

# Life to ad(d)mire

Restoration of wetlands and mires in seven counties

The project Life to ad(d)mire has during 2010-2015 restored 35 drained and overgrown wetlands and mires in seven counties. The restoration has meant that the ground water level has been restored, which ensures a continuing favourable conservation status for the plants and animals dependent on this environment.

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## LIFE

LIFE is the EU's environmental fund, from which projects are financed to protect and manage the natural and environmental areas of Europe.



The objective for the specific programmes Nature and Biological diversity and Environmental programme is to contribute to the implementation of EU policies and legislation for nature and biological diversity as well as promoting integration with other areas of policy.

## Natura 2000

Natura 2000 was created by the EU to stop the eradication of animals and plants and to prevent the disturbance of their habitats.



Every EU member country must protect its valuable nature through Natura 2000 and care for these areas in order to preserve or strengthen the natural world.

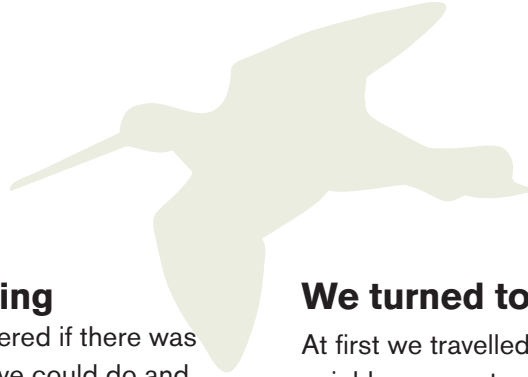
More information about LIFE can be found at the websites of the Swedish Environmental Protection Agency and the EU.

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# Introduction



**Many of the mires in our country are in need of restoration. The target of the project during 2010-2015 was to restore 35 of these areas to a so-called favourable conservation status.**

During the mid 2000s a major review of mires and wetlands was started in Sweden's Natura 2000 areas.

Those who worked on the inventory created a network to discuss and share experiences of the theme.

A recurring discussion point in the group was the drained mires that were present in the areas we visited. Most of the mires were drained and the hay meadows abandoned. Places designated as Natura 2000 areas must according to the EU represent the finest Europe has to offer.

## Financing

We wondered if there was anything we could do and we heard about LIFE. This is the EU's environmental fund from which you can apply for co-financing for restoration of Natura 2000-areas and their species.

Other co-financiers were the participating county administrative boards as well as the Swedish Environmental Protection Agency.

In 2008 the seven county administrative boards wrote an application and in 2010 the project Life to ad(d)mire was started.

## The purpose of the project

The work included filling the ditches so that the mires were no longer being drained and opening up the hay meadows to the light.

## We turned to the east

At first we travelled to our neighbour country in the east. Mires have been restored over a period of 20 years in Finland and their experience would assist us in becoming time- and cost-effective.

We have been in contact with our Finnish colleagues during the whole of the project period and have met on several occasions in both countries.

## The starting gun was fired

During the first year of the project we talked to the people who would be affected by the work.

We spoke to landowners and neighbouring property owners, fish conservation areas, hunting clubs, colleagues at the seven county administrative boards, affected municipalities and

others. After this the first excavators drove onto the mires and filled in the ditches, some of which had been dug more than a hundred years before.

## **The project received a lot of attention**

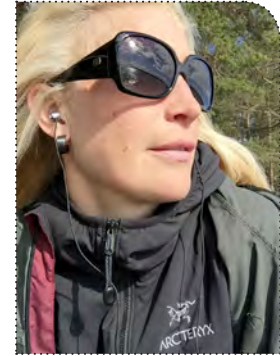
The project received both national and international attention

The project manager has given lectures about the project

methods and progress in Sweden, Europe and the USA.

It is important to share experiences. Knowledge must be shared.

Knowledge is also the key to cost-effective progress. In this booklet, you can follow our journey through the enormous work of restoring some of Sweden's most beautiful wetlands.



*Lisa Tenning, project manager*







# About the project

**The county administrative boards that took part in the project were Jämtland, Västernorrland, Dalarna, Östergötland, Jönköping, Kronoberg and Skåne.**

The project has restored more than 40,000 hectares of mires and hay meadows in Sweden.

