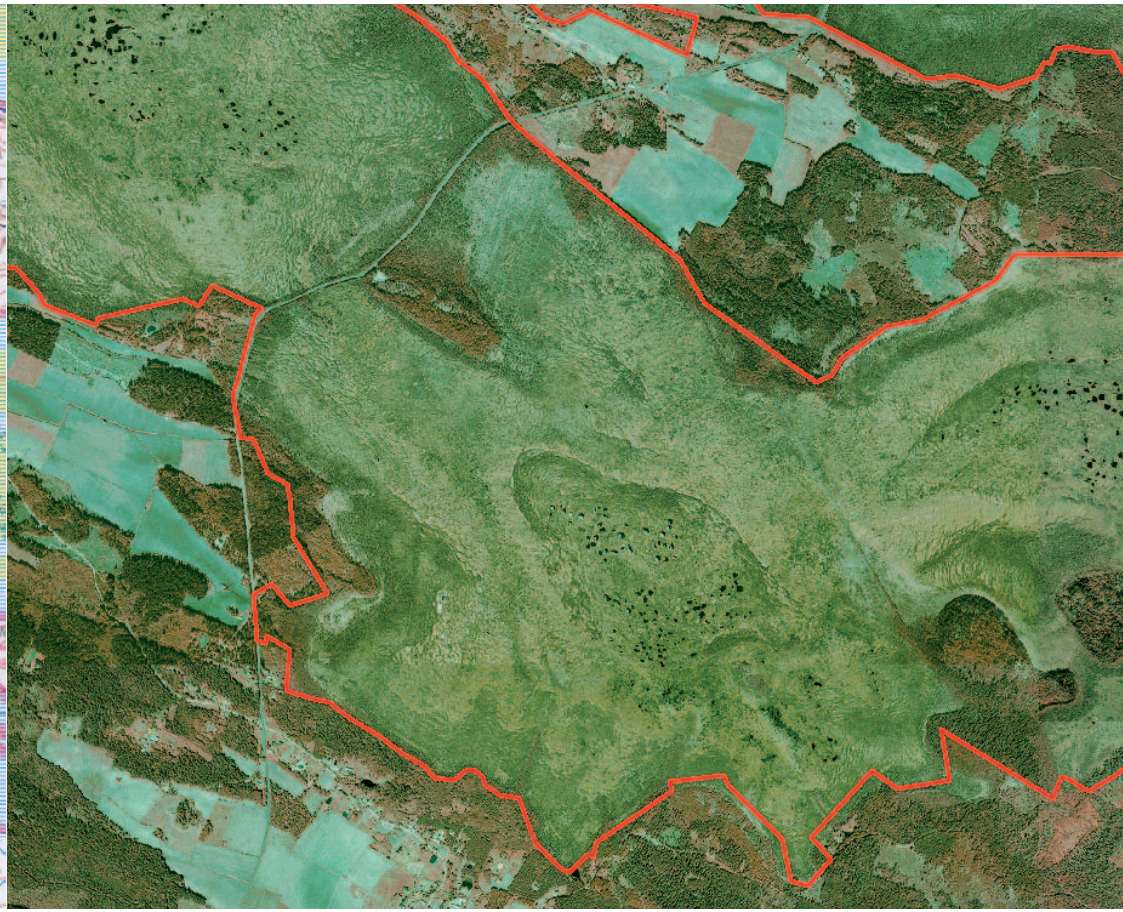
Topographic map of Torronsuo National Park. Each grid square is 1 km2.
© National Board of Survey, permission no. 7/MYY/06.



False-colour infrared aerial photograph of Torronsuo National Park. The red line shows the boundaries of Natura 2000 area.
© National Board of Survey, permission no. 7/MYY/06.

When several units make one large bog massif

Torronsuo – Finland's largest raised bog massif

Teemu Tahvanainen

Conservation

With the area of about 26 km^2, Torronsuo mire is the largest raised bog in Finland. It is the greatest bog in three dimensions also, as the mean depth of peat in Torronsuo is as much as six metres. The Torronsuo National Park was established in 1990 with an area of 24 km^2. With minor extensions, the area belonging to the park is today 26.7 km^2, including the raised bog, and in the northern part of the park, Lake Talpianjärvi, which has a lowered water table and has grown into a marsh. Only very small areas in the park are forests on mineral ground (26 ha). The Torronsuo area was included in the National Mire Protection Programme (1981) and in the plan of Finnish National Parks (1979), as a site of both national and international significance. Earlier, there had been interest in the utilisation of the peat resources. Aartolahti (1965) reviewed the possibilities of utilisation but stated in clear terms that Torronsuo should be considered as a most valuable site of natural heritage in the national level. Today, the area is a part of the NATURA 2000 network. It is also included in the Ramsar list (Ramsar site no. 1536). Most of the Torronsuo area is in its pristine state but the marginal lagg fens are partly cleared into fields. Only minor parts have been drained (ca. 160 ha) and these have been restored under an EU Life project in 1997-1998.

Mire system

Torronsuo is located in the zone of concentric raised bogs. Its gross forms, surface patterns and vegetation are typical of the area, although the large size of the basin makes the bog system more complex (Aartolahti 1965). There are several more or less distinct bog massifs interconnected in the Torronsuo system. Clear concentric, cupola forms are seen in the western part of the system, while the eastern part is more level. Torronsuo lies on a comparably dry watershed area. The mire system has a small drainage area and minerogenous hydrological influence is very weak in the whole system level.

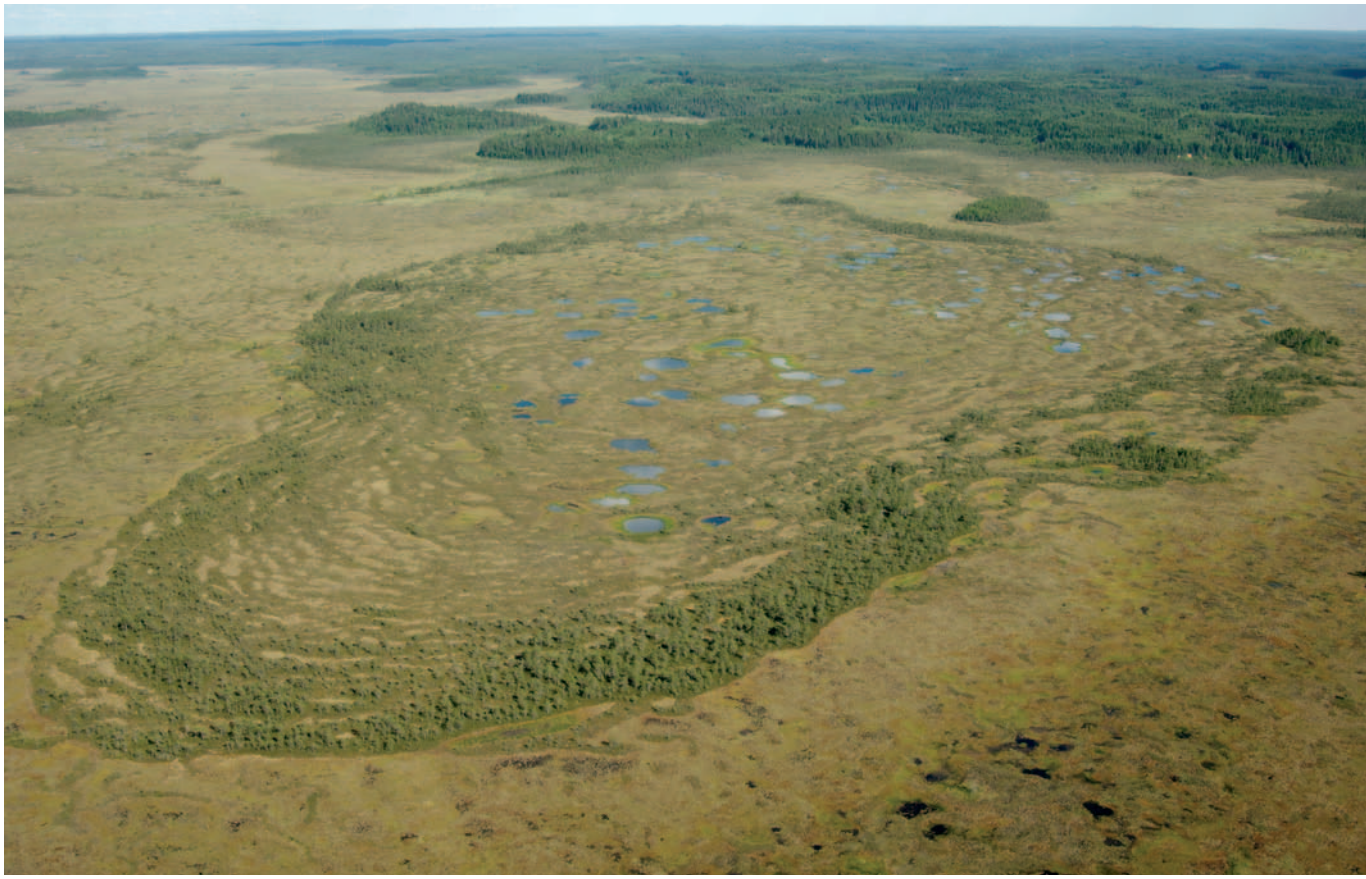
A remarkable feature of the concentric bog massifs in the Torronsuo system is the occurrence of multiple pine-bog slopes in a stepwise, concentric pattern. In a way, there are lesser bog massifs on top of larger massifs. Such patterns are seen in the Kakarlampi bog massif, in the westernmost part of the system, and in the Vehkasuo bog massif, the northern lobe of the system. Both of these two massifs also have very distinctly concentric patterns of hollows and hummocks. Concentric patterns and multiple pine-bog slopes are found in the central part of Torronsuo as well, but there

An oblique aerial view towards the east over the eastern part of Torronsuo mire. Photo Hannu Vallas.

another typical feature is perhaps even more characteristic. These bog plains are patterned with hundreds of pools, often round in shape and several metres deep. Some pools reach in depth to the underlying *Carex* peat and in such cases *Nuphar lutea* is abundant. Elsewhere as well, numerous pools of varying depth and form are found and altogether there are more than one thousand bog pools in the Torronsuo system. In addition, wet hollows with open water surface are abundant in central bog plains. The richness of different surface patterns is a very significant factor to the diversity of the fauna, particularly of birds and insects.

