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Hydrocotyle ranunculoides

Species description

Floating pennywort (*Hydrocotyle ranunculoides*) is a perennial aquatic plant species native to America. The species was introduced to Europe, including Belgium, through the aquatic nursery trade as a popular oxygenating plant for aquarium and garden ponds. The first record of floating pennywort's presence in the environment in Belgium dates from 1992. Disposal of aquarium and pond waste in water systems along with multiples escapes from aquatic nurseries are probably at the origin of the species' occurrence in the wild. Today, floating pennywort represents a problematic aquatic invasive species in many countries worldwide and is now listed as IAS of Union concern under the EU Regulation No 1143/2014. Its distribution on the Belgian territory is probably rather exhaustive due to the plant high detectability. At early development stages, the species can, however, easily be confused with native macrophytes like *Hydrocotyle vulgaris*.

Fig 1. *Hydrocotyle ranunculoides*. Photo: Kieft Ben

Guide de gestion complet en version française

Volledige beheergids in Nederlandse versie

Photo: Etienne Branquart

Hydrocotyle ranunculoides

Floating pennywort grows well in both shallow stagnant or slow-moving freshwater such as ponds, ditches, streams, canals and marshes. The plant, rooted in mud, can grow up to 40 cm above the water surface and is able to colonise the banks of water systems. As a highly competitive invasive species, the plant has diverse environmental, social and economic impacts. This invader can form dense interwoven mats that completely cover the water surface. This has significant detrimental impacts on the ecosystem and biodiversity including through light exclusion, native plant community displacement and water quality modification. Social and economic effects include restriction of recreational activities (angling, boating), swimming hazards and management related costs.

Biological characteristics, reproduction and spread

Floating pennywort starts growing in spring, with its highest growth rate occurring during summer. During the winter months, the species usually remains dormant along banks, and regrows from persisting plants the following spring.

Reproduction of floating pennywort in western Europe is probably exclusively vegetative. When the plant breaks into fragments, naturally or because of human activity, those small fragments can form a new plant and, therefore, a new population, away from the initial invaded area. The species is, however, also known to produce viable seeds in its native range, although seed production has not yet been observed in Europe. Compared to many other aquatic weeds, floating pennywort has high and impressive spread capacities. Dispersal can occur through water flow or via fragments attached to boats and other water equipment. The species displays impressive regeneration capacities with new shoots developing within 1 or 2 weeks from one single fragment. Those high regeneration and dispersal abilities highlight the importance of the implementation of effective management measures.

Fig 2. Dense mat of floating pennywort covering the entire surface of the water body and causing many problems such as choking the pond of oxygen. Photo: Adrien Latli

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General considerations about management

A range of management options have successfully been used to control or eradicate this species. Local eradication of floating pennywort is considered achievable for small and large infestations. While the species is probably one of the easiest invasive water plant to manage, terrestrial forms rooted in the banks make the management more challenging as the plant is intermixed with riparian vegetation. In addition, it was suggested that the percentage of rooted plants within a population can influence management results: the greater the proportion of plants rooted in the substrate, the smaller the chances of eradication success. The eradication feasibility of floating pennywort populations must always be assessed on a case-by-case basis, considering site specificities, the invaded area, etc., and be thoroughly discussed within the management team.

Due to the species' ability to reproduce vegetatively by fragmentation, precautionary measures must be put in place prior to management to prevent fragment spread within the managed area or to other water systems. Managed areas are, therefore, isolated by physical barriers.

The harvested plant material must be safely disposed of away from the water and is either dried and incinerated, buried or composted. If important quantities of sediments are present (e.g. dredging), the harvested material is transported to refuse facilities. Material that has been in contact with the plant (e.g. waders, clothing) should be checked, cleaned and dried before going to another site. It is also recommended to restrict public access to the managed area to isolate the infestations as much as possible and limit the risk of spread.

Managed and downstream sites must remain under enhanced surveillance for a 5-year period after the implementation of the last treatment.

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Manual removal

- v Local eradication can be achieved
- v Manual removal is highly selective and will have minimal impact on ecosystems and other organisms
- x The method is more suitable for small and early-detected infestations (<500 m²) or in small water systems
- x Manual removal can create plant fragments with the risk to spread the species to uninvaded areas and other parts of the managed water body

Fig 3. Hand-pulling with waders and waterproof gloves. Photo: Marie Patinet

Fig 4. Operators using rakes and synthetic buckets to remove and stock the plant material. Photo: Marie Patinet

Fig 5. Small dumper truck used to transport the harvested plant material to the container. Photo: Dido Gosse

Fig 6. Large rake being pulled by a winch from the bank helping operators to remove important quantity of plant material. Photo: Adrien Latli

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Method description

The principle is to remove the whole plant from the ecosystem. Plants are pulled out by the roots by operators wading in shallow waters, from boats and from the bank. For large floating mats, tools such as large rakes pulled by a winch from the bank can facilitate the operation. This management strategy is conducted in spring and during the whole vegetative period. Operators must pay great attention not to fragment the plants as much as possible. They must also ensure to remove all individuals rooted on the banks. Manual removal of plant regrowth is repeated every month, following the initial removal, until the end of the vegetative phase. Several interventions are then necessary between June and November. Aftercare is repeated in the same way for the next following years, usually for 2 to 5 years.

