Waders of the Novgorod region: peculiarities of their distribution and important breeding areas

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Surveys undertaken in the Novgorod region in May - July 1991 and 1992, demonstrate that the two most important habitats for waders are the vast raised bogs where there are unafforested areas, and the large expanse of flood-plain meadows in the Lake Ilmen' basin. The largest populations recorded on a single peat-bog system were 1,400-1,800 pairs of Curlew *Numenius arquata*, 150 pairs of Whimbrel *N. phaeopus* and 200-250 pairs of Golden Plover *Pluvialis apricaria*. Lapwing *Vanellus vanellus* and Black-tailed Godwit *Limosa limosa* breed on the most swampy parts of the bogs where there are areas of open peat (mires). Thus, human activities such as drainage and the development of industrial peat production are serious threats to the wader populations on peat-bogs. Human activity on the flood-plain meadows is not necessarily so damaging. Indeed, the suitability of this habitat for breeding waders is closely connected with man's agricultural activities; cessation of cattle-grazing and hay-mowing leads to the vegetation becoming overgrown and the disappearence of suitable breeding areas. The flooded meadows which were not used as pastures at all during the breeding period were the best for waders and held the highest densities of Redshank *Tringa totanus*, Common Snipe *Gallinago gallinago*, Marsh Sandpiper *Tringa stagnatilis* and Terek Sandpiper *Xenus cinereus*. Flooded meadows with moderate daily grazing of 35-55 cattle/km^2 held the highest breeding densities of Ruff *Philomachus pugnax*. Red-necked Phalarope *Phalaropus lobatus* also bred here, and the rather dry, irregularly flooded meadows with moderate grazing supported the highest densities of Lapwing and Great Snipe *Gallinago media*.

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Исследованиями, проведенными в Новгородской области в мае - июле 1991 и 1992гг. было установлено, что два важнейших местообитания куликов - это безлесые места крупных верховых болот, и обширное пространство пойменных лугов в бассейне озера Ильмень. Самые многочисленные популяции, зарегистрированные на единичном массиве торфяных болот, насчитывали 1400-1800 пар больших кроншнепов *Numenius arquata*, 150 пар средних кроншнепов *N. phaeopus* и 200-250 пар золотистых ржанок *Pluvialis apricaria*. Чибис *Vanellus vanellus* и большой веретенник *Limosa limosa* гнездятся на самых топких частях болот, где есть открытые участки торфянников. Поэтому такие деятельности человека, как осушение и развитие промышленных разработок торфа, представляют собой серьезную угрозу популяциям куликов на торфяных болотах. Антропогенная деятельность в пойменных лугах не обязательно так опасна. В действительности, пригодность этого местообитания для гнездящихся куликов тесно связана с сельскохозяйственной деятельностью человека; прекращение выпаса скота и сенокоса ведет к зарастанию местностей и к исчезновению пригодных для гнездования участков. Залитые луга, которые вообще не использовались под выпас в гнездовой период, оказались наилучшими для куликов, где была отмечена максимальная плотность травника *Tringa totanus*, бекаса *Gallinago gallinago*, поручейника *Tringa stagnatilis* и мородунки *Xenus cinereus*. На залитых лугах с умеренным ежедневным выпасом 35-55 голов скота на 1 км^2 была зарегистрирована максимальная плотность гнездования турухтана *Philomachus pugnax*. Там же гнездился и круглоносый плавунчик *Phalaropus lobatus*, тогда как на относительно сухих, нерегуляно заливаемых лугах с умеренным выпасом скота максимальной плотности гнездования достигали чибис и дупель *Gallinago media*.

Introduction

The birds of the Novgorod region are rather poorly studied, in comparison with neighbouring areas of European Russia (Leningrad and Tver regions). No inventories of the avifauna or areas important for waders within the Novgorod region have been compiled, despite the fact that the Novgorod region contains vast raised bogs and flood-plain meadows which are extremely important for waders. The purpose of our study was to find out which areas support the largest wader populations, as well as to evaluate the level of human influence on these habitats and work out measures that could be used for both the optimisation of agricultural activities and the protection of breeding wader communities.

Study area

The Novgorod administrative region is situated in north-west European Russia between 29°37' to 36°15'E, and 56°55' to 59°25'N and covers an area of 55,300 km^2. The region is divided into two parts which have different environmental conditions: a western part - the Lake Ilmen' lowland, and an eastern part - the Valdai upland (Figure 1). The Ilmen' Lake lowland is between 18 and 50 m above sea level; Lake Ilmen' itself is at the lowest altitude.