Vegetation

The vegetation of Torronsuo is typical of south-western Finnish raised bogs. A detailed inventory of vegetation is provided by Kotiluoto & al. (1996). The dominant bryophyte of the hummocks is by far *Sphagnum fuscum*. In lower hummocks, also *Sphagnum angustifolium, Sphagnum magellanicum* and *Sphagnum rubellum* are abundant. In the intermediate water-level surfaces, *Sphagnum tenellum* is common and in the hollows, *Sphagnum balticum* and *Sphagnum cuspidatum* are typical. The commonest dwarf shrubs of the kermis (the ombrotrophic hummock ridges) are *Calluna vulgaris, Vaccinium uliginosum, Ledum palustre* and *Betula nana*. Also *Andromeda polifolia, Vaccinium oxycoccos* and *Eriophorum vaginatum* are common. In contrast to bogs in eastern Finland, *Chamaedaphne calyculata* is very rare in Torronsuo, being found only in one locality, which is among the south-westernmost sites of the species. Among the vascular plants, *Scheuchzeria palustris* and *Rhynchospora alba* are characteristic in the hollows,



An oblique aerial view of a concentric bog over a bog in the eastern part of Torronsuo mire. Photo Hannu Vallas.

sometimes also *Carex limosa*. Typical species of narrow, flooded lagg fens are *Potentilla palustris, Menyanthes trifoliata, Carex canescens, Carex echinata, Eriophorum angustifolium, Peucedanum palustre* and *Lysimachia thyrsiflora*. In some places, wider lagg fens are poor sedge fens with *Carex lasiocarpa, Carex rostrata* and sometimes *Carex chordorrhiza*. Only in the southern margins of the central parts of the system, some ground water influence is found. There, in small areas, species like *Potentilla erecta, Carex panicea, Carex vaginata, Carex dioica, Carex flava, Scirpus sylvaticus, Trichophorum alpinum, Sphagnum warnstorfii, Sphagnum teres* and *Scorpidium scorpioides* are found (Kotiluoto & al. 1996).

Bird fauna

The Torronsuo bog system hosts a valuable bird fauna and is an important staging area during migration periods (Salminen 1980). The number of Cranes *(Grus grus)* has peaked up to one thousand individuals during the autumn migration. Local specialities include the Willow Grouse *(Lagopu lagopus)*, and the Red-throated Diver *(Gavia stellata)* that are very rare in southern Finland. There is a rich presentation of waders, gulls and waterfowl. The Mallard *(Anas platyrhynchos)* and the Teal *(Anas crecca)* are numerous, while the Northern Pintail *(Anas acuta)* a distinctly northern species is also found. The Curlew *(Numenius arquata)* and the Lapwing *(Vanellus vanellus)* are typical waders, but also more northern species such as the Wood Sandpiper *(Tringa glareola)* and the Ruff *(Philomachus pugnax)* nest in Torronsuo. A coastal element among the waders is represented by the Common Redshank *(Tringa totanus)*. Several gull species nest in Torronsuo *(Larus ridibundus, Larus canus, Larus argentatus)* which

Hummock-hollow patterns from the eastern part of Torronsuo mire. The hummock ridges rise gently only some 20-30 cm above the hollow surfaces. Photo Raimo Heikkilä.

is rare in Southern-Finnish bogs. Among the Passerines, the Meadow Pipit *(Anthus pratensis)* and the Yellow Wagtail *(Motacilla flava)* are the most abundant and other typical species include the Skylark *(Alauda arvensis)*, the Wagtail *(Motacilla alba)*, the Whinchat *(Saxicola rubetra)*. Also the Great Grey Shrike *(Lanius excubitor)* is met in Torronsuo.

Lepidoptera

The Lepidoptera fauna of the Torronsuo is exceptionally diverse and interesting. The richness of the Lepidoptera is preserved thanks to the pristine state and the vast area of the bog. Altogether 50 species typical of mire environments have been found in Torronsuo and in an inventory in 1992, Järventausta (1996) found 45 of these species. There is an interesting mix of northern, eastern and southern elements in the species list. To the northern element belong species such as *Pyrgus centaurea, Clossiana freia, Chloroclysta infuscata, Lycia lapponaria* and the endangered species *Clossiana frigga*. The southern species include *Gynaephora selenetica, Chlorissa viridata, Perconia strigillaria* and the nationally endangered *Aspitates gilvaria*. Among the *Trichoptera* found in Torronsuo, *Limnephilus externus* is one species rare in South-Finland (Järventausta 1996).

Mire development

The development of the Torronsuo mire system was initiated by the terrestrialization of a shallow lake (Aartolahti 1965). Layers of clay and gyttja as well as some *Carex* peat at the base of the peat were deposited during the Boreal phase around 8500 BP in the light of the pollen stratigraphy. During the Atlantic Period indicated by pollen of *Quercus, Ulmus, Corylus* and *Tilia*, the peat accumulation was slow and yielded a layer of about one metre of *Carex* peat with variable amounts of *Equisetum* and wood remains. The *Carex-peat* phase ended right before the arrival of *Picea* in the area,

which took place at about 4500 BP. At this phase, in the switch from the Atlantic to the Boreal Period, there was a marked switch in vegetation and the accumulation of *Sphagnum* peat began (Fig. 1). Also the peat macrofossils were examined by Aartolahti (1965), and according to his conclusion, this switch from *Carex* to *Sphagnum* peat soon lead to ombrotrophic conditions and to the development of the mire into a raised bog. Above the 1.5 metres of basal gyttja and *Carex* peat there is five to six, in some places almost eight metres of *Sphagnum* peat, which give a range of 1.1 to 1.8 mm/yr for the long-term rate of peat accumulation.

Ecosystem services

Torronsuo National Park provides significant services such as maintenance of water quality, environmental education, scientific research, outdoor recreation and bird watching. Annually, there are more than 20 000 visitors in the Torronsuo National Park. Most visitors spend a day or few hours taking a walk along the wooden board walks and viewing the bog scenery from the observation tower. There are twelve kilometres of marked trails in the park and 200 metres is suitable for handicapped visitors also.

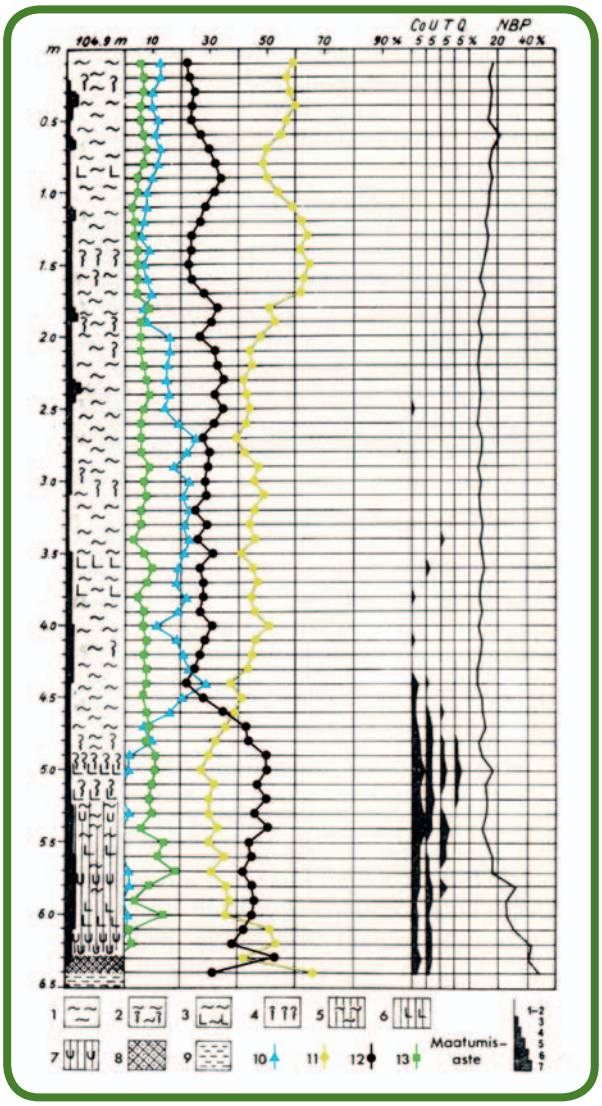


Figure 1. Pollen diagram of Torronsuo mire. Modified from Aartolahti (1965). 1 = *Sphagnum* peat, 2 = *Eriophorum vaginatum* – *Sphagnum* peat, 3. *Sphagnum* peat with abundant ligneous remains, 4 = *Eriophorum vaginatum* peat, 5 = *Sphagnum* – *Carex* peat, 6 = *Carex* peat with abundant ligneous remains, 7 = *Carex* peat with *Equisetum*, 8 = coarse detritus gyttja, 9 = fine detritus gyttja, 10 = *Picea*, 11 = *Pinus*, 12 = *Betula*, 13 = *Alnus*, C = *Corylus*, U = *Ulmus*, T = *Tilia*, Q = *Quercus*. Maatumisaste = Humification (von Post).

REFERENCES

Aartolahti, T. 1965: Torronsuo. (Referat: Das grösste naturbedingte Hochmoor Finnlands.) – Terra 77: 62-69.

