

## **Managing the Flemish dunes: from eco-gardening to mechanical disturbances created by bulldozers**

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### **Abstract**

The 'Conseil Général du Département du Nord' is the manager of 480ha of Flemish dunes located at the far North of France. These spaces, initially preserved by the action of the 'Communauté Urbaine de Dunkerque' are now the property of the 'Conservatoire de l'Espace Littoral et des Rivages Lacustres'. Characterised by an aelian dynamism and by the winter flooding of their damp depressions, these systems had represented a very high patrimonial richness before man, by these actions (the pumping of the aquifers, the parcelling out of dune massifs, the fixation of sand by plantations, the destruction of rabbits), reduced to nothing the natural expression of perturbations (storms, floods, important sandbanks) and made dune massifs become wastelands and low marshes and dry lawns disappear. The first step for preservation was the in extremis safeguard and the maintenance by secateurs (1989) then by motor scythes (1992) of micro-habitats with a high richness over a 2ha total surface lost in very important pre-forested systems. Rapidly, the objectives of preservation obliged us to put into practice the restoration of natural environments by stripping and clearing the ground (1994 and 1997). But these operations of a large scale (10ha) were always based on a 'fixist' and 'museographical' approach to the environment (the maintenance of a representative sample of habitats). The management which consists of stopping certain pioneer and post-pioneer stages of vegetation can in fact correspond to a counter-natural step as these dune systems make the proof of a very high dynamism and permanent evolution. Today the management of dune space is done by bulldozers: first the pre-forested vegetation is totally destructed (16ha in 2004) leaving systems of bare sand freely evolving and accepting their spontaneous wastelanding over more than 50% of their surfaces. The return to uncontrolled vegetal dynamism is only accepted if perturbations are periodically created in order to regularly produce the starting or reappearance conditions of the different series of vegetation. The last stage of our managing operations would consist, with a middle-term effect, in reducing the stability of the edging dune row and in favouring the development of wind passages with their devastation or saving effects on the dune we intend to preserve.

Keywords: Flemish dunes; Alkaline marshes or dune wetlands; Dune dry grasses; Grazing; Mechanical disturbances.

## Introduction

Characterized by a very dense population, a heavy industrial past and a performing agriculture, the North department territory has seen many of these natural habitats disappear. The coastal areas have not been spared by this logic of sacrifice, especially around the Dunkerque metropolitan area and its vast industrialo-portuary complex: over 85% of the dunes originally present have thus disappeared. The entire departmental coastline is 38km long. In the 1950's, there were 25km of dunes; 7km today are located and protected east of Dunkerque. These are located in the immediate proximity of the Belgian border.

The dunes are situated in Leffrinckoucke, Ghyvelde, Zuydcoote and Bray-Dunes. Today most are preserved, thanks to the Land Mastership Program first initiated by the Urban Community of Dunkerque, then by the North Department Council (Conseil Général du Nord) and the 'Conservatoire de l'Espace Littoral et des Rivages Lacustres' (Seashore and Wetlands Conservatory). This organization is now the owner of about 480ha of seaside dunes, now managed by the North Department Council (Conseil Général du Nord). These are the Dewulf dunes (203.7ha), the Marchand dune (108.2ha), and the Perroquet dunes (169.7ha). These ranges of dunes are considered to be young by the geomorphologists, since they were formed after the last marine transgressions from the 7<sup>th</sup> and 12<sup>th</sup> centuries, and are presently being reworked by aeolian sedimentation.

One of their characteristics is found in their dynamism coming from an active morphology. In fact, the dominant winds from the south-west have modelled the dunes to a 'Flemish' type (parallel to the coast), whereas the north-east winter winds, more violent, have shaped in these ranges of dunes some vast parabolic depressions with flat bottoms locally named 'pannes', in which ground-stored water occasionally surfaces. These 'pannes' form truly unique ecosystems that are constantly on the move.

## Very rich spaces

These habitats with a particular ecology (winterly floods) are peaty systems that host a remarkable flora. This flora and its different habitats thus make up one of the major ecological interests in the Flemish dunes. Next to this typical vegetation of the humid lands, the Flemish dunes welcome beautiful complexes of dry grasses considered as habitats whose conservation is a top priority for European authorities (appendix 1 of the European Directive 'habitats, fauna and flora').

