Information Sheet on Ramsar Wetlands (RIS)

1. Date this sheet was completed/updated: 12 March 2002

2. Country, region: Republic of Belarus, Belarusian Polesie

3. Name of wetland: Zvanets

4. Geographical coordinates: 52°05'N, 24°50'E

5. Elevation: 145-151 m above see level

6. Area: 15,873 ha

7. Overview

The described site is the largest European mesotrophic fen mire with numerous open mineral islands. Proliferation of carbonate soils defines unique characteristics of the site's landscapes, flora and fauna. Open fen mires absolutely dominate by area. Mineral islands of various size (0.2 to 10 ha) are scattered all over the mire. Forests and shrubs cover 34,000 ha and are mainly located on the mineral islands. Comparison of aerial photos dated 1950s and 1990s shows shrinkage of the open fen area and encroachment of shrubs and forests. Open waters are represented by a lake and a network of canals and ditches. The largest European population of the globally threatened Aquatic Warbler *Acrocephalus paludicola* breeds here. Large groups of other globally threatened and rare for Belarus animal and plant species occur on the site.

8. Wetland Type: (please circle the applicable codes for wetland types as listed in Annex I of the Explanatory Note and Guidelines document)

Marine-coastal:	A	B	C	D	E	F	G	H	I	J	K	Zk (a)
Inland:	L	***M***	N	***O***	P	Q	R	Sp	Ss	Tp	Ts	
	U	Va	Vt	***W***	***Xf***	Xp	Y	Zg	Zk (b)			
Human-made:	1	2	3	***4***	5	6	7	8	***9***	Zk (c)		

Please now rank these wetland types by listing them from the most to the least dominant: U, W, Xf, O, M, 4, 9

9. Ramsar Criteria: (please circle the applicable criteria; see point 12 below)

1 ***2*** ***3*** 4 5 6 7 8

Please specify the most significant criterion applicable to this site: 1, 2

10. Map of site included? yes

11. Name and address of the compiler of this form

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12. Justification of the criteria selected under point 9

The site is of international importance because it meets the following criteria:

Criterion 1
It is a particularly good representative example of sedge-*Hypnum* fen mires typical of the Polesie biogeographic district.

Criterion 2
The site is of international significance mainly because it support the globally threatened species: the Europe's biggest population of the Aquatic Warbler *Acrocephalus paludicola* (3000-6000 of singing males - 16% of the European population), at least 2 pairs of the Spotted Eagle *Aquilla clanga*, and more than 30 pairs of the Corncrake *Crex crex*.

Criterion 3
The site is a "hotspot" for conservation of biological diversity of Northeastern Europe biogeographic region. It supports particular elements of biological diversity (species, habitat types) of fen mires. The Zvanets mire contains a significant proportion of species adapted to special environmental condition (mesotrophic open fen mire). 29 plant species were discovered to be rare and disappearing within the district in question (Polesie). One of the identified species (*Silene lithuanica*) is included in the European Red List of Animals and Plants and is considered globally threatened. 10 vegetation communities formerly widespread across Polesian fen mires, now rare for Belarus and Europe, are found here. Bird species composition of Zvanets is not very rich but includes some typical fen mire species: Bittern *Botaurus stellaris,* Short-toed Eagle *Circaetus gallicus,* Lesser Spotted Eagle *Aquila pomarina,* Spotted Eagle *Aquila clanga*, Kestrel *Falco tinnunculus*, Hobby *Falco subbuteo*, Little Crake *Porzana parva*, Crane *Grus grus,* Curlew *Numenius arquata,* Scort-eared Owl *Asio flammeus*, Savi's Warbler *Locustella luscinioides,* Aquatic Warbler *Acrocephalus paludicola*, Penduline Tit *Remiz pendulinus*, Great Grey Shrike *Lanius excubitor*.

13. General location

The site is located in Drogichin and Kobrin Districts of Brest Oblast 17 km to south-east from Drogichin. The site borders on the Dnieper-Bug Canal (DBC) in the North, Belooziorsk Canal in the East, bypass canals of the Orekhov and Krasny Partizan collective farms' drainage systems in the South, Orekhov Canal in the West. The borders of the area have been identified and described.

14. Physical features:

Geology and geomorphology

The area in question is a lake alluvial plain, which is a marginal lake pit filled with alluvial sediment. It was formed obviously through erosion processes related to icy water flows generated by melting of the Rissian glacier. The resulting depression was getting filled with water. Gradually, with warming up of the climate, sedimentation of silty and sandy matter became a regular process here. Evolution of physical and geographical conditions, specifically outflow of water upon recession of the glacier combined with lower

erosion base level in the outflowing rivers, ultimately resulted in termination of the lake. The former lake was gradually getting filled with rich matter brought by rivers from the fluvioglacial plain, its size was shrinking and it continued its existence only as a waterlogged plain.

The ancient alluviolacustrine sediments, except where they underlye the modern peat sediments, come close to the mire surface. The deepness of these alluviolacustrine sediments varies from 1.1 to 14 m. These are mainly gray, dark-gray and yellow fine- and medium sands, often with a mixture of plant and/or shell remnants.

The Zvanets mire belongs to the group of vast fen mire of Polessian landscapes. The numerous large but shallow depressions of Polesie are normally under-laid by glaciofluvial sands, and since the groundwater table comes very close to the surface their active waterlogging started at some point in the past. Watterlogging and peat accumulation started in the deepest depressions, where a sapropel layer was present between the layer of peat and the under-lying mineral soils. These small lakes subsequently turned into *Hypnum* swamps with a relatively shallow *Hypnum*-peat layer. The *Hypnum*-peat layer eventually got over-laid by a 0.5 m deep reed peat, which in turn got topped up by a 35% decomposition degree sedge-reed peat.

