WETLANDS IN RUSSIA

Volume 2
Important peatlands

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Foreword

Peatlands, lakes, river valleys and deltas, sea shallows and bays have played a crucial role in human history. The first cultures depended on these natural complexes for food, in particular fish and meat, clothing and building materials. Many prehistoric settlements were located in the wetlands, which also provided important transportation facilities. Later, floodplain and peatland complexes became a basis for irrigated agriculture and for the development of power engineering and many other industries.

These long-lasting relations between man and wetlands have had a large number of negative results. The development of agriculture has resulted in the drainage of wetlands over extensive areas. The regulation of major rivers for the production of hydro-electricity has resulted in the alteration of natural hydrological regime and the degradation of floodplain wetlands. The greatest impact on the natural wetland ecosystems has been caused by industrial and agricultural pollution.

Over the past decades, the importance of wetlands for ecological processes has been widely recognized. Wetlands have been understood as regulatory components in the landscapes. They maintain hydrological and climatic conditions over extensive areas and act as natural filters of polluted waters, as a basis for traditional resource use of indigenous peoples, and as refuge for biodiversity conservation.

At present, the conservation of wetlands is regarded as one of the most important conditions for supporting the quality of human life, and often for the very survival of many people.

The framework for international cooperation for the conservation of wetland ecosystems is provided by the Convention on Wetlands of International Importance, especially as Waterfowl Habitat, also known as the Ramsar Convention from its place of adoption in 1971 in Iran. The Russian Federation has been a Party of the Convention since 1975.

One of the priorities of wetland conservation is the compilation of national wetland inventories and designation of the most important sites for the List of Wetlands of International Importance under the Ramsar Convention.

The Government of the Russian Federation designated 35 wetland sites for the Ramsar List by Decree No. 1050 in 1994. By providing international status for these sites, which cover a total of 10.6 million hectares, the country made only the first step toward conservation of its wetlands. According to some estimates, over 400 sites should be protected within the network of internationally, nationally and locally important wetlands in Russia.

To meet this objective, it is required to carry out an inventory of the most important wetlands. The information collected will allow evaluation of wetland areas and indentification of priority sites to be included in the Ramsar List, as well as in the lists of nationally and locally important wetlands.

During the last five years, wetland inventory activities have been carried out on a large scale in Russia, with support from a number of international conservation organisations, such as Wetlands International, Ramsar Bureau, TACIS, and in particular from the Government of the Netherlands via the Ministry of Agriculture, Nature Management and Fisheries. The first publication resulted from these activities has been Volume 1 of the *Wetlands in Russia* series providing information on the 35 Russian Ramsar sites.

This volume contains information on 51 important peatland areas collected by a group of experts supervised by the late professor Marina S. Botch. This information has been compiled on the basis of the revised TELMA List (first published in 1979) and some recent inventory studies. The total area of these sites is over eight million ha, including the world’s largest peatland of Vasyuganskooye, which covers five million ha.
This information has a direct relationship to the objectives of the Ramsar Convention. The Sixth and Seventh Meetings of the Conference of the Contracting Parties to the Convention have recognized peatlands as an under-represented wetland type in the Ramsar network of wetlands of international importance.

This publication helps to broaden our knowledge on the status of peatlands in European Russia and, to a lesser extent, in the Asian portion of the country, and is particularly valuable for the designation of important peatlands under the Ramsar Convention. Information on the sites is provided in accordance with the Ramsar Information Sheet.

**Vitaly G. Krivenko**

Deputy Chairman  
Coordination Group on the Ramsar Convention  
State Committee of the Russian Federation for Environmental Protection  
Winner of the Ramsar Wetland Conservation Award
Acknowledgements

This volume is a compilation of information provided by a number of governmental agencies, scientific institutions, and individuals. The major contributions were made by O.L.Kuznetsov (Institute for Biology, Karelian Scientific Centre, Russian Academy of Sciences), E.D.Lapshina (Tomsk State University), O.L.Liss (Moscow State University), T.Yu.Minaeva (Central Forest Biosphere Nature Reserve), A.L.Mishchenko (Research Institute for Nature Conservation, State Committee of the Russian Federation for Environmental Protection), N.M.Semenova (Tomsk State University), V.I.Valutskii (Novosibirsk State University), and T.K.Yurkovskaya (Komarov Botanical Institute, Russian Academy of Sciences). Most helpful assistance was given by N.V.Blagoveshchenskaya, I.V.Blagoveshchenskii, E.O.Kuzmina, and V.A.Smigin (Komarov Botanical Institute). Recognition should also be given to the many other contributors in each region of the country who it has not been possible to identify individually.

Nationally, this project was co-ordinated by the late professor Marina S. Botch, who was Head of the National Working Group under the TELMA Project and the undisputed leader in peatland research and conservation in Russia for many years.

Tatiana Minaeva and Irina Kamennova undertook the task of finalising the compilation of this volume. Grateful thanks go to the Coordination Group on the Ramsar Convention of the State Committee of the Russian Federation for Environmental Protection, in particular Vitaly G. Krivenko and Valentin Yu. Iliashenko, who provided substantial help and advice.

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Olga Anisimova

National Coordinator
Wetlands International–Russia Programme
Introduction

Peatlands are ecosystems that develop under conditions of high precipitation, poor drainage, low level of oxygen in the waterlogged soil, and retarded biogeochemical processes. These ecosystems are characterised by the ability to accumulate peat and by specific vegetation adapted to waterlogged ground. Peatlands occupy over 500 million hectares on Earth and occur in all biogeographical regions, from the Arctic to the Antarctic.

Peatlands provide a variety of ecological functions, including:

- regulation of the hydrological regime over extensive areas (peatlands play a key role in groundwater discharge and recharge, hold large amounts of drinking water, store and slowly release flood waters, maintain river flow during dry periods, etc.; many lowland rivers originate in peatlands);
- regulation of geochemical processes in the biosphere (carbon sequestration, filtering of polluted waters, and removing heavy metals, pesticides and other toxins from the water);
- maintenance of species and ecosystem diversity (peatlands provide habitat for specific flora and fauna, including rare and endangered species, as well as provide refuges for threatened animals displaced from anthropogenically modified open areas).

Peatland ecosystems and their components provide diverse services and resources that are presently or potentially valuable to people, such as:

- many natural resources, ranging from drinking water, fuel, and commercially used plants and animals to genetic materials and historical information stored in the peat matrix (peatlands are the major contributor of our knowledge on the Late Pleistocene and Holocene);
- cultural and educational values (peatlands preserve archaeological remains and contain historical and sacred objects);
- recreational values (many peatland sites are popular tourist destinations for sightseeing, fishing, hunting, gathering of berries and mushrooms, bird-watching, and other activities).

Peatlands occupy 161 million hectares in Russia (Botch et al., 1994). They are unevenly distributed throughout the country, covering over 80% of the total land area in Western Siberia, 30% in Karelia, and relatively small areas in central European regions.

Since the late 1960s, the importance of peatland conservation has become more and more recognized, both nationally and internationally. In 1967, an international project of ‘TELMA’ was launched under the aegis of UNESCO, IUCN, and the International Biological Programme (IBP). Twenty countries took part in this project, including the USSR where a national working group was established. During ten years of work, this group initiated several meetings and published a number of articles and books. As a main result of this work, the objectives of peatland conservation and major threats to the ecological character of peatlands have been identified. A List of Peatlands in the USSR that require protection was compiled and published in the book of ‘Peatland ecosystems in the USSR’ by M.S.Botch and V.V.Masing (1979). This list was based on the reports and conclusions of peatland experts from all major regions of the country and included 309 sites totally covering 1.5 million hectares. Later, in the 1980s, the list was extended considerably, but this version was not published.

In the late 1980s, a project to identify peatland sites important for conservation in European Russia and to develop measures for sustainable utilisation of peat resources was implemented.
under the USSR Ministry of Geology. The resulting report entitled ‘Ecological and economic evaluation of peat deposits, their sustainable utilisation and the conservation of peatlands’ (Melnikova, S.V., ed. 1990) has not been published and is now stowed in the National Geological Depository.

At present, peatlands are protected within protected natural areas (PNA) of various types as well as in areas with different kinds of environmental regulation. At the state forest lands, important peatlands are mainly included in the category of specially protected sites within water-protecting zones. In the 1980s, the administrations of many regions in European Russia established a PNA category of ‘peatlands maintained in their natural state’. These sites have been withdrawn from regional plans for forest cutting and peat extraction; other activities are usually allowed.

1,265 peatland sites with a total area of 1,066,600 ha are protected in zapovedniks (strict nature reserves) and zakazniks (sanctuaries/wildlife refuges). Peatlands are the predominant ecosystems in the strict nature reserves of Yugansky, Polistovsky, Rdeisky, Darvinsky, Central-Forest and some others. Many peatland sites have been designated as natural monuments.

This volume contains information on 51 important peatland areas that meet the Ramsar Convention criteria. This information has been compiled on the basis of the revised TELMA List and some recent inventory studies. The sites are mostly situated in the taiga biogeographical region, to the south of which peatlands do not cover large areas and have been considerably modified by human activities. A number of proposed sites are located within the tundra region. Due to the fact that peatlands in Central and Eastern Siberia have not received adequate study, there are few Siberian sites on the list. We hope that these gaps will be filled in the near future.

The list includes peatlands which contain river heads and lakes, support rare and endangered species of plants and animals, provide representative examples of mire types characteristic of the appropriate biogeographical region, as well as those peatlands which have been the focus of scientific research and monitoring for many years. It might be well to point out that areas on the list are very different in size, including

- Mire massifs which are important for supporting the biodiversity at local to global level, for conserving unique plant communities and landscape types (such as raised bogs in the forest-steppe), and for representing types of peatland ecosystems that used to cover large areas but have been destroyed and degraded throughout most of Europe during the present century.

- Large mire systems, which serve a variety of regulation functions and are of importance for maintaining adequate climatic, hydrological, and ecological conditions over large areas and for supporting globally significant biodiversity.

- Large wetland complexes, such as river valleys and deltas, watershed areas and lake systems, which are only partially covered by peatlands.

The descriptions of sites are given in accordance with the biogeographical zoning and classification, generally agreed in Russian mire science (Pic. 1).

Marina S. Botch
Pic. 1. Map of mire zones and provinces: 1 – zone of polygon mires; 2 – zone of palsa mires; 3 – zone of aapa mires; 4 – zone of domed raised bogs with hummocks and hollows; 5 – zone of forested sphagnum raised bogs and grass fens; 6 – zone of sedge-reed fens; 7 – zone of freshwater and brackish grass mires; 8 – Siberian continental mire provinces; 9 – Far-eastern coastal provinces; 10 – mountain mire provinces (Botch & Mazing, 1979).
EUROPEAN RUSSIA

Zone of aapa mires

Provinces:
3.1. Kolsky (Chalmny Varre Mire)
3.2. North-Karelian (Yupyauzhso and Muksalma Islands)
3.3. East-European (Sebboloto)

1. Chalmny Varre

Compiler: M.S.Botch

Geographical coordinates: 67°12'N, 37°30'E
Altitude: 144 m above sea level (a. s. l.)
Area: 50,538 ha

Overview: A complex mire system located in the floodplain of the Ponoi River. Lakes occupy 3445 ha. Mires are represented by fens, aapa-mires, and raised bogs with ridges, hollows, and pools. Dwarf shrubs and grasses (Molinia sp., Baeothryon sp.) cover mesotrophic ridges. The moss layer is dominated by Sphagnum papillosum and S. fuscum. Horsetails Equisetum spp., buckbean Menyanthes trifoliata, and sedges Carex spp. are found in the hollows. The mire of Chalmny Varre is the largest aapa-mire complex on the Kolsky Peninsula, characteristic of the appropriate biogeographical region.

Wetland Type (By international/Ramsar classification – Annex 1): U.

Ramsar Criteria (Annex 2): 1 (one of the largest mire systems within the Kolsky province of the Laplandian aapa-mires); 2 (supports rare species of birds and mammals); 3 (provides important breeding and staging areas for waterbirds).

General location: Murmansk Region, 145 km southeast of the town of Lovozero, 3 km of the village of Chalmny Varre.

Physical features: The area is situated in the valley of the Ponoi River intersecting the Baltic shield, on alluvial sand and clay sediments overlying the granite layer. The layer of fen peat is 1 m thick.

Hydrological values: There are large freshwater supplies in the mires and lakes.

Ecological features: Major habitat types are ombrotrophic and mesotrophic aapa-mires with ridges and pools, as well as numerous lakes.

Noteworthy fauna: The mires of Chalmny Varre provide breeding habitat for Whooper Swan Cygnus cygnus, Peregrine Falcon Falco peregrinus, and Osprey Pandion haliaetus. The site is important for migratory waterbirds, regularly holding several thousand individuals of Whooper Swan.

Social and cultural values: For the local population, the site is important for gathering cranberries, cowberries, bog whortleberries, mushrooms, medicinal plants (marsh tea, sundew, buckbean, and many others), and honey plants. Fishing is carried out in the lakes.
Land tenure/ownership: State owned

Conservation measures taken: The site has been designated as the Ponoisky Nature Reserve (‘Zakaznik’ – See Annex 4).

Jurisdiction: Administration of Murmansk Oblast

2. Yupyauzhsuo

Compilers: M.S.Botch and O.L.Kuznetsov (Institute for Biology, Karelian Scientific Centre, Russian Academy of Sciences. 11 Pushkinskaya Str., Petrozavodsk 185610, Russia).

Geographical coordinates: 65°00’N, 32°25’E

Altitude: 92-99 m a.s.l.

Area: c. 40,000 ha

Overview: The largest Karelian mire system, which includes several merged aapa ring massifs with dystrophic lakes and dry islands. The site is a good example of the aapa mires of eastern Fennoscandia, with typical flora and plant communities. Pine and spruce forests occur at the fringes of the mire. Wet meadows on alluvial sediments are found along the rivers Kem and Kepa. The area is important for breeding cranes, swans, and waders, and for migrating water birds.

Wetland Type:
By international/Ramsar classification: U, O, Xf.
By national classification (Annex 3): 3.9.1.1 (85%), 3.8.1.5 (2%), 2.5.1.1 (3%), swampy and dry spruce and pine forests of the north taiga type (10%).

Ramsar Criteria: 1 (characteristic of Karelian mires); 2 (rare plant species); 3 (supports the biodiversity of aapa-mires); 4 (important for breeding and migrating waterbirds).

General location: Republic of Karelia, Kalevala District, 60 km southeast of the village of Kalevala, 100 km west of the town of Kem. The site borders the Kepa River to the north, the road connecting the settlements of Kepa and Yushkozero to the west, the Kem River to the south and forest rides to the east.

Physical features: The site is situated at the western edge of the White Sea lowland, mainly composed of marine clays. The formation of mires in this area dates back to the White Sea transgression, which occurred 9,000 BP. To the west of the site, fluvioglacial landforms are found covered by dry pine forests alternating with mires. Soils at the adjacent areas are podzolic, podzolic-gley, and peat-podzolic. The water in the rivers and lakes is fresh and acid, with a high humus content. The mire provides water for the river Kem. This river is regulated by several dams downstream.

The aapa-mire system is not easily accessible due to high water level. The rate of peat accumulation is low. Peat deposits are 3-4 m thick, mainly composed of the sedge fen and transitional peats, in places underlain by lacustrine sediments.

Hydrological values: The mire plays an important role in groundwater discharge and recharge, and in the stabilisation of the Kem river banks. The lakes contain large freshwater supplies.

Ecological features: The central portion of the mire system is dominated by open-water complexes: hollows and pools with Carex limosa, Menyanthes trifoliata, Equisetum fluviatile and some other hydrophilous plants. Narrow sinuous ridges, covered by the associations of Carex lasiocarpa+Sphagnum papillosum and Molinia caerulea+ Sphagnum papillosum, occupy 10 to 15 percent of this area. The edges of the mire are more drained and are occupied
by sedge and sphagnum communities and by mixed communities with trees or dwarf shrubs, which grade into a lagg. In the surrounding forests, fellings have been carried out for the last 20 years.

**Noteworthy flora:** The flora of the mire is typical for the north taiga subzone of Fennoscandia. *Carex livida* and *Dactylorhiza traunsteineri* are listed in the Russian Red Data Book (1988). A number of amphiatlantic species, such as *Molinia caerulea*, *Baeothryon cespitosum*, *Sphagnnum pulchrum*, and *S. subfulvum* are common in the area, but do not occur often in the peatlands of Russia outside Fennoscandia. The grass layer is dominated by sedges (*Carex lasiocarpa*, *C. limosa*, and *C. rostrata*), *Molinia caerulea*, *Baeothryon cespitosum*, and *Menyanthes trifoliata*. Mosses include *Sphagnnum papillosum*, *S. balticum*, *S. jensenii*, *S. angustifolium*, *S. subfulvum*, and *S. fuscum*. There are no calciphilous species and eutrophic mire communities in the area due to the poorness of Quaternary sediments.

**Noteworthy fauna:** The site is important for breeding Crane *Grus grus* and Whooper Swan *Cygnus cygnus*, as well as for thousands of migrating waterbirds.

**Land tenure/ownership:** State owned (*Goslesfond*: State Forest Lands).

**Current land use:** Being hardly accessible, the area is not visited often. The surrounding forests are partially cut. The Kem River is regulated by a chain of dams. When the construction of the downstream Beloporozhsky hydropower plant is completed, floodplain meadows will be flooded in the southern portion of the site.

**Factors adversely affecting the site's ecological character:** A peat extraction project was proposed but was not undertaken due to the high expense of drainage and road construction.

**Conservation measures taken:** A nature reserve (*zakaznik*) is being established at the site.

**Current scientific research and facilities:** The vegetation and stratigraphy of the Yupyauzhuo mire system were studied by the Laboratory for Mire Ecosystems, Institute for Biology, Karelian Scientific Centre of the Russian Academy of Sciences, in 1957 and 1971. The investigation of peat deposits was undertaken by the ‘Sevzapgeologia’ Peat Expedition (St. Petersburg) in 1993. The area is of much interest for research in botany, ornithology, and hydrology.

**Current conservation education:** None at present. There are plans to develop an information centre and a network of ecological paths and signposts as soon as a nature reserve is established and a new road is built near the site.

**Current recreation and tourism:** The Kem River is used for boating and rafting. The recreational pressure seems to be low.

**Jurisdiction:** Government of the Republic of Karelia; Federal Forestry Service.

**Management authority:** Kalevala Regional Forestry Service.

**Bibliographical references:** Tsinzerling (1938).

3. Bolshaya Muksalma and Malaya Muksalma Islands

**Compilers:** M.S.Botch and T.Y.Minaeva (Central-Forest Biosphere Nature Reserve, Tver Oblast 172513, Russia).

**Geographical coordinates:** 65°00’N, 36°00’E

**Altitude:** 20-100 m a.s.l.

**Area:** 1,200 ha
Overview: A non-forested aapa-mire system, situated on the coastal terraces of the White Sea islands. There are raised bogs with pools and ridges, overgrown by dwarf birches, sedges, and Deer Grass *Baeothryon cespitosum*. On the low flattened ridges, *Sphagnum fuscum* and *S. papillosum* are found, together with reed, sedges, and Buckbean *Menyanthes trifoliata*. The vegetation is characteristic of the Karelian aapa mires, and is unique for the White Sea region, where raised bogs with sphagnum dominate.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (characteristic of Laplandian aapa mires); 2 (rare plant species); 3 (important for breeding and migrating waterbirds).

General location: Arkhangelsk Region, Solovetsky Islands, 8 km east of the village of Solovki (Kremlin).

Physical features: The Solovetsky archipelago includes six large islands, totalling 300 km² in area, and a large number of small ones. The islands are composed of Quaternary sandy and clayey marine sediments, overlying the bedrock. There are various glacial landforms, with hills, boulders, numerous freshwater lakes, and mires. The largest islands are occupied by the taiga forest. Bolshaya Muksalma Island is the third in size, and is mainly covered by mires and meadows. The area is situated within the Atlantic-Arctic climatic zone and has a transitional continental-marine climate, with a mean annual air temperature of +0.5°C.

Hydrological values: The mires play an important role in the stabilisation of the shoreline.

Ecological features: The major habitat types are ridges with dwarf shrubs, sedges, and sphagnum, and hollows with reed, sedges, and buckbean. The peatlands found on the islands display a quite distinct character which, in reviewing existing knowledge about other mire systems within the White Sea area, appears to be unique to these islands. This is caused by the oceanic influence of the surrounding White Sea on the climatic conditions.

Noteworthy flora: A number of rare species are found on the islands, including *Carex livida* (listed in the Russian Red Data Book), *Hammarbya paludosa*, and *Sphagnum subfulvum*.

Noteworthy fauna: In published literature the archipelago is described as a remarkable site for waterbirds, providing breeding and staging areas for Common Eider *Somateria mollissima*, geese *Branta sp.*, and diving ducks (Skokova, 1987). Recent censuses by Cherenkov et al. (unpublished) have highlighted its value for seabirds (including Eider, Lesser Black-backed Gull *Larus fuscus*, and Arctic Tern *Sterna paradisea*) and also for wetland-dependent raptors, e.g. White-tailed Eagle *Haliaeetus albicilla* and Osprey *Pandion haliaetus*.

Social and cultural values: The cultural heritage of the archipelago is of world status. There is a monastery on the Bolshoi Solovetsky Island founded in the 15th century, a prominent example of the northern Russian architecture. All recent history of the islands has been connected with the monastery: the monks have constructed a system of canals to connect many lakes with each other, as well as dams, churches, chapels, a botanical garden, and other structures of cultural importance. A cattle breeding farm was kept on Bolshaya Muksalma Island from the 16th century until the beginning of the 20th century. To connect the farm and the monastery, an 800 m stone dam was built between the islands of B.Muksalma and B.Solovetsky in the 19th century. This dam and the remains of the farm are attractive to tourists.

