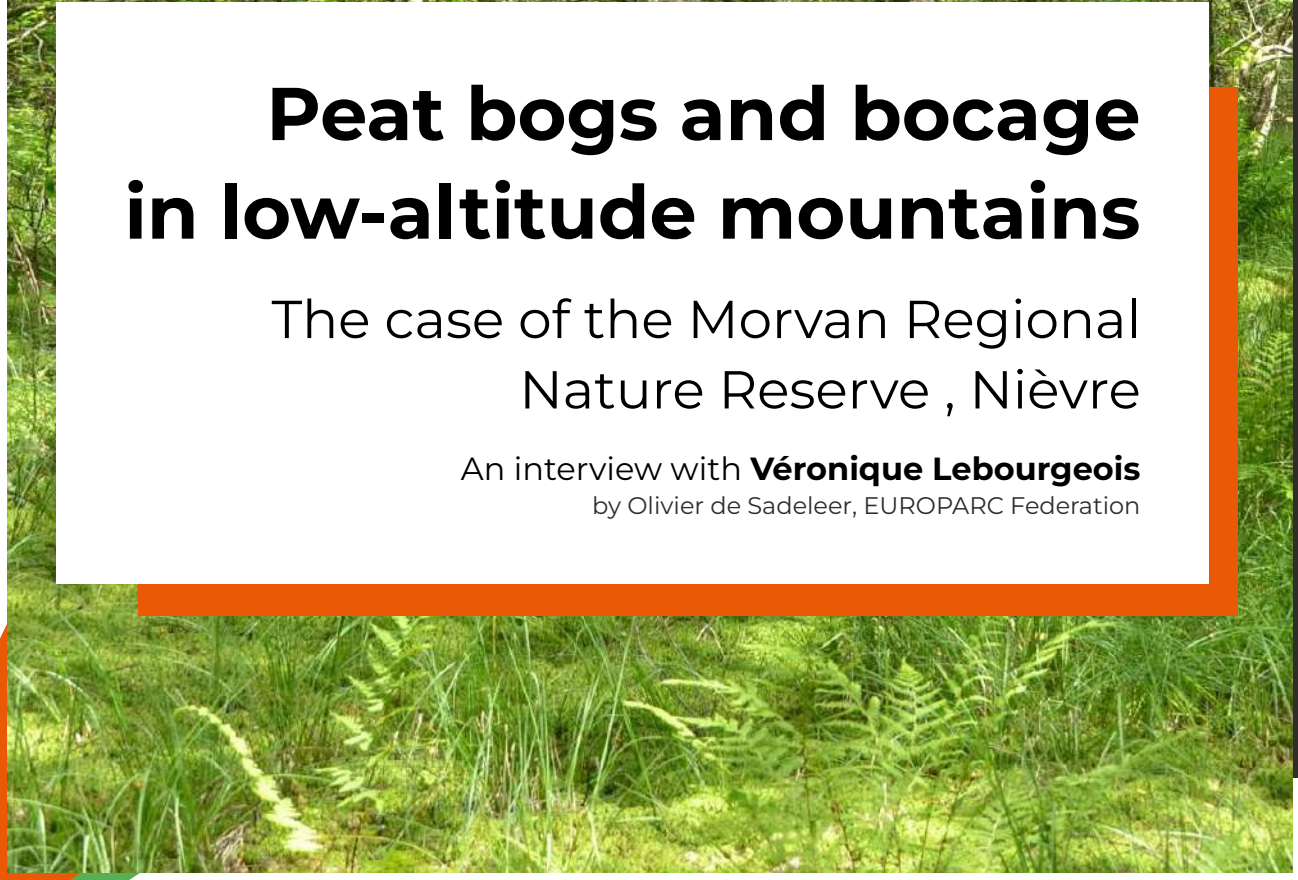
LIFE NATUR' ADAPT

Adapting to climate change in Protected Areas

Peat bogs and bocage in low-altitude mountains

The case of the Morvan Regional Nature Reserve , Nièvre

An interview with **Véronique Lebourgeois**
by Olivier de Sadeleer, EUROPARC Federation



Sphagnum woods, Tourbières du Morvan RNR - © Christine Dodelin

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Peat bogs and wetlands in the heart of Morvan

Morvan is a rural area with a landscape of bocage and small mountains at an altitude ranging from 150 to 900 metres. There is water everywhere. Its physical and climatic characteristics have always been favourable to the development of peat bogs. Some of them are over 10,000 years old.

