

УДК 630*905.2 (066)

L. N. Rozhkov, D.Sc. (Agriculture), professor (BSTU)

SWAMP WOODS OF BELARUSIAN WATER COLLECTION OF THE RIVER NEMAN

Object of research is the marsh woods of the Belarusian reservoir of the Neman River. It is established that for expired five decades after drying melioration (the 60th years of the XX century) in the Neman River reservoir practically disappeared the woods on bogs of riding type. Today the woods of low-lying type (86.2%) presented by fifteen forest formations, including birch (40.5%) and european alder (40.2%) prevail. About 21% of the area of the marsh woods are occupied with derivatives (not radical) forest stands. Higher carbonproductivity of the marsh woods in comparison with the woods on a waterless valley is revealed.

Research is executed within the Project of the international technical assistance “The Baltic landscape in development – innovative approaches to steady forest landscapes” by request of the republican unitary enterprise “Belgosles”.

Introduction. Today swamp woods are an object of a special attention of scientists (and not only) as a unique ecological system with generous resources of plants and biological diversity and as an important accumulative link in a balance of “flow - emission” of carbon dioxide.

Especially important role of swamp woods is in Belarusian water collection of the river Neman situated within a hilly plain with ranges or groups of hills related to Minsk Elevation.

Researches about the results of land melioration of forests and bogs in Russian Nonblack Soil Zone and Belarusian Polesye [1, 2, 3] testify about a varied assessment of the drying effect and reasonability of draining of swamp woods.

One point of view is based on the idea of bogs and swamp lands as an accumulator of flowing and rivers supply supporting high water content of rivers. Therefore, intensive drying-out of bogs and other swamp lands including swamp woods deteriorates hydrological river regime and causes their shallowing [3, p. 27].

Another point of view states that bogs decrease water content of rivers [3, p. 28], after drying-out total and drought flow increase [2, p. 30], ‘in reality bogs are not at all regulators of rivers supply and their role in this respect is quite the opposite [4, p. 71]’. Intensive draining of bogs, swamp woods and meadows causes local shallowing of brooks and small rivers connected with decrease of groundwater level near hydro land reclaiming objects while water content of larger rivers changes too little and even slightly increases [3, p. 30].

Methods of research. In accordance with the materials of the state recording of forests and special samples from the data base “Forest fund” characteristics of swamp woods of a water collection of the river Neman. Carbonic balance of swamp woods with application of the methodology [5] is established.

Main results. Swamp woods of Belarusian water collection of the river Neman occupy 5.0% of its area and situated on the bogs of raised

(0.3%), transitional (13.5%) and lowland (86.2%) type, thus, forests with lowland bogs predominate. They are introduced (in percentage out of occupied area) by the following forest formation: birch (*Betuleta pendulae*) – 40.5%; black alder (*Alneta glutinosae*) – 40.2%; pine (*Pineta silvestriae*) – 12.9%; spruce (*Piceeta abietiae*) – 3.3%; speckled alder (*Alneta incanae*) – 0.9%; other species and shrubs – 2.2%. Among the last, there are swamp forests of the following formation: oak (*Querceta roburiae*) – 286 ha, hornbeam (*Carpineta betulisiae*) – 9 ha, ash (*Fraxineta excelsioriae*) – 274 ha, maple (*Asereta platanoidesiae*) – 5 ha, aspen (*Tremuleta popalusiae*) – 713 ha, linden (*Tilieta cordatae*) – 15 ha, poplar (*Populeta albae*) – 36 ha, tree-like willow (*Salixeta albae*) – 663 ha, marsh elder (*Salixeta capreae*) – 2521 ha. Birch formation (*Betuleta pendulae*), in its turn, includes forest stand of white birch (*Betuleta pubescensiae*) – 77 ha.

Mixed forest stand predominate – 72.9%; pure forest stand occupy 27.1% of area. However pine bogged formation has 52.2% of area of pure forest stand while spruce – only 1.4%.

