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# NATURE OF THE "KAMIONKA VALLEY" RESERVE (GREAT POLAND)

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ABSTRACT. As a result of conducted floristic studies in the Kamionka Valley reserve 301 species of vascular plants were identified, belonging to 65 families, as well as 58 moss species. A total of 28 protected species and 14 rare species were reported. Twenty plant associations were reported, including seven forest associations (communities). Broad-leaved forests from class *Querco-Fagetea* are found in the reserve and in the valley floor it is mainly currant alder swamp forest *Ribeso nigri-Alnetum*. This mosaic of alder swamp, riparian, oak-hornbeam and beech forest ecosystems concentrated in the area – highly diverse in terms of its surface features – of this relatively small reserve makes this object a centre of habitat diversity of western Wielkopolska.

KEY WORDS: "Kamionka Valley" reserve, flora, fauna, old trees

## INTRODUCTION

In 1986 the area of the Kamionka River Valley – from Lewice to Kamionna – was incorporated into the Pszczewski Landscape Park. At the same time one of the most valuable sections of this valley was destroyed. Fishing ponds were dug, thus completely changing landscape and water relations at a section of approx. 2 km. A fragment of the meandering river disappeared for ever, water in the river Kamionka became polluted and its flow was being reduced. In view of the observed situation an idea was developed to protect two most valuable fragments of the valley as a reserve. In 1994 the scientific and technical documentation was prepared (Stefanek and Antkowiak 1994) for the purpose of establishment of the "Dolina Kamionki" [The "Kamionka Valley"] nature reserve. Results of this survey were published in print (Stefanek-Pańczuk and Antkowiak 1997). Flora of liverworts in the reserve was published by Górski (2007).

This study is an attempt to supplement the characteristic of the natural environment in the "Dolina Kamionki" reserve, established in 2004 (Rozporządzenie... 2004 b).

## METHODS

Field studies included a survey of resources of fauna, flora and plant communities in the reserve. The Latin nomenclature of vascular plants was adopted after Mirek et al. (2002), while that of mosses after Ochyra et al. (2003). The approach to communities, their nomenclature and taxonomy was adopted after Matuszkiewicz (2002), whereas synonymic names of communities are given after Brzeg and Wojterska (2001).

In studies on flora of mosses the applied method was to identify all species within the radius of 30 m from selected points, relatively uniformly distributed throughout the reserve.

Information on soils in the reserve – a description of genetic profiles, the analysis of soil, textural groups and chemical properties of soils are contained in the Forest Management Plan of the Bolewice Forest Division (Plan urządzania lasu... 2006). The soil pit and detailed soil analysis are presented in an unpublished study by Stefanek and Kicińska-Nabzdyk (1974).

The qualification of trees to the category of monument trees was adopted after Kasprzak (2005).

## RESULTS

*General data on the reserve*

The reserve is located in the Poznań Lake District (Kondracki 2000), in the Wielkopolskie province, the Międzychód commune and the Międzychód County. The Dolina Kamionki reserve covers forest compartments denoted as 4c, d, f, g, h, i, j, l, m, n, o, p, r, 5a, b, 7a, b, f,

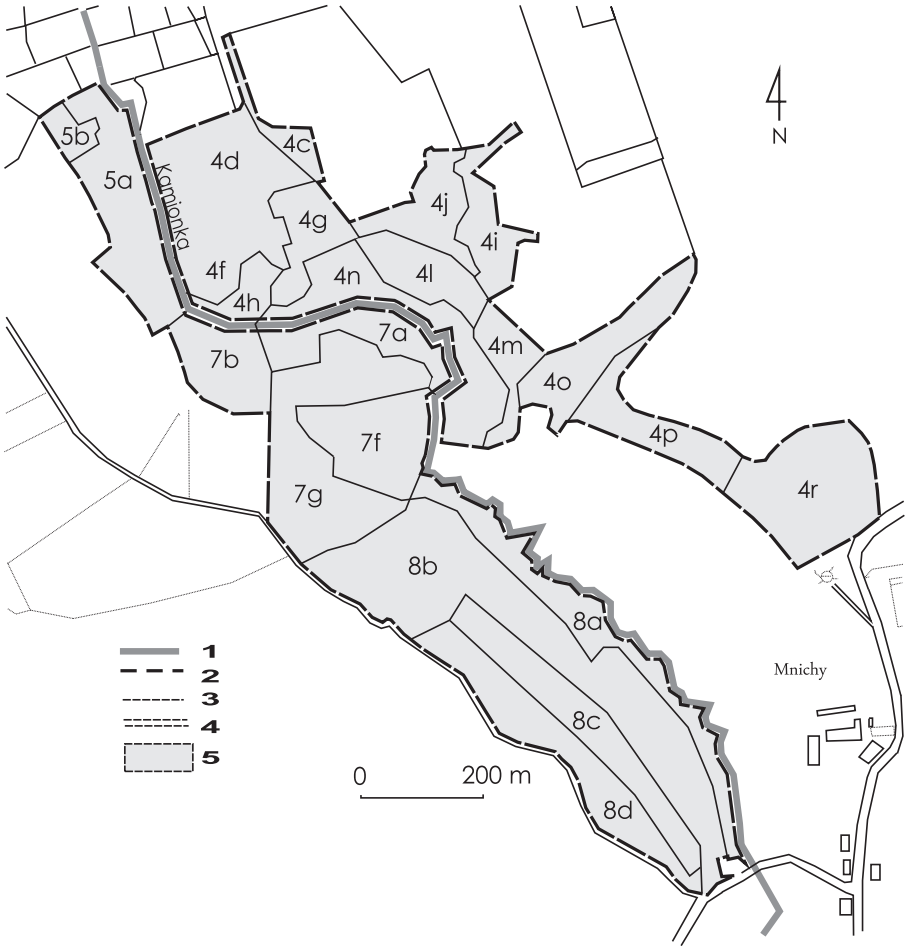


Fig. 1. A register map showing uniform forest subcompartments in the "Dolina Kamionki" reserve. 1 – the river Kamionka, 2 – boundary of reserve, 3 – boundaries of uniform forest subcompartments, 4 – roads, 5 – area of reserve

g, 8a, b, c, d (Fig. 1). The entire reserve lands (59.16 ha) constitute the property of the State Treasury and are administered by the State Forests National Forest Holding – the Bolewice Forest Division, the Papiernia Forest District, the Lewice working cycle. Extreme points of the reserve have the following geographical coordinates: 15°57'44" E and 52°33'01" N, 15°58'00" E and 52°33'06" N, 15°58'59" E and 52°32'42" N, as well as 15°58'45" E and 52°32'22" N. The highest point of the reserve is located at an altitude of 90.8 m above the sea level.