The surface of the mire is uneven, mainly tussucky, with numerous mineral islands, protruding up to 1 m above mire surface. The eastern and southern parts of the mire represent an alteration of low-grade convex elevations and peaty depressions. In these parts the plain may be sometimes complicated by eolian matter, accumulation of which adds roughness to the relief in many parts.

Hydrography and hydrology

Zvanets mire is located in the interfluve of the Dniper-Bug Canal (DBC) and its tributaries, Belooziorsk and Orekhovo Canals. The main recharge source of the mire is underground water. Atmospheric recharge is significant only in autumn and spring.

The underground water regime is defined mainly by the climatic factors and surface streams and rivers. Deep confined aquifers in the river floodplains play a less important role. Owing to the lack of impervious strata the waters of the modern lacustrine and mire sediment layer are hydraulically well connected to the waters of the ancient alluvial sediments and fluvioglacial sediments dated to the recession of the Rissian glacier. The first aquifer is located very close to the surface on most of the site area. This leads to excessive watering of the lower parts, which in turn results in mire-formation processes and accumulation of peat. The water level fluctuates within +0.5 - -0.5 m.

The surface flow is directed both – to the east and to the west. The watershed line goes between villages Povitie and Golovchitsy. The Northern part of the mire is partly drained by DBC. The hydrological regime of the area is also influenced by amelioration polder systems.

Almost annually the summer and fall no-flood period is interrupted by rainfall floods. The height and duration of summer floods are significantly lower than the same parameters of the spring floods. However, in some years (1984, 1993) the summer rain flood water levels surpass those of the spring melt floods.

In especially dry years the groundwater table can drop up to 0.5 below surface. As was noted above the hydrological regime of the mire is influence by amelioration polder systems and the drainage canals and ditches. Their exploitation defines the groundwater table on the mire. Incorrect operation of the polders and drainage canals often results in unexpected inundations, draughts, and catastrophic fires on the site incurring large damages to the biological diversity.

Climate

The area in question is located within the Brest Region. It is typified by a temperate wet climate with a short mild winter and mesothermal long summer. The annual average temperature for a multiannual period is $+6.5^0$C. The average temperature for January is -5.1^0C, for July: $+18.3^0$C. The absolute minimum air temperature is -38^0C and the all-time high air temperature is 36^0C. The warm period (with positive temperatures) is longer than in other areas of the country and normally lasts for 250-252 days. The cold period (with negative temperatures) usually starts in late November and lasts up to the 20s of March. The catchment area is characterized by frequent and long (45 days) thaws.

On average 777 mm of precipitation fall per annum on site. Rainfall is highest in the warm season. Some years are characterized by drastic fluctuations from the annual average data recorded over a multiannual period. The range of fluctuations varies from 50 to 150%. Over the year, the minimal monthly precipitation has been observed from January to March, and the maximal from July to August

Soil cover

Most of the Zvanets mire was not subject to soil monitoring. However, building on the survey of composition and condition of soil of the neighboring areas, as well as areas formerly (before transfer to the reserve) exploited by agricultural enterprises the following general conclusions can be drawn:

- The site is dominated by mire-formation processes, although the structure of the soil cover is very diverse and non-uniform (in terms of genetics, waterlogging, texture, etc.). Territorial distribution of soils is extremely mosaic.
- Fen mire soils dominate on the site. Peaty and peat-gley soils, as well as peat-mire low-capacity soils (peat layer of 0.5-1.0 m) dominate along the margins. Central part of the site is dominated by moderately deep and deep peat mire soils (peat layer exceeding 1 m).
- Mineral waterlogged gley and gleyish soils develop mainly on the numerous islands amidst the mire. Some of the islands are pretty large (up to 30-40 ha). These soil types are practically all calcareous soils characterized by high fertility level. They are pretty diverse in terms of texture (sands, sandy loams, loams) and underlying rocks (ranging from loose sands to moraine loams).

15. Hydrological values

The Zvanets mire is a typical example of a watershed-located sedge-*Hypnum* fen mire of the Belarusian Polesie, still remaining in a close-to-natural state. The site was a part of the formerly existing *Golovshchitskoie mire*. Zvanets was the eastern outskirts of that vast waterlogged complex of areas located in between the Osinovka, the Mukhavets, the Pina, and the Pripyat rivers. After 1960-80 drainage campaigns most fens were transformed into agrophytocenoses. Only six large fens were left in natural state in Europe. Zvanets is the largest of them.

The watershed location of the mire protects the hydrological regime and water quality from deviations from their natural norms. Zvanets can therefore be considered as a reference site. Open sedge fen parts of the mire are natural habitats for many species under minimal anthropogenic load. They can serve as reference mires in planning for management of fens, as well as for rehabilitation of wetlands.

Site Zvanets is located on the watershed of two river basins it has high water conservation and hydrology-regulating value for the region.

16. Ecological features

The total area of the potential Ramsar site Zvanets is 15,873 ha. Open fens are absolute dominants by area, 11,150 ha. The area of forests and shrubs, which are mainly found on the mineral islands, is 2,575 ha. Open (non-forested) mineral islands cover 2,089 ha.

Depending on the landscape features, geographic location, level and type of anthropogenic load the area can be divided into several parts: the western part, the central and the southern part together, the northern and the eastern parts.

The western part is characterized by abundance of mineral islands with alternating small open or partially overgrown with shrubs sedge fen mires. The islands are characterized by high degree of transformation; arable farming is very frequent on the islands. Broad-leaved forests are narrow strips located long the slopes.