Lying within the southern taiga and subtaiga subzones, the Novgorod region is a typical forest area, where areas suitable for waders were extremely small and restricted in number before intense agricultural development took place. The most important natural areas for breeding waders are the vast raised bogs with large deforested areas.

The region has been a centre of agriculture and cattle-breeding since ancient times, and even in the 13th and 14th centuries large areas of forest were cut down round Lake Ilmen' and along the tributary rivers. By the beginning of the 19th century less than 40% of Lake Ilmen' lowland was still covered with forests (Zhekulin 1982). Characteristic populations of breeding waders have formed on the large pastures and hay meadows in the flood-plain of Lake Ilmen', a hydrologically unique water body in European Russia.

More recently, forests and shrubs account for about 68% of the area, agricultural landscapes about 16%, other habitats about 3% and more than 13% of the region is occupied by bogs and water-bodies (Serova *et al.* 1988). Most of the peat-bogs and meadows are situated in the Lake Ilmen' lowland and so the main breeding grounds of waders are concentrated in the western parts of the region.

Peat-bogs

The vast areas of raised bogs, which have developed in the post-glacial lake depressions, are characteristic of the Lake Ilmen' lowland. The largest bog systems (Figure 1a) are the Polistovo-Lovatskaya (111,000 ha including the area in Pskov region), Polistovskoye (43,000 ha), Belebelkovskoye (31,400 ha), Mironovskoye (15,800 ha), Nevij Mokh (18,000 ha), and Spasskiye Mkhi (37,000 ha).

The bogs of the Novgorod region have been included by specialists in the east Baltic bog province (Boch & Mazing 1979). They are characterised by a raised surface and central areas which are naturally unafforested; a few stunted pines grow on ridges which form concentric circles around the central parts of the bogs. The ridges are interspersed with pools or, occasionally, with pond complexes. The sloping sides of the bogs are covered with plant communities consisting of *Pinus silvestris f. litwinowii, Eriophorum vaginatum* and *Sphagnum magellanicum*. The most characteristic plants of these bogs are *Sphagnum fuscum, Chamaedaphne calyculata* and *Ledum palustre* (Boch & Mazing 1979). Eutrophic and mesotrophic parts are usually located on the edges of large bog areas.

On the Valdai upland in the eastern part of Novgorod region there are no large bogs, except the Igorevskiye Mkhi bog area (19,200 ha, Figure 1a), located in the low north-western part of the upland. The other oligotrophic pine-*Sphagnum* bogs are not as large (several tens and hundreds of hectares) and are distributed throughout the forests.

Flood-plain meadows

The most extensive meadows, like the bogs, are located in the Lake Ilmen' lowland. They cover the largest areas and are most diverse in the flood-plains of Lake Ilmen' and large tributary rivers (Msta, Lovat' and Shelon'). The large fluctuations in water level which occur in Lake Ilmen' are not known for any other similar water body. This lake is the only one in Russia where the water level can increase during spring floods by as much as 7 m; its water surface area varies by as much as three and a half-fold in different years, from 660 km^2 up to 2,230 km^2. The vast flood-plain meadows of Lake Ilmen', which occupy about 50,000 ha, support the largest wader populations (see Results). Within these meadows three levels, low, middle and upper, can be recognised; the most important for waders are the upper meadows that are unflooded by May or are only partly-flooded in spring. Grass with leguminous herbs, sedge-grass and Deschampsietum plant communities prevail on this type of meadow. Dry meadows, both in the Lake Ilmen' lowland and in the region as a whole, cover rather small areas and are not as important for waders.

Methods

Data were collected from May-July 1991 and 1992, and counts were made in May and June. Wader censuses were carried out on transects and all birds recorded up to the distance at which they could no longer be accurately detected, usually up to 300 m from the observer; later, densities were calculated for a 1 km^2 standard unit. In some cases, when the deforested areas were surveyed, easily detected species such as Curlew *Numenius arquata*, Whimbrel *N. phaeopus* and Golden Plover *Pluvialis apricaria*

were recorded up to a distance of 500 m. Wader numbers for the whole area of bog or meadow complex were extrapolated from these figures using 1:100,000 scale maps; only habitats suitable for a species were used in the calculations. In total, surveys were carried out on 30.8 km^2 of bogs and on 11.6 km^2 of meadows. On the latter, the influence of grazing intensity for the breeding period was also estimated; it is represented here as the daily average number of cattle per km^2.

