



Curly Waterweed

(Lagarosiphon major)

Managing curly waterweed in the Salagou reservoir (Hérault department)

Hérault departmental council

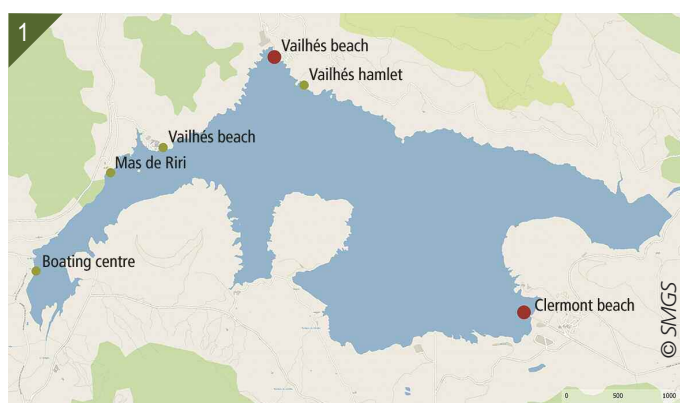
- The department owns the Salagou dam, the reservoir (750 hectares) and its banks (1 000 ha). It is consequently responsible for maintaining and managing the water body.
- In 2014, the department set up a five-year plan to monitor and limit the spread of invasive alien plants in the Salagou and Olivettes reservoirs.
- It provides technical assistance and funding for work to limit curly waterweed in the Salagou reservoir.
- Contact: Corinne Roumagnac, policy officer for water, risks and littoral zones - croumagnac@herault.fr

Grand Site Salagou-Cirque de Mourèze (SMGS) board

- The board was founded in 2005. Members include the Hérault department and the Clermontais, the Lodévois et Larzac and the Grand Orb intermunicipal boards.
- Its mission is to manage the entire Grand Site Salagou-Cirque de Mourèze, which covers a total of almost 10 000 hectares.
- In its work to preserve landscapes, the board coordinates management projects for invasive alien species (water primrose, curly waterweed, etc.).
- Contact: Victoria Dubus, Natura 2000 policy officer - victoria.dubus@lesalagou.fr

Intervention site

- The purpose of the Salagou reservoir, created following the construction of the dam on the Salagou River in the 1960s, was to provide water for irrigation and regulate the flow of the Hérault River. The reservoir covers 750 hectares in the towns of Clermont l'Hérault, Liausson, Octon, Salasc, Celles and Le Puech.
- The humid environment stands in stark contrast to the surrounding dry landscape of ruffes¹. The mouth of the Salagou River and the banks of the lake are listed under the Landscapes law (1930) and as Natura 2000 (special protection zone for birds) and ZNIEFF (natural zone with high ecological value) sites.
- The reservoir is now the site of numerous recreational activities.
- The presence of curly waterweed in the reservoir was first observed by the Porquerolles National botanical



Key
 ● Mechanical harvesting
 ● Manual uprooting

1. Sites where work on curly waterweed was done in the Salagou reservoir in 2014.

2, 3. Beds of curly waterweed in the Salagou reservoir.

conservatory in 2009. Then in 2011, the department ran an underwater inspection that revealed that the species existed virtually everywhere along the perimeter of the reservoir and was spreading rapidly. The plants grow in the water from the banks to a depth of five metres and are visible at the water surface from the spring to the fall (during the winter, the stems lie on the bottom).



Disturbances and issues involved

- The thick mat formed by curly waterweed prevents the development of other submergent plants and encourages sedimentation by blocking sediment particles among the plants and due to the deposit of plant fragments on the bottom.
- The plants also hinder recreational activities on and around the reservoir (boating, swimming).
- On the other hand, the dense beds of curly waterweed would seem to benefit certain species, notably as a spawning ground for fish (carp, pike, etc.) and for nesting by birds (coots, grebes, etc.). Before the arrival of curly waterweed, very few submergent beds of plants existed in the reservoir.
- On the basis of this information, the department set up a five-year plan (2014-2018) to monitor and limit the spread of the species, in order to better understand its proliferation and to determine how to optimise the role of each stakeholder involved in its management.

