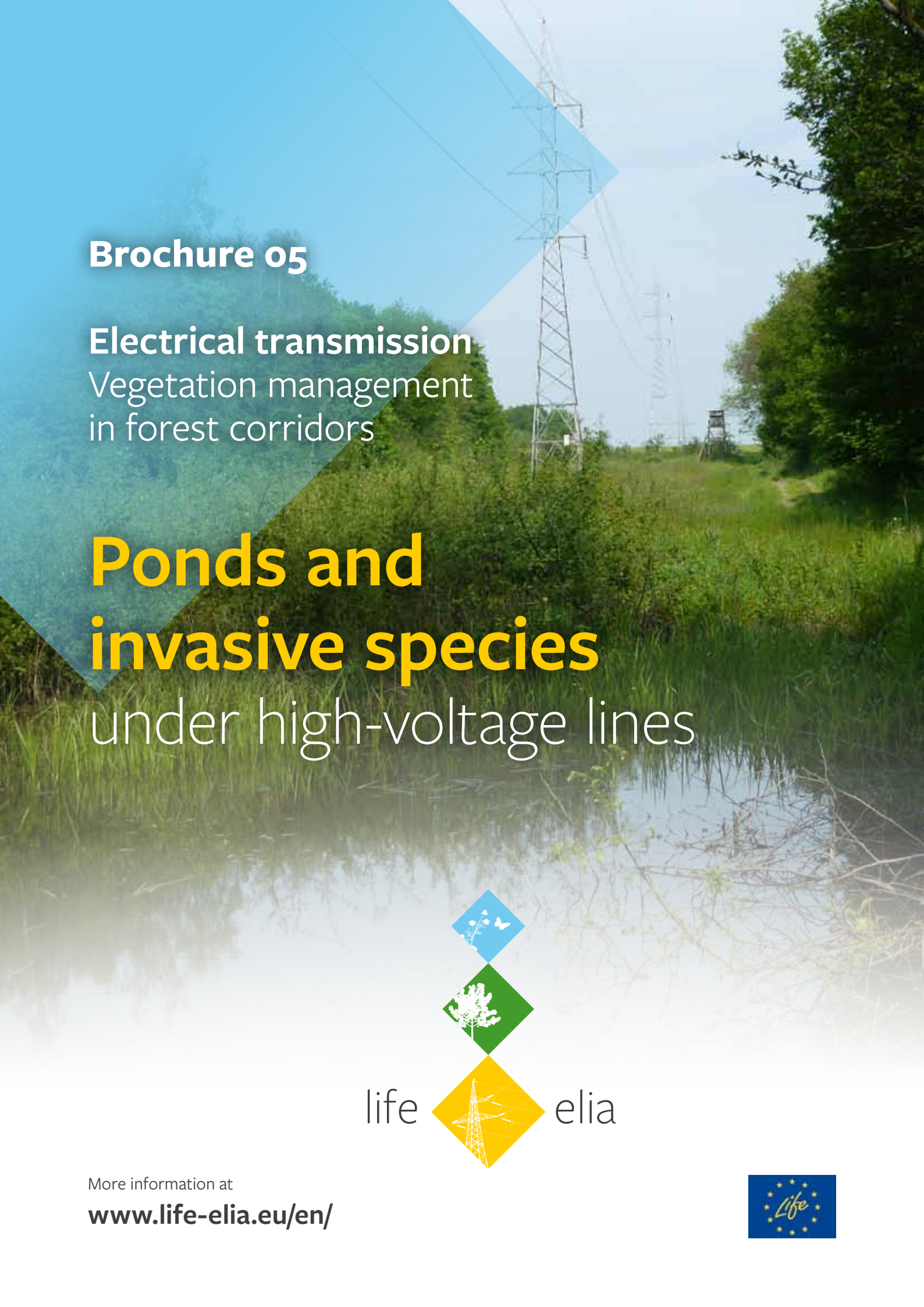

Brochure 05

Electrical transmission
Vegetation management
in forest corridors

Ponds and invasive species under high-voltage lines

life elia

More information at
www.life-elia.eu/en/

Summary

LIFE Elia-RTE
Using electricity transmission network routes as active vectors for positive developments in biodiversity

CE Reference
LIFE10 NAT/BE/709

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Partners

Elia – Powering a world in progress
Rte – Réseau de transport d'électricité
Wallonie
SPW – Service public de Wallonie

The LIFE Elia-RTE project is co-financed by the European Union’s LIFE+ programme.