*Geological structure and surface features*

The Kamionka River Valley is a deep channel, formed by snowmelt waters of the glacier of the Würm glaciation, the Poznań substage. It runs meridionally, from Lewice to Międzychód, where it joins the Warta marginal stream valley. It is of interest that snowmelt waters, which carved the channel were flowing in the southerly direction and at present the river Kamionka flows to the north (Schubert 2004).

The valley head is located in the Lewice outwash. Its margins in this section are flat and sandy. North of the village of Krzyżkówko the valley crosses the deposits of the end moraine. They are steep hillocks formed from boulder clays and loamy sands. In turn, north of the village of Kamionna the valley edges are formed by structures of the ground moraine, being very gentle hillocks.

The area of the "Dolina Kamionki" reserve includes this fragment where the river flows among high hillocks of the end moraine. The deep incision results in the opening of the water-bearing layers, which is thus connected with the incidence of waterheads feeding the river Kamionka. In the reserve the valley edges are steep, with a slope angle up to 40°, and the E exposure (the left bank) and the W exposure (the right bank). Slopes are incised by ravines of varying slope angles; the two deepest are located in subcompartment 4r. Waterheads from which streams outflow are found there.

The river Kamionka flows through the reserve from the south to the north. In its central part the river forms large meanders, surrounding the edge, which creating a large headland which in a way blocks the free flow of the river waters. Such a feature of the valley bank results in a slight slowing down of the river flow and considerable swamping on the southern side of the obstacle.

*Soils*

The distribution of different types of soil in the reserve is determined by surface features. Two different areas are found there, i.e. the valley floor with a high level of groundwaters and steep valley scarps with groundwaters lying several meters below the surface. In valley scarps **brown soils** are found, formed from boulder clays and loamy sands, while on the valley floor

there are **hydrogenic soils**. The following soil types were found:

- **peat soils** – formed on the most swampy fragments of the valley floor, closer to its scarps, on the vast majority of subcompartments 4d, 5a, b and 7b,
- **alluvial muck peat soils** – they are moist (groundwaters area periodically on the surface); chemical analyses showed that the reaction is slightly acid on the soil surface, with pH increasing with depth, reaching neutral reaction at a depth of 140 cm; silty peat soils are found at the river bed and extend in wide belts on its both sides, covering parts of subcompartments 4n, 7a, f,
- **bog soils** – with high moisture contents, formed in compartments 4h, l, covered mainly by rush communities,
- **mud soils** – formed in the immediate vicinity of the Kamionka bed, in subcompartment 8a,
- **brown deluvial soils** – formed from heavy loams, with a medium cover of loamy sand; this soil type is found in the transition zone from the valley floor to the scarps, i.e. the boundary of subcompartments 8a and 8b, subcompartments 4i, j, m, r,
- **acid brown soils** – formed from sandy loam; found in the plateau and on the scarp, in subcompartments 4o, p, 8b,
- **brown rusty soils** - formed from loamy sands lying on sands, with a very low level of groundwaters (from 3 to 5 m); found in subcompartments 4c, d, f, g, 8c, d,
- **brown lessivè soils** – formed from boulder clays lying on sandy loam, where groundwater level is also low; found in subcompartments 7a, g.

The distribution of soils is presented by Figure 2.

*Surface waters*

Several streams are found in the reserve, which flow out of heads located on scarps. At the valley floor there are several highly moist areas forming permanent swamps: subcompartment 7f – two swamps of 0.20 and 0.24 ha; subcompartment 5a three swamps of 0.13, 0.10 and 0.06 ha; subcompartment 4h – a swamp of 0.66 ha, and subcompartment 4l – a swamp of 1.61 ha. **The river Kamionka flows through the reserve, but it was not included in it.** Hydrography is presented in Figure 3.

*Structure of forest site types*

The following forest site types are observed in the reserve: ash-alder swamp forest (subcompartments 4n, 5a, 7a, 8a), alder swamp forest (subcompartments 4d, 7b, f), fresh broad-leaved forest (subcompartments 4i, j, m, r, 7g, 8b, c, d) and fresh mixed broad-leaved forest (subcompartments 4c, f, g, o, p). The distribution of the above mentioned types is presented in Figure 4.