Interventions

- Given the size of the colonised area and the high growth rates of the plant, curly waterweed could not be eradicated. The intervention had to be adapted to the available human resources and to the technical limitations weighing on the local governments. Priorities were set, i.e. the management work focussed on the sites receiving large numbers of tourists.
- Each year, a company was hired by the town of Clermont l'Hérault and by the Lodévois et Larzac intermunicipal board to harvest the plants over respective surface areas of 10 000 (Clermont beach) and 5 000 (Vailhès bay) square metres.
- At the request of the tourism companies and the towns, volunteer work sites for manual uprooting of the plants have been organised since 2014 on beaches receiving moderate numbers of people.
- These work sites are organised by the SMGS board.

■ Mechanical harvesting

- This technique was used for the Clermont beach from 2013 to 2017 and in the Vailhès bay from 2013 to 2016.
- The company used a harvester boat that collects the plants immediately after they have been cut. The maximum cutting depth was three metres.
- A net was installed around the work zone to avoid the dispersal of plant fragments.
- Each year, the surface area harvested depended on the local conditions, the water level and the development of the plant beds.
- The company also handled the plant waste produced by the work. Following temporary storage to dry the plants, the waste was sent to the composting unit of the nearest civic amenity site.

■ Volunteer work sites

- Different techniques were used, depending on the configuration of each site and the available means:
 - purely manual uprooting, from the bank or in the water, to a depth accessible on foot;
 - uprooting using a rake, from the bank or in the water;
 - manual uprooting from a boat (skiff, canoe), by hand or by making circular movements in the plant bed with a rake;



4. Harvester boat.

5. A test on dragging the plants using a cable.

6, 7, 8. Manual uprooting by volunteers.

- mechanised uprooting by running a chain or cable around a part of the bed and pulling the plants out with a four-wheel drive vehicle or a tractor.

- The harvested areas were geolocated (GPS coordinates) in order to monitor over several years the changes in the plant colonies.

During the initial work, nets supplied by the departmental council were installed around the harvested zones in order to avoid the dispersal of plant fragments by water currents and the wind. However, due to the size of the harvested areas and the depth of the reservoir, the nets were not suited to the work conditions and ineffective. They have not been reused to date.

- The plant waste produced by the work was composted on site, on dry surfaces and at a distance of at least five metres from the reservoir.

■ Tests on mechanical uprooting

- In 2017, the Lodévois et Larzac intermunicipal board experimented with a second technique in view of improving the effectiveness of the work and reducing the cost.

- When the Vailhés beach was originally created, a layer of coarse gravel was put down in the water, which later enabled the curly waterweed to take root. The project was therefore to scrape the layer of gravel in order to remove the curly waterweed and its root system.

- The work was done from the bank by an excavator equipped with a special scraper blade. The collected plants were placed in a dumper. The plants were initially deposited near the reservoir to dry and were then sent to a nearby field, owned by the town of Lodève, for composting.

Results and costs

■ Results

- The work enabled the pursuit of recreational activities by removing the plants from the bathing zone and facilitating the passage of recreational craft from the bank to the open water.

- Following several years of work, the colonisation of the reservoir by curly waterweed would not seem to have slowed. It is, however, very difficult to monitor changes in the plant beds and to assess the effectiveness of the various work methods because the density and growth rates of the beds depends on a large number of parameters, i.e. sunlight, annual changes in high and low water levels, the water level during the growth period, water temperature, etc.

- The technique used to manage the curly waterweed in the Vailhés bay using an excavator could be significantly improved. The yield in terms of plants is low when the density of curly waterweed is low and the work is limited to the depth of water accessible to “terrestrial” equipment.

- The technique involving setting cables from a boat is more effective and makes it possible to remove the alevins caught up in the mass of plants and to put them back into the water. For the next campaign, the plan is to uproot the curly waterweed using a winch set up on the banks. Unfortunately, this technique does not remove the entire root system with the plant.