The central and southern parts of the mire are dominated by open fen mires with shrubs covering about 10-30%. Mineral islands are scattered all over the mire complex, but their area is small (0.2 to 1 ha). Mineral islands in this part of the mire are the least transformed and are used by people only as hay-making fields. These small mineral islands are used by a number of rare bird species for nesting.

Mineral islands dominate by area in the eastern part of the site. Natural forest vegetation here forms narrow strips along the slopes of the islands. Most of the island area is used for arable farming by local population, mainly to grow potatoes. Fen mires located between the islands have severely overgrown with shrubs.

The Northern part of the site is greatly impacted by the presence of the DBC. The share of open fens here is the lowest. Willow shrub proportion is the highest here, the area being strongly waterlogged. Lower islands give rise to *Pubescenso–Betuletum Caricosum*, higher areas are covered by fragmented nemoral vegetation. Most of the islands in this part is used for hay-making, although in the past they were all plowed. The eastern part contains the largest island, i.e. the Zvanets Island.

Open water surfaces are represented by a lake and a network of canal and ditches. Zalesskoie Lake became very shallow following drainage of the adjacent territories. Over the last 15 years it has turned into a dystrophic water body, completely overgrown with Water Soldier *Stratiotes aloides*.

17. Noteworthy flora

644 upper plant species occur on the site.

Flora of strongly and moderately waterlogged areas of the Zvanets mire with constant or prolonged (more than 2 months) water level at 10-50 cm above soil is characterized by a small list of flowering plants. No rare or protected species are to be found in this group. The most common plants are *Carex elata, Carex lasiocarpa, Carex appropinquata, Phragmites australis, Carex juncella, Utricularia minor, Equisetum fluviatile, Utricularia vulgaris, Ranunculus lingua, Menianthes trifoliata, Calamagrostis canescens, Comarum palustre, Epilobium palustris, Galium uliginosum, Eriophorum angustifolium, Sparganium minimum, Naumburgia thyrsiflora, Salix aurita, Salix rosmarinifolia, Salix lapponum, Salix pentandra*. Less waterlogged areas give shelter to *Calamagrostis neglecta, Carex disticha, Betula pubescens, Salix myrsinifolia, Carex acutiformis, Carex nigra, Carex vesicaria, Thelipteris palustris, Caltha palustris, Agrostis stolonifera, Cardamine pratensis* (32 higher vascular plant species have been discovered altogether in the extremely waterlogged ecotopes).

The situation at mineral islands and ecotone parts between the mire and the islands is very different. The mineral islands are indeed islands of rich and sometimes unique flora amongst the monotonous mire vegetation.
The species diversity of the mineral islands is 3-10 times higher than the species diversity of the mire tracts. Preservation of the unique flora of the mineral islands is to a large extent dependent on the conservation of the open mire: any changes in the hydrological regime on the latter cause rapid simplification of the floristic composition and falling out of a number of species.

Quite a big group of plants among those recorded in Zvanets belongs to the category of rare and/or protected. 23 species belong to categories I-IV of the National Red Data Book (Red Data Book of Belarus, 1993):

Cypripedium calceolus, *Dentaria bulbifera, Pimpinella major, Gentiana cruciata, Iris sibirica, Listera ovata, Equisetum variegatum*, *Nymphaea alba, Allium ursinum, Dactylorhiza majalis, Gladiolus imbricatus, Carex flacca, C. umbrosa, C. davalliana, Cucubalus baccifer, Dianthus carthusianorum, Salix myrtilloides, Pedicularis sceptrum-carolinum, Gymnadenia conopsea, Lythospermum officinale, Hypericum tetrapterum, Siline lithuanica, Tofieldia calyculata, Saxifraga hirculus*. Some of the plants are included in the so-called list of plants for preventive protection and rational use according to the Red Data Book of Belarus. There are 14 such species altogether. 29 species were discovered to be rare and disappearing within the district in question (Polesie). One of the identified species (*Silene lithuanica*) is included in the European Red List of Animals and Plants and is considered globally threatened. Thus, 67 of the higher vascular plants identified on the site require various forms of protection. This is one tenth of the overall number of plants occurring on the site, which indicates of high nature-conservation value of the site.

18. Noteworthy fauna

The fauna of the site is defined by the presence of the following habitat types: open sedge fens, high surface water vegetation, waterlogged shrub stands, open and forested mineral islands, rivers, streams, canals, ditches, standing water reservoirs.

The vertebrate fauna of the site is characterized by high diversity and includes 29 mammal, 125 bird, 5 reptile and 9 amphibian species.

Mammals

29 mammal species have been recorded on the Zvanets mire, including two National Red Data Book species (Badger *Meles meles*, Lynx *Felis linx*). The "typical numerous" category includes *Sorex araneus*, *Sorex minutus*, *Neomys fodiens, Mustela erminea, Arvicola terrestris, Microtus oeconomus*, *Micromys minutus* and *Apodemus agrarius*. The "typical few" category includes *Neomys anomalis, Vulpes vulpes*, *Nyctereutes procyonoides*, *Mustela putorius*, *Mustela vison*, *Mustela nivalis*, *Clethrionomys glareolis*, *Microtus arvalis*, *Sus scrofa*, *Capreolus capreolus*, *Alces alces*. The visiting category includes *Talpa europaea, Canis lupus, Martes martes*, *Martes foina*, *Meles meles, Felis linx, Lepus europaeus, Cervus elaphus.*