Land tenure/ownership: State owned.

Current land use: No economic activity is carried out presently on the islands of Bolshaya Muksalma and Malaya Muksalma.

Conservation measures taken: The site is included in the Solovetsky Architectural and
Natural Museum-Zapovednik.

**Conservation measures proposed but not yet implemented:** There is a proposal to establish a national park on the Solovetsky Islands, with zones of different protective status including strictly protected ones. The archipelago is also proposed to be designated as a World Heritage Site.

**Current scientific research and facilities:** Mires on Bolshaya Muksalma Island were studied by the International Mire Conservation Group in August 1997.

**Current conservation education:** The Solovetsky Museum has published a number of leaflets, posters and maps, which include information about the islands of Muksalma.

**Current recreation and tourism:** Bolshaya Muksalma Island is a popular tourist destination, mainly due to the dam (see above). The recreational pressure is low, as most tourists coming to the islands are organized in guided groups.

**Jurisdiction:**
Territorial: Administration of Arkhangelsk Oblast.
Functional: Ministry of Culture of the Russian Federation

**Management authority:** Administration of the Solovetsky Architectural and Natural Museum-Zapovednik.

**Bibliographical references:** Skokova, N.N. 1987. Wetlands of international and national importance in the USSR. Pages 26-36 in: Wetlands and Waterfowl: Proceedings of the VIth Ornithologists' Days, Parnu, 18-22 May 1979, E.Kumarov (Ed.)

### 4. Sebboloto

**Compilers:** M.S.Botch and T.K.Yurkovskaya (V.L.Komarov Botanical Institute. 2 Popov Str., S.Petersburg 197376, Russia.)

**Geographical coordinates:** 64°30’N, 43°30’E

**Altitude:** 30-40 m a.s.l.

**Area:** 15,120 ha, including the 3,420 ha Sebboloto mire

**Overview:** The site is comprised of a system of forested peatlands, pools, rivers, and streams, including Lake Shuksha and a portion of the Yezhuga River. The core area is formed by the Sebboloto mire system consisting of several aapa-mires and raised bogs with ridges, hollows, and pools. This mire is characteristic of the northeastern European taiga region and yet has some peculiarities. For a number of species (such as *Eriophorum russeolum* and *Rhynchospora alba*), the site is at the border of their distribution areas. The site is important for breeding and moulting swans. The Seba River originating in the mire is the only source of drinking water for the adjacent villages.

**Wetland Type:**
*By international/Ramsar classification:* U, Xf, M, O.
*By national classification:* 3.9.1.1 (30%), 3.9.2.1 (40%), 2.5.3.2 (5%), 3.8.1.4 (1%), 3.8.1.5 (4%).

**Ramsar Criteria:** 1, 2, 3, 4.

**General location:** Arkhangelsk Region, 85 km north of the town of Karpogory, 40 km east of Pinega, 3 km north of the village of Valteev. The nearest airport Trufanovo is 10 km southward. The site borders the Yezhuga River to the east, Kymboloto peatland and Lake Shuksha to the north, and the Pinega River valley on the south and west.
**Physical features:** The site is situated in the watershed area separating the Pinega and Mezen river systems, at a rolling plain composed of Palaeozoic sedimentary rocks. A rare natural phenomenon is found in the northwestern portion of the site: there is a runoff in both directions simultaneously, to the south, into the Pinega, and to the north, into the Mezen. The mires are lacustrine in origin, the peat formation started 9,500 BP, in the Praeboreal. The peat layer is up to 5 m thick. The complex also contains forests on peat, peat-gley, and podzolic soils.

**Hydrological values:** The Seba River, a tributary of the Pinega, has its source at the site. The peatland is important for regulating the natural hydrological regime of the river, and for maintaining the level and quality of water in adjacent areas.

**Ecological features:** The Sebboloto mire system contains a wide variety of bogs ranging from young communities dominated by sphagnum, shrubs, and pine at small flat sites, to patterned bog complexes at all stages of development and old raised bogs with hollows, pools, and ridges covering large areas. Raised bogs occupy the northern portion of the system, and aapa mires, the southern part. The transitional communities found in the ecoton zone between the aapa and raised bogs attract particular attention of botanists.

**Noteworthy flora:** For several rare species, including *Hammarbya paludosa*, *Eriophorum russeolium*, and *Rhynchospora alba* the site is located at the border of their ranges. On the right bank of the Yezhuga River, a large number of communities and species have not received enough study so far: spruce forests with larch and northern liana *Atragene sibirica*, large areas with *Paeonia anomala*, and several species of *Gentiana*. The communities found at small spring mires in the southwestern portion of the area, near Gagarii Island, are also of interest. Information on the moss flora can be found in the article by L.A.Volkova and T.K.Yurkovskaya (1998), rare mire communities have been described by T.K.Yurkovskaya (1992, 1995, 1998).

**Noteworthy fauna:** The area is important for migrating, breeding, and moult ing Whooper Swans *Cygnus cygnus*. Crane *Grus grus* and many species of waders have been noted. The Yezhuga River contains spawning grounds of salmon and grayling.

**Land tenure/ownership:** State Forest Lands (*Goslesfond*) of Arkhangelsk Region and agricultural farms (the latter are in the southern portion of the site).

**Current land use:** The site is used for fishing, gathering of berries, and for winter hunting. Forest felling is carried out at the southern edge of the site. In summer, the central part of the mire is not accessible.

**Factors adversely affecting the site's ecological character:** The most southern known population of reindeer seems to have disappeared as a result of motorized hunting in winter.

**Conservation measures taken:** None at present.

**Conservation measures proposed but not yet implemented:** It is proposed to establish a nature reserve (*zakaznik*) of regional importance.

**Current scientific research and facilities:** The vegetation and flora of mires, peat resources and paleogeography have been studied. The mire vegetation dynamics has been traced through the Holocene, and large-scale maps have been compiled for the key Holocene sections. There is a need to carry out research on fauna, in particular on birds and invertebrates.

**Jurisdiction:** Administration of Arkhangelsk Oblast

**Management authority:** Arkhangelsk Regional Forestry Service

Zone of domed raised bogs with hummocks and hollows

Provinces:

4.1. White Sea Coastal (Morskiye Mkhi and Nyukhcha)
4.2. Northeastern (Koltsa, Usinskoye, and Martyushevskoye)
4.3. South-Karelian (Vazhinskoye, Rakovy Ozera, and Lakhtinskoye)
4.4. Baltic Coastal (Tselau)
4.5. East-Baltic (Chisty Mokh, Polistovo-Lovatskoye, Spasskiye Mkhi, Igorevskiy Mkhi, Nikandrovskoye, Staroizborskiye, Zharkovsko-Svitskaya mire system, and Verkhnevolzhsky wetland complex)

5. Morskiye Mkhi

Compilers: M.S. Botch and O.L. Kuznetsov (Institute for Biology, Karelian Scientific Centre, Russian Academy of Sciences. 11 Pushkinskaya Str., Petrozavodsk 185610, Russia).

Geographical coordinates: 66°20'N, 36°30'E

Altitude: 0-100 m a.s.l.

Area: c. 13,000 ha

Overview: A mire system consisting of raised bogs with hummock-hollow complexes. Hummocks are covered by heather and lichen, and hollows by sphagnum-hepatica communities. In addition to mires, the site incorporates an adjacent complex of lakes, streams, and pine forests of the north taiga type, as well as a coastal area including a tidal zone.

Wetland Type:
By international/Ramsar classification: A, B, D, H, O, U, Xf.
By national classification: 3.9.2.2: 70% of the total area of the site; 3.8.1.4 and 3.8.1.5: 5%; 1.2.1.1, 1.2.3.2, 1.4.2.4, 1.4.2.5, 2.5.1.2 and 2.5.3.2: 5%; pine forests: 20%.

Ramsar Criteria: 1, 3.

General location: Murmansk Region, Terskii District, on the White Sea coast, 4 km south of the village of Varzuga, 6 km northwest of the village of Kuzomen, 200 km southeast of the town of Kandalaksha. The site borders the White Sea on the south, an old road to Varzuga village on the west, lakes Tonkoye, Krugloye, and Dedkino on the north, and the Varzuga River on the east.

Physical features: The site comprises several coastal terraces of post-glacial age, mainly occupied by raised bogs with secondary pools, which are intersected by many streams. Along the northern edge of the peatland system, there is a chain of primary lakes, varying from 30 to 50 ha in area. The coast is rocky and covered by pine forests.

Hydrological values: The site is important for maintaining the natural hydrological regime of the White Sea coast.

Ecological features: The vegetation of the mires is dominated by heather-lichen and shrub-sphagnum communities on the hummocks, and sedge-sphagnum communities (including Carex limosa, C. rariflora, Baeothryon cespitosum, Sphagnum lindbergii, and S. balticum) in the hollows. The vegetation on the coast has not been studied.

Noteworthy flora: The flora is characteristic of the north-taiga raised bogs, including such species as Baeothryon cespitosum, Carex rariflora, C. rotundata, and Sphagnum lindbergii.
More detailed studies are required.

**Noteworthy fauna:** Large numbers of waterbirds have been noted during migration periods. No faunistic research has been carried out at the site.

**Land tenure/ownership:** State Forest Lands (Goslesfond) of Murmansk Region.

**Current land use:** Fishery in the coastal waters, gathering of cloudbERRries in the mires, and boating in the Varzuga River and in the sea.

**Conservation measures taken:** The site is protected as a nature reserve (zakaznik).

**Conservation measures proposed but not yet implemented:** The area is included in the proposed national park of ‘Terskii Bereg’, with a total area of 250,000 ha.

**Current scientific research and facilities:** A detailed inventory of the site is needed, with particular regard to the flora and fauna.

**Current recreation and tourism:** Boating and rafting. There is a popular route along the Varzuga River and the White Sea coast. Recreational pressure has not been investigated but seems to be low.

**Jurisdiction:**
Territorial: Administration of Murmansk Oblast.
Functional: Federal Forestry Service.

**Management authority:** Terskii Regional Committee for Forestry.

**Bibliographical references:**

### 6. Nyukhcha

**Compilers:** O.L.Kuznetsov and T.Yu.Khokhlova (Institute for Biology, Karelian Scientific Centre, Russian Academy of Sciences. 11 Pushkinskaya Str., Petrozavodsk 185610, Russia).

**Geographical coordinates:** 63°55’N, 36°15’E.

**Altitude:** predominently 0 to 30 m a.s.l., up to 100 m (Svyataya hill)

**Area:** 15,000-20,000 ha

**Overview:** The White Sea shallow waters with a group of islands, and a coastal area occupied by raised hummock-hollow bogs, grass marshes, and saline meadows.

**Wetland Type:**
*By international/Ramsar classification:* A, B, H, M, Ts, U, Xf.
*By national classification:* 1.1.1.1, 1.1.1.2, 1.2.1.2, 1.2.3.2, 1.3.0.0, 1.4.1.1, 1.4.2.2 and 1.4.2.5: 20-30% of the total area; 2.5.1.3, 2.5.3.2 and 3.8.1.5: 1-2%; 3.9.2.1: 50%; 3.9.1.2: 5%; swampy spruce and pine forests: 10%; and dry spruce and pine forests: 10%.

**Ramsar Criteria:** 1, 2.

**General location:** Republic of Karelia, Belomorsk District, 100 km southeast of the town of Belomorsk. The site borders the Belomorsk-Vologda railway on the south, the Nyukhcha River on the west, the Chelitsa River on the east, and the White Sea waters on the north.

**Physical features:** There are well pronounced post-glacial terraces reflecting the major
stages of the White Sea regression. The terraces are covered by mires, mainly by dystrophic and oligotrophic hummock-hollow bogs, the formation of which started 8,000 BP. The lowest terrace is occupied by marshes overgrown with sedges and reed, which give way to extensive wet meadows.

**Geology:** The bedrock consists of archean gneiss and granite-gneiss. These are overlain by Quaternary sediments, mainly by marine clays. The soils at the site are peat, gley, and peat-gley.

**Hydrological values:** The site is important for maintaining the natural hydrological regime of the White Sea coast.

**Ecological features:** The vegetation of the mires is almost intact and is dominated by heather-lichen complexes (*Calluna vulgaris* + *Cladina sp.* + *Cetraria sp.*) on the hummocks, and communities formed by *Eriophorum vaginatum* with sphagnum or Hepaticae in the hollows. Shrubs, pine, and sphagnum complexes occur on the fringes of the mires. Pine trees are short (1 to 3 m high) and have flag-shaped crowns. Vegetation of the coastal marshes includes sedges, reed beds, and sphagnum (*Sphagnum squarrosum*, *S. riparium*, and *S. fallax*). In the sea shallows, *Fucus* and *Laminaria* sp. are found. Saline meadows within the tidal zone are dominated by *Tripolium pannonicum*, *Salicornia europaea*, *Juncus gerardii*, *Plantago salsa*, and *Triglochin maritimum*. Further inland, these give way to meadows, dominated by *Atriplex nudicaulis*, *Leymus arenarius*, *Lathyrus aleuticus*, *Ligusticum scoticum*, and *Agrostis gigantea*. These meadows are used for grazing and hay harvesting. Coastal spruce forests are short and sparse due to severe winds, and have been transformed considerably by human activities. Light birch forests, three to five meters high, mixed with some *Betula czerepanovii*, occur along the coastline.

**Noteworthy flora:** Three species that occur at the site are listed in the Karelian Red Data Book (1995). These are *Rhodiola rosea*, *Bolboschoenus maritimus*, and *Sanguisorba polygama*. The site is located at the western border of the distribution areas of *Ligularia sibirica*, *Veratrum lobelianum*, and *Allium schoenoprasum*.

**Noteworthy fauna:** The area lies on a major waterbirds migration way and provides staging habitat for thousands of geese, sea ducks, and waders. A number of rare and endangered species, including *Cygnus columbianus bewickii* and *Branta leucopsis*, occur at the site.

**Land tenure/ownership:** State owned (Karelian State Forest Lands)

**Current land use:** Local people gather seaweeds along the shore, cranberries and cloudberries at the peatlands, and cowberries and mushrooms in the forests. Meadows are used for grazing and hay harvesting. Fishing takes place in the coastal waters.

**Conservation measures taken:** 3,500 ha are protected as a nature reserve (*zakaznik*).

**Conservation measures proposed but not yet implemented:** It has been proposed to improve the conservation status of the nature reserve, with an extension in area, and inclusion of the site into a larger national park.

**Current scientific research and facilities:** Research on mire vegetation, stratigraphy of peat deposits, and paleontological reconstructions of vegetation history were conducted in the 1960s and 1970s (Yelina, 1971, 1981).

**Current recreation and tourism:** Small-scale tourism takes place, with little impact on mire ecosystems. The only exception is the population status of *Rhodiola rosea*, collected intensively for medicinal purposes.

**Jurisdiction:**

Territorial: Government of the Republic of Karelia.

Management authority: Belomorskiy Regional Forestry Service.


7. Koltsa

Compiler: M.S. Botch

Geographical coordinates: 66°N, 44°E

Altitude: 156 m a.s.l.

Area: 71,276 ha

Overview: An extensive mire system located on the shore of Mezen Bay, the White Sea, in the confluence of the rivers Mezen and Kuloi. Mires are mainly represented by raised bogs with hummock-hollow and hummock-hollow-pool complexes.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (characteristic of northern raised bogs; important for natural functioning of the Mezen and Kuloi Rivers); 3 (plays a substantial role in maintaining regional biodiversity).

General location: Arkhangelsk Region, Mezen District, 2 km west of the town of Mezen, in the confluence of the rivers Mezen and Kuloi.

Physical features: The mire is situated at a coastal plain, over glacial-marine and alluvial deposits (mainly loam).

Hydrological values: The site is important for regulating the natural hydrological regime of the Mezen tributaries, and for shoreline stabilization.

Ecological features: The system contains non-forested raised bogs with hollows and pools and, to a lesser extent, pine-sphagnum bogs.

Noteworthy fauna: The mire provides staging areas for migrating swans and geese (in particular for Barnacle Goose Branta leucopsis). Moultin geese have been noted.

Land tenure/ownership: State owned

Conservation measures taken: The area is protected as a nature reserve (zakaznik), established at regional level.

Jurisdiction: Administration of Arkhangelsk Oblast.

Bibliographical references: Kiryushkin (1965, 1980).

8. Usinskoye

Compiler: M.S. Botch

Geographical coordinates: 65°45'N, 57°20'E

Altitude: 100 m a.s.l.

Area: 139,190 ha

Overview: A system of north taiga raised bogs, one of the largest in Europe. There are
plenty of lakes and mineral islands. Mires are represented mainly by raised bogs, as well as by small patches of transitional mires and fens.

**Wetland Type** *(By international/Ramsar classification)*: U.

**Ramsar Criteria:** 1 (one of the largest systems of north taiga raised bogs; important for maintaining the hydrological regime of the Usa River); 3 (support species diversity of north taiga peatlands); 4 (provides breeding and staging areas for waterbirds).

**General location:** Komi Republic, Usinsk District, 1.5 km south of the town of Usinsk, in the confluence of the rivers Usa and Bolshaya Vyatkina.

**Physical features:** The site is situated in a depression surrounded by the marine-erosion landforms of the mid-Quaternary glaciation. Loam and loamy sands are overlain by a bog peat layer 2.5 to 4.6 m deep.

**Hydrological values:** The site is important for maintaining the natural hydrological regime of the Usa River catchment. There are 860 lakes and several rivers, originating in the mire.

**Ecological features:** Major habitat types are raised bogs with hummock-hollow-pool complexes, sphagnum swamps, and forests.

**Noteworthy fauna:** The mire provides breeding habitat for Whooper Swan *Cygnus cygnus* (16 pairs), Crane *Grus grus* (18 pairs), and White-tailed Eagle *Haliaeetus albicilla* (4 pairs). During migration, 1,100 ducks and geese and 100 swans have been noted.

**Land tenure/ownership:** State owned

**Factors adversely affecting the site's ecological character:** An active search for oil, with explosions, took place in the 1980s.

**Conservation measures taken:** Nature reserve *(zakaznik)* since 1978.

**Current scientific research and facilities:** The peat deposits were investigated in the 1950s and in 1996 by the expedition of the Komi Scientific Centre, Russian Academy of Sciences.

**Current recreation and tourism:** None, due to inaccessibility of the mire.

**Jurisdiction:** Government of Komi Republic.

**Management authority:** Pechorsky Forestry Farm.

**Bibliographical references:** Alekseeva (1998); Cadastre of protected areas in Komi Republic (1993); Nikonov (1953).

### 9. Martyushevskoye

**Compiler:** M.S.Botch

**Geographical coordinates:** 62°39’N, 56°21’E

**Altitude:** 100 m a.s.l.

**Area:** 8,700 ha

**Overview:** A large raised bog system with many mineral islands. Large areas are covered by berry plants. The site is important for breeding cranes *Grus grus*.

**Wetland Type** *(By international/Ramsar classification)*: U.

**Ramsar Criteria:** 1 (characteristic of mires in European Russia; important for natural functioning of the Pechora catchment); 3 (supports the biodiversity of mires).
**General location:** Republic of Komi, Troitsko-Pechorsky District, 2 km southeast of the town of Troitsko-Pechorsk, at the confluence of the Pechora and Severnaya Mylva Rivers.

**Physical features:** The mire is located at the terraces of the Pechora River, over alluvial sand sediments. Peat deposits are up to 4 m thick.

**Hydrological values:** The site is important for maintaining the water level in the Pechora and Severnaya Mylva Rivers.

**Ecological features:** The key habitat types include raised bogs with hummock-hollow-pool complexes, mires with pine-trees, and islands with pine forest.

**Noteworthy fauna:** The site is located at the northeastern border of the distribution area of the Crane *Grus grus*.

**Land tenure/ownership:** State owned

**Current land use:** Recreation, gathering of berries and mushrooms.

**Factors adversely affecting the site's ecological character:** Commercial forest cutting was carried out on the islands and the fringes of the mire in the 1950s.

**Conservation measures taken:** The entire area was designated as a nature reserve (*zakaznik*) in 1978.

**Current scientific research and facilities:** The vegetation, peat deposits, and hydro-chemical composition of the mire were studied in the 1970s and 1980s by the Komi Scientific Centre of the Russian Academy of Sciences. The biology and productivity of cloudberry plants were studied by the Research Institute for Nature Conservation.

**Current recreation and tourism:** Local recreation.

**Jurisdiction:** Government of Komi Republic.

**Management authority:** Troitsko-Pechersky and Pechero-Ilychsky Forestry Farms.

**Bibliographical references:** Alekseeva (1988); Cadastre of protected areas in Komi Republic (1993); Oplesnina (1965).

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**10. Vazhinskoye**

**Compilers:** M.S.Botch and O.L.Kuznetsov (Institute for Biology, Karelian Scientific Centre, Russian Academy of Sciences. 11 Pushkinskaya Str., Petrozavodsk 185610, Russia).

**Geographical coordinates:** 61°20’N, 33°30’E

**Altitude:** 130-140 m a.s.l.

**Area:** c. 15,000 ha

**Overview:** A large system of eccentric (sloping) raised bogs, including several oligotrophic and primary dystrophic lakes. The site is surrounded by middle-taiga forests, crossed by many streams flowing from the mires. The area is of importance for migrating waterbirds.

**Wetland Type:**
*By international/Ramsar classification:* O, U, Xf.
*By national classification:* 3.9.2.1 (60%), 3.9.1.2 (10%), 3.8.1.5 (5%), 2.5.3.2; dry and swampy spruce and pine taiga forests (25%).

**Ramsar Criteria:** 1, 3, 4.

**General location:** Republic of Karelia, Pryazhinsky District, 40 km south of the village of
Pryazha, 4 km northeast of the village of Interposelok. To the north and east, the site borders the Tuksha River. The western border lies along the shoreline of Lake Vazhozero. To the south, the borderline follows the Teterka River.