The Marchand dune is classified as a natural reserve of 83ha, and was awarded the title of 'biogenetic reserve' by the European Council. All of the dunes are selected to fit in the Natura 2000 network as a future Zone of Special Conservation (ZSC). Some rare or endangered vegetal species can be encountered in these spaces, a few having strong boreal affinities, as much on the humid series level as on the dry grasses level. Among the humid series, the main species with patrimonial interest are *Parnassia palustris* var. *condensata*, *Carex viridula* subsp. *Pulchella*, *Pyrola rotundifolia* subsp. *arenaria*, *Epipactis palustris*, *Herminium monorchis*, *Gentianella* gr. *uliginosa*, *Equisetum variegatum* and diverse *Dactylorhiza* species (*D. incarnata*, *D. praetermissa*, *D. fuschsii*), ...

The dry series includes *Viola curtisii*, *Viola canina* subsp. *canina* var. *dunensis*, *Jasione montana* subsp. *maritima* that accompany sheets of mousses and lichens. This series

welcomes remarkable associations of dry grasses of *Festuca* sp., *Carex arenaria*, *Corynephorus canescens*, *Phleum arenarium* and *Tortula ruraliformis* or even of *Luzula campestris* and *Gaillum verum* subsp. *maritimum*. Some *Helianthemum nummularia* var. *obscurum*, *Rosa pimpinifolia* and xérophile screens of *Calamagrostis* and *Thalictrum minus* var. *durenensis* can be seen too.

### **Spaces particularly threatened by bushes overgrowth**

These spaces, before the voluntarist management operations started in the early 1990's, had found themselves highly threatened by the omnipresent overgrowth of bushes that affects all the dunes areas.

The 'pannes' were invaded by the ligneous creeping trees, especially by the *Salix repens* var. *argentea* and the *Hippopae rhamnoides*; they were colonised by dry grasses (themselves threatened by *Hippophae ligustrum vulgare*, *Crataegus monogyna* and *Rosa canina*). These invasions were worsened by anthropic factors such as the drying out of the dunes because of water pumping in neighbouring spaces, the parcelling of the dunes and their fixation, which prevents any rejuvenating process by the aeolian dynamic. Myxomatosis eliminated most of the rabbits and traditional practices of grazing and clearings were abandoned, so that arbustive colonization and forestation accentuated.

Without 'natural disturbances', alkaline lower-marshes and dry grasses subdued by this vegetal dynamic were rapidly invaded by bushes, eliminating by then pioneer and herbaceous stages from these spaces, as well as remarkable and characteristic species.

Facing this situation, managers decided as early as 1988 to intervene and restore the bushy 'pannes'. First manually, then mechanically (in 1991), they eliminated ligneous vegetation to recreate vast open spaces of alkaline lower-marshes, then of dry lawns.

Some of us could think that a ground-clearing operation is far from a concept of nature preservation. Forest development could be considered as a logical result of natural and spontaneous dynamics. Upholding open spaces can thus appear as a biased will of the managers deciding to conserve or to restore anthropic spaces of high patrimonial value resulting from clearing practices that have spread from Neolithic to Middle Age. This passionate debate is not relevant in the case of the dunes. Dunes welcome a significant sample of rare primary grasses (that existed before man's action) in Western Europe. These grasses, and secondary grasslands resulting from clearings as well, are now threatened by the absence of natural disturbances or of agricultural habits like grazing that would slow down, stop or reverse brushwood overgrowth dynamics.

### **Different and evolutive approaches**

#### ***Clearing the dune thickets***

The first step to be considered was to open micro-habitats, where bush growth was recent, in order to save a mosaic of spaces rich in characteristic dry grasses as well as humid area species disseminated all over the dunes. This 'in extremis' rescue management aimed to operate a qualitative conservation of remarkable habitats. This looks like a museographical approach of natural patrimony conservation. Without the means or power to do anything better, the managers succeed in preserving a significant sample of remarkable vegetal stages by blocking their evolution through mechanical cuts

and exportation of cut products, or through extensive grazing. This approach could be qualified as eco-gardening, and concerns 2ha of exceptional habitats over a dozen micro-sites.

### **Scouring the humus-rich soil**

Soon came the question of the presence or the maintenance of pioneer and post-pioneer stages, which are naturally fugacious. The 2<sup>nd</sup> step taken was scouring. The goal then was to gain knowledge and enable the process of re-colonization of 'new' habitats, first by typical species of the dune 'pannes', then by dry grasses species.