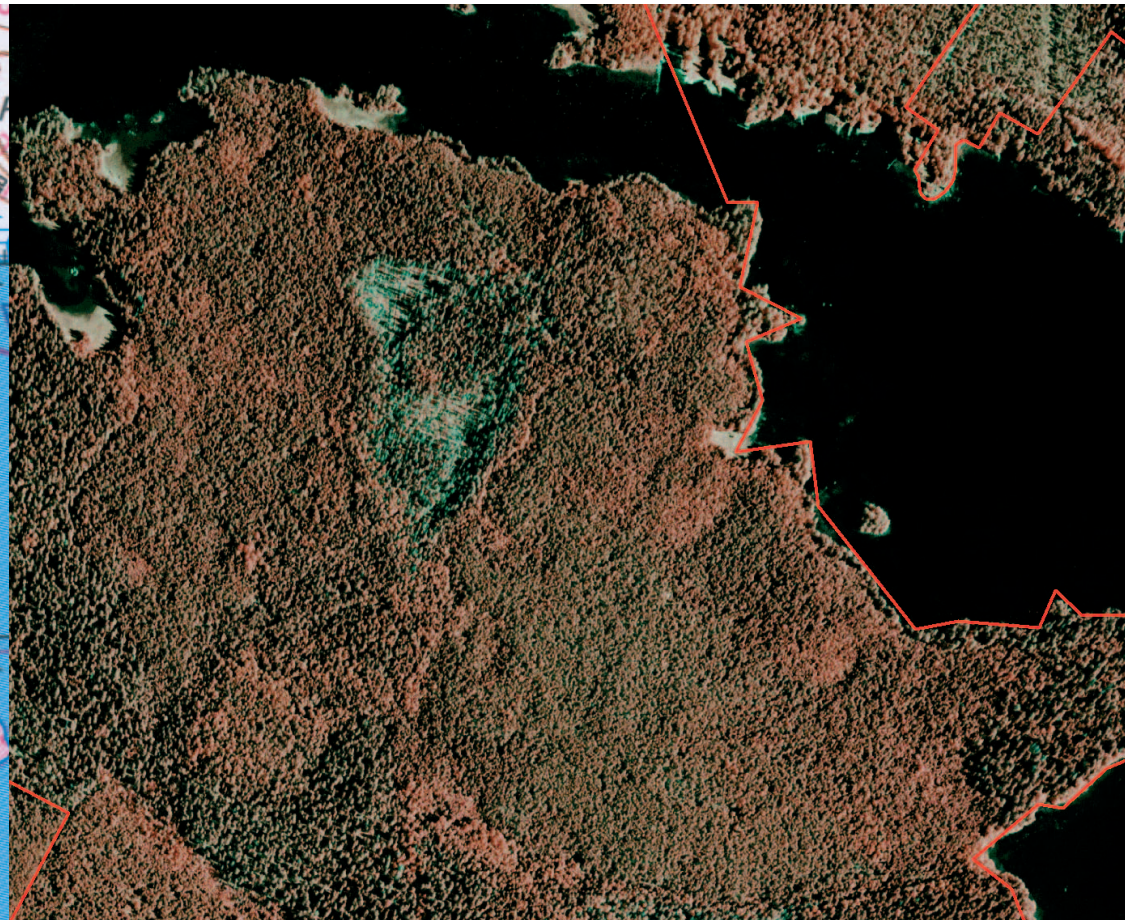
Järventausta, K. 1996: Perhostutkimuksia eräillä Etelä-Suomen luonnonsuojelualueilla osa 1: Puurijärvi-Isosuo, Kurjenrahka, Torronsuo, Kurasmäki, Tammimäki ja Lenholm. [Lepidoptera studies in some nature reserves in southern Finland, part 1.] – Metsähallituksen luonnonsuojelujulkaisuja A 57: 1-86.

Kotiluoto, R., Talvia, O. & Toivonen, H. 1996: Torronsuon kansallispuiston kasvillisuus. (Abstract: Vegetation of the Torronsuo National Park.) – Metsähallituksen luonnonsuojelujulkaisuja A 60: 1-104.

Salminen, P. 1980: Torronsuo – eteläisen Suomen suursuo. In Suomen Luonto III Suot. pp. 202-206. sYhteiskirjapaino, Helsinki. (A book chapter, in Finnish).

Web sites: http://www.luontoon.fi/ (-> In English -> Destinations -> National Parks -> Torronsuo)

Topographic map of Soukonkorpi area in Liesjärvi National Park. Each grid square is 1 km2.



False-colour infrared aerial photograph of Soukonkorpi area in Liesjärvi National Park.
The red line shows the boundaries of Natura 2000 area.

Restoration of forest and mire mosaic

Liesjärvi National Park

Teemu Tahvanainen & Raimo Heikkilä

Introduction

Liesjärvi National Park was established in 1956, covering an area of 1.5 km^2. Some forests in the area had been protected since 1926, already. The park has been extended in several occasions. In 2005, the area of the park was doubled and the total area today is 22 km^2. There are old-growth forests in the older parts of the park, while most of the forests have been subject to variable forestry practices and, thus, there are forests with variable age structure in the park. However, over one-third of the forest is over 100 years old. In 1993, Metsähallitus began a project in order to restore forests to their natural state. They have been burnt in a way, which resembles natural forest fires, and trees have been felled so that there would be more decaying wood on the forest floor. Also most of the mires in the national park had been drained before the establishment and extensions of the park, and these mires are now under restoration.

Mires of Liesjärvi: vegetation and flora

The mires in Liesjärvi national park are very small. Typically they are narrow strips of spruce mires or pine mires between moraine hills. They do not form mire massifs. About two thirds of the spruce mires and practically all pine mires have been drained. Also the tree stands in mires have been logged. The ditching of mires started already in the beginning of 1900s, and the most active drainage period was in the 1930s. The last ditches were dug in 1964. Due to the long time after the ditching it is in most cases difficult to identify the original natural site type (Luttinen 1985). The pristine spruce mires are mostly fern-dominated thin-peated intermediate rich spruce mires. There are also some *Equisetum sylvaticum* spruce mires, which are more poor (Luttinen 1985).

The mire flora of Liesjärvi is rather poor, and there are no rare or threatened species. The most interesting vascular plants are *Carex disperma* and *C. loliacea. Hylocomium umbratum* is an uncommon indicator of ground water influence in spruce mires (Luttinen 1985).

Fauna

Several woodpeckers inhabit the forests of the national park, including the Black Woodpecker *(Dryocopus martius)*, the Great Spotted Woodpecker *(Dendrocopos major)*, the Three-toed Woodpecker *(Picoides tridactylus)*, Grey-headed Woodpecker *(Picus canus)* and the Lesser Spotted Woodpecker *(Dendrocopos minor)*. For the woodpeckers, the forest restoration activities are favourable and the woodpeckers in turn favour many other species that use their nest holes. One such species is the Siberian Flying Squirrel *(Pteromys volans)*.

REFERENCE

Luttinen, R. 1985: Liesjärven kansallispuiston kasvillisuus. [Vegetation of Liesjärvi national park.] – Metsähallitus SU 4(62): 1-59.

Restoration of the spruce mire Soukonkorpi in Liesjärvi national park

Kaisu Aapala & Harri Tukia

Drainage of spruce mires has been very extensive, especially in southern Finland, where 78 % of them have been drained. Less than 1 % of spruce mires in southern Finland have been protected and almost half of these have been drained, so there is an obvious need for restoration.

A large amount of dead spruce wood in the restored Soukonkorpi area. Photo Tapio Lindholm.

Dead *Hylocomium splendens* in a wet depression in the restored Soukonkorpi mire, being replaced by *Sphagnum*. In the upper left corner there is still living *Hylocomium* on a hummock. Photo Tapio Lindholm.

The study site, Soukonkorpi, is a 13 ha spruce mire situated in the Liesjärvi national park. It was drained in the 1930s. Liesjärvi national park was established in 1956 and extended substantially in 1981 when also this study site became a part of the national park. Soukonkorpi was restored in 1995 by damming the ditches with an excavator. In the northern part of the mire a 0.8 ha opening was made by cutting 1/3, girdling 1/3 and leaving 1/3 of the trees untouched. Otherwise the tree stand was left untreated. Monitoring the effects of restoration includes monitoring of water level, tree stand, vegetation, beetles and polypores. There are no pristine spruce mires in the vicinity to use as a reference area.

The water table level was monitored in five points from 1995 (before restoration) until 1998. In the northern part of the peatland, where the drainage had been most effective, the water level was c. 60 cm below surface throughout the growing season. After restoration the water table rose on average 40 cm. In the southern part of the peatland, where the drainage had had less effect, the restoration did not have much effect on water table level.

Tree stand monitoring is based on 19 sample plots (0.04 ha). Monitoring started in 1995, before restoration, and has been repeated three times. Before restoration the tree stand consisted of even-aged (85 yrs) and even-sized spruce and the average volume was 200-250 m^3/ha. The proportion of deciduous species was very low. The volume of snags was on average 5 m^3/ha and of logs 6 m^3/ha. The rise of the water table has

been detrimental to spruce in parts of the restored peatland, and a lot of trees have died, especially near the blocked ditches. The very wet summer in 1998 accelerated the process. Restoration has increased the amount of dead wood, so that in 2005 the volume of snags was on average 50 m^3/ha and the volume of logs 30 m^3/ha. Also natural disturbances, such as snow and storms, have increased the amount of dead wood.

Vegetation changes are monitored in two study sites (14 x 28 m) with 30 1m2 sample plots in each. First monitoring was made before restoration and so far monitoring has been repeated five times. In the northern part of the peatland the coverage of *Sphagnum* has increased from 50 % to 85 % and in the middle part of the mire from 75 % to 90 % in ten years (Aapala, unpubl. data). The total number and the total coverage of vascular plant species in study sites has increased.

The changes in beetle *(Coleoptera)* species assemblages are monitored in three sites with pit-fall and window traps and trunk window traps. Monitoring began in 1995 and has been repeated four times. The total number of beetle species has decreased from 220 to 120 in five years (Tukia, unpubl. data). The generalist forest species have disappeared and species favoring swamp forests have become more common. The increased volume of dead wood increased locally the amount of bark beetles in 1996-1998, but in 2000 the amount was already lower.

An inventory of the polypore species growing on dead wood was made before restoration. Altogether 24 species were found, of which three were nearly threatened (NT).

