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CLASSIFICATION OF MIRES IN THE FORESTRY IN THE FORMER USSR

Soiden luokittelu metsätaloutta varten entisessä Neuvostoliitossa

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Peatlands and paludified forests have been regarded and classified as forests on peat soil in the former USSR. Treeless mires and sparsely forested mires with poor-quality tree stands have considered to be real mires. That is why in Russia, the term of forest type is traditionally used instead of mire type. The dominant tree species has the indicator role of the site type and this is also reflected in the name of the forest type. Besides the nationwide classification based on Sukachev's works, there are also some interesting regional (now national) classification systems especially in Latvia and Lithuania.

Key words: forest drainage, Latvia, Lithuania, Russia, Siberia

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INTRODUCTION

In the former USSR peatlands and paludified forests have become an object of special attention only since the 1940's. Before this small-scale drainage was carried out without proper scientific substantiation.

From the very beginning peatlands and paludified forests have been classified and regarded as forests on peat soils. Open treeless mires and sparsely forested mires with unclosed, poor-quality tree stands, have been considered as "real" mires. That is why in Russia, in the classification of peatlands and paludified forests, the term of "forest type" is traditionally used instead of "mire type".

In this review we present first the nationwide classification which is then followed by some regional classification systems.

NATIONWIDE CLASSIFICATIONS

The forest type is interpreted by most of the Russian typologists in the way it was defined by Sukachev (1928, 1930), i.e. in a narrower sense than the forest type interpreted according to Cajander (1909). The latter identified the type of the forest with that of forest and ground vegetation conditions. In Russian forest typologies the dominant tree species has the indicator role of the site type and this is also reflected in the name of the forest type. But the use of the forest type (in a narrow sense) is not justified under the low level of forestry practice. That is why in the 1930's and 1940's objects of forest drainage were divided only into 3 types of mire site types (eutrophic, mesotrophic, oligotrophic) and only 6 types of forests were named according to the Sukachev

classification system (Dubakh 1934) (*Vaccinium myrtillus* pine forests, *Vaccinium myrtillus* spruce forests, *Polytrichum* and *Sphagnum* pine and spruce forests).

From the 1950's, the classification of paludified forests suggested by P'yavchenko (1956) has widely been used. It referred to the European part of the country, excluding northern taiga, where drainage was not implemented at that time. All peatlands and paludified forests were classified into 3 ecological series according to the origin of water and mineral nutrition: ground water, atmospheric-ground water and atmospheric water, or respectively flowing, weakly flowing and stagnant types of water nutrition (index of aeration and nutrient content). In addition, every series was subdivided into 3 groups of forest types, characterizing 9 types of conditions of site types of forests themselves — the smallest units of the classification. Initially, the classification by P'yavchenko (1963) comprised 9 groups of forest types and 15 forest types.

When planning forest drainage the groups of forest types were the basic units. At that time they were as follows: — for the ground water series: tall-herb alder fens, tall-herb spruce fens, and tall-herb pine fens; — for the atmospheric-ground water series: Poly*trichum*-rich spruce forests, *Sphagnum*-rich spruce fens, and low-sedge *Sphagnum* pine forests; — and for the atmospheric water series: *Polytrichum*-rich pine forests, *Sphagnum fuscum* pine bog, and *Sphagnum* bog with pine.

Later on, in spite of the fact that practical forestry was quite satisfied with delimiting only groups of forest types, P'yavchenko continued to develop his classification, increasing the number of both groups of forest types and forest types themselves. In its final posthumously published variant (P'yavchenko 1985) the classification covered the whole area of USSR, including Siberia, and contained 17 groups of forest types and 31 forest types (Table 1). But even now the level of forestry in Russia does not use forest types; the practical forestry activity is based on the groups of forest types.

It should be noted that in Russian scientific literature the term "peatland forest" or "forest mire" is understood as a forest stage in the mire´s development (P'yavchenko 1963). Later on, from the point of ecosystem functioning, forested mires were classified into "weakly forested mires" or mires with weakly functioning tree stand — with biomass formed mainly by mire plants of lower layer — and "peatland forests" — with the increase in tree stand phytomass exceeding that of mosses and other ground layer species (Vompersky 1991). The term "peatland forest" refers both to virgin tree-covered mires and artificially drained forests.

From the beginning forest drainage and forestry on drained areas have urgently required an evaluation of its efficiency. Beginning in 1955, objects of forest drainage have been classified according to groups of expected efficiency in all the technical instructions and guides prepared for the development of forests intended for drainage.

The efficiency of drainage is determined according to the volume of additional current increment in tree stand after drainage. Traditionally, four groups are used: I = the additional annual increment is very high = 4–6(10) m^3/ha year, II = the additional annual increment is high = 2–3(4) m^3/ha, III = the additional annual increment is moderate = 1–2 m^3/ha, IV = the additional annual increment is inconsiderable = 0.5–1 m^3/ha.

