MARIE PATINET - ETIENNE BRANQUART - ARNAUD MONTY

Heracleum spp.

Species description

The invasive giant hogweed (*Heracleum mantegazzianum*), Persian hogweed (*Heracleum persicum*) and Sosnowsky's hogweed (*Heracleum sosnowskyi*, syn. *Heracleum pubescens*) are 3 terrestrial perennial plants native to western Caucasus, eastern Caucasus and western Asia (Iran, Iraq and Turkey) respectively. The species were introduced to Europe, including Belgium, for horticulture and apiculture but also as agricultural crops (Sosnowsky's hogweed). The first record of non-native hogweeds in the environment in Belgium dates back to the late 1940s and concerns the giant hogweed. Spread from cultivated plants in private or botanical gardens, along with accidental introductions of seeds through soil transportation, are probably at the origin of their escape into the wild. Today, the 3 plants represent problematic invasive alien species in many countries worldwide and are now listed as IAS of Union concern under the (EU) Regulation No 1143/2014. The distribution of the giant hogweed on the Belgian territory is probably rather exhaustive due to its high detectability and active monitoring efforts. The other two *Heracleum* species have never been found in Belgium so far, but their presence cannot be excluded due to misidentification risks, as the 3 hogweed species are genetically and morphological close to each other.

Fig 1. The 3 hogweed species are similar in appearance and are, therefore, complicated to differentiate. *Heracleum mantegazzianum* remains, however, the most widely distributed in Belgium. Photo: Huhu Uet

Guide de gestion complet en version française

Volledige beheergids in Nederlandse versie

Photo: Etienne Branquart

Heracleum spp.

Hogweeds thrive along waterways and in artificial and semi-natural habitats such as roadsides, gardens and grasslands. These competitive species, which can reach heights of 4-5 meters, have diverse environmental, social and economic impacts. They can form large monospecific stands that negatively affect ecosystems and biodiversity through native plant exclusion, species richness reduction, riverbank erosion, modification of soil biota, etc. One of the main concerns regarding their establishment, is probably the risk it poses to human health as all 3 species produce phototoxic sap. Direct contact with these plants can result in severe and permanent damage to human skin, especially when exposed to UV radiation, including severe burns, blisters, scars, hyperpigmentation, and other injuries that may require hospitalization. From an economic perspective, impacts include management and healthcare related costs. In Germany, annual healthcare costs associated with human exposure to the toxic sap amounts to 1 million euros.

Biological characteristics, reproduction and spread

Flowering of all 3 species takes place between June and August, with several thousands hermaphrodite flowers developing on a single plant. These flowers are then pollinated by various insect species. By July, fruits appear, each containing 1 seed which germinates in early spring and mainly emerges from fertilisation between 2 plants (self-fertilisation has also been observed).

Fig 2. Giant hogweed can grow to 4 to 5 meters tall. Photo : Dido Gosse

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While the plants can live for more than 10 years (Persian hogweed has a longer lifespan than the other 2 species), they usually start producing flowers when they are 3 to 5 years old. Unlike Persian hogweed which can flower multiple times before dying, Sosnowsky's and giant hogweed die after flowering once. All 3 species overwinter, with the leaves fading during cold months, and regrow from overwintering roots the next growing season. In western Europe, hogweeds propagate exclusively by seeds. On average, one plant produces around 20,000 to 100,000 seeds, which fall near the parent plant (within a few meters) and are dispersed by wind over short distances. Spread over long distances (several kilometers) occurs though waterways, where seeds have been found to float for 3 days, and through the transport of soil contaminated by seeds. Seeds can remain viable for at least 5 years, forming persistent seedbanks. The plants have an important reproductive potential as the majority of the seeds produced engender healthy new plants capable of forming new populations, even away from the initial invaded area. The vast majority of the seeds are found in the upper soil layer (from 0 to 5 cm deep). Unlike giant hogweed and Sosnowsky's hogweed, Persian hogweed is thought to be capable of vegetative reproduction when sexual reproduction is unsuccessful. Scientific information remains, however, highly limited. Hogweeds' high regeneration and dispersal abilities highlight the importance of implementing effective management measures.

