



ENVIRONMENT CONTROLS

PART OF JKL

INVASIVE WEED CONTROL

AQUATIC WEED CONTROL

AMENITY WEED MANAGEMENT

CONTAMINATED GROUND REMOVAL

AQUATIC WEEDS MANUAL

Japanese Knotweed Ltd & Environment Controls
NATIONAL SPECIALIST CONTROL SERVICES

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MANAGEMENT PLAN | SURVEY | TREATMENT | REMOVAL | TRAINING RESOURCES

Environment Controls provides specialist control services for; Invasive Native and Non-Native Weeds (INNS), aquatic weeds, invasive species, amenity weed management, and removal of asbestos contaminated soils.

Water weeds create havoc on our British waterways every year, with some invasive aquatic species such as Azolla, Parrot's feather and Floating pennywort having huge environmental impact on the biosystems (a system of mutually interacting living organisms) they invade. Species vary greatly but generally either float on the surface or partially or fully submerged. Without controls to keep them in check these invasive species will create an ecological imbalance which can result in:

- altered habitat (water quality)
- light deficit reduces photosynthesis
- depletion of natural oxygen levels
- altered pH levels
- navigational blockages
- impact on flood control due to slowed water flow
- issues for recreational activities such as fishing, wild swimming and boating
- clogged irrigation and hydroelectric power facilities
- death of fish and native water organisms
- out-compete native species

For these reasons alone invasive aquatic species are **NOT TO BE IGNORED!**

**JAPANESE
KNOT WEED
TO BE
IGNORED**

Environment Controls is a trading name of Japanese Knotweed Ltd (JKL)

JKL provides specialist services for the control of Japanese knotweed; survey, treatment, excavation and removal, with guarantee and insurance option.

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This manual provides information on the UK's most common invasive water weeds:

- **identifying characteristics**
- **habitat**
- **environmental impact**
- **toxicity levels**



MANAGEMENT AND CONTROL

Without regular control measures in place, invasive weeds not only create difficulties for native species, but can also place financial burden on land management and change of land use activities.

Gaining control early before they take over avoids the operation becoming a much bigger (and costlier) task. We use the most sustainable methods that gain control and are best for the environment, and this isn't always herbicide.

Working with regulatory bodies and in accordance with industry best practices, our qualified teams of surveyors and field operatives, together with our in-house specialist advisory services ensure we can help businesses and organisations to maintain healthier habitats and protect our native species.

SPECIALIST CONTROL SERVICES

SURVEYS A site survey can enable us to recommend the right service option for you. As an accredited contractor, we have expert CSJK qualified surveyors who will be able to identify and record visible signs of target invasive weeds, or species.

TREATMENT We provide a range of in-situ treatment options. Our recommendations will be influenced by careful consideration to the local environment, the type of infestation, and any site requirements, which will be outlined to you in a proposed management plan. Treatments may include one or several of the following:

- Hand methods of extraction from the water
- Mechanical methods such as pulling dredging or excavation
- Herbicide treatments such as spraying, stem injection or leaf wiping
- Biological methods such as introducing a natural predator

REMOVAL Clearance or excavation enables change of land use plans or immediate improved amenity use of impacted ground. Waste can be removed from site or sustainably managed on site.

TRAINING We are happy to share the knowledge we have accrued over the years, if this is of interest to you please get in touch so we can assess your CPD requirements. contact@knotweed.co.uk 0330 056 8880

INTERACTIVE CONTENTS

AMERICAN SKUNK CABBAGE

CRASSULA HELMSII

CURLY LEAVED WATERWEED

DUCKWEED

FLOATING PENNYWORT

HEMLOCK WATER DROPWORT

HORNWORT

NUTTALL'S WATER WEED

PARROT'S FEATHER

WATER FERN (AZOLLA)

WATER HYACINTH

WATER SOLDIER

WATER WEED (CANADIAN PONDWEED)

AMERICAN SKUNK CABBAGE

SCIENTIFIC NAME: *Lysichiton americanus* ORIGIN: North America

IDENTIFYING CHARACTERISTICS

American skunk cabbage is predominantly recognised for its large leathery leaves, bright yellow flowers and foul smell. Its name comes from the putrid odour the flowers produce in spring. Prolific in swamp forests and associated wetlands. When not in flower, it may be confused with the native Water plantain (*Alisma plantago*) which is fairly common in slow flowing habitats.

- Leaves can grow to 1m long.
- Large yellow sheath that surrounds a spike of greenish flowers.
- Central seed head sits on a long stalk.
- Distinctive smell likened to 'rotten flesh'.

HABITAT

Thrives in semi-aquatic and aquatic habitats such as swamps, damp woodlands, along streams and riverbanks, lake sides, ponds, boggy and other wet areas. As long as the site is wet, it has no specific soil requirements so it can grow in shade or full sunlight.

ENVIRONMENTAL IMPACT: MEDIUM

No social or environmental impacts are reported, other than the costs related to control or eradication measures. It can, however have an effect on the reduction in biodiversity if established in vulnerable habitats with no control measures in place.

