



Asian knotweed

(*Reynoutria* spp.)

Managing Japanese knotweed in the Gardons basin

Board for balanced management of the Gardons basin (SMAGE)

■ The SMAGE is a public river-basin territorial agency (EPTB) created in 1995 that represents 122 towns in the Gardons river basin (2 000 square kilometres on the right bank of the Rhône River) and the departmental council of the Gard department.

■ It is the project manager for the SBMP (sub-basin management plan) and for the Gardons river contract. It has set up consistent, basin-wide policies for:

- flood prevention;
- management of water resources;
- preservation and restoration of aquatic environments.

■ Since 2009, management of invasive plant species has become an important part of the policy for natural environments.

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Intervention site

■ The Gardon River flows through the heart of the Languedoc-Roussillon region. The river and its tributaries originate in the Cévennes mountains, in the Lozère department. They flow through the Gard department and into the Rhône River.

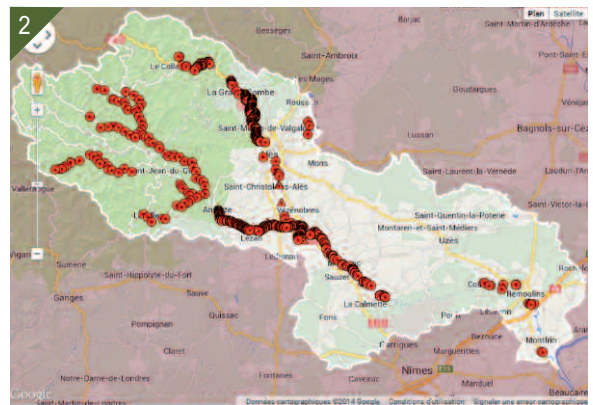
■ The Gardons basin comprises many remarkable aquatic environments (Cévennes national park, Galeizon biosphere reserve, Natura 2000 sites, the Gardon gorges) that are home to an array of emblematic species such as the European beaver and the otter, Bonelli's eagle, shad, eels, bug orchids and summer lady's-tresses.

■ A large number of invasive species have been observed in the rivers of the basin. Given the size of the area (2 000 kilometres of river including 500 km of large rivers), a multi-year management plan was set up in 2011. The plan includes work on water primrose, knotweed, amorpha and summer lilac, as well as research, early-detection efforts and awareness raising.

■ The Gardons basin is heavily impacted by Asian knotweed. The area in the Cévennes mountains down to Vézénobres is widely infested and the situation is considered irreversible in most places. The Gardon d'Alès River is a local exception upstream of Collet-de-Dèze and downstream



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1. Map showing the Gardons basin.

2. Map showing the location of Japanese knotweed colonies. Note. The map above shows all the known sites. The surveys were conducted with varying degrees of accuracy and the density of points does not necessarily correspond to the actual degree of colonisation. The map should be interpreted as simply indicating the presence or the absence of knotweed.

of Alès. In the Gardonnenque and lower Gardon areas, the plants are less heavily established and management work is undertaken in those places where it is thought to be effective. The tributaries (outside the Cévennes) are not yet impacted by Japanese knotweed and active monitoring is carried out regularly.



Disturbances and issues involved

■ Impact on bank stability and on flooding

- The presence of the plants destabilises steep banks (shallow root system and withering of the above-ground parts of the plant in the winter).
- It also limits the mobility of gravel bars during flooding.

■ Impact on native plants and on habitats

- In some places, other species can be eliminated through competition and a reduction of sunlight.
- Large stands of knotweed reduce the diversity of habitats.

■ Impact on the landscape and on human activities

- The plants produce a more uniform landscape, are highly unsightly in the winter and make access to and circulation on river banks more difficult.

Interventions

■ A joint approach

■ In 2009, a steering committee for invasive plant species was set up by the water stakeholders in the river basin to identify their mutual needs and define the necessary monitoring and management work to be divided among the managers of natural areas. Since 2011, a number of different management techniques have been implemented and inventories using GPS data have been carried out on the main rivers.

■ The management plan includes more or less ambitious projects for plant species other than the invasive knotweed species, e.g. water primrose, summer lilac, amorpha, giant hogweed. Research is also being done, in conjunction with ANSES (the Agency for food, environmental and occupational health & safety) on an emerging species, Japanese hop (*Humulus japonicus*). Finally, a general monitoring system for the entire river basin is being progressively set up.

■ The work done by the Gardons SMAGE on invasive knotweed is presented below. However, a number of other local managers also organise manual uprooting and awareness raising, e.g. the Galeizon board, the Alès urban area, the Natura 2000 Mialet site, etc.).