Flora and land bird fauna of the presented mire sites

Vascular plants and bryophytes of mires in the IMCG 2006 excursion sites

Raimo Heikkilä

Table: The vascular plants and bryophytes recorded in the sites visited by the IMCG 2006 excursion. The locations are as follows: 1 Teuravuoma, 2 Karhakkamaanjänkä, 3 Martimoaapa, 4 Ryöskäri-Ihanalampi, 5 Hirvisuo, 6 Olvassuo, 7 Hummasti, 8 Salamajärvi, 9 Levaneva, 10 Lauhavuori, 11 Kauhaneva, 12 Seitseminen, 13 Punassuo, 14 Harpar Storträsk, 15 Torronsuo, 16 Liesjärvi.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TREES AND SHRUBS																
Alnus glutinosa				x		x	x		x	x	x	x		x	x	x
A. incana		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Betula nana	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
Betula pendula		x	x		x	x	x	x	x	x	x	x			x	x
B. pubescens	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Daphne mezerum		x								x						x
Hippophaë rhamnoides				x			x									
Juniperus communis	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Myrica gale				x			x							x		
Picea abies	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pinus sylvestris	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Populus tremula	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Prunus padus		x		x			x			x		x			x	
Rhamnus frangula			x	x	x	x	x		x	x	x	x	x	x	x	
Ribes nigrum		x								x						x
R. spicatum		x														x
Rubus idaeus			x			x	x	x		x		x	x	x	x	x
Salix aurita		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. caprea		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. cinerea		x	x	x	x	x	x	x	x	x	x	x	x		x	x
S. glauca	x	x														
S. hastata		x														
S. lapponum	x	x	x	x	x	x	x	x	x	x	x					
S. myrsinifolia		x							x	x	x	x			x	
S. myrsinites	x	x														
S. myrtilloides	x	x	x	x	x	x	x	x	x	x	x			x	x	
S. pentandra		x	x	x		x	x	x	x	x	x	x		x	x	x
S. phylicifolia	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. repens				x	x		x		x	x	x	x		x	x	x
Sorbus aucuparia	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DWARF SHRUBS																
Andromeda polifolia	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Calluna vulgaris		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Chamaedaphne calyculata			x	x	x	x	x	x								
Empetrum	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Ledum palustre	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
Vaccinium microcarpum	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
V. myrtillus	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
V. oxycoccos	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
V. uliginosum	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
V. vitis-idaea	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
SEDGE PLANTS																
Carex acuta		x	x			x	x	x	x	x	x	x				x
C. appropinquata		x														
C. aquatilis		x	x	x	x	x	x				x	x				
C. atherodes		x														
C. brunnescens	x		x		x	x	x	x		x	x	x			x	
C. buxbaumii								x								
C. canescens	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. capillaris		x		x												
C. capitata		x														
C. cespitosa		x	x	x	x	x	x					x				
C. chordorrhiza	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x
C. diandra	x	x	x	x	x	x	x		x		x			x		
C. dioica	x	x	x	x	x	x	x	x		x	x			x	x	
C. disperma				x		x	x			x					x	x
C. Echinata			x	x	x	x	x	x	x	x	x	x		x	x	x
C. elongata				x										x	x	
C. flava		x		x											x	
C. globularis	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. heleonastes	x	x		x		x										
C. lapponica	x			x			x									
C. Lasiocarpa	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. laxa				x		x										
C. limosa	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. livida	x	x	x	x	x	x	x	x	x	x						
C. loliacea				x		x	x	x		x	x	x		x	x	x
C. mackenziei				x			x									
C. magellanica	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. nigra ssp. juncella		x	x		x	x	x			x					x	
C. nigra ssp. nigra		x	x	x		x	x	x	x	x	x	x	x	x	x	x
C. panicea		x						x		x					x	
C. paniculata										x	x					
C. pauciflora	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. rhynchophysa				x											x	
C. rostrata	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. rotundata					x											

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C. vaginata		x	x	x		x	x	x	x	x		x			x	x
C. vesicaria	x	x		x		x		x	x	x		x	x	x	x	x
C. viridula var. bergrothii		x														
C. viridula var. viridula							x			x						x
Eleocharis palustris				x			x					x				x
E. quinqueflora		x		x			x									
Eriphorum angustifolium	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
E. gracile	x	x	x	x	x	x	x	x	x					x		
E. latifolium		x	x	x			x							x		
E. russeolum	x				x											
E. scheuchzeri			x													
E. vaginatum	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Rhynchospora alba			x	x	x	x	x	x	x	x	x	x	x	x	x	x
R. fusca					x		x	x		x	x					
Schoenoplectus lacustris				x			x									
Scirpus sylvaticus															x	x
Trichophorum alpinum	x	x	x	x	x	x	x	x		x		x			x	x
T. cespitosum	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
GRAMINEOUS PLANTS																
Agrostis canina		x	x	x	x	x	x	x	x	x	x	x		x	x	x
Calamagrostis canescens			x	x	x	x	x	x		x	x	x			x	x
C. epigejos		x	x		x	x	x	x	x	x	x	x			x	x
C. lapponica	x	x			x	x										
C. purpurea	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. stricta	x	x	x	x		x	x			x	x	x		x	x	x
Deschampsia cespitosa		x	x	x		x	x	x	x	x	x	x	x	x	x	x
D. flexuosa	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
Elymus caninus							x									
Festuca ovina		x						x			x	x			x	x
F. rubra		x	x	x		x	x	x		x	x	x				x
Glyceria fluitans							x								x	x
Hierochloë hirta				x												
Juncus bulbosus							x			x	x					
J. filiformis			x	x	x	x	x	x	x	x	x	x	x	x	x	x
J. stygius	x		x	x	x	x	x	x		x	x					
Luzula pilosa	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
L. sudetica		x		x		x					x					
Melica nutans		x		x			x	x		x		x			x	x
Milium effusum		x		x			x		x	x		x		x		x
Molinia caerulea	x	x	x	x	x	x	x	x	x	x	x	x				x
Nardus stricta			x	x		x	x	x		x	x					
Phalaris arundinaceae		x	x			x	x	x		x	x	x		x		x
Phragmites australis		x	x	x	x	x	x	x	x	x	x	x		x	x	x
Poa alpigena				x		x					x					
P. palustris																x
Poa subcaerulea										x						
P. trivialis			x	x		x	x			x		x				x

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HERBS																
Alisma plantago-aquatica				x		x	x							x		
Angelica sylvestris		x	x	x		x	x	x	x	x	x	x		x		x
Athyrium filix-femina			x	x		x	x	x	x	x	x	x		x	x	x
Bistorta vivipara		x		x		x	x		x	x	x	x				
Calla palustris	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Caltha palustris		x	x	x		x	x	x		x	x	x	x	x	x	x
Cardamine amara										x			x			
C. pratensis				x		x	x							x	x	
Chrysosplenium alternifolium										x						
Cicerbita alpina																
Cicuta virosa	x		x	x	x	x	x	x	x					x	x	x
Cirsium helenioides		x	x	x		x	x	x	x	x	x	x			x	x
C. palustre		x	x	x		x	x	x		x	x	x	x	x	x	x
Coeloglossum viride		x		x					x							
Convallaria majalis		x	x	x			x	x	x	x	x	x		x	x	x
Corallorhiza trifida		x	x	x	x	x	x	x	x	x		x		x	x	
Cornus suecica		x	x	x	x	x	x			x						
Crepis paludosa		x		x		x	x			x	x			x		
Cypripedium calceolus		x														
Dactylohiza fuchsii										x						
D. incarnata	x	x	x	x	x	x	x	x	x	x						
D. incarnata ssp. cruenta		x		x			x									
D. maculata	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
D. traunsteineri		x		x			x									
Drosera longifolia	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
D. rotundifolia	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Dryopteris expansa							x	x		x		x		x	x	x
D. carthusiana		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
D. cristata														x		
Epilobium angustifolium	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
E. davuricum		x														
E. hornemannii						x										
E. palustre	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
Epipactis palustris		x														
Epipogium aphyllum								x								
Equisetum arvense		x	x	x	x	x	x	x	x					x	x	x
E. fluviatile	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
E. hyemale				x												
E. palustre	x	x	x		x	x	x	x	x	x	x	x		x	x	x
E. pratense		x														
E. sylvaticum	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x
Euphrasia frigida				x												
Filipendula ulmaria		x	x	x		x	x	x		x	x	x		x	x	
Galium boreale				x			x					x			x	x
G. palustre		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
G. trifidum	x			x		x	x	x	x		x					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
G. uliginosum		x	x	x		x	x		x	x		x		x	x	x
Geranium sylvaticum		x	x	x	x	x	x	x	x	x	x	x		x	x	x
Geum rivale		x	x	x		x	x	x	x	x		x		x	x	x
Goodyera repens								x		x						
Gymnadenia conopsea		x														
Gymnocarpium dryopteris		x	x		x	x	x	x	x	x	x	x	x	x		x
Hammarbya paludosa		x	x	x		x	x		x	x					x	
Hieracium Sylvatica -group		x	x			x	x			x	x	x	x	x		x
Hippuris vulgaris				x		x	x							x		
Huperzia selago		x		x		x				x	x				x	x
Impatiens noli-tangere														x		
Iris pseudacorus														x	x	
Lactuca sibirica				x												
Lathyrus palustris				x			x									
Linnaea borealis	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
Listera cordata		x		x	x	x	x	x		x		x		x		x
L. ovata		x														
Lychnis flos-cuculi										x						
Lycopodiella inundata					x	x	x			x						
Lycopodium annotinum			x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lycopus europaeus														x		
Lysimachia thyrsiflora		x	x	x	x	x	x	x	x	x	x	x		x	x	x
L. vulgaris			x	x		x	x	x				x		x	x	x
Lythrum salicaria				x			x	x						x		
Maianthemum bifolium		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Melampyrum pratense	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
M. sylvaticum		x	x	x	x	x	x	x	x	x	x	x			x	x
Menyanthes trifoliata	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Moneses uniflora		x		x		x	x	x		x	x					x
Montia fontana	x					x	x		x	x						
Nuphar								x	x					x	x	
Nymphaea								x			x			x		
Orthilia secunda		x	x		x	x	x	x	x	x	x	x	x	x	x	x
Oxalis acetosella		x					x	x		x				x	x	x
Paris quadrifolia		x		x		x	x	x	x	x	x	x		x	x	x
Parnassia palustris	x	x	x	x		x	x									
Pedicularis palustris	x	x	x	x	x	x	x	x		x	x			x		x
P. sceptrum-carolinum		x	x	x	x	x		x		x	x					
Petasites frigidus		x				x										
Peucedanum palustre	x	x	x	x	x	x	x	x	x	x		x		x	x	x
Phegopteris connectilis		x	x	x		x	x	x		x	x	x		x	x	x
Pinguicula vulgaris	x	x	x	x												
Potentilla erecta						x	x	x	x	x	x	x			x	x
P. palustris	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pyrola minor	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
P. rotundifolia		x	x	x		x	x	x	x	x		x		x	x	x
Ranunculus acris		x		x		x	x	x	x	x	x	x		x		x

