

## Characteristics of the forest vegetation of Biloozersky National Nature Park (Ukraine)

OLESYA A. YAROVA<sup>1</sup>

<sup>1</sup>Pereyaslav–Khmelnitsky Hryhoriy Skovoroda State Pedagogical University, Sukhomlynskyi Str., 30, 08401, Kiev Reg., Ukraine; olesyagr@ukr.net

---

Yarova O. A. (2017): Characteristics of the forest vegetation of Biloozersky National Nature Park (Ukraine) – Thaiszia – J. Bot. 27 (2): 65-72. – ISSN 1210-0420.

Abstract: The article presents the results of study on Biloozersky National Nature Park's forest vegetation, which occupies 92.4 % of the Park's territory. The classification of the forest vegetation is made based on the dominant system. The forest vegetation is represented by the communities of the formations *Pineta sylvestris*, *Querceta roboris*, *Alneta glutinosae*, *Betuleta pendulae*, and *Populeta tremulae*. The area is dominated by pine forests (about 70 %); there are significantly less oak-pine and oak forests. The pine forests with green mosses are the most common. In similar environmental conditions, but on more fertile soils the association *Pinetum (sylvestris) convallariosum (majalis)* occurs often. The communities of the association *Querceto (roboris)–Pineta sylvestris*, occupy significant areas; they are formed on the straightened plots and the bottoms of slopes. The communities of the formation *Querceta roboris* occupy small territories and are confined to the second sandy terrace of the Dnieper. In oak forests the fragments of vernal ephemeroïd synusiae occur with *Scilla bifolia*, *Corydalis solida*, and the rare for the region boreal species *Pyrola minor* and *Chimaphila umbellata*. The derivate communities of *Populeta tremulae* have been formed on the old pine clearings. The communities of this formation occur on small areas sporadically throughout the Park. The waterlogged ecotopes in the floodplains of the Bile Lake have small areas of *Alneta glutinosae*.

Keywords: Biloozersky National Nature Park, forest vegetation, classification, formation.

---

## Introduction

Biloozersky National Nature Park is located in Ukraine, on the territory of Pereyaslav-Khmelnysky district, Kyiv region and Kaniv district in Cherkasy region; it covers an area of 7014.44 hectares. The total area of the park has the following administrative and organizational structure: Biloozersky forest estate (3660 hectares) located in Pereyaslav-Khmelnysky district of Kyiv region and Lipyava forest estate (3356 hectares), located in Kaniv district of Cherkasy region. The park consists of 215 forest compartments of various sizes, the largest ones are 126 hectares, and the minimal ones are 11 hectares.

According to physiographic zoning Ukraine, the territory belongs to Dnieper floodplain-pine forest physiographic district of the Dnieper terrace plain in the Northern forest-steppe region of the Dnieper Left bank forest-steppe province (PORYVKIN 1968, SHCHERBAN 1982).

According to the geobotanical subdivision Ukraine of (1977), the park belongs to the Middle Dnieper geobotanical district of flood plains, oak-pine forests and low moors; Bakhmach-Kremenchuk division of terrace meadow steppes, terrace oak-pine forests, floodplain meadows, eutrophic moors, and meadow-halophytic vegetation; Dnieper Left Bank subprovince; Eastern European province of Euro-Siberian steppe region.

The first data about the park's vegetation can be found in J.D. Kleopow, who initiated the study of the vegetation in the region. During 1923-1924 J.D. Kleopow, together with M.V. Dubovik studied forest vegetation of the second terrace above the floodplain of the Middle Dnieper left bank (KLEOPOW & DUBOVIK 1926). In their article, the scientists described the oak-pine forests of the second above floodplain terrace of the Middle Dnieper Left Bank area as the *Querceto (roboris)–Pineta (sylvestris) hylocomiosa* group of associations.

V.K. M'yakushko also studied the pine forests on the Left Bank of the Forest-Steppe zone. In his article (M'YAKUSHKO 1972) he names the associations *Pinetum (sylvestris) hylocomiosum*, *Querceto (roboris)–Pinetum (sylvestris) pteridiosum (aqulini)* for the second Left Bank pine terrace of Dnieper. During 1980-1994 V.I. Melnyk studied the state of oak-pine forests on the Left Bank of the Middle Dnieper (MELNYK 1994).

