



Smooth cordgrass

(*Spartina alterniflora*)

Originated in the United States and Canada.
Introduced into France in the 1800s, probably via
maritime transport and ballast water.

Description

- A perennial grass, smooth surfaces
- Upright leaves, grey-green in colour, flat or canaliculate, from 20 to 55 cm long and 5 cm wide
- The stalk is 60 cm to 1.2 metres tall and up to 2 cm wide at the base
- The panicle is 10 to 40 cm long, with numerous branches closely spaced
- The seeds are elongated, between 0.5 and 1 cm long
- The rhizomes spread horizontally and produce stolons

Ecology and reproduction

- The plants can develop in different types of littoral wetlands (intertidal zones), e.g. salt meadows, mud flats (slikkes), lagoons
- They can accept high salt concentrations and daily submersions
- They can take root on different substrates, e.g. sand, silt, gravel
- They disperse via seeds produced by sexual reproduction
- Clumps of plants propagate via the stolons

Documentation

- Hudin S., Vahrameev P. et al., 2010. Guide d'identification des plantes exotiques envahissant les milieux aquatiques et les berges du bassin Loire-Bretagne. Fédération des conservatoires d'espaces naturels, 45 pp.
- *Télabotanica*. 2016. E-flora fact sheet for *Spartina alterniflora*.

<http://www.tela-botanica.org/bdtx-nn-65440-synthese>

Author: Emmanuelle Sarat, IUCN French committee

Classification

Order	Poales
Family	Poaceae
Genus	<i>Spartina</i>
Species	<i>S. alterniflora</i> (Loiseleur, 1807)



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Smooth cordgrass

(*Spartina alterniflora*)

Managing smooth cordgrass in Brest bay (Finistère department)

Armorique regional nature park

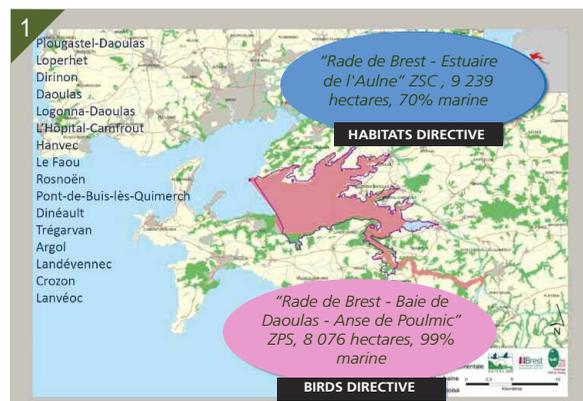
- The park, founded in 1969, covers an area of 130 000 hectares and 44 towns in the Finistère department, ranging from the islands in the Iroise Sea to the area east of the Monts d'Arrée hills.
- Its missions include protecting and enhancing the natural and cultural heritage through suitable management of the natural environments and the landscapes, contributing to territorial development, to economic, social and cultural development and living conditions, ensuring the welcome, education and information of the public, conducting experimental and/or exemplary projects in the above fields and contributing to research programmes.
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Intervention site

- Management work is conducted in the “Rade de Brest - Estuaire de l’Aulne” and “Rade de Brest - Baie de Daoulas - Anse de Poulmic” Natura 2000 site operated by the park.
- The work is done in five towns, namely Plougastel-Daoulas, Daoulas, Logonna-Daoulas, Hanvec and Rosnoën.
- The hydrographic network on the site is dense and flows into the southern basin of Brest bay, which explains the presence of many small rivers comprising mud flats and salt meadows in the Aulne estuary.

Disturbances and issues involved

- The EU-listed salt meadows on the site are threatened by the smooth cordgrass (*Spartina alterniflora*).
- The species originated in the United States and Canada, and was introduced into France in the 1800s, probably via maritime transport and ballast water.
- The rhizome-producing grass colonises environments and has a negative impact on many native plants in the salt meadows.
- In soft mud, the plants can propagate up to one metre per year. A single cordgrass plant can, over a few decades, create a vast, single-species meadow covering several hectares.