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
R. repens		x		x		x	x	x		x	x	x		x	x	x
Rubus arcticus		x	x	x	x	x	x	x	x	x	x	x		x		x
R. chamaemorus	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
R. saxatilis		x	x	x	x	x	x	x	x	x	x	x		x	x	x
Rumex acetosa		x				x	x	x	x	x	x	x		x		x
R. aquaticus		x														
Saussurea alpina		x														
Saxifraga hirculus	x	x				x										
Scheuchzeria palustris	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Scutellaria galericulata				x		x	x							x	x	
Selaginella selaginoides		x	x	x		x		x								
Solanum dulcamara														x		
Solidago virgaurea	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sparganium hyperboreum				x						x	x					
Stellaria crassifolia	x	x		x		x										
S. longifolia		x					x			x				x		
S. nemorum				x												
S. palustris				x			x			x				x		
Succisa pratensis										x						
Thalictrum alpinum		x														
T. flavum				x												
Thelypteris palustris														x		
Tofieldia pusilla	x	x	x	x		x				x						
Trientalis europaea	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Triglochin palustris		x		x												
T. maritima				x												
Trollius europaeus		x		x												
Tussilago farfara								x		x					x	
Typha							x							x	x	
Utricularia intermedia	x	x	x	x	x	x	x	x	x	x	x			x	x	x
U. minor	x	x	x			x	x			x		x			x	x
U. vulgaris				x												
Valeriana sambucifolia		x		x			x		x	x				x		
Viola epipsila		x	x	x	x	x	x	x			x					
V. palustris		x	x	x		x	x	x	x	x	x	x	x	x	x	x
HEPATICAE																
Aneura pinguis		x	x			x	x			x				x	x	
Barbilophozia kunzeana		x														
Calypogeia (sphagnicola)										x						
Chiloscyphus polyanthos						x				x	x		x			
Cladopodiella fluitans			x			x	x		x	x	x	x	x	x	x	
Gymnocolea inflata			x			x	x		x	x	x	x	x		x	
Kurzia pauciflora										x						
Leiocolea rutheana		x														
Marchantia polymorpha			x			x	x		x	x	x			x	x	x
Mylia anomala		x	x			x	x		x	x	x	x	x		x	x
Odontoschisma elongatum																

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Pellia						x				x				x		
Ptilidium ciliare										x						
Scapania			x			x	x				x					
SPHAGNIDAE																
Sphagnum angustifolium		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. annulatum (incl. S. jensenii)		x	x	x	x	x	x	x	x	x	x	x				
S. aongstroemii			x	x	x	x		x								
S. balticum			x	x	x	x	x	x	x	x	x	x	x	x	x	
S. capillifolium		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. centrale		x	x	x	x	x	x	x	x	x	x	x	x	x	x	
S. compactum			x	x	x	x	x	x	x	x	x	x		x		
S. contortum				x		x	x									
S. cuspidatum									x	x	x				x	
S. denticulatum				x	x	x	x		x	x	x			x		
S. fallax		x	x	x	x	x	x	x	x	x	x	x		x		x
S. fimbriatum			x	x	x	x	x	x	x	x	x	x		x		x
S. flexuosum			x	x	x	x	x	x	x	x	x	x		x		
S. fuscum		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. girgensohnii			x	x	x	x	x	x	x	x	x	x		x	x	x
S. lindbergii		x	x	x	x	x	x	x	x	x	x	x			x	
S. magellanicum		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. majus		x	x	x	x	x	x	x	x	x	x	x	x		x	
S. molle										x	x					
S. obtusum			x	x		x	x	x	x		x	x		x		
S. papillosum		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. platyphyllum		x	x	x	x	x	x	x	x	x	x					x
S. pulchrum			x		x	x	x	x	x	x	x	x				
S. quinquefarium								x				x				
S. riparium		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. rubellum			x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. russowii		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
S. squarrosum		x		x	x	x	x	x	x	x	x	x		x	x	x
S. subfulvum		x	x	x	x	x	x	x		x						
S. subnitens					x		x	x		x		x				x
S. subsecundum		x	x	x	x	x	x	x	x	x	x	x		x	x	x
S. tenellum			x		x	x	x	x	x	x	x	x	x	x	x	x
S. teres		x	x	x	x	x	x	x	x	x	x	x		x	x	x
S. warnstorfii		x	x	x	x	x	x	x	x	x	x	x		x	x	
S. wulfianum		x		x	x			x				x			x	
BRYIDAE																
Amblyodon dealbatus		x														
Aulacomnium palustre		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Brachythecium reflexum				x						x						x
B. rivulare				x		x		x	x	x	x					
B. rutabulum										x						
B. starkei										x						
Bryum neodamense		x														

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Bryum pseudotriquetrum		x		x		x	x		x					x		
B. weigelii						x				x	x					
Calliergon cordifolium		x	x	x	x	x	x	x	x	x	x	x		x	x	x
C. giganteum		x		x		x	x	x		x				x		x
C. megalophyllym				x												
C. richardsonii		x		x		x	x		x					x	x	
Calliergonella cuspidata		x		x		x	x			x	x			x	x	
C. Lindbergii				x		x	x									x
Campylium stellatum		x	x	x		x	x	x						x		
Catoscopium nigritum		x														
Cinclidium stygium		x		x		x	x							x		
C. subrotundum				x	x	x	x									
Climacium dendroides		x	x	x		x	x	x	x	x		x	x	x	x	x
Cratoneuron filicinum		x														
Dicranella cerviculata										x	x					
Dicranum angustum				x												
D. bergerii			x	x	x	x	x	x	x	x	x	x	x	x	x	
D. bonjeanii		x		x		x	x									
D. fuscescens							x			x	x			x		
D. leioneuron				x												
D. majus			x	x	x	x	x	x	x	x	x	x	x	x	x	x
D. polysetum		x	x		x	x	x	x	x	x	x	x	x	x	x	x
D. scoparium			x	x	x	x	x	x	x	x	x	x	x	x	x	
Drepanocladus aduncus		x		x			x									
Fissidens adianthoides		x		x		x	x							x		
F. osmundoides		x														
Fontinalis antipyretica						x		x		x	x		x			
Hamatocaulis lapponicus	x	x			x	x										
H. vernicosus	x	x		x				x								
Helodium blandowii		x	x	x	x	x	x	x	x	x	x	x		x		
Hylocomiastrum umbratum								x								x
Hylocomium splendens		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Loeskypnum badium		x	x	x	x	x	x	x		x						
Meesia longiseta		x		x	x		x									
M. triquetra		x		x		x	x									
M. uliginosa		x														
Paludella squarrosa		x	x	x		x	x	x		x	x			x		
Palustriella falcata		x														
Philonotis fontana				x		x		x		x						
P. seriata						x										
Plagiomnium elatum		x														
P. ellipticum		x		x	x	x	x	x	x	x	x			x	x	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
P. medium				x		x	x	x				x		x		x
P. undulatum										x						x
Plagiothecium spp.						x	x			x	x			x	x	
Pleurozium schreberi		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pohlia nutans		x	x	x	x	x	x	x	x	x	x	x	x	x	x	
P. wahlenbergii								x								
Polytrichastrum formosum															x	
P. longisetum					x											
Polytrichum commune		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
P. strictum			x	x	x	x	x	x	x	x	x	x	x	x	x	
P. swartzii			x	x	x	x	x		x	x				x		
Pseudobryum cinclidioides		x	x	x	x	x	x	x	x	x	x	x		x	x	x
Pseudo-calliergon lycopodioides		x														
P. trifarium		x		x		x	x									
Rhizomnium magnifolium						x	x	x		x		x		x	x	x
R. pseudopunctatum		x		x	x	x	x	x				x				x
R. punctatum		x				x	x		x	x	x			x		x
Rhodobryum roseum							x	x		x				x	x	x
Rhytidiadelphus subpinnatus															x	
R. triquetrus		x			x	x	x	x	x	x	x	x		x		x
Sanionia uncinata		x		x		x	x			x		x		x	x	
Scorpidium cossonii		x		x		x										
S. revolvens		x	x	x	x	x	x	x		x					x	x
Scorpidium scorpioides		x	x	x	x	x	x	x						x	x	
Splachnum luteum		x	x	x		x	x		x		x					
Straminergon stramineum		x	x	x	x	x	x	x	x	x	x	x		x	x	
Thuidium recognitum				x												
Tomentypnum nitens		x		x		x	x	x		x	x					
Warnstorfia exannulata		x	x	x	x	x	x	x	x	x	x	x		x	x	
W. fluitans			x	x	x	x	x	x	x	x	x	x	x	x	x	
W. procera		x	x	x	x	x	x	x		x		x			x	x
W. sarmentosa		x	x	x		x		x		x						
W. tundrae				x		x	x									
LICHENS																
Cladonia, subgenus Cladina								x	x	x	x		x		x	
Cladonia, subgenus Cenomyce								x	x	x	x		x		x	
Cetraria ericetorum										x						
C. islandica									x	x	x		x			
Cetrariella delisei									x	x	x				x	
Icmadophila ericetorum										x	x					
Ochrolechia frigida										x						
Peltigera aphthosa										x						

Mire land birds of 14 Finnish mires and wetlands

Ari Rajasärkkä

Finnish Forest and Park Service (Metsähallitus) has started line transect censuses (Järvinen & Väisänen 1976) of land birds in Finnish nature reserves in 1981. In 25 years 1981-2005, census data has been collected in about 500 reserves, the total length of transects being about 15 000 km. Because the method is valid only for land birds, waterfowl, gulls and terns are not counted at all in these censuses. In each studied reserve transects were located so that the whole reserve is covered well with these transects. Therefore the results represent quite reliably the land bird fauna as a whole in each studied reserve.

