

# THE MANAGEMENT OF MIRES

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Many mires have been damaged, during the past decades, by human activities. The extent of the damage has been sometimes very severe, with the destruction of sites with an outstanding natural heritage. Today, hundreds, probably thousands of sites keep the memory of these activities: drained sites prior to drying or encroachment, artificially afforested sites, sites drawn under water or damaged by ponds, sites that have been filled up... now constitute an important part of the mires of our territory. Beside these direct damages, a more insidious threat exists on mires, which is now one of the major causes of decline and loss of mires in France: due to the changes in rural practices that occurred in our country 30 years ago, traditional farming activities, such as grazing, mowing for bedding or traditional peat digging have stopped on many sites where they used to maintain a high level of biodiversity. We have to keep in mind that, in our latitudes, without any human intervention, the vegetation of most of our mires (except some pristine oligotrophic bogs, especially in mountainous areas, that can reach a final stage without trees) will evolve through a slow natural process into a woody structure, the terminal stage of this evolution being most of the time a wet woodland.

These interventions will very often reproduce the action of the wild herbivorous species, now disappeared, which in the past maintained the habitats opened, preventing them from encroachment. Without this action, the very first stages of vegetation, with small and heliophilous species, are slowly replaced by taller species whereas litter accumulates and soil enriches with nutrients: most of the time, vegetation with tall and gregarious species (reedbeds, tall herbs, tall rushes...), then presylvan stages of willow, birch, aspen or alder in alkaline fens; cross-leaved heather, *Calluna*, *Vaccinium*, *Ulex* or *Molinia* then wet woods of birch, alder buckthorn or pines on acidic bogs. The whole ecosystem evolves, the mire-dependant animal and vegetal species become rarer and rarer and finally end up disappearing, leaving place to more tolerant species whereas the global biological diversity of the ecosystem decreases.

Thus, in order to maintain the so great biological heritage of mires, it is necessary to intervene in an active way in order to restore sites that have been damaged and to entertain sites with a good conservation status. Mires have to be actively managed.

## **Think globally, act locally**

It is very important to keep in mind the fact that mires, as most of the wetlands, have with their environment a wide range of exchanges. They are linked to their environment through migratory flows, through trophic chains and through their hydrology. It is thus important to manage mires as part of an environment that has to be taken into account globally. In most of the cases, mire management is therefore carried out in the framework of a global view at the mire watershed level. Hydrology, water quality, ground occupation... around the mire have to be studied carefully to ensure that they will not have negative effects on the mire. This is the reason why it is often suggested that a buffer zone should be defined from the double point of

view of hydrology and water quality, a buffer zone on which activities are controlled in order to ensure that they will be compatible with the specifications of the mire conservation.

### **Planning management**

Mire management has to be planned carefully in the framework of an accurate scientific approach. Indeed, it must be considered that each site has its own features, a particular history, its own biological and physical functioning... which differs from the others'. Management has to take this principle into account : before any intervention, a management plan is written which defines the actions to be carried out to ensure the conservation or the restoration of the mire. This management plan is based on an accurate and multi-disciplinary study of the ecosystem: the vegetation is mapped, the species listed, historical and hydrological studies are carried out... then the mire conservation status is assessed from the double point of view of its functioning and its heritage; targets are defined and the way to achieve them described and scheduled. Finally, scientific assessment and survey is planned to ensure that the management carried out matches the aims defined. Then only, management can start.

### **Restoration and management: often complementary actions**

There is a very wide range of actions carried out in peatlands by nature managers. These can be divided into two main groups: those , which are carried out for the restoration of mires and those, which are used for regular management of mires. The first ones often occur punctually (in the time), they use heavy means in order to change some of the features of the mire, usually with the aim to restore favourable conditions for peat accumulation and for the development of animal and plant communities typical of mires when these conditions no longer exist. This, for instance, is the case on sites that have dried out after drainage and which hydrology has to be restored, or on sites prior to encroachment and afforestation on which it is necessary to open the habitat for heliophilous community to develop, or when turf stripping is necessary, for instance after the colonisation by invasive species such as *Molinia*.

The second group of actions is constituted by recurrent management, which can be associated with restoration. These actions don't aim at changing the features of the site, but at maintaining them as they are. They are used regularly, with rather soft methods, such as extensive grazing or mowing.