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1. The intervention sites (ZSC = special conservation zone, ZPS = special protection zone).

- A consequence of colonisation is the disappearance of salt-meadow plants typical to the Brest bay, e.g. sea purslane (*Halimione portulacoides*), *Salicornia* spp., sea aster (*Aster tripolium* L.), as well as lax-flowered sea-lavender (*Limonium humile*), a plant protected on the national level and whose sole presence in France is in Brest bay.
- Large stands of smooth cordgrass accelerate the filling in and sedimentation of the small rivers and channels, and they cover mud flats. The probable consequence is a change in the benthic fauna, negatively affecting the fish and waders that feed in those areas (a study is now under way).
- The colonisation of mud flats by smooth cordgrass is a major problem for mussel and shellfish farmers and for professional and recreational anglers.
- The filling in of ports and channels by single-species stands of smooth cordgrass also creates problems for boating activities.

Interventions

- The purpose of the work is to limit the proliferation of smooth cordgrass in particularly important sectors (protected species, sites for the reproduction, feeding and rest of birds) that are not yet heavily colonised, i.e. where the work is still technically feasible.

Discussions with other stakeholders and partners

■ A work group was established in 2010 to discuss site selection and work methods with researchers (European university institute for marine science), local managers of natural areas (Brest Métropole), the managing entities of the “Rade de Brest” SBMP, the National botanical conservatory in Brest, local groups (hunters in the maritime public domain) and environmental-protection groups (Bretagne Vivante), local governments, State services (Departmental territorial and maritime agency and the Maritime and littoral agency) and social reintegration associations.

Description of the interventions

■ A precise map of the sectors colonised by smooth cordgrass was drafted using photo-interpretation and contour GPS techniques.

■ The priority sectors for work were then defined on the basis of various criteria:

- type of substrate;
- emblematic sites, e.g. biologically diverse salt meadows, the presence of lax-flowered sea-lavender (*Limonium humile*);
- the importance for birds (reproduction and nesting sites, etc.);
- the degree of colonisation and the residual surface of the salt meadows;
- site accessibility.

A number of management methods were tested in parallel on the sites:

- mowing;
- uprooting;
- scraping the surface;
- digging containment trenches;
- tarping.

■ Equipment used:

- sickle;
- brush cutter;
- spade;
- garden fork;
- excavator;
- agricultural tarp;
- hand shovel.

■ Scraping the surface is used in areas where the ground is harder or contains gravel, but only for surface areas of less than five square metres.

■ Containment trenches are a technique used for larger areas where the ground is harder or contains gravel, i.e. for colonised surface areas of less than 100 square metres.

■ Tarping is reserved for colonised surface areas of less than ten square metres.

■ Examples of interventions on three sites

■ Work site at Bedy, in the town of Logonna-Daoulas. The work consisted of digging trenches, removing plants using garden forks and laying tarps.

■ Work site in Troaon. The work consisted of digging trenches and laying tarps.

■ Work site in Daoulas with the creation of a multi-test zone. The tests consisted of tarping for two, three and four years and tests on germination. The purpose of the experiments is to check whether a fragment of rhizome is sufficient or an entire rhizome is required to produce a new plant in a favourable environment (bare mud flat). The results may confirm the importance of avoiding any dissemination of rhizomes. Seeds were voluntarily planted *in situ* to check whether the plants reproduce sexually (the hybrid is thought to be sterile according to the National botanical conservatory in Brest).

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2. Lax-flowered sea lavender (*Limonium humile*).

3. Area colonised by smooth cordgrass.

4. Cordgrass removal by scraping the surface, done by the Finistère group of hunters in the maritime public domain, in a partnership with Brest Métropole, the European university institute for marine science, the Armorique regional nature park and Bretagne Vivante.