1

Introduction

This brochure has been drafted by LIFE Elia-RTE's team. This 6.5 year project (2011-2017) is financed by the LIFE programme of the European Union, the Walloon Government, Elia and RTE, the latter two Transmission System Operators (TSOs) in Belgium and in France respectively.

The main objective of the project is to convert forest right-of-ways along the routes of high-voltage lines into ecological corridors in Belgium and in France. The restoration activities aim to establish innovative practices for managing the vegetation in these green corridors in the forest, and to raise awareness among various publics of the importance of biodiversity in these linear habitats.

2

Management of the vegetation under electrical lines

In forest areas in particular, management of vegetation is essential. The natural growth of seedlings and other new growth must be controlled at all times to guarantee that no current interruption will occur due to arcing from the line.

This precaution applies below the cables, but also on either side of them, to take account of swaying due to the wind, lengthening during the warmer months, and the risk of trees falling on the cables. Depending on the precautionary measures established by the TSO and the configurations of the terrain, this can result in a safety corridor over 50 m wide to be maintained.

One of the solutions most frequently adopted for managing the vegetation is to periodically clear it with tractor equipped with a rotary cutter.

This brochure deals with both creation of ponds, beneficial to biodiversity, and preventing and fighting the spread of invasive plant species, a hazard to biodiversity.

3

Ecological network and high-voltage network

Some species are struggling to cross a closed environment like forested areas. An open corridor like that formed by the high-voltage network in wooded areas allows these species to cross them. Placing ponds regularly along forest corridors allows amphibians to travel easily and so to colonise new areas and ensure genetic mixing of the populations. Dragonflies and a number of other aquatic insects will also benefit from better ecological connectivity. Ideally, these sites should not be too distant from one another to allow all the species to use them in travelling, feeding or reproduction.

The term amphibians includes frogs, toads (Anura), newts and salamanders (Urodela). They need ponds for reproduction and the development of their young; then they return to terrestrial environments. In following years, some of them return to the pond where they were born to reproduce in turn, while others go in search of new ponds to colonise.

While the electrical network is important for the movement of species, it also favours the propagation of undesirable species such as invasive species. The TSO has a role to play here in preventing the propagation of these species and implementing procedures to actively combat these species wherever possible.

Invasive species have been introduced into our countries deliberately or involuntarily, often for their aesthetic aspect. They adapt to our regional conditions and establish themselves easily, until they significantly compete with and then supplant the indigenous species. Invasive species are considered to be the third-largest cause of loss of biodiversity in the world (source: IUCN – International Union for Conservation of Nature).

4 Ponds

4.1. Semi-natural ponds

The ponds dug in the LIFE project are semi-natural; that is, they are manmade, but every effort is made to give them the same characteristics as natural ponds (no sheeting in the pond bed, irregular contours of the banks, no species introduced, etc.).

4.2. The advantage of a network of ponds

Since the end of the 90s in particular, the free dispersion of species thanks to interconnected natural habitats, essential for the genetic mixing of populations, has been taken into account more and more in projects for development and ongoing management of industrial infrastructures.

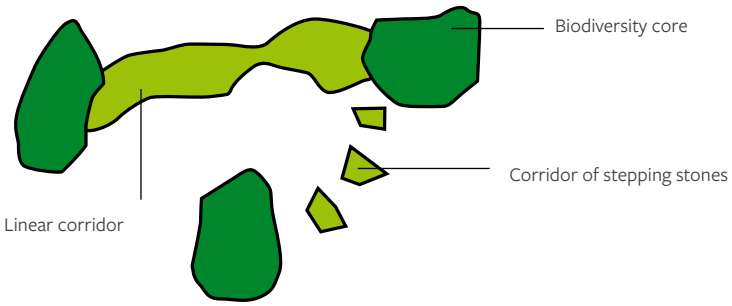
Natural ponds located in forest areas are rather rare. When they are present, they fill in rapidly due to the accumulation of organic matter, mainly leaves and branches.