The scouring work was implemented in priority in the 'pannes' where herbaceous plants have disappeared under 1.5m water-thirsty thickets of *Salix repens* (dune willows) and Hippophae, where a few typical species of lower alkaline marshes subsisted in closing thickets. These operations initially realized on surfaces of about 4m<sup>2</sup> by spading enabled to find from the 1<sup>st</sup> year on: *Agrostis stolonifera*, *Blackstonia perfoliata*, *Centaureum littorale*, *Carex viridula* subsp. *pulcella* and *Sagina nodosa*.

After this experience, vast operations of mechanical scouring were programmed. This meant exporting organic and humiferous material accumulated at the surface, and using a mechanical shovel to superficially dig from 10 to 50cm.

The aim of these works was to bring ground level closer to the end of spring ground water level, to recreate water conditions specific to the 'pannes': wintery flooding and progressive drought through the spring. All of this was meant to allow installation and healthy growth of pioneer species of humid sands *Centaureum littorale*, *Centaureum puchellia* and *Sagina nodosa* and then to allow their evolution towards panne vegetation: *Carex trivervis* of lower marshes and *Carex serotina* and *Parnassia palustris* of high-level alkaline lower marshes.

The scourings have allowed re-colonization of humid sand habitat species on over a hectare, thus confirming observations made in the first 4m<sup>2</sup> sectors of experimental scouring. Other species have thus come enriching these habitats, such as *Scirpus setaceus*, *Graphallium luteo-album* (the latter has only made one brief appearance).

Since 1994, botanical follow-ups have been realized (by guardians and interns) to monitor the evolution and, when necessary, take note of the appearance of new species. Bankings were realized through scouring by terrasse levels to enhance the surfacing of 'sleeping' grain banks and to move them towards favorable zones for germination of seeds.

The excellent results of these management operations put forward the very big potential of dunes (with the presence of 'sleeping' grain banks to recreate remarkable habitats). These experiences allowed the CRP/CBNB (State Botanic Conservatory) to work on the seeds' cryo-potential of dune sands of Picardie.

### **Restauration of dry grasses through the destruction and disposal of bush cover**

After the first actions were implemented, the North Department Council decided to restore vast open spaces through destruction and disposal of pre-forestal vegetal cover. To do this, it developed an original method to eliminate and export a dense 3.5m high bushy vegetation. A forest tractor was equipped with a chain.

Its rotation cut vegetation in two successive passages. The 0.20m-0.40m long pieces of wood products presented the advantage of being removable.

On the opposite, a simple shredding of vegetation would have prevented its exportation out of the site.

If this vegetation had been left on the site in a thick layer, it would have brought a thick layer of organic material that would have encouraged the installation of a nitrophile vegetation.

The pieces of wood produced were then gathered thanks to a claw specially created for, able to rake deep up to 0.20m and to completely pull out stumps and roots without mixing the different sandy layers. Also, swaths formed after raking were installed parallel to the dominant winds in order to stop aeolian erosion, and then burnt. The ashes were evacuated.

From 1994 to 1998, 7ha of open spaces have been restored, which, being far from the ground water level, evolved towards dry grasses in the central zone of the Natural Reserve of the Marchand dunes.

In order to realize a well-finished quality work, the North Department Council has established a convention with a local social reinsertion association (*Ecoflandres*) to help the actual departmental team.

It seemed essential from the beginning to organize manual cuts with exportation of the by-products to thin-up soils and to limit the development of nitrophile species. These operations were doubled by punctual operations of manual stump-removal.

After and in addition to annual scything, implementation of an extensive horse grazing allowed to contain and eliminate the few ligneous rejects and to reduce again development of the following nitrophile species: *Cirsium arvense*, *Eupatorium cannabinum* or typical species of dunes like *Senecio jacobaea*.

These different interventions (grazing and scything) encouraged the return of typical dry grasses species of dunes, which after 5 years have more or less mingled with nitrophile species still present at that time and that have finally disappeared.

With time, management by scything or by grazing has enabled dune lawn habitats to develop at the expense of nitrophile habitat.