Birds

The species composition of birds of the Zvanets potential Ramsar site includes 125 species, 110 of which are breeding species. 21 species is entered in the Red Data Book of Belarus: Little Grebe *Tachibaptus ruficollis*, Bittern *Botaurus stellaris,* Great Egret *Egretta alba*, Black Stork *Ciconia nigra*, White-tailed Eagle *Haliaeetus albicilla*, Short-toed Eagle *Circaetus gallicus,* Lesser Spotted Eagle *Aquila pomarina,* Spotted Eagle *Aquila clanga*, Kestrel *Falco tinnunculus*, Hobby *Falco subbuteo*, Little Crake *Porzana parva*, Crane *Grus grus,* Curlew *Numenius arquata,* Eagle Owl *Bubo bubo*, Scort-eared Owl *Asio flammeus*, Kingfisher *Alcedo atthis,* Bluethroat *Luscinia svecica*, Savi's Warbler *Locustella luscinioides,* Aquatic Warbler *Acrocephalus paludicola*, Penduline Tit *Remiz pendulinus*, Great Grey Shrike *Lanius excubitor*.

The site is of international significance mainly because it support the globally threatened species: the Europe's biggest population of the Aquatic Warbler (3000-6000 of singing males), at least 2 pairs of the Spotted Eagle, and more than 30 pairs of the Corncrake *Crex crex*. It also supports the number of rare species breeding on fen sedge mires once widespread across Europe, but now disappearing: Bittern (50-300 males), Montagu's Harrier *Circus pygargus* (10-20 pairs), Spotted Crake *Porzana porzana* (1000–4000 pairs), Curlew (50-100 pairs), Short-eared Owl (100-200 pairs).

Amphibians and reptiles

9 amphibian and 5 reptile species have been registered at the Zvanets mire. Open fen mires are dominated by *Rana arvalis. Emys orbicularis* (a protected species for Belarus) has been registered in canals on the Zvanets mire and on adjacent areas.

Fishes

27 fish species are found in the waters of the site and its adjacent areas. Most of them are traditional for Belarus lake and river species found in most rivers and lakes of Belarus.

Arthropods

728 species of *Arthropods* were found on the territory, including 14 National Red Data Book species: *Calopteryx splendens, Sympetrum pedemontanum* (*Odonata*), *Noterus lutea* (*Hemiptera*), *Carabus nitens C. menetriesi, C. violaceus, Dytiscus latissimus, Liocola marmorata* (*Coleoptera*), *Papilio machaon, Apatura iris, Parnasius mnemosyne, Polyommatus daphnis* (*Lepidoptera*), *Bombus schrenkii, Bombus muscorum* (*Hymenoptera*). Additionally, 5 species of the European Red List of Animals and Plants (IUCN) were found on the mire: *Aeschna viridis* (*Odonata*), *Graphoderes bilineatus (Coleoptera), Euphydryas maturna, Licaena dispar, Carterocephalus palaemon (Lepidoptera).*

The following species were found on the mire for the first time in Belarus: *Aranea: Argiope bruennichi*; dragonflies: *Orthetrum albistylum* and *Anax parthenope*; *Coleoptera*: *Zygaena achilleae*, *Z. ephialtes, Polyommatus elena, Idaea cararia*.

214 hydrobionts were found in the waters of the site, belonging to the following classes: *Hydrozoa* – 1 species; *Turbellaria* - 1; *Oligochaeta*– 2; *Hirudinea* – 3; *Phylactolaemata* – 1; *Arachnoidea* – 44; *Crustacea* – 2; *Insecta* – 160 species. 3 species are listed in the National Red Data Book of Belarus, 3 are in the European Red List of IUCN; 27 were found for the first time in Belarus; 12 are rare not only for Belarus, but for the whole Europe (*Caenis lactea*; *Gerris sphagnetorum*; *Laccornis oblongus*; *Hydroporus brevis*; *Hydroporus notatus*; *Eylais bisinuosa*; *Eylais glubokensis*; *Eylais mutila*; *Hydryphantes crassipalpis*; *Arrenurus compactus*; *Arrenurus nodosus)*.

19. Social and cultural values

There are no archeological, cultural, historic or any other protected monuments on the territory of the site. The Dnieper-Bug Canal (DBC) and the Belooziorsk Canal, however, represent certain historic value.

The DBC was constructed in 1775-1783, the Belooziorks Canal in 1905-1910. Ancient embanking facilities from oak, and parts of old sluices have remained on some parts of the canals. These are examples of hydrotechnical facilities dated late 19 – early 20th century.

Some of the existing economic activities are also a part of the traditional culture. Up to late 1950s there were many so-called one-house villages on mineral islands in the western and southern part of the now protected area. At present there are practically no such villages on the site, but arable farming on mineral islands for domestic purposes is still practiced by the inheritors of the former land-owners. Horticulture is another traditional type of economic activities. Bee-houses were mounted on large ancient oaks, the latter presenting significant historic, esthetic, and scientific value.

Historic and ethnographic sites are also found in close vicinity of the potential Ramsar site. Galik village is located on the northern border of the protected area. In 1942 during World War 2 it was burned down. A small obelisk in the memory of the victims was mounted in the center of the restored village. Yamnik village, especially its southern part has retained almost all historic features typical for the Polesie region.

Reed-roofs, traditional hedges, shadoofs are nicely matched by nests of white storks on old trees and house roofs.

20. Land tenure/ownership

On the site

The site is owned by the state. The land is leased to Karl Marx and Krasny Partizan collective farms (Drogichin District). Other land-users in Drogichin District are Golovtchitsy and Radostovo village councils, and Kobrin forest district; in Kobrin District it is Kirov collective farm. A large part of the site's lands is included in the reserve fund of Drogichin and Kobrin executive committees.

On the adjacent areas

These are all state-owned lands under lease to collective farms and forestries.