Photo: Jérémie Guyon


Photo: Dragan Marjanovic

Fig 3. The phototoxic sap contained in hogweeds can cause serious damages to the skin such as severe case of phytophotodermatitis.


Photo: grisdee/shutterstock

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General considerations about management

Numerous and well-documented management options have successfully been used to control and eradicate hogweeds. Local eradication of the 3 species is considered achievable, even for large and dense infestations. The feasibility of eradicating hogweed populations must, however, always be assessed on a case by case basis, considering site specificities, and be thoroughly discussed within the management team.

Due to the species' ability to reproduce through seeds, precautionary measures must be adopted prior to management to prevent seed spread in the environment and uninvaded areas. The plants should ideally be managed before seed production, and the harvested material must be safely disposed of away from the water and piled up on the site to dry and decompose. If there are inflorescences and seeds, they should be placed in trash bags, which are then burned or exposed to the sun in a secure location.

Material that has been in contact with soil that may contain seeds (e.g. clothing, spades) should be checked and cleaned before going to another site. Due to the phototoxic sap, operators must avoid direct contact with the plant. Adequate and protective clothing and equipment must be used during management. It is also essential to protect the eyes. Skin that has been exposed to sap must immediately be washed with soap and water and protected from exposure to UV. It is recommended to apply sun cream prior to management actions. After any management action, equipment, clothing and skin must immediately be washed thoroughly and exposure to sunlight is discouraged. For limited invasions, it could be recommended to work after sunset to limit the risks associated with exposure to UV. Operators must not hesitate to seek medical advice if contact with sap has occurred.

Managed sites must remain under enhanced surveillance and be monitored at the end of each growing season for a 7-year period (10 years for Persian hogweed) following the last treatment.

Fig 4. Giant hogweed invasion. Photo : Helena56/Shutterstock

Manual removal: root cutting

- v Local eradication of small and early-detected populations can be achieved
- v Manual removal is highly selective and will have minimal impact on ecosystems and other organisms
- x The method is time consuming for the control of large infestations (>200 individuals)
- x Manual removal requires long-term management due to the persistent seedbank
- x Operators are exposed to health hazards. The use of skilled operators with protective clothing is necessary

Method description

The principle is to remove the plants from the ecosystem and exhaust the seed bank while preventing seed production. The roots are cut by operators, causing the immediate death of the plant. Roots should be cut at a depth of 15 to 20 cm below ground level whenever possible, with a minimum depth of 10 cm below soil level. Management must be conducted early in the growing season (April - May) before umbel production, when the size of the plant is still limited. For tall and large individuals, the upper part can be removed to facilitate root cutting. The treatment has to be repeated in mid-summer to remove seedlings or individuals that would have been overlooked and ensure that no plants are producing seeds. Manual removal is then continued for several years to progressively exhaust the seedbank until no seedling is found. In case of large populations, plants older than 1 year old should be prioritized for management and small seedlings can be left on site to be managed the following year. If management is implemented too late (start of seed-setting), umbels must be separated from the stem, collected, and destroyed (e.g. burned).

Material

Management: Spades with sharp blades or hoe. Loppers can be used to cut upper parts of large individuals

Transport and stocking: Bags to stock flowers or seed heads (if relevant).

Safety equipment: Adequate clothing including long sleeves and waterproof gloves, trousers, boots as well as eye protection is essential. It is strongly recommended to have access to clean water and soap in case of contact with sap.

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Fig 5. Operators must wear protective clothing and equipment during management to prevent exposure to the dangerous phototoxic sap. Photos : Jérémie Guyon