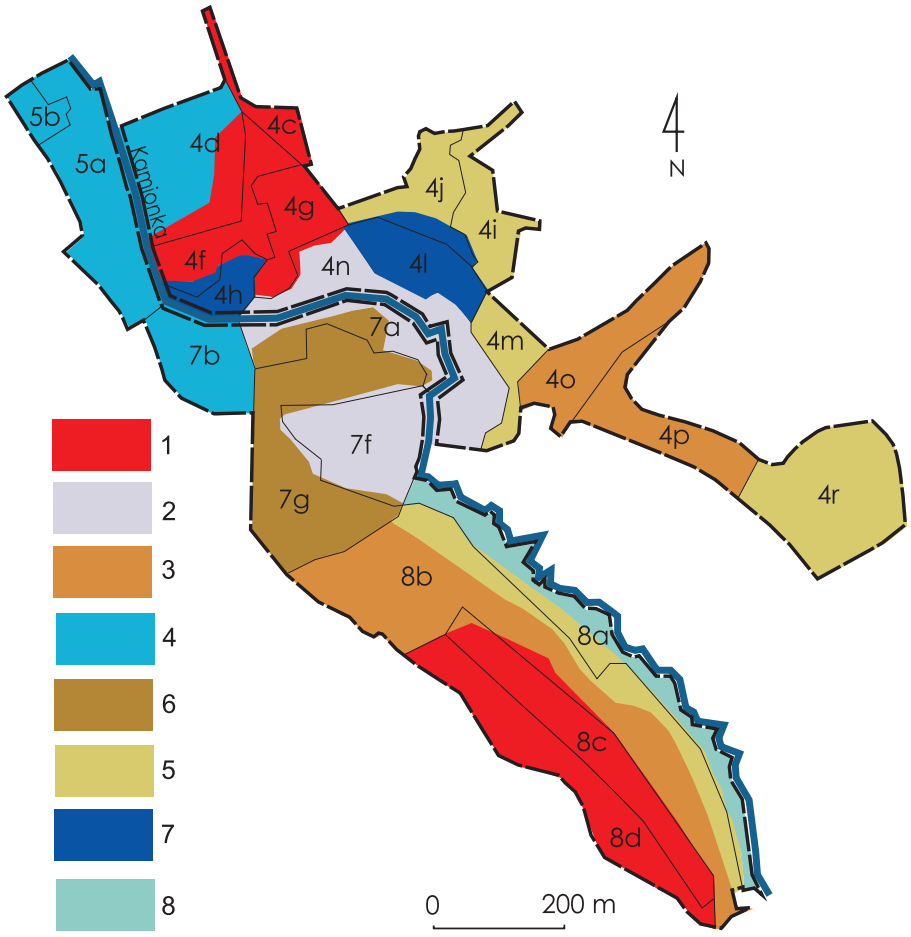


Fig. 2. Soils in the "Dolina Kamionki" nature reserve. Soils: 1 – brown rusty soil, 2 – muck-peat soil, 3 – acid brown soil, 4 – peat soil, 5 – deluvial brown soil, 6 – grey-brown podsolic soil, 7 – bog soil, 8 – muck soil

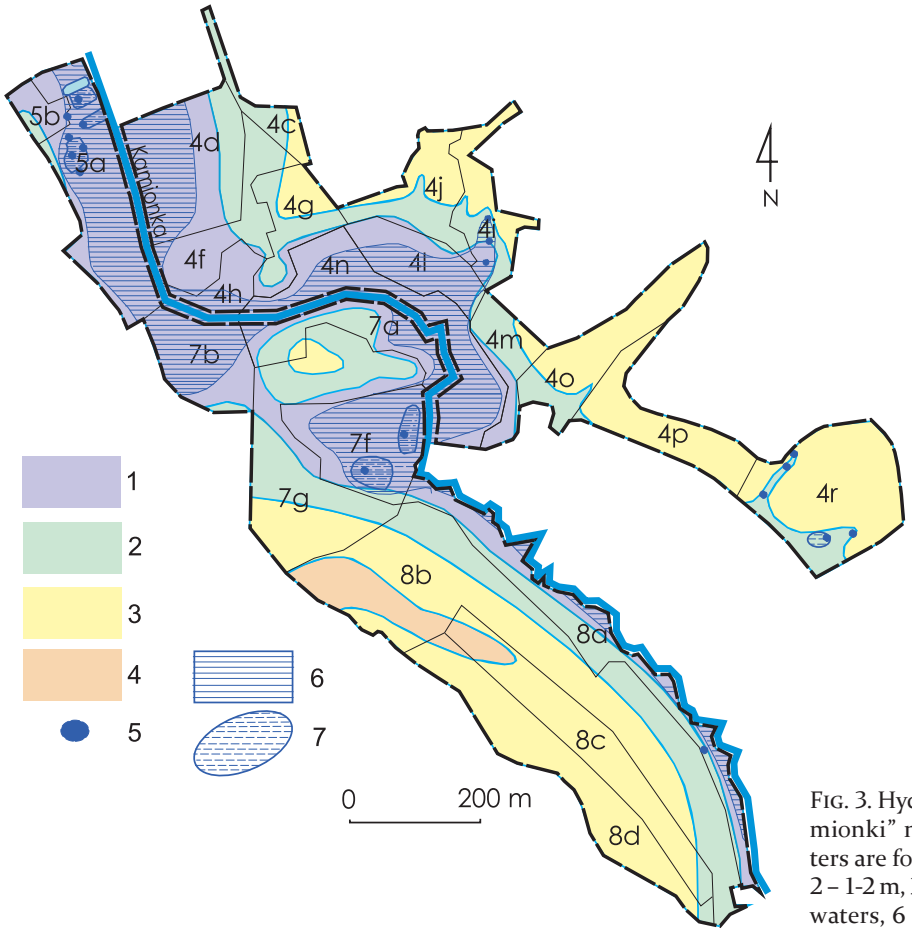


FIG. 3. Hydrography of the "Dolina Kamionki" nature reserve. Ground waters are found at a depth of: 1 – > 1 m, 2 – 1-2 m, 3 – 2-5 m, 4 – < 5 m, 5 – headwaters, 6 – swamps, 7 – marshland