The drainage efficiency group is given for a certain tree species, destined for a purposeful forestry. Unfortunately, defining some types of paludified forests on mineral and paludified forest soils to concrete groups of efficiency turned out to be insufficiently substantiated.

The classification of P'yavchenko (1963) is the basic one for peatlands and paludified forests in many regions of the country. It must be confessed that an attempt to embrace all the diverse peatland forest ecosystems by one common classification did not prove to be correct and possible. This entailed further attempts to develop regional classifications.

REGIONAL CLASSIFICATIONS

The typology of Latvian forests and mires, according to Bush (1976), is one of the most interesting regional classifications of peatlands and paludified forests. From the beginning, it was developed for practical forestry. The author tried to reduce the number of forest types to a minimum using larger typological units. He classified forest and marsh communities into three trophy classes of water–mineral nutrition: oligotrophic, mesotrophic, and eutrophic.

According to the degree of paludification, Bush (1976) described the following series: 1) dry soils, 2) excessively wet mineral soils and 3) peat soils. Oligotrophic mires with deep (60 cm and more)

Table 1. Classification of paludified forests and forested peatlands (forest mires). According to Pyavchenko (1985).

Taulukko 1. Pyavchenkon (1985) soistuneiden metsien ja metsäisten soiden luokitusjärjestelmä.

Water nutrion type	Site type	Group of paludified forest and forested peatland site type	Site type of paludified forest and forested peatland
1.Eutrophic nutrition type (flowing-water mire)	1. Herb-rich	1. *Alneta uliginoso-herbosa*	Tall-sedge reed alder fen Tall-herb alder swamp Tall-herb hardwood alder swamp
		2. *Piceeta uliginoso-herbosa*	Tall-herb *Hylocomium* spruce swamp Tall-herb *Sphagnum.girgensohnii* spruce swamp
		3. *Pineta sibiricae uliginoso-herbosa*	*Calamagrostis* siberian pine forest Tall-sedge siberian pine swamp Tall-herb siberian pine swamp
		4. *Lariceta uliginoso-herbosa*	*Calamagrostis* larch forest Tall-sedge larch forest
		5. *Pineta uliginoso-herbosa*	Tall-sedge reed pine fen Tall-herb pine swamp
		6. *Betuleta uliginoso-herbosa*	*Sphagnum girgensohnii* pine fen Tall-sedge reed birch fen Tall-herb birch swamp
2. Mesotrophic nutrition type (semi-flowing mire)	2. Low-herb mesotrophic *Sphagnum* mire	1. *Piceeta herboso—sphagnosa*	Tall-sedge *Sphagnum* spruce fen *Sphagnum* mesotrophic spruce swamp *Vaccinium myrtillus-Sphagnum* spruce swamp
		2. *Pineta sibiricae herboso-sphagnosa*	Tall-sedge *Sphagnum* siberian pine swamp
		3. *Lariceta herboso-sphagnosa*	Tall-sedge dwarf-shrub *Sphagnum* larch fen
		4. *Pineta herboso-sphagnosa*	Tall-sedge *Sphagnum* pine fen Tall-sedge dwarf-shrub *Sphagnum* pine fen
		5. *Betuleta herboso-sphagnosa*	Tall-sedge *Sphagnum* birch fen
	3. Meso-trophic paludified forest	1. *Piceeta politrichosa*	*Polytrichum commune* spruce forest
		2. *Pineta sibiricae politrichosa*	*Polytrichum commune* siberian pine forest
		3. *Betuleta politrichosa*	*Polytrichum commune* birch forest
3. Oligotrophic nutrition type (stagnant water mire)	4. Oligotr. paludified forest	1. *Pineta sphagnosa*	*Polytrichum commune* pine forest
	5. Oligotr. *Sphagnum* type	1. *Pineta sphagnosa*	Dwarf-shrub *Sphagnum fuscum* pine bog Low-sedge S*phagnum fuscum* pine bog
		2. *Lariceta-sphagnosa*	Dwarf-shrub *Sphagnum fuscum* larch bog

Key to the terms used in the forest classification of mires: Forest — Exclusively paludified forests with shallow peat-layer or hydromorphic mineral soils; Swamp — Forested peatlands with dominance of tree production or with equal parts of tree, herb, shrub and moss production; Fen — Eutrophic and mesotrophic forested peatland with dominance of herb, shrub and moss production; Bog — Oligotrophic forested peatlands; Herb-rich — Tall-herb type (*uliginoso-herbosa*) represents the highest productivity (eutrophic paludified forests and forested peatland) class. It is characterized by species richness with the dominance of tall herb species (Fig. 1); Low-herb — Low-herb and tall-sedge types (*herbosa-sphagnosa*) with the dominance of tall-sedge, low-sedge and mesotrophic *Sphagnum* species. *Sphagnum* — *Sphagnum* type (*sphagnosa*) with the dominance of oligotrophic *Sphagnum* species and cotton-grasses.