■ Scientific monitoring

- Several monitoring sites for smooth cordgrass were established in 2011 by the LEMAR lab (European university institute for marine science). Phytosociological surveys are also carried out at specific spots or along transects.
- The resulting chronological data are used to precisely analyse the expansion process and speed of smooth cordgrass within the vegetation in salt meadows. This monitoring provides valuable information that usefully complements mapping.
- Unfortunately, due to a lack of funding, the monitoring had to be suspended except on the “Ria du Faou” site.

■ Waste management

- The smooth cordgrass removed by scraping the surface of small plots less than five square metres in size was transported to a farm or to an area in the immediate proximity of the work site, taking care to ensure that it was placed well above the high-water mark (embankments) to avoid any risk of later dissemination.
- The clumps of soil produced by digging the containment trenches outside of colonised areas were left on site because they did not contain any smooth cordgrass.

Results and costs

- The experiments conducted since 2011 by the Armorique regional nature park and its partners were an occasion to test various techniques. A certain number were dropped (inefficient, physically difficult or overly expensive) given the poor results obtained:
 - uprooting, mowing;
 - removal stalk by stalk, except when mixed with stands of lax-flowered sea lavender (*Limonium humile*), for example;
 - scraping the surface of soft mud;
 - trampling.
- Other techniques proved more effective and may be used on other sites:
 - scraping and removal stalk by stalk on substrates containing gravel;
 - mechanical means (if access by land is easy, however it would be useful to test access by sea);
 - tarping for a long period (five years);
 - isolating small stands of smooth cordgrass by digging shallow trenches around them;
 - repeated mowing prior to flowering.

■ Résultats

- No regrowth was observed in the scraped zones, on the condition that the rhizomes were completely removed.
- According to an experiment conducted by the National botanical conservatory between 2005 and 2010, tarps must remain in place for five years before the rhizomes are completely destroyed. Tests are now under way on shorter durations.
- *In situ* tests of rhizome germination are also being conducted.



5. 6. 7. 8. Digging a ditch.

■ Results on three sites

	Bendy	Troan	Daoulas
Technique	Trenches, removing plants using garden forks and laying tarps	Trenches and laying tarps	Multi-test zone for tarping and germination tests (in progress)
Work days	2 days in 2012	2 days in 2014	1 day in 2015
	2 days in 2013		
	1 day in 2014		
	1 day in 2015		
Treated surface area	1.5 hectare	112 sq. metres	16 sq. metres
Number of people	2011: 4 people	10 people	10 people
	2013: 10 people		
	2014: 8 people		
	2015: 10 people		
Results	No regrowth in sectors treated with garden forks on substrates containing gravel. Regrowth and progression in sectors of soft mud. The smooth cordgrass did not cross trenches (except where trenches became filled in, hence the need to rework the trenches every two years).	The tarped plants were rapidly destroyed. In the spot where the tarp was accidentally removed, the plants regrew. The clips on the tarp held well, but the ends of the tarp exposed to strong currents were torn. The smooth cordgrass did not cross trenches.	Tarp well set in spite of an outlet with a high outflow. No germination has been observed for the time being.



9. 10. Laying tarps.

■ Human and financial aspects

- Scraping a colonised surface less than five square metres in size can be done by one person in a half-day.
- Digging a metre of ditch takes one person five to ten minutes.
- To date, the work on sites has been done by volunteers.
- In 2015, an intervention was organised by a non-profit that specialises in “eco-volunteer” projects. * The cost was 1 000 euros for the two-day project.
- The cost of the tools purchased in 2011 (shovels, pick-axes, forks, tarps, hand shovels, duckboards, pails, funded by Brest Métropole) was approximately 1 000 euros (the excavator is not included in this total).
- The participation of a park employee was not calculated, but may be estimated at 5 000 euros since 2011.
- The tarps cost 0.25 to 0.50 euros per square metre.
- The excavator was lent free of cost by the hunting group.