TOXICITY LEVEL: ZERO

American skunk cabbage presents no physical danger to either humans or animals.



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CRASSULA HELMSII

SCIENTIFIC NAME: *Crassula helmsii* ORIGIN: Australasia

IDENTIFYING CHARACTERISTICS

Crassula helmsii (often referred to as New Zealand pigmyweed or Australian swamp stonecrop) is a small succulent flowering perennial that grows rapidly to form an extensive lush-green carpet that can either float on freshwater or be fully submerged. It is recognisable when growing at the water's edge by its narrow, fleshy leaves, and can spread onto nearby land. *Crassula* regenerates from tiny fragments and therefore easily spreads to new areas, it grows on muddy margins of ponds and can completely cover the water surface with tangles of stems and shoots.

- Stems that are rigid and round.
- Leaves up to 2cm long and arranged on the stem in opposite pairs, they are fleshy when emergent and less fleshy and flat when permanently submerged.
- The base of the leaves are joined around the stem to form a collar.
- Very small white flowers with four petals show in summer on long stalks.

HABITAT

Grows in lakes or slow moving water.

ENVIRONMENTAL IMPACT: HIGH

This plant forms dense mats that smother other vegetation and may cause changes to other species inhabiting the environment and it is extremely costly to control. *Crassula* can tolerate extreme environmental conditions and, as such, management can be challenging however, the result of a study undertaken by CABI in 2010 showed the mite, *Aculus crassulae* gave some success as it affects the plant's reproductive system, which in turn reduces plant growth.

TOXICITY LEVEL: ZERO

Crassula Helmsii presents no physical danger to either humans or animals.



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CURLY LEAVED WATERWEED

SCIENTIFIC NAME: *Lagarosiphon major* ORIGIN: South Africa

IDENTIFYING CHARACTERISTICS

Curly leaved waterweed (also known as curly water thyme) is a totally submerged aquatic with rhizomes rooted in the water bed and shoots which reach the water's surface. An aggressive weed its most active growth period occurs during the winter, it can also spread easily from broken fragments.

- Fully submerged aquatic plant.
- Brittle stems up to 3m long.
- Tends to form dense stands.
- Tightly spiralled leaves 6 - 30mm long, 1 - 3mm wide form in whorls around the stem.

HABITAT

Can be found in inland surface waters. In the wild they have spread very quickly across the UK but predominantly in Ireland, but with climate warming will become more profuse and problematic in the future.

ENVIRONMENTAL IMPACT: HIGH

Because of its speedy growth and dense formation it can quickly out-compete native species thereby posing a threat to biodiversity. It thrives in alkaline waters such as those found in limestone areas and can affect the water's pH, making it even more alkaline which prohibits photosynthesis by other plants. It can cause fluctuations in the amount of oxygen available in the water which is harmful to invertebrates and fish. In slow flowing rivers, drainage channels and canals, its dense growth from water bed to surface impedes water flow, choking the waterway which then exacerbates flooding.

TOXICITY LEVEL: ZERO

Curly leaved waterweed presents no physical danger to either humans or animals.



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DUCKWEED

SCIENTIFIC NAME: *Lemna Minor* ORIGIN: Africa, Asia, North America

IDENTIFYING CHARACTERISTICS

A floating aquatic plant with small, round leaves that cover the water surface, Duckweed (from the family Araceae) is one of the smallest flowering plants in the world but with an extreme growth pattern. One plant produces two more plants and those grow to produce two more and so on which creates the characteristic dense colony. It has sticky roots that enables it to adhere to bird's plumage which aids its spread to other waterways.

As Duckweed has been shown to remove heavy metals like lead, copper, zinc and arsenic very efficiently from waters with non-lethal concentrations, it is known to be used in wastewater treatments.

- Has one, two, three or four leaves each having a single root hanging in the water.
- Leaves are oval, 1 - 8 mm long and 0.6 - 5 mm broad, light green in colour.
- Forms dense carpets covering the entire water surface.

HABITAT

It prefers freshwater ponds or slow moving streams.

ENVIRONMENTAL IMPACT: HIGH

It's dense matting like structure reduces light penetration and oxygen levels, it is highly invasive and its ability to completely smother the water's surface leads to death of fish and beneficial algae.

TOXICITY LEVEL: ZERO

Duckweed presents no physical danger to either humans or animals.



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FLOATING PENNYWORT

SCIENTIFIC NAME: *Hydrocotyle ranunculoides* ORIGIN: North America

IDENTIFYING CHARACTERISTICS

Hydrocotyle is a perennial aquatic plant part of a widely distributed genus of more than 130 species. It was first brought into Northern Ireland as a plant for tropical aquariums and ponds, but since it escaped into the wild, its ability to out-compete native species has a severe effect on biodiversity.

- Perennial, with thin rooting stems, often floating.
- Shiny, kidney-shaped leaves with crinkled edges arranged in a rosette formation.
- Leaves up to 10cm in diameter on thin, usually erect petioles.
- Leaves extend up to 40 cm above the water surface.
- Small creamy yellow flowers approximately 3 mm in diameter.
- Produces dense, interwoven floating mats across slow-flowing waters.

