



Water hyacinth

(*Eichhornia crassipes*)

Managing plant development, including water hyacinth, in the channels of the Yiyi marshes (French Guiana)

Preface

This management report is exceptional in that it deals with managing native plant species in Guiana. Among those species, water hyacinth is a plant deemed alien and invasive in many parts of the world, and it is currently establishing itself in Southern Europe. That is why we found it interesting to document the management of the plants in the the Yiyi Pripris (i.e. the Yiyi freshwater marshes) in order to provide information to managers confronted with the species in parts of the world where it is alien and perhaps also invasive.

Town of Sinnamary and the S panguy non-profit association

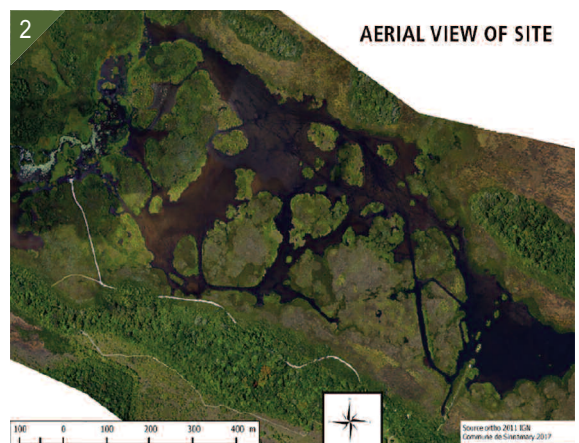
- The town of Sinnamary has been the main manager of the Yiyi wetlands since they were purchased by the Seaside and Lake Conservation Trust in 1996.
- The S panguy non-profit (study, protection and management of nature) has been the co-manager since 2009.
- The Sinnamary House of Nature, founded in 1999, welcomes visitors and informs them on the richness of the various local environments and on the need to protect them. It is also an educational centre for local schools.
- Contact: Charles Berg re, guard and manager of the Yiyi marshes - charles.bergere@ville-sinnamary.fr

Intervention site

- The Yiyi marshes are located along the western section of the Atlantic coast in Guiana between the towns of Sinnamary and Iracoubo.
- No management work has been undertaken on these large wetlands, spanning almost 27 000 hectares, with the exception of a small area comprising 680 hectares where protective measures and efforts to raise public awareness have been launched. An initial management plan initiated in 2007 served to begin the management work and the plan was updated in 2016.



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1. Map showing the Yiyi site.
2. Aerial view of site.

- The marshes are one of eight sites selected among the French overseas territories in the framework of the MANG programme. The objective of this experimental programme is to optimise the management of wetlands in the French overseas territories (<http://www.pole-tropical.org/les-actions-du-pole-relais-outremer/>).
- The managed sector of the Yiyi marshes comprises a set of highly diversified biotopes, e.g. wet savannah, "floating" meadows (called "tremblants" locally), freshwater marshes, mud flats, littoral mangroves, etc. The area is home to exceptional biodiversity, including almost 400 plant species, 127 bird species and 44 mammal species, which led it to being declared a Ramsar zone in 2009.

■ The savannahs are invaded by alien species, but free-standing waters are colonised by native species such as *Cabomba aquatica*, water hyacinth (*Eichhornia crassipes*) and a species belonging to the genus *Utricularia* (*Utricularia foliosa*). The water edges are colonised essentially by a species of helophyte with large leaves, locally called Moucou-moucou (*Montrichardia arborescens*).

Disturbances and issues involved

- The development of these plants leads to the loss of open areas (open water and savannah) and hinders the circulation of water.
- They also create barriers, primarily for canoes used to present the site to tourists.

Interventions

- The management work for aquatic plants spans 200 hectares with the objective of maintaining open channels throughout the site following the departure of the previous occupants (farmers, inhabitants, hunters) and the lower level of human presence due to its protected status.
- The work consists of regularly clearing the plants from the channels before the latter become blocked.
- The equipment used to harvest the plants is a BPH 8, a boat with hydraulic equipment designed by the CDO Innov company, that is only two metres wide for access to narrow areas. The boat can be equipped with either a cutting bar or an uprooting fork equipped with a basket to collect the aquatic plants and any floating debris. The cutting bar is useful for rooted plants, particularly *Cabomba aquatica* and more rarely for a lily species (*Nymphaea rudgeana*) which are then drawn out by the current to the sea. The fork is used to collect submergent plants, such as bladderworts (*Utricularia foliosa*), or surface plants such as water hyacinth, and to deposit them along the banks where the plants are stored to decompose.
- This work is done on a regular basis during the year. The work done by the partners in managing the site (the elected officials from Sinnamary, the Sépanguy non-profit and the Seaside and Lake Conservation Trust) resulted in the drafting of technical specifications for environmental preservation and the creation of a system to monitor the impacts of the cutting and removal of the plants.
- The system aims to assess changes in floristic diversity and in the recolonisation of the channels and deposit areas, and to monitor the populations of fish, birds and capybara (*Hydrochoerus hydrochaeris*), the largest rodent worldwide, in order to determine whether the management work has an impact on biodiversity in the marshes.

Results and costs

Results

- Approximately 6 000 metres of channel are maintained. The image on the next page indicates the work sites in 2013.
- Since the beginning of the management programme, 145 interventions, each lasting approximately two hours, have been carried out.