Digging ponds in the electrical corridor has various advantages. For some species, a forested region of large area can seem to be an insurmountable wall. So the forest safety corridors for high-voltage lines and the associated open environments constitute advantageous routes of dispersion for a large number of species. The creation of ponds in the safety corridor of the line will facilitate their progress and so their dispersion. These ponds, preferably laid out in chains, will also constitute so many possible stopovers for animals in search of new territories (the concept of “stepping stones”).

In general, as long as water accumulates there rapidly, ponds are very quickly colonised by fauna. Among the first colonisers, aquatic bugs and beetles, newts and dragonflies often appear. The latter are in fact capable of covering large distances rapidly and so can quickly discover a new pond. Amphibians make their appearance there shortly thereafter. These animals are the prey of certain birds, so an entire food chain benefits from this. From the point of view of vegetation, algae, aquatic plants and shore plants will progressively establish themselves.

Aside from their undeniable ecological interest, ponds also constituent an excellent tool for raising awareness on nature conservation.

For the TSO, these ponds are sometimes an answer to problems of stagnant water in the vicinity of pylons or on the route of the patrollers. They allow water to be concentrated in one place and consequently help drain these too-wet areas.



Thierry Paternoster, biologist, SPW- DEMNA, Belgium

Since 1999, I have had the opportunity to follow a project initiated by the Public Service of Wallonia that consists of creating and restoring ponds in forests.

In the initial phase, dragonflies and other mobile species colonise the ponds dug. Then come the amphibians, caddisflies, and aquatic plants.

The creation of this network of ponds has in particular allowed the return of the small emerald spreadwing, a dragonfly that disappeared almost 60 years ago in Wallonia. In a few years, it has colonised dozens of ponds... distributed over several kilometres. This success emphasises the advantage of connecting areas like forest corridors under electrical lines.

4.3. Choice of location of the pond

When a semi-natural pond is to be dug, the decisive criterion in the choice of location is the possibility of a natural and regular water supply. This criterion is generally met in two particular cases:

- either the terrain is marshy, muddy or peaty by nature and it is mainly the water table that will supply the pond,
- or it is dug along the natural runoff path of rainwater that will thus constitute the water supply (this does not involve diverting streams, which requires authorisation in addition to that for digging). In this case in particular, the soil must have good water retention.

With a bit of experience and a good sense of observation, core sampling and even a soil map can be dispensed with in determining locations in which to dig. The presence of ruts under water, small stagnations of surface water or even a "muddy" terrain for a long period of the year are often good indicators to justify an emplacement. Observation of the herbaceous plants in the vicinity also sometimes substantiates these indices.

Soils that is too well drained (sandy or chalky, for example) are not suitable. Clay soil is much more conducive to accumulation of water.

From the point of view of the work of network maintenance teams, no pond has been dug in the less than 20 m away from the pylons. But this distance is left to the judgement of the TSOs. Maintenance and monitoring vehicles must keep an easy access to the pylons.

Once all these criteria have been taken into account, it will also be ensured that the pond is, ideally, dug in a sunny location and not too close from surrounding trees to avoid a fast sedimentation (natural filling).

Finally, on a Natura 2000 site, if certain habitats that are rare and of major biological importance (e.g., peaty or alluvial land, etc.) are under the line, the relevance of digging must be carefully evaluated in order not to destroy the natural environment in place.

The proper criteria for ideal emplacement:

- an area with a sufficient water supply
- at a sufficient distance from the pylons
- does not hinder the circulation of monitoring vehicles
- a sunny location
- not too close to large trees

4.4. Characteristics of the "ideal" pond

4.4.1. Area

In the framework of the LIFE Elia-RTE project, we mainly create ponds of around 100 to 150 m².

4.4.2. Shape and orientation

Gentle slope and pond in the course of filling just after it is dug

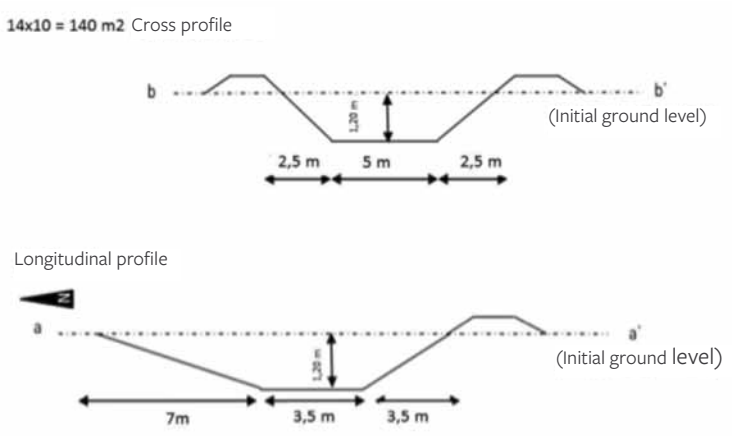
On flat land, the ponds are kidney-shaped, with the longer axis oriented east-west. The south-facing slope will be gentler than that facing north, in order to have a large shallow area that will favour rapid warming of the pond. On sloped land, the longer axis is oriented perpendicularly to the direction of the slope.