- » The budget was 6.8 million Euro. The work included the following:
- » The ground water level has been raised in 29 drained mires by filling in the ditches.
- » Excavators have been used to fill in several miles of ditches on these mires.
- » Trees and bushes have been removed from 31 drained mires. The mires were so dry that trees and

bushes that would not normally grow there had established themselves.

- » This has meant that golden plovers and ruffs regained 3,800 hectares to rear their young.
- » Seven fens\* have been cleared for mowing. Thanks to this project, orchids will be flowering on a further 152 hectares of fens.
- » Five bird-watching towers have been built for visitors to experience the wonders of the wetlands.
- » Nine areas have new walkways in order for visitors to gain access to the fields.
- » Five wind shields have been built.

## Reporting to the EU

The project has been reported to the European Commission every 18 months. Reports of how the project is keeping to the project plan approved by the European Commission at the start of the project have been sent to Brussels.

The excavator drivers who were commissioned to undertake the work were unaccustomed to this type of work. There had to be close cooperation between the project and the contractors.

The excavator drivers knew what the excavators could do and we knew what results we wanted.

We worked methodically and creatively together to find the best solution for each of the mires.

*\* Fens are richer in species than other wetlands and are most usual in chalky grounds.*



# This is what we have done

Hay meadows and mires have been restored to functioning living environments for birds, fish, insects, plants and people.

## Jämtland County

Five mires were restored in Jämtland - Tysjöarna, Öjsjömyrarna, Stensundet, Brötarna and Ånnsjön.

In all these areas, the ditches have been filled in order for the ground water to rise to ground level, so as to stop the mires from becoming overgrown and disappearing.



## Västernorrland County

Five mires were restored to their original condition by filling in the ditches and removing vegetation such as birch, spruce and scrub.

The areas in Västernorrland are called Mossaträsk, Stensjöflon, Gideåbergsmyrarna, Sörlappmyran and Prästflon.

## Dalarna County

Three areas were restored in Dalarna – Haftahedarna, Koppången and Blåbergsåsflyten. The ditches have been filled and the ground water has risen.

The areas that should be wet are now restored.

## Östergötland County

Seven mires have been restored in Östergötland –

Fjällmossen, Bredsjömossen, Kärnskogsmossen, Bibergskärren, Trolleflod and Rocks.

The ditches have been filled in Fjällmossen, Bredsjömossen and Kärnskogsmossen. The vegetation that appeared after the drying effect of the lowered water level has been removed which resulted in the wetlands being opened up.

Hay-making has been performed at Bibergskärren, Trolleflod and Rocks.

## Jönköping County

In the county of Jönköping, old peat extraction areas at Anderstorp great mire and Store Mosse national park have been restored to living wetland again.

The forest land drain at Komosse has been filled in.