HABITAT

Can be found on many inland surface waters such as lakes, rivers, canals & other slow moving water-bodies.

ENVIRONMENTAL IMPACT: HIGH

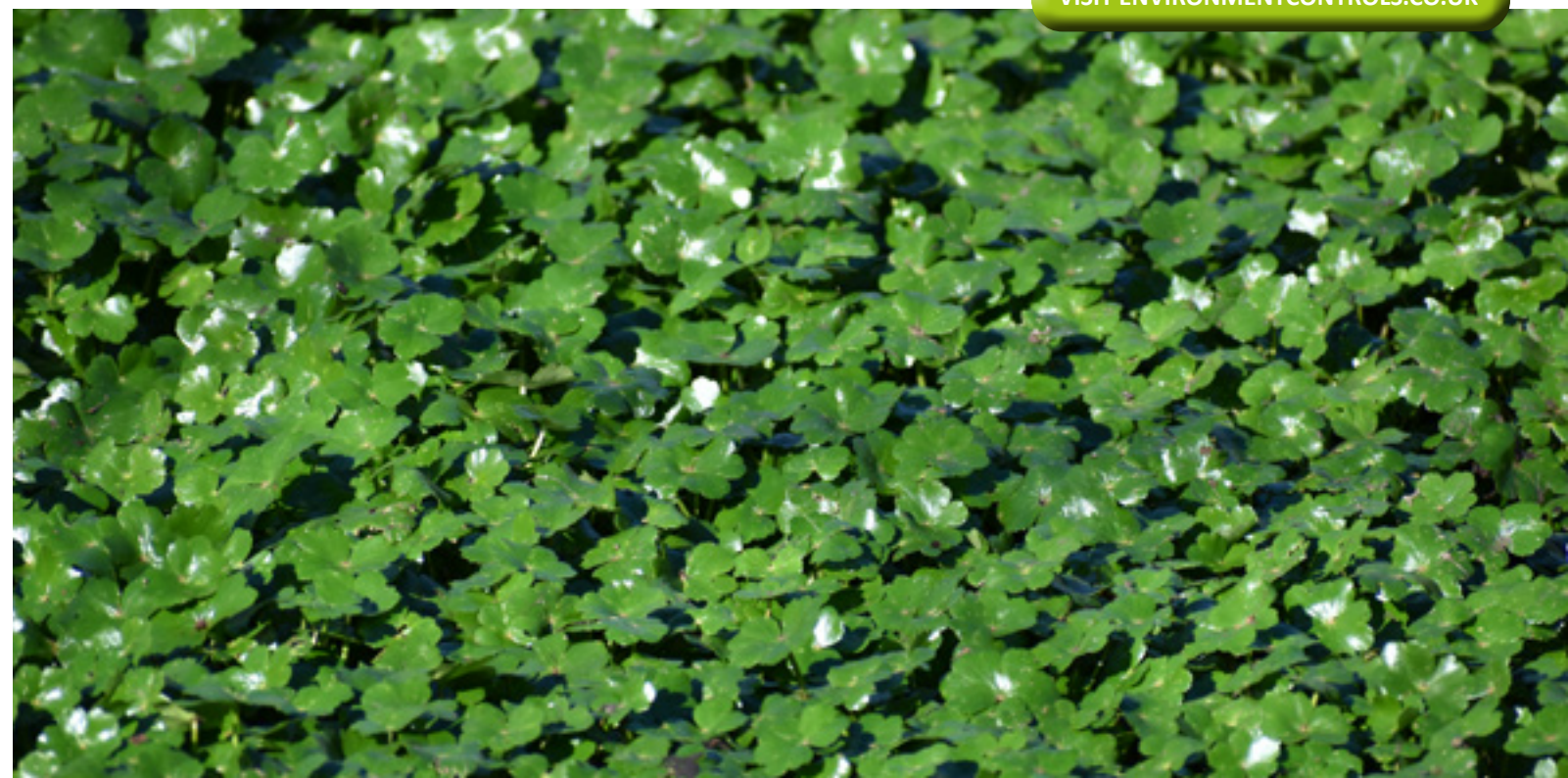
The dense carpet causes problems for fish and other aquatic species as their environment becomes limited and movement up and down rivers and waterways becomes increasingly difficult. Infestation is a major causation of flooding events where channels and water control structures are blocked.

TOXICITY LEVEL: ZERO

Floating pennywort presents no physical danger to either humans or animals.



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HEMLOCK WATER DROPWORT

SCIENTIFIC NAME: *Oenanthe crocata* ORIGIN: UK

IDENTIFYING CHARACTERISTICS

Hemlock Water dropwort is a native plant found in shallow water, streams, ditches, rivers and lakes. This is the most toxic plant to both humans and animals in Britain. Not to be confused with its equally toxic cousin Hemlock (*Conium maculatum*). Known for its highly toxic properties, in pre-Roman Sardinia Hemlock water dropwort was used as a humane agent of euthanasia. Ingesting the plant caused contortion of the face into a smile (named *risus sardonius* by physicians), it became known as the plant that caused a 'sardonic smile'. It propagates via prolific seed production following flowering, the seeds are readily spread via waterways.