**Physical features:** The peatland of Vazhinskoye is a complex mire system containing several raised bogs with pools and residual lakes. The system is situated at the watershed area between Ladozhskoye (Ladoga) and Onezhskoye Lakes, over Proterozoic rocks overlain by sandy glacial sediments. The deepest portions of the mire system are lacustrine in origin, the remainder have resulted from paludification of terrestrial habitats. Peat formation started 9,000 BP. The peat deposits are 6 m thick. The lower layers contain fen peat and the higher ones sphagnum bog peat. Surrounding areas have sandy podzolic soils. The mean air temperatures range from -11°C in January to +16°C in July. Annual precipitation is between 600 and 650 mm. The peatland belongs to the catchment area of Ladozhskoye Lake, with the rivers Vazhinka and Svir.

**Hydrological values:** The peatland provides water supply for the Vazhinka River.

**Ecological features:** The central portion of the mire system is covered by raised bog complexes with dwarf shrub-sphagnum communities (mainly *Chamaedaphne calyculata* and *Sphagnum fuscum*) on the hummocks, and herb-sphagnum communities (*Scheuchzeria palustris*, *Eriophorum vaginatum*, *Sphagnum majus*, and *S. balticum*) in the hollows. There are also extensive transitional mesotrophic swamps occupied by sedge-sphagnum communities and large secondary lakes. The fringes of the mire are covered by oligotrophic plant communities containing pine-trees, shrubs, and sphagnum, which give way to wet pine forests. The northern edge of the mire has been drained for forestry purposes.

**Noteworthy flora:** The flora is characteristic of the middle taiga biogeographical zone, although no detailed information on species composition is available.

**Noteworthy fauna:** The site supports staging and breeding areas of waterbirds. Migratory species include Bean Goose *Anser fabalis*, Whooper Swan *Cygnus cygnus*, and Curlew *Numenius arquatus*. The breeding population has not received enough study. Breeding Bean Goose has been recorded, and occasional pairs of Black Stork *Ciconia nigra* and Whooper Swan have been noted.

**Land tenure/ownership:** State owned (Karelian State Forest Fund)

**Current land use:** Hunting, gathering of cranberries and cloudberrries; gathering of mushrooms in the surrounding forests.

**Conservation measures taken:** 8,500 ha of mires are protected as a nature monument. The lands adjacent to the nature monument have been set aside as the Vazheozersky monastery.

**Conservation measures proposed but not yet implemented:** It has been proposed to extend the protected area and change its status to nature reserve.

**Current scientific research and facilities:** The peatland has been studied by the Moscow Peat Institute in 1932 and by zoologists from the Karelian Institute for Biology in the 1980s. There is a need for more detailed research on vegetation, hydrology, and zoology.

**Jurisdiction:**
Territorial: Government of the Republic of Karelia.

**Management authority:** Pryazhinsky Regional Forestry Service; Petrozavodsk Committee for Environment.

**Bibliographical references:** Antipin & Tokarev (1992); Khokhlova, Antipin & Tokarev (1995); Peat deposits in Karelian ASSR (1979); Zimin (1993).
11. Rakovy Ozera

Compiler: M.S.Botch

Geographical coordinates: 60°30’N, 29°25’E

Altitude: 12-30 m a.s.l.

Area: 5,990 ha

Overview: A system of densely vegetated eutrophic lakes and fens interconnected by channels with the Vuoksinskaya mire system. Between the lakes, there are extensive mires overgrown with grasses and willows. Black alder forests occur on the fringes.

Wetland Type (By international/Ramsar classification): U, Tr.

Ramsar Criteria: 4 (important for migrating and breeding populations of waterbirds).

General location: Leningrad Region, Vyborg District, 40 km southeast of the town of Vyborg.

Physical features: The site is located in the central portion of the Karelian Isthmus, at the southern edge of the Baltic shield, at a low plain composed of Quaternary sediments. The landforms are characterised by flat moraine hills, stepped plains tilted towards Rakovy lakes, isolated kames and eskers. Water supply is provided mainly by surface inflow, but there is also substantial groundwater seepage. The high level of precipitation and low relief lead to water-logging conditions. Soils are soddy podzolic in the watershed areas, soddy-gley and podzolic on the slopes, and soddy-peat-gley with a high humus content at the fringes of the mires.

Hydrological values: The hydrological functions of the peatland system consist in continuous mire formation, development of a stream network, and regulation of runoff.

Ecological features: Aquatic vegetation in the lakes includes the following vascular plants: horsetails *Equisetum spp.*, bulrush *Scirpus lacustris*, reed *Phragmites australis*, bur-reed *Sparganium sp.*, pondweeds *Potamogeton spp.*, and *Nuphar pumila*. The lakes have extensive littoral belts of vegetation, composed of sedges, horsetails, buckbean, and mosses, which give way to communities dominated by sphagnum and including sedges, *Comarum palustre* and *Eriophorum sp.* Willows occur at the fringes of the mire. Swampy birch and black alder forests are found along the mineral shore and pine forests, on the ridges.

Noteworthy flora: Noteworthy are *Nuphar pumila*, *Scolochloa festucaea*, *Sphagnum palustre*, and *Salix lapponum*.

Noteworthy fauna: Species of breeding and migrating waterbirds include: *Haliaeetus albicilla*, *Pandion haliaetus*, *Tringa totanus*, *Podiceps ruficollis*, *Asio flammeus*, *Podiceps ruficollis*, *P. griseigena*, *P. auritus*, *P. nigricollis*, six species of geese dominated by *Anser albiros;* and *A. fabalis* (up to 6,000 individuals during migration), swans *Cygnus cygnus* and *C. columbianus bewickii* (5,000 during migration); seven species of dabbling ducks (50,000 during migration in spring and 100,000 in autumn).

Current land use: Sport fishing and hunting.

Factors adversely affecting the site's ecological character: In the last decades, the water level in the lakes has decreased. A portion of mires has been drained. However, silting of old drains leads to water-logging and regeneration of the mires. The soil and vegetation cover at the edge of the mire has been altered by recreationists.

Conservation measures taken: The entire area was designated as a nature reserve (zakaznik) in 1976. The reserve is managed by the regional Society of Hunters and Fishermen. The following human activities are forbidden: forest cutting on the lake shores;
application of pesticides, and waterfowl hunting without permit. The protective regime is widely violated.

**Current scientific research and facilities:** Field studies were conducted by the Research Institute for Lakes, Russian Academy of Sciences. An inventory of vegetation was compiled by the Botanical Institute, Russian Academy of Sciences, in 1989.

**Current recreation and tourism:** Recreation activities include waterbird hunting and fishing from boats. There is a large number of camps and shelters along the shores.

**Jurisdiction:** Administration of Leningrad Oblast

**Management authority:** Leningrad Regional Society of Hunters and Fishermen; Vyborg Forestry Farm.

**Bibliographical references:** Botch & Katanskaya (1992); Merikallio (1929); Nature conservation in Leningrad Region (1983); Vereshchagin (1977).

### 12. Lakhtinskoye

**Compiler:** M.S.Botch

**Geographical coordinates:** 60°00’N, 30°07’E

**Altitude:** 0-5 m a.s.l.

**Area:** 800 ha

**Overview:** A 600 ha transitional mire, with an adjacent lake, located in an ancient lagoon of the Baltic Sea. The mire is largely forested with birch at the fringes and with pine in the central portion. There are also sites with spruce and pine forests subjected to drainage. The mire stores ancient Baltic sediments: Ancylus peat deposits (dating back 8,180±160 years) are overlain by loamy sand, which is in turn overlain by buried Littorina Sea peats (dating back 7,490±90 years), which are separated by a loamy-sand layer from the modern peats.

**Wetland Type** *(By international/Ramsar classification):* U.

**Ramsar Criteria:** 1 (substantial hydrological role: storage of water, supply of two rivers); 2 (large population of Bog Myrtle *Myrica gale* listed in the Russian Red Data Book); 4 (important staging area for waterbirds).

**General location:** The site is located near the northwestern suburbs of Saint Petersburg City, bordering the rivers Kamenka and Yuntolovka on the north and Lakhtinsky Bay on the south.

**Physical features:** The peatland is situated in the ancient depression which was subject to variations in the Baltic Sea level and contained the Yoldia, Ancylus, and Littorina Seas. The area is slightly tilted from north to south, soils are clayey. There are three layers of peat dating from the Ancylus, Littorina, and Sub-Atlantic periods. They are separated by layers of loamy sand. The modern peat deposits are 2 to 3 m thick, mainly consisting of fen sedge peat and, in the top layer, sphagnum peat. pH value is between 4 and 4.5.

**Hydrological values:** The lake is 2 to 3 m deep and is connected with the mire, developing an entire hydrological system. The Chernaya River flows into the mire, and the rivers Yuntolovka and Kamenka, bordering the mire, flow into the lake.

**Ecological features:** The fringes of the mire are covered by birch forests with pine-trees and Buckbean *Menyanthes trifoliata*. Birch forests with dwarf shrubs, buckbean, and sphagnum occur on the slopes. Pine forests with shrubs, sphagnum, and sedges occupy the central portion of the mire. There are two sites of open sphagnum bogs. Willows with alder
and grasses are found on a cape in the southern portion of the site. Bog Myrtle *Myrica gale* is found all over the site (the area lies at the eastern border of the distribution area of this rare species).

**Noteworthy flora:** The following species listed in the Russian Red Data Book occur at the site: *Myrica gale*, *Viola uliginosa*, *Drosera intermedia*, and *Carex buxbaumii*.

**Noteworthy fauna:** The fauna of Lakhtinskoye includes 25 fish species, 5 amphibian species, and 2 reptile species. Elk *Alces alces*, Eurasian Badger *Meles meles*, Brown Hare *Lepus europaeus*, and Red Fox *Vulpes vulpes* represent the common mammals in the area. The site lies on a major waterbirds migration route between the White Sea and the Baltic Sea, linking breeding areas in the tundra and north taiga with wintering areas in western Europe. 150 species of birds visit the site at different times of the year. 13 of these have been entered in the national and regional Red Data Books, including Bewick’s Swan *Cygnus columbianus bewickii*, Greylag Goose *Anser anser*, Bean Goose *Anser fabalis*, Smew *Mergus albellus*, Spotted Eagle *Aquila clanga*, Osprey *Pandion haliaetus*, Corncrake *Crex crex*, and Great Snipe *Gallinago media*. The breeding population includes 90 species. Four of them are listed in the Red Data Books: Corncrake, White-backed Woodpecker *Dendrocopos leucotos*, Short-eared Owl *Asio flammeus*, and Bluethroat *Luscinia svecica*.

**Land tenure/ownership:** State owned

**Current land use:** Sport fishing, gathering of mushrooms and berries.

**Factors adversely affecting the site's ecological character:** In the last century, the peatland covered the whole depression (presently, only the central part of it) and was subjected to drainage. At a large portion of the area, natural mire rehabilitation has occurred. The eastern portion of the depression has been drained and built on. In the western portion, peat extraction was carried out, and now, construction of houses is being planned there. Fires occurred many times at the site.

**Conservation measures taken:** The site has been designated as a nature reserve (*zakaznik*) managed by the city authorities. A management plan has been developed for the area.

**Current scientific research and facilities:** Research on the peatland began in the 1920s. Since the early 1990s, regular monitoring studies of flora, fauna, and hydrology have been carried out.

**Current conservation education:** Regular excursions are organized for school children, students, and teachers. A leaflet about the nature reserve has been published. An ecological track is being constructed.

**Current recreation and tourism:** Recreation is intense, including fishing, gathering of mushrooms and berries, swimming, and other kinds of outdoor recreation.

**Jurisdiction:** Administration of Saint Petersburg.

**Management authority:** Environmental Department of the St.Petersburg Administration.

**Bibliographical references:** Botch & Vasilevitch (1992); Polyniv & Yurjev (1925); Yuntolovskii Zakaznik (1997).

### 13. Chisty Mokh

**Compiler:** M.S.Botch

**Geographical coordinates:** 59°22’N, 32°10’E

**Altitude:** 24 m a.s.l.
Area: 8,500 ha

Overview: A complex system composed of six merged mires. The mires are mainly represented by raised bogs with hummock-hollow and hummock-hollow-pool complexes, as well as by patches of pine mires, and oligotrophic and eutrophic sphagnum mires with dwarf shrubs. Grassy swamps and black alder forests occur on the fringes. The system is a good representative example of the raised bogs that are found in northwestern Russia. A number of features are present that are characteristic of the East-Baltic mire province: the mires are domed, sparsely forested, and their flora includes many eastern species (such as *Chamaedaphne calyculata* and *Sphagnum fuscum*). Representatives of the western flora are not frequent, and northern species (*Betula exilis* and *Sphagnum lindbergii*) occur occasionally.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (characteristic of the East-Baltic mire province); 3 (supports diverse flora and fauna).

General location: Leningrad Region, 8 km southeast of the town of Kirishi, 3 km west of the village of Belaya.

Physical features: The site is located at a lacustrine depression, which was occupied by a shallow lake in the post-glacial period. The lake has transformed into a mire. The mire system contains six merged mires. There are a large number of islands that used to be the borders of individual mires, and peninsulas wedged far into the mires. The basal part of the depression is filled by varved clays. The peat layer is up to 7 m thick, mainly composed of sphagnum oligotrophic peat.

Hydrological values: The natural functioning of the mire system helps to maintain groundwater level at the adjacent forests and to purify polluted waters. The peatland contains sources of two rivers.

Ecological features: The main habitat types are oligotrophic hummock-hollow and hummock-hollow-pool complexes, treeless sphagnum swamps, sparsely forested raised bogs, and eutrophic grass and black alder swamps.

Noteworthy flora: *Sphagnum lindbergii* occurs at the southern border of its distribution area.

Noteworthy fauna: The population of breeding birds includes Crane *Grus grus* (40 pairs), Common Plover *Vanellus vanellus*, and Curlew *Numenius arquatus*.

Land tenure/ownership: State owned

Current land use: All human activities are prohibited at the nature reserve, with an exception of gathering berries and mushrooms.

Factors adversely affecting the site's ecological character: The mire was damaged by fire several times in the past. Grass vegetation has been trampled in places.

Conservation measures taken: 6,500 ha are protected as a nature reserve (zakaznik) established by the regional authorities in 1976.

Current scientific research and facilities: To carry out regular research in hydrology, a mire station of the State Hydrological Institute was established at the site in the 1940s. Hydrological monitoring was conducted from 1944 until 1996. Vegetation monitoring at 13 sample sites has been conducted since 1976.

Current recreation and tourism: Recreation activities include gathering of wild berries and mushrooms.

Jurisdiction: Administration of Leningrad Oblast.
Management authority: Kirishi Forestry Farm.

Bibliographical references: Abramova (1954); Botch (1991); Botch & Vasilevitch (1992); Solonevitch (1960).

14. Tselau (Zehlau)

Compilers: M.S.Botch and M.G.Naprienko

Geographical coordinates: 54°30’N, 20°20’E

Altitude: 32-38 m a.s.l.

Area: 2,336 ha

Overview: A raised bog, characteristic of the Baltic coastal mires, the westernmost in Russia.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (a good representative example of the Baltic coastal mires; plays a substantial hydrological and ecological role for the watershed areas between the rivers Prokhladnaya, Baidukovka, and Gvardeiskaya); 3 (supports the biological diversity in an area, where most mires have been drained).

General location: Kaliningrad Region, Pravdinsk District, 30 km southeast of the city of Kaliningrad, 8 km northwest of the town of Pravdinsk, 1.5 km northeast of the village of Grushevka.

Physical features: The mire is situated in a post-glacial lacustrine depression. The landforms are morainic, of Upper Quaternary glacial age.

Hydrological values: The mire provides water for the Prokhladnaya, Baidukovka, and Gvardeiskaya Rivers. The Prokhladnaya River originates in the mire and flows into Vislinsky Bay. The river is navigable in the lower reaches and supports fisheries. There are pools and large lakes within the site.

Ecological features: Raised bog with hummock-hollow and hummock-hollow-pool complexes. There are also pine-forested mires, rivers, and lakes.

Noteworthy flora: The site supports a number of species that are under protection in the region, including Rhynchospora alba, Scheuchzeria palustris, Carex limosa, Drosera anglica, and D. rotundifolia.

Noteworthy fauna: 23 bird species breed at the site, including Golden Plover Pluvialis apricaria, Great Grey Shrike Lanius excubitor, Wood Sandpiper Tringa glareola, and Crane Grus grus.

Land tenure/ownership: State owned

Current land use: Gathering of wild berries; geological prospecting.

Factors adversely affecting the site's ecological character: The area is managed by the Defence Office, the activities of which affect the mire. There are oil searching activities and caterpillar vehicles are used. The recreational pressure is high, and the vegetation is being trampled in some places. At the site there is an old drainage network which is presumed to have been constructed in the beginning of the century.

Conservation measures taken: The Federal Government Resolution No. 572 on the establishment of the Pravdinsky Strict Nature Reserve (zapovednik) in the area was issued on 23 April 1994. However, this resolution has not been implemented by the local authorities.
Current scientific research and facilities: Botanical and zoological studies are carried out by Kaliningrad University.

Jurisdiction: Administration of Kaliningrad Oblast.

Management authority: Defence Office

Bibliographical references: Gams & Ruoff (1929).

15. Polistovo-Lovatskoye

Compiler: M.S.Botch

Geographical coordinates: 57°07’N, 30°40’E

Altitude: 98-100 m a.s.l.

Area: 134,433 ha

Overview: The largest system of raised bogs in northwestern Russia, composed of 15 merged mire massifs, many lakes, streams, and rivers. The major mire types are treeless sphagnum swamps and raised bogs with hummocks, hollows, and pools. Studies of the mire ecosystems have been conducted at the site since the 1920s.

Wetland Type (By international/Ramsar classification): U

Ramsar Criteria: 1 (the mire system provides a good representative example of the northwestern mires, being distinguished for its large size and high inundation level; plays a substantial hydrological role providing water supply for the rivers Polist and Lovat); 2 (important for a number of rare bird species); 3 (supports the biological diversity in the area).

General location: In Pskov and Novgorod Regions, 26 km northeast of the village of Bezhanitsy, 30 km northeast of the railway station of Loknya.

Physical features: The mire system covers an extensive lowland, comprising a chain of merged post-glacial depressions. The mires are underlain by clays and loams.

Hydrological values: There are a great number of lakes and streams. The mire provides water for the Lovat and Polist Rivers and maintains the natural hydrological regime at the adjacent areas.

Ecological features: Major communities are open bogs with hummocks, hollows, and pools, sphagnum swamps, pine-forested mires, lakes, and forested mineral islands.

Noteworthy flora: Rare species include Sphagnum tenellum, S.palustris, and S. lindbergii.

Noteworthy fauna: A number of rare and endangered bird species have been registered in the area, including Black-throated Diver Gavia arctica, Grey Heron Ardea cinerea, Black Stork Ciconia nigra, Golden Eagle Aquila chrysaetos, Spotted Eagle A. clanga, Lesser Spotted Eagle A. pomarina, White-tailed Eagle Haliaeetus albicilla, Willow Grouse Lagopus lagopus, Golden Plover Pluvialis apricaria, and Great Grey Shrike Lanius excubitor.

Land tenure/ownership: State owned (attributed to the State Land Reserve category).

Current land use: Within the nature reserves, economic activities are prohibited. Sport fishing and gathering of berries and mushrooms are carried out by recreationists.

Factors adversely affecting the site's ecological character: Peat extraction was carried out in the southern portion of the site until 1994. Recreational pressure is high.

Conservation measures taken: Two strict nature reserves (zapovedniki) were established in the area in 1994: the 36,922 ha Rdeisky Nature Reserve and the 36,036 ha Polistovsky
Nature Reserve.

**Current scientific research and facilities:** Research is conducted in the nature reserves according to the standard ‘Chronicle of Nature’ Programme.

**Current recreation and tourism:** Uncontrolled recreation is intense and includes sport fishing and gathering of berries and mushrooms.

**Jurisdiction:**
Territorial: Administrations of Pskov and Novgorod Oblasts.
Functional: State Committee of the Russian Federation for Environmental Protection (within the nature reserves).

**Management authority:** Administrations of the Polistovsky and Rdeisky Nature Reserves; Regional Forestry Service.

**Bibliographical references:** Bogdanovskaya-Gienef (1933, 1956); Filatov (1912); Mishchenko, Sukhanova, Nikolaev & Avdanin (1991); Sukachev (1910).

### 16. Spasskiye Mkhi

**Compilers:** M.S.Botch and A.L.Mishchenko

**Geographical coordinates:** 58°50’N, 32°30’E

**Altitude:** 100-127 m a.s.l.

**Area:** 57,000 ha

**Overview:** A large, relatively intact mire system, characteristic of the East-Baltic province, with forested islands and lakes. The site is mainly occupied by hummock-hollow complexes with sphagnum-cottongrass, sphagnum-scheuchzeria, and sphagnum-shrub associations. Forests on the islands provide good nesting conditions for raptors, in particular Golden Eagle *Aquila chrysaetos*.

**Wetland Type** *(By international/Ramsar classification):* U

**Ramsar Criteria:** 1 (a good representative example of the East-Baltic mire province); 2 (important for a number of rare bird species).

**General location:** Novgorod Region, 2 km northwest of the town of Malaya Vishera.

**Physical features:** The site is located on an extensive fluvioglacial plain, within the Ilmen-Volkhov depression.

**Hydrological values:** The site contains 11 lakes and the sources of the rivers Oskuya, Sharya, Burga, and smaller streams. The lakes provide drinking water for Malaya Vishera.