21. Current land use

On the site

Collective farms and village councils manage 278 ha of the site (1.7% of the overall area of the site). Arable farming is conducted on 94 ha, 36 ha are used for hay-making, 149 ha for cattle pasturing. Theoretically, agricultural lands, including the reserve fund lands, amount to about 10% of the mire area. The main types of land-use on the territory are hay-cutting and cattle pasturing.

Mineral islands are partially used by the local population for plowing and subsequent growing of arable crops, mainly potatoes. The western part of the mire is used most intensively. This part has not yet been included in the protected area. The eastern part of the mire adjoining the Belooziorsk Canal is also used quite intensely

Forested area amounts to 2,654 ha, which is 16.7% of the total area of the site. Forest organization activities have been carried out only on 278 ha: these are quarters 1 forest group forests categorized as "Water conservation zone forests", comprising quarters 48-51 of Antopol forestry, Kobrin forest district. The rest of the forests have not been organized and belong to the so-called "reserve fund" category.

The area of the mire is also used as a large reservoir to store water pumped out of the ameliorated (poldered) areas in rainy periods and supply water for drained tracts during dry periods. Large canals are used by local population for non-commercial fishing.

The area of the site includes the Veliky Les peat deposit. Zalesskoie Lake, rich in sapropel, is also located here, but extraction of sapropel is not planned for the future.

Horticulture has always been popular among local population and the traditions of this household craft are still alive here.

On the adjacent areas

The economy of the ameliorated areas adjoining the site is based on agricultural activities (growing of perennial crops, arable and grain crops) although the physical features of the area (soil type, climate) are unfavorable for high-income agriculture. The low quality of agricultural production is explained by mosaic alteration of various soils, rough microrelief, unfavorable water regime, presence of carbonate layers, as well as by the fact that the peat layer on the ameliorated areas before amelioration was not deep, varying form 0 to 1 m. Exploitation of soils during agricultural activities was accompanied by mixing peat with sand,

contributing to a decline in the quality of lands. Currently large portions of ameliorated areas are not used in agriculture due to their poor quality or natural reinstallation of wetlands.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects

On the site

- *Disruptions changes in the hydrological regime of the mire.* This is evidenced in either elevated or declined groundwater table. The main cause of disruptions in the hydrological regime of the mire is lack of coordination of the rules and procedures for exploitation of the DBC with the need for conservation of the Zvanets mire.
- *Speeding up of vegetation successions*. Steady increases or declines of the groundwater table as a results of disruptions in the hydrological regime lead to replacement of plant associations. . Mire tracts with an elevated groundwater table have higher projective coverage of reeds, and this results in changes in the species composition of plants and animals. The tracts with a lowered groundwater table (especially closer to the boundaries of the mire) are characterized by encroachment of shrubs and forests.
- *Fires*. This is the most dangerous ecological threat for the whole mire. Fires on the mire are mainly caused by the unsanctioned agricultural burning of vegetation practiced to improve the quality of grass-stands. Fires are especially dangerous in years when the groundwater table falls below the soil surface. In such years, all of the mire biodiversity is damaged.
- *Changes in economic activities*. Recent decades have seen a rapid decline in the amount of haymaking on the mire. Some 20 years ago, about 70% of the mire was hay-cut by the local population. . Today less than 10% of the mire are cut: most hay-making is now performed on more accessible fields which emerged as a result of drainage. Hence, many mire tracts get overgrown with shrubs and reeds. Over the last several decades open fen area has shrunk by 4.55%, while the area of forests and shrubs has increased by 6.9% for the same period.
- *Disturbance factor*. Numbers of some of the rare bird species (Spotted Eagle, Curlew, Short-eared Owl) are limited due to disturbance during nesting. Frequent visits of local inhabitants to the mineral islands (seeking secluded places for illegal brewing of moonshine, land plowing and forest logging) prevent these rare birds from nesting.
- *Land plowing*. Land plowing on mineral islands presents a serious threat to floristic diversity. This type of economic activity brings about fires, biological and technogenic pollution, leading to the irreversible loss of forests on lands used for plowing (neither natural nor artificial restoration is possible).
- *Forest logging.* The islands were formerly occupied by nemoral oak forests, which created a positive environment for a number of rare plants and served as breeding sites for many birds of prey. Nowadays, the islands have retained only scattered fragments of those forests. Forest logging continues to negatively impact the mire because most of the mire's forests are under jurisdiction of agricultural enterprises, which use forests without limitations, that would be impossible if the forests, for example, were under the jurisdiction of forestries. Most damaging in terms of ecology is the logging of oak and its satellites (lime, elm, maple).
- *Biological pollution.* This is present on all mineral islands amidst the mire and in many of the forests in the north of the site. This is in most cases related to the dissemination of weeds and forest-steppe species imported from numerous agricultural fields and pastures located of the mineral islands. This presents a threat to local flora. Quarter 48 of the Antopol forestry of Kobrin Forest District has in its composition a phytocenotically active and fast-growing tree species, Northern Red Oak *Quercus rubra*, introduced here some years ago. This species subdues young undergrowth and leads to degradation of grass cover.
- *Absence of inventory and forest management plan*. For most forests (except quarters 48-51 of Antopol Forestry of the Kobrin Forest District), this presents a serious barrier to the efficient protection and management.
- *Poaching*. This activity results in declined biological diversity, especially among huntable species. As a result, numbers of key huntable animals (Elk, Wild Boar, Roe) are sometimes far below the biological capacity of the site.
- *Use of poisonous seeds*. The use of poisonous seeds on fields adjoining the site has frequently resulted in mass killing of black grouses, partridges and cranes, the latter species being a nationally protected one..