Results

Peat-bogs

Eight wader species were found breeding on the bogs of the Novgorod region: Curlew, Whimbrel, Golden Plover, Greenshank *Tringa nebularia*, Wood Sandpiper *Tringa glareola*, Common Sandpiper *Gallinago gallinago*, Black-tailed Godwit *Limosa limosa* and Lapwing *Vanellus vanellus*. Densities of all these species, except Greenshank, are shown in Table 1. Curlew was the most characteristic and numerous wader of the oligotrophic and mesotrophic bogs. Breeding birds were distributed evenly over most of the bog areas, with the exception of the edges or the vicinities of ponds with rather dense pines and unvegetated areas of bare peat. The largest densities of the species were recorded in moderately wet ridge-pool complexes (Table 1), while in pine-*Sphagnum* areas the densities were lower.

The largest local breeding population of Curlew in the Novgorod region (and probably in Europe) occured on the Polistovo-Lovatskaya bog system. In this area, including the part in Pskov region, at least 1,400-1,800 pairs of Curlew were estimated to be breeding; the density of the species there (5.1 birds km^{-2}) was larger than on any other surveyed bog in the region.

Large local populations of Curlew were also found breeding on the Spasskiye Mkhi, Neviy Mokh and Igorevskiye Mkhi peat-bogs (Figure 1a). It was also found breeding in small numbers on most of the other oligotrophic and mesotrophic bogs in both western and eastern parts of the region.
Unlike Curlew, Whimbrel and Golden Plover avoid

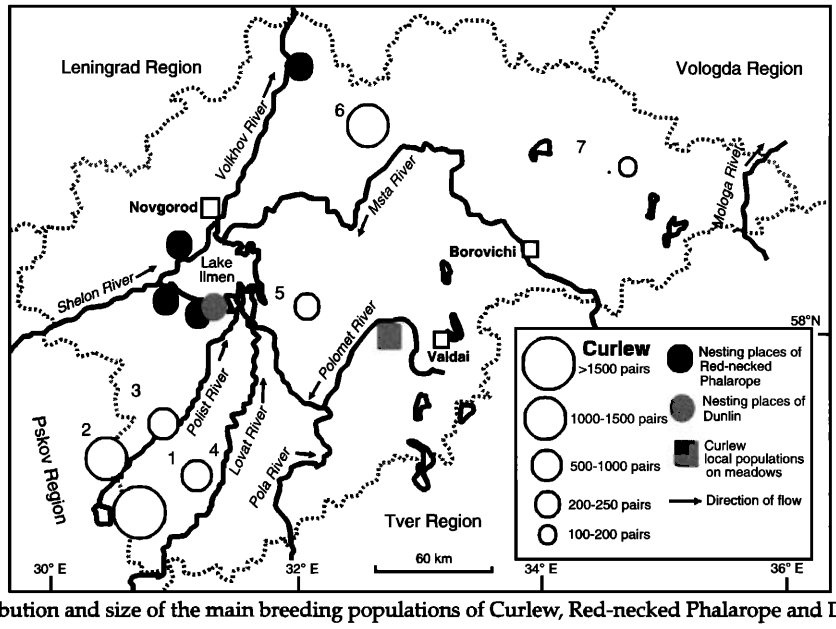

Figure 1a. Distribution and size of the main breeding populations of Curlew, Red-necked Phalarope and Dunlin in the Novgorod region. Numbered locations are some peat-bogs mentioned in the text: **1** - Polistovo-Lovatskaya; **2** - Polistovskoye; **3** - Belebelkovskoye; **4** - Mironovskoye; **5** - Neviy Mokh; **6** - Spasskiye Mkhi; **7** - Igorevskiye Mkhi.

Table 1. Densities of waders (individuals km^{-2}) on 30.8 km^2 of different peat-bog habitats of Novgorod region.