The vegetation of the park is distinctive for its diversity and variety, due to alternation of two types of landscapes, floodplain and sandy forest. One of its most notable features is the large territory of the forest cover (92.4 %). The forest vegetation is represented by the communities of the following formations: *Pineta sylvestris*, *Querceta roboris*, *Alneta glutinosae*, *Betuleta pendulae*, *Populeta tremulae*.

## Materials and Methods

The study is based on the materials of the field work conducted during 2009-2014 years, using the route field methods. The geobotanical analysis is made using dominant vegetation classification by conventional methods on test plots with an area of 0.25 hectares. We have taken the principles of classification of

the vegetation of Ukraine as the basis for the classification of the vegetation in the study area (AFANASYEV et al. 1956). The names of the syntaxa are given according to the Prodomus of the Vegetation of Ukraine (SHELYAG-SOSONKO et al. 1991). The test plots were selected based on the area of phytocoenosis occurrence. The description of the test plots was made using such parameters: serial number, date, geographic location, topography, soil type, moisture conditions, human activity impact, crown density, age, height, forest capacity and trunk diameter of an edificator, undergrowth density, general projective cover of herbs and mosses layer and the projective cover for each species (percentage). The main taxonomic units of classification are: group of associations, association, formation, and vegetation type.

## Results and discussion

The total area of forests in the Biloozersky NNP is 6481.7 ha or 92.4 % of the total area of the park. The natural forests constitute 30 % of the total forested area. The average age of plantations is 65 years. Forests of the NNP have the following age groups in percentage terms: the young forest - 14.5 %, middle-aged - 68.8 %, mature - 7.5 %, and overmature trees - 9.2 %.

As it was noted before, the area is dominated by pine forests that cover about 70% of the territory. It is determined by the prevalence on the pine forest terrace of the fine grained and medium sands, that have glaciofluvial origin at the bottom and alluvial in the upper layers. In the areas of pine forest terrace, which are covered with loess-like loam, there are oak forests.

There is not much left of the natural pine forests, a large part consists of pine plantations of various ages. *Pineta sylvestris* grow on the plains or low hills, taking ecotopes of varying degrees of moisture. Sod-podzolic soils are prevalent.

*Pineta (sylvestris) hylocomiosa* occur frequently throughout the park. They are confined to shallow ridges or hills with podzolic soils. Single-storeyed forest (crown density 0.7-0.8) is formed by *Pinus sylvestris* L. with the I-II class of forest capacity, 50-60 years old, 20-22 m tall, the average diameter of trunk is 30 cm. *Betula pendula* Roth. occurs as an admixture in the forest stand. The undergrowth is usually not very distinctive. The grass and brush layer is understocking (10-20 %), mostly consisting of *Convallaria majalis* L. (sometimes it dominates with 20-25 % cover), *Pteridium pinetorum* C.N. Page & R.R. Mill., *Polygonatum odoratum* (Mill.) Druce, *Calamagrostis epigeios* (L.) Roth and others. The well marked moss layer has the projective cover of 40-60 %. It is mostly dominated by *Pleurozium schreberi* (Brid.) Mitt. with considerate participation of *Dicranum polysetum* Sw. and admixture of *Polytrichum commune* Hedw. These forests are represented by the communities of the *Pinetum (sylvestris) hylocomiosum*, and *Pinetum (sylvestris) convallarioso (majalis)-hylocomiosum* associations.

In more fertile soils (sod-semipodzolic) *Pineta (sylvestris) convallariosa (majalis)* occur often. They are characterized by single-storeyed forest stand, formed by *Pinus sylvestris* I-II class of forest capacity with canopy density 0.6-0.8. At the age of 50-65 years it is 20-22 meters high. *Betula pendula* and

*Quercus robur* L. occur solitary in the forest stand. The undergrowth is usually not distinctive; the grass and brush layer is of middle density (30-40 %) with domination of *Convallaria majalis* (20-30 %) and significant participation of *Polygonatum odoratum* (3-5 %). The following species occur commonly: *Pteridium pinetorum*, *Melampyrum pratense* L., *Calamagrostis epigeios*, *Chelidonium majus* L., *Hypericum perforatum* L., *Erodium cicutarium* (L.) L'Her., *Milium effusum* L., *Genista tinctoria* L. The moss layer is not distinctive, *Pleurozium schreberi* occurs in clumps. They are represented by the association *Pinetum (sylvestris) convallariosum (majalis)*.