## Kronoberg County

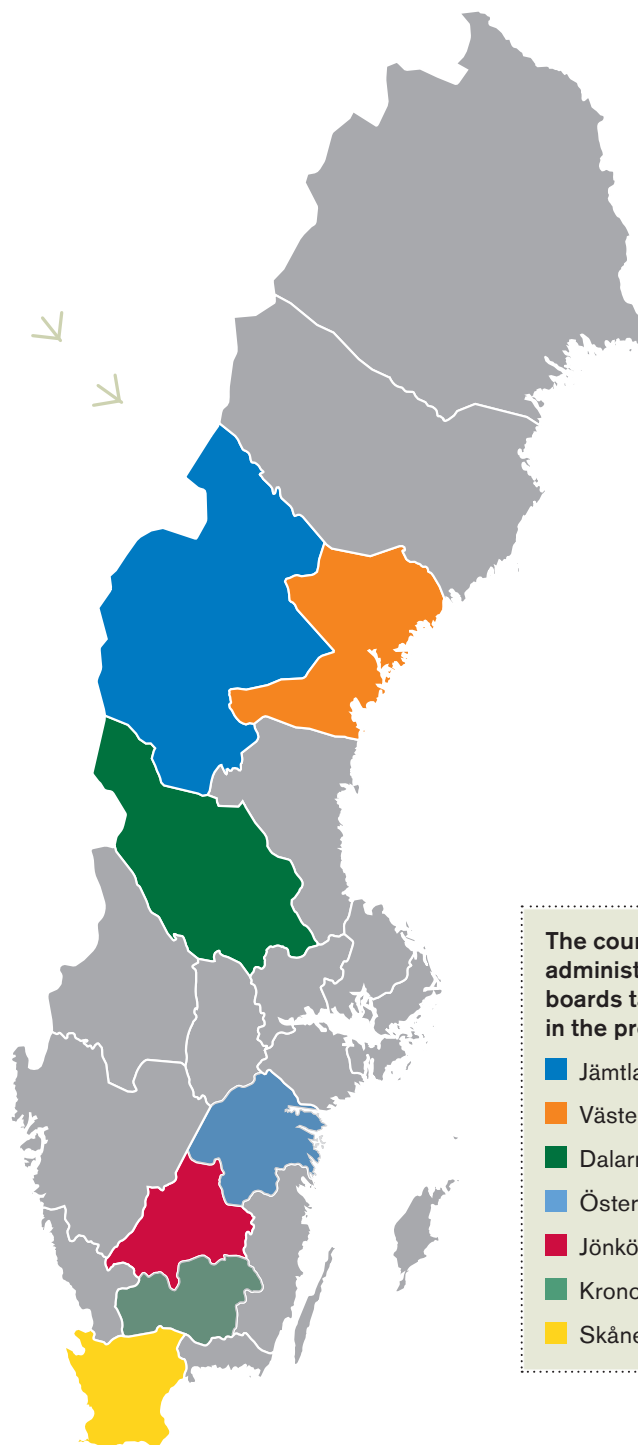
Five areas in Kronoberg have been restored to their original condition, at Årshultsmyren, Horsnäsamossen, Hästasjömyren and Tängsjöfly.

Here too, the ditches have been filled and the vegetation that had grown due to the drying effect of the lower water level has been removed.

## Skåne County

Seven areas have been restored in Skåne –  
Djurholmamossen, Fjällmossen, Lya Ljunghed and Älemossen, Söderåsen, Traneröds mire, Härkeberga-Skoggård, Åralövs mire and Dagtorps mire.

A railway embankment has also been removed in Skåne in order to improve the flow of the water in the mire.



### The county administrative boards taking part in the project

- Jämtland
- Västernorrland
- Dalarna
- Östergötland
- Jönköping
- Kronoberg
- Skåne



# What is wetland and what is a mire?

**Wetland is an area of land where, during a great part of the year, there is water under or over the ground level, for example mires. Coastal meadows, fens and marsh forests are included in the expression wetlands.**

A mire is a wet area of land where the water level is the same as the ground level;

it squelches around your feet as you walk on the land. Cloudberry and cranberry amongst others grow in mires.

Since the mire is constantly wet, it is also low in acid, meaning dead plant materials are not broken down in the same way as in other areas such as forests, coastal meadows and hay meadows.

The dead plant material remains, forming an ever-thicker layer of peat.

## **Mires in Sweden**

Approximately 15 percent of Sweden's land area is mire. Sweden has the world's sixth-largest area of peat land. Boggy areas are found from tropical areas to the poles, in approximately 175 countries.





# It is important that we restore wetlands

**A large number of plants and animals, including many threatened or disadvantaged species, live on wetlands. Approximately a quarter of the wetland areas have been drained and destroyed in Sweden since the beginning of the 19th century.**

Most of the remaining wetlands are more or less affected by drainage, nitrogen deposition or that they are no longer used for hay making or grazing.

This leads to overgrowth and makes for impaired conditions for animals, plants and people.

Drained miregy areas have a lower ability to deliver important

ecosystem services such as to bind and store carbon, clean water, serve as flood protection and contribute towards biological production.

Many wetlands have archaeological remains and cultural history value that can be damaged when they are exploited or overgrown.

## Plants and animals

Birds nest in the mires during the summer. Bird watchers can see migratory birds staying for a while to rest during their long journey.

Frogs and salamanders swim in the ponds. If you are in the right place at the right time, you can see flowers in all the colours of the rainbow stretching over the open landscape.

Moose and deer graze peacefully in the extensive grazing land.

Insects thrive and become food and people in rubber boots enjoy looking for berries.