Species	unafforested eutrophic fens without open water	unafforested peat-bogs with mires and pools	ridge-pool and ridge-pond peat-bog complexes	pine-*Sphagnum* peat-bogs
Pluvialis apricaria	-	0.7	1.0	0.8
Vanellus vanellus	9.3	1.4	-	-
Tringa glareola	3.3	-	0.1	-
Gallinago gallinago	6.0	-	-	-
Numenius arquata	3.3	5.0	5.3	4.8
Numenius phaeopus	-	3.6	0.7	-
Limosa limosa	2.7	3.2	-	-

- species not present

small peat-bogs of less than 1,000 ha. Whimbrel were distributed much more sporadically than Curlew and never reached such high densities (Figure.1b). They also avoided pine-*Sphagnum* areas of bogs and were restricted to open and very moist areas with *Sphagnum* and *Scheuchzeria* as well as to areas with open peat (mires), and locally also to the pond complexes of the peat-bogs. The largest concentration of Whimbrel was found on the Neviy Mokh bog (150 pairs) and on the Polistovo-Lovatskaya bog system, where its numbers were more than 10 times lower than Curlew - *i.e.* no more than 100-150 breeding pairs. Golden Plover

Greenshank was found to be a common wader in the Novgorod region, occupying a variety of bog types, although preferring the interface between pine-*Sphagnum* bogs and open peatlands. In contrast, the Wood Sandpiper was distributed sporadically and was restricted to unafforested mossy areas with cotton grasses *Eriophorum* spp. and without an open water surface (Table 1); such habitats occupy rather small areas in the peat-bogs of the Novgorod region. Common Snipe particularly avoided raised bogs, but bred at their edges on the swampy eutrophic and mesotrophic parts. It is interesting that when Lapwing and

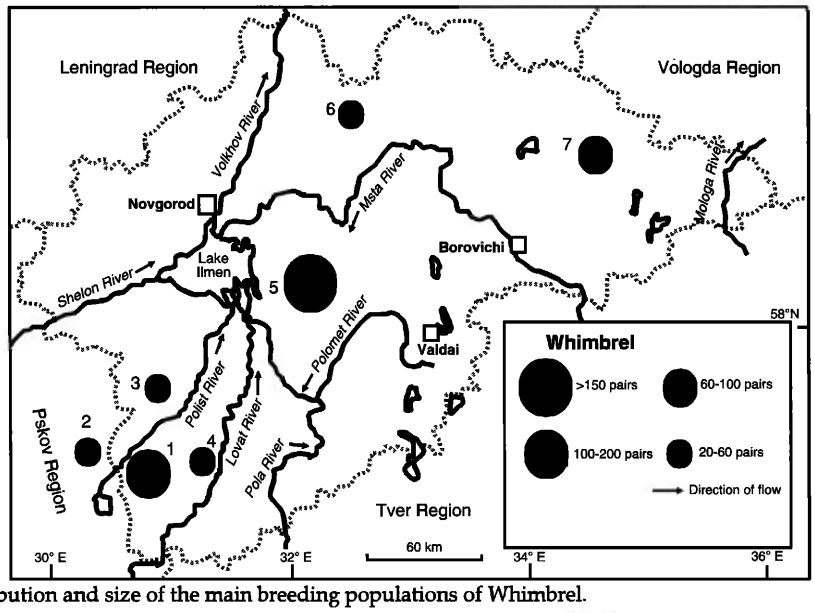

Figure 1b. Distribution and size of the main breeding populations of Whimbrel.

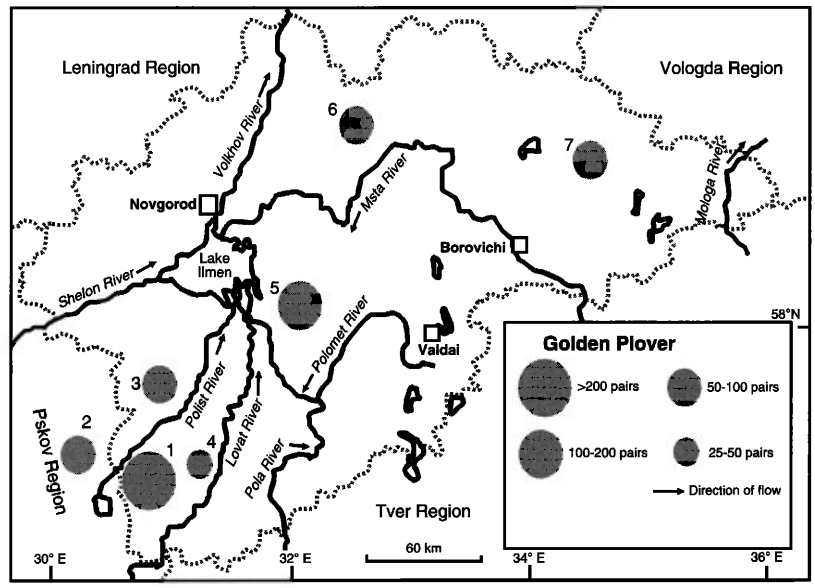

Figure 1c. Distribution and size of the main breeding populations of Golden Plover.

abundance on raised bogs was similar to that of Whimbrel. This wader occupied a wide habitat spectrum, which was generally similar to that of Curlew. However, Golden Plover also bred on open moist areas with Whimbrel. The largest colony (200-250 pairs) was recorded on the Polistovo-Lovatskaya peat-bog system, large colonies also inhabit the Spaskiye Mkhi, Neviy Mokh and Igorevskiye Mkhi bog systems (Figure 1c).