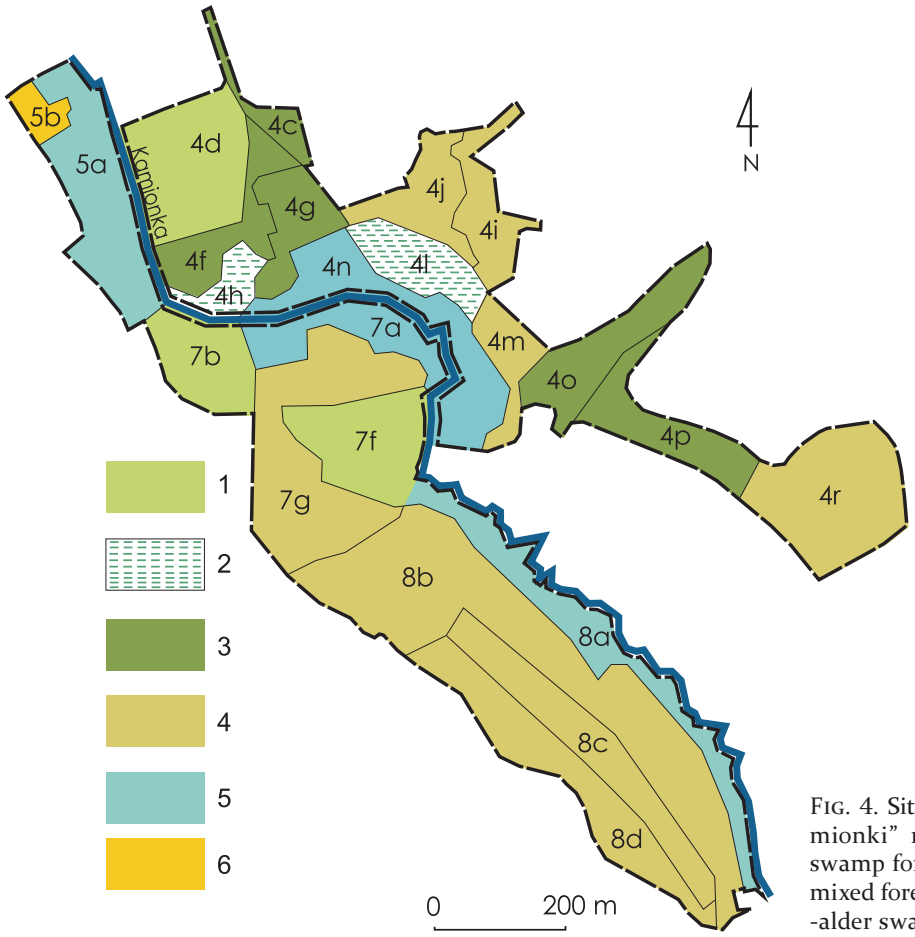


FIG. 4. Site types in the "Dolina Kamionki" nature reserve: 1 – alder swamp forest, 2 – swamps, 3 – fresh mixed forest, 4 – fresh forest, 5 – ash-alder swamp forest

*Natural habitats*

Six ecosystems of interest of the European Union, including two priority ones (*), are found in the reserve. They include:

1. central European oak-hornbeam forest *Galio-Carpinetum* 9170-1, in compartments 4r, 7g, 8b, covering 14.5 ha; the association is at its range limit, it is relatively well-developed,
2. acidophilous lowland beech forest *Luzulo pilosae-Fagetum* 9110-1, in compartments 7g and 8b, covering 1.5 ha; the association is at its range limit, it is relatively well-developed,
3. lowland ash-alder riparian forest *Fraxino-Alnetum* *91E0-3, in compartments 4d, n, 5a, 7a, b, f, 8a, covering approx. 6.5 ha,
4. lowland riparian forest edge communities *Calystegio-Eupatorietum* 6430-3, in compartments 4d and 5a,
5. limestone headstreams with communities *Cratoneurion commutati* *7220, at the boundary of compartments 4l and 4m, 4r, covering approx. 0.015 ha, it is well-developed,
6. ryegrass meadows *Arrhenatheretum elatioris* 6510-1 found in compartment 5b at an area of 0.02 ha, deformed as a result of ceased grassland utilization.

*Vegetation*

In the "Dolina Kamionki" nature reserve alder forests with rich and varied forest floor vegetation predominate on the valley floor. Among them phytocenoses of tall sedge and reed rush associations are scattered, while in fragments meadow communities are also found on edges. On the left and right valley margins there is an oak-hornbeam forest with a large proportion of beech, with many impressive trees of tree monument size (Fig. 5).

*Systemic review of communities*

CLASS: *EPILOBIETEA ANGUSTIFOLII* R. Tx. et Prsg 1950
Order: *Atropetalia* Vlieg. 1937
Alliance: *Sambuco-Salicion* T. Tx. et Neum. 1950
Association: ***Sambucetum nigrae*** Oberd. 1973 = ***Aegopodio-Sambucetum nigrae*** Doing 1962 em. M. Wojterska 1990 (compartment 4r)
CLASS: *ARTEMISIETEA VULGARIS* Lohm., Prsg et R. Tx. in R. Tx. 1950
Order: *Convolvuletalia sepium* R. Tx. 1950
Alliance: *Convolvulion sepium* R. Tx. 1947 em. Th. Müll. 1981
Association: ***Calystegio-Eupatorietum*** Görs 1974 = ***Eupatorietum cannabini*** R. Tx. 1937 (compartments 4b, d, h; 5a)