### **The restoration of damaged mires...**

#### A special care for the hydrology

Among the wide range of interventions carried out by nature conservationists on peatlands, hydrological restoration is from far the main target. Water has, indeed, an essential importance in peatlands since peat growing and accumulation totally depends on the ground being waterlogged. When drained, mires are condemned to dry out and slowly disappear. Unfortunately, a huge number of mires have been drained in the past to transform them for agriculture or forestry, these interventions having caused severe damages to these ecosystems.

Mires which suffer from hydrological dysfunctions after drainage are almost common. These drainage ditches have many consequences: first of all, of course, the hydrological functioning is damaged with the lowering of the water table which shows more important fluctuations. This lowering of the water table leads the ground to dry out slowly, its physical and chemistry properties will change in a drastic way: mineralisation, loss of structure and capability to keep water... In these conditions, mire species, which are at the basis of peat forming, will not find favourable conditions and will slowly disappear and be replaced by other species more adapted to these drier conditions, most of the time common species with a low biological value.

On these sites, when mires have not dried out for too long, managers intervene to raise the water table in order to restore hydrological conditions favourable to peat accumulation. Restoration of these drained sites consists in blocking or infilling the ditches responsible for the drying of the site. These ditches are first described (slope, width, depth) and mapped, and the ground water can also be studied (monitoring of its level and fluctuations). The method usually implemented consists in the insertion in the ditches of series of small dams, with a regular spacing, these dams acting as impermeable barriers aiming at retaining the water upstream: the flow is slowed down, and the raising of the water level in the ditch allows a consequent raising of the water table. These interventions are very often labour intensive: the number of dams to be constructed can be important on sites with a dense ditch network, these dams are sometimes difficult to build and need a careful survey to ensure of their water tightness.

Many different techniques exist to block ditches. We lack for practical examples in France and most of the references come from abroad, from Great Britain, Switzerland, Germany or Belgium. But the use of these techniques is now developing in our country where the priority has been given in the past to the conservation of sites that had remained intact or with very little damage. The dams are sometimes peat dams, sometimes plank dams combined or not with peat, metal sheet dams or plywood dams. This latest method turns out to be the most efficient one since it uses water resistant plywood, which acts as a one-piece impermeable barrier in the ditch.

These series of dams permit the creation of a succession of small ponds very favourable to water communities (plants, dragonflies, amphibians...). Their effects on the raising of the water table however are not total, dams keeping a certain power of drainage. This is the reason why it can be advised, instead of blocking the ditches, to infill them with impermeable materials (peat or clay most of the time). This method is very time and labour intensive as the ditches have to be erased, to restore the water table to its initial level on the whole site. It requires very large amounts of peat, which are not easy to obtain. This is the reason why very few experiments of this type have been carried out so far in France.

### Preventing encroachment

As we mentioned above, many mires, without any intervention, evolve naturally to reach woody stages. Encroachment also and especially occurs on sites which natural functioning has been damaged by human-related activities, above all drainage. Scrubs and trees, when they develop on previously open sites, damage mires since they change their hydrological functioning (important evapotranspiration rates, interception of the rainfall...) leading them to dry out slowly and enhancing the mineralisation of the soil, they change the microclimate, create shadow and enrich the habitat (leaves deposition). If some woody habitats in mires can

have a great interest for conservation, some of them being part of the European Habitats Directive, the development or the invasion of this type of vegetation in mires is most of the time dangerous since it is often the result of damaging activities and is almost always related with a loss of biodiversity and of species with high biological value.

Scrub control is now one of the main activities of peatland managers in France. Avoiding the development of this type of vegetation first of all consists in making sure that the local conditions will not be favourable to its development, for example that the site is not drying out, and that the management allows the habitats to remain open, preventing encroachment through a regular and light grazing or mowing for instance.

When mires are prior to encroachment, managers first have to identify the causes responsible for that scrub colonisation (for instance a lowering of the water table as the consequence of drainage) and eliminate them in this case. Furthermore, scrubs must not be eradicated, but controlled: shrubby or woody areas must be conserved here and there for their biological interest and to promote diversity in the ecosystem.