- Perennial plant growing up to 150 cm tall.
- Hollow, cylindrical, grooved stems up to 3.5 cm across.
- Flat heads of small white flowers appear in late spring that can grow up to 1.5 m in height.
- Leaves look similar to the herb Chervil and smell of parsley, making it easy to mistake as a safe foraging plant.

HABITAT

Common in shallow fresh water streams, marshes, lakes, ponds, canals and wet woodland.

ENVIRONMENTAL IMPACT: HIGH

Its tuberous root can become exposed when flooding, dredging or dry summers cause bank erosion. The tuberous roots are sweet tasting (apparently) and appear palatable to grazing animals. For amenity managers landowners/ farmers with land used for grazing at certain times of year, it is of particular concern due to its high toxicity.

TOXICITY LEVEL: EXTREMELY HIGH

All parts of the plant are deadly poisonous but the roots contain the highest concentration of toxins. The toxic compound is oenanthotoxin, which poisons the central nervous system of mammals. The symptoms of poisoning include convulsions, seizures, nausea, diarrhoea and tachycardia. Quite small amounts can be lethal.

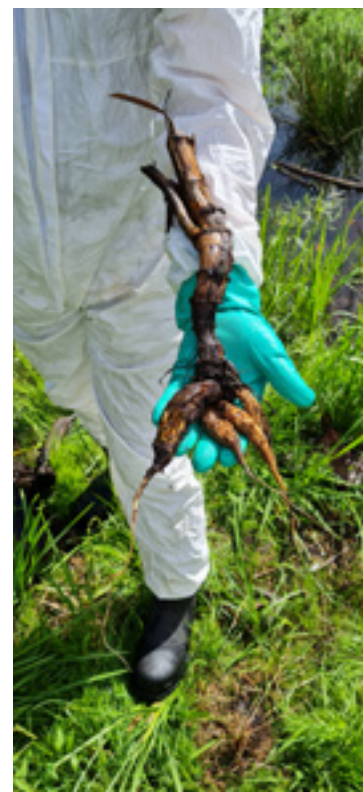


BRITAIN'S MOST TOXIC PLANT

These roots have an alternative name of 'Dead Man's Finger's' due to their appearance. No British wild plant has been responsible for more fatal accidents, in one instance a party of workmen repairing a hole that had appeared in a Canal tow-path dug up and ate the roots, mistaking them for parsnips.

Another instance, a team working in a field thought that a few of the leaves with their bread and cheese would prove a tasty condiment. In each case, death occurred within three hours. On another horrifying occasion, eight young boys ate the roots, five of them sadly died and the other three had violent convulsions.

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HORNWORT

SCIENTIFIC NAME: *Ceratophyllum demersum* ORIGIN: US and Canada

IDENTIFYING CHARACTERISTICS

Hornwort, also known as called Coontail, Coon's Tail (because its stems resemble a Raccoon's tail) Hornwort is a submerged rootless aquatic plant that is a natural floating oxygenator, however it excretes substances that inhibit the growth of phytoplankton and blue-green algae. Hornworts lack roots, although the plants may be anchored by leafless branches, they float beneath the surface of still or slow-moving water bodies. In autumn the plants sink to protect themselves from low temperatures. Hornworts reproduce readily from pieces of stem.

- Free floating, rootless plant.
- Each leaf can grow up to 3 metres in length.
- Extensive 'forked' leaves arranged in whorls around the stems.
- Flowers from July to September.
- Grows to a height of 1 metre.
- Feels rough to touch.

HABITAT

Thrives in lakes and slow moving waterways or streams.

ENVIRONMENTAL IMPACT: LOW

Forms substantial floating masses that will block waterways, out-compete other aquatic plants and cause problems for hydroelectric schemes. Can be effectively controlled by the introduction of Grass carp.

TOXICITY LEVEL: ZERO

Hornwort presents no physical danger to either humans or animals.



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NUTTALL'S WATERWEED

SCIENTIFIC NAME: *Elodea nuttallii* ORIGIN: North America

IDENTIFYING CHARACTERISTICS

Nuttall's water weed (often confused with Canadian waterweed) is a fully submerged aquatic plant that is native to North America but has become invasive in the UK. It reproduces through fragmentation, whereby fragments of the plant break off and form new plants. It forms dense mats that float on the water surface, which can reduce light penetration, and oxygen levels in the water.

- Long, slender stems and bright green leaves that are pointed at the tip.
- Soft green whorled leaves typically 1cm long.
- Leaves are arranged in groups of three or four around the stem.
- Non-flowering.
- Can grow up to 3m in length.
- Distinctive red ring where leaves shoot from the stem.

HABITAT

It is commonly found in rivers, lakes, and canals, it thrives in inland surface waters such as estuaries, also commonly found in drainage channels.