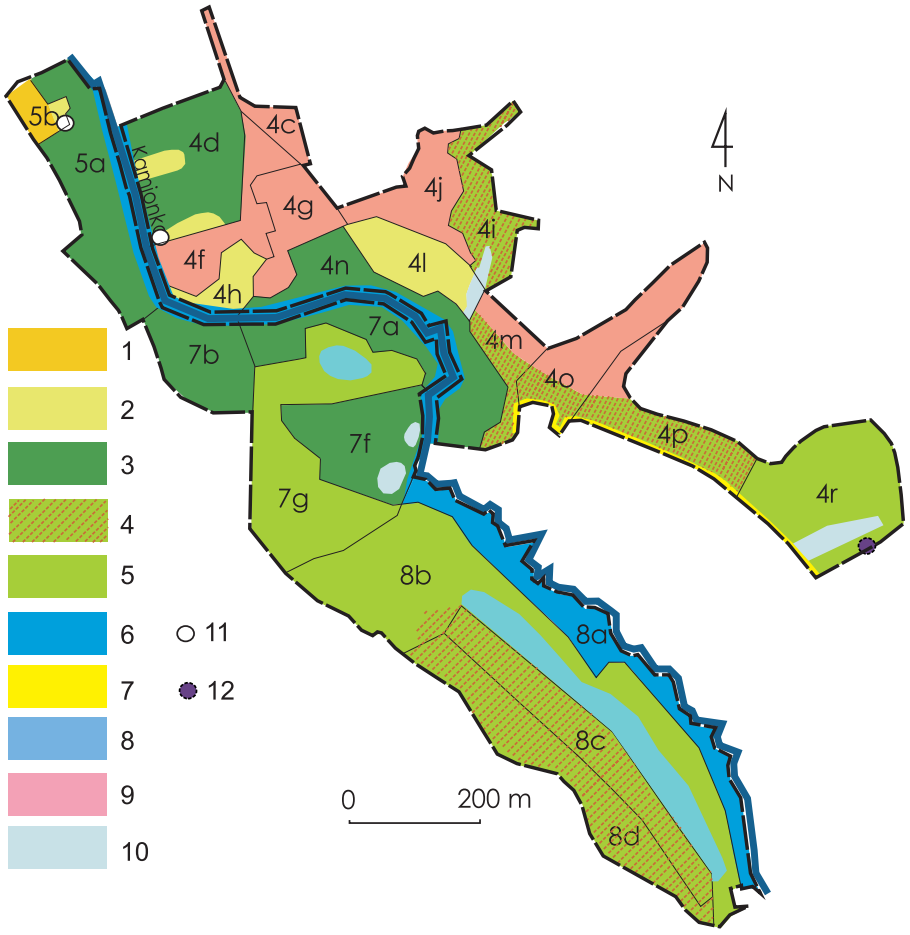


FIG. 5. Actual vegetation of the "Dolina Kamionki" nature reserve: 1 – meadow communities, 2 – rush communities, 3 – *Ribeso nigri-Alnetum*, 4 – *Galio-Carpinetum* transformed anthropogenic community, 5 – *Galio-Carpinetum*, 6 – *Fraxino-Alnetum*, 7 – *Rhamno-Cornetum sanguinei*, 8 – *Luzulo-Fagetum*, 9 – community with *Pinus sylvestris*, 10 – headwaters community, 11 – *Calystegio-Eupatorietum*, 12 – *Sambucetum nigrae*

CLASS: *MONTIO-CARDAMINETEA* Br. Bl. et R. Tx. 1943
Order: *Montio-Cardaminetalia* Pawł. 1928
Alliance: *Cardaminenion* (Maas 1959) Den Held et Westh. 1969
Communito ***Cardamine amara-Chrysosplenium alternifolium*** Oberd. 1977 = ***Cardamino-Chrysosplenietum alternifolii*** Maas 1959 (compartment 7f)
Association: ***Pellio-Conocephaletum*** Maas 1959 (compartments 4l, 4r, 8a)
CLASS: *PHRAGMITETEA* R. Tx. et Prsg 1942
Order: *Phragmitetalia* Koch 1926
Alliance: *Phragmition* Koch 1926
Association: ***Phragmitetum australis*** (Gams 1927) Schmale 1939 (compartments 4d, h, l; 7a, b)
Alliance: *Magnocaricion elatae* Koch 1926
Association: ***Thelypterido-Phragmitetum*** Kuiper 1958 (compartments 4h, 7a, 8a)
Association: ***Caricetum acutiformis*** Sauer 1937 (compartments 4d, 7a, 8a)
Association: ***Caricetum gracilis*** (Graebn. et Hueck 1931) R.Tx. 1937 (compartment 4h)
Association: ***Caricetum paniculatae*** Wangerin 1916 (compartments 4d, l, 5b)
Association: ***Caricetum elatae*** Koch 1926 (compartments 4l, 7a)
CLASS: *MOLINIO-ARRHENATHERETEA* R. Tx. 1937
Order: *Molinietalia caeruleae* W. Koch 1926
Alliance: *Filipendulion ulmariae* Segal 1966
Association: ***Filipendulo-Geranietum*** W. Koch 1926 (compartment 4h)
Alliance: *Calthion palustris* R. Tx. 1936 em. Oberd. 1957
Association: ***Angelico-Cirsietum oleracei*** R. Tx. 1937 em. Oberd. 1967 (compartments 4d, l, 5b)
Order: *Arrhenatheretalia* Pawł. 1928
Alliance: *Arrhenatherion elatioris* (Br.-Bl. 1925) Koch 1926
Association: ***Arrhenatheretum elatioris*** (Br.-Bl. 1925) Koch 1926 (compartment 5b)
CLASS: *ALNETEA GLUTINOSAE* Br.-Bl. et R. Tx. 1943
Order: *Alnetalia glutinosae* R. Tx. 1937
Alliance: *Alnion glutinosae* (Malc. 1929) Meijer Drees 1936
Association: ***Ribeso nigri-Alnetum*** Sol.-Górn. (1975)1978 = ***Carici elongatae-Alnetum*** W. Koch 1926 ex R. Tx. 1931 (compartments 4d, n; 5a; 7a, b, f)
CLASS: *QUERCO-FAGETEA* Br.-Bl. et Vlieger 1937
Order: *Fagetalia silvaticae* Pawł. in Pawł., M. Sokoł. et Wall. 1928
Alliance: *Alno-Ulmion* Br.-Bl. et R. Tx. 1943
Association: ***Fraxino-Alnetum*** W. Mat. 1952 (compartments 4d, n, 5a, 7a, b, f; 8a)
Alliance: *Carpinion betuli* Issler 1931 em. Oberd. 1953
Association: ***Galio sylvatici-Carpinetum betuli*** Oberd. 1957 (compartments 4i, m, o, p, r, 7g, 8b, c, d)
Communityfrom alliance ***Carpinion betuli*** Issler 1931 em. Oberd. 1953
Alliance: *Fagion sylvaticae* R. Tx. et Diem. 1936
Association: ***Luzulo pilosae-Fagetum*** W. Mat. et A. Mat. 1973 = ***Deschampsio flexuosae-Fagetum*** Schröder 1938 (compartments 7g, 8b)
Community with ***Pinus sylvestris*** (compartments 4c, f, g, j, m, o)
CLASS: *RHAMNO-PRUNETEA* Rivas Goday et Garb. 1961
Order: *Prunetalia spinosae* R. Tx. 1952
Alliance: *Berberidion* Br.-Bl. (1947)1950
Association: ***Rhamno-Cornetum sanguinei*** (Kais. 1930) Pass. (1957)1962 = ***Euonymo-Prunetum spinosae*** (Hueck 1931) Pass. in Pass. et Hofmann 1968 (a narrow belt of thickets extending along the southern boundary of forest subcompartments 4o, p, r, at the contact zone with the meadow)

*Characteristics of selected plant communities*

***Pellio-Conocephaletum*** Maas 1959 (compartments: 4l, 4r, 8a)

Phytocenoses *Pellio-Conocephaletum* found in the reserve within the area of waterheads, at the base of moraine rampart slopes, in locations of water seepage outflows. They overgrow earthen escarpments, over which water runs permanently (or periodically). They are found in fertile broad-leaved forests, most frequently oak-hornbeam forests *Galio-Carpinetum*, extensively in the complex with *Cardamino-Chrysosplenietum alternifolii* or in headstreams in trunk communities, with predominating curled hook-moss *Palustriella commutata*. They were recorded in forest reserve subcompartments 4f, l and 8a.