Black-tailed Godwit, which are usually species of dry meadows, were found breeding on peat-bogs, they were on the most swampy and inaccessible places (mires) - areas with open peat as well as eutrophic edges (Table 1). However, these sites superficially resembled their dry meadow breeding habitats. Lapwing occupied the parts with low clumps of *Eriophorum* and *Scheuchzeria* and patches of bare and dry hummocks of peat. Black-tailed

Table 2. Densities of waders (number .km² on 11.6 km² of the flood-plain meadows of the Lake Ilmen' lowland*

	Flooded meadows			Unflooded meadows		
Grazing intensity	intense (70-80 head/day/km²)	moderate (35-55 head/day/km²)	none in breeding season	none in breeding season	moderate (35-55 head/day/km²)	none in breeding season
Forage crops	absent	absent	absent	present	absent	absent
Pluvialis squatarola	-	-	3.0	-	-	-
Charadrius dubius	-	-	-	0.5	-	-
Vanellus vanellus	11.6	12.6	14.5	5.5	16.5	-
Tringa glareola	4.1	-	-	-	4.3	-
Tringa nebularia	0.8	0.4	0.6	-	-	-
Tringa totanus	2.5	7.2	10.8	-	7.0	-
Tringa erythropus	-	-	0.6	-	-	-
Tringa stagnatilis	0.8	0.4	5.4	0.9	1.7	-
Xenus cinereus	-	0.4	7.2	-	-	-
Phalaropus lobatus	-	2.5	-	-	-	-
Philomachus pugnax	6.6	36.9	13.9	-	3.5	-
Calidris alpina	-	1.6	1.2	-	2.6	-
Calidris spp.	0.8	-	-	-	-	-
Gallinago media	-	2.7	-	-	29.6	-
Gallinago galinago	8.3	9.5	13.2	1.8	29.6	
Numenius arquata	-	-	-	4.6	-	-
Limosa limosa	0.8	0.7	-	0.9	-	2.6
TOTAL	36.3	74.9	70.4	14.2	94.8	2.6

*Only flood-plain meadows were surveyed during the study; meadows analysed in Table 2 were within 1.5 km from the edge of Lake Ilmen' and the Volkhov river. During the surveys we did not separate meadows with or without moderate pasturing from hay meadows, because mowing took place on all of them during the second half of the summer.

Godwits occupied similar places but with more dense, mosaic vegetation.

Flood-plain meadows

Eleven species of waders were found breeding in the flood-plain habitats of the Novgorod region: Little Ringed Plover *Charadrius dubius*, Lapwing, Redshank *Tringa totanus*, Marsh Sandpiper *Tringa stagnatilis*, Terek Sandpiper *Xenus cinereus*, Red-necked Phalarope *Phalaropus lobatus*, Ruff *Philomachus pugnax*, Great Snipe *Gallinago media*, Common Snipe, Curlew and Black-tailed Godwit. It is quite possible that Dunlin *Calidris alpina schinzii* also breed on the Lake Ilmen' flood-plain (Figure 1a), since we recorded song-flights in several territorial pairs, but it has not yet been confirmed.

Ruff and Red-necked Phalarope were only found breeding on the flood-plains of Lake Ilmen' and the Volkhov river. All the other species mentioned were distributed more widely in the region although, with the exception of Curlew, they were present in the highest densities on the flood-plain meadows of Lake Ilmen'.

The first case of breeding in Red-necked Phalarope in Novgorod region was confirmed on the south-western shore of Lake Ilmen' in 1991 (Sukhanova & Mischenko 1992). In total, four small breeding colonies of the species are currently known in the region (Figure 1a).