The Morvan Regional Nature Reserve (*Réserve naturelle régionale des Tourbières du Morvan*) is a group of very discreet sites. Twelve peat bogs covering 266 hectares were classified as a regional nature reserve (RNR) in 2015. It is managed by the reserve team, represented by its manager Christine Dodelin, in partnership with the other owners of the sites: the *department of Nièvre*, the *Conservatoire des Espaces Naturels de Bourgogne Franche-Comté*, the *Natural History Society of Autun* and the *Conservatoire Botanique National du Bassin Parisien*.

What are the main conservation challenges?

The main objective is to maintain and restore the functionality of peat bogs, pond trails, peat meadows and cool streams. These habitats are directly dependent on the proper hydrological functioning of their catchment areas. Meadows have a natural tendency towards reforestation. Open areas are maintained by our herd of Highland cows and with the help of farmers with whom we have agreements.

What about human activities?

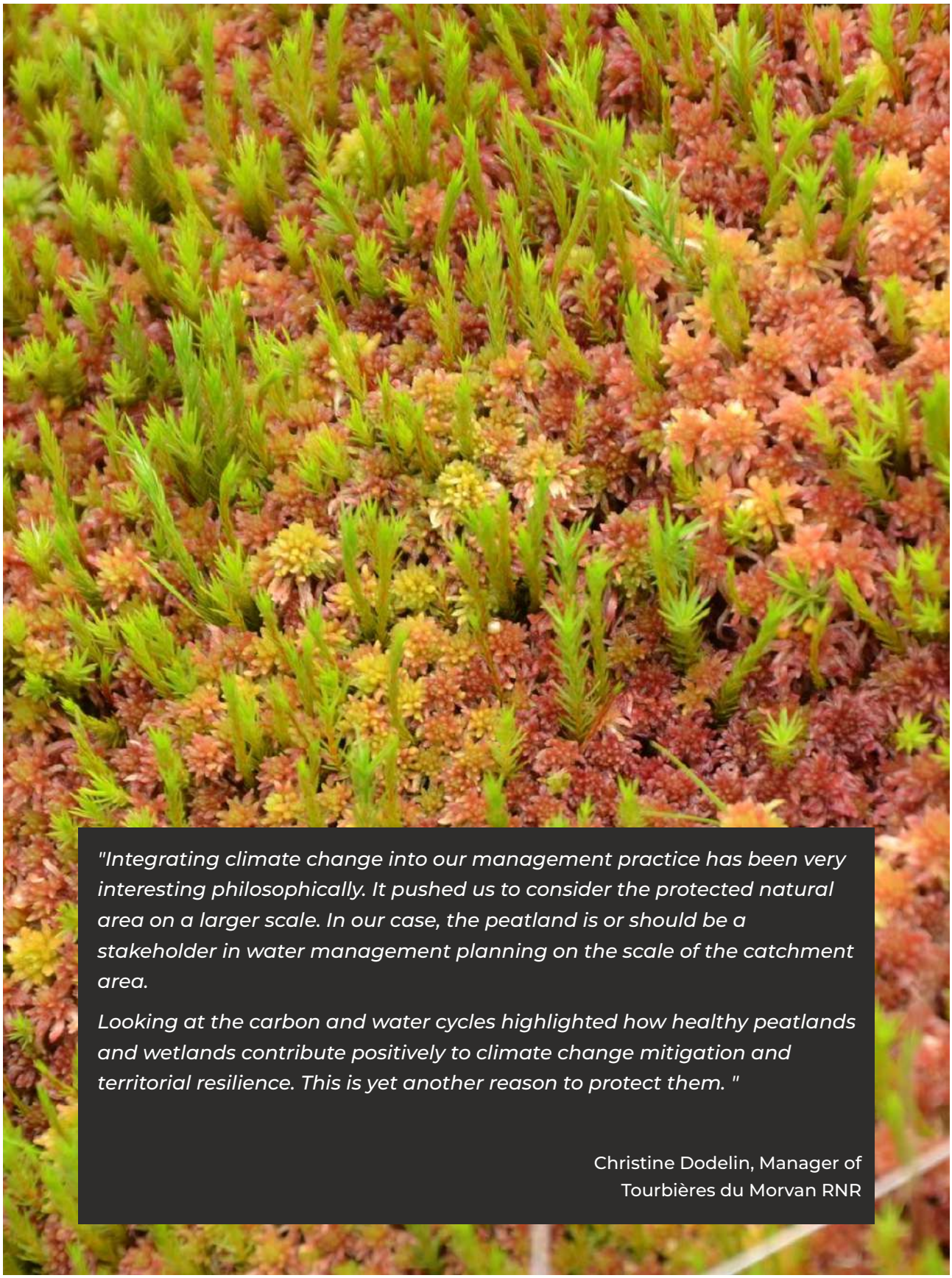
The pressures within the reserve are fairly well controlled. They are mainly linked to pastoralism and particularly to trampling or, conversely, land abandonment. Some sites feature walking itineraries, but there is little pressure. The quantity and quality of water that reaches the sites determines the health of the peat bogs. We are therefore dependent on agricultural practices, the quality of the meadows and crops located upstream of peat bogs. The challenge is therefore to work on the scale of the catchment area, i.e. approximately 6,000 km2.