# Hay making

**Seven abandoned hay meadows have been restored by the project.**

These lush hay meadows are located in the counties of Östergötland, Jönköping, Västernorrland and Skåne.

The hay meadows became overgrown, as no hay making has been performed for many years and the fields have been abandoned. In these fields there is a great richness of species and many species are dependent on these small open spaces for their survival. Here you may find amongst others marsh helleborine, parnassia and fragrant orchids.

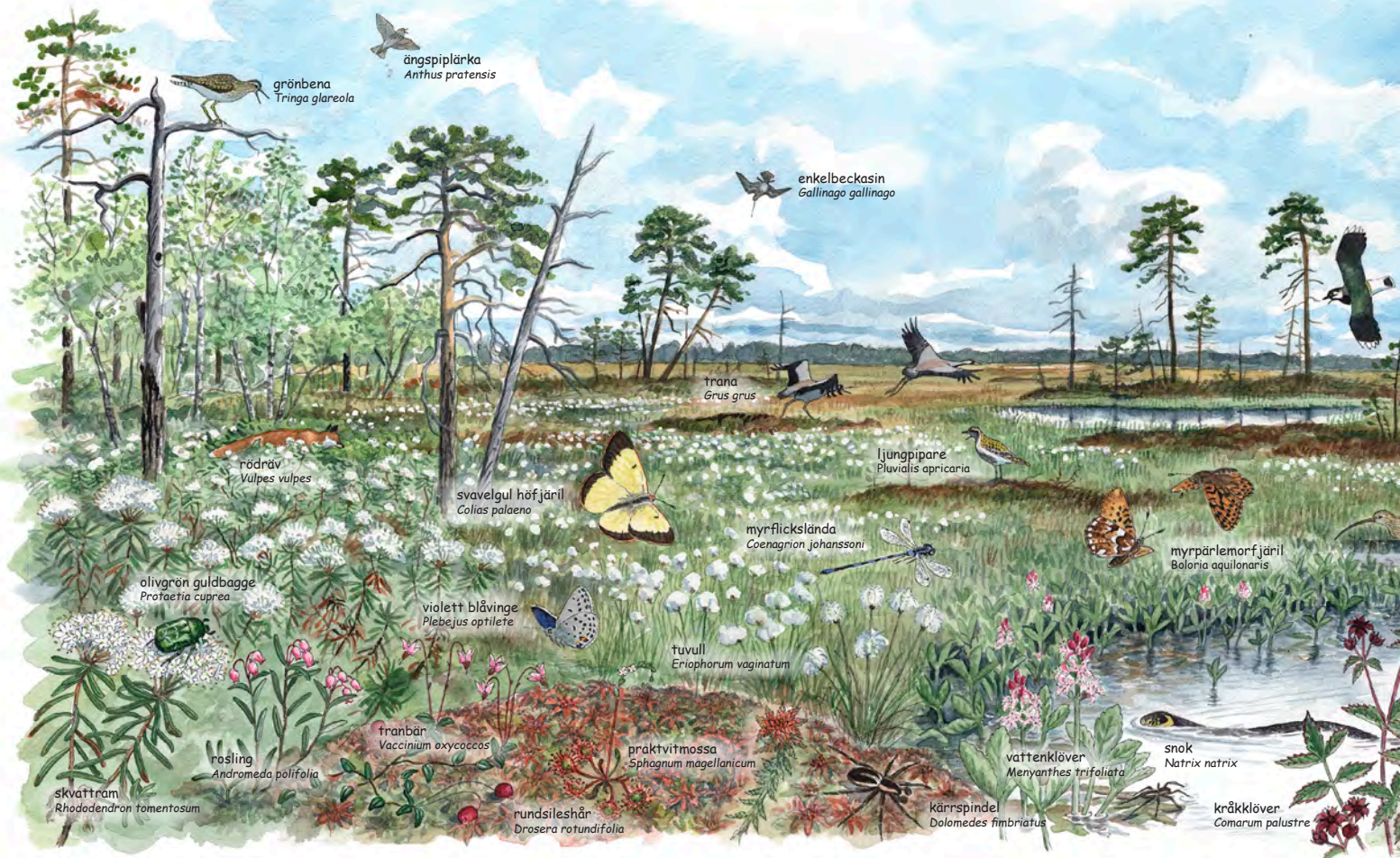
The restoration has been performed by removing vegetation and milling stumps and tussocks, and the tall grass that choked the ground has been cut with mowing machines. The fields have now been improved for coming years of mowing.