■ Manual uprooting

■ Grand'Combien site (since 2009), in the framework of a citizen project to recover a neglected urban sector. Joint management of work to open paths and remove Japanese knotweed along a 3-kilometre section of river banks:

- regular manual uprooting of the knotweed, 3 to 6 interventions between April and October;
- opening and maintenance of a discovery trail along the banks.

■ Cendras sector (since 2009). Monitoring of 18 sites where regrowth was manually uprooted. Approximately 35 square metres were mechanically uprooted in 2013.

■ Collet-de-Dèze site. Uprooting of 1 square metre of isolated knotweed in the upstream section of the river basin in 2012. The site was monitored in 2013.



3. Manual uprooting of knotweed.
4. The uprooted material is sent two or three times through the grinder.
5. Grinder in the bucket.
6. The ground material is deposited in the hole from which the plants were uprooted.
7. It is then covered with a biodegradable fabric.

■ Manual uprooting with mechanical assistance

■ Sainte Croix-Vallée française site. Six mats of knotweed were uprooted manually or with mechanical assistance in 2012, along a kilometre of river in the uppermost colonised area on this tributary. This work was followed by manual uprooting of the regrowth in 2013 and 2014.

■ Manual derooting with mechanical assistance

■ This technique consists of manually removing the rhizomes from a large volume of soil progressively cleared by an excavator. It should be used only for small to mid-sized mats of plants.

■ This work was carried out in 2010 on 46 mats of knotweed representing a total of 204 square metres spread over six kilometres along the downstream Gardon d'Alès River.

■ Grinding-tarpping of the waste and rhizomes

■ This technique was developed and implemented by the Concept Cours d'Eau consulting firm. An initial test phase was conducted on a pilot site in Grand'Combe in 2011-2012, prior to large-scale implementation in 2013.

■ In 2013, work was carried out in two main sectors, namely on the downstream Gardon d'Alès River and the downstream Gardonnenque River. A total of 202 mats representing 886 square metres of stalks were split into four groups along 20 kilometres of river:

- the waste was sent through a crusher-grinder bucket two or three times on site;
- the waste was returned to the hole and covered with a tarp to inhibit regrowth and accelerate rotting of the rhizomes;
- the tarps were then covered with healthy soil from the site to reduce any risk of the waste being exposed during flooding;
- any regrowth from dispersed fragments was uprooted the following year;
- the sites are monitored.

■ Initially, the technique called for plastic tarps to be used to cover the waste. However, given that plastic tarps had to be mechanically removed and that the sectors spanned a large area (20 km) subject to flooding, it was decided to use a thick, biodegradable fabric made of hemp and burlap (1 200 grammes per square metre).

Results and costs

■ Manual uprooting

■ On the Grand'Combien site, five years after the intervention, the results are very positive. The knotweed has retreated along the entire river section and only rare shoots may now be found. The general public is present on the banks much more often and the quantity of waste thrown by local residents from the road has dropped regularly. The work using unemployed people had a positive social impact in that the project was fully supported by the employees of the Cévennes development association (TEDAC) and approved by the local residents.

■ In the Cendras sector, of the 18 mats uprooted, new shoots were present on 12 in April, but on only 7 in October. Concerning the 35 square metres uprooted mechanically in 2012, the results are satisfactory in that very little new growth had to be uprooted in 2013. In the other sectors, the reduction in the quantity of regrowth has continued.



8. 9. The Grand'Combe sector colonised by Japanese knotweed in 2009 and after the work in 2013.



■ Manual uprooting with mechanical assistance

■ Collet-de-Dèze site. Monitoring in 2013 of the treated site confirmed that the work in 2012 resulted in the disappearance of knotweed from the site. Monitoring nonetheless continues.

■ Sainte Croix- Vallée française site. Only one of the sites was insufficiently treated and regrowth in the hole would indicate that the deepest rhizomes were not removed. On the other sites, the results are positive and it may be assumed that knotweed will soon be eliminated from the sector.

■ Manual derooting with mechanical assistance

■ This technique is highly effective in that it definitively eliminated the knotweed colonies from approximately 30 sites. Colonisation of the other sites has fallen back significantly and the regrowth is managed on an annual basis. However, its implementation requires very meticulous work and should be reserved for mats less than a few square metres in size.

■ Grinding-tarpping of the waste and rhizomes

■ Additional mats of knotweed were discovered during the work, unfortunately the original budget was not sufficient to treat all the colonised areas. It was nonetheless possible to remove most of the knotweed present in the selected sectors and to treat all the priority sites (landings and areas affected by flooding).

