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Inland wetlands of the Northern Iberian Peninsula: Management and restoration of peatlands and wet environments



Restoration actions implemented as part of the European project LIFE TREMEDAL

1. Picos de Europa and Galicia

Restoration actions implemented at Vega de Comeya and Vega de Liordes (Picos de Europa National Park) as part of the European project LIFE TREMEDAL

In order to make farming compatible with the conservation of the mire habitats at the Comeya (Asturias) and Liordes (Castile and Leon) sites, the LIFE TREMEDAL project proposed that certain infrastructures be installed. This basically involved fencing off small plots of mire to prevent livestock (and wild herbivores) from gaining access to them. This would mean that the mire habitats within these plots would not be subjected to intense trampling, grazing and fertilisation.

In the end, five areas have been fenced off from livestock, three in Comeya and two in Liordes, work related to livestock farming has been carried out to compensate farmers and the mire habitats in the fenced-off plots have been monitored annually.

Initial marking out of the plots

The first task consisted of adapting the initial, more ambitious plans to the hydromorphological characteristics of the terrain (presence of ditches and pools), the sizes and shapes of the mires, their positions within the sites and, above all, the budget available. Finally, two plots were fenced off in Liordes, a particularly difficult site because it is at an elevation of 1,850 m. One has a perimeter measuring 140.59 m (in the fen with *Salix hastata subsp. picoeuropeana*) and the other has a perimeter of 90.29 m (in the fen with *Juncus balticus subsp. cantabricus*).

Three plots with perimeters of 98.18, 133.00 and 96.00 m were selected in Comeya in one of the areas of greatest interest for the recovery of mire habitats at the site.



Erection of fences to keep livestock out

This action consisted of installing three fences at mire plots to keep livestock out. In Comeya, two fences consisting of metal posts and barbed wire, protected by electric wiring, were erected first (757.17 m² and 739.98 m²), followed by a third wooden fence to close off the larger plot (1319.19 m²).



Fencing in Vega de Comeya. Left: Erection of metal fencing. Right: General view of the wooden fence.

In Liordes, it was necessary to overcome the drawbacks of a high-mountain area. The material had to be flown to the site by helicopter once the first supplies had been transported by pack animals, no easy task given the rugged terrain and difficulties involved in the climb. Two fences were installed in areas occupied by habitat 7230: one, closing off 814.67m², to protect a sector of the area which is home to the willow Salix hastata subsp. picoeuropeana and the other, around 640.39 m², where the rush Juncus balticus subsp. cantabricus grows.



Inspection of the fencing

The fences were checked at the end of spring to see if they had been damaged by snowfall, storms, livestock or vandalism. The state of the electrified wiring and the charges of the batteries supplying it were also checked.



Inspecting the state of the fences.

Implementation of actions to compensate farmers

In Liordes, a hut used by local farmers as a shelter in bad weather or in the event of other types of emergency was restored. It was re-roofed, its walls were repaired and a rudimentary bed was installed.



Left: previous state. Right: current state of the farmers' hut in Liordes following repair.

Although not at the expense of TREMEDAL, the track for vehicles to Vega de Comeya was repaired as a means of compensating farmers for the loss of pastures as a result of the erection of the fences.



General view of Comeya, where the track leading to the area has been repaired as compensation for the LIFE+ TREMEDAL project.

Restoration actions implemented in Galicia (Wetland of Cospeito, the Island of San Roque and Ollos de Begonte) as part of the European project LIFE TREMEDAL

WETLAND OF COSPEITO

Work was performed at this site to improve the state of conservation of wet and temporarily waterlogged habitats, and to adapt the habitat and reinforce the population of *Eryngium viviparum*.

Improving the state of conservation of wet habitats

The work was performed in three stages:

Defining the area of action

In this initial stage, the area of action was delimited and the pools which were going to be created were marked out. Once the presence and absence of protected species had been verified in the area of action, the different areas were suitably cordoned off so that the work would not affect them. The conditions according to which machinery and operators could move through sensitive areas at the site were also established.



Left: marking out the area of action. Right: area delimited due to the presence of protected species.