ENVIRONMENTAL IMPACT: HIGH

Poses a major risk to native biodiversity and native ecosystems in slow-flowing or still waters due to its capacity to spread rapidly and establish a thick, dense carpet. It out-competes most native species and cause large fluctuations with the amount of oxygen within the watercourse causing harm to fish and invertebrates. Their dense growth often impedes flow of slow moving waterways which can exacerbate flooding.

TOXICITY LEVEL: ZERO

Nuttall's waterweed presents no physical danger to either humans or animals.



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Images by Christian Fischer

PARROT'S FEATHER

SCIENTIFIC NAME: *Myriophyllum aquaticum* ORIGIN: South and Central America

IDENTIFYING CHARACTERISTICS

Parrot's feather is a partially submerged perennial aquatic plant that has become highly invasive in the UK. The leaves are usually around 2cm long and are finely divided, giving them a delicate appearance. Parrot's feather will easily re-establish from its roots that remain in the bed even when the above water growth has died back. First brought to the UK in the 1870s as an aquatic plant to aerate garden ponds. After being discarded, it found its way into the wild.

- Distinctive leaf arrangement with a feathery appearance.
- Bright green leaves often with a bluish sheen.
- Leaves can grow up to 2cm long and whorl around the stem.
- Flowers from May to August with very small flowers that form at the base of the leaves.
- In winter it dies back and is only found in its submerged form.

HABITAT

Parrot's feather thrives in non-tidal, freshwater, slow-moving water bodies including tributaries, ponds, lakes and canals but will grow in any still water habitat including reservoirs. It is abundant in southern England.

ENVIRONMENTAL IMPACT: HIGH

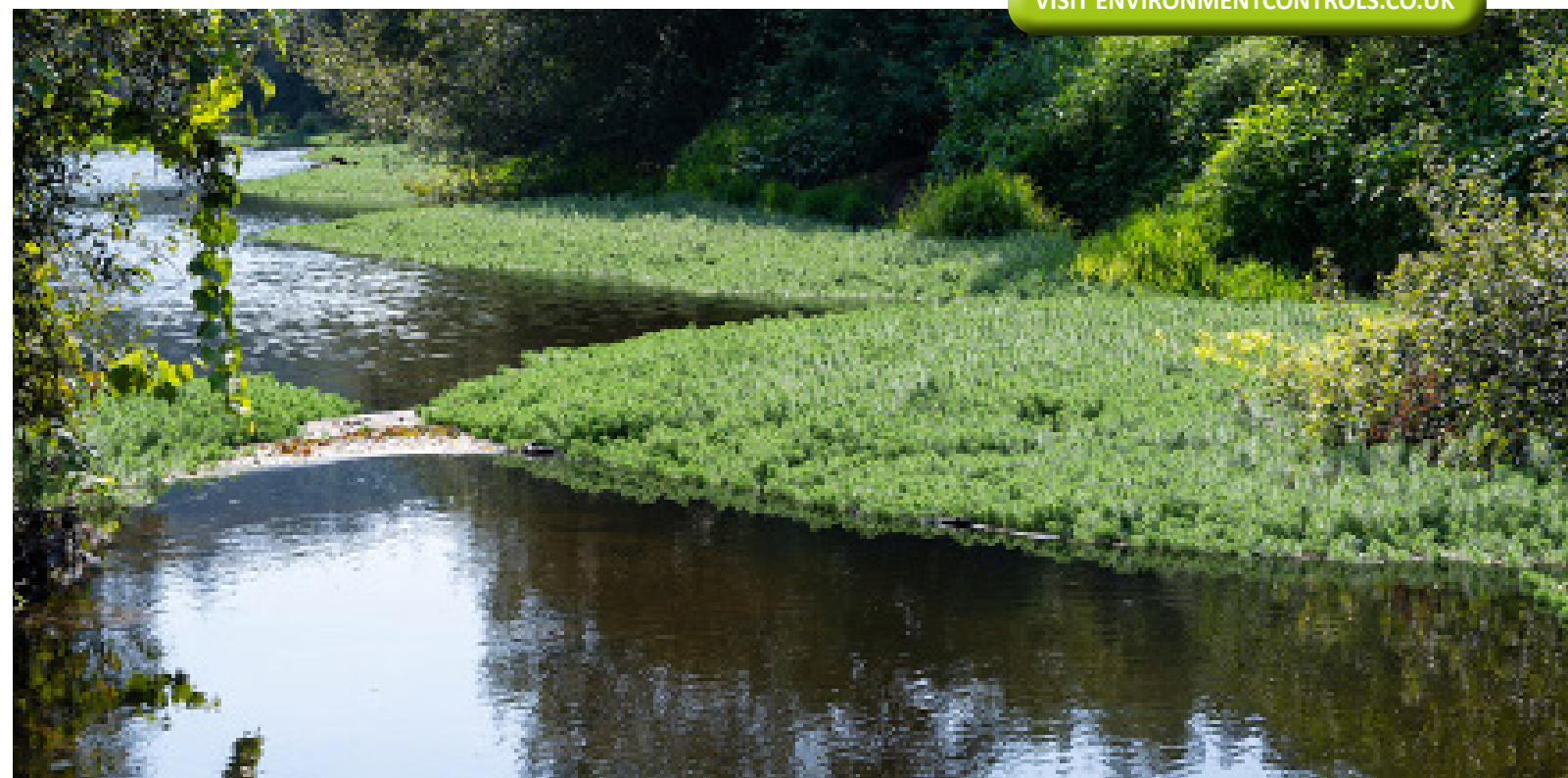
It is highly invasive, choking water bodies and out-competing native species by blocking out their natural light source. Its dense growth blocks drainage systems and can also cause flooding by impeding water flow. Parrot's feather could be considered a threat to leisure activities such as angling and boating as well as causing issues with hydro-electric power stations.