Mowing these areas will be done by the county administration boards after the project has ended.

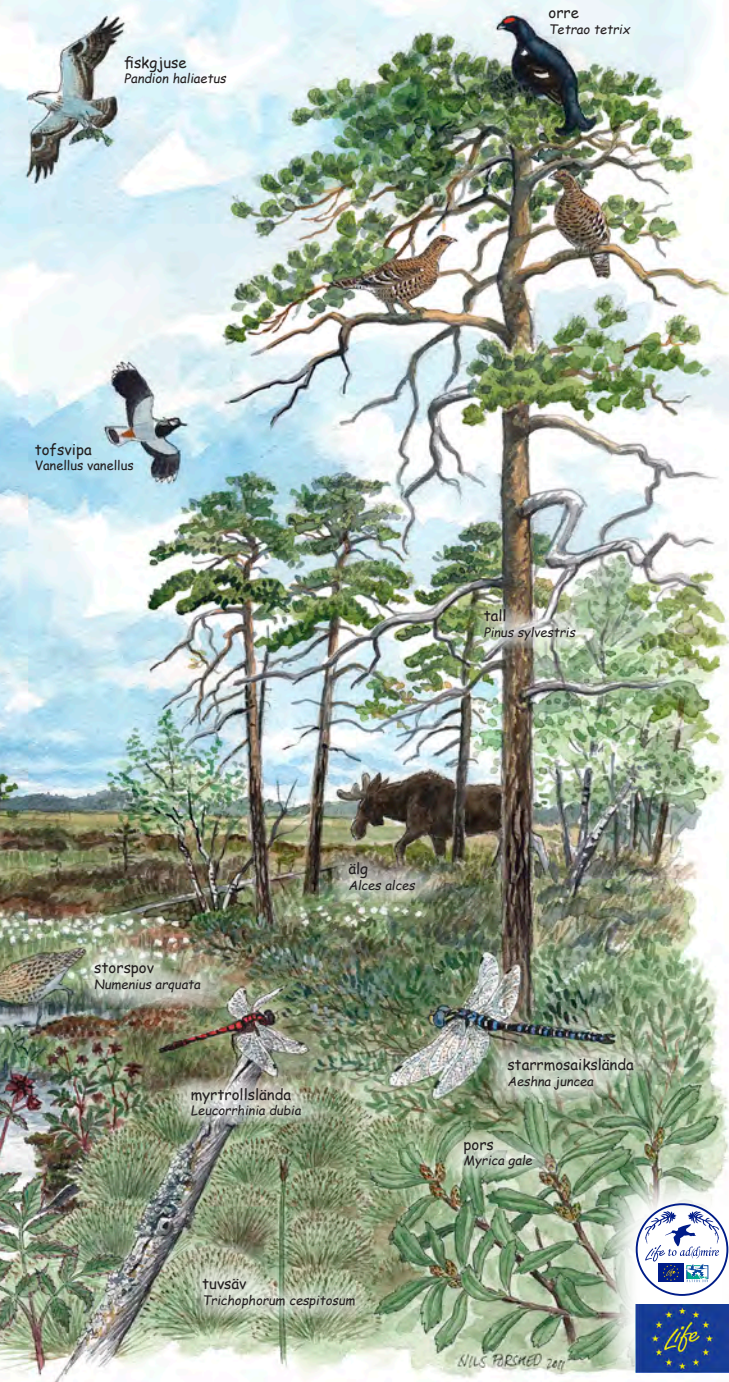


# Life in the mire

– a unique diversity of species







## Shame on the trees, said the bird and flew away

Moors and other wetlands were left in peace by humans for a long time. But during the latest 200 years many wetlands have been drained or dug away.

The population of Sweden grew during the 19th century and more land was required for growing food. One way was to lower lakes and drain mires.

During the 20th century, peat was dug up and used for animal shelters or as fuel for heating. A lot happens when a mire is drained or dug away.