Véronique, tell us a little about yourself.

I studied Biology and have a Master's in Water and Environmental Management. I have spent the last 18 months integrating climate change into the management of the Morvan peat bogs. This mission was an exciting and enlightening interlude in my long-term work on the management of the region's rivers.

I am not a naturalist in the strictest sense. I particularly enjoy working with local communities. Before devoting myself to nature conservation, I had some experience in emergency humanitarian aid. When I'm not saving the world, I love to go on nature walks with my family, with my children, for adventures and wonders.

Véronique Lebourgeois, Project Manager, Tourbières du Morvan RNR



"Integrating climate change into our management practice has been very interesting philosophically. It pushed us to consider the protected natural area on a larger scale. In our case, the peatland is or should be a stakeholder in water management planning on the scale of the catchment area.

Looking at the carbon and water cycles highlighted how healthy peatlands and wetlands contribute positively to climate change mitigation and territorial resilience. This is yet another reason to protect them. "

Christine Dodelin, Manager of
Tourbières du Morvan RNR

Community of red sphagnum, Tourbières du Morvan RNR © Christine Dodelin

A clear pathway: warmer and drier

Projections predict warmer temperatures and stable average precipitation. However, recent observations show that the most pessimistic models on surface water quantity and quality are the closest to reality. The Morvan mountain range will likely lose a lot of surface water in the future due to excess heat and disrupted rain patterns.

What is the current climate?

The low mountains of the Morvan are located where the continental climate of Eastern France intersects with the Western Atlantic and Mediterranean climates. The current climate is cold, rainy and humid. We have mild summers and very cold winters. Temperatures regularly drop to -15°C. Between 1980 and 2010, we had an annual average of 1,300 mm of rainfall.

Which model did you use?

In agreement with the members of the reserve's advisory committee, we chose the IPCC's median scenario, RCP 4.5, as our reference. For my analysis, I consulted the data provided by DRIAS, and the CNRM model in particular.

What climate do you expect to see in the future?

According to these projections, by 2050, we should see a 1.4°C rise in average annual temperatures. The average summer temperature is expected to rise by 2°C. In concrete terms, the climate in 2050 is likely to resemble that of the summer of 2018, when the region suffered severe droughts.