**Ecological features:** The bog is mainly occupied by hummock-hollow complexes with sphagnum-cottongrass, sphagnum-scheuchzeria, and sphagnum-shrub associations. Pine forests occur on the mineral islands.

**Noteworthy fauna:** A number of species and subspecies listed in the Russian Red Data Book breed in the area, including European Black-throated Diver *Gavia arctica arctica*, Golden Eagle *Aquila chrysaetos*, Spotted Eagle *A. clanga*, Great Grey Shrike *Lanius excubitor excubitor*, and Willow Grouse *Lagopus lagopus rossicus*. Breeding waders occur in large numbers: Curlew *Numenius arquatus*, 500-1000 pairs; Whimbler *N. phaeopus* and Golden Plover *Pluvialis apricaria*, several hundred pairs. The site supports populations of locally threatend Merlin *Falco columbarius* and Crane *Grus grus*. There occur many commercially valuable species, including Capercaillie *Tetrao urogallus*, Polar Hare *Lepus...*
timidus, Red Squirrel *Sciurus vulgaris*, and European Beaver *Castor fiber*.

**Land tenure/ownership:** State owned.

**Current land use:** Fishing and gathering of wild berries.

**Factors adversely affecting the site's ecological character:** Threats to the site include the increasing use of caterpillar vehicles, poaching, and timber cutting in the adjacent forest areas.

**Conservation measures taken:** There are two protected areas within the site, established at the regional level: a 31,200 ha nature reserve (*zakaznik*) and a 17,300 ha wildlife refuge (*zakaznik* of the regional hunting management office).

**Current recreation and tourism:** The site is used as a recreation area of local importance.

**Jurisdiction:** Administration of Novgorod Oblast.

**Management authority:** Malovishersky and Volotovsky forest farms.

**Bibliographical references:** Spiridonov (1922).

17. Igorevskiye Mkhi

**Compiler:** M.S.Botch

**Geographical coordinates:** 58°45'N, 34°40'E

**Altitude:** 160 m a.s.l.

**Area:** 18,000 ha

**Overview:** A large mire system, mainly composed of hummock-hollow raised bogs with sphagnum and pine trees. There are many lakes with islands.

**Wetland Type (By international/Ramsar classification):** U.

**Ramsar Criteria:** 1 (characteristic of the northwestern mire region; plays an important hydrological and ecological role in the watershed area between the rivers Msta and Chagoda); 2 (important for a number of rare species of plants and birds).

**General location:** Novgorod Region, Khvoinensky and Moshensky Districts, 5 km east of the railway station of Khvoinaya.

**Physical features:** The site is located in an extensive fluviglacial depression. Moraine hills and kames are characteristic of the landscape.

**Hydrological values:** The site contains many freshwater lakes. The largest is glacial Lake Igor covering 535 ha.

**Ecological features:** Major communities are raised bogs with hummocks and hollows, pine-sphagnum complexes, lakes, and mineral islands with pine and spruce forests.

**Noteworthy flora:** *Cypripedium calceolus*, a species listed in the Russian Red Data Book, occurs at the site.

**Noteworthy fauna:** A number of rare and endangered bird species occur at the site, including Black-throated Diver *Gavia arctica*, Golden Eagle *Aquila chrysaetos*, Osprey *Pandion haliaetus*, Willow Grouse *Lagopus lagopus*, Crane *Grus grus*, Curlew *Numenius arquatus* (250 breeding pairs), Great Grey Shrike *Lanius excubitor*, Golden Plover *Pluvialis apricaria*, and Black-tailed Godwit *Limosa limosa*. 
Social and cultural values: There are archaeological sites, such as slavonian burial mounds, Zmeiny Kamen and Mys Trizna, where excavations take place.

Land tenure/ownership: State owned.

Current land use: Sport fishing of pike, roach, and perch; gathering of berries and mushrooms.

Factors adversely affecting the site's ecological character: The construction of an irrigation canal in 1987 has caused a decrease in the water level of Lake Igor.

Conservation measures taken: Regional nature reserve (zakaznik) since 1994.

Current recreation and tourism: Outdoor recreation takes place at Lake Igor.

Jurisdiction: Administration of Novgorod Oblast.

Management authority: Regional Environmental Committee; Regional Forestry Service; Khvoinensky Forestry Farm.

18. Nikandrovskoye

Compiler: M.S.Botch

Geographical coordinates: 57°47’N, 29°15’E

Altitude: 56-70 m a.s.l.

Area: 10,000 ha

Overview: The site comprises a mire system composed of raised bogs and fens, many lakes and springs with sulphur water. Next to the hollow-hummock bog complexes and pine forests with dwarf shrubs and sphagnum, characteristic of the raised bogs in the region, there are grass fens around sulphur springs, where rare plants Cladium mariscus and Saxifraga hirculus occur.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (a rare type of mire: composition of bogs and fens, with rich fen flora); 2 (rare plant species: there are only three places in northwestern Russia where Cladium mariscus is found); 3 (endemic algae species).

General location: Pskov Region, Porkhovsky District, 2 km north of the railway station of Podsevje, 3 km west of the village of Khilovo.

Physical features: The site is situated in the depression between two highlands, on moraine deposits.

Hydrological values: The site is important for maintaining the natural hydrological regime of adjacent areas, contains many lakes (the largest are 66.7 ha Velikoye Lake, 57.3 ha Lunyevo Lake and 23.7 ha Khuditchevo Lake), and the sources of rivers Demyanka, Chernaya and Tenyukha.

Ecological features: Major communities are raised bogs with hummocks and hollows, pine-shrub-sphagnum mires, lakes, sulphur-water springs, and lakes. Lake Lunevo has an extensive littoral belt of Cladium mariscus.

Noteworthy flora: Cladium mariscus is listed in the Russian Red Data Book; Saxifraga hirculus is regionally threatened.

Social and cultural values: The health resort of Khilovo uses the Lunevo muds for medicinal purposes. Local people gather wild berries at the site.
Land tenure/ownership: State owned.

Factors adversely affecting the site's ecological character: There are remains of old drainage ditches.

Conservation measures taken: Regional nature reserve (zakaznik) since 1967; regional nature monument since 1974.

Jurisdiction: Administration of Pskov Oblast.

Management authority: Pskov Regional Committee for Environmental Protection.

Bibliographical references: Botch (1983); Botch & Smagin (1993); Sukachev (1908).

19. Staroizborskiye

Compiler: M.S.Botch

Geographical coordinates: 57°42′N, 27°51′E

Altitude: 100 m a.s.l.

Area: 800 ha

Overview: Fens with brownmoss, sedges, and black alder in Izborsk depression around Lakes Malskoye and Gorodishchenskoye. The fens are rich in flora due to the presence of carbonate rich water springs. A large number of plant species listed in the Russian Red Data Book have been registered at the site.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (a rare mire type for northwestern Russia: lacustrine fens with diverse flora); 2 (rare plant species); 3 (supports the biodiversity of fens)

General location: Pskov Region, Pechersky District, to the north of the village of Stary Izborsk. The villages of Maly and Brod are located within the site borders.

Physical features: The site is situated in an ancient limestone depression, which used to be covered by glacial lakes. These lakes have partially transformed into fens with a peat layer of 3 to 5 m thick.

Hydrological values: The fens supply water to the lakes.

Ecological features: Main communities are presented by lacustrine marshes, brownmoss fens, sedge mires, black alder and willow groves.

Noteworthy flora: Rare and endangered species include Carex paniculata, Dactylorhiza traunsteineri, D. longifolia, Liparis loeselii, and Swertia perennis. Regionally protected species are Carex hostiana, Saxifraga hirculus, Schoenus ferrugineus, and Eleocharis quinqueflora.

Social and cultural values: The cultural heritage of the site is of national importance. The area has the status of architectural museum and natural reserve. It contains a monastery, churches, and a few historical places where archaeological excavations take place.

Land tenure/ownership: State owned

Current land use: Fishing from lakes and rivers; forest cutting for local purposes.

Factors adversely affecting the site's ecological character: Intense recreation and tourism, peat extraction, tree cutting, and cattle grazing.

Current scientific research and facilities: Biological and archaeological studies were carried out between 1970 and 1990.

Current recreation and tourism: The area is a popular tourist destination, for sightseeing, fishing, and recreation. Many people go on pilgrimage to the monastery.

Jurisdiction:
Territorial: Administration of Pskov Oblast.
Functional: Ministry of Culture of the Russian Federation.

Management authority: Administration of the Staroizborsky Muzeum and Reserve; Pskov Regional Committee for Environmental Protection.

Bibliographical references: Botch (1983); Botch & Smagin (1993); Kostochkin (1971).

20. Zharkovsko-Svitskaya Mire System


Geographical coordinates: 55°45’N, 32°30’E

Altitude: 150-200 m a.s.l.

Area: 130,000 ha

Overview: A large mire system, containing a complex of raised bogs, characteristic of the East-Baltic mire province, lacustrine fens, transitional mires, and floodplain mires on outwash plains in a frontal moraine area. Floodplain complexes of the Obsha, Mezha, and Velesa Rivers which belong to the Zapadnaya Dvina catchment. Relic floodplain broad-leaved and alder forests.

Wetland Type (By international/Ramsar classification): Xp, U, Tp, O, M.

Ramsar Criteria: 1, 2, 3.

Justification of the Criteria: The Zharkovsko-Svitskaya mire system is the largest in the Upper Volga catchment area and one of the largest in the European forest zone. The system is relatively intact and plays a substantial role in maintaining the hydrological regime of the Mezha-Velesa watershed area and in supporting populations of rare and endangered animal species. There is a large breeding population of Curlew Numenius arquatus; breeding pairs have been registered at all mires within the site. Other common species include Mallard Anas platyrhynchos, Golden Plover Pluvialis apricaria, Whimbril Numenius phaeopus, and Ruff Philomachus pugnax. Brent Goose Branta bernicla and Osprey Pandion haliaetus occur during migration; breeding of these species was registered in the beginning of the century. Breeding White-tailed Eagle Haliaeetus albicilla has been noted. Black Stork Ciconia nigra occurs in the floodplain and lake complexes. Large populations of Water Chestnut Trapa natans are found in the lakes. All rivers of the Upper Zapadnaya Dvina catchment support populations of trout, whitefish, and vendace.

General location: Southwestern Tver Region on the border with Smolensk Region, close to the village of Zharkovsky, 22 km southwest of the town of Nelidovo, 5 km west of the town of Bely.

Physical features: The site is located in the postglacial depression on outwash plains. The mire provides a representative example of the domed oligotrophic peatlands, floodplain lake complexes, and relic floodplain broad-leaved forests.

Ecological features: The major portion of the area is covered by raised bogs:
Peletsky/Zharkovsky Mokh (38,863 ha), Temny Mokh (2,778 ha), Sheikinsky Mokh (5,329 ha), Budnyansky Mokh (3,156 ha), Sosenka (1,370 ha), and Pushnyak (1,153 ha). The dominant bog ecosystems are cottongrass-pine communities and forested ridge-pool complexes. The margins of the bogs are occupied by transitional sphagnum-reed mires, pine forests with reeds, and black alder groves. The lake complex is a unique natural feature, comprising a chain of the floodplain-channel lakes along the Turosna River (Lakes Almyshevo, Zharki, Pesotno, Ostrovno, etc.), moraine lakes of Emlen and Plovno, and karst lakes (Chistik). The 10,469 ha mire of Stakhovsky Mokh is the largest system of fens and transitional mires on outwash plains in the frontal moraine area of the Valdai glacial age.

**Noteworthy flora:** Large populations of *Epipactis palustris* (over 500 plants), *Betula humilis*, and *Viola uliginosa* are found at the mire of Stakhovsky Mokh. Water Chestnut *Trapa natans* occurs commonly in the Turosna chain of lakes. *Lunaria rediviva* occurs along the Turosna and Cherneika river banks. *Gladiolus palustris* occurs in the Turosna floodplain.

**Noteworthy fauna:** A number of rare and endangered species occur at the site, including Black Stork *Ciconia nigra*, Golden Eagle *Aquila chrysaetos*, Spotted Eagle *A. clanga*, Lesser Spotted Eagle *A. pomarina*, Willow Grouse *Lagopus lagopus rossicus*, Great Grey Shrike *Lanius excubitor*, and Golden Plover *Pluvialis apricaria*.

**Land tenure/ownership:** State owned.

**Current land use:** Fishing, hunting, gathering of wild berries and mushrooms. Forestry and agriculture on adjacent lands.

**Conservation measures taken:** There are two nature reserves (*zakazniki*) established at the local level: 37,000 ha Zharkovsky and 10,000 ha Stakhovsky Mokh. The former is a seasonal wildlife refuge. The remainder of the area has no protection status.

**Conservation measures proposed but not yet implemented:** It has been proposed to include the site into the Central Forest Biosphere Nature Reserve through developing a cluster nature reserve. It is also proposed to increase the number of rangers.

**Current scientific research and facilities:** The site was intensively studied by the Smolensk University biologists in the 1920s and 1930s (G.L.Grave, V.V.Stanchinsky, A.M.Konchits). Some studies were carried out prior to the establishment of the Central Forest Nature Reserve. The Department of Vascular Plants, Moscow University, conducted research at the site in the 1970s. Ornithological studies were performed by V.I.Nikolaev (Tver University) and A.V.Avdanin (Central Forest Nature Reserve).

**Current conservation education:** In the last few years, the mire of Stakhovsky Mokh has been a popular destination for student excursions. This mire was investigated by a group of mire experts from five countries during the International Workshop on Fen Restoration in 1997.

**Current recreation and tourism:** The site is intensively used for outdoor recreation, including fishing, hunting, gathering of berries, and boating in the rivers.

**Jurisdiction:** Administration of Tver Oblast.

**Management authority:** Regional Forestry Service; forestry farms: Zharkovsky, Nelidovsky, and Zapadnodvinsky; Tver Regional Committee for Environmental Protection (Zharkovsky Zakaznik); Nelidovo Committee for Environmental Protection (Stakhovsky Mokh Zakaznik).

**Bibliographical references:** Grave (1926, 1927, 1933); Konchits (1937); Stanchinsky (1927).
21. Verknevolzhsky wetland complex


Geographical coordinates: 57°N, 33°E

Altitude: 207-270 m a.s.l.

Area: c. 250,000 ha

Overview: A complex of large glacial lakes, karst lakes, and raised bogs at the Upper Volga area.

Wetland Type (By international/Ramsar classification): Xp, U, Tp, O, M.

Ramsar Criteria: 1, 2, 3.

Justification of the criteria: The site represents a characteristic watershed moraine wetland landscape. The wetland complex is of high hydrological value, providing water supply for extensive areas. Diverse natural habitats support rich biodiversity in the region, including breeding and migrating populations of waterbirds and a number of rare fish species. Regular research on wetland ecosystems has been conducted for many years (there is an ornithological station at the Chistik bog and a student training station of Tver University at Lake Seliger).

General location: Western Tver Region and southern Novgorod Region; close to the town of Ostashkov, to the northwest of the town of Selizharovo.

Physical features: The site is located in the southern part of the Valdai highlands, comprising the Volga river head area, the Verkhnevolzhsky (Upper Volga) lake complex (including the lakes of Sterzh, Vselug, Peno, and Volgo), adjacent lakes (Sig, Sabro, Seliger, Seremo, Granchnoye, Tikhmen, Kamennoye, and Sonino), watershed areas occupied by raised bogs (8,402 ha Chistik bog, 7,155 ha Lebyazhye, Slivy, Ostrov, Bolshoi Mokh, etc.), small lakes and forests, and also various small rivers, marshy depressions, and watershed slopes.

Hydrological values: The wetland complex provides water to extensive watershed areas and is of particular importance for the hydrological regime of the Volga River.

Noteworthy flora: Rare and endangered species Alisma wahlenbergii, Isoetes setacea, Lunaria rediviva, Corallorrhiza trifida, Botrychium multifidum, B. matricariifolium, Gymnadenia conopsea, Helichrysum arenarium, and Subularia aquatica occur in Lake Seliger. Lobelia dortmanna is found at the lakes of Sabro, Sig, and Seremo. Cypripedium calceolus has been noted on the shore of Lake Vselug.

Noteworthy fauna: There is a breeding site of Black Stork Ciconia nigra at Lake Volgo. Golden Eagle Aquila chrysaetos and White-tailed Eagle Haliaeetus albicilla nest at the Chistik bog. Breeding of Osprey Pandion haliaetus at the lakes has been noted.

Social and cultural values: The site is one of the most popular recreation areas. There is a large number of cultural, historical, and archaeological places.

Land tenure/ownership: State owned.

Current land use: Forestry, agriculture.

Factors adversely affecting the site's ecological character: Intense recreation and tourism, cutting of watershed forests.

Conservation measures taken: A portion of Lake Seliger (Polnovsky Ples) has been included in the Valdaisky National Park. The Chistik bog is protected as a nature reserve.
A number of bogs are maintained in their natural state.

Conservation measures proposed but not yet implemented: It is planned to establish a national park at Lake Seliger. The whole site has been included in the Okovsky Les area proposed to be designated under the World Heritage Convention.

Current scientific research and facilities: Zoological and botanical studies have been conducted at Lake Seliger and Verkhnevolzhsky Lakes for many years. Bird populations have received much attention. A breeding centre for Capercaillie *Tetrao urogallus* was developed at the Chistik bog. Birds, bred in captivity, are released into natural habitats.

Current conservation education: Student field studies have taken place at the site for many years.

Current recreation and tourism: Organised and uncontrolled intense recreation, including boating, fishing, hunting, and gathering of berries.

Jurisdiction:
Territorial: Administration of Tver Oblast.
Functional: Federal Forestry Service (Valdaisky National Park).

Management authority: Forestry farms, societies of hunters and fishermen.

**Zone of forested raised bogs and sedge fens**

5.2. *East European Province*

22. Orshinsky Mokh


Geographical coordinates: 57°10'N, 37°30'E

Altitude: 140-150 m a.s.l.

Area: 43,200 ha

Overview: A mire system on the Volga terraces, comprising large lakes, bogs, fens, and transitional mires.

Wetland Type (By international/Ramsar classification): Xp, U, Tp, O, M.

Ramsar Criteria: 1, 2, 3.

Justification of the criteria: Orshinsky Mokh provides a representative example of a lake-mire complex on the terraces of a large lowland river in the temperate forest biogeographical region. The site is located on the border between two mire zones: the zone of raised hummock-hollow bogs and the zone of forested raised bogs and sedge fens. These mires play a substantial hydrological role, providing water to the Volga River through the Soz River. The site supports diverse habitats of peatland-dependent animals and plants, including migrating and breeding populations of waterbirds. Several rare and endangered species occur at the site.

General location: Eastern Tver Region, 35 km northeast of the city of Tver, 30 km north of the town of Konakovo.

Physical features: The site comprises a lake-mire complex on the terraces of the Volga River in the temperate forest biogeographical region. The landforms are moraines, outwash and alluvial plains.
Hydrological values: The mires provide water to the Volga River through the Soz River.

Ecological features: The mire complex includes raised bogs, transitional mires, and fens, as well as large lakes and abandoned open pits.

Noteworthy flora: Rare and endangered species that occur at the site are Potamogeton trichoides, Rubus arcticus, Betula humilis, Hammarbya paludosa, and Epipactis palustris.

Noteworthy fauna: Breeding birds include Black Stork Ciconia nigra (a nesting site is found in the Orsha floodplain), Black-throated Diver Gavia arctica, Great-crested Grebe Podiceps cristatus (at Petrovsky lakes), Bittern Botaurus stellaris (breeding pairs are found in all pits where peat extraction used to be carried out), and Golden Eagle Aquila chrysaetos (breeding was noted a few years ago).

Social and cultural values: Gathering of wild berries, sport fishing, and hunting take place at the site.

Land tenure/ownership: State owned.

Current land use: Agriculture and forestry.

Factors adversely affecting the site's ecological character: Intense recreation, gathering of cowberries, poaching, and continuing peat extraction.

Conservation measures taken: The area has no protection status.

Conservation measures proposed but not yet implemented: It has been proposed to establish a regional nature reserve in the area, and to designate it as a wetland of international importance.

Current scientific research and facilities: Research on birds has been conducted.

Jurisdiction: Administration of Tver Oblast.


23. Pykhanskoye

Compiler: M.S. Botch

Geographical coordinates: 58°30'N, 39°45'E

Altitude: 148-150 m a.s.l.

Area: 8,647 ha

Overview: A forested fen with birch, spruce-birch, pine, and black alder communities. The site supports over 60 species of plants, which are considered rare and endangered in the region.

Wetland Type (By international/Ramsar classification): Xp.

Ramsar Criteria: 1 (a rare mire type for central Russia); 2 (rare and endangered plant species); 3 (important for the conservation of fen biodiversity).

General location: Yaroslavl Region, Pervomaisky and Prechistensky Districts, 23.5 km southwest of the railway station of Skalino.

Physical features: The site is located on a glacial plain, over clay and loam sediments. The peat layer is up to 7.8 m thick.

Hydrological values: The Soga River, a tributary of the Volga River, originates at the site.
Ecological features: Major communities are birch, spruce-birch, pine and alder fens.

Noteworthy flora: Species listed in the Russian Red Data Book: *Cypripedium calceolus*, *Liparis loeselii*, and *Dactylorhiza traunsteineri*. Species protected within the region include *Carex capitata*, *C. tenuiflora*, *Petasites frigidus*, *Rubus humilifolius*, *Salix myrtilloides*, and *S. lapponum*.

Land tenure/ownership: State owned

Current land use: Gathering of wild berries and medicinal plants, and hunting.

Conservation measures taken: Regional nature reserve (zakaznik) since 1988.

Jurisdiction: Administration of Yaroslavl Oblast.

Bibliographical references: Map of protected natural areas in the Yaroslavl Region (1990); Nature conservation in the Yaroslavl Region (1990).