Different techniques are used, from very simple methods such as hand or saw cutting to techniques as heavy as crushing with heavy machinery on the less sensitive sites, through the local pulling of trees that permits the diversification of the micro-topography with local and wet depressions replacing the roots, or the use of more experimental techniques such as ring-barking or flooding, or even the very careful use of specially wetland-adapted herbicides. Wood wastes have to be taken off the site using systems that prevent the vegetation and the ground from being damaged (for example on horse pulled sleigh). They can also be burnt on site in special burning bins to protect the ground, prevent uncontrolled fires and enable ash to be collected in order not to enrich the soil. Sometimes, they are chipped to reduce their volume and use the material for domestical fires, or are disposed on the less sensitive margins of the site to promote biodiversity (fungi, insects, small mammals...).

### **... and the conservation of mires with a good conservation status**

We have seen that most of the mires have to be managed in order to maintain or restore rich and diversified habitats. This management was not necessary in the past when large and wild herbivorous species used these ecosystems to feed. Traditional farming activities, extensive, sustainable, taking care of the renewable status of resources, like the ones implemented by our grand-parents, have for part substituted to this natural action of herbivores. The use of domestic herbivores or the mowing of mires and marshes permitted to maintain open, diversified and species-rich space. These activities would prevent the habitats from being colonised by tall herbs and scrubs, they would avoid encroachment because they would permit the extraction of the organic matter (being grazed by herbivores or cut and taken off by mowing) which accumulation as a litter and mineralisation encourage the development of spreading and invasive species and the global closing of the habitat.

Today, managers get inspired of these observations, they use these traditional techniques for the management of mires. As soon as possible, managers and farmers become partners: farming activities can match the aim of nature conservation when conservationists and farmers agree on a contract which clearly establishes the rules and the way to achieve the management of the habitats in an ecological way. It is easy to demonstrate that both the managers and the farmers can benefit from this partnership. Some financial measures

encourage the involvement of farmers in nature conservation, especially within the framework of the European agriculture policy, for instance through the Agri-Environment Measures allowing the financial support for farmers who get involved in the ecological management of sensitive habitats, among which mires are not far from the pole position. Today, for instance, in the network of the « Conservatoires d'Espaces Naturels » (NGOs that protect over 1400 sites throughout the French territory through land tenure and management agreement), one third of the sites are managed with farmers.

Extensive grazing and mowing both can be used for the current management of mires. They often turn out to be complementary: a preliminary mowing is sometimes necessary before the settlement of cattle and acts as a restoration ; in other cases, it can be associated to grazing in order to eliminate the plants that the herbivores refused to graze. Their global effects on mires are quite similar: control of encroachment and spreading of invasive species, conservation or restoration of diversified and species-rich stratum of vegetation, conservation or increase of the global biodiversity of the ecosystem.

Extensive grazing is often considered as the most natural way of management, which permits the softest and the most ecological management since the herbivores are part of the managed ecosystem, re-creating in a way the past conditions, when these ecosystems were managed by large wild herbivores. The conditions in peatland being sometimes quite difficult (coldness, waterlogged soil, acidity, low nutritive value of vegetation...), the animals used by managers often belong to traditional and tough breeds, with good adaptations to these conditions: let us mention the Highland cattle coming from Scotland, the « Bretonne pie noire », small breed of cattle from Brittany, the Highland or the Polish Konik Polski ponies, the Mediterranean Camargue horses or the Solognot and the Shetland sheep. These animals prevent litter from accumulating by plant grazing and the trampling of the vegetation and the litter. The grazing intensity has to be determined carefully, the good balance has to be found between under- and overgrazing. Usually, an average pressure of between 0.2 and 0.8 UGB (Cattle Unit)/ha is recommended by managers. It is advised to start with a low pressure that will be increased if it turns out not to be sufficient. If grazing proves quite effective in maintaining the global biodiversity of mires, some habitats will be too sensitive to be grazed: it is the case of bogs which *Sphagnum* carpets and hummocks are too sensitive to trampling for being grazed, the hollows being also hazardous for the animals. Moreover problems sometimes occur when the animals graze species that the managers would have liked to conserve, or on the contrary when some species are not appreciated and left by the animals.