■ Intervention costs in euros (2011-2015)

	2011	2012	2013	2014	2015	TOTAL
Number of work projects	2	3	1	2	2	10
Cost of work	0 (volunteers)	0 (volunteers)	0 (volunteers)	0 (volunteers)	1 000 (eco-volunteer project)	1 000
Cost of tools/equipment (tarp)	1 000 (in 2011)	0	0	0	30 (tarp)	1 030
Management costs	1 400	1 400	600	1 200	800	5 400
People involved (total per year)	40	30	12	18	18	118
Work days	5	5	1	4	2	17

Information on the project

- Since 2010, each work project has been the topic of at least one press article. Public opinion is, on the whole, highly positive concerning the work. The articles have raised awareness concerning the problem.
- A public meeting on smooth cordgrass was held in the town of Faou in 2015. The results were positive with 20 people attending and new volunteers signing up for work projects in their town. New projects are planned in the framework of the “Citizen days” organised by the town.
- A report on the work was broadcast by France 3 Iroise television in 2011.

Outlook

- A “2016 action plan” is being set up in a partnership with the Agency for protected marine zones. Extensive work is planned in several towns, namely Loperhet, Hanvec, Le Faou, Argol and Pont-de-Buis les Quimerch. Firms specialised in this type of work and volunteers will take part.
- The search for funding will be pursued to continue the work on the sites and avoid regrowth, and to open new sites in the priority zones.
- A study is planned on the impact of smooth cordgrass on benthic fauna, migratory fish and birds hibernating in the area, in a partnership with local research organisations (European university institute for marine science).
- A second partnership is now under way with the institute to test the resistance of smooth cordgrass to flooding under laboratory conditions. Further tests will be conducted *in situ*.

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For more information

■ Internet site of the Armorique regional nature park:

[http://www.pnrarmorique.fr/Agir/Preserver-labiodiversite/Lutte-contre-les-especesinvasives/La-spartine-americaine *Spartina-alterniflora*](http://www.pnrarmorique.fr/Agir/Preserver-labiodiversite/Lutte-contre-les-especesinvasives/La-spartine-americaine_Spartina-alterniflora)

■ Querne J. 2011, Invasion de *Spartina alterniflora* dans les marais de la rade de Brest. Comportement invasif et impact sur le cycle biogéochimique du silicium. 217 pp.

■ Toupet J. 2010, Quelles solutions de gestion pour l'espèce invasive, *Spartina alterniflora*, en rade de Brest ? État des connaissances, synthèse bibliographique et perspectives de travail, rapport de stage de Master 1, Institut universitaire européen de la mer. 84 pp.

■ Le Noac'h J. 2011, Mise en place d'une gestion expérimentale d'une plante invasive en rade de Brest, *Spartina alterniflora*, rapport de stage de master 1, Parc naturel régional d'Armorique et Institut universitaire européen de la mer. 63 pp.

■ Hourdé M. 2014, Mise en place d'un plan opérationnel de lutte contre l'invasion de l'espèce invasive *Spartina alterniflora* dans les sites Natura 2000 « Rade de Brest », Parc naturel régional d'Armorique. 47 pp.

■ Larzillière A. 2014. Document d'objectifs Natura 2000 – Rade de Brest-Estuaire de l'Aulne et Rade de Brest-Baie de Daoulas-Anse du Poulmic, tome 3 : Actions et opérations. Parc naturel régional d'Armorique, Brest métropole océane, Dreal Bretagne, 385 pp.

This management report was drafted in January 2016 by the work group for biological invasions in aquatic environments, set up by Onema and IUCN France, in addition to those already presented in the second volume of the book titled “Invasive alien species in aquatic environments, Practical knowledge and management insights”, in the Knowledge for action series published by Onema.
<http://www.onema.fr/sites/default/files/EN/EV/cat7a-thematic-issues.html>