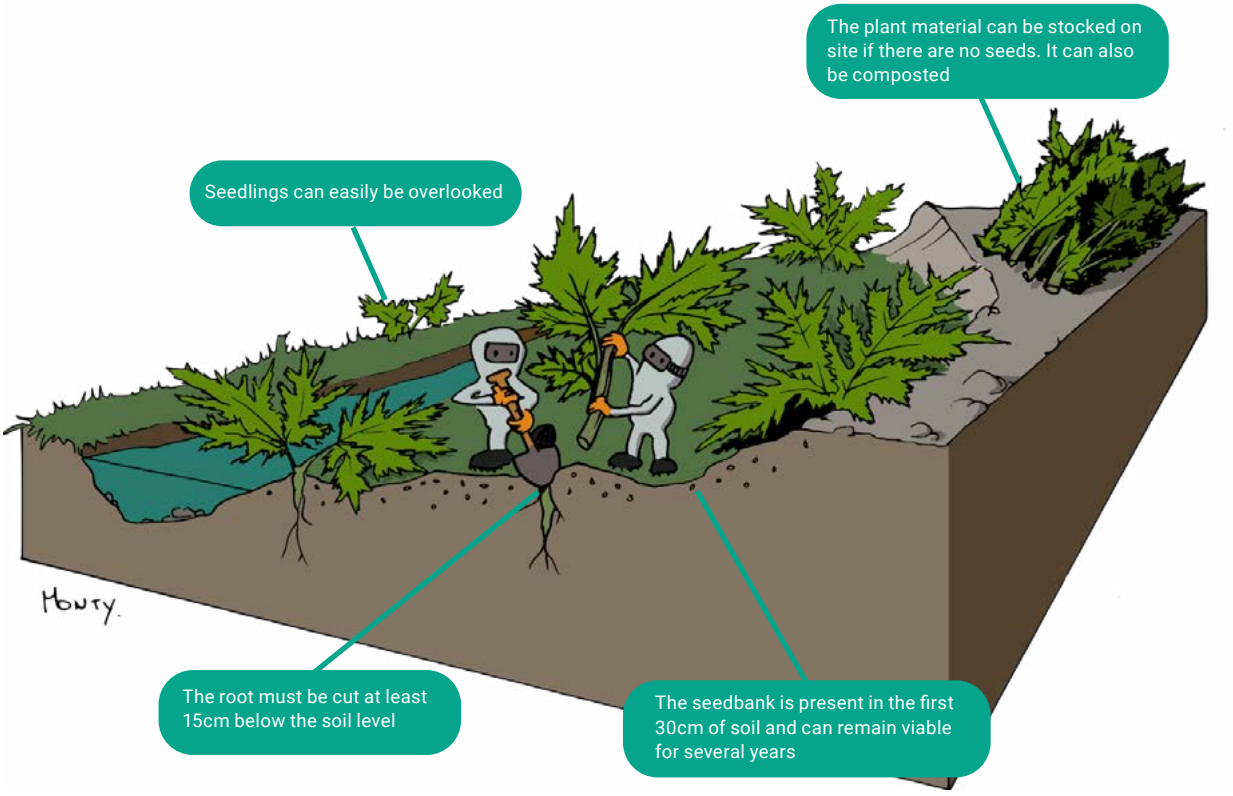

Fig 6. Manual removal of hogweeds. Operators sever the tap root below soil level to kill the plant

Mechanical removal: repeated ploughing

- v Local eradication can be achieved if a long-term treatment is conducted
- v Good control can be expected rapidly
- v The method is effective for large populations (>1000 individuals)
- x This method can only be implemented in specific sites where access with heavy machinery is possible
- x Ploughing must be repeated several times a year

Method description

The principle is to mechanically destroy the root system of the plant to cause its death. Plants are uprooted by heavy machinery through deep ploughing of the soil (20 to 30 cm deep) in agricultural lands. The method effectively kills the plant and reduces seed germination by burying seeds at depths that prevent germination (germination is hindered if seeds are covered by 25 cm of soil). Ploughing is implemented in spring (around May) and is repeated 3 to 5 times a year until no regrowth or seedlings are found, which usually takes a few years. This method can also be implemented in autumn as winter freezing temperatures can encourage root stock degradation. Regular monitoring is conducted, and manual removal is carried out as a follow-up measure if limited regrowth or seedlings are observed.

Material

Management: Agricultural machinery for ploughing. Any plowing equipment such as tractors with plough machine.

Transport and stocking: Bags to stock flowers or seed heads are also required (if relevant).

Safety equipment: Adequate clothing including long sleeves, trousers, boots as well as eye protection as sap can be ejected in the machine (although less likely than during manual removal). It is strongly recommended to have access to clean water and soap in case of contact with sap.

