Raised bog conservation and management in MELNAIS LAKE MIRE in LATVIA

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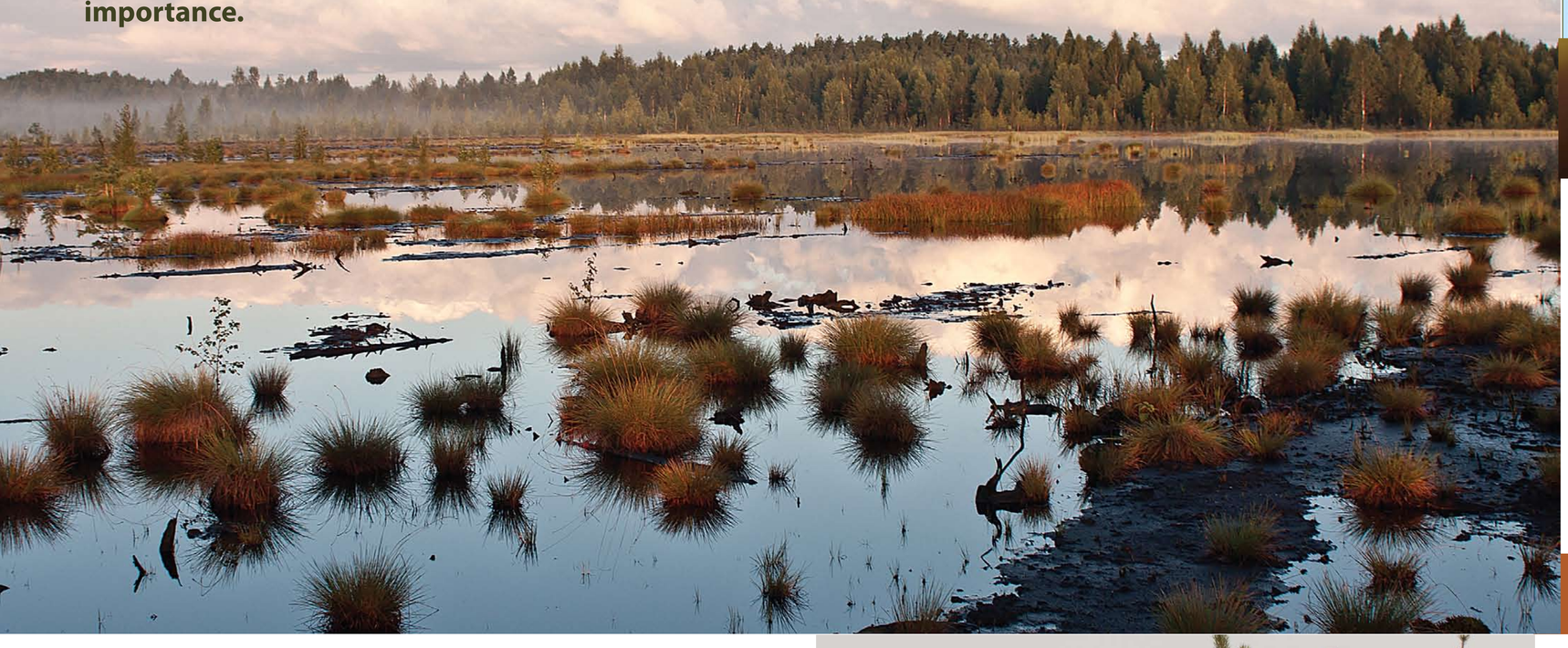
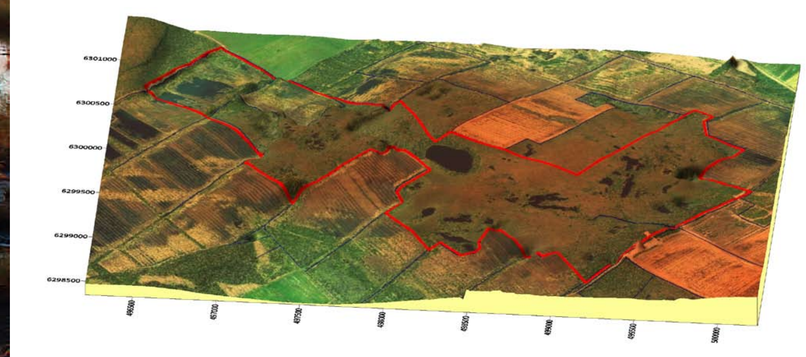
Raised bogs are one of Europe's rarest and most endangered habitats and important habitat in terms of conservation of plant and animal species occurring there. However, in the recent decades raised bogs have been negatively influenced by various human activities, like drainage, peat extraction, forest planting and land reclamation. Degradation of the intact raised bog habitats due to the drainage is a common feature for all the project sites.

From February 2010 until August 2013 the EC LIFE+ Project "Restoration of Raised Bog Habitats in the Especially Protected Nature Areas of Latvia" LIFE08 NAT/LV/000449 is carried out in the 4 project sites – Melnais Lake Mire, Aklais Mire, Rožu Mire and Aizkraukle Mire and Forests Nature Reserves.