Fig 1. Tall-herb type represents the highest productivity class of eutrophic paludified forests and forested peatlasnds. Photo taken near Zapadnaya Dvina Mire Research Station app. 300 km west from Moscow. (Photo: J. Päivänen).

Kuva 1. Lehtokorpea vastaava kasvupaikkatyyppi edustaa ravinteikkainta tasoa venäläisessä soistuneiden metsien ja metsäisten soiden luokittelussa. Kuva otettu n. 300 km länteen Moskovasta Zapadnaya Dvinan suotutkimusaseman läheisyydestä. (Kuva. J. Päivänen).

Sphagnum surface layer are considered separately. The drainage of these mires should necessarily be accompanied by fertilization for further afforestation. Forests on drained peat soils and on drained mineral soils are described separately (Table 2). Ecological groups obtained are divided into types of forest and vegetational conditions, and the latter — into forest types. Forest types can then be classified into variants.

Types of forest and vegetational conditions differ from each other according to many site and tree stand characteristics: position in the relief, genesis, acidity of the root zone, botanical composition, degree of decomposition and ash content of peat, class of tree stand quality, character of the soil cover, etc. Bush (1976) considers the impact of tree stand and other plants on characteristic soil features not exceeding the limits of the type of forest and vegetational conditions.

In the drainage of peatland forests and mires in Lithuania the typological classification of Kapustinskaite (1973) was used. In this classification a series of flowing water (index of aeration and nutrient content, eutrophic) unites *Filipendula ulmaria* and types of forest and vegetational conditions on sward-gley soils. *Urtica dioica* and *Carex* site types on humus-peat and eutrophic peat soils were described. *Polytrichum* and *Carex-Sphagnum* types on peaty-podzol-gleyic and peat soils of the mesotrophic type refer to a series of weakly-flowing water. A series or stagnant water (oligotrophic) includes *Polytrichum* and *Sphagnum* types with pine on thin peat-podzol-gleyic and oligotrophic peat soils.

In the north-western part of Russia, Elpatievsky et al. (1978) suggested classifying treeless mires into 6 groups: I. (eutrophic) herbaceous, II. (eutrophic-mesotrophic) herbaceous-*Sphagnum*, III. (mesotrophic) *Sphagnum*, IV. raised bogs in the initial stage of development (mesotrophic-oligotrophic), V. raised bogs in the advanced stage of development (oligotrophic), VI. raised bogs in the final stage of development (dystrophic). For forestry use, only the groups II–V are recommended. Determination of the conditions of site types is supposed to be carried out on the basis of the composition of the peat deposit down to a depth of 2 m, its thickness and the characteristics of underlying mineral soil (impermeable loams, loams and clays and permeable sand loams and sands).

The minimum taxatory unit of the classification is a peatland forest-plant community, it is a mire site type. Nomenclature and list of the existing types are not given by the authors, since they have not yet been developed. This is a draft for a classification rather than a classification itself and is why it has not found application in practical forestry on treeless mires.

Special classifications of peatlands and paludified forests have also been suggested for eastern regions of Russia. For extensively paludified West Siberian region, Glebov (1971) developed a nomenclature at a level of plant communities. For paludified forests and mires of the Far East, Prozorov (1985) suggested his own typology. Both the classifications are based on the geobotanic approach. In spite of high accuracy

Table 2. Genetic scheme of the types of forest and vegetational conditions in latvia. According to K. Bush (1976).

Taulukko 2. Bushin (1976) latvialainen metsien luokittelu.

		Drained sites			
On mineral soils	*Callunosa*	*Vacciniosa*	*Myrtillosa*	*Mercurialiosa*	
On peat	*Callunosa*	*Vacciniosa*	*Myrtillosa*	*Oxalidosa*	
		Natural sites under the conditions of excessive moisture			
Forest on mineral hydromorphous soils	*Callunosa sphagnosa*	*Vacciniosa sphagnosa*	*Myrtillosa sphagnosa*	*Myrtillosa polytrichosa*	*Dryopteriosa*
On peat	*Sphagnosa*	*Caricosa-phragmitosa*	*Dryopteriosa-caricosa*	*Filipendulosa*	

of the types described and strictly logical nomenclature, these classifications are weakly confirmed in terms of both physico-chemical properties of soils and forest drainage experience. That is why they are not used in practice. Forest drainage is not intensive in Siberia and the Far East; therefore, the classification of paludified forests, suggested by P'yavchenko, is traditionally used also in these regions.

REFERENCES

Bush K.K. 1976: Principles of forest typology in Latvijskaja SSR. Review. — Latvian institute of scientific information. Riga 25 pp. (in Russian)

Cajander A.K. 1909: Ueber Waldtypen. — Acta For. Fennica 1(1): 1-176.