Age structure of swamp woods is the following: young stand – 22.0%; middle-aged – 53.9%; ripening – 13.9%; ripe and overripe – 10.2% of forest covered lands.

Typological diversity of swamp forests of the water collection of the river Neman is represented by 57 types of forests which are combined into 12 forest type series:

– ferny (*Betuletum filicosum* – 16.9%, *Glutinoso-alnetum filicosum* – 11.0%, *Piceetum filicosum* – 2.7% and etc.) – 32.1% out of the area, covered with forest, lands of swamp wood of water collection of the river Neman;

– sedge (*Betuletum caricosum* – 12.1%, *Glutinoso-alnetum caricosum* – 9.5%, *Pinetum caricosum* – 1.8% and etc.) – 25.0%;

– spiraea (*Glutinoso-alnetum filipendulosum* – 11.0% and etc.) – 15.3%;

– sedge-sphagnum (*Pinetum caricoso-sphagnosum* – 4.4% and etc.) – 7.2%;

- ledum (*Pinetum ledosum*) – 5.8%;
- others – 14.6%.

In water collection of the river Neman the following types are represented fragmentarily and deserves to be regarded as “rare” or “single” types of swamp woods: bog moss pine forest (*Pinetum sphagnosum*) – 0.29%, brook-grass spruce forest (*Piceetum fontinale-herbosum*) – 0.30%, birch iris forest (*Betuletum iridosum*) – 0.11%, birch sphagnous forest (*Pubescentio-Betuletum sphagnosum*) – 0.03%, ash spiraea forest (*Fraxinetum filipendulosum*) and some other. It should be mentioned that in general within Belarus these types of forest are relatively wide-spread.

On the territory of Belarusian water collection of the river Neman 88.5 thousand ha of natural bogs and 245.0 thousand ha of swamp woods have been preserved that makes 7.3% of the water collection area. 92.5% of these lands, practically all, are localized in state forest fund.

In the 60s of the XX c. 74% of the area of natural bogs and a small part of swamp woods were exposed to draining; including other excessively wet lands drainage amelioration was carried out on 12.4% of area of Belarusian water collection of the river Neman.

Carbonic reserve of swamp woods of the water collection of the river Neman is presented in the table.

Total carbonic reserve in swamp woods of the water collection of the river Neman (forest-swamp pool of carbon) makes 254.6 million tons of carbon. Average accumulation of carbon by one hectare of covered with forest swamp woods of the water collection of the river Neman (carbonpro-

ductivity of swamp woods) is 1104 tones of carbon. Main reserve of carbon (94.7%) is accumulated in soil of swamp woods. As for phytomass carbon it is only 4.8% of forest-swamp pool of carbon. Only 27.4% of carbon reserve of swamp woods is included into a small biocycle (phytomass + dead wood + forest litter + organic carbon of 30-centimeter-long layer of soil).

Accumulation of carbon by swamp woods is considerably identified by a forest site type.

The largest resources of swamp woods carbon are connected with forests of sedgey, ferny, spiraea and sedge-sphagnum series of forest type.

As for carbonproductivity level (t C/ha) there are the following swamp woods: sedge-sphagnum – 1455, sphagnum – 1393, ledum – 1298, sedge – 1267, spiraea – 1072, swamp-ferny – 1018, iris – 1011, sedge-grass – 1001, ferny – 992, willow – 862 and brook-grass – 560.

Swamp woods are distinguished by extensive carbonproductivity and perspective of a potential sequestrum of atmospheric carbon dioxide in the form of out of biocycle peat. At the amount of swamp woods of 14.06% (on area) with accumulation of carbon in them of 48.55% from forest pool of carbon on covered with forest lands in the water collection of the river Neman. Average carbonproductivity of swamp woods makes 1104.6 t C/ha, while upland woods – 191.0 t C/ha, or 5.78 times lower. This is a result of a slower mineralization of humus in swamp woods in comparison with upland woods. As a result only 23.4% of organic carbon of the soil of swamp woods includes into a small biological cycle while in upland woods – 92.6%.