Material

Management: Waders, small boats, manure or grappling hooks, rakes, winch and large rake, gloves

Transport: Buckets or synthetic bags, trucks, dumpers and containers

Precautionary measures: Hand net, floating booms, containment nets

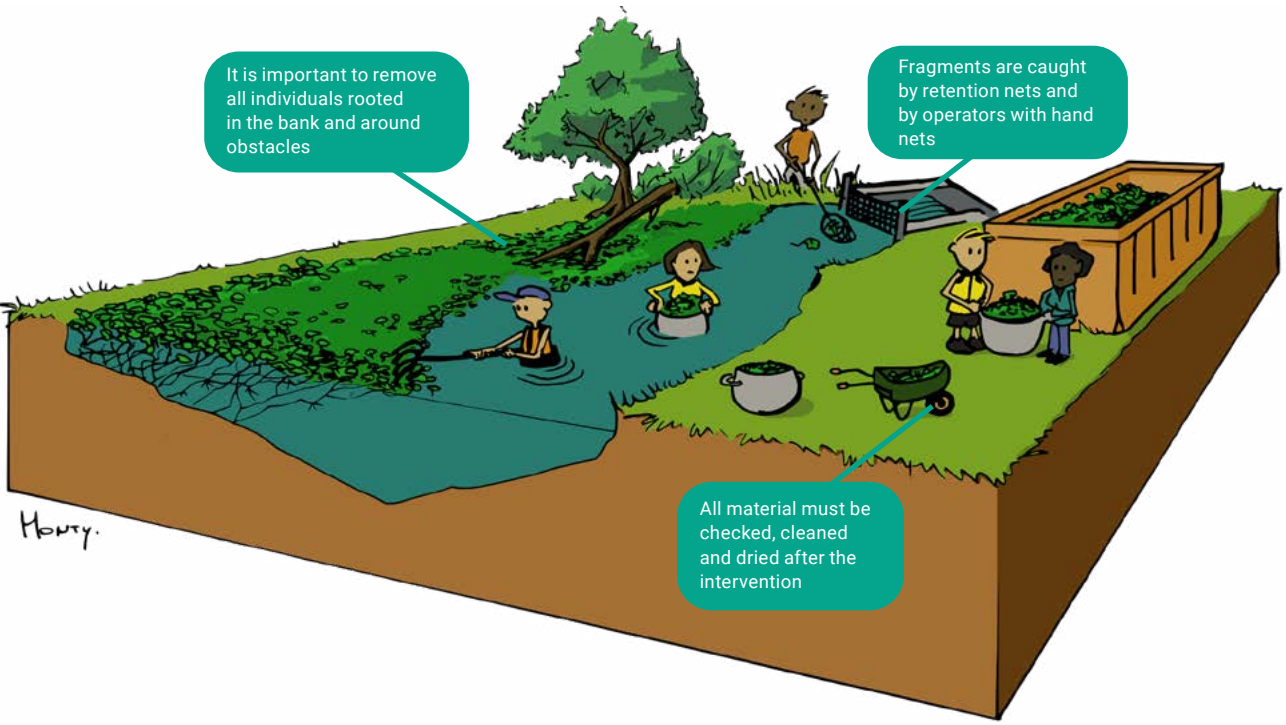

Fig 7. Manual removal of floating pennywort involving pulling out the plant by the root while wading through water

Mechanical removal: floating and terrestrial machines

- v Local eradication can be achieved
- v Rapid good control can be expected
- v Mechanical removal is suitable for well-established populations and large water systems
- x This method can only be implemented in sites where the entire invaded area is accessible to the machines
- x Mechanical removal can create vast numbers of plant fragments with the risk to spread the species to uninvaded areas and other parts of the managed water system

Method description

The principle is to mechanically remove the whole plant from the ecosystem. Plants are either uprooted and collected by excavators on the bank or on floating pontoons or by specialised weed conver boats equipped with various attachments such as mechanically controlled rakes that scoop out plant material and unloaded it on the bank. While terrestrial machines are preferred for narrow water systems such as ditches or streams, conver boats are adopted for large water systems. Mechanical removal is possible to implement all year round, whenever the plant is visible, and is immediately followed by manual removal of remaining plants and fragments. Manual aftercare is then conducted several times during spring and summer to remove any regrowth and is repeated for the next following years, usually 2 to 5 years.