TOXICITY LEVEL: ZERO

Parrot's feather presents no physical danger to either humans or animals.



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WATER FERN

SCIENTIFIC NAME: *Azolla filiculoides* ORIGIN: North & South America

IDENTIFYING CHARACTERISTICS

Water fern is a genus of seven species of aquatic ferns in the family Salviniaceae. A floating variety, first introduced as a decorative water plant for garden ponds and aquaria. It has since naturalised, entering lakes and ponds and has become well established in some areas in Northern Ireland. *Azolla* forms dense mats on the water surface up to 30cm deep, for this reason it is often called Mosquito fern as it is said that mosquitoes are unable to hatch, but can also called Fairy moss.

- Forms small plants around 2.5cm long which can cluster to form a dense mat up to 30cm deep.
- Small leaves consisting of rosettes up to a few cm in diameter, which turn a deep shade of red in autumn and winter.
- Dark brown hair like roots.

HABITAT

Most frequently found in ponds, lakes, canals, ditches and slow flowing rivers.

ENVIRONMENTAL IMPACT: HIGH

Water fern can achieve 100% cover over the water surface, it out-competes native vegetation caused by the lack of light penetration, which creates an anaerobic environment and prevents photosynthesis of aquatic plants. It also prevents amphibians and invertebrates from reaching the surface and may disrupt movement of water borne species on the water surface itself. Water fern has economic impact by causing a detrimental effect on the fish farming industry. Mats of water fern on reservoirs and slow-moving water-bodies can also cause economic loss to water facility companies. *Azolla* alters the pH of water which poses a risk to other native species. Drinking water quality can be reduced, and farmers have been known to lose animals due to contaminated water-bodies, and drowning due to dense infestations appearing as solid ground.

TOXICITY LEVEL: MEDIUM

Water fern itself presents no physical danger to either humans or animals, however the effect on drinking water for livestock can be harmful.



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WATER HYACINTH

SCIENTIFIC NAME: *Eichhornia Crassipes* ORIGIN: South America

IDENTIFYING CHARACTERISTICS

A perennial free-floating, aquatic plant with long dark roots and showy purple or blue flowers, it may appear attractive but will quickly take over lakes, rivers and marshlands and can completely block waterways, impeding flow.

- Leaves are formed in rosettes which can reach up to 30 cm in diameter.
- Leaves are spongy, bulbous near the base, roundish, glossy green and up to 15 cm wide.
- Flowers are lavender-blue with yellow highlights, growing up to 5 cm wide.
- Plants can grow over 3ft tall.

HABITAT

Thrives well in any freshwater environment.