3. Floating leaves of the *Cabomba aquatica* plant.
 4. Water hyacinth (*Eichhornia crassipes*).
 5. Bladderworts (*Utricularia foliosa*).
 6. Moucou-moucou (*Montrichardia arborescens*) along the edges of channels.
 7. The cutting bar in action.

- The average volume of fresh plants uprooted by the fork and deposited on land is approximately 30 cubic metres per intervention.
- Six deposit sites were used representing approximately 30 square metres each.

Costs

Table of intervention costs.

Item	Details	Hourly cost (€)
Fuel	Average consumption per hour: 6 litres of diesel fuel	10
Equipment	Purchase of the machine and transport: 121 462.13 € Depreciation over 8 years, i.e. 15 182.77 € per year (on the basis of 240 operating hours per year)	63
Supplies and maintenance	10% of hourly depreciation cost	6.3
Labour	Operator	13
	Total hourly cost	92.3

Assessment of impacts

- The plant demonstrating the strongest recolonisation dynamics in the channels is *Cabomba aquatica*. The intervention method would not appear to encourage the development of water hyacinth, however it remains the primary colonising species in the areas where it dominated prior to the work. The existence of isolated water hyacinth plants in certain parts of the marsh requires enhanced observation of its growth dynamics in the Yiyi marshes. Regular harvesting of the water hyacinth in conjunction with passage of the harvesting boat is advised.
- Regular interventions would appear, however, to be sufficient to keep the two species in check. The recommended intervention frequency is 45 days.
- The work should preferably be done during the rainy season because the organic matter remobilised by the work is carried away from the site, thus avoiding its accumulation in the slower sections where it contributes to the development of invasive plants.
- The deposit sites receiving essentially *Cabomba aquatica* are fairly rapidly colonised by several helophyte species, whereas colonisation is slower on sites where water hyacinth is stored.



8. The fork in action.
9. Deposit zone for water hyacinth.
10 and 11. Photos of the colonised channel before and after the work.



Work sites in November and December 2013.

- The deposits would not appear to modify the overall dynamics of the marsh flora, but would appear to encourage the development of certain significant native species such as *Vigna trichocarpa* (a small plant with yellow flowers from the Fabaceae family) and two orchids, *Habenaria longicauda* and *Eulophia alta*.
- The assessment did not reveal any significant impact of the work on fish populations. Of note is the fact that the assessment discovered five new species on the site, bringing the current list of fish species to 57.
- Concerning birds, the assessment did not reveal any negative impacts, however changes were noted in the behaviour of opportunistic species, due to the expansion of the open-water zones. For example, the passage of sungrebes (*Heliornis fulica*) and anhingas (*Anhinga anhinga*) would appear to have increased, resulting in more regular observations on the site. In addition, the deposit sites serve as migratory stations for Charadriiform birds (waders) such as the spotted sandpiper (*Actitis macularius*) and the solitary sandpiper (*Tringa solitaria*), and also benefit opportunistic species such as the wattled jacana (*Jacana jacana*) and the striated heron (*Butorides striata*).
- Finally, it was not possible to assess the impact of the work on the capybara populations, but it may be advisable to limit the use of the boat in areas where there are clear signs that the species is present.

Information on the project

- An informational document on the management work undertaken to control the development of the aquatic plants was posted at the end of 2014 on the internet site of the Wetland Centre for Overseas Territories (<http://www.pole-tropical.org/>).
- Information on the management of the Yiyi marshes is also available on the internet site of the Sinnamary House of Nature.

Outlook

- In addition to pursuing the regular maintenance work, one possibility would be to restore other aquatic areas in view of developing ecotourism on the site, an effort already undertaken by the Sinnamary House of Nature.
- The impact assessment of the work could include long-term monitoring of the deposit areas (accumulation of organic matter, plant recolonisation, changes in fauna) and address the reptile and amphibian communities in the maintained open-water areas and the deposit areas. Funding must be found for this work.

Authors: Charles Bergère, Town of Sinnamary, Clément Lermyte, Biotope, Alain Dutartre, independent expert, and Doriane Blottière, IUCN French committee, for the Resource Centre on invasive alien species in conjunction with the overseas IAS initiative. July 2018. Published by the French Biodiversity Agency.

This management report fills out the collection already published in the second and third volumes of the book titled "Invasive alien species in aquatic environments, Practical knowledge and management insights", in the Knowledge for action series published by the French Biodiversity Agency.

(<https://professionnels.ofb.fr/index.php/en/node/416>)



12. A channel cleared of invasive plants.

For more information...

- Site of the Sinnamary House of Nature: <http://www.sepanguy.com/site/maison-de-la-nature>
- Lermyte C. 2015. Suivis scientifiques liés au programme de faucardage des Pripis de Yiyi. Service Environnement de Sinnamary. Rapport Biotope, 40 pp.
- Facebook page devoted to the work in the protected natural area of the Yiyi marshes: <https://www.facebook.com/Pripideyiyi/>
- Brochure on the management programme for the Yiyi marshes prepared by the Seaside and Lake Conservation Trust: www.conservatoire-du-littoral.fr/publications_liste/102/10-publication.htm
- Impact Mer, Hydero, BIOS. 2016. Plan de gestion simplifié des Pripis de Yiyi – État des lieux et diagnostic – version finale actualisée. Rapport pour le Conservatoire du littoral, 92 pp.
- Impact Mer, Hydero, BIOS. 2016. Plan de gestion simplifié des Pripis de Yiyi – Enjeux, objectifs et plan d'actions – version finale actualisée. Rapport pour le Conservatoire du littoral, 101 pp.