On this point, mowing is much easier to manage and very often permits to eliminate the kind of random related to the use of animals, for example by the choice of the period and frequency of intervention, of the species or the areas to be treated or conserved, of the height of the vegetation to be mown...But mowing supposes that machinery has to come on the site which can be a traumatism for the ecosystem: mowing leads to an even treatment of the vegetation, it presents risks of mortality for the animals and creates a brutal rupture in the development cycle of the vegetation. In order to avoid these problems, managers take precautions, such as the choice of a late mowing period (after mid-July or August) which allows most of the species to have completed their biological cycle, or the implementation of mowing practices that prevent mortality, by the mowing of the vegetation from the inside to the outside or in strips to prevent animals from getting trapped. Rotational mowing which consists in dividing a site in a certain number of plots mown each year one after the other permits to limit the even structure of the vegetation (vertical structural heterogeneity of the vegetation with the juxtaposition of different stratum, factors of great biological diversity)

and the conservation of shelters for animals in the areas that have not been mown. At last, managers often use machineries adapted to the sensitivity of mires and to some of their technical constraints (for instance the low bearing of the ground): small and light mowers (like motor mowers, special equipped quad bikes) or the adaptation of tires (low pressure, twinned wheels).

Other comparisons could be made to stress differences between grazing and mowing. For instance, from the economical point of view, grazing very often involves a huge initial investment for the purchase of the animals and the different infrastructures they need (fences, paddock, watering place...) and also important human and financial resources for the monitoring of animals and equipment. Mowing is also a very powerful and efficient means to restore damaged habitats prior to encroachment whereas grazing, most of the time, can only keep a habitat opened. But mowing must be limited to easy sites, with no obstacles, with a flat surface and a ground not too waterlogged... As a conclusion, we must remember the important complementarity of these two management tools, which induce quite different consequences in the field but whose association (grazing with a pluriannual mowing for instance) could turn out to be very effective and produce very interesting results.

Other interventions are sometimes carried out beside these more usual actions. For instance, in order to diversify habitats for bio-diversity, ponds are sometimes dug for aquatic and amphibian species (plants, dragonflies, amphibians...). Turf-stripping is also carried out, most often in two different situations: in order to restore damaged habitats, for instance on peatlands that have been drained and whose surface has been colonised by invasive species adapted to these new and drier conditions. *Molinia* often occurs in these situations. Where hydrological restoration is not possible to raise the water table, peatland managers sometimes intervene on the peat surface to remove the upper layer and drop the surface down to a lower level, closer to the water table. This creates new and wetter conditions, better for the settlement of the species which can start again the formation and accumulation of peat. The second situation where turf-stripping is often used (it constitutes the most current situation), is when managers want to diversify habitats and create local conditions favourable for pioneer species which often have a special biological interest: turf-stripping creates bare ground by the removal of the plants and the shallow digging of the ground, often on small scale plots (up to some hundreds m<sup>2</sup>). These species, among which we can find interesting species such as *Rhynchospora alba* and *Rhynchospora fusca*, *Drosera intermedia* or *Drosera rotundifolia*, *Lycopodiella inundata*... can colonise the bare ground through the seed bank protected in the peat, which can remain alive for years (maybe several hundreds years), or through seeds dispatched with the wind, the water or with animals. These pioneer communities will last a short time and succession will quickly make them disappear, hence the necessary management of these plots (mowing).

## CONCLUSION

Half of the peatlands of our territory have now disappeared, and with them a huge part of the biological diversity of our nature. In order to cope with this dramatic evolution, public services and conservationists often acting as leaders in the field of nature protection, have developed a very wide range of interventions: natural reserves, lists of protected species, management and restoration tools, financial support and inducement for farmers, land tenure and management agreements, the implementation of national and international strategies for nature conservation, including the Natura 2000 network... It must be stressed that peatland

management in France is only starting, most of the experiments carried out in our country are young, they date back to less than 10 years and knowledge has to improve. It is important to develop knowledge networks to share our experience. This is essential for the future management of the natural heritage of the mires in France.

### **To be read**

Espaces Naturels de France published the first practical peatland management handbook in France, in the framework of the *Life* programme « Peatlands of France ».

DUPIEUX, N., 1998 - La gestion conservatoire des tourbières de France : premiers éléments scientifiques et techniques. Espaces Naturels de France, programme *Life* Tourbières de France, 244 p.

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