## Water + Mires = True

When the earth dries out, the sphagnum that continuously raises the height of the mire dies. When the sphagnum disappears, the fungi, lichens and insects that normally live there die. Most often, the only things left are heather, birch and conifers.

When the plants thrive, the birds and other animals that belong in the wetlands can return.

Why does drainage frighten the wetland birds away? The problem is that when the field dries, trees start to grow on the mire. The trees suck the water from the ground and the

drying-out process becomes even faster.

When the trees grow, wading birds that nest in the wetlands are frightened away. Birds are born with a fear of building their nests too close to trees, since birds of prey might hide there and scout for their eggs and youngsters.

We must therefore remove the invading trees to ensure that the wetland birds will thrive.

It is not unusual for an undrained mire to become gradually overgrown with trees and scrub.

This is a natural process.

Today however, this rate of growth is faster than is natural, since the rain contains high levels of nitrogen from various emissions. The trees are fertilised by the nitrogen.

We have therefore felled trees in some places that are not affected by ditches, but where the overgrowth has been accelerated in an undesirable manner.

Birds like black grouse and golden plovers will benefit from these measures.











# Filling the ditches

**Excavators have been used in all the different places to fill in the ditches. A common method was to use tree trunks from the mire to build so-called dams.**

The dams, made up of tree trunks in bundles, were placed in the drained mires to stop the water.

Another common method was to use peat as the material for larger types of dams.

The method of completely filling the ditch or of leaving an open gap between the dams was dependent on the condition of the mire.

The following pages will show some of the methods we used.



*To the left: Excavator on a mat of trunks building a dam.*

## Different methods

The methods used to fill the ditches are different depending on the circumstances at each site.

Sometimes the ditches were far out in the mires, and the excavators were able to drive for long stretches over undisturbed mires without damaging the mire. Most often this was done by using logs that the excavator would drive across and move along with it.

In other places, the mires were overgrown with shrubs and trees since the drains had effectively dried the ground. The mires were cleared of vegetation before the filling in of the ditches could start. Most often this was done during the winter when the ground was frozen.

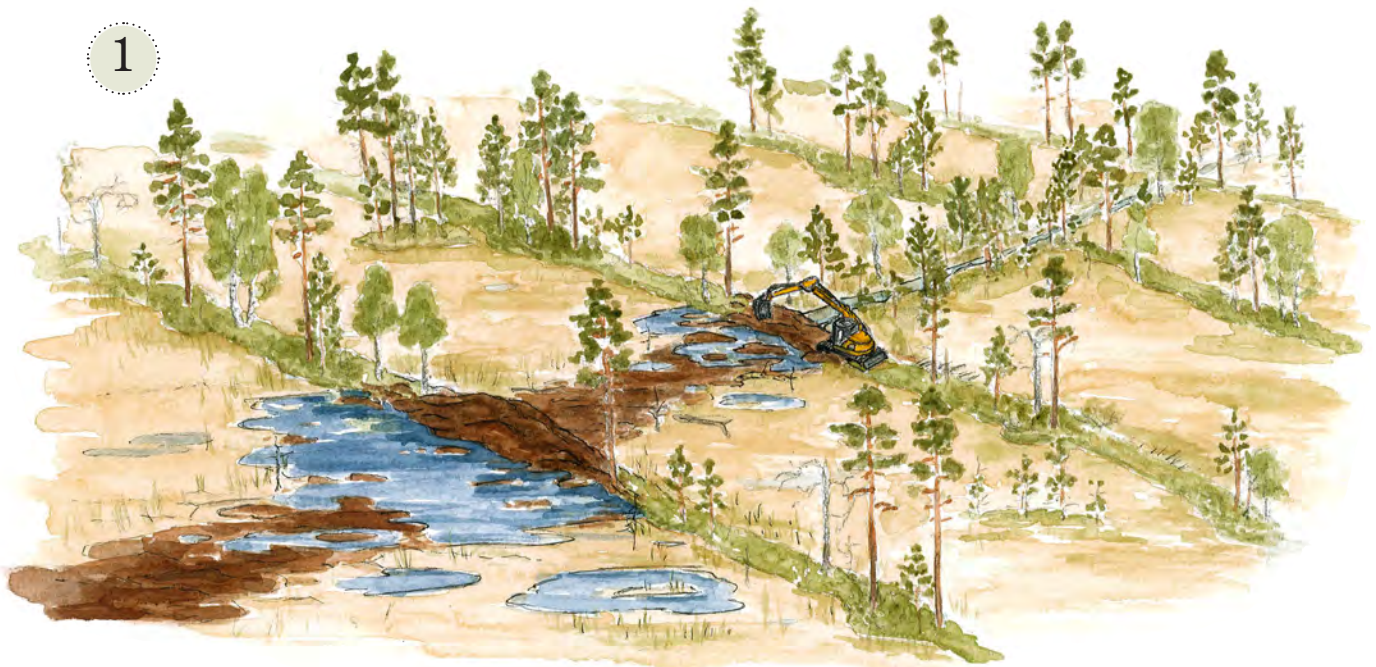
Peat from the mire was used to fill in the ditch. The peat that was once dug up and left in so-called peat embankments was used in preference.