24. Somino

Compiler: M.S.Botch

Geographical coordinates: 56°35’N, 38°35’E

Altitude: 135-140 m a.s.l.

Area: 2,371 ha

Overview: A floodplain fen with alder and birch forests, which supports large breeding and migrating populations of waterbirds and a number of rare plant species.

Wetland Type (By international/Ramsar classification): Xp.

Ramsar Criteria: 1 (represents a mire type unusual in the Volga catchment area; maintains natural ecological and hydrological regime in the Nerl floodplains); 2 (supports rare plant species).

General location: Yaroslavl Region, Pereslavl District, 16 km northwest of the railway station of Berendeevo; the Nerl floodplain.

Physical features: The mire is situated in a frontal moraine lowland within the Nerl River valley. The peat layer is up to 5 m thick.

Hydrological values: The site is of high hydrological value for lakes Pleshcheevo and Somino and the Nerl River.

Ecological features: The major habitat types are black alder and birch fens, and shallow river waters.

Noteworthy flora: Endangered and regionally rare species are *Carex atherodes*, *C. loliacea*, *Angelica palustris*, *Acorus calamus*, and *Iris sibirica*. *Geranium robertianum* and *Carex paucuncula* are found at the southern border of their distribution area.

Land tenure/ownership: State owned.


Current recreation and tourism: The Pereslavsky National Park has good recreational facilities.

Jurisdiction:
Territorial: Administration of Yaroslavl Oblast.
25. Kurakinskoje

Compiler: M.S.Botch

Geographical coordinates: 56°35’N, 42°10’E

Altitude: 180 m a.s.l.

Area: 1,781 ha

Overview: A mire system consisting of two massifs: one is composed of raised bogs and the other is a transitional mire with fens on the fringes. The site contains the sources of three rivers and three large lakes.

Wetland Type (By international/Ramsar classification): Xp.

Ramsar Criteria: 1 (a rare mire type due to a very thick peat layer and the presence of interglacial peats; plays a substantial role for the hydrology of the Lukh and Klyasma catchments and for maintaining the water level of three large lakes); 2 (rare species of plants on the southern border of their distribution range); 3 (supports the biodiversity of peatland flora and fauna).

General location: Ivanov Region, Yuzhsky District, 34 km northeast of the station of Mstera, 5 km of the town of Uyzha, near the village of Neestovo.

Physical features: The site is located in the watershed area between the rivers Lukh and Klyasma, in an extensive depression. The relief is morainic and eroded. The layer of peat is up to 13.6 m thick.

Hydrological values: The Voksha and Serzukh Rivers originate in the mire. The site is of high value for maintaining the water level of three large lakes.

Ecological features: The peatland is dominated by pine-shrub, sedge-sphagnum, and birch-sedge-sphagnum communities, with willows and sedges on the fringes.

Noteworthy flora: Rare species occurring on the border of their distribution areas are Carex pauciflora, Oxyccoccus microcarpus, and Drosera anglica.

Noteworthy fauna: The site is on the border of the distribution area of Willow Grouse Lagopus lagopus. The Capercaillie Tetrao urogallus, Black Grouse Lyurus tetrix, and Hazelhen Tetrastes bonasia occur in large numbers.

Land tenure/ownership: State owned.

Current land use: The major land user is the Mostovsky Forestry Farm. Local people use the site for gathering berries and recreation.

Conservation measures taken: Regional nature monument since 1978.

Jurisdiction: Administration of Ivanovo Oblast.

Management authority: Mostovsky Forestry Farm, Regional Society of Hunters and Fishermen.

Bibliographical references: Matveev (1985); Shilov (1980).
26. Vyaznikovskiy

Compiler: M.S.Botch

Geographical coordinates: 56°20’N, 42°15’E

Altitude: 200 m a.s.l.

Area: 8,725 ha

Overview: A large group of raised bogs and fens in the Klyasma floodplain, including Lake Velikoye and the mires of Simbirka, Berezovskoye, Luzhkovskoye, Poludennoye, Vykhodnoye, and Gnomovskoye.

Wetland Type (By international/Ramsar classification): Xp.

Ramsar Criteria: 1 (an extensive fen, rare for the region; plays an important ecological and hydrological role in the Klyasma floodplain); 3 (supports the diversity of fen flora and fauna).

General location: Vladimir Region, Vyaznikovsky District, 9 km northeast of Vyasniki, along the Klyasma River.

Physical features: The site is located on an extensive outwash plain, on the 1st and 2nd fluvial terraces above the Klyasma floodplain.

Hydrological values: The site includes Lake Velikoye, the largest floodplain lake in the region. The mires perform important water protection and regulation functions.

Ecological features: The site comprises sedge fens, forested fens, and a large lake.

Noteworthy flora: There are highly productive vegetations of wild berries.

Land tenure/ownership: State owned

Current land use: Forestry, fishing, gathering of berries. Major land users are the Gorokhovetsky and Vyaznikovsky Forestry Farms.

Factors adversely affecting the site's ecological character: There used to be a dam near the site, which burst and caused the flooding of one of the mires and damage to adjacent forests.

Conservation measures taken: Regional nature monument since 1977.

Jurisdiction: Administration of Vladimir Oblast.

Management authority: Regional Committee for Environmental Conservation; Gorokhovetsky and Vyaznikovsky Forestry Farms.

27. Kryazh

Compiler: M.S.Botch, I.V.Blagoveshchenskii, and N.V.Blagoveshchenskaya.

Geographical coordinates: 53°48’N, 47°24’E

Altitude: 210 m a.s.l.

Area: 50 ha

Overview: A 30 ha lake with a belt of floating mats 25 to 150 m wide. The vegetation includes reed, sedges, sphagnum, cranberry, and a number of rare species.

Wetland Type (By international/Ramsar classification): U.
Ramsar Criteria: 1 (oligotrophic sphagnum mires in the forest-steppe biogeographical region, to the south of their distribution area); 2 (supports rare species of plants and animals); 3 (supports regional biodiversity).

General location: Ulyanovsk Region, Baryshevsky District, 6 km west of the village of Kaldy.

Physical features: The site is located in an eroded lacustrine depression within the Privolzhsky Hills, on sandy soils.

Hydrological values: The dense vegetation of the mire helps stabilise the shoreline, preventing erosion.

Ecological features: Major communities are reed beds, sedge-sphagnum with cranberry, birch with sphagnum, and open water of the lake.

Noteworthy flora: A number of species which are considered rare for the forest-steppe, such as Oxycoccus palustris, Scheuchzeria palustris, Drosera anglica, D. rotundifolia, Hammarbya paludosa, Andromeda polifolia, and Chamaedaphne calyculata occur on the southern border of their distribution areas.

Noteworthy fauna: Noteworthy bird species include Crane Grus grus, Osprey Pandion haliaetus, Stock Dove Columba eversmanni, Crested Tit Parus cristatus, and Black Woodpecker Dryocopus martius. Rare invertebrate species are Tyris fenestrella and Clossiana eunomea.

Land tenure/ownership: State owned

Conservation measures taken: Regional nature monument since 1976.

Current recreation and tourism: Local recreation.

Jurisdiction: Administration of Ulyanovsk Oblast.

Management authority: Regional Committee for Environmental Conservation.


28. Kaiskoye

Compiler: M.S. Botch

Geographical coordinates: 60°05’N, 47°15’E.

Altitude: 218 m a.s.l.

Area: 10,517 ha

Overview: A raised bog composed of hummock-hollow and hummock-pool complexes, one of the largest peatlands in the region. The bog contains large populations of wild berries. The site is important for migrating and breeding birds.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (one of the largest peatlands in the region, characteristic of the regional raised bogs; performs hydrological and ecological functions, important for the river catchment); 3 (supports the biodiversity of peatland flora and fauna).

General location: Vyatka Region, Podosinovsky District, 4 km south of the village of Lodeina, 13.5 km southeast of Podosinovets.

Physical features: The site is located in the watershed area of the Pushma, Bylina, and
Keras Rivers, over sandy sediments.

**Hydrological values:** The peatland provides water supply for the above mentioned rivers.

**Ecological features:** Major communities are hummock-hollow and hummock-pool bog complexes, with small patches of transitional mires and fens.

**Noteworthy fauna:** The Willow Grouse *Lagopus lagopus* and Capercaillie *Tetrao urogallus* occur at the site. Swans and geese have been registered during migration. Mammals include European Beaver *Castor fiber*.

**Land tenure/ownership:** State owned.

**Conservation measures taken:** Regional nature reserve (*zakaznik*)

**Jurisdiction:** Administration of Vyatka Oblast.

**Management authority:** Regional Committee for Environmental Protection.

# 29. Salamatievskoye

**Compiler:** M.S.Botch

**Geographical coordinates:** 60°05’N, 52°55’E

**Altitude:** 239 m a.s.l.

**Area:** 10,556 ha

**Overview:** A forested peatland dominated by fens with pine, spruce, and birch trees in the Kama catchment area.

**Wetland Type (By Ramsar classification):** Xp.

**Ramsar Criteria:** 1 (a mire type, characteristic for the region; plays a substantial hydrological role for the watershed area between the Kama and Porysh Rivers); 3 (supports the biodiversity of peatland flora and fauna).

**General location:** Vyatka Region, Verkhnekamsky District, 37 km northeast of the district centre of Loino, 6 km east of the village of Kichanovskiye Sady.

**Physical features:** The site is located on a high plain, in the watershed area between the Kama and Porysh Rivers.

**Hydrological values:** The peatland provides water to the Kama and Porysh Rivers.

**Ecological features:** The major communities are fens with pine, spruce, and birch trees.

**Noteworthy flora:** The English Sundew *Drosera anglica* is found on the southern border of its distribution area.

**Noteworthy fauna:** The peatland supports breeding areas of geese. Swans occur in large numbers during migration.

**Land tenure/ownership:** State owned

**Conservation measures taken:** Regional nature reserve (*zakaznik*).

**Jurisdiction:** Administration of Vyatka Oblast.

**Management authority:** Regional Committee for Environmental Protection.
30. Bolshoye Kamskoye

**Compiler:** M.S.Botch

**Geographical coordinates:** 60°20’N, 55°15’E.

**Altitude:** 195 m a.s.l.

**Area:** 80,950 ha.

**Overview:** A mire system comprising raised bogs, fens, and transitional mires in the confluence of the Kama and Timsher Rivers. The mires occupy the first terrace above the Kama floodplain. The site includes a large number of lakes, pine forests, and meadows.

**Wetland Type (By Ramsar classification):** Xp.

**Ramsar Criteria:** 1 (a very large floodplain mire with diverse vegetation; plays a substantial hydrological role in the Kama catchment area); 3 (supports the diversity of peatland flora and fauna); 4 (an important staging area for migrating waterbirds).

**General location:** Perm Region, Cherdyn District, 45 km west of Cherdyn, 1 km northwest of the village of Palniki.

**Physical features:** The site is located in the confluence of the Kama River and its tributary of Timsher, on the terrace above the Kama floodplain.

**Hydrological values:** The mires supply water to the Kama River and help to stabilize the river banks.

**Ecological features:** Major communities are raised bogs with pine trees, hummock-hollow and hummock-pool complexes, forested transitional mires, grass fens, lakes, and streams.

**Noteworthy fauna:** The site provides breeding and staging areas for waterbirds.

**Land tenure/ownership:** State owned

**Conservation measures taken:** Regional nature reserve (zakaznik).

**Jurisdiction:** Administration of Perm Oblast.

**Management authority:** Regional Committee for Environmental Protection.

**Bibliographical references:** Lebedev (1965).

31. Ostrov-Morotskoye

**Compiler:** M.S.Botch

**Geographical coordinates:** 59°00’N, 37°30’E.

**Altitude:** 107 m a.s.l.

**Area:** 40,495 ha.

**Overview:** A large mire system, comprised of raised sphagnum bogs and transitional mires. There are also many lakes of different sizes.

**Wetland Type (By international/Ramsar classification):** U.

**Ramsar Criteria:** 1 (characteristic of the zone of raised bogs; plays an important hydrological role in the watershed area); 3 (supports regional biodiversity).

**General location:** Vologda Region, Cherepovets District, 26 km southwest of the town of
Cherepovets.

**Physical features:** The peatland is situated on a flat, slightly dissected plain with isolated hills in the confluence of the Chagodoshcha and Suda Rivers, within the Mologa-Sheksna Lowland. The site includes the northern shore of the Rybinsk Reservoir.

**Ecological features:** The site includes bogs with hummock-hollow complexes and pine-trees, sedge-sphagnum swamps, and lakes.

**Noteworthy fauna:** Breeding birds include a number of rare and endangered species, such as Golden Eagle *Aquila chrysaetos*, Osprey *Pandion haliaetus*, White-tailed Eagle *Haliaeetus albicilla*, and Black-throated Diver *Gavia arctica*. The White-fronted Goose *Anser albifrons*, Bean Goose *A.fabalis*, and Whooper Swan *Cygnus cygnus* have been noted during migration.

**Land tenure/ownership:** State owned

**Jurisdiction:** Administration of Vologda Oblast.

**Management authority:** Regional Committee for Environmental Protection.
SIBERIA

Zone of polygon mires

1.2. Subarctic province

32. Mires along the Pyasina River, near the Tareya River Mouth

Compiler: M.S.Botch

Geographical coordinates: 73°20’N, 90°40’E

Altitude: 40-50 m a.s.l.

Area: 7,000 ha

Overview: A polygonal mire, characteristic of the Siberian sub-arctic tundra. The vegetation is characterised by two major types: ridges with willows, dryas, sedges, and green mosses and hollows with sedge-brownmoss complexes.

Wetland Type (By international/Ramsar classification): Vt.

Ramsar Criteria: 1 (characteristic of the Siberian tundras; plays an important hydrological role in the Pyasina catchment area); 3 (supports the regional diversity of flora and fauna; provides habitats for most bird species that occur in the region).

General location: Krasnoyarsk Territory, Taimyr Autonomous Area, on the right bank of the Pyasina River, 7 km downstream of the Tareya River mouth, 30 km upstream of Ust-Tareya Airport.

Physical features: The site is located on the highest terrace above the Pyasina floodplain, over alluvial loamy sands. The layer of permafrost is 300 to 400 m deep. In the summer, the soil thaws down to 5 m below surface. In the mires, ice veins 8 to 10 m long and up to 2.5 m thick are developed.

Hydrological values: The mires play an important hydrological role in the Pyasina catchment area. There are numerous large and small lakes, which support populations of waterbirds and mammals.

Ecological features: Major communities are ridge-hollow and ridge-pool polygonal complexes, as well as large and small lakes.

Noteworthy flora: *Betula exilis* and *Andromeda polifolia* on the northern border of their ranges.

Noteworthy fauna: Ornithological descriptions of the area list 61 bird species, 38 of these species breed at the site, including Black-throated Diver *Gavia arctica*, White-fronted Goose *Anser albifrons*, Bean Goose *A. fabalis*, Common Eider *Somateria mollissima*, Long-tailed Duck *Clangula hyemalis* (flocks of 150 individuals have been observed), Ptarmigan *Lagopus mutus*, Wood Sandpiper *Tringa glareola* (on the northern border of its range), and Lapland Bunting *Calcarius lapponicus*.

Conservation measures taken: None at present.

Current scientific research and facilities: The Taimyr Research Station was established at the site by the USSR Academy of Sciences in 1965, and various studies were carried out

**Jurisdiction:** Administration of Taimyr Autonomous Area.

**Bibliographical references:** Biogeocenoses of the Taimyr tundra and their productivity (1971); Botch (1980); Botch & Vasilevitch (1975); Siberian Green Book (1996).

### 33. Kideran

**Compiler:** M.S.Botch

**Geographical coordinates:** 71°05’N, 149°00’E

**Altitude:** 50 m a.s.l.

**Area:** 500 ha

**Overview:** A polygon mire, characteristic of the East Siberian sub-arctic tundra. Dwarf willows, dryas, mosses, and lichens occur on the ridges and sedges in the hollows. Sphagnum patches, rapidly increasing in area, are found everywhere.

**Wetland Type (By international/Ramsar classification):** Vt.

**Ramsar Criteria:** 1 (a good representative example of a specific arctic mire type with recent sphagnum expansion; plays important hydrological, biological, and ecological roles in the functioning of the Indigirka Delta); 3 (supports regional biodiversity); 4 (moulting waterbirds occur in large numbers).

**General location:** Republic of Sakha (Yakutia), Allaikhovsky District, 12 km north of the settlement of Russkoye Ustie (Polyarny), on the left bank of the Indigirka River.

**Physical features:** The site is located on an extensive flat alluvial plain, in the Indigirka Delta. The permafrost develops down to 500 m. The mire occupies a lacustrine depression. The layer of peat is 0.25 to 0.40 m.

**Ecological features:** Polygonal ridge complexes, sphagnum hummocks, and small lakes represent major habitat types.

**Noteworthy flora:** Sphagnum mosses (predominantly *Sphagnum fimbriatum* and *S. nemoreum*) are abundant, which is unusual for the Arctic.

**Noteworthy fauna:** Birds have received little study, although there are plenty of them at the site, including large concentrations of moulting geese and ducks. The numbers of moulting Spectacled Eider *Somateria fischeri* are between 30,000 and 40,000.

**Current scientific research and facilities:** The mire was studied by the botanists of the Research Institute for Botany in 1969.

**Jurisdiction:** Government of the Republic of Sakha (Yakutia).

**Bibliographical references:** Botch (1973).
Zone of domed raised bogs with hummocks and hollows

4.6. West Siberian province

34. Tlyatovskoye

Compiler: M.S. Botch

Geographical coordinates: 62°21’N, 76°29’E

Altitude: 83 m a.s.l.

Area: 3,000 ha

Overview: The site comprises a portion of a very large wetland complex situated between the rivers Vat-Yegan and Amputa. The complex covers 550,000 ha, with mires occupying 72% of the area. Approximately 80% of the mires are hummock-hollow complexes with pools and lakes.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (characteristic of the northern portion of the zone of raised bogs in Western Siberia; plays substantial hydrological, biological, and ecological roles in the Vat-Yegan and Amputa catchment area); 3 (supports the floristic and faunistic diversity in the watershed region).

General location: Khanty-Mansi Autonomous Area, north of the town of Nizhnevartovsk, in the interstream area between the rivers Vat-Yegan and Amputa. The site borders the Khalkhputuyai River to the north, the Amputa River to the east, the Vatjegan River to the west and Lake Tlyato to the south.

Physical features: The site is located on a marshy outwash plain with many lakes. There are large lakes, over 1 sq.km in area, and many smaller ones. The layer of peat is 2 to 5 m thick.

Ecological features: Major habitats are lakes, hummock-hollow and hummock-pool bog complexes.

Land tenure/ownership: State owned

Conservation measures taken: None at present

Current scientific research and facilities: The site was studied intensively by the expeditions of the State Hydrological Institute from 1976 to 1981.

Jurisdiction: Administration of the Khanty-Mansi Autonomous Area.

Management authority: Regional Committee for Environmental Protection.
35. Dubches

**Compiler:** M.S.Botch

**Geographical coordinates:** 60°30’N, 89°30’E

**Altitude:** 80 m a.s.l.

**Area:** 90,400 ha

**Overview:** Hummock-hollow bogs on the eastern outskirts of the West Siberian lowland.

**Wetland Type** *(By international/Ramsar classification):* U.

**Ramsar Criteria:** 1 (characteristic of the eastern portion of Western Siberia; plays a substantial role in supporting the hydrological regime in the region); 3 (supports the regional floristic and faunistic diversity).

**General location:** Krasnoyarsk Territory, Yeniseisky and Turukhansky Districts, 15 km south of the village of Vorogovo, in the interstream area of the Sym, Dubches, and Yenisei Rivers.

**Physical features:** The site is located on a low, slightly dissected plain, on the terraces of the Yenisei River, over sandy sediments.

**Hydrological values:** The site contains many lakes and the river heads of several Yenisei tributaries. The bogs help to stabilize the Yenisei banks.

**Ecological features:** The mire system includes hummock-hollow and hummock-pool bog complexes, pine mires, streams, and lakes.

**Noteworthy fauna:** The Vorogovsky Islands, situated near the site, are of importance for migratory waterbirds. During the spring migration period, the total number of geese and ducks passing through the area reaches a million.

**Conservation measures taken:** None at present.

**Current scientific research and facilities:** The mire system has been studied by the Institute for Forest Studies, Siberian Division of the Russian Academy of Sciences (Krasnoyarsk City) for many years.

**Jurisdiction:** Administration of Krasnoyarsk Territory.

**Management authority:** Regional Committee for Environmental Protection.

36. Bolshoye Vasyuganskoye

**Compiler:** E.D.Lapshina, N.M.Semenova (Tomsk State University, Faculty of Biology, 36 Lenin Prospekt, Tomsk 634010, Russia), and V.I.Valutskii (Novosibirsk University).

**Geographical coordinates:** 55°40’-57°18’N, 76°04’-82°30’E

**Area:** The area of the Bolshoye Vasyuganskoye peatland system is over five million ha. The precise area of the site has not been defined yet.

**Overview:** The Bolshoye Vasyuganskoye mire is considered the largest peatland system in the world. This mire is a particularly good representative example of the southern taiga
peatland landscapes found in the central portion of Western Siberia. The mire regulates the major river basins of the Ob and the Irtysh and provides a variety of environmental services to the biosphere.

**Wetland Type (By international/Ramsar classification):** U, Xf, Xp.

**Ramsar Criteria:** 1, 2, 3.

**General location:** Central part of Western Siberia, in the border districts of the Tomsk, Tyumen, Novosibirsk, and Omsk Regions.

**Physical features:** The Bolshoye Vasyuganskoye mire covers the northern part of the interstream area between the Ob and Irtysh Rivers. The axis of the mire is aligned with the waterdivide. The mire is of particular importance as catchment of the Ob and Irtysh tributaries.