In the vegetation cover of phytocenoses liverworts predominate, mainly *Conocephalum salebrosum* and *Pellia ediviifolia* var. *furcigera*. Apart from liverworts the combination of species in the above association is composed of headstream mosses, i.e. *Palustriella commutata* and *Rhizomnium punctatum*. A permanent, although slight admixture of other bryophytes, i.e. *Mnium hornum*, *Fissidens taxifolius*, as well as vascular plants – *Aegopodium podagraria*, *Viola reichenbachiana*, *Galeobdolon luteum* and *Brachypodium sylvaticum* indicates a fertile habitat. It needs to be added here that in the analysed area *Conocephalum salebrosum* forms separate types of phytocenoses of the nature of moss synusias, overgrowing high escarpments at the river Kamionka. They no longer are of headstream character. They only indicate a larger scale of *C. salebrosum* itself, covering forest earth, fertile and shaded habitats connected with eutrophic and wet ecosystems of broad-leaved forests.

***Ribeso nigri-Alnetum*** Sol.-Górn. (1975)1978 (compartments: 4d, 4n, 5a, 7a, 7b, 7f)

Alder forests are found in the majority of this fragment of the Kamionka Valley floor, which is covered by reserve protection. Among them, forming mosaics in small patches, phytocenoses of rush and reed vegetation and associations of tall sedges are scattered. These forests grow on lowmoor peats and peat-muck soils. Soil moisture content is high – in many places water stagnates periodically on the surface, especially in the spring and summer after considerable rainfall. The most bogged and inaccessible area is alder forest in subcom-

partment 7f. In this community there are two swamps of 0.20 and 0.24 ha, respectively. High moisture content levels are found in alder swamp forest in subcompartments 4d and 7b.

Alder stands vary in age – the biggest number of splendid, over 70-year old *Alnus glutinosa* specimens grows in subcompartment 7a. Stands aged approx. 50 years predominate, with tree diameters of 30-50 cm. Canopy density is 50-90%.

*Ribes nigrum*, *Frangula alnus* and *Salix cinerea* grow in the shrub layer. Shrubs are considerably scattered – only *Ribes nigrum*, a species characteristic for alder swamp forest, forms larger clusters.

The structure of alder forests in most of the reserve area is not connected with large tree groups (over 5a in area) in dells. This type of structure may be observed only in those fragments, where the older stand is found. The forest floor vegetation is exceptionally lush, represented primarily by rush species from class *Phragmitetea*. A considerable proportion is also recorded of meadow species from the order *Molinietalia* and class *Molinio-Arrhenatheretea*. The proportion of water meadow and oak-hornbeam forest species is slight – only noli-me-tangere *Impatiens noli-tangere* is found in bigger numbers. This may result from the absence of distinct large tree groups, where species sensitive to water-logging may be found. A dominant species in the forest floor cover is *Carex acutiformis*. *Equisetum limosum*, *Phragmites australis* and *Carex elata* are found in large numbers. These species have constancy degrees III-V. Among meadow species *Poa trivialis*, *Deschampsia caespitosa* and *Cirsium oleraceum* are recorded most frequently. The moss layer is most frequently represented by *Plagiomnium elipticum* and *Brachytecium rutabulum*.

Alder swamp forests in the Kamionka valley are mostly young alder forests (30- to 50-year old stands), which have found advantageous conditions for development and expansion after land reclamation works and grassland utilization were discontinued.

***Fraxino–Alnetum*** W. Mat. 1952 (compartments: 4d, 4n, 5a, 7a, 7b, 7f, 8a)

The phytocenosis of this association was distinguished mainly due to the occurrence of ash-alder swamp forest site, which extends in a belt on both sides of the river in subcompartments 4d, n, 5a, 7a, b, f and 8a. It is also an alder stand. From the neighbouring alder swamp forests it differs in the occasional incidence of *Fraxinus excelsior*, as well as a bigger abundance of *Impatiens noli-tangere*. *Chrysosplenium alternifolium* and *Urtica dioica* also grow there. Phytocenoses of *Fraxino-Alnetum* are subjected to dynamic transformations; their range depends on the moisture content of the valley floor. The existence of this phytocenosis may be threatened by the reduction of water flow in the Kamionka by pond users.

***Galio sylvatici-Carpinetum betuli*** Oberd. 1957 (compartments: 4i, 4m, 4o, 4p,4 r, 7g, 8b, 8c, 8d)

Oak-hornbeam forest grows on the scarps of the Kamionka valley on its both sides. Phytocenoses of this association are found in subcompartments 7g, 8b, c, d, (on the western side of the valley) and 4i, m, o, p, r (on the eastern side of the valley). Oak-hornbeam forest is found in the fresh forest and fresh mixed forest sites on brown soils formed from boulder clays and loamy sands. Moreover, both typical phytocenoses and those transformed by anthropogenic factors as a result of inappropriate forest economy conducted in the past are also found here.

Oak-hornbeam forest similar in character to natural forest is found in subcompartments 8b, 7g and 4r. The stand is formed by *Quercus robur*, *Fagus sylvatica*, *Carpinus betulus*, *Acer platanoides* and *Acer pseudoplatanus*. The oldest trees are 130-170 years old and reach impressive dimensions. In the vertical structure of the forest *Fagus sylvatica* specimens predominate, reaching up to 34 m in height and DBH of 50-140 cm. *Fagus sylvatica* grows here at the limit of its range. *Quercus robur* and *Carpinus betulus* form approx. 50% stand, *Acer platanoides* and *Acer pseudoplatanus* are found singly, scattered throughout the entire area covered by oak-hornbeam forest.

The shrub layer is not well-developed and it is composed of undergrowth of *Carpinus betulus* and *Fagus sylvatica* as well as *Corylus avellana* shrubs.