In order to increase the integration of the pond into the landscape and the number of micro-habitats favourable to fauna and flora, the contours of the pond will be laid out irregularly and in curves.

4.4.3. Slopes of the banks

The banks of the ponds are dug with a gentle slope (3 to 5°), which will facilitate the circulation of amphibians and, later, the establishment of vegetation.

The slopes are laid out so as to progressively converge toward a low point located about 1.2 metres below ground level. This low point will play the role of a refuge in the event of severe drought that leads to a significant drop in the water level.



4.4.5. No fish or plants introduced!

The ponds are left to their natural development, and introduction of plants and fish is prohibited for several reasons:

- fish consume insects, eggs of amphibians and plants present in the pond, thus causing troubles for the ecological balance
- plants or animals introduced may not be suited to the conditions of the environment
- plants for sale commercially are often ornamental varieties (e.g. pink water lily) or invasive species (e.g. water pennywort, water primrose, etc.).
- the introduction of various organisms can lead to the spread of virulent pathogens (chytridiomycosis in amphibians) and invasive species.

The administrative formalities

Depending on the size and emplacement of the ponds, a permit can sometimes be required by national, regional or local administrations. Depending on the country, the TSO will ensure compliance with these provisions.

A digging permit application file can include an environmental impact assessment notice, specifications of the location of the ponds, and location photos.

4.5. The earthworks

Unless the works operator has already done semi-natural ponds, the best way to ensure that high-quality work is produced is to be present the day the ponds are dug to advise the operator. The specifications sent to the operators will nevertheless delineate precisely the work to be conducted.

The pond digging work must take account of the following aspects:

- **dates and deadlines:** in order to avoid creating ruts on the access paths to the worksite, digging is ideally carried out on dry ground (for example, after 15/08 or on frozen ground). This provision is even more important when water is already abundant at the surface before digging. If the soil is muddy, the stability of the banks can in fact be jeopardised.
- **the equipment used:** the type of equipment can be either imposed or left to the judgement of the contractor depending on the specific features of the worksite. Most often a backhoe is used to perform the work. In order to limit the impact on the soil, points to which special attention is to be paid in particular are the width of the treads of the vehicle and its weight. Especially on sensitive soils, it is necessary to take precautionary measures like using organic oils, having an anti-pollution kit with in particular sorbent booms, etc.

- **the technical characteristics of the ponds:** location of the ponds, area of the ponds, profiles, etc. Markers that indicate the extremities of the four axes can be set up before work begins.
- **layout of an overflow outlet:** if overflow is possible (mainly slope areas), one or even two natural outlets should also be designed to avoid rupture of the bank due to pressure and erosion due to the water. This water overflow outlet should ideally be located at one of the extremities of the longest axis of the pond.
- **the access paths** that must be taken
- **management of the soil:** For the sake of cost reduction, it is preferable to spread the excavated earth around the pond (unless there is a habitat of high biological value around the pond), ideally at a height not exceeding 20 cm. The excavated earth will then be rapidly recolonised by the local flora. If there is a gentle slope, the excavated earth is used to build the embankment that will retain the water.

- **miscellaneous precautions:**

- the presence of high-voltage cables in the immediate proximity of the worksite demands absolute observance of a safety height into which entrance is strictly prohibited (including, for example, with the arm of a crane). This safety height varies depending on the voltage of the line.

- on very wet land (for example in a bog), the use of sheet metal for the circulation of work machinery can be necessary or even essential.

Philippe Mignon, contractor in Bastogne, Belgium

I have worked for Elia for a number of years, but my missions have evolved over time. Before the LIFE Elia-RTE project arrived, my missions were mostly safety-related: rotary cutting under the lines, hazard clearing, etc. Since 2011, I also carry out other types of work. So in addition to traditional rotary cutting, I also dig ponds or perform top peat removal (removal of the top layer of the soil) to restore moorland to heather, for example.