On the adjacent areas

- *Withdrawal of water from the Pripyat to supply water for the watershed pool of the DBC.* In order to maintain the water in the DBC at a level suitable for navigation and to observe the sluice operation procedures withdrawal of water from the Pripyat is practiced, with subsequent supply of the water via the Belooziorks Canal. Fluctuations of the water level in the Canal influence the hydrological regime of the mire. Observational data indicate, however, relatively insignificant fluctuations in the water level during the navigation period in the past years, which is connected with a decrease in the amount of water being re-directed from the Pripyat following declines in the amount of commercial shipping practiced at the DBC.
- *Exploitation of the adjacent amelioration systems*. The amelioration systems are all drainage polder-type systems, i.e. they are separated from the external catchment by embankments. Excess water is pumped out of the polders by pump stations and is supplied to tail-water ditches (escape ditches) which form the southern boundary of the Zvanets mire. When in operation, the pump stations of these systems lead to the excessive waterlogging of the mire. Since there are no embankments on the mire side, the under-flooding may be significant. Dry years are characterized by the opposite situation: pump stations supply water from the mire into the respective polder systems leading to a catastrophic decline of the groundwater table in the mire, ultimately resulting in huge fires.
- *Climate change.* Changes in the amount of winter precipitation in the last years have resulted in years with either no spring flood or – the opposite – with a very high spring flood. Summer rainfall floods have also become more frequent. Absence of flood or prolonged inundation of the floodplain during the vegetation season results in serious changes in the "operational mechanics" of the mire ecosystem, exemplified by temporary replacements of vegetation associations, changes in species composition distribution and density of birds, flooding of nests and as a result mass killing of nestlings.
- *Operations of the Novosiolki fish-farm.* The Novosiolki fish-farm is located in the northern part of the mire. It is supplied from the DBC, but the recharge is also partly carried out with water pumped out of the mire.

23. Conservation measures taken

The Zvanets National Biological Zakaznik (10,460 ha) was established 11 April 1996 by the Council of Ministers' Decree # 257.

Active scientific research which was carried out on the site afterwards allowed to identify micropopulations of a number of animal and plant species on the site, as well as on adjacent areas, that are rare and/or protected in Belarus and Europe.

In 1998, an Important Bird Area called "Zvanets" was established with an area (at that time) of 15,000. In 2001 the area and the boundaries of the IBA were completely clarified. The area of the Zvanets IBA, which is also potential Ramsar site at the moment, is 15,873 ha.

Today, the site is on all sides surrounded by ameliorative drainage systems. Wetland areas around the site were drained and plowed. Drainage of lands around the site has resulted in disturbances of the natural hydrological regime of the mire itself: the groundwater table has dropped and shrub encroachment has started leading to degradation of open fens. Vast areas of open sedge fens got overgrown with shrubs. Up to recently a big part of the mire in Kobrin district, which is outside the borders of the zakaznik but directly linked to it, was under threat of drainage. If the drainage took place, most of the site would quickly turn into a degraded land following irreversible changes in the hydrological regime.

The problems pertaining to the site could hardly be resolved through designation of an IBA status to the site alone. A need to expand the boundaries of the zakaznik to coincide with those of the IBA and potential Ramsar site, as well as for reforming the biological zakaznik into a landscape zakaznik, was identified and

raised by the scientists. In 2001 a scientific paper for extension of the zakaznik and review of its status was developed by the National Academy of Sciences and submitted to the Government for approval.

The Provision on Zvanets National Biological zakaznik prohibits the following activities on the territory of the site:

- activities that entail landscape and hydrology alteration, as well as damage to the soil cover (excluding agricultural land-use); application of pesticides for plant protection; cattle pasturing in forests; discharge of raw or inadequately purified liquid and solid municipal and industrial wastes into the waters of the site; construction of tourist camps; breaking up fires in places not specifically assigned for that purpose.
- Clear felling on all territory of the zakaznik; thinning logging in especially valuable parts of Antopol forestry of Kobrin Forest District;

The following activities can be carried out on the territory of the zakaznik in accordance with the national legislation, upon sanction from the Ministry of Natural Resources and Environmental Protection of Belarus and the Ministry of Architecture of Belarus: construction of recreation sites, buildings and other facilities; power lines, roads, pipelines and other engineering facilities; mining of common minerals for economic use.

The protection regime of the Zvanets National Biological zakaznik should be taken into account in elaboration and review of land-use plans for Drogichin and Kobrin districts, development plan for Kobrin Forest District State Enterprise, as well as physical plans of corresponding dwellings.

Establishment of Zvanets National Biological zakaznik does not entail withdrawal of lands from land-users. The land-users are in turn obligated to follow the established regime.

Operational management of the zakaznik is delegated to Drogichin and Kobrin executive councils. Together with nature-conservation agencies they should ensure respective and efficient protection of the site.

People and organizations violating the established regime of the zakaznik will be prosecuted in accordance with the legislation of the Republic of Belarus.

Damage done to the zakaznik is compensated by persons and organizations found guilty to the amount established in accordance with the national legislation of the Republic of Belarus.

24. Conservation measures proposed but not yet implemented

In 2001 a management plan for the Zvanets IBA was elaborated in the framework of an international project "Management Planning for Key Fen Mire Biodiversity in Belarus" funded by the Darwin Initiative for Survival of Species (UK), Royal Society for the Protection of Birds (RSPB, UK), UNDP. The project was implemented by National NGO Bird Conservation Belarus – partner of BirdLife International, in cooperation with the Ministry of Natural Resources and Environmental Protection of Belarus, UNDP, RSPB, and the National Academy of Sciences of Belarus.
The management plan is now in stage of it's official approvement by Ministry of Nature Resourses and other organizations. Project on implementation of urgent measures for stabilization of hydrological regime of the mire indicated in the management plan is prepared.