**Hydrological values:** The hydrological value of the Bolshoye Vasyuganskoye mire is very high. The mire contains the river heads of the Ob’s left tributaries (the Vasyugan, Parabel, Chaya, and Shegarka Rivers) and the Irtysh’s right tributaries (the Om and Tara Rivers), as well as the sources of the Chulym and Kargat Rivers supplying water to several interior-basin lakes which are of great importance for fisheries.

The area is unique in forming and maintaining the hydrological system of the West-Siberian artesian basin. The groundwater recharge from the mire is extremely important for the peatland landscapes where mires with a large number of pools and lakes cover the whole catchment. The runoff from the Bolshoye Vasyuganskoye mire determines the high level of inundation in the Barabinskaya forest-steppe, located to the south, which contrasts with the prevailing climatic conditions. The mire stores large amounts of freshwater.

**Ecological features:** The mire is situated on the border of two biogeographical regions: the southern taiga and the small-leaved forest regions, and two mire zones: the domed hummock-hollow bogs and the zone of eutrophic and pine-sphagnum mires, with inclusion of transitional mires (the latter corresponds partially to the zone of forested bogs and fens according to the zoning concept followed in this review).

The Bolshoye Vasyuganskoye mire system includes peculiar combinations of forested and non-forested peatlands, specific types of mire massifs, various plant communities common to the region, and unique complexes of mire vegetation, as well as rare and endangered species and ecosystems.

The northern portion of the mire is mainly occupied by raised bogs. There occur specific bog massifs of the peculiar ‘Narym’ type studied by A.Ya.Bronzov in the 1920s, the description of which has become classic for Russian mire science. At the Bolshoye Vasyuganskoye mire, it is possible to observe successive stages of the raised bog development.

A characteristic of this mire system is a rich diversity of fens, which vary in vegetation type and minor surface forms.

**Noteworthy fauna:** The forested peatlands of the Bolshoye Vasyuganskoye system contain staging areas of migratory waterbirds and are important for the conservation of many rare and endangered species. Breeding birds include waders (Curlew *Numenius arquatus*, Black-tailed Godwit *Limosa limosa* and some others) and a large number of rare raptors. The last proved recordings of the Slender-billed Curlew *Numenius tenuirostris* have been made at this site. The Peregrine Falcon *Falco peregrinus* occurs in large numbers at the raised bogs in the eastern portion of the area.

Many mammals, including species of high commercial value, occur at the site due to the rich diversity of habitats and the inaccessibility of some areas. In light forest with rivers and streams on the fringes of open mires, Sable *Martes zibellina*, European Mink *Mustela lutreola*, Eurasian Otter *Lutra lutra*, and large concentrations of Elks *Alces alces* are found.
The concentrations of Capercaillie *Tetrao urogallus* and Hazelhen *Tetrastes bonasia* also occur there. Until 1984, there was a local population of European Reindeer *Rangifer tarandus*, but the 1995 aerial counts showed only a small group (up to eight individuals) in the area between the Kazanka and Yemelich riverheads.

**Social and cultural values:** Wild berries of high commercial value, such as cranberry, cowberry, bog whortleberry, and cloudberry, as well as various medicinal plants cover large areas within the site.

**Land tenure/ownership:** State owned

**Current land use:** The Bolshoye Vasyuganskoye area has never been highly populated or modified by human activities. During the last decades, it has become more easily accessible by various vehicles and used for commercial purposes. The western portion of the mire experiences most serious impacts from gas and oil producing industries.

The increasing human impact has generated a need for conservation measures. There are still large intact areas within the mire complex that may be set aside as nature reserves without harm to the economic activities in the region.

**Factors adversely affecting the site's ecological character:** Factors affecting the mire include forest cutting, use of track-laying vehicles, trampling down vegetation, oil spills, and pollution with fuel, structural materials, and refuse. The rivers are polluted with sewage and agricultural runoff, as well as with oil in the areas where oil and gas production takes place. The pollution level in the river waters in the northern Novosibirsk Region poses a serious threat. The water in some rivers (e.g. the Tartas and Tara) exceeds the accepted standards for maximum permissible concentrations of various substances with 1.7 up to 23 times.

**Conservation measures taken:** No conservation measures have been taken so far. Several proposals to establish protected areas have been made but these have not been accepted by the relevant authorities. The area has not been included in the current plan of the protected areas network development (in force until 2005).

**Conservation measures proposed but not yet implemented:** A special meeting, organized by the Novosibirsk Regional Committee for Environmental Protection, the Regional Society for Nature Conservation, and scientific institutions of the Siberian Division of the Russian Academy of Sciences (Novosibirsk, 30 January 1998) has proposed to apply to the Administrations of the Novosibirsk, Tomsk, and Omsk Regions for the establishment of an inter-regional nature reserve (*zakaznik*) of federal importance at the Bolshoye Vasyuganskoye mire and for the development of a mire monitoring station in this reserve. It has also been proposed to apply to the Federal Government for designating the area as a Ramsar site.

Considering the priority values of the Bolshoye Vasyuganskoye mire system as well as the existing economic activities, it seems reasonable to set aside the eastern portion of the mire where the Kenga, Chaya, and Om riverheads are situated. This site is at the highest elevation within the Ob-Irtysh interstream area.

**Jurisdiction:** Administrations of the Novosibirsk, Tomsk, and Omsk Oblasts.

**Bibliographical references:** Bronzov (1936)

### 37. Lottery

**Compilers:** E.D.Lapshina and E.Ya.Muldiyarov (Tomsk State University, Faculty of Biology. 36 Lenin Prospekt, Tomsk 634010, Russia).

**Geographical coordinates:** 58°05’-58°18’N, 86°50’-87°50’E
Area: The area of the site has not been defined yet. Approximate 50,000 ha.

Overview: A mire system comprising hummock-hollow and hummock-lake-swamp oligotrophic and mesotrophic complexes. The site includes ten large lakes (over 1 km diameter) and hundreds of smaller ones. The lakes support populations of several indigenous fish species and subspecies, and provide feeding habitats for migratory waterbirds.

Wetland Type (By international/Ramsar classification): U, M, O, Xp.

Ramsar Criteria: 1 (a representative example of a natural peatland, characteristic of the West Siberian middle taiga; plays substantial hydrological, biological, and ecological roles in the natural functioning of two major river basins of Ob tributaries); 7 (supports populations of a number of indigenous fish species and subspecies).

General location: Tomsk Region, Pervomaisky District, 140 km of the district centre of Pervomaiskoye, 110 km west of the village of Bely Yar.

Physical features: The Lotary mire system is situated in the watershed area between the Ulyula and Ket Rivers (the right tributaries of the Ob River). From east to west, this peatland extends for 50 km, and from south to north, only for 8 to 15 km. The system contains the river heads of the Bolshaya Utka, Verkhnya Olenka, Srednya Olenka, and Chuika Rivers, as well as ten large lakes (over 1 km across) and hundreds of smaller ones. All lakes, except the largest one of Shchuchiye, are secondary lakes that appeared in the course of mire development, and are components of the hummock-hollow and hummock-pool-swamp oligotrophic and mesotrophic complexes. The site includes isolated sand dunes and mineral islands covered by pine forests, that provide refuge for sables, elks, and bears.

Land tenure/ownership: State owned

Current land use: The site is important for hunting. Fishery is carried out in the largest lakes.

Conservation measures taken: None at present.

Jurisdiction: Administration of Tomsk Oblast.

38. Salymo-Yuganskaya Peatland System

Compiler: O.L.Liss (Moscow State University, Faculty of Biology. Vorobjevy Gory, Moscow 119899, Russia).

Geographical coordinates: 60°58’N, 69°73’E

Altitude: 60-90 m a.s.l.

Area: 1,500,000 ha

Overview: An oligotrophic mire system, characteristic of the boreal-atlantic oligotrophic hummock-hollow and pine-shrub-sphagnum mires of the West Siberian middle taiga.

Wetland Type (By international/Ramsar classification): U, Xf, Xp.

Ramsar Criteria: 1 (a good representative example of a natural peatland: an intact mire system, characteristic of the West Siberian middle taiga); 2 (supports rare and endangered species of plants and animals); 3 (important for supporting the genetic and ecosystem diversity in the region).

General location: Khanty-Mansi Autonomous Area, 90 km of the city of Nefteyugansk.

Physical features: The Salymo-Yuganskaya mire system occupies the third terrace of the Bolshoi Salym River, the first terrace of the Bolshoi Yugan River, the left bank of the
Demjanka River, and adjacent alluvial plains. The landscape is predominantly a flat, slightly dissected plain, with low sand dunes.

The Bolshoi Yugan, Bolshoi Salym, Tukan, and Chepyrjega Rivers provide some drainage in the peatland area and develop marshy valleys dissecting the southern portion of the Salymo-Yuganskaya system in a meridional direction. The tributaries of the above rivers originate on the fringes of the mire system. These small rivers are fed by the surface runoff from the mires. The river network in the central portion of the system is less developed. In the northern part of the area, there are large primary lakes, which used to comprise one shallow water body. The majority of small lakes, situated mainly in the centre, are secondary (i.e. palustrine in origin).

The area has a humid and cool climate. Annual precipitation is between 450 and 500 mm, with evaporation from 300 to 360 mm. Natural drainage is slow. Up to 65% of the precipitation falls during the warm period, when the temperature is above zero. The mean air temperature is -20°C in January and +17°C in July.

The peat layer in the mires is on average 2.6 m (to a maximum of 6.7 m) thick, with bog peats dominating (75%).

**Hydrological values:** The Salymo-Yuganskaya mire system has a considerable effect on the hydrological and temperature regimes in the adjacent areas; it accumulates precipitation and groundwater, serves hydrogeological functions, prevents erosion, and traps toxic pollutants, including organic compounds and heavy metals.

**Ecological features:** The mire system is dominated by oligotrophic pine-shrub-sphagnum, hummock-hollow, and hummock-hollow-pool communities. These cover the flat central portion and the slopes of the mire system, where the water-nutrient supply is ombrotrophic. Mesotrophic and eutrophic communities are found on the fringes of the system, in the river floodplains, along the shores of the lakes, and around the islands, under richer nutrient conditions. These communities occupy small areas, genetically linked with each other.

**Noteworthy flora:** The flora of the mire is of interest from a biogeographical point of view: the site is important for the conservation of characteristic Siberian middle-taiga species and communities.

**Noteworthy fauna:** The site is inhabited by the southernmost population of European Reindeer *Rangifer tarandus* in Western Siberia. There are large healthy populations of many commercially valuable species, including Sable *Martes zibellina* and Eurasian Otter *Lutra lutra*. The habitat conditions are favourable to reintroduce European Beaver *Castor fiber*.

**Social and cultural values:** There are over 200 historical and cultural objects in the area: archaeological remains, ancient settlements, burial mounds, and sacred places. The Punsi architectural and natural complex is of particular interest. The area around Lake Bolshoye Kayukovo in the northern portion of the area is important for the traditional culture of Khanty.

**Land tenure/ownership:** State property. Part of the area is owned by Khanty tribes.

**Current land use:** Traditional Khanty activities include gathering of berries, fishing, reindeer breeding, and hunting.

**Factors adversely affecting the site’s ecological character:** The recent development of intensive gas and oil production in Western Siberia has affected the natural complexes at the site. Further activities are planned within the Salymo-Yuganskaya mire system.

**Conservation measures taken:** In 1994, the Administration of Nefteyugansk District proposed to establish a protected area in the catchment of the Higher Bolshoi Salym. This initiative was approved by the Federal Government, with a recommendation to establish a national park in the area. In 1997, the Administrations of Nefteyugansk and Uvatsk Districts...
prepared the necessary documentation for the establishment of the Salymo-Yugansky Zakaznik to protect the most valuable animal species.

**Conservation measures proposed but not yet implemented:** It is required to designate the whole area as a Ramsar site and continue making efforts to establish a national park.

**Current scientific research and facilities:** There is a biological station at the site established by Moscow University in 1975. A number of research and monitoring studies have been carried out since then. The station hosted two meetings: the National Workshop on Ecological Aspects of Research into Mire Ecosystems (1991) and the International Conference of ‘Peatlands and Archaeology’ (1998).

**Current recreation and tourism:** Ecotourism is being developed.

**Jurisdiction:** Administrations of Khanty-Mansi Autonomous Area and Nefteyugansk District.

**Bibliographical references:** Atlas of Tyumen Oblast (1971); Dobrinsky & Plotnikov (1997); Liss & Berezina (1981); Liss (1990).

**Zone of forested raised bogs and sedge fens**

5.3. **West Siberian province**

**39. Ulukh-Chayakh**

**Compiler:** E.D. Lapshina (Tomsk State University, Faculty of Biology. 36 Lenin Prospekt, Tomsk 634010, Russia).

**Geographical coordinates:** 57°20'-57°25'N, 88°-89°E

**Area:** c. 20,000 ha

**Overview:** The southernmost large mire massif in the southeastern portion of Western Siberia, comprising mesotrophic (transitional) mires and, to a lesser extent, raised bogs and fens.

**Wetland Type (By international/Ramsar classification):** U, O.

**Ramsar Criteria:** 1 (characteristic of the biogeographical region of the West Siberian southern taiga; plays a substantial hydrological, biological, and ecological role in the natural functioning of the Chulym River catchment).

**General location:** Tomsk Region, Teguldet District; the village of Teguldet is located on the northwestern border of the site.

**Physical features:** The Ulukh-Chayakh mire system is situated on the left-bank terrace of the Chulym River, extending for about 100 km from the border of the Krasnoyarsk Territory on the east to the village of Teguldet on the west. This is a narrow strip, 1 to 5 km wide. The area belongs to the West Siberian southern taiga biogeographical region, being located near the borderline of the dark coniferous forests of the Altai-Sayan foothills.

**Hydrological values:** The mire system is connected by channels with the Chulym floodplain mires and plays an important role in maintaining the hydrological regime of the river.

**Ecological features:** The majority of the area (up to 70%) is occupied by mesotrophic, open, and slightly forested sedge-sphagnum mires.
Noteworthy fauna: The fauna of the site has received little study. Without doubt, there are feeding areas important for forest birds and cranes, as well as the indigenous population of Elk *Alces alces*.

Current land use: Gathering of cranberries.

Jurisdiction: Administration of Tomsk Oblast.

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### 40. Chilinskoye

**Compiler:** E.D.Lapshina (Tomsk State University, Faculty of Biology. 36 Lenin Prospekt, Tomsk 634010, Russia).

**Geographical coordinates:** 55°40'-55°55'N, 83°30'-84°50'E

**Area:** c. 10,000 ha

**Overview:** A floodplain brownmoss mire massif, characteristic of the zone of flat eutrophic and mesotrophic (sedge-brownmoss and forested) mires in the West Siberian southern taiga.

**Wetland Type (By international/Ramsar classification):** U, M, O, P, Xf, Xp.

**Ramsar Criteria:**
1. (characteristic of the West Siberian southern taiga biogeographical region; plays a key hydrological and ecological role in the natural functioning of the Ob floodplain complex);
2. (supports a number of rare and endangered plant species).

**General location:** Tomsk Region, Kozhevnikovo District, between the villages of Baturino and Yelovka, 95 km southwest of the city of Tomsk, 35 km south of the district centre of Kozhevnikovo.

**Physical features:** The Chilinskoye Mire is situated in the left portion of the Ob floodplain, under the scarp of an ancient terrace. The water supply is abundant, bringing in ground and surface waters, rich in carbonates. The mire is regularly flooded by the Ob waters. The area is divided into two portions by the Kinda River. In the southern portion, there are two oxbow-lakes, 8 ha and 16 ha in area, laying over a 7 m peat layer. Five oxbow lakes, connected with the river, are found in the central portion of the site.

**Ecological features:** The majority of the site (60-79%) is occupied by sedge-brownmoss and buckbean-sedge-brownmoss communities with dwarf birches. Closer to the river, these give way to the grass-sedge communities with trees and birch-willow tussocky marshes.

**Noteworthy flora:** The mire features a high diversity of plants, especially of rare and endangered species of orchids. *Epipactis palustris*, *Herminium monorchis*, and *Dactylorhiza incarnata* are found commonly in the brownmoss mires. *Malaxis monophylla* occurs occasionally, as well as *Liparis loeselii*, a European species, rare in Siberia. In adjacent floodplain communities, *Cypripedium macranthon*, *C.calceolus*, *Gymnadenia conopsea*, *Dactylorhiza maculata*, *Epipactis helleborine*, and *Listera ovata* have been recorded.

Conservation measures taken: None at present

Conservation measures proposed but not yet implemented: The plant communities of the Chilinskoye mire have been entered in the Green Book of Siberian Plant Communities (1996) and recommended for conservation.

Jurisdiction: Administration of Tomsk Oblast.

41. Tyukhtetskoye and Shadatskoye

Compiler: M.S.Botch

Geographical coordinates: 53°00’N, 93°00’E

Area: 12,000 ha

Overview: A mire in a mountain river valley, one of the most southern in Middle Siberia. The vegetation is oligotrophic and contains boreal and arctic-boreal species. Major communities are sedge-sphagnum complexes, sphagnum pools, and hummocks with dwarf shrubs and mosses.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (a mountain mire with unusual vegetation); 2 (supports rare species of plants and animals).

General location: Krasnoyarsk Territory, Karatuzsky District, near the villages of Verkhnii Kuzhebar and Chervizul.

Physical features: The site is located in the northeastern portion of the Western Sayan Mountains, in the interstream area between the rivers of Amyl-Tyukhtet and Shadat. The peat layer is 2 m thick underlain by riverine sediments.

Hydrological values: The mire provides water to the Amyl-Tyukhtet and Shadat Rivers.

Ecological features: Oligotrophic sphagnum communities, mesotrophic sedge-sphagnum communities, pools and streams.

Noteworthy flora: A number of species rare for southern Siberia occur at the site, including Frangula alnus, Nuphar pumila, Rhynchospora alba, Dactylorhiza incarnata, and Drosera anglica.

Noteworthy fauna: Two species listed in the Russian Red Data Book are known to occur in the area: Osprey Pandion haliaetus and European Beaver Castor fiber.

Land tenure/ownership: State owned

Current land use: Hunting, gathering of berries.

Factors adversely affecting the site's ecological character: The mires have not been influenced much by human activities, although such factors as over-harvesting of berries, chemical pollution from the Sayan Aluminium Plant, and construction of winter roads give reason for concern.

Conservation measures taken: None at present.

Jurisdiction: Administration of Krasnoyarsk Territory.


42. Chernoye

Compiler: M.S.Botch

Geographical coordinates: 55°22’N, 69°06’E

Area: 1,000 ha

Overview: A sphagnum mire in the southern forest-steppe of Western Siberia. Vegetation includes various grasses, birches, dwarf shrubs, and sphagnum.
Wetland Type (By international/Ramsar classification): Xp.

Ramsar Criteria: 1 (a sphagnum mire, unusual for the southern forest-steppe); 2 (rare plant species); 3 (supports the diversity of boreal peatland flora).

General location: Tyumen Region, Ishim District, 4 km northeast of the village of Sumnoye.

Physical features: The mire is underlain by aleuritic clays. The water supply is rich in nutrients, with a pH value between 6.0 and 7.2.

Hydrological values: The mire stores snow melt waters.

Ecological features: Major communities are presented by birch-shrub-sphagnum associations and hollows filled with water.

Noteworthy flora: There are eight boreal species, rare for the given biogeographical region, including Chamaedaphne calyculata, Andromeda polifolia, Oxycoccus palustris, Drosera rotundifolia, and Eriophorum vaginatum.

Current land use: Grazing, gathering of cranberries, hay harvesting, forest cutting.

Jurisdiction: Administration of Tyumen Oblast.


43. Indersky Ryam

Compiler: M.S.Botch

Geographical coordinates: 54°31’N, 80°03’E

Area: 800 ha

Overview: A raised bog in the southern forest-steppe. Major communities are cottongrass-cranberry-sphagnum, sedge-cranberry-sphagnum, and reed-cranberry-sphagnum with sparse birch trees.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (type of mire, unusual for the Barabinskaya Lowland: a raised bog occurring far to the south of the normal mire zone); 3 (supports the regional biodiversity).

General location: Novosibirsk Region, Dovolensky District, southeastern portion of the Barabinskaya Lowland, near the village of Inder.

Physical features: The mire is situated in the Bagan River valley, in a lacustrine depression. The water supply comes from the river and from precipitation. The fen peat layer is 2 m thick.

Ecological features: Major communities are cottongrass-cranberry-sphagnum, sedge-cranberry-sphagnum, and reed-cranberry-sphagnum with sparse birch trees.

Noteworthy flora: There are several boreal species, rare for the given biogeographical region: Empetrum nigrum, Ledum palustre, Oxycoccus palustris, O. microcarpus, Eriophorum vaginatum, Drosera rotundifolia, Sphagnum fuscum, and S. balticum.

Noteworthy fauna: Waterbirds occur in large numbers, but no counts have been carried out.

Land tenure/ownership: State owned

Factors adversely affecting the site's ecological character: Cranberry over-
harvesting, pollution with waste material. Peat extraction is being planned in the area. In the western portion of the site, there is an old canal which drains into Lake Inder.

**Conservation measures taken:** Regional nature monument since 1992.

**Jurisdiction:** Administration of Novosibirsk Oblast.

**Management authority:** Regional Committee for Environmental Protection.

**Bibliographical references:** Green Book of Siberian Plant Communities (1996).
THE FAR EAST

Provinces:

8.7. Amur lowlands (Selgono-Kharpinskiye, Evurskiye, and Takhtinskoye)
9.1. Western Kamchatka (Krutogorovskoye and Bolshoye Kolpakovskoye)
9.2. Eastern Kamchatka (Ossorskoye)
9.4. Northern Sakhalin Island (Okute, Utinoye, and Baikalskoye)

44. Selgono-Kharpinskiye

Compiler: M.S.Botch

Geographical coordinates: 49°30’N, 135°30’E

Altitude: 100 m a.s.l.