The LIFE Elia-RTE project constitutes a fine opportunity to diversify my activities and add to the knowhow of my team.

4.6. Estimation of the costs

Digging a 100 m² pond takes from three to five hours, depending in particular on the type of equipment used, the nature of the terrain and the experience of the operator.

Considering that most of the ponds dug in the framework of the project have an area close to 100 m², we estimate the average cost of each of them (transport included) at less than € 350 without VAT.

This cost can be reduced if the worksite includes a large number of ponds. By contrast, moving a machine to dig a single pond can significantly increase this unit cost.

4.7. Long-term management

Ponds are environments with a lifespan related to their size and depth; the smaller and shallower they are, the more quickly they fill in naturally. From the point of view of biodiversity, it is very advantageous in a network of ponds to have some that dry up or fill in more rapidly than others, in order to offer a broad spectrum of micro-habitats suitable to a large number of animal and plant species.

When the surface area and water depth start to decline, two solutions are possible: cleaning or digging a new pond nearby. As a series of species corresponds to each stage of evolution of the pond, it is preferable to dig a new pond.

Cleaning, which consists of removing the excess organic matter, must be done carefully, as care must be taken not to penetrate the watertight layer of soil at the bottom of the wet area. Ideally, it should be done during the winter dry period or at the beginning of autumn. During this operation, care will be taken to clean a maximum of only ¾ of the surface, and so to leave an unperturbed refuge area. The excavated mud can be stored for several days at the edge of the pond to allow the various organisms to escape from it. But it should ideally be removed subsequently to avoid enriching the soil (and so the pond) in nitrogen and so contributing to reduction in the variety of aquatic flora.

4.8. Some useful reading

- La vie des mares de nos campagnes. [The life of the ponds in our countryside] Graitson, E., Morelle, K. and Feremans, N. (2009).
  Collection agrinature no. 4. Public Service of Wallonia, Namur. 169 pp.
  Downloadable: http://www.agrinature.be/pdf/agrinature4.pdf
- Avis sur la création de mares en milieu forestier. [Recommendation on the creation of ponds in a forest environment] Motte, G., Laudelout, A., Delescaille, L.-M., Fichefet, V. with aid of Paternoster, Th. and Goffart, Ph. (2012). DEMNA and Natagora, 11 pp.
  Downloadable: http://environnement.wallonie.be/publi/dnf/Guide_mares_foret.pdf

5 Invasive species

The presence of corridors and so of open environments in a forest area is advantageous for biodiversity. However, these stretches can become vectors for the spread of invasive plant species.

Propagation of these species is often accidental (via fragments released during crushing or in clandestine disposal of garden waste). It can be reduced, in particular by raising awareness of the public and of managers, but also by promoting proper techniques for prevention and management.

Although there are also numerous invasive animal species, we will only deal with plant species here, as it is mainly on these that management of the corridors can have an impact.

The European Commission has also studied the issue of invasive species and has drawn up a list of species that cannot be sold anymore. It has drafted a regulation on prevention and management of introduction and propagation of invasive exotic species in Europe.

5.1. What is an invasive species?

The definition proposed on the AlterIAS platform (http://www.alterias.be/fr/) is the following:

“Invasive plants are plant species that:

- have been introduced by man (deliberately or accidentally) outside their natural distribution area (these are the so-called ‘exotic’ species)
- have been introduced after 1500
- are capable of becoming naturalised, that is, surviving and reproducing in nature
- have a high capacity for dispersion, leading to a sizeable increase in their populations.”

5.2. Attempts to control three invasive plants

Fortunately, not all the invasive plant species are found under the high-voltage network, but some are more problematic than others. This section will deal with several species to which special attention must be given, either to prevent their establishment or to avoid their propagation.

In Wallonia, three main invasive plants are found in electrical corridors: Japanese knotweeds, black cherry and goldenrod.

Etienne Branquart, Interdepartmental invasive species unit, SPW-DEMNA, Belgium

Invasive plants - or invasive exotic plants - represent a significant threat to biodiversity. They tend to form dense populations in semi-natural environments and to supplant the species that develop there. Once they are established it is very difficult to dislodge them, as they regrow vigorously after mowing and regenerate abundantly from seeds or fragments of subterranean organs contained in the soil. Therefore every effort must be made not to introduce them, avoiding in particular bringing in fill dirt and garden waste contaminated by these plants.