The management plan envisages the following actions for protection and management of the site:

- Introduce management of the hydrological regime of the Zvanets mire to attain sustainable functioning of the wetland and maintenance of an optimal groundwater level on the mire that would enable conservation of the fen and its biodiversity while at the same time taking into account the interests of the various land-users. This will require:
    - review of operational rules for the drainage systems
    - engineering planning and subsequent construction of water-regulating facilities
    - considering feasibility for a cross-border Belarus-Ukraine Agreement on regulation of the DBC system

- Elaborate a plan of area organization for the Zvanets mire that would optimize various land-uses and serve as an economic, ecological, and legal basis for limiting arable farming on the site and unsanctioned logging on the mineral islands.
- Establish a conservation zone along the periphery of the site. Elaborate a plan and recommendations for nature-friendly economy within the borders of the zone.
- Establish biodiversity-friendly forestry on the territory of the site. This will require special forest-organization activities, including compilation of a complete inventory of the forests, preparation of a draft Provision on organization and carrying out of forestry activities on the territory.
- Establish a hunting unit for the the site to ensure protection and rational use of huntable resources
- Elaborate plans for regulated and orderly ecological tourism building on the plan of area organization. The ecotourism plans would include: development of tourist routes on the site and adjacent areas in such a manner that would allow to prevent unregulated visits of people around the site contributing significantly to a disturbance factor; introduction of infrastructure for development of regulated ecological tourism.
- Stabilize succession processes, "fixing" them at the sedge stage of mire development, through regulation of the groundwater table and artificial limiting of reeds proliferation.
- Organize ecological education of local population in order to raise their awareness of the biodiversity values of the Zvanets mire.
- Establish a system for monitoring of water levels and quality on and around the mire, as well as monitoring of flora, vegetation communities, habitat distribution, populations of key birds (Aquatic Warbler and other species), entomological fauna. This will ensure continuous evaluation of mire ecosystems and contribute to reviewing the management plans in the future.

25. Current scientific research and facilities

The first integrated scientific survey of the Zvanets mire complex was undertaken in the 1950s during the inventory of the peat sites. In 1996, a description of the flora and fauna of the Zvanets mire was for the first time done as part of the work to prepare the scientific background for establishment of the Zvanets National Biological Zakaznik.

Since 1945, the water level has been studied by the Upper Dnieper – Bug Branch of the river transport administration based on measurements done in the cross-sections of the hydro-technical facilities functioning in the area. In 1978 Goskomgidromet of Belarus (State Committee on Hydrology and Meteorology) started to study the water flow parameters of the Belooziorks and Orekhovo canals.

In 1997 – 1998 a study of the distribution and ecology of the Aquatic Warbler in Belarus was carried out, assisted by the Michel Otto Foundation (Germany) and the Royal Society for the Protection of Birds (UK). The study discovered that the Zvanets mire supports the world's largest populations of this bird. and its outcome clearly indicated a need for a Management Plan for this area.

In 1997, a permanent monitoring plot was established in the southern part of Zvanets, enabling annual studies of the dynamics of the mire flora and fauna. This monitoring plot was included in the 'National List of Sites' established for the monitoring of the fauna and vegetation of Belarus.

In 2001 – 2002 a number of projects on study and description of Zvanets as a Ramsar site were implemented with financial support of OMPO (France), e.g. *Number and Distribution of Snipe and Great Snipe; Social and Cultural Value of the Site; Study of Possibilities for Recreation and Tourism at the Site*.

Being one of the largest near-natural fen mires of Europe, the site presents an enormous potential for scientific research of the ecosystems of fen mesotrophic mires, as well as for the training of specialists in this area.

26. Current conservation education

On of the key conclusions of the 1st International Conference on Conservation and floodplains and lowland mires of Polesie in 1997 was a need for active awareness raising campaigns among local people. Ecological education started on the Zvanets mire with implementation of the project "Management Planning for Key Fen Mire Biodiversity in Belarus". The value of the site was communicated to local people through national and local media. Establishment of an information center affiliated with one of the schools in Drogichin district is envisaged by the management plan for the Zvanets mire.

At the moment National Union Bird Conservation Belarus together with the Ministry of Natural Resources and Environmental Protection of Belarus are working on production of pocket guides, calendars, for Zvanets, Sporovo, and Dikoie IBAs. Calendars, posters, postcards about the Zvanets mire will be produced as part of management plan implementation.

27. Current recreation and tourism

The main form of recreation before establishment of a biological zakaznik in 1996 was hunting and amateur fishing. A special hunting house was constructed on Zvanets for visitors, with an improved road leading to the house. The house had electricity, telephone connection, other elements of infrastructure were put in place and functioning. However, hunting was prohibited with establishment of the zakaznik. The hunting house is no longer used, the infrastructure is getting old.

There were almost no other forms of tourism and recreation on the territory of the site. However, the high scientific, landscape and biological value of the mire for the country, as well as for Europe, imply that ecological and scientific tourism would be successful developments. Thus, from 1995 to 2000 several international scientific expeditions and two foreign tourist groups visited the site. It is therefore necessary to develop in agreement with local land-users zones for recreation and build the necessary tourist infrastructure, including car parking lots.

Restoration of the hunting unit for the territory is recommended for resolving the poaching problem and support to the still existing hunting infrastructure. This should certainly be done in accordance with the protection regime and with due account of the ecological and modern hunting norms.