In somewhat drier areas of such ecotopes the communities of the association *Pinetum (sylvestris) polygonatosum (odorati)* occur, they are similar to the previous ones by their phytocoenotic characteristics.

In the central part of the park in small sites the communities of the association *Pinetum (sylvestris) pteridiosum (aquilini)* are formed. They are confined to the straightened plots or the middle of the smooth slopes on soddy- middle podzolic sandy-loam soils, that are characterized with a little higher richness. In the forest stand (0.6-0.7), besides *Pinus sylvestris*, 20-24 meters tall, there are solitary admixtures of *Betula pendula* and *Quercus robur*, that are somewhat suppressed and are in an unpronounced second layer. The undergrowth is commonly indistinctive; sometimes there are bushes of *Frangula alnus* Mill. The grass and brush layer is quite thick (50-70 %) and distinctively differentiated into several sublayers. The regeneration of pine is not noted. *Pteridium aquilinum* prevails in the grass stand (40-60 %) and there are nemorose species and the ones with ecologically wide ranges (*Milium effusum*, *Genista tinctoria*, *Melica nutans* L., *Polygonatum odoratum*, *Campanula persicifolia* L., *Geranium sanguineum* L.). The moss layer is not prominent.

On the plots with somewhat loose stand (0.5–0.6) with notable anthropogenic disturbance on large areas, the serial communities *Pinetum (sylvestris) calamagrostidosum (epigeioris)* and *Pinetum (sylvestris) rubosum (caesii)* are formed.

In addition to the described above associations of the main pine forests, there are plots of high phytocoenotic value with rare communities of the association *Pinetum (sylvestris) juniperoso (communis)–sparsiherbosum*. The forest stand is mostly single-storeyed, understocking (0.4–0.5), comprised of *Pinus sylvestris*, I-II class of forest capacity, 24–25 m high. Sometimes the stand is double-storeyed (0.6), the second layer (17–18 m) is composed of *Quercus robur* with solitary occurrence of *Betula pendula*. The undergrowth layer (0.2–0.4) is formed by small trees or shrubs of *Juniperus communis* L., in various forms. The grass and brush layer is understocking (20–30 %), its basis consists of *Convallaria majalis*, *Polygonatum odoratum*, *Agrostis capillaris* L., as well solitary occurring *Viscaria viscosa* (Scop.) Aschers., *Galium verum* L., *Veronica spicata* L., *Asparagus officinalis* L., *Viola matutina* Klokov, *Verbascum lychnitis* L. The moss cover is unpronounced, *Pleurozium schreberi* occurs in clumps.

In large areas there are pine plantations of different ages, created in different ecotopes and varieties of relief. Single-storeyed monospecific forest stands are

typical for them; they are thick (0.8–0.9) with trees in lines. The undergrowth is often formed with *Sambucus racemosa* L., *S. nigra* L., *Euonymus verrucosa* Scop. The grass and brush layer is prevailed by *Rubus caesius* L. and *Impatiens parviflora* DC. The floristic basis constitutes of ruderal species and those with wide ecology: *Urtica dioica* L., *Hypericum perforatum*, *Artemisia vulgaris* L., *Arctium lappa* L., *Polygonum aviculare* L., *Galinsoga parviflora* Cav., *Erodium cicutarium* etc.

We have identified the following associations of the oak-pine forests: *Querceto (roboris)–Pinetum (sylvestris) convallariosum (majalis)*, *Querceto (roboris)–Pinetum (sylvestris) ruboso (caesii)–convallariosum (majalis)*, *Querceto (roboris)–Pinetum (sylvestris) ruboso (caesii)–sparsiherbosum*, *Querceto (roboris)–Pinetum (sylvestris) calamagrostidoso (epigeioris)–hylocomiosum*.