The development of the forest floor vegetation is limited by the presence of beech litter. Herbaceous species grow in phytocenoses, with larger clusters formed by *Stellaria holostea*, *Galeobdolon luteum* subsp. *luteum*, *Galium odoratum*, *Polygonatum multiflorum*. *Cephalantera rubra* was also recorded here.

Strong winds fell many old trees, currently overgrown by mosses and epixylic fungi. Areas exposed by fallen trees are naturally seeded by broad-leaved species. Natural seedings and undergrowths are most numerous in subcompartment 8b.

The substitutional forest community in the *Galio-Carpinetum* site is found in subcompartments 8c, d, 4i, m, o, p. The transformation of these forests consisted in planting of *Pinus sylvestris* and *Robinia pseudoacacia* on fertile oak-hornbeam sites. Individual phytocenoses vary in terms of stand age and proportions of *Pinus sylvestris* and *Robinia pseudoacacia:*

- phytocenosis in subcompartment 8c – the stand is 48 years old, with *Betula pendula* and *Robinia pseudoacacia* predominating (50%), gaps overgrown with *Prunus spinosa*, in the shrub layer *Robinia pseudoacacia* and *Corylus avellana* predominate;
- phytocenosis in subcompartment 8d is a 160-year old stand, in 50% comprised of previously resin-tapped *Pinus sylvestris*. *Quercus robur* and *Fagus sylvatica* are found in different age classes, forest floor species grow occasionally;
- phytocenosis in subcompartment 4i – the stand is 73 years old, with the proportion of *Pinus sylvestris* of 40%, dense undergrowth of broad-leaved species, mainly *Carpinus betulus* and *Fagus sylvatica*;
- phytocenosis in subcompartment 4m – *Pinus sylvestris* predominates as a 68-year old stand, while *Fagus sylvatica*, *Carpinus betulus* and *Quercus robur* form a dynamically developing undergrowth;
- phytocenosis in subcompartment 4o – *Pinus sylvestris* and *Robinia pseudoacacia* aged 68 years constitute 70% stand; regeneration of *Quercus robur* and *Fagus sylvatica* is observed;

– phytocenosis in subcompartment 4p – among 120-year old *Quercus robur* trees there are *Pinus sylvestris* specimens of identical age and 80-year old *Robinia pseudoacacia*; in the underbrush and forest floor vegetation there are nitrophilous species, such as *Sambucus nigra*, *Chelidonium majus*, *Urtica dioica*.

Although in these transformed communities the proportion of *Pinus sylvestris* is high (even up to 70%), coniferous forest species are not observed. However, dynamically developing undergrowths of *Carpinus betulus*, *Fagus sylvatica* and *Acer platanoides* are found.

***Luzulo pilosae-Fagetum*** W. Mat. et A. Mat. 1973 (compartments: 7g, 8b)

On steep slopes in subcompartment 8b and at an elevation in subcompartment 7g there is a small phytocenosis of this association. It is beech forest at the limit of the range for its species. *Fagus sylvatica* trees reach considerable dimensions – many of them are over 300 cm in girth and 33 m in height. They are characterized by column-like stems and wide-stretching branches. A thick layer of litter lies on the forest floor and natural seeding and undergrowths of *Fagus sylvatica* are also found. Scattered specimens of *Luzula pilosa* and *Anemone nemorosa* are also recorded. In terms of its landscape it is the most beautiful area of the reserve. A serious threat for this beech forest may be connected with natural processes – strong winds and soil overdrying as a consequence of rainfall shortage. Soil erosion on slopes results in a situation when huge *Fagus sylvatica* trees have their root system exposed on one side, which makes them susceptible to windfall in case of big storms. In exposed places natural seeding and undergrowth of *Fagus sylvatica* appears. These plants are occasionally eaten by animals, which suggests that hopefully beech forest will be naturally regenerated.

**Community with *Pinus sylvestris*** (compartments: 4c, 4f, 4g, 4j, 4m, 4o)

On valley slopes in the north-eastern part of the reserve pine stands are found, planted at variance with site conditions. They cover subcompartments 4c, f, g, j, m, o. *Pinus sylvestris* trees aged 41-68 years grow in fresh forest and fresh mixed forest sites, where potential communities are acid oak forest and oak-hornbeam forest. The phytocenosis in subcompartments 4f, g, j, is *Pinus sylvestris* monoculture with the underbrush of broad-leaved species in 4f – *Fagus sylvatica* and *Prunus spinosa*, at 30%; in 4g – *Corylus avellana*, *Carpinus betulus*, *Fagus sylvatica*, at 50%; in 4j – *Prunus spinosa*, *Crataegus laevigata*, *Quercus robur*, *Corylus avellana*, at 80%. In the phytocenosis in subcompartments 4m, o, *Pinus sylvestris* predominates in the stand (60%), but there is also an admixture of broad-leaved species *Fagus sylvatica*, *Carpinus betulus*, *Betula pendula* and *Robinia pseudoacacia*. In the underbrush, similarly as in 4f, g, j, there is a large proportion of broad-leaved species, mainly *Carpinus betulus* and *Fagus sylvatica*. A considerable percentage of *Carpinus betulus*, *Quercus robur*, *Acer platanoides* and *Fagus sylvatica* in the underbrush and the absence of coniferous forest species in the forest floor cover confirm the suggestion that the *Pinus sylvestris* stand is at variance with the site.

*Nature monuments and trees of monument size in the reserve*

Four nature monuments, established by the Council of the Międzychód Commune in 2002, are found in the reserve. These are 150-year old *Fagus sylvatica* trees, 34 m in height and in good health state. A beech no. 251/10 is growing in compartment 7g and is 340 cm in girth, while the other trees nos. 251/11-13 are growing in compartment 8b and have girths of 320, 373 and 397 cm, respectively.

In the reserve there are 32 impressive trees of monument size. In compartment **4m**: two *Quercus robur* trees with girths of 408 and 429 cm; in compartment **4p** *Q. robur* with a girth of 400 cm; in compartment **4r**: five *Carpinus betulus* trees with girths of 210, 227, 254 cm, another one having two stems with girths of 170 and 200 cm, while the last has three trunks, of which two are coalescent with girths of 118 and 215 cm; 10 *Fagus sylvatica* trees with girths of 320-595 cm; in compartment **7g**: one *F. sylvatica* with a girth of 335 cm and five *Q. robur* trees with girths of 318-421 cm; in compartment **8b**: five *F. sylvatica* trees with girths of 359-391 cm, one *C. betulus* with a girth of 243 cm and one *Fraxinus excelsior* with a girth of 286 cm. In compartment **8c** there is a specimen of *Cerasus avium* with a girth of 140 cm.