Area: 158,000 ha

Overview: A transitional mire complex, characteristic of the Middle Amur lowlands, comprising grass mires along the river banks, as well as levees and ridges covered with forest. The majority of the area is occupied by mesotrophic sedge-sphagnum and shrub-sphagnum communities with sparse trees, mainly Dahurian Larch *Larix gmelini*. The site is important for breeding and migrating waterbirds.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (characteristic of the Amur biogeographical region; plays a key hydrological, ecological, and biological role in the functioning of the catchment areas of the Kharpi River, Selgon River, and Lake Bolon; 3 (supports regional biodiversity); 5 (supports large populations of waterbirds).

General location: Khabarovsk Territory, Komsomolsky District, 2 km east of the railway station of Selgon.

Physical features: The site is located in the interstream area between the Kharpi and Selgon Rivers, in a lowland composed of Late Quaternary lacustrine clays. The layer of peat is up to 2 m thick.

The area has a transitional monsoon-continental climate. The annual air temperature variations reach 50°C, with the mean January temperature of -28°C and the mean July temperature of +21°C. Annual precipitation varies between 400 and 500 mm, with 50-55% falling between July and September, and only 15% from November till March. Snow cover is 35-40 cm deep and persists from early November until mid-April. The soil gets frozen down to 160 cm (Nikonov & Anisimova, 1974).

Hydrological values: The mire performs important regulating functions during the period of summer flooding.

Ecological features: Major communities include open sphagnum-sedge, shrub-sedge-sphagnum and grass mires, ‘mari’ complexes (larch-moss forests) on the levees, lakes, and rivers.

Noteworthy fauna: The mire is situated to the southwest of the Lake Bolon Ramsar Site, providing a link in a network of sites important for migratory waterbirds. The total number of birds passing through the area is between 800,000 and 1,200,000; about 10,000 of these stay at the site for a longer time. The breeding population includes 5,000 to 30,000 ducks and
geese, and a number of rare and endangered waterbird species, such as Mandarin Duck *Aix galericulata*, Chinese Merganser *Mergus squamatus*, Whooper Swan *Cygnus cygnus* (10 pairs), Hooded Crane *Grus monachus* (5-7 pairs), Japanese Crane *G. japonensis* (10-15), White-naped Crane *G. vipio* (30), Oriental White Stork *Ciconia boyciana* (60), White-tailed Eagle *Haliaeetus albicilla* (35-50), and Osprey *Pandion haliaetus* (10-15 pairs).

**Land tenure/ownership:** State owned

**Conservation measures taken:** Nature reserve (*zakaznik*).

**Conservation measures proposed but not yet implemented:** It has been proposed to establish a strict nature reserve (*zapovednik*) in the area.

**Jurisdiction:** Administration of Khabarovsk Territory.

**Management authority:** Litovsky Forestry Farm, Regional Committee for Environmental Protection.

**Bibliographical references:** Nikonov & Anisimova (1974); Prozorov (1965); Skokova & Vinogradov (1986).

### 45. Evurskiye

**Compiler:** M.S.Botch

**Geographical coordinates:** 51°45’N, 136°30’E

**Area:** 69,134 ha

**Overview:** A grass fen, overgrown with Rough Blue-joint *Calamagrostis langsdorffii*, characteristic of the Amur biogeographical region. The site includes Lake Evoron and the Evur River.

**Wetland Type (By international/Ramsar classification):** U.

**Ramsar Criteria:** 1 (characteristic of the Amur biogeographical region; plays a substantial hydrological, ecological, and biological role in the functioning of the Amgun catchment area); 3 (supports the biodiversity in the river valley); 5 (important for migrating and breeding populations of waterbirds).

**General location:** Khabarovsk Territory, Solnechny District, 110 km northwest of the city of Komsomolsk-on-Amur, along the Evoron and Evur Rivers, bordering Lake Chukchagirskoye.

**Physical features:** The area comprises a former lake-river basin, drained in the Late Quaternary. The site is located on an eroded plain, with cut-off lobes 5 to 7 m high. The peat deposits are up to 18 m thick.

**Hydrological values:** The mire performs important regulation functions during the period of summer flooding.

**Ecological features:** Major communities are grass fens with sedges and small-reeds, patches of transitional sedge-sphagnum mires, rivers, streams, and lakes.

**Noteworthy fauna:** Between 150,000 and 200,000 waterbirds occur at the mire and adjacent areas during migration. The breeding population includes ducks (5,000 pairs), geese (100-150), waders (8,000), herons (700-800), Whooper Swan *Cygnus cygnus* (8-10), Oriental White Stork *Ciconia boyciana* (15-18), Hooded Crane *Grus monachus* (10-15), White-tailed Eagle *Haliaeetus albicilla* (15-20), and Osprey *Pandion haliaetus* (5-7 pairs).

**Jurisdiction:** Administration of Khabarovsk Territory.
Bibliographical references: Prozorov (1985); Skokova & Vinogradov (1986).

46. Takhtinskoye

Compiler: M.S.Botch
Geographical coordinates: 53°05’N, 139°40’E
Altitude: 100 m a.s.l.
Area: 23,500 ha
Overview: The site comprises raised bogs with hummock-hollow and hummock-pool complexes, palsa mires on the southeastern border of their distribution, and lakes.

Wetland Type (By international/Ramsar classification): U.
Ramsar Criteria: 1 (a representative example of a mire with frost peat mounds, common to areas located far northward; plays an important hydrological, biological, and ecological role for the basin of Lake Orel); 3 (supports the biodiversity in the Lower Amur area); 4 (an important waterbirds staging area).

General location: Khabarivsk Territory, Takhta District, 2 km west of the town of Takhta, south of Lake Orel.
Physical features: The site is located in the Amur-Amgun lowland, in a large lacustrine depression, covered by loam. The peat layer is 2 to 3 m thick.
Hydrological values: The mires help maintain the water level in Lake Orel and perform important flooding regulation functions.
Ecological features: Major communities are raised bogs with hummock-hollow and hummock-pool complexes and palsa mires.
Noteworthy fauna: Waterbirds occur in large numbers during migration and breeding periods, but no counts have been carried out.
Land tenure/ownership: State owned
Factors adversely affecting the site's ecological character: The 1954 fire partially changed the vegetation pattern.
Jurisdiction: Administration of Khabarovsk Territory.
Management authority: Takhta forestry farm.

47. Krutogorovskoye and Bolshoye Kolpakovskoye

Compiler: M.S.Botch
Geographical coordinates: 54°50’N, 155°45’E
Altitude: 150 m a.s.l.
Area: 88,000 ha
Overview: A system of mires comprising sphagnum blanket bogs on sea terraces and peat islands with birches.
Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (sphagnum blanket bogs, characteristic of the western coast of the Kamchatka Peninsula; play a key biological, hydrological, and ecological role in the watershed of the Krutogorov and Kolpakov Rivers); 2 (rare plant species, that have not been found anywhere else in Russia); 3 (supports the biodiversity of the western coast of Kamchatka).

General location: Kamchatka Peninsula, Kirovsky District, coast of the Sea of Okhotsk, the interstream area between the Krutogorov and Kolpakov Rivers.

Physical features: The site is located on the coast of the Sea of Okhotsk, over sandy and clayey sediments with volcanic material. The sea terraces are covered with peat of 2.5 to 6.5 m depth.

Hydrological values: The site is important for providing water supply for the rivers.

Ecological features: Sphagnum blanket bogs, hummock-hollow and hummock-pool complexes, small lakes, and rivers.

Noteworthy flora: A number of Far-eastern and American species occur at the site, including Carex cryptocarpa, C. middendorfii, Lobelia sessilifolia, Coptis trifolia, Iris setosa, Myrica tomentosa, and Sieversia pentapetala.

Noteworthy fauna: The Krutogorov and Kolpakov Rivers are important spawning areas of salmon.

Land tenure/ownership: State owned

Factors adversely affecting the site's ecological character: The site has been explored for gas, and there are remains of drilling derricks and vehicle tracks.

Current scientific research and facilities: The mire was studied by M.S.Botch (1990).

Jurisdiction: Administration of Kamchatka Oblast.

Bibliographical references: Botch (1990); Lyubimova (1940).

48. Ossorskoye

Compiler: M.S.Botch

Geographical coordinates: 59°13’N, 163°03’E

Area: 700 ha

Overview: An aapa mire with hummocks and hollows located in a former lagoon depression on the Pacific coast. On the fringes of the mire, frost peat mounds of 0.5 m height with dwarf-pine elfin wood are found.

Wetland Type (By international/Ramsar classification): U.

Ramsar Criteria: 1 (characteristic for northern Kamchatka; the Kamchatka type of aapa mires does not occur in other regions of Russia); 3 (supports the diversity of coastal habitats and species); 4 (important for migrating and breeding waterbirds).

General location: Kamchatka Region, Koryak Autonomous Area, Karaginsky District, 1 km west of the Pacific coast, close to the village of Ossora.

Physical features: The site is located in a former coastal lagoon, covered by riverine sediments. The fen peat layer is 1 to 2 m thick, with a pH value of 5.0 to 5.5.
**Hydrological values:** The mire plays a key hydrological role in the natural functioning of the Karaga River catchment, stores freshwater and helps stabilise the coastline.

**Ecological features:** Hummock-hollow and hummock-pool complexes, frost peat mounds. *Ranunculus pallasii, Comarum palustre,* and *Sphagnum squarrosum* occur on the hummocks, and *Carex rariflora* and *Sphagnum lindbergii* in the hollows.

**Noteworthy flora:** East Siberian species: *Betula divaricata, Carex middendorfii, Coptis trifolia,* and *Iris setosa.* Arctic species: *Ranunculus pallasii.*

**Noteworthy fauna:** Waterbirds are known to occur in large numbers during migration and breeding periods, but no information on their numbers and species composition is available.

**Jurisdiction:** Administration of Kamchatka Oblast.

**Bibliographical references:** Botch (1983; 1995).

49. **Okuto**

**Compiler:** M.S.Botch

**Geographical coordinates:** 49°30’N, 143°31’E

**Altitude:** 100 m a.s.l.

**Area:** 13,891 ha

**Overview:** A raised bog with the adjacent lagoon of Lake Nevskoye. The site comprises hummock-hollow complexes of ‘roopa’ type, occasional frost peat mounds (far beyond the normal area of their distribution), and many lakes.

**Wetland Type (By international/Ramsar classification):** U.

**Ramsar Criteria:** 1 (a mire type, characteristic of Sakhalin Island, that does not occur in other regions of the country; plays an important hydrological role for Lake Nevskoye and several rivers entering Terpenia Bay of the Sea of Okhotsk); 3 (supports regional diversity of flora and fauna).

**General location:** Sakhalin Region, Poronaisky District, 37 km northeast of the town of Poronaisk.

**Physical features:** A coastal lagoon developed into a mire. The hydrological regime of the mire complex is closely connected with the tidal regime of the Sea of Okhotsk.

**Hydrological values:** The site plays an important hydrological role for Lake Nevskoye and several rivers entering Terpenia Bay.

**Ecological features:** Major communities are hummock-hollow complexes of the ‘roopa’ type. Frost peat mounds occur occasionally.

**Noteworthy flora:** Noteworthy are the Far-eastern species of *Myrica tomentosa, Iris setosa,* and *Hemerocallis sp.*

**Noteworthy fauna:** Waterbirds occur in large numbers during migration and breeding periods.

**Jurisdiction:** Administration of Sakhalin Oblast.

**Bibliographical references:** Kuzmin & Petrovskii (1979); Vlastova (1960).
50. Utinoye

**Compiler:** M.S.Botch

**Geographical coordinates:** 50°30’N, 143°00’E

**Altitude:** 180 m a.s.l.

**Area:** 4,753 ha

**Overview:** A raised bog with hummock-hollow complexes and frost peat mounds.

**Wetland Type** *(By international/Ramsar classification):* U.

**Ramsar Criteria:** 1 (characteristic of the Central Sakhalin peatlands; plays a key hydrological, ecological, and biological role in the Poronai catchment); 3 (supports regional biodiversity).

**General location:** Sakhalin Region, Tymovsky District, 43 km of the village of Tymovsky.

**Physical features:** The site is located in the Tom-Poronai lowland between the West Sakhalin and East Sakhalin mountain ridges. The lowland is slightly tilted towards the coast and is composed of Tertiary marine and Quaternary alluvial sediments.

**Hydrological values:** The mire supports the hydrological regime of the adjacent river catchments.

**Ecological features:** Major communities are hummock-hollow and hummock-pool bogs and frost peat mounds.

**Noteworthy flora:** *Iris setosa, Myrica gale,* and *Sphagnum lenese.*

**Noteworthy fauna:** The site is important for the conservation of spawning areas of migratory fish. Waterbirds occur in large numbers during migration and breeding periods.

**Land tenure/ownership:** State owned

**Current scientific research and facilities:** The site was studied by ‘Glavtorffönd’ in 1953 and by the Expedition of the Peat Research Institute in 1973.

**Jurisdiction:** Administration of Sakhalin Oblast.

**Bibliographical references:** Kuzmin & Petrovskii (1979); Vlastova (1960).

51. Baikalskoye and Bolshaya Mar

**Compiler:** M.S.Botch

**Geographical coordinates:** 53°20’N, 142°30’E

**Altitude:** 150 m a.s.l.

**Area:** 18,304 ha

**Overview:** A mire complex comprising of raised bogs, transitional and palsa mires with sphagnum, dwarf shrubs, and reeds.

**Wetland Type** *(By international/Ramsar classification):* U.

**Ramsar Criteria:** 1 (characteristic of northern Sakhalin Island; plays an important hydrological, and ecological role for Baikal Bay and the northern coast of the island); 3 (supports the biodiversity of northern Sakhalin); 4 (important staging area for waterbirds).
**General location:** Sakhalin Region, Rybinsky District, 38 km northeast of Rybinsk, along the coast of Baikal Bay.

**Physical features:** The site is located on the northeastern coast of Sakhalin Island, on a low plain gently tilted towards the sea. The peat layer is 2 to 2.5 m thick underlain by marine sandy sediments.

**Hydrological values:** The mire supplies water to many streams.

**Ecological features:** The site is dominated by sedge-sphagnum oligotrophic and mesotrophic communities, reed beds, and frost mounds.

**Noteworthy flora:** *Picea glehnii*, an endemic of northern Sakhalin, occurs at the site, as well as other oriental species.

**Noteworthy fauna:** Waterbirds occur in large numbers during migration. The site is important for breeding Swan Goose *Anser cygnoides*, listed in the Russian Red Data Book.

**Land tenure/ownership:** State owned

**Jurisdiction:** Administration of Sakhalin Oblast.

**Bibliographical references:** Kuzmin & Petrovskii (1979); Vlastova (1960).
Wetland Type

The codes are based upon the Ramsar Classification System for Wetland Type as approved by Recommendation 4.7 and amended by Resolutions VI.5 and VII.11 of the Conference of the Contracting Parties. The categories listed herein are intended to provide only a very broad framework to aid rapid identification of the main wetland habitats represented at each site.

Marine/Coastal Wetlands

A -- Permanent shallow marine waters in most cases less than six metres deep at low tide; includes sea bays and straits.
B -- Marine subtidal aquatic beds; includes kelp beds, sea-grass beds, tropical marine meadows.
C -- Coral reefs.
D -- Rocky marine shores; includes rocky offshore islands, sea cliffs.
E -- Sand, shingle or pebble shores; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.
F -- Estuarine waters; permanent water of estuaries and estuarine systems of deltas.
G -- Intertidal mud, sand or salt flats.
H -- Intertidal marshes; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.
I -- Intertidal forested wetlands; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.
J -- Coastal brackish/saline lagoons; brackish to saline lagoons with at least one relatively narrow connection to the sea.
K -- Coastal freshwater lagoons; includes freshwater delta lagoons.
Zk(a) - Karst and other subterranean hydrological systems, marine/coastal

Inland Wetlands

L -- Permanent inland deltas.
M -- Permanent rivers/streams/creeks; includes waterfalls.
N -- Seasonal/intermittent/irregular rivers/streams/creeks.
O -- Permanent freshwater lakes (over 8 ha); includes large oxbow lakes.
P -- Seasonal/intermittent freshwater lakes (over 8 ha); includes floodplain lakes.
Q -- Permanent saline/brackish/alkaline lakes.
R -- Seasonal/intermittent saline/brackish/alkaline lakes and flats.
Sp -- Permanent saline/brackish/alkaline marshes/pools.
Ss -- Seasonal/intermittent saline/brackish/alkaline marshes/pools.
Tp -- Permanent freshwater marshes/pools; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.
Ts -- Seasonal/intermittent freshwater marshes/pools on inorganic soils; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.
U -- Non-forested peatlands; includes shrub or open bogs, swamps, fens.
Va -- Alpine wetlands; includes alpine meadows, temporary waters from snowmelt.
Vt -- Tundra wetlands; includes tundra pools, temporary waters from snowmelt.
W -- Shrub-dominated wetlands; shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils.
Xf -- Freshwater, tree-dominated wetlands; includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.
Xp -- Forested peatlands; peatswamp forests.
Y -- Freshwater springs; oases.
**Zg** -- Geothermal wetlands

**Zk(b)** - Karst and other subterranean hydrological systems, inland

**Note:** “floodplain” is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forests. Floodplain wetlands are not listed as a specific wetland type herein.

**Human-made wetlands**

1 -- **Aquaculture** (e.g., fish/shrimp) ponds

2 -- **Ponds**; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).

3 -- **Irrigated land**; includes irrigation channels and rice fields.

4 -- **Seasonally flooded agricultural land** (including intensively managed or grazed wet meadow or pasture).

5 -- **Salt exploitation sites**; salt pans, salines, etc.

6 -- **Water storage areas**; reservoirs/barrages/dams/impoundments (generally over 8 ha).

7 -- **Excavations**; gravel/brick/clay pits; borrow pits, mining pools.

8 -- **Wastewater treatment areas**; sewage farms, settling ponds, oxidation basins, etc.

9 -- **Canals and drainage channels, ditches.**

**Zk(c)** - Karst and other subterranean hydrological systems, human-made
### Annex 2

**Criteria for Identifying Wetlands of International Importance**

Adopted by the 7th Meeting of the Conference of the Contracting Parties (1999), superseding earlier Criteria adopted by the 4th and 6th Meetings of the COP (1990 and 1996)

<table>
<thead>
<tr>
<th>Group A of the Criteria. Sites containing representative, rare or unique wetland types</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criterion 1:</strong> A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group B of the Criteria. Sites of international importance for conserving biological diversity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criteria based on species and ecological communities</strong></td>
</tr>
<tr>
<td><strong>Criterion 2:</strong> A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.</td>
</tr>
<tr>
<td><strong>Criterion 3:</strong> A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.</td>
</tr>
<tr>
<td><strong>Criterion 4:</strong> A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific criteria based on waterbirds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criterion 5:</strong> A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.</td>
</tr>
<tr>
<td><strong>Criterion 6:</strong> A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Specific criteria based on fish</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criterion 7:</strong> A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.</td>
</tr>
<tr>
<td><strong>Criterion 8:</strong> A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.</td>
</tr>
</tbody>
</table>
## National Wetland Classification *

<table>
<thead>
<tr>
<th>Region</th>
<th>Wetland type</th>
<th>Wetland classification</th>
<th>Wetland group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Marine</td>
<td>1. Open marine shallows</td>
<td>1. Intertidal</td>
<td>1. Rocky</td>
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<tr>
<td></td>
<td>2. Subtidal</td>
<td>2. Sandy</td>
<td>2. Sandy</td>
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<tr>
<td>2. Bays and straits</td>
<td>1. Exposed at low tide</td>
<td>1. Sandy</td>
<td>1. Rocky</td>
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<tr>
<td></td>
<td>(mudflats)</td>
<td>2. Silty</td>
<td>2. Sandy</td>
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<td></td>
<td>2. Deepwater bays</td>
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<td></td>
<td>3. Shallow bays</td>
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<tr>
<td>2. Subtidal</td>
<td>1. Sandy</td>
<td>1. Rocky</td>
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<tr>
<td>3. Subtidal</td>
<td>3. Silty with sandy ridges</td>
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<tr>
<td>2. Bays and straits</td>
<td>2. Sandy</td>
<td>1. Submerged beds of flowering plants and Charophyta</td>
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<td></td>
<td>2. Sandy</td>
<td>2. Submerged beds of other algae</td>
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<td></td>
<td>3. Bare bottom</td>
<td>3. Beds of emergent vegetation</td>
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<tr>
<td>2. Bays and straits</td>
<td>4. Bare bottom</td>
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<tr>
<td>3. Bays and straits</td>
<td>5. Lagoons</td>
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<td>3. River mouths</td>
<td>1. Estuaries</td>
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<td></td>
<td>2. Deltas</td>
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<td>4. Coastal</td>
<td>1. Small islands</td>
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<td></td>
<td>2. Mainland coasts,</td>
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<td></td>
<td>shores of large islands</td>
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<tr>
<td>2. Valleys</td>
<td>5. Rivers and their valleys</td>
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<tr>
<td>2. Valleys</td>
<td>1. Lowlands</td>
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<td></td>
<td>2. Mountains</td>
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<td></td>
<td>3. Streams</td>
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<td>6. Reservoirs</td>
<td>1. Lowland with stable water level</td>
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<td>2. Lowland with sharp changes in water level</td>
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<tr>
<td>drainage regions</td>
<td></td>
<td>2. Frequent sporadic fluctuations in water level</td>
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<td>7. Lake groups</td>
<td>1. Stable</td>
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<td>2. Cryogenic</td>
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<td>1. Eutrophic</td>
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<td>2. Mesotrophic</td>
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<td></td>
<td>3. Oligotrophic</td>
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<td>4. Complex</td>
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<td></td>
<td>1. Tundra</td>
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<tr>
<td>Category</td>
<td>Type</td>
<td>Subtypes</td>
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<tr>
<td>8. Individual lakes</td>
<td>Stable</td>
<td>1. Saline</td>
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<td></td>
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<td>2. Brackish</td>
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<td>3. Freshwater</td>
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<td>4. Oligotrophic</td>
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<td>5. Distrophic</td>
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<td>With variable water level</td>
<td>1. Saline</td>
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<td>2. Brackish</td>
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<td>3. Freshwater</td>
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<td>4. Variable salinity</td>
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<td>9. Mires</td>
<td>Fens, carrs and transitional mires</td>
<td>1. With open water</td>
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<td>2. Without open water</td>
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<td></td>
<td>Raised bogs</td>
<td>1. With open water</td>
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<td></td>
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<td>2. Without open water</td>
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<td>10. Seasonal water bodies</td>
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<td>1. Tundra</td>
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<td></td>
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<td>2. Forested</td>
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<td>3. Palustrine</td>
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<td>4. Steppe</td>
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<td>5. Desert</td>
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<tr>
<td>11. Man-made water bodies</td>
<td>Ponds</td>
<td>1. Fishponds</td>
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<td></td>
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<td>2. Agricultural</td>
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<td>3. Water mills</td>
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<td>4. Flooded gravel pits</td>
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<td></td>
<td>Irrigation systems</td>
<td>1. Rice-fields</td>
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<td>2. Drainage systems</td>
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<td>3. Irrigation sewage disposal fields</td>
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<td></td>
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<td>4. Filtration lakes</td>
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</tbody>
</table>

Glossary

AAPA. A cold climate variant of minerotrophic, extensive, watery sedge mires, with ombrotrophic hummocks, and with hummock and hollow surfaces oriented along topographic contours.