■ Some problems were encountered with the biodegradable fabric (used to replace the plastic tarp):

- the fabric degraded very rapidly once buried, thus making it easier for rhizome shoots to push through;
- the highly permeable fabric prolonged the life of the rhizomes because it did not block water or air.

■ Consequently, the biodegradable fabric will no longer be used and the monitoring programme in 2014 will provide information on success of the measure. The grinding-tarpping technique using a plastic tarp will be tested on a few strategic sites in 2014.

■ Human and financial aspects

Summary table of the techniques used, the results and the costs.

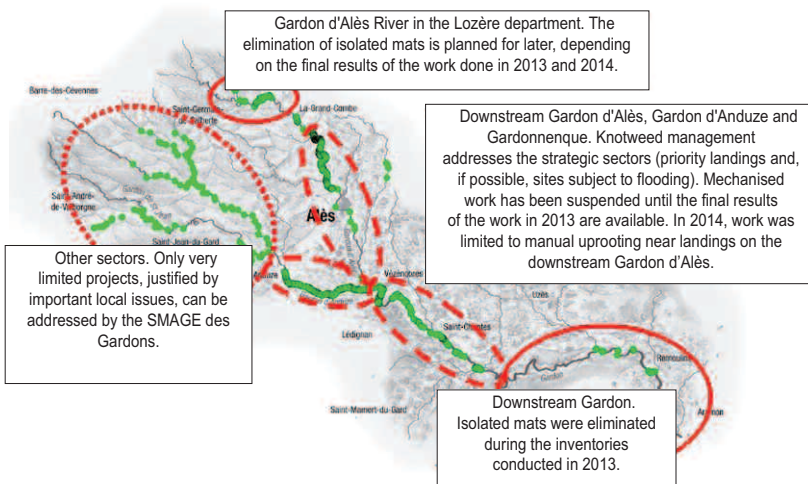
Site	Technique	Linear distance	Surface area *	Cost not incl. VAT (2013)	Duration
Grand'Combien	Manual uprooting	3 km	Widespread colonisation over 50% of linear distance	34 220	29 weeks per year since 2009
Cendras	Manual and mechanical uprooting	2 km	18 mats with scattered regrowth	4 890	1 week per month in 2013
Collet-de-Dèze	Manual uprooting with mechanical assistance	Isolated site		400	1 day in 2012
Croix Vallée-Vallée française	Manual uprooting with mechanical assistance	1 km	6 mats and 40 m ²	10 886	2 weeks in 2012
Downstream Gardon d'Alès	Manual derooting with mechanical assistance	6 km	46 mats and 206 m ²	55 420	6 months in 2010
Downstream Gardon d'Alès and downstream Gardonnenque	Grinding-tarpping	20 km	202 mats and 886 m ²	255 168	4 months for 4 sectors in 2013

* The unit of measure is the surface area covered by dense stalks at ground level. The surface areas effectively treated during interventions are much larger because they extend, on average, 1.5 metres beyond the visible stalks.

Outlook

■ The management plan for Japanese knotweed was regularly adjusted taking into account the work assessments and the inventories carried out in 2012 and 2013. Depending on the degree of colonisation along rivers by the plant, specific strategies have been formulated:

- heavily colonised areas are not included in the management plan given the excessive human and financial resources required and the technical difficulties;
- for areas less severely colonised, the work focusses on the most important sectors (urban areas, priority landings);
- for isolated sites, the work is undertaken immediately.



Map showing the location of Japanese knotweed along the Gardons Rivers in 2013 (prior to the work on the downstream Gardon d'Alès and the Gardonnenque). Green dots indicate the presence of Japanese knotweed.

Map showing the sites for the various techniques employed. © SMAGE des Gardons

Information on the project

■ An internet site with mapping applications for early detection of new species and monitoring of established species was created. It can be used by persons having observed a plant to signal the observation. It also serves for disseminating links, photos and information on invasive species to facilitate their identification and locate their presence in the Gardons basin:

<http://invasives.les-gardons.com>

The site is intended for collective monitoring of the river basin and to improve the effectiveness of management in sectors where colonisation has just begun.

■ Presentation of the management plan during various meetings (symposium on management of non-agricultural areas organised by AFPP in Toulouse, October 2013, work group of managers for protected natural areas in the Languedoc-Roussillon region, ATEN, etc.).

■ During various events (flower shows, plant sales, fishing events, etc.), stands informing on invasive plant species are set up.

■ Efforts to raise awareness are made via local radios, the press, town bulletins, public meetings and signs on work sites.

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For more information

- www.les-gardons.fr
- <http://invasives.les-gardons.com/>
- SMAGE des Gardons, 2014. Management plan for invasive plant species in the Gardons basin. Report on work in 2012 and 2013. 27 pp.