Among the forest vegetation large areas are occupied by the forests *Querceto (roboris)–Pineta (sylvestris)*, which are formed in somewhat more fertile soils, than the pine forests, with various degrees of moisture. The distinctive feature of these forests is the presence of the double-storeyed stand and floristically rich grass and brush layer, which combines boreal, nemorose, and species with wide ecologic ranges. They grow on sod-podzolic, clay-loam and sandy loam soils with layers of loams. They occupy straightened plots and bottoms of slopes. The most common is *Querceto (roboris)–Pineta (sylvestris) convallariosa (majalis)*. The first layer of those forests is formed by *Pinus sylvestris*, and *Quercus robur* mostly forms the second layer of the stand. *Betula pendula* and *Populus tremula* L. occur solitary in the second layer. The undergrowth is not formed, there are solitary plants of *Frangula alnus*, *Crataegus rhipidophylla* Gand. (= *C. curvisepala* Lindm.), *Corylus avellana* L. and *Berberis vulgaris* L.

The communities of the association *Querceto (roboris)–Pinetum (sylvestris) convallariosum (majalis)* have the forest stand with the density of 0.7–0.8, in which the first layer is formed by *Pinus sylvestris* of the II–III class of forest capacity; the second layer is comprised of *Quercus robur* aged 50–55 years and 15–17 m high, canopy density is 0.5–0.6, where *Tilia cordata* Mill. occurs sporadically. The undergrowth is usually not pronounced, with solitary occurrence of *Frangula alnus*, *Crataegus rhipidophylla*. The grass and brush layer has the total projective cover 65–70 %, it mostly consists of *Convallaria majalis* (sometimes it dominates with 40–45 % cover), *Polygonatum odoratum*, *Iris hungarica* Waldst. & Kit.; with occurrence of *Galium aparine* L., *Viola matutina*, *Euphorbia cyparissias* L., *Chamaecytisus ruthenicus* (Fisch. ex Wolf.) Klásková. The moss cover is unpronounced.

In the similar ecological conditions on small areas the associations *Querceto (roboris)–Pinetum (sylvestris) ruboso (caesii)–convallariosum (majalis)* occur often. The first layer is formed by *Pinus sylvestris* 45–50 years of age, 17–20 m tall, forest capacity II, canopy density 0.3–0.4. The regeneration of pine is not noted. The second layer is formed by *Quercus robur* of 50–55 years old, 15–17 meters high, canopy density 0.5–0.7. In an unpronounced third layer there are solitary individuals of *Pyrus communis* L. In the undergrowth layer there are *Acer tataricum* L., *Frangula alnus*, *Crataegus rhipidophylla*, and *Sambucus nigra*. The

grass and brush layer is 35-50 cm high, average density (30-35 %) with dominance of *Convallaria majalis* (15-20 %) and significant role of the trailing *Rubus caesius* (10 %). The following plants occur commonly: *Urtica dioica*, *Dryopteris filix-mas* (L.) Schott., *Impatiens parviflora* DC, *Galium aparine*, *Chelidonium majus*, *Erodium cicutarium*, and *Dactylis glomerata* L. The moss cover is unpronounced.

The small-area communities of the formation *Querceta roboris* are related to the second sandy terrace of Dnieper, where they occupy depressions, hollows with sandy-loam soils. The most typical are the phytocoenoses of the associations *Quercetum (roboris) convallariosum (majalis)*, *Q. caricosum (pilosae)*, *Q. coryloso (avellanae)-caricosum (pilosae)*, *Q. pteridiosum (aquilini)*.