Dubakh A.D. 1934: Forest drainage with principles of hydrotechnology. — Leningrad. 360 pp. (in Russian).

Elpatievsky M.M., Kirushkin V.N. and Konstantinov V.K. 1978: Forestry development of mires. — Lesnaja Promishlennost Publ. Moscow. 135 pp. (in Russian).

Glebov F.Z. 1971: On the improvement of the evaluation of the forest reclamation fund. — Lesnoye Khozjaistvo, 1/1971:55-60. (in Russian).

Kapustinskaite T.K. 1973. Afforestation of drained peatlands in the USSR and abroad. — Central bureau of scientific and technical information on forestry. Moscow. 3 pp. (in Russian).

Prozorov Ju. S. 1985: Regularities of development, classification and use of peatland biocoenoses. — Nauka. Moscow. (in Russian).

P'yavchenko N.I. 1956: Experience in the classification of peatland forests. — In: To 75-th anniversary of Academician V.N. Sykachev. Moscow–Leningrad. USSR Acad. of Science Publ.:463–480. (in Russian).

P'yavchenko N.I. 1963: Forest-peatland science. — USSR Acad. of Science Publ. Moscow. 192 pp. (in Russian).

P'yavchenko N.I. 1985: Peatlands, their natural and economic importance. — Nauka. Moscow. 152 pp. (in Russian).

Sukachev V.N. 1928: Plant communities (introduction into fitocoenology). 4th ed. — Kniga. Leningrad–Moscow. 232 pp. (in Russian).

Sukachev V.N. 1930: Guide to the investigation of forest types. — Selkhozgiz 2nd ed. Moscow-Leningrad. 318 pp. (in Russian).

Vompersky S.E. 1991: The forest and the mire: specific features of matter cycle and the manifestation of the biospheric role. — Lesovedenija 6/1991:54–64. (in Russian).

TIIVISTELMÄ:

SOIDEN LUOKITTELU METSÄTALOUTTA VARTEN ENTISESSÄ NEUVOSTOLIITOSSA

Entisessä Neuvostoliitossa heräsi kiinnostus soiden ja soistuneiden kankaiden metsätalouskäyttöön vasta 1940-luvulla. Tätä ennenkin oli soita ojitettu, mutta ilman kunnollista tieteellistä luokittelun perustaa. Neuvostoliitossa metsäiset turvemaat on luettu metsiin, ja tästä syystä niistä

luokittelussa käytetään käsitettä metsätyyppi suotyypin sijaan. Ainoastaan avoimet ja harvapuustoiset suot on luettu suotyyppeihin kuuluviksi.

Venäläisen Sukachevin luokitusjärjestelmän mukaan vallitseva puulaji on määräävänä metsätyypin käsitteessä ja se myös näkyy metsätyypin nimessä. Pienimmillään yleisliittolaisessa metsätyypittelyssä käytettiin 1930-luvulla ainoastaan kuutta metsätyyppiä, jotka edustivat kolmea eri ravinteisuustasoa. 1950-luvulta lähtien on käytetty yksityiskohtaisempaa P'yavchenkon luokittelua, jonka viimeisessä versiossa vuodelta 1985 erotettiin 17 metsätyyppiryhmää ja 31 metsätyyppiä (Taul. 1). Tosin on todettava, että tälläkin hetkellä Venäjällä käytännössä toimitaan metsätyyppiryhmien eikä metsätyyppien puitteissa. Ojituksen tehokkuus ilmaistaan yleensä neliasteikolla sen mukaan, miten paljon ojitus on lisännyt puuston tilavuuskasvua. Parhaassa ryhmässä vuotuinen lisäkasvu on 4–6(10) m^3/ha ja heikoimmassa 0,5–1 m^3/ha.

Alueellisista luokitteluista erityisen mielenkiintoisia ovat Latviassa ja Liettuassa käytetyt luokitussysteemit. Latvialaisessa luokittelussa (Taul. 2) erotetaan ensin kolme ravinteisuustasoa: oligo-, meso- ja eutrofia. Soistumisasteen mukaan erotetaan kolme ryhmää: kuivat maat, märät kivennäismaat ja turvemaat. Näistä erikseen erotetaan vielä paksuturpeiset rahkasuot. Samoin erotellaan ojitetut suometsät ja kivennäismaametsät.

Omia alueellisia luokituksia on kehitetty myös Luoteis-Venäjälle, Siperiaan ja Kauko-Itään. Ne ovat yleensä hyvin seikkaperäisiä, mutta niistä puuttuu yhteys käytännön metsätaloustoimenpiteisiin. Tästä syystä näilläkin alueilla on yleensä käytössä P'yavchenkon luokittelusysteemi.

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