Clearance of vegetation in the areas to be restored

The aim of this second stage was to allow the different types of habitat to be favoured by the restoration work to develop suitably. The three habitats of community interest to be favoured were: "Oligotrophic waters (*Littorelletalia uniflorae*)", "Molinia meadows" and "Atlantic wet heaths with *Erica ciliaris* and *E. tetralix*".

The work involved in this second stage was performed using both handheld tools, brush cutters and chainsaws, and small construction machinery (a minidumper and a small backhoe loader). The plant material was removed.



Left: vegetation clearance work in the Wetland of Cospeito using hand-held tools. Right: vegetation clearance work in the Wetland of Cospeito using construction machinery.

Topographic correction and landscaping

The last stage of restoration consisted of topographically correcting and landscaping the terrain in order to favour winter waterlogging, thereby benefiting the three types of target habitat -Oligotrophic waters (*Littorelletalia uniflorae*), Molinia meadows and Atlantic wet heaths with *Erica ciliaris* and *E. tetralix*- by providing them with a greater water supply over a longer period.

Meadows and wet heaths are now colonising those areas in which the terrain was landscaped and a system of small pools was created for the Oligotrophic waters habitat. It is also hoped that populations of endangered species, such as *Eryngium viviparum*, will take hold in these pools, given the presence of stable clusters in areas near to the area of action.

All the work was performed using light construction machinery, two minidumpers and a small backhoe loader, with the aid of a high-precision digital level.



From left to right: operator using the high-precision digital level to landscape the terrain exactly. Work at one of the pools created in the Wetland of Cospeito. View of one of the pools following the first autumn rains.

Reinforcing the *Fryngium viviparum* population

Work was also performed in Cospeito to adapt the habitat and reinforce the population of *Eryngium viviparum*, a priority species which thrives in seasonal pools (oligotrophic waters with very low mineral content) in danger of extinction in Galicia.

The work was organised into three activities:

In vitro cultivation of the species Eryngium viviparum for micropropagation

High success rates have been achieved with the in vitro reproduction of *Eryngium viviparum* using seeds from the action sites and leaves and stolons taken from adult individuals.



From left to right, top to bottom: Unscarified fruit. Seeds after scarifying the fruit. Seeds infected with fungus. *E. viviparum* seed showing endosperm breakage in a cultivation flask. In vitro cultivation of *Eryngium viviparum*. Detail of the in vitro cultivation of *Eryngium viviparum* plants. *E. viviparum* ready to be hardened off. Hardened-off *E. viviparum* plant.

Once they had grown sufficiently in the in vitro cultivation process, the plants were hardened off to prepare them for planting out.

Adapting the habitat for *Eryngium viviparum* and planting out individuals obtained from in vitro cultivation

When the areas of action had been marked out, vegetation clearance work was performed, the area was topographically corrected and the terrain was landscaped in order to encourage winter waterlogging and, consequently, adapt the habitat for *Eryngium viviparum*.

Finally, 160 individuals of *Eryngium viviparum* were planted out, followed by approximately 400 more at a later stage. In order to be able to monitor these plants properly, it was decided that they should be planted out in marked trays buried in the ground.



Eradication of invasive exotic species

The numerous examples of *Eucalyptus sp.* Present were removed from the site by chainsawing the trunks and then carrying them away with a forwarder. Given the sensitive nature of the site, chemical control methods were not used on the stumps. The area will be visited each year to eliminate any stump shoots.



Left: Eucalyptus sp. trunk chopped up. Right: shoots on a Eucalyptus sp. stump in the Wetland of Cospeito.

ISLAND OF SAN ROQUE

Reinforcing the *Fryngium viviparum* population

Work was also performed on the Island of San Roque to propagate *Eryngium viviparum* previously cultivated in vitro. The same work stages and methods as those employed at the Cospeito site were used on the Island of San Roque to reinforce the population of *Eryngium viviparum*.



Improving the state of conservation of wet habitats

The types of wet habitat which it is hoped that this action will improve are: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*, Oligotrophic waters with very low mineral content, Molinia meadows and Hydrophilous tall herb communities.

The objective was the same: to improve land-use management on the island, the chief aim being the conservation of natural values and the sustainability of conservation actions.