Aim of the project is to re-establish the active raised bog habitats and site hydrology in the areas that are influenced by drainage and to protect the raised bog habitats, plants and animals of European and Latvian importance.



3 D model of Melnais Lake Mire Nature Reserve



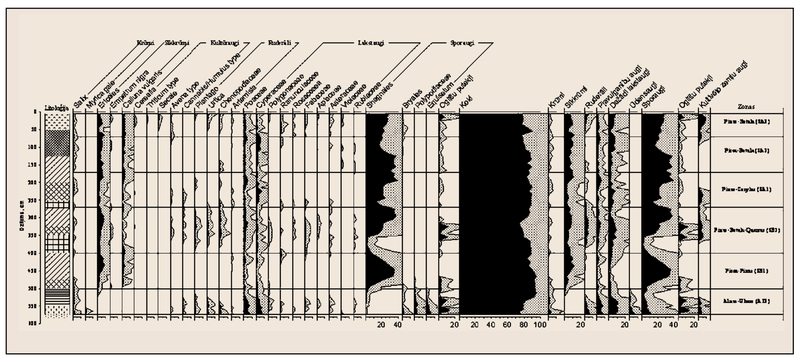
STUDY SITE

Melnais Lake Mire Nature Reserve with the total area of 317 ha lies a few km from the capital of Latvia – Riga. According to the Geobotanic classification of the districts of Latvia Melnais Lake Mire is situated in the Coastal Lowland. Especially protected nature area was established there in 2004.

Melnais Lake Mire includes raised bog habitats (7110*) of the vegetation Class Oxycocco-Sphagnetea and fen habitats (7140, 7150) of the Scheuchzerio-Caricetea fuscae. Melnais Lake Mire is a remnant of a formerly more extensive raised bog, the largest part of which nowadays is drained and cut for peat. Peat extraction fields border with Melnais Lake Mire Nature Reserve. There are drainage ditches along the edge and across the centre of the raised bog. The nature reserve includes open peat fields where previously peat extraction was caried out.

Melnais Lake Mire Nature Reserve is of national and international importance. The vegetation of the intact part of Melnais Lake Mire has a hummock-hollow complex and includes labyrinths of bog pools and ridges. Transition mire habitat is located on the margins of Melnais Lake and near the largest raised bog pools. In places the bog woodland (91D0*) occurs, especially close to the raised bog pools. On the margins of Melnais Lake Mire the drainage ditches have lowered the water level.

Spore-pollen and vascular plan diagram from Melnais Lake Mire Nature Reserve



THE MAIN NATURE VALUES

- Raised bog with hummock-bog pool complex (36%)
- Dystrophic lake (6%)
- Permanent shallow lakes that have developed in place of the previous peat fields and are important for birds (12%)
- In total, 17 especially protected bird species
- Especially protected habitats cover 84% of the nature reserve

MIRE ORIGIN AND DEVELOPMENT

Melnais Lake Mire started to develop at the end of the warm and humid Atlantic period, about 5000–6000 years ago when the peat sediments accumulated in

the depression of the Plain of the Baltic Ice Lake. As a result of land paludification, the fen vegetation begun to develop from decayed parts of plants. Since the Sub boreal period, about 4500 years ago, due to the climate change, the raised bog vegetation begun to dominate in the mire. At present, in the deepest place the peat depth reaches almost 6 m, but medium depth is 3 m.

During thousands of years, the mire has gone through all the phases of mire development – from fen till raised bog. The plant remains in the composition of peat indicate to the development course of the mire.

MATERIAL AND METHODS

In 2010 monitoring plots were set up in transect lines perpendicularly to drainage ditches and in sites relatively less affected by drainage. In total, there are 58 monitoring plots. The size has a diameter of 4m or 1m. They were established on ditches where dam building is planned, in the raised bog area most likely influenced by dam building, in remnants of non-flooded cutover peat fields, on intact areas of raised bog to compare with the drainage and peat extraction influenced sites.

The vegetation in the monitoring plots was described according to a Standard protocol, including parameters such as micro-relief, vegetation structure, coverage of vascular plant, moss and lichen species (estimated in percent) and vitality of trees, shrubs and dwarf shrubs. Geographical coordinates of each plot were recorded and a digital data file created. Additionally, digital photographs of all plots were taken.

Profiles of groundwater observation wells are installed in Melnais Lake Mire in order to monitor the hydrological regime. The well depth is 1.5-3 m, depending on the thickness of peat layer. In total, 13 groundwater monitoring wells were installed.

RESULTS

HABITAT AND HYDROLOGICAL MONITORING

The greatest impact of drainage is observed in plots close to the drainage ditches (no or little cover of sphagnum mosses, dominance of mosses of dry coniferous forests, overgrowing with pines, and well-pronounced dominance of dwarf shrubs). The cover of Sphagnum moss increases with increasing distance from drainage ditches, while the cover of dwarf shrubs decreases.