The communities of the association *Querceum (roboris)-pteridiosum (aquilini)* have the forest stand with crown density 0.5-0.7 and consist mostly of *Quercus robur* III; sometimes there are admixtures of *Betula pendula*. The undergrowth is understock with crown density 0.2-0.3, it is mostly dominated by *Corylus avellana*, *Frangula alnus*; *Juniperus communis* also occurs sometimes. The herbaceous cover is abundant (55-60 % of cover) and distinctively two-storeyed. The dominant is *Pteridium aquilinum* (35-40 %), except it in the first sublayer *Anthericum ramosum*, *Dactylis glomerata* (10-15 %) also occur; there are also solitary *Athyrium filix-femina*, *Vincetoxicum hirundinaria* Medik., *Betonica officinalis* L. and others. In the second sublayer the following species prevail: *Convallaria majalis*, *Melica nutans*, *Lathyrus vernus* (L.) Bernh., *Asarum europaeum* L., *Potentilla alba* L., *Veronica chamaedrys* L., and *Viola matutina*.

Other associations of the formation *Querceta roboris* grow in similar conditions. Their single-storeyed stand with density 0.6-0.7, trunk height up to 15-20 meters, and trunk diameter up to 40 cm is formed by *Quercus robur*. There are solitary *Fraxinus excelsior* L., and *Betula pendula*. In the undergrowth there are *Corylus avellana*, *Frangula alnus* and sometimes *Juniperus communis*. In the herbaceous layer the dominants are *Convallaria majalis*, *Carex pilosa* Scop., with the following species commonly occurring: *Trifolium montanum* L., *Epipactis helleborine* (L.) Crantz, *Melica nutans*, *Carex leporina* L., *Iris hungarica* Waldst. et Kit., *Veronica officinalis* L., *Fragaria vesca* L. and others. In the oak forests the fragments of vernal ephemeroïd synusia occur with *Scilla bifolia* L. and *Corydalis solida* (L.) Clairv. Also in these communities boreal species occur, *Pyrola minor* L. and *Chimaphila umbellata* (L.) W. Barton.

The forests of the associations *Betuleto (pendulae)-Quercetum (roboris) pteridiosum (aquilini)*, *Betuleto (pendulae)-Quercetum (roboris) convallariosum (majalis)* occur rarely on the territory of the park. The forest stand with density 0.6-0.7 and height 18-20 meters, is formed not only by *Quercus robur* but *Betula pendula* as well. The undergrowth is not formed, sometimes *Frangula alnus* and *Pyrus communis* occur. In the herbaceous layer the dominants are *Pteridium aquilinum* or *Convallaria majalis*. The common species of these forests are *Carex leporina*, *Polygonatum odoratum*, *Melica nutans*, *Melampyrum nemorosum*.

The derivate communities *Populeta tremulae* have formed on the old pine clearings. The communities of the formation occur sporadically throughout the park territory on small-area plots.

In the wet ecotopes of the Bile Lake floodplains there are small plots of the communities *Alneta glutinosae*. On the very waterlogged spots, in depressions, the water stays 20-30 cm deep. There are mostly communities of the association *Alnetum (glutinosae) urticosum (dioici)*. In such conditions *Alnus glutinosa* (L.) Gaertn. reaches 12-14 meters high, trunk diameter up to 20 cm and it grows up to III–IV forest capacity class. The herbaceous layer is dominated by *Thelypteris palustris* Schott, *Potentilla palustris* (L.) Scop., *Lycopus europaeus* L., *Lysimachia nummularia* L. etc.

While study of the forest vegetation in Biloozersky NNP we have discovered rare associations of the forest vegetation, which are listed in the Green Data Book of Ukraine (ZELENA KNYHA UKRAINY 2009): *Pinetum (sylvestris) juniperoso (communis) sparsiherbosum* та *Querceto (roboris)–Pinetum (sylvestris) juniperoso (communis)–convallariosum (majalis)*.

## Conclusions

Overall, the territory of the park, despite its relatively small area, contains a variety of forest vegetation, represented by the communities of the formations *Pineta sylvestris*, *Querceta roboris*, *Alneta glutinosae*, *Betuleta pendulae*, *Populeta tremulae*. In terms of area the pine forests dominate (about 70%), there are much less oak-pine and oak forests.