The densities (pairs / km^2) of each land bird species were calculated from the original observation numbers by using species specific correction coefficients (see e.g. Järvinen & Väisänen 1983). These densities are the average densities per total land area of each reserve. Mire birds use only a certain part of all the habitats occurring in each reserve, avoiding forests. For each reserve the proportion of suitable habitat for mire birds can be calculated from the ratio between the area of open or semiopen sparsely wooded land and the total land area. For calculating the mire bird densities in suitable (semi)open habitats the original average densities of each species were divided by the proportion of the area of (semi)open land. The same was done for species of other open habitats, too.

The total density of birds of open areas is usually quite low in the mires of nature reserves when considering the whole mire areas of the reserves. The density of 14 IMCG excursion sites varies from 13 to 202 pairs / km^2, the highest density of these areas being found in Liminganlahti wetland. At Liminganlahti, a very rich bird fauna occurs in almost all open land (incl. reedbeds and other helophyte vegetation). In most nature reserves, the bird fauna of large areas of open mires and especially of sparsely wooded pine bogs is quite poor, the highest densities concentrating in only relatively small "hot spots". That lowers the bird density in the whole mire area in the reserves. The bird density in these "hot spots" may be manifold compared to the average density in larger mire areas.

REFERENCES

Järvinen, O. & Väisänen, R.A. 1976: Finnish line transect censuses. – Ornis Fennica 53: 115-118.

Järvinen, O. & Väisänen, R.A. 1983: Correction coefficients for line transect censuses of breeding birds. – Ornis Fennica 60: 97-104.

Table: From the IMCG field excursion sites 14 are nature reserves whose land birds are thoroughly censused. The mire bird fauna (incl. birds of other open habitats too) of these 14 reserves are presented in the following tables. The columns of the tables are: D = density in open and semiopen habitats (pairs / km^2), Min = estimate of minimum breeding population and Max = estimate of maximum breeding population. * = not a breeding species in the area. The Total row sums the densities and population size estimates. The actual total bird density in these mires is somewhat higher because only land birds were counted in the line transect censuses. In addition to land birds the diversity of waterfowl, gulls and terns may be high in many areas.

		D	Min	Max
TEURAVUOMA - KIVIJÄRVENVUOMA				
Willow Grouse	*(Lagopus lagopus)*	1,6	80	150
Crane	*(Grus grus)*	0,2	10	15
Broad-billed Sandpiper	*(Limicola falcinellus)*	1,0	50	45
Jack Snipe	*(Lymnocryptes minimus)*	0,1	5	9
Snipe	*(Gallinago gallinago)*	1,7	85	120
Whimbrel	*(Numenius phaeopus)*	0,0	2	3
Curlew	*(Numenius arquata)*	0,1	3	5
Spotted Redshank	*(Tringa erythropus)*	0,1	3	4
Greenshank	*(Tringa nebularia)*	0,3	13	18
Wood Sandpiper	*(Tringa glareola)*	6,6	330	500
Red-necked Phalarope	*(Phalaropus lobatus)*	0,2	8	12
Meadow Pipit	*(Anthus pratensis)*	7,5	370	550
Yellow Wagtail	*(Motacilla flava)*	10,8	550	850
Wagtail	*(Motacilla alba)*	0,3	17	27
Whinchat	*(Saxicola rubetra)*	0,4	21	31
Sedge Warbler	*(Acrocephalus schoenobaenus)*	0,3	14	23
Reed Bunting	*(Emberiza schoeniclus)*	5,8	290	430
Total		36,9	1900	2800
MARTIMOAAPA				
Willow Grouse	*(Lagopus lagopus)*	0,6	60	100
Crane	*(Grus grus)*	0,3	32	45
Golden Plover	*(Pluvialis apricaria)*	0,2	20	28
Lapwing	*(Vanellus vanellus)*	0,9	85	120
Broad-billed Sandpiper	*(Limicola falcinellus)*	0,9	85	130
Ruff	*(Philomachus pugnax)*	2,5	230	340
Jack Snipe	*(Lymnocryptes minimus)*	0,3	23	46
Snipe	*(Gallinago gallinago)*	2,2	200	280
Whimbrel	*(Numenius phaeopus)*	0,6	50	70
Curlew	*(Numenius arquata)*	1,1	100	140
Spotted Redshank	*(Tringa erythropus)*	0,2	19	27
Redshank	*(Tringa totanus)*	0,0	4	6
Greenshank	*(Tringa nebularia)*	0,5	48	65
Wood Sandpiper	*(Tringa glareola)*	8,2	750	1100
Red-necked Phalarope	*(Phalaropus lobatus)*	0,2	16	26
Skylark	*(Alauda arvensis)*	0,0	3	4
Meadow Pipit	*(Anthus pratensis)*	13,2	1200	1800

		D	Min	Max
Yellow Wagtail	*(Motacilla flava)*	15,8	1500	2300
Wagtail	*(Motacilla alba)*	1,0	90	140
Whinchat	*(Saxicola rubetra)*	0,4	39	60
Sedge Warbler	*(Acrocephalus schoenobaenus)*	0,7	60	100
Reed Bunting	*(Emberiza schoeniclus)*	4,0	360	550
Total		53,8	5000	7500
HIRVISUO				
Willow Grouse	*(Lagopus lagopus)*	0,5	20	35
Crane	*(Grus grus)*	0,4	16	23
Golden Plover	*(Pluvialis apricaria)*	1,6	60	85
Lapwing	*(Vanellus vanellus)*	0,1	3	5
Broad-billed Sandpiper	*(Limicola falcinellus)*	0,4	17	25
Ruff	*(Philomachus pugnax)*	0,8	32	48
Snipe	*(Gallinago gallinago)*	0,3	10	14
Whimbrel	*(Numenius phaeopus)*	1,4	55	75
Curlew	*(Numenius arquata)*	1,2	44	60
Spotted Redshank	*(Tringa erythropus)*	0,2	9	12
Greenshank	*(Tringa nebularia)*	0,3	12	17
Wood Sandpiper	*(Tringa glareola)*	3,0	120	170
Marsh Owl	*(Asio flammeus)*	0,1	5	8
Skylark	*(Alauda arvensis)*	0,1	4	6
Meadow Pipit	*(Anthus pratensis)*	23,9	900	1400
Yellow Wagtail	*(Motacilla flava)*	9,7	370	600
Wagtail	*(Motacilla alba)*	0,6	24	39
Whinchat	*(Saxicola rubetra)*	0,6	23	34
Reed Bunting	*(Emberiza schoeniclus)*	1,0	36	55
Total		46,4	1800	2700
OLVASSUO				
Hen Harrier	*(Circus cyaneus)*	0,0	2	3
Kestrel	*(Falco tinnunculus)*	0,1	14	21
Willow Grouse	*(Lagopus lagopus)*	0,5	100	180
Crane	*(Grus grus)*	0,8	150	210
Ringed Plover	*(Charadrius hiaticula)*	0,0	6	10
Golden Plover	*(Pluvialis apricaria)*	0,9	180	250
Lapwing	*(Vanellus vanellus)*	0,5	85	120
Broad-billed Sandpiper	*(Limicola falcinellus)*	0,2	34	50
Ruff	*(Philomachus pugnax)*	0,5	85	130
Jack Snipe	*(Lymnocryptes minimus)*	0,2	29	55
Snipe	*(Gallinago gallinago)*	2,0	380	550
Whimbrel	*(Numenius phaeopus)*	0,8	160	220
Curlew	*(Numenius arquata)*	1,1	210	290
Spotted Redshank	*(Tringa erythropus)*	0,1	20	28
Greenshank	*(Tringa nebularia)*	0,7	140	200
Wood Sandpiper	*(Tringa glareola)*	4,0	750	1100

		D	Min	Max
Marsh Owl	*(Asio flammeus)*	0,0	3	4
Skylark	*(Alauda arvensis)*	0,0	2	3
Meadow Pipit	*(Anthus pratensis)*	11,5	2200	3300
Yellow Wagtail	*(Motacilla flava)*	8,7	1600	2600
Wagtail	*(Motacilla alba)*	0,8	150	250
Whinchat	*(Saxicola rubetra)*	0,9	180	270
Wheatear	*(Oenanthe oenanthe)*	0,1	16	25
Sedge Warbler	*(Acrocephalus schoenobaenus)*	0,1	16	26
Red-backed Shrike	*(Lanius collurio)*	0,0	7	11
Little Bunting	*(Emberiza pusilla)*	0,1	10	16
Reed Bunting	*(Emberiza schoeniclus)*	1,3	240	360
Total		35,9	7000	10000
LIMINGANLAHTI				
Bittern	*(Botaurus stellaris)*	0,2	5	7
Marsh Harrier	*(Circus aeruginosus)*	0,7	16	23
Hen Harrier	*(Circus cyaneus)*	0,0	1	2
Crane	*(Grus grus)*	0,2	4	5
Oystercatcher	*(Haematopus ostralegus)*	0,1	3	4
Little Ringed Plover	*(Charadrius dubius)*	0,4	9	17
Ringed Plover	*(Charadrius hiaticula)*	0,2	6	9
Lapwing	*(Vanellus vanellus)*	3,0	75	100
Dunlin	*(Calidris alpina schinzii)*	0,4	10	15
Broad-billed Sandpiper	*(Limicola falcinellus)*	0,6	16	23
Ruff	*(Philomachus pugnax)*	16,3	390	600
Snipe	*(Gallinago gallinago)*	3,6	85	120
Black-tailed Godwit	*(Limosa limosa)*	0,9	23	32
Whimbrel	*(Numenius phaeopus)*	0,1	1	2
Curlew	*(Numenius arquata)*	3,7	90	130
Spotted Redshank	*(Tringa erythropus)* *	2,1	50	70
Redshank	*(Tringa totanus)*	4,8	120	170
Greenshank	*(Tringa nebularia)*	0,8	19	26
Wood Sandpiper	*(Tringa glareola)*	1,9	46	70
Turnstone	*(Arenaria interpres)*	0,2	5	8
Red-necked Phalarope	*(Phalaropus lobatus)*	1,1	26	42
Skylark	*(Alauda arvensis)*	2,1	50	70
Meadow Pipit	*(Anthus pratensis)*	5,0	120	180
Yellow Wagtail	*(Motacilla flava)*	7,3	180	280
Wagtail	*(Motacilla alba)*	1,2	29	46
Whinchat	*(Saxicola rubetra)*	4,0	95	150
Sedge Warbler	*(Acrocephalus schoenobaenus)*	109,4	2600	4200
Red-backed Shrike	*(Lanius collurio)*	0,3	6	10
Ortolan Bunting	*(Emberiza hortulana)*	0,7	16	25
Reed Bunting	*(Emberiza schoeniclus)*	30,7	750	1100
Total		202,0	4800	7500