28. Jurisdiction

a)territorial jurisdiction: Drogichin and Kobrin district executive committees

b) functional jurisdiction:
Brest Oblast Committee of Natural Resources and Environmental Protection, Ul. Malaia 3, 224013 Brest, Belarus

Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, Ul. Kollektorknaia 10, 220048 Minsk, Belarus

29. Management authority

The lands of the Zvanets National Biological zakaznik fall under the jurisdiction of the Drogichin and Kobrin district executive committees. The main structure supervising the established nature-conservation regime on the territory of the site on behalf of the Ministry of Natural Resources and Environmental Protection is Drogichin district inspection of nature resources and environmental protection, staffed with 3 persons. With the supervisory function delegated for the whole Drogichin district, the Inspection can devote only 5 % of their time to the Zvanets zakaznik, which clearly indicates of a need for a separate management

unit. Address of Drogichin district inspection of nature resources and environmental protection is: Lenina street, 83, Drogichin 225830, Belarus

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Annex I

Table 1. Expert estimate of numbers of regularly breeding and rare bird species on Zvanets mire

Species	National Red Data Book Category	Annex of Bern Convention	Type of occurrence	Estimated numbers, pairs (min-max)*	% of the overall Belarusian population of the species
Botaurus stellaris	II	II	B	50-300 males	5
Egretta alba	III		P	50-200 birds	
Haliaeetus albicilla	I	II	B	1	2
Circaetus gallicus	I	II	B	1	0.2
Circus cyaneus		II	B	5-10	2
Circus pygargus		II	B	10-20	1.7
Aquila pomarina	III	II	B	3-4	0.1
Aquila clanga	I	II	B	1-2	5
Falco subbuteo	III		B	2	0.07
Rallus aquaticus			B	500-2000	6

Porzana porzana		II	B	1000-4000	4
Crex crex		II	B	50-100 males	0.2
Grus grus	II	II	B	50-100	6
Gallinago gallinago			B	500-1000	0.7
Gallinago media		II	B	5	0.25
Numenius arquata	II	III	B	50-100	5
Tringa totanus		III	B	10-20	0.025
Bubo bubo	I	II	B	15	6
Asio flammeus	II	II	B	100-200	20
Luscinia svecica	III		B	50	1
Locustella naevia		II	B	100-200	0.8
Locustella luscinioides	IV	II	B	1500-3000	25
Acrocephalus paludicola	IV	II	B	3000-6000 males	50
Acrocephalus schoenobaenus		II	B	5000-8000	0.8

Abbreviations:
B – regular breeding species;
R – breeding resident;
N – non-breeding visitor;
P – passage visitor.

* - Belarus population data based on: *Nikiforov M.E., Kozulin A.V., Grichik V.V., Tishechkin A.K.* Birds of Belarus on the Threshold of the XXI century. – Minsk., 1997. – 188 pages

Annex II.
Modern state of most important bird species' populations on Zvanets mire.

The Bittern. The distribution of the species is quite uniform over the site area during the breeding season. Higher densities have been recorded for more waterlogged areas bordering on canals and ditches, however it can also be noted in sedge parcels with small (up to 30%) reed coverage. Two nests were found at the monitoring plot (100 ha). When nesting in sedge parcels deprived of open water females cover distances of up to 500 m to reach the nearest canals and/or ditches for food. In dry years numbers of the species fall to 50 males.

Montagu's Harrier. Numbers of the species fluctuate significantly between years. The highest number was recorded in 1996 (1 pair per 100 ha). Single pairs have been recorded occasionally in subsequent years.

The Spotted Eagle. Two pairs with nesting behavior have been identified at the site. The analysis of demands of the species to the environmental allows to conclude that the Zvanets mire has very favorable feeding conditions for the species, but the numbers are limited due to a lack of places suitable for nesting, the latter fact being a consequence of tree logging on mineral islands and excessive disturbance factors (local people's visits to the mineral islands for economic activities).

Water Rail. This species is uniformly distributed throughout the area of the mire. Its numbers fluctuate between years depending on the water level (500 to 2,000 pairs). In favorable years the density of the species on the monitoring plot is as high as 22 pairs per 100 ha.

Spotted Crake. This species is uniformly distributed throughout the area of the mire. Its numbers fluctuate between years depending on the water level. In favorable years the density of the species on the monitoring plot is as high as 46 pairs per 100 ha.

Crane. The Zvanets mire is one of the key Polesian breeding and post-breeding concentration sites of the Common crane. The overall number of the breeding pairs is 50-100. About 200 non-breeding birds of the species also spend their summer here. During the post-breeding season Zvanets turns into a concentration ground for all birds from the adjacent territories. In August – October the number of the species can be as high as 500 birds.

Curlew. It is very difficult to estimate the number of the species accurately due to its non-uniform distribution throughout the mire area. The minimum number, however, can be estimated at 50 pairs. Curlews nest on shrub-free mineral islands, open mire tracts and on wet formerly ameliorated fields bordering on the mire. Zvanets serves a concentration site for birds during their post-nesting migrations.

Short-eared Owl. Zvanets is the largest breeding site of this species in Belarus: 100-200 pairs.

Savi's Warbler. Zvanets is one of the key breeding sites of this species. The species is quite uniformly distributed over the whole area of the mire. Open sedge fens with a relatively low projective coverage of reeds (30-60%) and groundwater table level of 0-50 cm is the most favorable biotope of the Savi's Warbler. The density of the species at the monitoring plot was 35.6 pairs per 100 ha (overall number up to 3000 pairs).

Sedge Warbler. The Zvanets mire is the only of the studied mires where the density of the Aquatic Warbler (96 pairs per 100 ha) and the Sedge Warbler (94 pairs per 100 ha) are approximately equal.