- After four years of manual uprooting, it would appear that the density and vigour of the plant bed on one site harvested each year, the Mas de Riri, has declined. It should be noted, however, that this observation must be weighted against the changing weather conditions and is not confirmed by similar observations on other sites.



9. The excavator in action.

10. Curly waterweed deposited to dry.

■ Costs

- The mechanised harvesting work by the company takes two days on each site, i.e. four days total each year. In 2017, the experiment with the excavator working from the bank occupied company personnel a further day.
- The volunteer work involved between ten and thirty people on each work site.

Results of the work from 2013 to 2017.

Year	Town of Clermont l'Hérault				Lodévois et Larzac intermunicipal board			
	Dates	Surface area (sq. metres)	Volume (cubic metres)	Cost in euros, not incl. VAT	Dates	Surface area (sq. metres)	Volume (cubic metres)	Cost in euros, not incl. VAT
2013	First week of July	No data			No data			
2014	Last week of June	13 000	30 after drying for one week	6 600	Last week of June	5 000	No data	5 200
2015	Last week of June	10 000	16 after drying for one week	10 000	24 and 26 June	3 800	No data	6 000
2016	No data				No data			
2017	No data				14 and 16 June	6 000	150	4 776 € incl. VAT

Results of the volunteer work sites (coloured zones = no work)

		2014	2015	2016	2017
Boating centre (Octon)	Date	12 June	20 June	29 June	1er July
	Number of volunteers	22	20	11	10
	Surface area (sq. metres)	335	230	805	1 011
	Volume extracted (cubic metres)	12	6	No data	No data
Mas de Riri (Celles)	Date	5 July		25 June	24 June
	Number of volunteers	34		25	30
	Surface area (sq. metres)	1 025		790	2 615
	Volume extracted (cubic metres)	20		160	No data
Open-air recreational site (Clermont l'Hérault)	Date			11 and 12 March	April
	Number of volunteers			20	15
	Surface area (sq. metres)			1 000	1 000
	Volume extracted (cubic metres)			80	No data
Celles	Date	13 July			
	Number of volunteers	13			
	Surface area (sq. metres)	230			
	Volume extracted (cubic metres)	3			
Vailhès hamlet	Date	19 July			
	Number of volunteers	17			
	Surface area (sq. metres)	360			
	Volume extracted (cubic metres)	7			

Information on the project

- A brochure to raise awareness concerning alien plants was prepared and distributed in the Hérault department.

Outlook

- The work to limit curly waterweed will continue in order to enable the pursuit of recreational activities in the Salagou reservoir. The coordination of the work between the various stakeholders could be improved.
- One option would be to experiment with covering the curly waterweed in a test zone using screens made of a natural fabric (a geotextile made of burlap). This technique was tested in Ireland (http://www.onema.fr/sites/default/files/Grand_Lagarosiphon_R2.pdf) and in the Landes department in France (<http://www.gt-ibma.eu/wp-content/uploads/2017/01/6-Egerie-lac-21-09-16.pdf>) where it produced good results, however, the very different climate conditions in the Mediterranean environment must also be taken into account. The issues of project management and funding must also be clarified.
- Efforts must also be pursued to improve the monitoring system, given the difficulties in interpreting the data due to the fluctuating environmental parameters from one year to the next.
- It would be worthwhile to run a general inventory, similar to that in 2012, in order to assess the situation for the entire reservoir in terms of curly waterweed and other plant species (whether invasive or not) and to determine the impact of the work done.

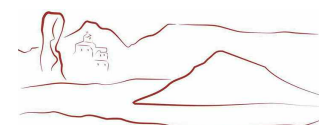
Authors: Corinne Roumagnac, Hérault departmental council, Doriane Blottière, IUCN French committee, Victoria Dubus, SMGS. January 2018.



11. Informational brochure distributed by the Hérault department.

For more information

- Internet site of the Grand Site Salagou-Cirque de Mourèze (SMGS) board: <http://www.grandsitesalagoumourèze.fr/Presence-d-un-herbier-aquatique.html>
- Plantes exotiques, halte à la colonisation des plans d'eau. Plaquette du Conseil départemental de l'Hérault. 2 pp.



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