Brown salwood

(Acacia mangium)

Experiments on techniques to regulate brown salwood in the savannahs of Guiana

Bird study and protection group of Guiana (GEPOG)

■ GEPOG is an environmental non-profit active in studying and protecting birds in Guiana, in managing natural areas, in contributing to public debates on environmental issues and in raising environmental awareness of different segments of the public in Guiana.

■ It launches and participates in scientific studies, and plays an active role in managing protected areas in Guiana as a member of various management committees. The group is a founding member of the *Guyane Nature Environnement* federation and currently presides the Guiana Nature Conservatory.

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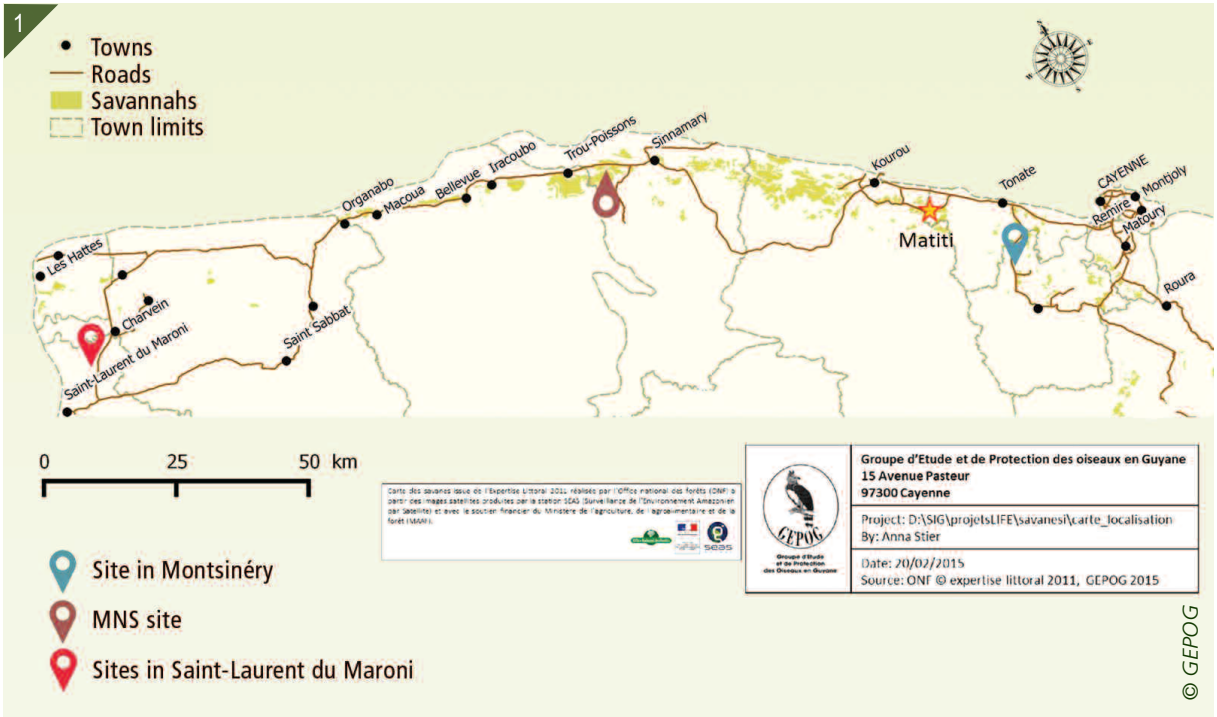
Intervention site

■ Savannahs are herbaceous environments in which bushes and trees are relatively rare and isolated. They represent only 0.3% of the total land area in Guiana (260 square kilometres) and exist as a narrow band on clay-sand soil lying between the coast and land further inland. These areas are vulnerable and threatened in that they tend to disappear in step with economic development and population growth along the coast. However, they are home to over 20% of the protected plant species in Guiana. Though small in size, these rich environments represent an exceptional, natural heritage that must be protected.