After 8 years of work, the presence of numerous typical dune grasses species such as *Phleum arenarium*, *Tortula ruraliformis*, *Erodium lebelli* et *circutarium*, *Galium verum* and *Luzula campestris* allows to record similar development of grasses in a form very close to the classical and original dune grasses.

A study of the 'Centre Régional de Phytosociologie, Conservatoire Botanique National de Bailleul' showed that the restored lawns, five years after the clearing operations, are of the *Phleo arenarii* type - *Tortuletum ruraliformis*, dunes lawns of the black dunes of mosses, and therophytes on stabilizing dry limestone sand, in conjunction with numerous variants like sand on the verge of decalcification or richer limestone sand in a warmer situation...

In some areas, we can observe more acidophilic elements such as *Luzula campestris* or *Vicia lathyroides*. Other nitrophilic and anthropic relics such as *Calamagrostis epigeos*, *Holcus latanus* or *Poa*. sp. equally form habitats more pasture-like, in mosaic habitats with lawns.

In fact clearing has revealed an original relief (military trenches, holes and depressions due to bomb explosions, ...) that condition the associations of vegetal expression.

In spaces where the relief is tormented, grasses are located on dunes summits, whereas prairie stretches find themselves in the most humid hollows where fertilizing elements accumulate.

Besides, thin raking after each scything in order to export organic materials has enabled the return, after 5 years, of the very rare *Botrychium lunaria* – 50 in 2003 – a species that had not been observed for about 30 years on the Marchand dune, just like the *Ophrys apifera*.

### Which new approaches?

The excellent management results obtained on structured and existing relics (2ha) either by soft clearing of brushwood and scything, by punctual scouring (2ha) or by heavy clearing of pre-forestal stages (10ha) resulted in a dunes high reactivity and evidenced a need to reconsider our actions in a dynamic approach. Before installing an extensive grazing scheme, managing operations need a heavy follow-up (scything, raking) for years to contain new shoots and to favour the open space vegetation we are trying to promote. Managing nature may appear as a paradox because nature is supposed to escape human control. It is our will to fix different stages of particular vegetation ‘as it is’, though on a bigger scale. When habitats in natural spaces, and more particularly in dunes, show a very high dynamism, isn’t keeping them static a risk of denaturing them? In fact, in these systems more than anywhere else, everything moves, everything changes and nothing stays the same... If we want to keep them as they are, we must accept to fight against nature, again and again.

It therefore seems necessary to change our approach, to give those spaces their dynamic aspect back, and to accept the natural spreading of bushes in the new spaces we have created. But on the opposite side, we have to regularly recreate the starting conditions in other places, because we are not ready yet to completely abandon years of patrimonial management approach based upon previous habits if natural disturbances don’t occur.

Instead of replacing the disturbance results (replacing their effects), the managers decided to replace disturbances by other disturbances so that the same effects will result. Because storms and wild fires don’t occur on the sites, the departmental team does not hesitate to significantly disturb the dunes by destroying, or by using heavy machineries to excavate large areas in order to recreate the starting conditions of vegetal dynamics with the creating of wide spaces of bare sand.

The dune is then left to its own dynamism without any intervention, except for the implementation of a grazing program upon 50% of its surface. The regular disruption with scrapers (16ha have been treated in the winter of 2003-2004) should allow the system to maintain its mosaic of spaces in a long term, using the soil seeds ‘bank’ and seeds coming from the spaces mechanically managed right now.

Here, no tree or bush exportations. The purpose was to limit the cost of exportation and to open more spaces by stocking these scything by-products over 5% of the cleared spaces. We hope these piles of material will activate the rabbit population by creating warrens and will preserve a typical xylophage population. Those spaces will eventually be wintering places for micro mammals and amphibians. A close follow-up is to be done to control the development of fallow lands within these places.

Nature should thus take its rights back and impose its dynamic rules. The real purpose of management would be to create – and only to create – the starting conditions to allow the habitats to destroy and model the spaces that characterize them.

A next step in this process would consist, if we use this ‘non-interventionism’ reasoning, in reducing the stability of the dune strand and encouraging the ‘siffle-vent’ or the ‘caouderque’ and their devastating or saving effects. These last terms are to the reader’s appreciation, according to his scale of values about naturality of these spaces and nature conservation technics.

Should we preserve exceptional microhabitats through delicate ‘pruning shears’ intervention? Should we try to create the conditions of their reappearance through the use of scrapers? That is the question.

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