		D	Min	Max
SALAMAJÄRVI				
Willow Grouse	*(Lagopus lagopus)*	0,6	28	50
Crane	*(Grus grus)*	0,4	17	24
Golden Plover	*(Pluvialis apricaria)*	0,7	33	46
Lapwing	*(Vanellus vanellus)*	0,5	23	32
Ruff	*(Philomachus pugnax)*	1,0	47	70
Jack Snipe	*(Lymnocryptes minimus)*	0,2	11	22
Snipe	*(Gallinago gallinago)*	2,2	100	140
Whimbrel	*(Numenius phaeopus)*	0,5	23	32
Curlew	*(Numenius arquata)*	0,2	8	11
Greenshank	*(Tringa nebularia)*	1,1	50	70
Wood Sandpiper	*(Tringa glareola)*	4,8	230	340
Meadow Pipit	*(Anthus pratensis)*	6,8	320	480
Yellow Wagtail	*(Motacilla flava)*	6,6	310	490
Wagtail	*(Motacilla alba)*	3,0	140	220
Whinchat	*(Saxicola rubetra)*	0,8	39	60
Wheatear	*(Oenanthe oenanthe)*	0,1	7	11
Sedge Warbler	*(Acrocephalus schoenobaenus)*	0,4	18	29
Red-backed Shrike	*(Lanius collurio)*	0,1	5	9
Great Grey Shrike	*(Lanius excubitor)*	0,2	9	14
Reed Bunting	*(Emberiza schoeniclus)*	2,4	110	170
Total		32,6	1500	2300
LEVANEVA				
Kestrel	*(Falco tinnunculus)*	0,2	6	9
Willow Grouse	*(Lagopus lagopus)*	0,8	21	38
Crane	*(Grus grus)*	0,4	10	14
Golden Plover	*(Pluvialis apricaria)*	3,9	110	160
Lapwing	*(Vanellus vanellus)*	0,5	15	21
Ruff	*(Philomachus pugnax)*	0,9	26	40
Jack Snipe	*(Lymnocryptes minimus)*	0,1	2	5
Snipe	*(Gallinago gallinago)*	0,5	14	20
Whimbrel	*(Numenius phaeopus)*	1,9	55	75
Curlew	*(Numenius arquata)*	0,4	12	17
Spotted Redshank	*(Tringa erythropus)*	0,3	10	13
Redshank	*(Tringa totanus)*	0,4	11	16
Wood Sandpiper	*(Tringa glareola)*	5,9	170	250
Red-necked Phalarope	*(Phalaropus lobatus)*	0,4	12	19
Meadow Pipit	*(Anthus pratensis)*	25,9	750	1100
Yellow Wagtail	*(Motacilla flava)*	2,6	75	120
Total		45,2	1300	3800
LAUHANVUORI				
Willow Grouse	*(Lagopus lagopus)*	0,8	12	21
Crane	*(Grus grus)*	0,5	7	10
Golden Plover	*(Pluvialis apricaria)*	1,3	18	26
Lapwing	*(Vanellus vanellus)*	0,6	8	11

		D	Min	Max
Ruff	*(Philomachus pugnax)*	0,3	5	7
Snipe	*(Gallinago gallinago)*	0,8	12	16
Greenshank	*(Tringa nebularia)*	0,1	1	2
Wood Sandpiper	*(Tringa glareola)*	4,5	65	95
Meadow Pipit	*(Anthus pratensis)*	16,2	230	350
Yellow Wagtail	*(Motacilla flava)*	12,5	180	290
Wagtail	*(Motacilla alba)*	2,0	29	46
Great Grey Shrike	*(Lanius excubitor)*	0,3	4	6
Reed Bunting	*(Emberiza schoeniclus)*	0,4	5	8
Total		40,2	600	900
KAUHANEVA				
Willow Grouse	*(Lagopus lagopus)*	1,2	50	95
Crane	*(Grus grus)*	0,3	13	19
Golden Plover	*(Pluvialis apricaria)*	3,6	150	210
Lapwing	*(Vanellus vanellus)*	1,1	48	65
Ruff	*(Philomachus pugnax)*	1,3	55	85
Snipe	*(Gallinago gallinago)*	0,7	32	45
Black-tailed Godwit	*(Limosa limosa)*	0,1	3	4
Whimbrel	*(Numenius phaeopus)*	1,4	60	85
Curlew	*(Numenius arquata)*	0,8	35	49
Redshank	*(Tringa totanus)*	0,3	13	20
Greenshank	*(Tringa nebularia)*	0,3	15	20
Wood Sandpiper	*(Tringa glareola)*	8,0	340	500
Marsh Owl	*(Asio flammeus)*	0,1	5	7
Meadow Pipit	*(Anthus pratensis)*	34,5	1500	2200
Yellow Wagtail	*(Motacilla flava)*	7,8	340	550
Wagtail	*(Motacilla alba)*	0,7	32	50
Whinchat	*(Saxicola rubetra)*	1,4	60	90
Red-backed Shrike	*(Lanius collurio)*	0,8	35	55
Ortolan Bunting	*(Emberiza hortulana)*	0,2	10	15
Reed Bunting	*(Emberiza schoeniclus)*	0,4	16	24
Total		65,1	2800	4200
SEITSEMINEN				
Willow Grouse	*(Lagopus lagopus)*	0,2	3	6
Crane	*(Grus grus)*	0,3	5	7
Golden Plover	*(Pluvialis apricaria)*	0,7	10	14
Lapwing	*(Vanellus vanellus)*	0,0	0	1
Snipe	*(Gallinago gallinago)*	0,5	7	10
Curlew	*(Numenius arquata)*	0,1	1	2
Greenshank	*(Tringa nebularia)*	0,1	1	2
Wood Sandpiper	*(Tringa glareola)*	2,2	33	49
Meadow Pipit	*(Anthus pratensis)*	1,7	25	38
Yellow Wagtail	*(Motacilla flava)*	2,8	42	65
Wagtail	*(Motacilla alba)*	3,0	45	70
Whinchat	*(Saxicola rubetra)*	1,3	19	29

		D	Min	Max
Sedge Warbler	*(Acrocephalus schoenobaenus)*	0,2	3	6
Red-backed Shrike	*(Lanius collurio)*	0,1	2	4
Reed Bunting	*(Emberiza schoeniclus)*	0,5	7	10
Total		13,6	200	310
PUURIJÄRVI - ISOSUO				
Bittern	*(Botaurus stellaris)*	0,0	1	2
Marsh Harrier	*(Circus aeruginosus)*	0,0	1	2
Water Rail	*(Rallus aquaticus)*	0,1	2	3
Spotted Crake	*(Porzana porzana)*	0,3	8	11
Crane	*(Grus grus)*	0,3	9	13
Golden Plover	*(Pluvialis apricaria)*	4,0	120	170
Lapwing	*(Vanellus vanellus)*	1,3	39	55
Ruff	*(Philomachus pugnax)*	0,5	14	21
Snipe	*(Gallinago gallinago)*	1,2	34	47
Curlew	*(Numenius arquata)*	0,9	26	37
Redshank	*(Tringa totanus)*	0,6	17	26
Greenshank	*(Tringa nebularia)*	0,0	1	2
Wood Sandpiper	*(Tringa glareola)*	2,6	75	120
Skylark	*(Alauda arvensis)*	2,0	60	85
Meadow Pipit	*(Anthus pratensis)*	17,6	500	750
Yellow Wagtail	*(Motacilla flava)*	17,4	500	800
Wagtail	*(Motacilla alba)*	1,2	34	55
Whinchat	*(Saxicola rubetra)*	3,8	110	170
Sedge Warbler	*(Acrocephalus schoenobaenus)*	13,9	410	650
Reed Warbler	*(Acrocephalus scirpaceus)*	0,6	18	27
Red-backed Shrike	*(Lanius collurio)*	0,3	8	12
Ortolan Bunting	*(Emberiza hortulana)*	0,1	3	5
Reed Bunting	*(Emberiza schoeniclus)*	7,9	230	350
Total		76,7	2200	3400
PUNASSUO				
Crane	*(Grus grus)*	0,2	0	1
Lapwing	*(Vanellus vanellus)*	3,4	7	9
Curlew	*(Numenius arquata)*	1,0	2	3
Greenshank	*(Tringa nebularia)*	0,3	1	2
Wood Sandpiper	*(Tringa glareola)*	1,8	4	5
Skylark	*(Alauda arvensis)*	2,8	5	8
Meadow Pipit	*(Anthus pratensis)*	10,5	21	31
Yellow Wagtail	*(Motacilla flava)*	7,4	15	23
Wagtail	*(Motacilla alba)*	11,9	24	38
Total		39,3	80	120