5.2.1. Japanese knotweeds

Description

Japanese knotweeds constitute a group composed of three species: the Japanese knotweed Fallopia japonica (*Houtt.*), the Sakhalin knotweed *Fallopia sachalinensis* (*F. Schmidt Petrop.*), and the hybrid knotweed Fallopia X bohemica (*Chrtek & Chrtkova*).

These plants, which with their large hollow stalk can recall bamboo, are extremely invasive. They have a sprawling root system that allows them to rapidly create very extensive and dense colonies that stifle indigenous plants through lack of access to light. This supremacy is further heightened by the fact that knotweeds release substances into the soil that inhibit the growth of other plants.

Their root system can extend up to 25 m horizontally and descend 3 to 7 m deep.

Identification

These are perennial herbaceous plants with sturdy erect hollow bamboo-like stalks that can range up to 4 m high. The species produces white flowers.

Threat and dispersion

The greatest problem posed by knotweeds is their substantial capacity for vegetative regeneration; a fragment of a few grams of rhizome (a type of root) or stalk (especially if it includes a node) suffices to give rise to a new plant!

Knotweed populations thus have a tendency to expand step by step via projections of fragments or the accidental deposition of pieces spread by management machinery. This is therefore a major risk in standard management of the vegetation under lines by rotary cutting. **Given this, management techniques that generate fragments, that is, rotary cutting and string trimming, must be avoided at all costs.**

Specific management

A large number of management techniques have already been tested almost everywhere in Europe (repeated mowing with or without exportation, cutting and herbicide treatment combined, injection of herbicide product alone, control with fire, sheeting, etc.) but to date none has managed to irreversibly eradicate the populations in place, especially when they are large. In a good number of the cases cited above, the effect is sometimes even contrary to that desired; the number of stalks or their density increases after management!

Knotweed grazed and trampled by a flock of sheep

Under high-voltage lines, any type of crushing will be prohibited **in a radius of 5 m** around the population in place.

The area to be avoided must be delimited with coloured markers or tape and the methods for avoidance cited in Knotweeds grazed and trampled by a flock of red Ardennes sheep the specifications.

Aside from these preventive measures, active control can be conducted in the following cases:

→ **Plantings in a knotweed area:** for this purpose, indigenous shrubs with rapid growth and dense foliage can be planted in the middle of knotweed beds. The aim is to get ahead of the knotweed by creating a shade situation that will be unfavourable to them as quickly as possible. The hazel tree is undoubtedly the species to be preferred in this case.

A dense planting can be made on the basis of one plant every 50 cm along the line and 1 metre between the lines. Planting will be done during the winter, after the knotweed is removed and heaped at the edge of the corridor. In the course of the first two years, it may also be necessary to extricate the shrubs planted, so that they are not submerged under knotweed. This is done by manually pulling the knotweed at the base. The stalks removed must either be left to dry in place and then burned, or conveyed (sheeted load) to an industrial composting centre.

→ **Knotweed grazed by livestock:** On sites highly infested with knotweed, fencing off the area in order to let it be grazed can also be considered. The choice of the type of fence (fixed or mobile) will depend on the size of the knotweed population, the ideal being that the livestock have few other food resources and are constrained to consume the knotweed.

However, as beds of knotweed offer little plant life diversity by definition, the choice of the species to allow to graze will lean toward hardy species, especially goats and sheep.

5.2.1. The black cherry

Description

The black cherry Prunus serotina Ehrh. is a shrub or small tree that can reach approximately 12 m in height.

Flowering black cherry © M. Halford

Black cherry with fruit

Identification

The species has alternating lanceolate leaves. Their upper side is shiny while their underside is matt, with a reddish-brown pubescence along the midrib.

The flowers of this species are white, scented and arranged in terminal clusters.

Like others of the same family, this species produces small black fruits similar to small cherries at maturity.

Threat and dispersion

This American specie has two dispersal strategies. It produces numerous fruits that can be spread by birds, and it produces many sprouts and suckers (shoots starting from the roots), especially when it is cut.

The black cherry can occupy space quickly and, with its abundant branches and foliage, limit the light reaching the ground and so also the growth of indigenous plants.