■ A conservation project specifically targeting the savannahs (2011-2015), in the framework of the LIFE + Cap DOM programme (efforts in favour of birds and threatened habitats in the overseas territories), included three experiments, launched in 2013, to develop effective management techniques for *Acacia mangium*.

■ The two initial phases of the project were launched in Matiti (see the map below) on abandoned farm land that had previously been savannah and was subsequently invaded by the species. The five lots in the third phase were distributed east to west along the coast with two in natural areas (savannah) in Montsinéry and at the House of Nature in Sinnamary (MNS), one in an agricultural area (Saint-Laurent du Maroni) and two on previously forest land that had been cleared and then rapidly invaded by the brown salwood (also in Saint-Laurent du Maroni).



1. Experimental sites along the coast in Guiana.

Disturbances and issues involved

■ *Acacia mangium* has been identified as one of the two most troublesome, naturalised species in Guiana. The trees grow rapidly and can form single-species stands. Their propagation in the open ecosystem of a savannah is encouraged by the frequent fires.

■ The species closes in the environment and results in higher nitrogen levels in the soil and in dryer soil. The falling phyllodes create a layer of litter on the ground that decomposes very slowly. Even when the trees have been eliminated from an area, the highly modified soil conditions hinder the re-establishment of plant communities native to the local savannahs.

Interventions

■ Efforts against adult trees

■ Adult trees, i.e. those with a diameter of more than 15 cm at a height of 1.3 metres, were split into four groups and treated using different techniques:

- girdling (removal of the bark around the tree) over a total height of 40 cm from the base;
- girdling with application of a phytocide (triclopyr diluted to 4%) at the bottom of the girdled section;
- sawing at the base of the tree;
- sawing at the base of the tree and application of a phytocide to the cambium layer.

■ The treated trees were then monitored for one year.

■ Study on depleting the seed bank

■ A first phase of the study (not presented in detail here) consisted of determining the distribution of seeds by taking soil samples around the issuing trees. It revealed that a major part of the seed bank was located under the crown of a tree and that the density fell off rapidly with the distance beyond the projection cone of the crown. Seed density per square metre as a function of the distance from a tree could thus be modelled. It also revealed that no seeds were found at depths exceeding 10 cm.

■ During the second phase, experiments were run on two techniques designed to deplete the seed bank. Forty plots (2 x 2 metres) were set up along a hedgerow of adult brown-salwood trees:

- ten were hoed manually to a depth of 15 cm (corresponding to a disturbance equal to that of uprooting the bushes);
- twenty plots were burned (using 500 grams of hay per square metre or more if the ground was wet);
- ten plots served as a control group that were not hoed or burned.

■ Any young sprouts were counted every three days. The seedlings were uprooted during each inspection to avoid subsequent counting errors.

■ Samples were also taken to determine the number of viable seeds remaining in the soil after burning, in comparison with the number of seeds modelled during the first phase of the study.

2. The advancing line of brown salwood in the savannah.
3. Girdling a tree trunk.
4. Study on depleting the seed bank using fire.

■ Test on eliminating the trees and seed banks over entire study areas

■ The techniques described above were used on the five experimental sites.

■ Juvenile trees were uprooted manually, adult trees were sawed at their base.

■ On two of the sites, fire was used to eliminate the seed banks.

■ During subsequent monitoring, any seedlings and sprouts were uprooted. Any trees that were missed during the first passage were also removed.

Results and costs

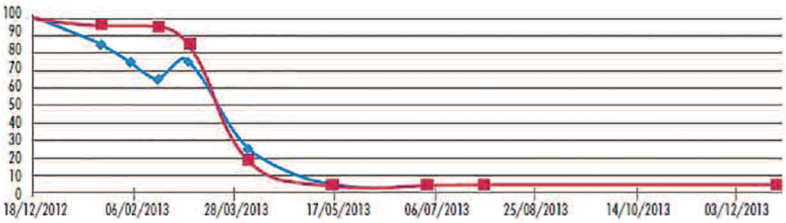
■ Results

■ No sprouts were observed on trees sawed off at the base, whether or not a phytocide was used.