ENVIRONMENTAL IMPACT: HIGH

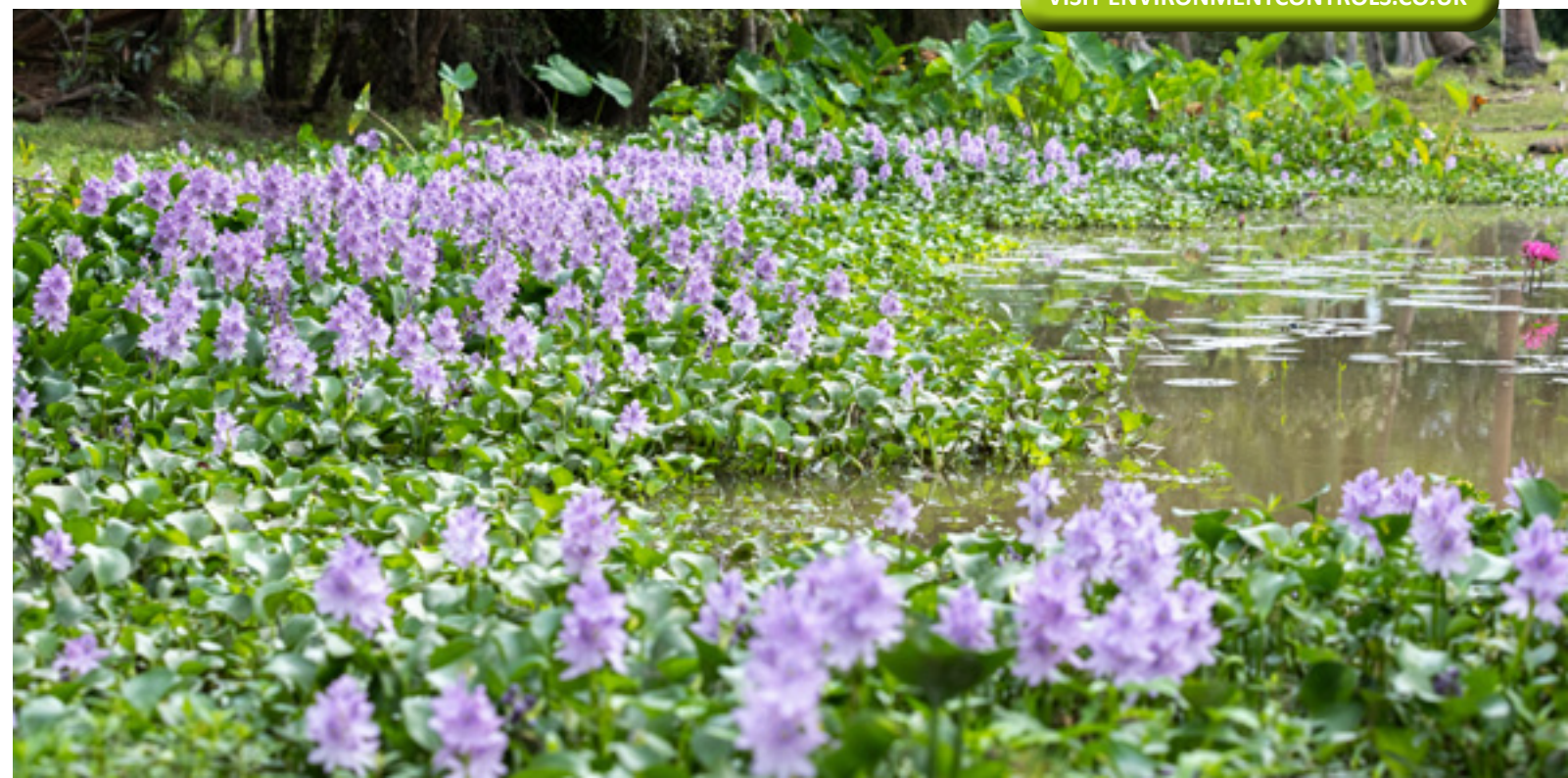
Its dense, impenetrable mats will clog waterways, making boating, fishing and almost all other water activities, impossible. It also causes issues with flood control. It degrades water quality by blocking air from reaching the water, greatly reducing oxygen levels in the water, eliminating underwater animals and fish and depletes other submersed plants and aquatic invertebrates. Despite being a threat to biodiversity worldwide, its biomass has been found useful for the absorption of toxic waste from polluted water. Biological methods of control are often the most effective, such as introducing arthropods to the affected area, which feed the leaves of water hyacinth. The most common and effective arthropods are weevils, but pathogens, bacteria, fungus, and viruses can also be effective.

TOXICITY LEVEL: ZERO

Water hyacinth itself presents no physical danger to either humans or animals.



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WATER SOLDIER

SCIENTIFIC NAME: *Stratiotes Aloides* ORIGIN: Asia and Europe.

IDENTIFYING CHARACTERISTICS

A submerged aquatic plant with stiff, spiky leaves that grow in rosettes on the water surface, often likened to a pineapple. The leaves float on the water surface, and become slimy in winter, secreting calcium carbonate. Water soldier is a good source of food for several species such as dragon flies, however if left to grow will quickly out-compete other native species.

- Plants remain submerged for most of the year.
- Long spiky leaves with serrated edges shaped in a whorl around a single stem.
- Submerged leaves can grow up to 60cm or more with 40cm showing above the water.
- When above water they produce a single 3-petalled white-slightly pink flower.

HABITAT

A rare yet invasive species usually inhabits shallow stagnant waters but can also be found in ponds and still open water such as canals, ditches and wetlands.

ENVIRONMENTAL IMPACT: MEDIUM

It may alter water chemistry, which may harm aquatic fauna and flora. It forms long dense mats that will out-compete native species and inhibit navigation and recreational activities by impeding flow and increasing sedimentation build up. Its serrated leaves may injure recreational water users. Being a rapid coloniser and a highly productive species makes control quite difficult.

TOXICITY LEVEL: ZERO

Water soldier itself presents no physical danger to either humans or animals.



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WATERWEED (or Canadian pondweed)

SCIENTIFIC NAME: *Elodea canadensis* ORIGIN: North America

IDENTIFYING CHARACTERISTICS

Often called Canadian pondweed, this submerged free-flowing perennial aquatic plant has overlapping leaves that create a dense carpet that if left uncontrolled, over a few seasons can cover hundreds of acres, severely impeding natural water flow. Reproduction is via fragmentation - fragments have high survival rates which allow them to be dispersed over long distances, often being carried by fish or other invertebrates, or when flooding increases river flow. Long, green stems and whorled leaves that are arranged in groups of three.