The peat embankments had broken down in many places. Peat from the undisturbed mire was used instead. This was an operation that required careful planning.

## Different approaches

There are many alternative approaches to the work. One method was required if the peat layer was shallow. If the mire was wet another method was required.

1





2



3

### Filling-in methods

1. When the structure of the mire was a mixture of firm ground and wet ground, embankments were built on the firm ground. This was done to capture the water in the wet areas.

2. Peat from the mire was used to fill in a ditch. The peat that was once dug up and left in so-called peat embankments was used in preference.

3. Sometimes the infill was strengthened using dams as extra security in the event of high water flow. These were sometimes made from timber, sometimes peat, dependant on the condition of the mire.



# Building dams

**This is a description of one of the methods used to fill in a ditch. The pictures on the right show how it is done, step by step. All the work was done before and after the birds were nesting. Thus ensuring the birds were not disturbed.**

1. The excavator dug a hole at an angle to the ditch, deeper than the ditch itself. The width of the hole had to be 10-15 meters in each direction from the ditch. In total the hole was approximately 30 meters in length. The dams were built with approximately 150 metres of space in between.
  2. A fibre cloth was then placed in the bottom of the hole to stop peat and fine-grained sediment being pushed through the dam.
  3. Following this, timber from the mire was used as filling material. It was important to fill the hole completely up to ground level.
  4. Fibre cloth was laid over the timber to insulate and reinforce it.
  5. Finally, we topped with peat in order for the dam not to show. We were careful to use plenty of peat so that a mound was formed. During the first year this is very porous and airy. But as time passes, weather and wind cause the mound to collapse. It melts in and becomes a natural part of the mire.
- Within 5–10 years, the restoration is overgrown and invisible to the eye.

## Eco-system services

An eco-system service is a service where nature contributes free of charge. The quality of life we enjoy today would be very expensive without these. Sometimes they are even necessary for our survival.

On occasions of heavy rainfall, water collects in the miregy areas and in this way stops floods - they are so-called buffer zones.

Mires clean our rainwater so that the ground water becomes clean and drinkable without adding chemicals.

The water is also cleaned by peat before flowing into the lakes and watercourses, giving good conditions for fish, birds and water-borne insects.

The mires also store and bind carbon dioxide from the air when the peat is formed, thereby reducing greenhouse gases in the atmosphere. This helps to slow global warming.

Carbon dioxide is a greenhouse gas that affects our climate in a negative way, as it contributes to global warming. A healthy mire binds more carbon dioxide than a rain forest.







# Inventories

**In order to decide where the restorations were to be carried out, the areas were made part of an inventory. It was important to know exactly what the area looked like before the measures were put in place.**

The inventories answered amongst other things how bird life was in the area, what plants were growing in the mires, how the quality of the water in surrounding streams and lakes had been affected by the ditches and how much the ditches had lowered the ground water level.

The bird inventories were carried out according to a national methodology from the Environmental Protection Agency. These inventories were made in all the areas.

Pipes were laid down to the ground water inside and outside the areas, in order to measure the ground water level during the restoration work.

The inventory gave information about how the ground water level had benefited from the restoration work.