Carbon reserve in swamp woods of the water collection of the river Neman, thousand tons of carbon (lands covered with forest)

Series of forest types	Phytomass			Dead wood	Forest litter	Organic carbon of soil				Forest-swamp pool of carbon
	Over-ground	under-ground	total			movable	firm	pre-served (peat)	total	
Brook-grass	410	38	448	13	33	719	1.437	1.952	4.108	4.602
Ledum	594	51	645	23	54	1.233	2.466	13.069	16.768	17.490
Sedge	2.147	2.042	2.351	78	134	4.490	8.980	56.558	70.028	72.591
Sedge-sphagnum	623	59	682	23	38	1.448	2.886	19.138	23.472	24.215
Sphagnum	10	3	13	0.4	0.9	63	126	832	1.021	1.035
Ferny	4.293	398	4.691	155	333	5.650	11.300	49.908	66.858	72.037
Spiraea	1.897	176	2.073	62	134	2.769	5.536	27.285	35.590	37.859
Swamp-mixed herbs	0.03	0.01	0.04	0.1	0.1	–	–	1	1	1
Sedge-grass	439	55	494	16	27	1.158	2.316	7.741	11.215	11.752
Swamp-ferny	429	39	468	15	37	724	1.448	4.837	7.009	7.529
Iris family	273	17	290	10	23	458	916	3.065	4.439	4.762
Willow	31	3	34	1	2	72	145	484	701	738
<i>Total</i>	11.146	1.043	12.189	396	816	18.784	37.556	184.870	241.210	254.611

Conclusion. Swamp woods of the water collection of the river Neman have important functions as for protection of water resources, conservation of biodiversity and carbon storage.

Lowland woods predominate (86.2%), presented by fifteen forest formations including birch (40.5%) and black alder (40.2%). Young stand occupy 22.0%, middle-aged – 53.9%, ripening – 13.9%, ripe and overripe – 10.2% of area covered with forest lands of swamp woods.

Typological diversity of swamp woods of the water collection of the river Neman is presented by 57 types of woods which are combined by 12 series of forest types. The following series of forest type predominate: ferny – 32.1%, sedgy – 25.0% and spiraea – 15.3% of area covered with forest lands. About 21.2% of area of swamp woods are occupied by secondary forest growth (not native) stand.

Minimalistic exploitation and prevention of swamp woods draining is preferable. During the cutting of swamp woods or their transformation under agricultural usage intensification of upper layer anthraciny at the amount of 56.3 mln. t C takes place, it leads to the emission of movable

carbon of soil. Size of emission may make ≈ 2 mln. t CO₂/year. Preservation of swamp woods – is one of the ways of prevention of extra greenhouse gas.

References

1. Взаимоотношение леса с болотом и лугом // Дендрология с основами лесной геоботаники / Сукачев В. Н. [и др.]. Л.: Гослестехиздат, 1954. С. 287.
2. Пьявченко Н. И. О взаимоотношениях леса и болота // Лесоведение. 1980. № 3. С. 24–33.
3. Рахманов В. В. Влияние осушения заболоченных лесов на сток рек // Лесное хозяйство. 1985. № 8. С. 27–33.
4. Сукачев В. Н. Болота, их образование, развитие и свойства. Л.: Изд. Лесного ин-та, 1925. 71 с.
5. Методика оценки общего и годовичного депонирования углерода лесами Республики Беларусь: утв. и введ. в действие приказом М-ва лесного хоз-ва Респ. Беларусь от 28.03.2011 № 81 / Л. Н. Рожков [и др.] Минск: БГТУ; ЛРУП «Белгослес», 2011. 19 с.

Received 20.01.2014