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Grazing

v Good control can be expected rapidly

v Grazing requires few resources

x Local eradication can be achieved in the long term but remains hardly achievable by grazing alone

x This method is not recommended in sites with conservation value or in riparian zones

x Frequent inspections of both livestock and fencing are required

Method description

The principle is to introduce generalist herbivores to control hogweed populations among other plant species. Livestock is released in a closed environment for a limited period of time. Grazing is similar to cutting, with the animals feeding on visible plant parts (above the soil), which eventually depletes nutrient reserves and prevents flowering and seed production. Livestock is released in early spring (April) when plants are still young and fresh, as they are more palatable, and remains all summer before being removed during winter months (from November to April). This operation must be repeated for at least 2 years to achieve efficient control or for at least 7 years to achieve potential eradication (when the seed bank is depleted). It is recommended to use livestock that is already accustomed to eating hogweeds, as animals usually require some time before they start feeding on these plant species. Once used to it, hogweeds become one of their preferred food. It is recommended to have a dense grazing pressure at first (spring) and to reduce the pressure (end of June) when plants are weak and biomass is diminished. Another method, applied for large and dense infestations, consists in implementing a couple of heavy but short grazing interventions where animals are repeatedly moved over between a few sites during the growing season. Livestock is then removed once stands of hogweeds have significantly been reduced. For the management of dense infestations, it is recommended to implement mowing prior to releasing livestock to encourage the establishment of other plant species, so that animals have a mixed diet.

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When fencing the managed site, operators must ensure that areas where seeds might have been dispersed are also included. Since the phototoxic sap contained in hogweeds can cause inflammation of the skin, lips, eyeball, etc., choosing the livestock wisely is important. Livestock with pigmented or hairy skin is strongly recommended. Animals must regularly be checked for any health issues caused by the sap. If some individuals display signs of poisoning such as blistering or swelling of genital organs, mouth, eyes or ears, they must immediately be temporarily removed from the field. Regular checks for ungrazed areas where plants could develop and produce seeds are necessary, and manual removal (root cutting) should be implemented if needed. Managing the invaded areas neighbouring the pasture that are inaccessible to the livestock is also necessary. This method is not recommended in sites with conservation value or in riparian zones, as intense grazing can have significant negative impacts on vegetation.

Material

Livestock: Black-faced sheep. The recommended animal density is a minimum of 20-30 sheep/ha in spring, followed by 5-10 sheep/ha in late June. This is, however, only an estimation as an appropriate stocking density depends on many variables such as invasion state, type of livestock used, timing, etc.

Equipment: Fencing such as electric wire or steel fences. Nutrient supplements such as minerals might also be needed.

Fig 7. Hogweed populations can be controlled by black-faced sheep through grazing. Invaded areas found outside the pasture and, therefore, inaccessible to livestock must also be managed. Photo : Richard Webb

DID YOU KNOW?

Other possible techniques to manage hogweed species

Terrestrial covers

Light deprivation using an opaque polythene cover is one of the multiple techniques used to control or eradicate limited hogweed populations. This method, effectively killing both the plants and the seeds, should be implemented at the beginning of the vegetative period when the size of the plants is still limited. This allows for easy fixation of the blanket to the ground. Regular checks for damages are recommended. While a year is sufficient to kill the plants, it is however necessary to leave the cover in place for several years to kill all the seeds (if a seed bank is present). Alternatively, manual removal (root cutting) is an effective option for similar situations, such as small stands. However, it requires more interventions and is likely to be more time-consuming. It is important to note that using an opaque polythene cover can be quite expensive and may have a non-negligible impact on other non-targeted plant and animal species.

Mowing

Mowing can be implemented as a management strategy for large and well-established hogweed populations. It is repeated 3 to 5 times over multiple years during the growing season to deplete nutrient reserves as well as prevent flowering and seed production. Repetitive scything can be implemented in areas where mowing would be unsuitable (e.g. riverbanks, slopes). To prevent the spread of seeds, it is crucial not to mow when the plants have flowers or seed heads. If flower heads are present, they should be removed prior to mowing and safely disposed of. It is important to note that while mowing can effectively prevent seed production and subsequent spread, it may lead to an increase in plant density and does not result in the plants' death.

Fig 8. Placement of terrestrial covers on a small giant hogweed population. Photo : Etienne Branquart

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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.