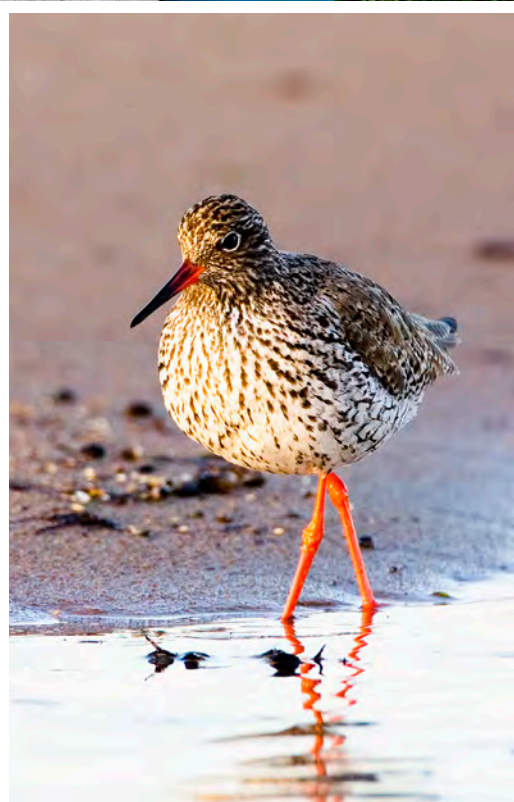
The target for the restoration was that the water level was to rise to ground level in the mire but not outside the Natura 2000 boundary.

This was precision work, which we were forced to weigh up before the restoration was carried out.

Water tests were even carried out downstream of the mires in order to check that no unwanted material was released into lakes or watercourses.







# Follow-up

A follow-up inventory was completed in 2015 to see if more mire-related plants had started growing. Follow-up of all the inventories will be carried out continuously in all areas by the county administrative boards even after the project has ended.

When the same inventory is followed up after a couple

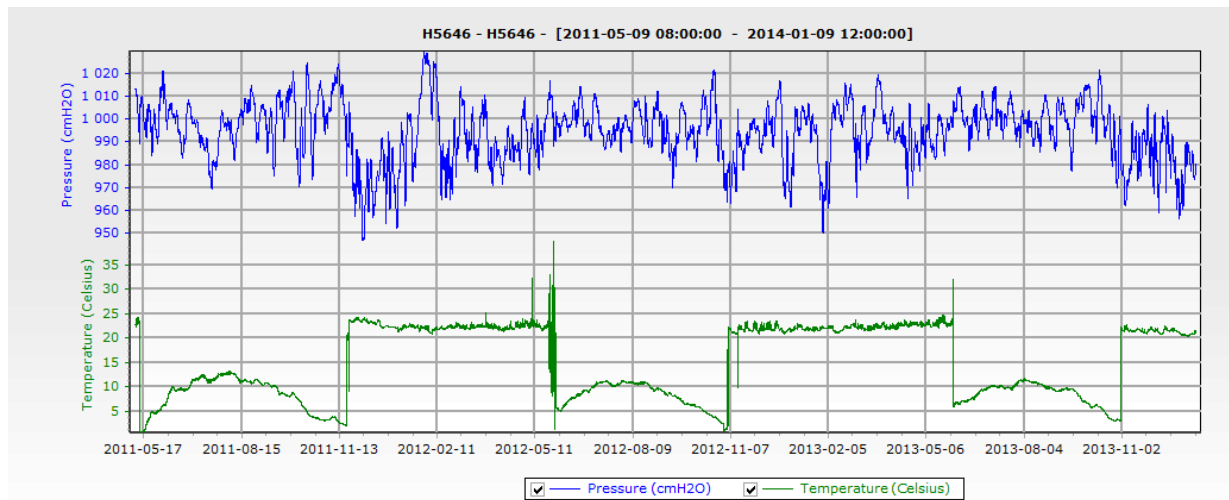
of years, the results of the inventory before and after can be compared and improvements tracked.

## What happens when the project comes to an end?

When the project is ended in 2015, the restored ditches will grow together with the

mires and in the longer term blend into nature. The restored meadows will continue to be protected and kept open.

The county administrative boards that were part of the project will share their knowledge about effective mire restoration.



*The graph shows how the ground water level has moved over time. You can see that the ground water was stable during the whole of the restoration period.*







”It is important to share experiences. Knowledge must be shared.”











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