■ All of the girdled trees had died after a period of five months, with or without application of the phytocide (two surviving trees had been incorrectly girdled).

■ Outside of the study plots, sprouts were regularly observed on trees that had been sawed at various heights.

■ In the framework of the study on the seed banks, no sprouts were observed on the plots making up the control group and only one sprout was seen on the plots that had been hoed manually.



Percentage of trees still with sap over time, following girdling.
(■ : girdling ; ■ : girdling + phytocide).

■ The use of fire destroyed 43% of the seeds in the soil, on average, or caused their germination, which facilitated subsequent uprooting. This technique can be used in certain cases because it partially eliminates the seed banks, but it is necessary subsequently to eliminate any sprouts. In addition, its use in protected areas may be problematic and the impact on other species must be taken into account.

■ The tests carried out over entire study areas revealed that when the trees were sawed at a height of less than 20 cm from the ground, the probability of new sprouts fell to below 5%.

■ The elimination of adult trees results in the growth of new trees and it is necessary to pursue the uprooting work until the seed bank has been depleted.

■ Costs

■ The total cost of the experiments on management techniques for brown salwood amounted to 66 910 euros (including 34 820 € for personnel costs).

■ For the GEPOG, three employees and an intern (Master 2) spent time on the project. Among the contributing partners, seven employees participated in the work, as well as a dozen volunteers.

5. The removal of juvenile brown-salwood trees from a site.
6. Monitoring sprouts and seedlings on treated sites.

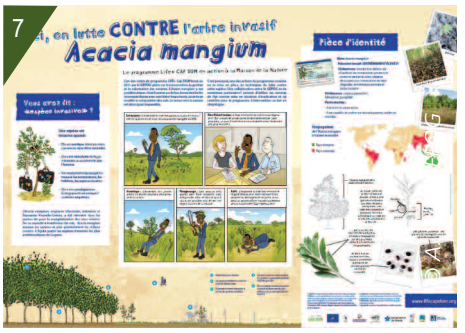
Information on the project

■ Numerous efforts were made to communicate on the work:

- posters were displayed in the museum of the MNS and at the national IAS conference;
- reports were sent to an array of internet sites;

www.savanes.fr, www.lifecapdom.org ;

- conferences were held;
- a LIFE+ Cap DOM exhibition toured Guiana during the project;
- presentations were given to students at the agricultural school of Matiti;
- articles were published in the information bulletins for the Yiyi marshes and the IUCN overseas IAS initiative;
- events were organised with the town of Sinnamary;
- explanatory videos were produced (http://www.savanes.fr/mediatheque/).



7. Poster displayed in the museum of the Sinnamary House of Nature.

Outlook

■ The study showed that the use of phytocides is not necessary and that chainsawing is the most rapid and least expensive management method for adult trees. Girdling is also an effective technique for trees that cannot be sawed, but particular care must be taken to completely remove the cambium layer to ensure that the tree does indeed die.

■ Regular monitoring is absolutely required for the treated areas to eliminate sprouts produced by the seed banks that can remain active for dozens of years. To say nothing of the fact that birds can constantly spread new seeds.

■ The use of these techniques on a much larger scale in the coastal savannahs is planned in the framework of one part of the LIFE+ Biodiv'OM programme starting in September 2018.

Authors: Doriane Blottière, IUCN French committee, and Anna Stier, GEPOG, for the Resource Centre on invasive alien species in conjunction with the overseas IAS initiative.December 2018. Published by the French Biodiversity Agency.

For more information...

■ Stier, A. et de Pracontal, N. 2015. Manuel technique de gestion des savanes de Guyane. Association GEPOG. 68 pp.

■ Leotard, G. et Chaline, O. 2013. Inventaire et cartographie de la répartition des espèces végétales invasives en Guyane : Rapport d'étude. DEAL Guyane. 470 pp.

■ Stier, A., Palisse, M., de Pracontal, N. 2014. Les ambivalences guyanaises autour de la gestion d'*Acacia mangium*. GEPOG. Poster displayed during the national IAS conference.

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)

GEPOG
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