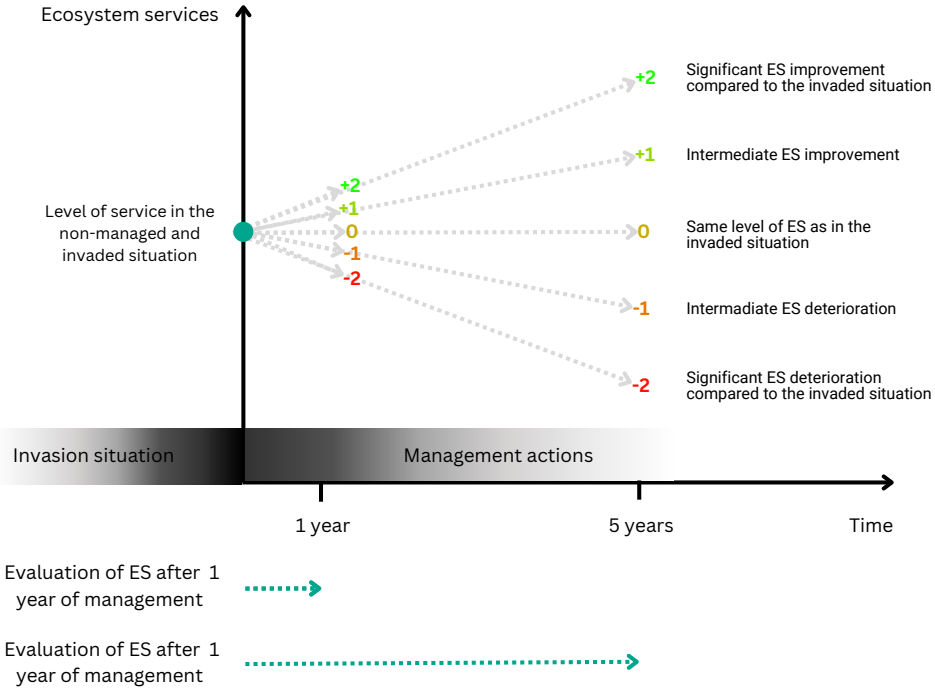

Fig 9. Representation of the survey process

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.

