off leaves but rhizomes survive and produce new stems. The only sure way to dispatch Japanese

knotweed is to introduce systemically acting herbicide directly into the stems by filling the cut stems or injecting intact stems.

Target area is the lower part of the aerial stem to minimize the distance for downward translocation into the rhizomes, the underground part of the stem. Best time is from late summer through autumn when rhizomes become the sinks for soluble food and nutrients translocated from the leaves before they senesce and fall off. Introduced systemic herbicide is subject to this same strong basipetal (downward) translocation of soluble chemicals into the rhizome system which is subsequently killed.

Hand-operated applicators used for stem-injection and 'stem cut and fill' of the hollow stems with total systemically acting herbicides like glyphosate are the preferred weapons of choice.

For stem injection a single shot (several ml) of herbicide is introduced into the hollow stem just below the first stem node up from soil level, as near as possible to the underground rhizome.

An alternative direct application option is wiping the outer surface of Japanese knotweed plants using hand-held weed-wiper applicators. This is carried out on flowering stems up to two metres in height during late summer.

Himalayan balsam and giant hogweed require an 'inside job'

Giant hogweed (*Heracleum mantegazzianum*) and Himalayan balsam (*Impatiens glandulifera*) are two alien (non-native) invasive weeds causing serious environmental damage across the UK. Both species are on the Schedule 9 list of alien invasive weeds under the Wildlife and Countryside Act 1981.

With a preference for damp waterside areas these plants spread

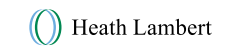
quickly and easily via water-borne seed to present increased flood risk while crowding out native waterside flora. However, their hollow stems open them up to a highly targeted and environmentally benign delivery of herbicide using stem injection.

With pretty pink flowers, which start to appear in June, Himalayan balsam grows up to three metres tall to completely out-compete nearby native plants and dies back in autumn to expose large areas of bare soil.

This makes river banks highly vulnerable to erosion form increased water flows during winter, thus increasing flood risk. Moreover it reduces harbourage, breeding sites and food supplies for native wildlife by obliterating native waterside flora. Seeds of the Himalayan balsam stay viable for two years or more.

There's nothing pretty about giant hogweed, growing up to five metres tall with huge flower heads (umbels) of several thousand seeds and around 50,000 seeds on every plant.

Seeds are readily dispersed along watercourses and may remain viable for 10 years. Giant hogweed poses an additional inherent



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Himalayan balsam by the waterside

danger from photosensitive toxic chemicals (furanocoumarins) contained in the sap. They cause severe burning and blistering (photodermatitis) of contaminated skin which is subsequently exposed to the UV spectrum of natural sunlight. Only minute traces are required for this to happen and the toxic chemical will remain active for several hours after the stem has been cut.

Control of these weeds alongside water courses should be carried out on a catchment basis, working from the upstream end to prevent seed colonization.

Treatment should be delayed until plants have a sufficiently large stem diameter to allow easy and effective injection, but should be carried out before viable seed has been set and dispersed. Seed pods of Himalayan balsam start to 'explode' and disperse their seed in late July.

Giant hogweed starts to flower in May with main period of seed set in late summer.

It is essential to establish and encourage growth of native plants as soon as possible after these alien invasive weeds have been controlled.

Sustainable chemical control requires light, portable, easy to use and cost effective chemical applicators. High environmental sensitivity of riverside areas infested with these two weeds means herbicide spraying is not the most appropriate application option because it can lead to contamination and damage through spray drift, run-off and leaching.

Safe and cost effective control requires an 'inside job' made all the more easy and effective, because the relatively large diameter and not too compact stems allow easy and effective use of the stem-injection method.

Other alien invasive weeds

Japanese knotweed, Himalayan balsam and giant hogweed are some of the most high profile alien invasive weeds but some others just as well established or on the verge of becoming so.

Rhododendron ponticum, which originates in the Mediterranean region and has been around in the UK since the 18th century, is another well established and damaging alien invasive weed.

Ludwigia species (creeping water primrose/willow-leaved primrose) originating in South America is almost certainly the one to watch of the newest arrivals and those waiting in the wings.