The models tell us that precipitation will remain stable. However, there are other interesting data in my view. The reality of the last three years is that precipitation has been distributed differently over the year, with severe summer droughts. When we look more closely at river flow, we can see that the Morvan has lost a lot of surface water since the 1960s, with the average flow down around 14%. Over the summer, this can fall to as much as -50%. In August 2018, it even fell by 60%. This water deficit is due to the combination of lower summer precipitation and higher temperatures, which cause a longer vegetation period and therefore an increase in evapotranspiration. The observed decrease in river flow corresponds to the average modelling forecast for 2050! Evapotranspiration will continue to increase (+15%). Groundwater recharge will further decrease by 10% to 20%.

To quantify the recent evolution, it is interesting to compare data before and after 1988, when there was a “climatic jump” of +1° in average annual temperatures. It has never come back down. The main thing we learned from this analysis is that we thought that the Morvan would remain wet. This will probably not be the case. We already knew that climate change will be more pronounced in mountain areas. This will likely be the case for low mountains too, like here. As the conservation of rivers and wetlands is our responsibility, we will have to focus adaptation strategies and measures on water flows in the reserve and its catchment area.

Climate change projections for 2050

+1,4 °C annual average

Significant decrease in surface water quantity

Access to groundwater is extremely vulnerable

The vulnerability analysis carried out on the scale of the reserve shows that, in light of climate forecasts, wetlands – peat bogs, peat meadows and freshwater habitats – may be considered vulnerable to very vulnerable in the face of droughts, reduced groundwater flows and increased temperatures.

Peatlands

They are vulnerable because there will be less water in warmer seasons. If the water level drops for a prolonged period of time in the peat bed, the upper layers dry out and may mineralize. This causes the carbon that was stored in the peatland in organic form to be released into the atmosphere. Furthermore, if the peat bog becomes mineralized, the soil is enriched in nutrients such as nitrogen and phosphorus, and becomes more favourable to the development of more generalist vascular plants. This is to the detriment of the peat-producing species specific to waterlogged and oligotrophic soils, such as sphagnum mosses or hare's-tail cottongrass. This habitat will evolve and could disappear, taking with it the species that depend on it, including a number of plants, butterflies and dragonflies, for example.

The aquatic environment

In Morvan, we are talking mainly about cool streams. The species that live there are vulnerable to a decrease in water flow, which exacerbates the increase in temperature. The fresh water pearl mussel (*Margaritifera margaritifera)* is a protected species in the nature reserve. It depends on trout for its reproduction. Unfortunately, these are very sensitive to warming. We know that wild trout suffer from heatwaves. At 20°C, they stop feeding and they die at 25°C. To adapt, they should be able to migrate downstream or upstream in search of freshness. This has become difficult because streams are often fragmented by human structures. As rivers warm, the number of fish species that normally live downstream, in warmer water, rises. They could end up competing with each other.

Cottongrass, Tourbières du Morvan RNR © A. Corbeau

Nuance and optimism

This analysis of the possible evolution of peatlands must be qualified. As the attention on carbon release from peatlands is high, there is a lot of literature on the subject. Recent studies show that sphagnum mosses could be replaced by others that play the same role in peat accumulation while withstanding periods of drought. It is known that peat bogs exist in different climates. On top of that, the hydrological systems of the Morvan may remain unchanged by drought episodes as they are connected to a resurgence of the water table through fissured granite. If we look at functionality, there is hope that peatlands will be able to adapt to global warming.

Northern emerald (*Somatochlora arctica*), Tourbières du Morvan RNR ©G.Doucet

Adaptation Plan

Working together to reduce water consumption upstream

To compensate for the probable decrease in surface water, we are developing an adaptation strategy based on both restoring the hydrological functioning of the sites and reducing "water loss" upstream. It is both a question of reducing internal disturbances at the sites and collaborating with local stakeholders to preserve the share of water that feeds the wetlands.

What are the main adaptation measures you have chosen?

Each new study shows how healthy peatlands and wetlands contribute positively to climate change mitigation and local resilience. Philosophically, this is interesting. This and our vulnerability analysis highlight that wetlands and peatlands should be stakeholders in water management plans on the scale of the river catchment area.