- Stems can grow to 15cm and are rooted from their nodes, typically in mud substrates.
- Slim green leaves are slightly curled, approximately 2-5 mm wide.
- Flower from May to October.

HABITAT

Waterweed can grow in a range of habitats, but prefers inland fresh waterways such as quiet ponds, lakes ditches, irrigation channels and slow-moving water with peaty or muddy silt substrates.

ENVIRONMENTAL IMPACT: MEDIUM

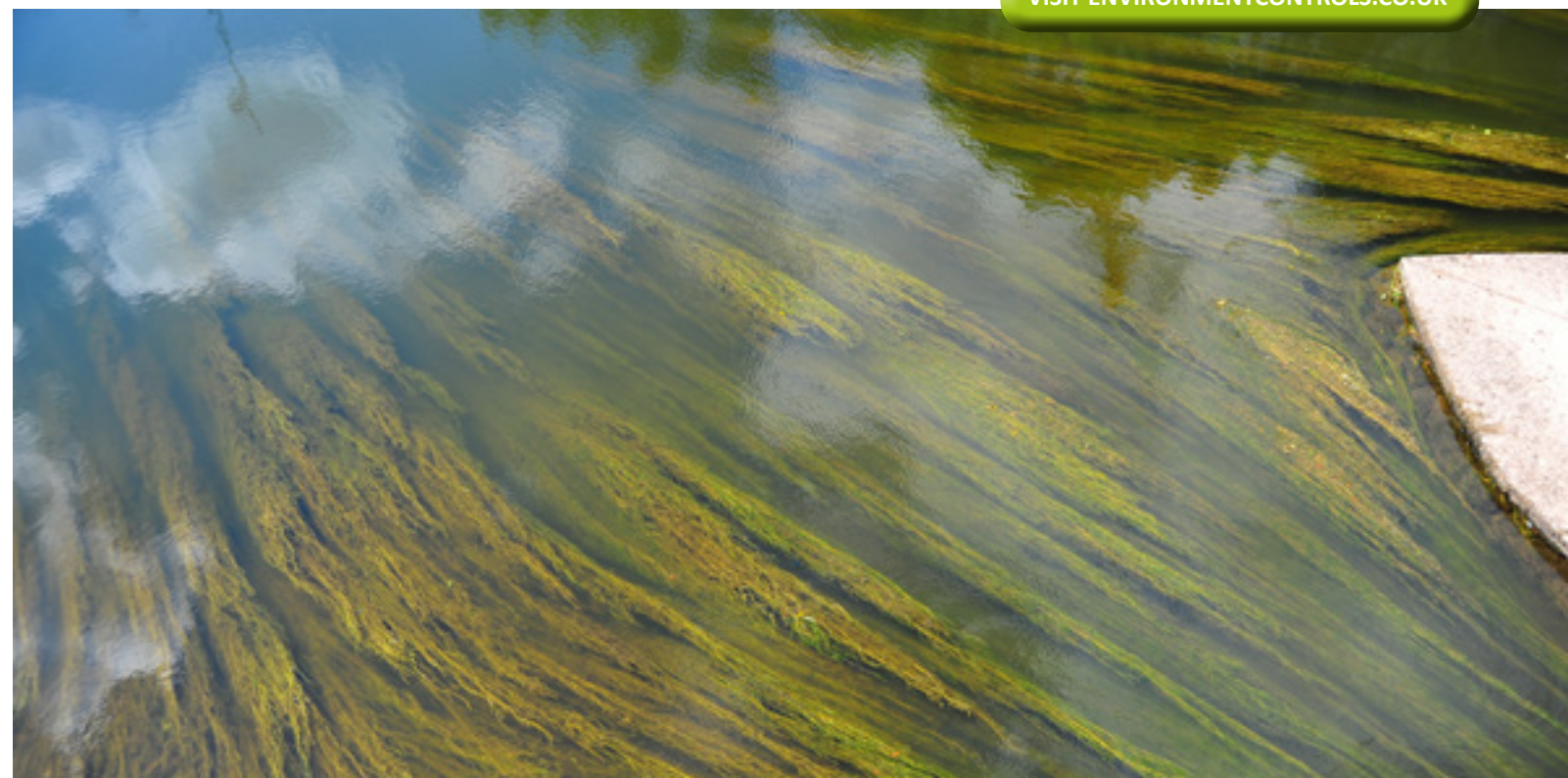
Because it has the potential to develop into dense submerged beds it can out-compete native plant species and therefore decrease the local biodiversity. Infestations naturally trap sediments, which has been known to reduce water flow in canals and streams by up to 80%. It will also clog and impede drainage waterways of irrigation channels. It can survive in water depths of up to 4 metres, making control operations complicated. *Lymnaea peregra* snails are natural herbivores of Waterweed, and so can serve as a biological control agent.

TOXICITY LEVEL: ZERO

Waterweed itself presents no physical danger to either humans or animals.



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