There is not much left of the natural pine forests, the large part consists of pine plantations of various ages. Natural pine redwood communities grow on flat plots or low hills, occupying ecotopes of various degrees of moisture. The most common are *Pineta (sylvestris) hylocomiosa*; there are also *Pineta (sylvestris) convallariosa (majalis)*; on less moist plots, the communities of the association *Pinetum (sylvestris) polygonatosum (odorati)*, and on the straightened plots there are the communities of the association *Pinetum (sylvestris) pteridiosum (aquilini)*. Large areas are occupied by serial communities *Pinetum (sylvestris) calamagrostidosum (epigeioris)* and *Pinetum (sylvestris) rubosum (caesii)* that are formed on the plots with significant anthropogenic disturbance.

Among the forest vegetation the large areas are occupied by the *Querceto (roboris)–Pineta sylvestris*, which are formed in somewhat more fertile soils, than the pine forests, with various degrees of moisture. The most common is *Querceto (roboris)–Pinetum (sylvestris) convallariosum (majalis)*.

The forests of *Querceta roboris* occupy small territories and are confined to the second sandy terrace of the Dnieper (depressions with sandy-loam soils). In oak forests the fragments of vernal ephemeroïd synusia occur with *Scilla bifolia* L. and *Corydalis solida* (L.) Clairv., as well as the rare for the region boreal species, *Pyrola minor* L. and *Chimaphila umbellata* (L.) W. Barton. The derivate communities of *Populeta tremulae* have been formed on the old pine clearings. The communities of this formation occur on small areas sporadically throughout

the Park. The waterlogged ecotopes in the floodplains of the Bile Lake have small areas of *Alneta glutinosae*.

## References

- AFANASYEV D.YA., BILYK H.I., BRADIS YE.M. & HRYN F.O. (1956): . Klasyfikatsiya roslynnosti Ukrayins'koyi RSR. – Ukr. Bot. Journ. 13 (4): 63–82 [in Ukr.]
- BARBARICH A.I. (ed.) (1977): Heobotanichne rayonuvannya Ukrainiskoi RSR. K.: Nauk. dumka, 303 pp. [in Ukr.]
- DIDUKH YA.P. & SHELYAH-SOSONKO YU.R. (2003): Heobotanichne rayonuvannya Ukrayiny ta sumizhnykh terytoriy. – Ukr. Bot. Journ. 60 (1): 6–17 [in Ukr.]
- DIDUKH YA.P. (ed.) (2009): Zelena knyha Ukrainy. Ridkisini i taki, scho perebuvayut pid zagrozoyu znyknennya ta typovi pryrodni roslynni uhrupovannya, yaki pidlyahayut okhoroni. Alterpres, 448 pp. [in Ukr.]
- КЕОПОВ J.D. & ДУБОВЫК M.V. (1926): Botanichna ekskursiya do kolyshn'oho Pereyaslavs'koho povitu Poltavshchyny. – Ukr. Bot. Journ. Kn. 3: 44–45 [in Ukr.]
- MELNYK V.I. (1994): Zalyshky korinnykh dubovo-sosnovykh lisiv na Livoberezhzhi Seredn'oho PryDnieperv'ya. – Ukr. Bot. Journ. 51(2-3): 48–51 [in Ukr.]
- M'YAKUSHKO V.K. (1972): Sosnovi lisy Livoberezhnoyi chastyny Lisostepu Ukrayiny – Ukr. Bot. Journ. 29 (4): 492–499 [in Ukr.]
- PORYVKIN O.V. (1968): Severnaya lesostepnaya oblast Pridneprovskoy vozvyshehnosti // Fiziko-geograficheskoe rayonirovanie Ukrainiskoy SSR. – Kiev: Izd-vo Kievskogo un-ta. p. 225-231 [in Rus.]
- SHELYAG-SOSONKO YU.R., DIDUKH YA.P. & DUBYNA D.V. (1991): Prodromus rastitelnosti Ukrainy – K.: Nauk. dumka, 272 pp. [in Rus.]
- SHCHERBAN M.I. (1982): Lisostepova zona // Fizichna geografiya Ukrainiskoi RSR. Za red. chl.-kor. AN URSS O.M. Marinicha. – K.: «Vyscha shkola», p.131-148 [in Ukr.]

Received: March 24<sup>th</sup> 2017  
Revised: September 13<sup>th</sup> 2017  
Accepted: September 20<sup>th</sup> 2017