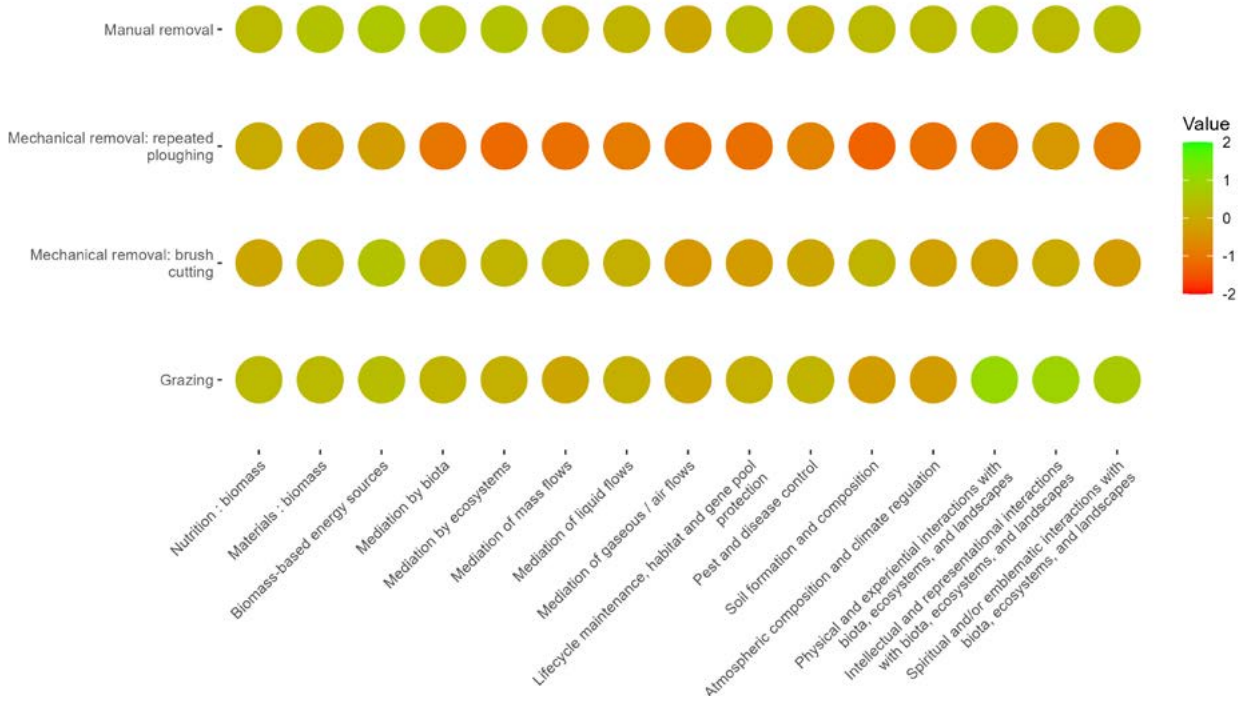

Fig 10. Matrix displaying the impact of management methods for riparian plant species on ecosystem services after 1 year

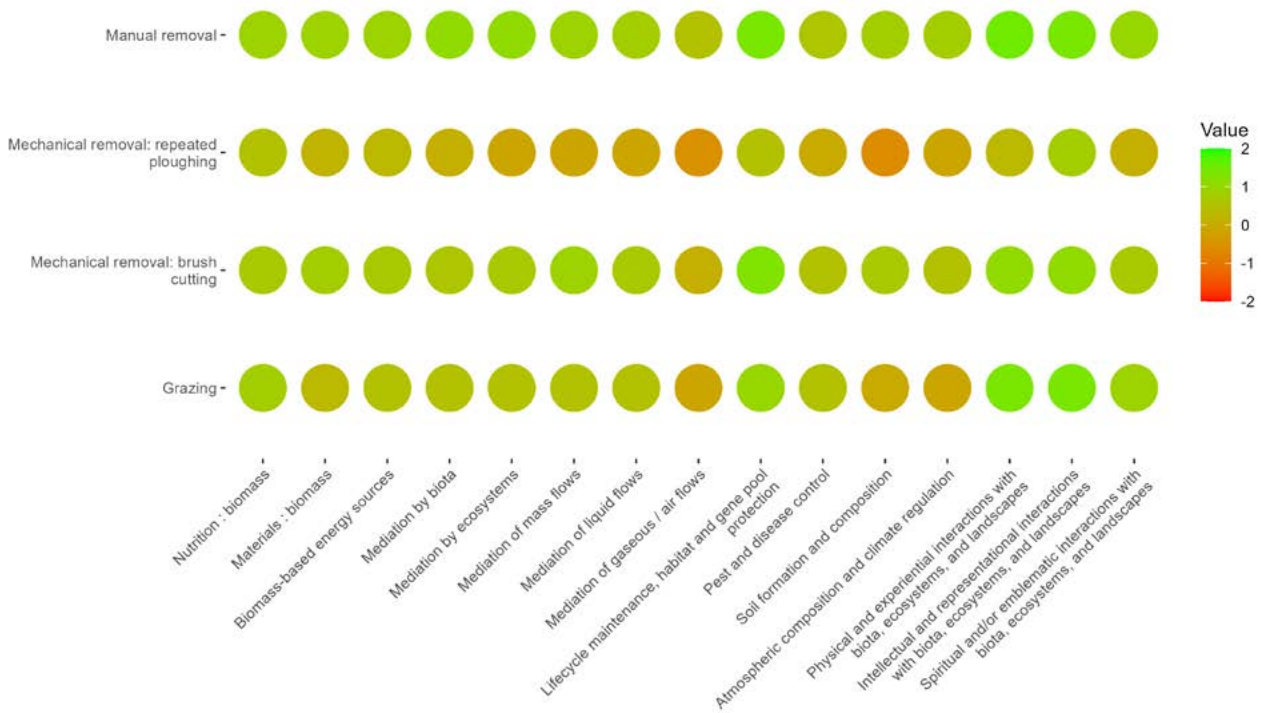

Fig 11. Matrix displaying the impact of management methods for riparian plant species on ecosystem services after 5 years

LIFE RIPARIAS

Reaching Integrated and Prompt Action in Response to Invasive Alien Species

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