Material

Management: Excavators or weed conver boat, waders

Transport: Dumpers, trucks and containers

Precautionary measures: Hand net, floating booms, retention nets, mesh grids

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Fig 8. Excavators placed on the bank to remove floating pennywort from a narrow water system. Photo: Jérémie Guyon

The impact of management actions on ecosystem services

While the adverse effects of IAS are well-known and provide strong incentives for implementing management actions, the impacts of these management actions on ecosystems and the services they provide are less considered. The matrices are the result of expert assessments of the evolution of relevant ecosystem services (ES) from a highly invaded situation towards a managed situation. ES evolution is considered over 2 given periods of time: 1 year and 5 years after the initiation of management.

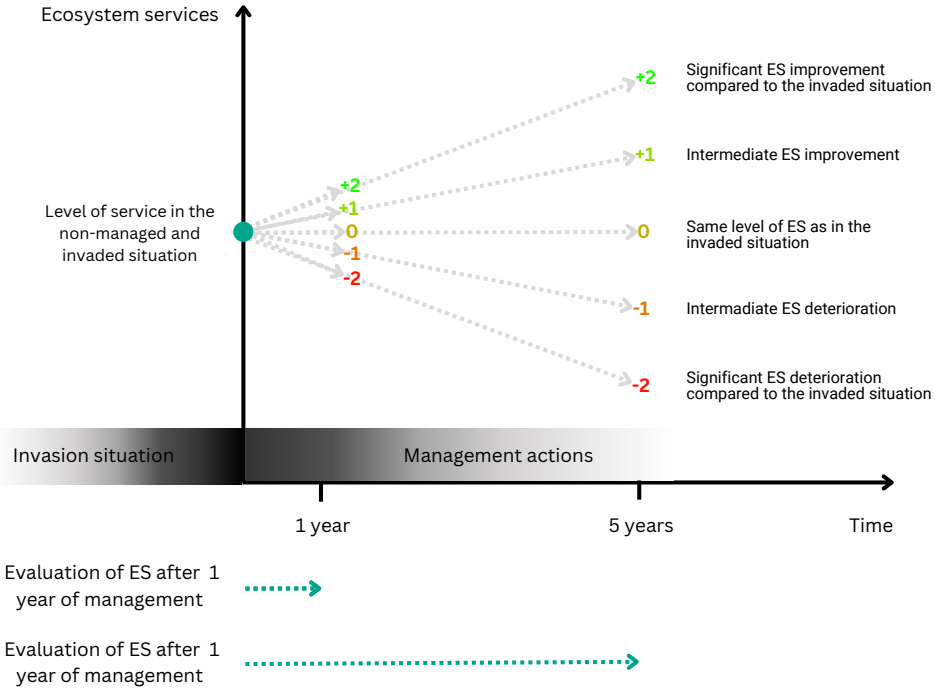

Fig 9. Representation of the survey process

Each matrix displays the average impact scores of management methods on ecosystem services. These scores have been associated to colours to facilitate the visualization of the impacts of every method on every relevant ecosystem service. Green indicates a significant improvement in the ecosystem services (ES) due to management, orange represents no or minimal effect, and red signifies a negative impact of the method on the ES.