In concrete terms, we will deepen our study and do a quantitative analysis to understand who uses how much water. We have already identified three main stakeholders with whom we need to work: the inhabitants, the cattle farmers and the foresters.

The consumption of drinking water by the inhabitants and for agricultural uses seems *a priori* marginal. It is mainly used to water the communities and the herds. For these uses, we will meet with the agricultural actors and the drinking water syndicates on the scale of the catchment area.

We are going to raise awareness among foresters about the impact of the large-scale use of resinous species for wood production in the Morvan massif. It appears that intensive conifer monocultures have a significant negative effect on hydrological flows. In these crops, rainwater barely touches the soil, and their rapid growth leads to high water consumption through pumping. We will work with foresters on the water issue to develop economically-viable wood production models based on irregular, less dense and more diversified forestry. The aim is to increase the capacity to absorb and store water. This will also be very beneficial for biodiversity in general.

In parallel, we will continue our conservation efforts by working on the reserves to maintain the best possible ecological conditions. We will reduce overgrazing and improve water retention in the wetlands themselves.

How will you measure the effects of these measures?

We will continue our monitoring as planned, which aims to quantify water levels and monitor river flows. We will try to correlate water levels with the state of the environment, biodiversity, etc. We are aware that it will be difficult to quantify the effectiveness of our actions without data about current and past climate on a timescale over decades.

School outing, Tourbières du Morvan RNR © Christine Dodelin

Adaptation, a collective endeavour

To carry out this reflection on climate change, we worked with a core group of six experts, all of whom are involved in the reserve's management planning: the director, a botanist from the CBN, an entomologist from the SHNA, a representative of the Nièvre department and a representative of the Conservatoire des Espaces Naturels, which own certain sites. All of them have gained expertise on climate change thanks to the Natur'Adapt approach and took part in the vulnerability assessment.

We realised together that we often did not have tangible elements or sufficient knowledge for the analysis. There are many species that we don't know enough about, let alone their responses to climate change. By searching and collaborating, we still managed to identify key elements.

We involved, for information, the scientific council of the Regional Nature Park and the Management Committee of the reserve, which includes around 60 invited guests, landowners and institutions. Several researchers were also consulted to answer questions in their field of expertise: climatologists, hydrogeologists, archaeologists, etc.

We also worked bilaterally with farmers and foresters in the area. Initially, we wanted to organise a truly participatory process, but this was cancelled because of the COVID-19 pandemic. We held a workshop with tourism stakeholders, but this area of activity is less relevant to the reserve's adaptation to climate change.

Any last tip?

Get your head around climate data and projections :) It is important to take the time to understand climate change in order to be able to explain the phenomenon and its expected effects to others. This is very useful in engaging other actors. It also helps to identify the relevant climate indicators for one's site or territory. This is the starting point for the adaptation process.

Tourbières de Montbé, RNR des Tourbières du Morvan © Christine Dodelin

Further Reading

1. [English] Summary - Vulnerability assessment and adaptation plan >>
2. [French] Website of the Réserve naturelle régionale du Morvan >>
3. [French] Vulnerability assessment of the Réserve naturelle régionale des Tourbières du Morvan. LEBOURGEOIS V., 2020. LIFE Natur'Adapt - Report PNRM. 77p. >>
4. [French] Adaptation plan of the Réserve naturelle régionale des Tourbières du Morvan. LEBOURGEOIS V., 2020. LIFE Natur'Adapt - Rapport PNRM. 13p. >>
5. [French] DRIAS, Climate futures: Regionalized climate projections site (France) >>

LIFE NATUR'ADAPT

A collective learning process on climate change adaptation in Protected Areas.

In Europe, Réserves Naturelles de France, EUROPARC and eight partners have come together in this LIFE Climate Action project to transform this challenge into an opportunity to innovate. Natur'Adapt aims at triggering a transition towards the adaptive management of protected areas while laying the foundations of a dynamic collective learning process.

www.naturadapt.com

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