ALLUVIUM. Material deposited by running water. The term is not usually applied to LAKE or marine sediments and may be restricted to un lithified, size-sorted fine sediments (silt and clay) (5).

AQUATIC VEGETATION. Grouped into four classes (a) 'marginal' for emergent plants forming a more or less narrow zone along the edge of standing or flowing open water; (b) 'emergent' for plants other than marginal which are rooted on the bottom and project above the surface; (c) 'floating' for plants forming mats, streamers or other patterns on the water surface; (d) 'bottom' for plants of which no part reaches or comes near to the surface (2).

ARCTIC. Commonly referred to as the region north of the Arctic Circle (the parallel of latitude 66°33'N). It comprises the area north of the 10°C July isotherm, where July is the warmest summer month, provided that the mean temperature of the coldest month is not higher than 0°C (9).

BEDROCK. The consolidated, unweathered rock exposed at the land surface or underlying the soil zone and unconsolidated surficial deposits (5).

BIOSPHERE RESERVE. A nature reserve designated under the UNESCO Biosphere Reserve Statutory Framework. See also PROTECTED NATURAL AREA.

BLANKET MIRE. A type of MIRE (BOG) covering the whole surface of the landscape, including upland terrain, like a blanket, occurring in cool or cold climates with high rainfall and high atmospheric humidity.

BOG. Peatland which receives its water supply mainly from the atmosphere. See MIRE.

BOREAL. A major bioclimatic zone, lying north of the TEMPERATE zone and south of the TUNDRA zone; this region has short, warm summers and long, cold winters with snow, and the characteristic vegetation is the TAIGA (conifer-dominated forest) (9).

CARR. A woodland developed over a FEN; typical trees include alder Alnus and willow Salix.

CATCHMENT (AREA). The area in which all water drains into a single river system, separated from other catchment areas by a WATERSHED (9). (American usage equals watershed).

COMMUNITY. A general ecological term for any naturally occurring group of organisms inhabiting a common environment. Each community is relatively independent of other communities (9).

DOMINANT. A species in a plant COMMUNITY which has a dominating influence on other members of the community, being larger in size, occupying more space and light, contributing more organic matter, requiring more nutrients, etc. (9).

DYSTROPHIC. Applied to freshwater bodies which are deficient in calcium, very poor in dissolved nutrients, and therefore unproductive. These waters are typical of acid peat areas, and have bottoms covered with undecomposed plant remains harbouring a poor fauna. The water is usually stained brown with peat. Cf. EUTROPHIC, MESOTROPHIC, OLIGOTROPHIC (1).
ENDEMIC SPECIES. A species confined naturally to a certain limited area or region (7).

ESKER. A long, narrow, usually sinuous ridge of sand and gravel. Eskers were deposited by melt-water within a glacier or ice sheet (1).

EUTROPHIC. Applied to freshwater bodies which are rich in plant nutrients and are therefore highly productive. The large number of organisms present may render their waters cloudy. The hypolimnion of eutrophic lakes becomes depleted of oxygen in the summer. Cf. OLIGOTROPHIC, MESOTROPHIC, DYSTROPHIC. See EUTROPHICATION (1).

EUTROPHICATION. Enrichment of a water body, e.g. by the input of organic material or of nutrient rich surface runoff. Eutrophication leads to an increase in the growth of aquatic plants, and often to a deficiency of oxygen. In extreme cases this results in the death of most of the aquatic animals and macrophytes. See EUTROPHIC, OLIGOTROPHIC (1).

FEN. Peatland mainly fed by water that has been in contact with the mineral bedrock/substrate. See also MIRE.

FLOOD PLAIN. Relatively level part of a RIVER valley, adjacent to the river channel, formed from sediments deposited by the river during periods of flooding (1).

FLUVIAL. Pertaining to the actions of RIVERS (1).

FLUVIOGLACIAL DEPOSITS. OUTWASH deposits (1).

FOREST TUNDRA. The zone, several or sometimes many kilometers wide, of stunted forest mixed with lichens and grassland and, in favoured valleys, with stands of well-grown trees, beyond the limit of continuous TAIGA, but by definition incompatible with true TUNDRA, which begins strictly beyond the tree line, and not merely beyond the forest edge (2).

GLACIAL DRIFT. The sediments deposited directly by glaciers or indirectly in melt water streams, lakes or the sea (1).

GLEY. Sticky, organic-rich soil layer that develops on ground that is frequently or continuously saturated with water (1).

GNEISS. A coarse-grained banded metamorphic rock with alternating layers of dissimilar minerals (1).

HABITAT. (a) The sum of the physical and biological conditions in which an individual or population lives. (b) A unit area of environment with such conditions (7).

HOLLOWS. Shallow depressions in the mire surface filled with water or at least with moss and peat completely saturated. Such depressions are rarely more than a few meters across or more than a few decimeters deep (3). See HUMMOCK-HOLLOW COMPLEX.

HOLOCENE. Refers to the younger subdivision of the QUATERNARY in which we are living, the previous subdivision being the PLEISTOCENE. The Holocene, or Recent, is approximately the time since the last glaciation, or about the last 10,000 years. Holocene also refers to rocks deposited during this time. However, some climatologists propose that the present is merely another interglacial of the Pleistocene and that the use of the term Holocene is premature (1).

HUMMOCKS. Convex (positive) surface features of mire microrelief formed by energetic growth of sphagnum mosses, tussock-forming plants or tree stumps. See HUMMOCK-HOLLOW COMPLEX.
HUMMOCK RIDGE. Expanding hummocks joint into compound forms. Bog ridges have a width of 1-4 (up to 10) meters and may reach a length of 100 meters (3). See HUMMOCKS, HUMMOCK-HOLLOW COMPLEX.

HUMMOCK-HOLLOW COMPLEX. A mosaic of alternating hollows and hummock ridges, situated on gentle slopes of bogs, which forms on a certain phase of bog development. The regular orientation, width and intervals of hollows and hummock ridges are regulated by the water regime. See HUMMOCKS, HOLLOWS, HUMMOCK RIDGE.

HUMMOCK-HOLLOW-POOL COMPLEX. A HUMMOCK-HOLLOW COMPLEX, in which some hollows have developed into pools. See POOL, HUMMOCKS, HOLLOWS.

HYDROPHYTES. Plants adapted to moist or wet conditions (9).

INDIGENOUS SPECIES. Species native to a specific area or region (not introduced) (7).

INTERGLACIAL PERIOD. Period of retreat during an ice age (1).

KAME. A long, steep-sided ridge, formed by streams flowing between a glacier and the sides of its trough (1).

LACUSTRINE. Of, or pertaining to, LAKES.

LAGG. The fringe of a MIRE, originally simply drainage channel, but by extension the area of its influence, often distinguished from rest of mire by different water quality and growth of moisture-loving trees and shrubs, usually at scrub height (2).

LAKE. Natural body of standing fresh water arbitrarily defined as having over 100 ha of open water. Subject to wind turbulence and wave action on margins. If very deep (over 60 m) or deep (8-60 m), tends to have little marginal vegetation and to be OLIGOTROPHIC (infertile). If shallow, especially under 8 m, more favourable to AQUATIC VEGETATION and likely to be EUTROPHIC (fertile), sometimes to excess and involving algal proliferation. If more acid and shallow, especially in north, more akin to BOGS with fewer aquatic organisms, but much marginal vegetation, and classed as MESOTROPHIC or DYSTROPHIC. See also POOL (2).

MARSH. WETLAND area in which standing water does not usually cover the surface, apart from fringes of LAKES, RIVERS, and other water bodies. Usually excludes peatland (see MIRES) and is associated with mineral soil, coastal levels, and depressions in river basins, usually at low or moderate altitude. May be of any size, but often small (2).

MESOTROPHIC. Applied to freshwater bodies which contain moderate amounts of plant nutrients and are therefore moderately productive (1).

MIRE. An arbitrary redefinition by modern botanists of a colloquial country word, now used to cover all unbalanced ecosystems in which an excess of organic matter produced by plants is only partly decomposed and the residue deposited as organic soil, or peat. Mires are classified according to whether they are fed by water that has been in contact with the mineral bedrock/substrate, often bringing in adequate nutrients, or is derived from precipitation on them, and is accordingly poor in nutrients, with a low pH value; and transition types. In habitat terms the first group are FENS or FEN MIRES, which may be sloping or flat; in the latter case varying according to whether they are flooded permanently or for long or brief periods, giving rise to sedge, scrub, alder, or other vegetation, while some in the TUNDRA zone are permanently frozen at subsoil level (see PERMAFROST). The second group includes BLANKET, RAISED, and flat BOGS, coastal or upland, continental or oceanic. These are often called mosses in northern Britain. General words for mire from countries having land of the relevant type include veen (Dutch), Moor (German), myr (Swedish and Norwegian), myrî (Icelandic), suo (Finnish), boloto (Russian), soo (Estonian), tourbière (French) and muskeg (Indian word used in Canada) (2,4,6).
MIRE MASSIF. A continual contour of the land surface covered by a mire and not crossed by mineral land, a basic topographical unit of the mire landscape classification.

MIRE SYSTEM. Several mire massifs hydrologically linked with each other.

MORAINE. (a) Ground moraine. A relatively flat-topped deposit of boulder clay which is exposed after the retreat of a glacier or ice sheet (b) Terminal (end) moraine. A ridge-like accumulation of GLACIAL DRIFT (usually boulder clay) formed during a full in a glacial retreat (1). This term is also used to define a distinct landform fashioned by the direct action of glacier.

NATIONAL PARK. See PROTECTED NATURAL AREA.

NATURE MONUMENT. See PROTECTED NATURAL AREA.

NATURE PARK. See PROTECTED NATURAL AREA.

OLIGOTROPHIC. Applied to freshwater bodies which are poor in plant nutrients and are therefore unproductive. Their waters are clear, and do not become depleted of oxygen. A deep LAKE may be classed as oligotrophic despite being productive in its surface layers, if its hypolimnion is large enough never to become depleted of oxygen. Cf. EUTROPHIC, MESOTROPHIC, DYSTROPHIC (1).

OMBROGENOUS. Referring to MIRES: those in which the only source of water is from rainfall (9). See also BOG.

OUTWASH DEPOSITS. A stratified deposit of material eroded by glaciers and reworked by melt-water. Outwash deposits are also known as FLUVIOGLACIAL DEPOSITS, and are one component of GLACIAL DRIFT (1).

OUTWASH PLAIN. A body of outwash deposits which form a broad plain beyond the edge of their associated ground MORAINES (1).

OXBOW (LAKE). A LAKE or pond formed by a loop in a RIVER, which eventually becomes cut off by silt-banks from the river itself (9).

PALAEOZOIC. One of the eras of geological time, occurring between the Precambrian and the Mesozoic, and comprising the Cambrian, Ordovician, Silurian, Devonian, Carboniferous (replaced by the Mississippian and Pennsylvanian in North America) and Permian Periods. Palaeozoic also refers to the rocks formed during this time. The Lower Palaeozoic comprises the Cambrian, Ordovician and Silurian, and the Upper Palaeozoic comprises the Devonian, Carboniferous and Permian (1).

PALSAS. A mound of peat with a permanently frozen core. Palsas often reach 3 to 6 or even 7 m in height and may sometimes be hundreds of meters in diameter. They are confined to winter-cold areas where, however, PERMAFROST is not continuous (4).

PALSTRINE. Pertaining to, or inhabiting, MARSHES.

PEAT. Partly decomposed plant remains which accumulate in waterlogged soils, primarily because of lack of oxygen (9).

PERMAFROST. Permanently frozen subsoil, and hence the zone over which this condition persists. See also TUNDRA (2).

pH. Standard measure of acidity and alkalinity, e.g. in water and soil, taken in terms of the number (on inverse logarithmic scale) of hydrogen ions or positively charged hydrogen particles in a solution. A pH value of 7 indicates neutrality; higher values, up to 14, indicate alkalinity, and lower values acidity (2).

PLEISTOCENE. Refers to the older subdivision of the QUATERNARY. The Pleistocene, usually ranking as an epoch, was the time of the most recent glaciation, and is thought to have lasted from about 2 million years ago to about 10,000 years ago. Some climatologists consider we are still living in an interglacial period of the Pleistocene.
Pleistocene also refers to the rocks deposited during this time: these are called the Pleistocene Series (1).

PODZOL (PODSOL). An acid soil where aluminium and iron oxides and hydroxides have been leached from the upper layers and redeposited in the lower layers, leaving a surface of raw humus over an upper pale horizon and a denser, darker horizon beneath (1).

POLYGON. In topography, a unit of polygonally-patterned ground surface found in regions of PERMAFROST, and also in areas of alternating flooding and dessication, such as playas. Polygons vary from a few millimeters to several tens of meters in diameter, and have several modes of origin. Polygons in regions of permafrost grade into stone stripes on hill tops (1).

POLYGON(AL) MIRE. A mire characterized by wet hollows dominated by grasses, sedges and brown mosses, surrounded by dry ridges (about 0.3 m high and 0.5 m wide) forming POLIGONS, covered with sphagnum and brown mosses and dwarf shrubs. Every ridge is separated from others by deep fissures filled with water (4).

POOL. A natural body of standing fresh water with less than 100 ha of open water. See LAKE (2). Pools also occur in BOGS, being dammed up by HUMMOCK RIDGES, mainly developed from a HOLLOW due to changes in water level, erosion, frost action, eruption of methane and peat burning. These pools may be a few meters wide and a few meters deep.

POPULATION. All individuals of a species inhabiting a defined area (7).

PROTECTED NATURAL AREA. An area in which any uses are restricted or prohibited by law which are incompatible with the purposes for which it is being protected (7). The Law on Protected Areas, adopted by the Government of the Russian Federation on 15 February 1995, defines the following seven types of protected natural areas in Russia:

- **Strict nature reserves (zapovedniki)**, including BIOSPHERE NATURE RESERVES, for which the highest level of protection is provided. Their objective is to conserve biodiversity and to maintain protected ecosystems in a natural state, for ecological monitoring and research, education and training of personnel of conservation organizations. Within these areas it is prohibited to undertake any economic activity which may affect the development of natural processes, threaten the state of natural ecosystems and objects, or that are unrelated to the implementation of the reserves' objectives. Zapovedniki are managed by federal bodies such as the State Committee of the Russian Federation for Environmental Protection, Russian Academy of Sciences and universities;

- **National parks**, which are established in areas of special ecological, historical and aesthetic value and intended for use for environmental, recreational, educational, scientific and cultural activities. Various different activities may take place in these parks through a zoning system, determined by an individual Act for each park. Each national park operates on the basis of an individual regulation approved by the federal body which manages the park;

- **Nature parks** which are established according to the decision of regional authorities and their objective is to conserve natural landscapes and provide opportunities for outdoor recreation;

- **State nature reserves/sanctuaries/wildlife refuges (zakazniki)** where partial limitations on landuse are introduced to preserve natural ecosystems or their components. Zakazniki may be established at the federal or regional level and the responsibility is shared by the State Committee for Environmental Protection, regional, district and autonomous sectors and local committees. Zakazniki are numerous, more easily created than zapovedniki and national parks, and have more flexibility in terms of protection regimes;
- **Nature monuments** which are individually valuable natural objects, protected in order to maintain their natural condition. They may be established at the federal or regional level and are managed by the landowner of the protected area or in coordination with other persons;

- **Botanical gardens and parks**, which are intended for the biodiversity conservation by developing plant collections as well as for scientific and educational activities and may be established at the federal or regional level; and

- **Health resort areas**, which are protected to maintain natural resources and objects used for medicinal purposes (muds, mineral waters, beaches, microclimate, etc.).

**QUATERNARY.** Refers to geological time since the end of the Pliocene, i.e. to PLEISTOCENE and HOLOCENE time. Quaternary, which also refers to rocks formed during this time, is ranked as either an era, following the Cenozoic Era, or a Period of the Cenozoic Era, following the Tertiary Period (1).

**RAISED BOG.** A type of BOG which builds up above the level of the mineral groundwater influence (becoming convex in cross-section) in climates of high rainfall where drainage is impeded.

**RANGE (of a species).** That part of the biosphere within which a species of plant or animal occurs (7).

**RECHARGE.** Process of renewing underground water by infiltration during wet seasons (1).

**RIVER.** Major flowing watercourse, more than 5 m broad between banks, having either a single channel or multiple channels which may be braided into a network of interlaced STREAMS between wide banks of sand, earth or gravel. Seasonal flow fluctuates, even ceasing entirely for periods more or less extended and regular, leaving occasional standing waters. Where the banks are low there may be ancillary backwaters, OXBOWS, and other small WETLANDS, in a riverine zone (2).

**RUN-OFF.** Water from rain or snow that runs off the surface of the land and through STREAMS and RIVERS (1).

**STEPPE.** Extensive, usually treeless and often waterless, plains or gently sloping terrain of warm lower mid-latitudes in the continental Palearctic, which vegetation is commonly dominated by grasses or dwarf shrubs.

**STREAM.** Perennial watercourse, or one whose bed seasonally contains appreciable water, mostly or wholly below 5 m wide, having a sloping profile sufficient to produce flow but not to create chronic turbulence or rapids (2).

**SWAMP.** Differs from a MARSH in that its saturated surface is permanently, or at least throughout summer, below water level; nevertheless richly vegetated, typically with reed *Phragmites, Papyrus* or other dense-growing tall aquatic plants, and frequently with moisture-loving trees. Applicable in such conditions to MIRES as well as non-peatland habitats. May be very large (2).

**TAIGA.** Dense, predominantly coniferous forest, little disturbed or dissected and often containing swampy areas. Occupies the broad belt south of the TUNDRA in upper mid-latitudes; frequently buffered from it by the intermediate, more open and fragmented zone, sometimes quite broad, which is often referred to as wooded tundra or FOREST TUNDRA (2).

**TELMA (Project).** A Greek word for MIRE. The TELMA Project was launched under the aegis of UNESCO, IUCN, and IBP in 1967. The objective was to prepare a world list of peatland sites of international importance and to promote their conservation and study.

**TEMPERATE.** A mid-latitude climatic zone including Cool temperate and Warm temperate climates. In the western Palearctic, the humid cool temperate climate with a short cold
season (fewer than 6 months with mean temperature below 6°C) is confined to Britain, Ireland, and a band from North Spain through France, Belgium and the Netherlands to Scandinavia below about 62°N. An extended zone with a longer winter season covers most of remaining land between 40°N and 60°N except the Mediterranean coast and part of Russia between the Black Sea and southern Ural (2).

TUNDRA. Loosely associated, like the ARCTIC region, with the 10°C isotherm, north of which the mean temperature of the warmest month falls below that value and tree growth ceases to be possible. The zone of treeless TUNDRA within the western Palearctic is mainly between the Kara and White Seas north of the Arctic Circle, with small extensions along the Urals and the Murmansk coast, as well as on islands from Novaya Zemlya to Iceland. TUNDRA is mainly lowland area and near coasts of the Arctic Ocean; it contains a wide variety of vegetation types, all low-growing, and it typically conditioned by PERMAFROST (2).

WATERSHED. The higher ground separating adjoining CATCHMENT AREAS (equivalent to American ‘divide’) (7).

WETLAND. Generic term used broadly to cover all areas where water is the primary factor controlling the environment and the associated plant and animal life. They occur where the water table is at or near the surface of the land, or where the land is covered by shallow water. Under the Ramsar Convention (Article 1.1), wetlands are defined as ‘areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres’. In addition, the Convention (Article 2.1) provides that wetlands ‘may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands’ (8).

ZAKAZNIK. See PROTECTED NATURAL AREA.
ZAPOVEDNIK. See PROTECTED NATURAL AREA.

Abbreviations
IBP. The International Biological Programme
IUCN. The World Conservation Union
UNESCO. United Nations Educational, Scientific and Cultural Organization
USSR. The Union of Soviet Socialist Republics

References