Specific management

Manual pulling of young black cherry shoots

In the initial stages of infestation, it can be controlled by manually pulling out the seedlings.

With mature plants, priority should be given to working on the seed trees before the fruit production period. They are cut with a chainsaw at a one metre high, which reduces the tendency to suckering. Debarking (total removal of the bark over a height of at least 10 cm) can complete the treatment.

The black cherry can also be controlled by relying on competition for light.

To do this, indigenous shrubs that create a great deal of shade, like the hazel tree, can be planted after the invasive plants are cut.

Once management has begun, it is imperative to pass through at least once annually during the growth period in order to repeat the process.

5.2.3. Goldenrods

Description

Two goldenrods are recognised as invasive plants in Belgium. These are the Canadian goldenrod Solidago canadensis L. and the giant or smooth goldenrod *Solidago gigantea* Ait. These two North American species are very close morphologically and ecologically; they will therefore be discussed together.

Identification

Goldenrods © E. Delbart

Goldenrods are herbaceous plants reaching 50 cm to 2 m in height, with yellow flowers grouped in a sort of spike. The aboveground part of these plants is annual, while the rhizomes are perennial. The leaves are lanceolate and serrated.

Threat

These species tend to form very dense single-species populations that very severely limit the establishment of indigenous plant species, including trees.

Specific management

These species owe their high capacity for dispersion to their substantial production of seeds spread by the wind. It seems that populations in place also spread laterally thanks to their rhizomes.

The most effective way to control it, and undoubtedly the easiest to implement, is mowing/crushing, which ideally should occur twice a year. It should be done first before flowering (or in June at the latest) and a second time in August. If only one intervention annually is feasible, it must be done before flowering to avoid any seed production.

The mown matter should ideally be gathered and heaped at the edge of the infested area. This management at several sites usually has a beneficial effect (reduction of the population in place) after several years of repetition. It is essential not to stop management before complete eradication, as abandoning management can re-energise the species.

5.3. Awareness and prevention

Awareness and prevention are important means of control, considering the sometimes significant costs related to active control of these invasive plants.

5.3.1. Awareness

Management of invasive plants necessarily involves raising the awareness of, and training, personnel, both those within the TSO and those of subcontractors involved in maintenance of the vegetation in the safety corridors.

5.3.2. Prevention

The main ways that invasive plants enter include accidental imports of plant fragments via worksite machinery and clandestine disposal of vegetation (pruning waste, clippings, etc.). In fact, management machinery (grinder, for example) of course goes from one site to another and fragments of species such as Japanese knotweed may thus be transported and dispersed. This being the case, it is essential to delineate the infested areas to exclude them from the worksites and so avoid accidental dispersion.

Along the same lines, if earth must be moved, it must be absolutely ensured that it does not contain invasive species. If so (and in particular in the case of Japanese knotweed), this earth is unsuitable for use and must be put in landfills.

For any worksite aiming to manage an invasive plant, or a worksite on a site where an invasive plant is present, the specifications must include technical notifications that are as precise as possible to ensure adequate management or implementation of measures to avoid dispersion.

5.4. Some useful reading

- Website of the LIFE ALTERIAS project: http://www.alterias.be/fr/. The AlterIAS project (http://www.alterias.be/en) is a Belgian LIFE project aiming to ensure communication and raise awareness of the issue of invasive plant species.
- Website, Invasive Species in Belgium: http://ias.biodiversity.be/
- Website of the Public Service of Wallonia: http://biodiversite.wallonie.be/invasives.
- Faut-il lutter ou vivre avec? Le cas de l'invasion par le Cerisier tardif, Prunus serotina. [Fight it or live with it? The case of invasion by the black cherry, Prunus serotina] Jacquemart, A.-L., Decocq, G., Vanhellemont, M. and Verheyen, K. (2010). Silva Belgica 117(3): 16-22. Downloadable: http://biodiversite.wallonie.be/servlet/Repository/?ID=28799

Implementation areas

In Belgium (Walloon Region):

- 55 km of electrical corridors

In France:

7 sites spread on different biogeographic zones

- Atlantic: Finistère, Seine-et-Marne
- Continental: Aube, Ardennes, Doubs
- Mediterranean: Drôme
- Alpine: Hautes-Alpes

Follow the project at:

www.life-elia.eu/en/