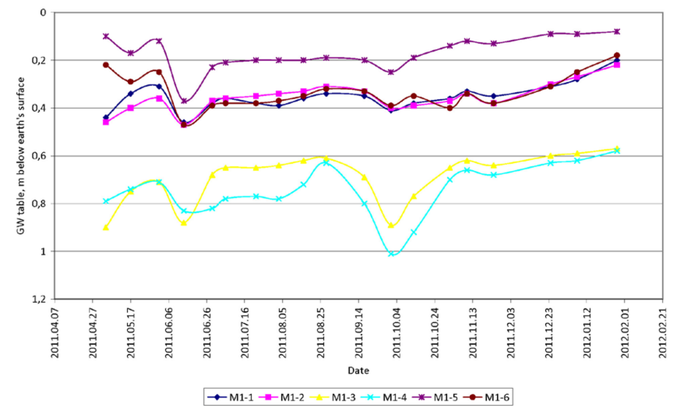
The hydrological monitoring is carried out in the ground water monitoring wells that are located as transects in the project sites. The hydrological monitoring transects cross the degraded areas of raised bogs and pass also intact parts of the bog. The groundwater level is measured in the monitoring wells twice per month. The results of both habitat and groundwater monitoring are summarised in the Monitoring Protocols and are published on the Project home page www.purvi.lv

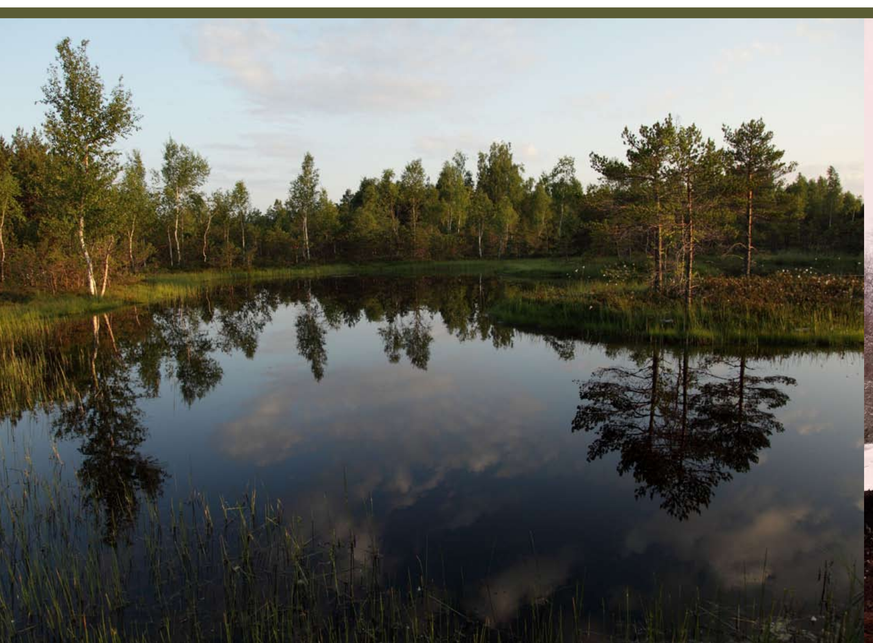
The groundwater (GW) table observations show that the direct impact of the ditches on hydrological regime reaches about 30 m from the ditch. The seasonal fluctuations of water table in the ditches have great importance in the hydrological regime – profiles A1, Ak1, R shows the seasonal impact of the ditch , where significantly lower GW table is observed near the ditch during the low season; but for the rest of the year it is the same like in other wells further from the ditch. But in profile A3 the draining impact of the ditch is observed throughout the whole measurement period due to the low water level in this ditch.

The hydrological regime depends also on the closeness of other surface water bodies, and their hydraulic connection. Profile Ak1 is located in the area, where ditch is connected to the lake and where is a row of smaller lakes connected to the main lake. The GW table stabilization takes much longer time, compared to the A1 profile, where the only nearby surface water body is the ditch.

Partially flooded peat fields in Melnais Lake Mire (M1) maintain rather stable hydrological regime for the whole observation period, but in the wells, closer to the main drainage ditches the GW fluctuations are more significant, proving the influence of those ditches.

Groundwater table at M1 area in Melnais Lake Mire, around the abandoned, partially flooded peat fields.





CONCLUSIONS

The habitat and hydrological monito ring results show that Melnais Lake Mire is greatly influenced by drainage, especially, near the ditches and peat extraction fields.

Therefore, the main management activity in the territory is building of dams on the drainage ditches to improve the hydrological condition and to prevent the impact of desiccation in the raised bog. In 2012, in total 54 dams were built on the drainage ditches in Melnais Lake Mire.

The results of the success of habitat restoration have to be evaluated using the habitat monitoring indicators - groundwater level in the project sites, plant species in the monitoring plots and bird species in the project sites. Sources of verification include - raise of groundwater table after building of dams on the drainage ditches, re-establishment of Sphagnum species in the drainage ditches, re-appearance of typical active raised bog species in the degraded project areas, occurrence of raised bog bird species in the open active raised bog areas.