With the exception of Common Snipe, waders of the Lake Ilmen' lowland generally avoid grass fens and, apart from Lapwing, they also avoided agricultural fields; the majority preferred flooded and unflooded meadows with moderate pasturing (Table 2). Apart from the breeding species, other waders which regularly occurred there during the breeding period are included in Table 2: Grey Plover *Pluvialis squatarola*, Wood Sandpiper, Spotted Redshank *Tringa erythropus* and small *Calidris* sandpipers, which were not positively identified.

Unflooded meadows without pasturing quickly become overgrown with dense, tall grasses and thus are not suitable for breeding waders even at the beginning of the season. Only Black-tailed Godwit, which were rare in the Lake Ilmen' flood-plain, sometimes nested there in areas of low grass cover where, if anything, its breeding density was slightly larger than on other types of meadow. Unflooded meadows with a mixture of forage crops *Phleum pratense*, *Dactylis glomerata* and *Trifolium hybridum* were the only type where Curlews bred. In the Lake Ilmen' flood-plain the numbers were not high and the birds only bred locally. Larger colonies, consisting of 25-30 pairs, existed in unflooded meadows with an admixture of forage grasses in the Polomet' river flood-plain (Figure 1a). However, the

role of meadows as breeding habitats for Curlews in the Novgorod region was much less important than that of peat-bogs.

Unflooded meadows with moderate pasturing (mostly by cows) in the Lake Ilmen' lowland and the Volkhov river valley were the best habitats for Lapwing and Great Snipe. The densities of Common Snipe shown in Table 2 do not reflect the real situation in this habitat, as most of the Common Snipe there were recorded close to the edges of *Carex-Glyceria* swamps.

In all types of flooded meadows, the four most numerous species were Lapwing, Common Snipe, Ruff and Redshank; only the proportion of each of these species varied between areas.

The highest densities of Redshank, Common Snipe, Marsh Sandpiper and Terek Sandpiper occurred in meadows from which floods had most recently drained and where pasturing had yet to occur that spring. These meadows had an even sward of low vegetation with a prevalence of low sedges (mostly *Carex nigra*).

The highest densities of Ruff occurred in moderately pastured, slightly tussocked meadows with mosaic vegetation (Table 2). Red-necked Phalarope bred only on this type of meadow. The total wader density there was similar to that on meadows without pasturing.

When intense pasturing occurred (70-80 head of cattle/day/km^2), the total wader density was half of that on meadows with or without moderate pasturing; on these intensely pastured meadows, Great Snipe, Red-necked Phalarope and Dunlin did not breed at all. If the pasturing was even more intense, almost all the waders disappeared; only Lapwing remained and bred locally in the extremely overgrazed places, even where herds of cattle passed through regularly.

Discussion

Analysis of the data collected during this study in the Novgorod region demonstrated that two main breeding habitats are important for waders there; these habitats differ in their environmental characteristics and thus require different conservation strategies. On raised peat-bogs, maintainance of the present wader species diversity is possible only if these habitats remain in their virgin state; this is still possible, since the human population in the region is not very large. The inclusion of bogs in economic development schemes (drainage and industrial peat production) leads to the complete disappearance of breeding waders, shown by Nikolayev (1988, and this volume) for the neighbouring Tver region. Therefore, the main strategy for protection of wader communities must be the establishment of protected areas - nature reserves and sanctuaries - with minimal human influence. The most urgent need is the creation of a Polistovo-Lovatsky Nature Reserve.

A different approach should be adopted for the conservation of meadow wader communities. Before the economic development of the Lake Ilmen' lowland, the area was covered with forests and, in wet places, with fens dominated by Alder *Alnus glutinosa* bushes. Almost all the presently available, open, non-mire areas around Lake Ilmen' and in the Volkhov river flood-plain are man-made and exist only due to traditional agricultural practices: husbandry, pasturing and haying. As concluded by Morozov (1990), the health of meadow bird communities is connected mostly with the expansion of meadow habitats and the maintainance of particular stages of succession there, due to pasturing and hay-mowing.

Traditional forms of agriculture used in the Lake Ilmen' lowland, moderate pasturing (35-55 head of cattle/day/km^2) and late hay-mowing (not earlier than 1 July), keep the bird communities stable. Overgrazing (more than 80 head of cattle/day/km^2) leads to impoverished wader communities. The regular passage of cattle and the erection of cattle fencing within 300 m of the water's edge is especially harmful in the coastal zone of Lake Ilmen' and the Volkhov river. However, complete abandonment of agricultural activities in these habitats is an undesirable action for conservation, as the development of dense grass cover will make these habitats unsuitable for breeding waders.

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