Left: dried out alder trees at the rear of one of the plots in the south of the Island of San Roque. Right detail of the bank devoid of trees and shrubs at one of the sites in the south of the Island of San Roque.

The work carried out on the Island of San Roque can be split up into 2 groups according to the target habitat types.

A) Improving the state of conservation of the habitat: Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion-incanae, Salicion-Albae)

This work was performed in 5 plots in the middle and south of the Island of San Roque. Now public land, in the past these areas were heavily farmed and the configuration of their habitats was modified. This gave rise to the presence of species alien to the wetland (including Lolium sp., Trifolium sp. and Dactylis sp.).

Species characteristic of alluvial forests were planted in the 5 plots: *Fraxinus excelsior*, *Betula pubescens*, *Salix atrocinera* and *Crataegus monogyna*. In those areas in which it was considered convenient to accelerate the establishment of alluvial woodland, plants measuring 2-3 m were used (for example, in the southernmost area to create a visual barrier quickly in order to block out the A6 motorway viaduct).

Special attention was paid to the waterside woodland fringes in the plots due to the damage caused to them by the plant pathogen *Phytophthora alni*. More plants were staked in these areas than further inland in order to stabilise the banks, which were suffering from severe erosion.



Fences were erected in the four northernmost plots to make conservation compatible with farming.

In conjunction with the improvement of the hydrophilous woodland in the southernmost plot on the Island of San Roque, the species of community interest *Narcissus pseudonarcissus subsp. nobilis* was reinforced by planting out new bulbs.



Plants were planted out entirely by hand. Previous delimitation of the plantation areas meant that bulbs which were already established were not damaged.

B) Improving the state of conservation of the habitats "Oligotrophic waters with very low mineral content", "Molinia meadows" and "Hydrophilous tall herb communities"

As in Cospeito, the work performed to improve the heterogeneity of these wet habitats consisted of delimiting the areas of action, clearing the vegetation and topographically correcting the terrain (recovering small channels and depressions).



Left: Dumper with front loader working on the Island of San Roque. Right: inspection of the work. Small marshy hollow.

OLLOS DE BEGONTE

Work was performed at this site to improve the state of conservation of the priority habitats: "Calcareous fens with *Cladium mariscus*" and "Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion-incanae, Salicion-Albae)".

Improving the state of conservation of the habitat "Calcareous fens with Cladium mariscus"

The actions consisted of adapting the terrain so that it would remain waterlogged for longer and thereby enable the formations of saw-sedge to develop (*Cladium mariscus*).

On the edge of Ollo Pequeño, affected by diversions of water to supply an old washing place, earth was used to block the channel and a traditional stone wall (chantos) was built as reinforcement. Examples of Salix atrocinerea were planted and staked to naturalise the environment.



From left to right: pre-existing remains of the old washing place at Ollo Pequeño. View of the washing-place channel with the remains removed.



From left to right: detail of the recovery of the edge of *Ollo Pequeño* using "chantos". Vegetation clearance, topographic correction and land preparation at Ollos de Begonte.

The area was then topographically corrected to favour the formations of saw-sedge (*Cladium mariscus*) and the species was planted out.

The topographic correction work was performed with the aid of a high-precision digital level. The work involved was carried out using both handheld tools, brush cutters and chainsaws, and small construction machinery (a minidumper and small backhoe loader). The remains of the old washing place were removed.

Improving the state of conservation of the habitat: Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-padion, Alnion incanae, Salicion albae)

The action was implemented in an old *Pinus radiata* plantation located on publicly owned land occupied until then by a meadow with herbaceous formations. The alluvial woodland was reinforced by planting autochthonous species: *Fraxinus excelsior*, *Betula pubescens*, *Salix atrocinerea* and *Crataegus monogyna*. Exotic species, specifically *Pinus radiata* from the old plantation forest, were eliminated.

Part of the access path was recovered in Ollos de Begonte and a hedge was created (with *Prunus spinosa* and *Crataegus monogyna*) to prevent the more sensitive areas from being affected by public use.



From left to right: Ollo Grande (Begonte, Lugo). Plantation at Ollos de Begonte.







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GOBERNO DEL PRINCIPADO DE ASTURIAS