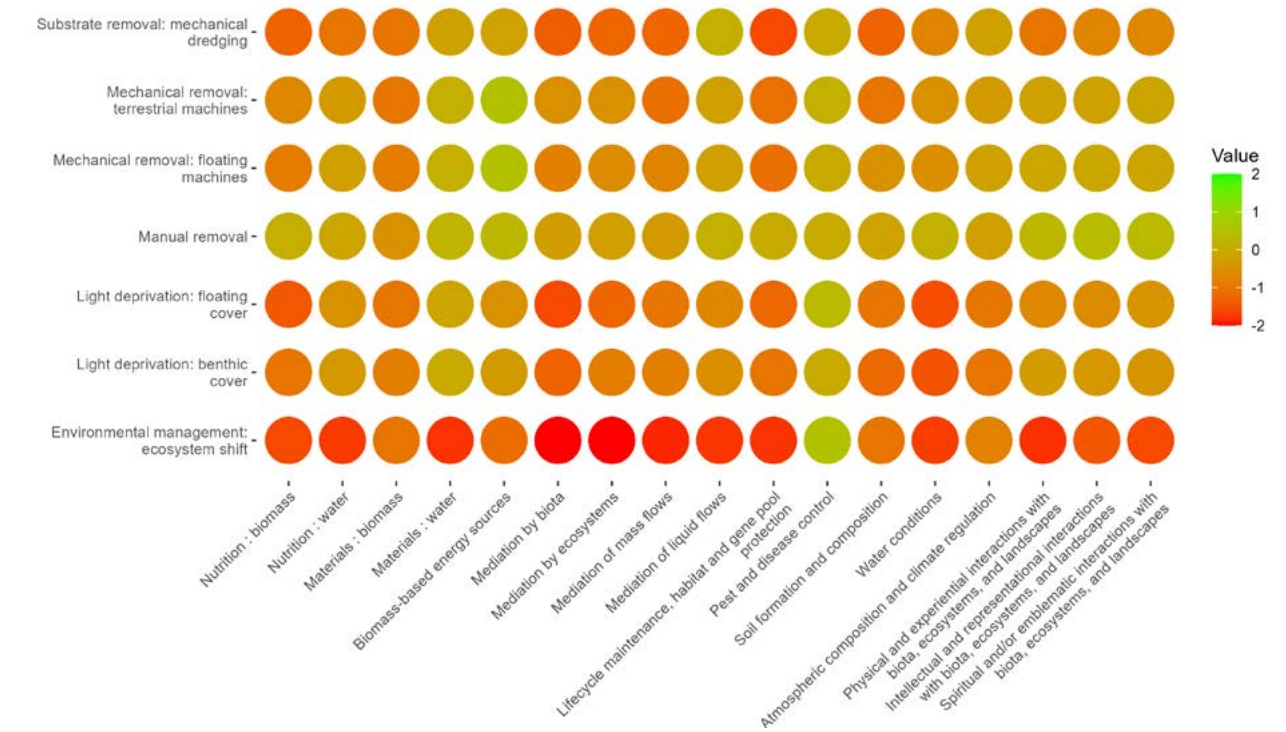

Fig 10. Matrix displaying the impact of management methods for aquatic plant species on ecosystem services after 1 year

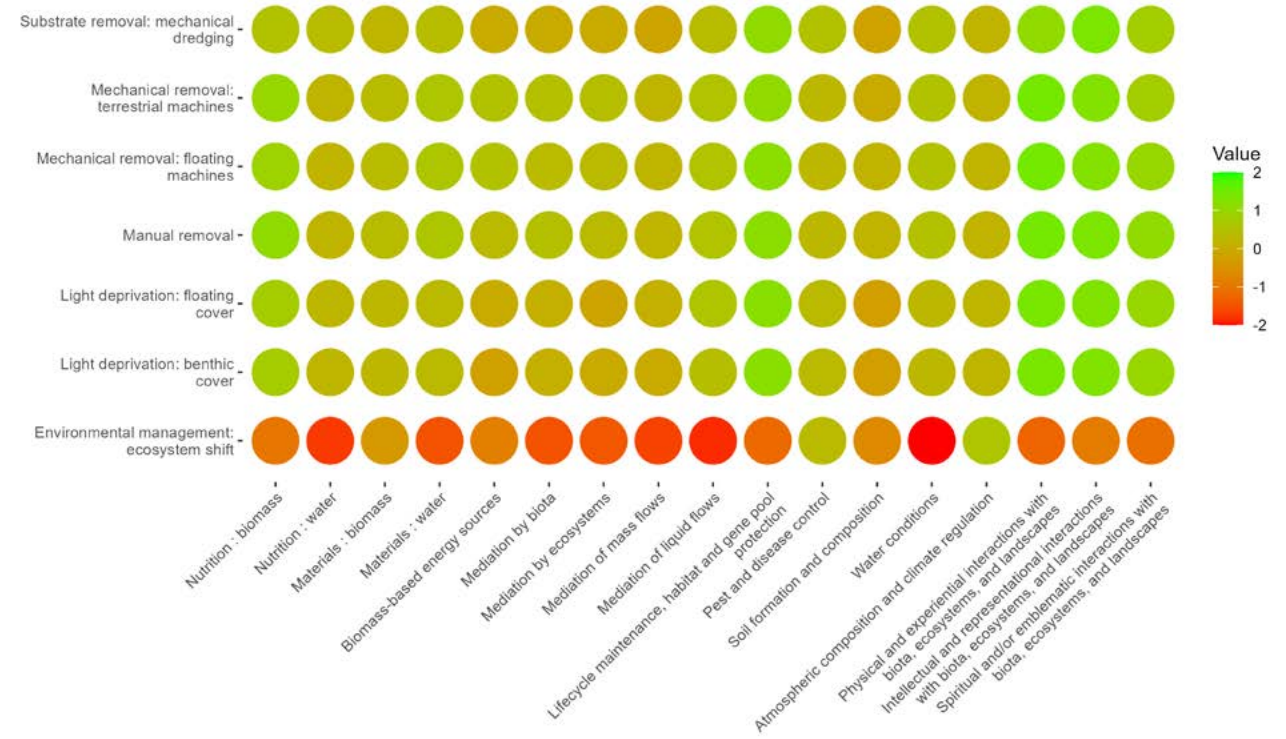

Fig 11. Matrix displaying the impact of management methods for aquatic plant species on ecosystem services after 5 years

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