		D	Min	Max
LIESJÄRVI				
Crane	*(Grus grus)*	0,1	0	1
Golden Plover	*(Pluvialis apricaria)*	1,1	3	5
Lapwing	*(Vanellus vanellus)*	0,2	1	2
Snipe	*(Gallinago gallinago)*	1,7	6	8
Curlew	*(Numenius arquata)*	0,1	0	1
Wood Sandpiper	*(Tringa glareola)*	0,5	2	3
Meadow Pipit	*(Anthus pratensis)*	7,0	23	34
Yellow Wagtail	*(Motacilla flava)*	1,1	3	6
Wagtail	*(Motacilla alba)*	6,9	23	36
Whinchat	*(Saxicola rubetra)*	2,1	7	11
Sedge Warbler	*(Acrocephalus schoenobaenus)*	2,0	7	10
Ortolan Bunting	*(Emberiza hortulana)*	0,3	1	2
Reed Bunting	*(Emberiza schoeniclus)*	0,9	3	4
Total		23,8	80	120
TORRONSUO				
Marsh Harrier	*(Circus aeruginosus)*	0,0	1	2
Water Rail	*(Rallus aquaticus)*	0,0	1	2
Spotted Crake	*(Porzana porzana)*	0,2	6	8
Crane	*(Grus grus)*	0,4	10	14
Golden Plover	*(Pluvialis apricaria)*	4,1	110	160
Lapwing	*(Vanellus vanellus)*	1,5	41	55
Ruff	*(Philomachus pugnax)*	0,4	10	15
Snipe	*(Gallinago gallinago)*	1,0	27	38
Black-tailed Godwit	*(Limosa limosa)*	0,0	1	2
Curlew	*(Numenius arquata)*	0,7	19	27
Spotted Redshank	*(Tringa erythropus)*	0,0	1	2
Redshank	*(Tringa totanus)*	0,5	12	19
Greenshank	*(Tringa nebularia)*	0,0	1	2
Wood Sandpiper	*(Tringa glareola)*	3,8	100	160
Marsh Owl	*(Asio flammeus)*	0,1	2	3
Skylark	*(Alauda arvensis)*	1,5	42	60
Meadow Pipit	*(Anthus pratensis)*	16,9	460	700
Yellow Wagtail	*(Motacilla flava)*	11,4	310	500
Wagtail	*(Motacilla alba)*	1,5	41	65
Whinchat	*(Saxicola rubetra)*	3,2	85	130
Sedge Warbler	*(Acrocephalus schoenobaenus)*	5,4	150	230
Red-backed Shrike	*(Lanius collurio)*	0,6	16	26
Ortolan Bunting	*(Emberiza hortulana)*	0,1	4	5
Reed Bunting	*(Emberiza schoeniclus)*	1,7	48	70
Total		55,1	1500	2300

DOCUMENTATION PAGE

Publisher	*Date* 7 / 2006 Finnish Environment Institute
Author(s)	Raimo Heikkilä, Tapio Lindholm and Teemu Tahvanainen (eds.)
Title of publication	**Mires of Finland – Daughters of the Baltic Sea**
Publication series and number	The Finnish Environment 28 / 2006
Theme of publication	Nature
Parts of publication/ other project publications	
Abstract	This book presents a transect of Finnish mire nature from Forest Lapland in the north to the hemiboreal mires on the southern coast of Finland. It has been compiled in connection with the International Mire Conservation Group field symposium in Finland in July 2006, and it gives an overview of the biodiversity of Finnish mires on mire system, massif, site and species levels as well as about the ecology, utilization, conservation and restoration of Finnish mires. A special topic is the primary succession of mires on the land uplift coast of the Bothnian Bay, which is a globally unique phenomenon in the boreal zone. Most of the mires presented here are protected as national parks or mire reserves. Thus this book gives a positive view over Finnish mires. We must remember, however, that about 75 % of Finnish mires have been destroyed by forestry drainage, agriculture, peat mining or reservoir building. The aim of this book is to emphasize the great diversity and high conservation value of Finnish mires. During the compiling of this book it was revealed that despite a long mire research tradition and intensive inventories conducted in nature reserves recently, we know surprisingly little about our mires. This emphasizes the importance of mire research in Finland – land of mires.
Keywords	Biodiversity, conservation, succession, nature reserve, mire research
Financier/ commissioner	Ministry of the environment
	ISBN 952-11-2319-2 (pbk.) / ISBN 952-11-2320-6 (PDF) / ISSN 1238-7312 (print) / ISSN 1796-1637 (online)
	No. of pages: 166 / *Language*: English / *Restrictions*: Public / *Price (incl. tax 8 %)*: 30€
For sale at/ distributor	Edita Publishing Ltd. P.O. Box 800, FI-00043 EDITA phone +358 20 450 05, fax +358 20 450 2380
Financier of publication	Finnish Environment Institute
Printing place and year	Kurikka 2006

KUVAILULEHTI

Julkaisija	*Julkaisuaika 7 / 2006* Suomen ympäristökeskus
Tekijä(t)	Raimo Heikkilä, Tapio Lindholm ja Teemu Tahvanainen (toim.)
Julkaisun nimi	**Mires of Finland – Daughters of the Baltic Sea**
Julkaisusarjan nimi ja numero	The Finnish Environment 28 / 2006
Julkaisun teema	Luonto
Julkaisun osat/ muut saman projektin tuottamat julkaisut	
Tiivistelmä	Tämä kirja esittelee poikkileikkauksen suomalaisesta suoluonnosta Metsä-Lapista etelärannikon hemiboreaalisille soille. Se on koottu Suomessa heinäkuussa 2006 järjestetyn kansainvälisen soidensuojelusymposion yhteydessä, ja se tarjoaa yleiskatsauksen Suomen soihin suosysteemien, yhdistymien, biotooppien ja lajien tasolla. Lisäksi käsitellään soiden ekologiaa, käyttöä, suojelua ja ennallistamista. Erityisaihepiiri on maailmanlaajuisesti boreaalisessa vyöhykkeessä ainutlaatuinen maankohoamisrannikon soiden kehitys Perämeren rannalla. Kirjassa esitellään enimmäkseen kansallispuistoina ja soidensuojelualueina suojeltuja soita. Siten kirja antaa positiivisen käsityksen suoluonnosta. On kuitenkin muistettava, että 75 % Suomen soista on tuhottu metsäojituksella, maataloudella, turpeennostolla ja tekoaltaiden rakentamisella. Kirjan tavoite on korostaa Suomen soiden suurta monimuotoisuutta ja suojeluarvoa. Kirjan kokoamisen aikana kävi ilmi, että pitkästä suotutkimusperinteestä ja nykyisin suojelualueilla tehtävistä intensiivisistä inventoinneista huolimatta soistamme tiedetään yllättävän vähän. Tämä korostaa suotutkimuksen tärkeyttä Suomessa.
Asiasanat	Monimuotoisuus, suojelu, kehityssarja, suojelualue, suotutkimus
Rahoittaja/ toimeksiantaja	Ympäristöministeriö
	ISBN 952-11-2319-2 (nid.) / ISBN 952-11-2320-6 (PDF) / ISSN 1238-7312 (pain.) / ISSN (verkkoj.)
	Sivuja: 166 / *Kieli*: Englanti / *Luottamuksellisuus*: Julkinen / *Hinta (sis. alv 8 %)*: 30€
Julkaisun myynti/ jakaja	Edita Publishing Ltd. PL 800, 00043 EDITA puh. +358 20 450 05, fax +358 20 450 2380
Julkaisun kustantaja	Suomen ympäristökeskus
Painopaikka ja -aika	Kurikka 2006

PRESENTATIONSBLAD

Utgivare	Finlands miljöcentral			*Datum 7 / 2006*
Författare	Raimo Heikkilä, Tapio Lindholm och Teemu Tahvanainen (eds.)			
Publikations titel	**Mires of Finland – Daughters of the Baltic Sea**			
Publikationsserie och nummer	The Finnish Environment 28 / 2006			
Publikationens tema	Natur			
Publikationens delar/ andra publikationer inom samma projekt				
Sammandrag	Den här boken presenterar ett transekt över finsk myrnatur från Skogs-Lappland till de hemiboreala myrarna på sydkusten. Den har sammansatts vid den internationella myrskyddskonferensen i Finland i Juli 2006, och den bjuder en översikt över Finlands myrar på nivåer av myrsystem, myrkomplex, biotoper och arter. Därtill behandlas myrarnas ekologi, utnyttjande, skydd och restorering. En speciell tema är den i boreala zonen globalt unika utvecklingsserien av myrarna på landhöjningskusten vid Bottenhavet. I boken presenteras myrarna mestadels skydda i nationalparker och myrskyddsområden. Därmed ger boken en positiv omfattning av myrnaturen. Vi måste ändå komma ihåg, att 75 % av finska myrarna har förstörts vid myrdikning, jordbruk, torvtäkten och konstruktionen av vattenreservoirer. Målet av boken är att betona den stora mångfalden och skyddsvärdet av Finlands myrar. Vid kompletteringen av boken blev det klart, att trots den långa myrforskningstraditionen och de intensiva inventeringarna pågående i skyddsområdena man vet överraskande litet om de finska myrarna. Det här accentuerar viktigheten av myrundersökning i Finland.			
Nyckelord	Mångfald, naturskydd, utvecklingsserie, skyddsområde, myrundersökning			
Finansiär/ uppdragsgivare	Miljöministeriet			
	ISBN 952-11-22319-2 (hft.)	ISBN 952-11-2320-6 (PDF)	ISSN 1238-7312 (print)	ISSN 1796-1637 (online)
	Sidantal 166	*Språk* Engelska	*Offentlighet* Offentlig	*Pris (inneh. moms 8 %)* 30€
Beställningar/ distribution	Edita Publishing Ltd. PL 800, FI-00043 EDITA tel. +358 20 450 05, fax +358 20 450 2380			
Förläggare	Finlands miljöcentral			
Tryckeri/tryckningsort och -år	Kurikka 2006			

This book presents a transect of Finnish mire nature from Forest Lapland in the north to the hemiboreal mires on the southern coast of Finland. It has been compiled in connection with the International Mire Conservation Group field symposium in Finland in July 2006, and it gives an overview of the biodiversity of Finnish mires on mire system, massif, site and species levels as well as about the ecology, utilization, conservation and restoration of Finnish mires. A special topic is the primary succession of mires on the land uplift coast of the Bothnian Bay, which is a globally unique phenomenon in the boreal zone. Most of the mires presented here are protected as national parks or mire reserves. Thus this book gives a positive view over Finnish mires. We must remember, however, that about 75 % of Finnish mires have been destroyed by forestry drainage, agriculture, peat mining or reservoir building.

SYKE

Order Service: Edita Publishing Ltd.
P.O. Box 800, FI-00043 EDITA
Customer Service:
phone +358 20 450 05, fax +358 20 450 2380
Edita-bookstore in Helsinki:
Annankatu 44, phone +358 20 450 2566

ISBN 952-11-2319-2 (pbk.)

ISBN 952-11-2320-6 (PDF)

ISSN 1238-7312 (print)

ISSN 1796-1637 (online)