*Mosses in the Dolina Kamionki reserve*

In the reserve the following moss species were identified: *Amblystegium juratzkanum* Schimp. (compartment 4m), *A. serpens* (Hedw.) Schimp. (4m, r), *Atrichum undulatum* (Hedw.) P. Beauv. (4m, o, r; 5a; 7g; 8b), *Aulacomnium androgynum* (Hedw.) Schwaegr. (4m, n, p; 7g; 8b, 8d), *Brachytheciastrum velutinum* (Hedw.) Ignatov & Huttunen (4l, m, p, r), *Brachythecium mildeanum* (Schimp.) Schimp. (7b), *B. rivulare* Schimp. (4n; 8d), *B. rutabulum* (Hedw.) Schimp. (4d, h, l, m, n, p, r; 5a, b; 7a, b, f, g; 8a, b, d), *B. salebrosum* (Hoffm. ex F. Weber & D. Mohr) Schimp. (4m, r), *Calliergonella cuspidata* (Hedw.) Loeske (4n; 5b), *Ceratodon purpureus* (Hedw.) Brid. (7g), *Climacium dendroides* (Hedw.) F. Weber & D. Mohr (4d, n; 5b; 7f), *Cratoneuron filicinum* (Hedw.) Spruce (4l, n, r), *Dicranella heteromalla* (Hedw.) Schimp. (4l, m, o, r; 7g; 8b), *Dicranoweisia cirrata* (Hedw.) Lindb. (8b), *Dicranum scoparium* Hedw. (4o; 7g; 8d), *Dryptodon pulvinatus* (Hedw.) Brid. (4r), *Fissidens adianthoides* Hedw. (4n), *F. taxifolius* Hedw. (4l, r), *Herzogiella seligeri* (Brid.) Z. Iwats. (4m; 8b), ***Homalia trichomanoides*** (Hedw.) Schimp. (8b, leg. Piotr Górski), *Hypnum cupressiforme* Hedw. var. *cupressiforme* (4l, m, n, o, p; 7g; 8b, d), *H. cupressiforme* Hedw. var. *filiforme* Brid. (4l, m; 8b), *Leptodictyum riparium* (Hedw.) Warnst. (5b), *Mnium hornum* Hedw. (4l, n, r; 8a), *M. stellare* Reichard ex Hedw. (8d), *Orthodicranum montanum* (Hedw.) Loeske (4o; 7g; 8b, d), *Orthodontium lineare* Schwaeger. (4m), *Orthotheciella varia* (Hedw.) Ochyra (4r), *Orthotrichum affine* Schrad. ex Brid. (4r), *O. diaphanum* Schrad. ex Brid. (4r), *Oxyrrhynchium hians* (Hedw.) Loeske (4n), *Palustriella commutata* (Hedw.) Ochyra (4l, n, r), *Plagiomnium affine* (Blandow ex Funck) T.J. Kop. (4o), *P. cuspidatum* (Hedw.) T.J. Kop. (8d), *P. elatum* (Bruch & Schimp.) T.J. Kop. (4l, n; 7f), *P. ellipticum* (Brid.) T.J. Kop. (4d, h, l, n; 5a, b; 7a, b; 8a), *P. undulatum* (Hedw.) T.J.

Kop. (4l, n, o; 5a; 7a, f; 8a, b, d), *Plagiothecium cavifolium* (Brid.) Z. Iwats. (4m, r; 7g), *P. denticulatum* (Hedw.) Schimp. (4l, n; 7g), *P. laetum* Schimp. (4n); *P. nemorale* (Mitt.) A. Jaeger. (4r); *Platygyrium repens* (Brid.) Schimp. (4m), *Platyhypnidium riparioides* (Hedw.) Dixon (4r), *Pleurozium schreberii* (Willd. ex Brid.) Mitt. (4m), *Pohlia nutans* (Hedw.) Lindb. (4l, m, o; 7g; 8d), *Polytrichastrum formosum* (Hedw.) G.L. Sm. (4l, m; 7g; 8b), *Polytrichum commune* Hedw. (5b; 8a; 8b; 8d), *Pseudoscleropodium purum* (Limpr.) M. Fleisch. (4m, o; 5b), *Pseudotaxiphyllum elegans* (Brid.) Z. Iwats. (4r), *Rhizomnium punctatum* (Hedw.) T.J. Kop. (4n; 8d), *Rhytidiadelphus squarrosus* (Hedw.) Warnst. (5b), *Rosulabryum capillare* (Hedw.) J.R. Spence (4m, n), *Schistidium apocarpum* (Hedw.) Bruch & Schimp. (4r), *Sciuro-hypnum oedipodium* (Mitt.) Ignatov & Huttunen (4n, o), *Serpoleskea subtilis* (Hedw.) Loeske (4r), *Sphagnum squarrosum* Crome (5a), *Tortula muralis* Hedw. (7g).

The moss species covered by strict protection was given **in bold**, while species covered by partial species protection are underlined.

*Vascular plants*

A total of 301 species of vascular plants, belonging to 65 families, were identified in the "Dolina Kamionki" reserve. Among species covered by strict protection in the reserve we found *Cephalantera rubra* (L.) Rich. (compartments 4r, 8b), *Dactylorhiza maculata* (L.) Soó (5b), *Dactylorhiza majalis* (Rchb.) P.F. Hunt & Summerh. (5b, 8d), *Daphne mezereum* L. (7b, 8d), *Epipactis palustris* (L.) Crantz (4l), *Equisetum telmateia* Ehrh. (5a), *Hepatica nobilis* Schreb. (7g, 8b, d), *Taxus baccata* L. (8b), *Trollius europaeus* L. (8a).

Moreover, 10 species under partial protection were recorded, i.e. *Convallaria majalis* L. (compartments 8b, d), *Frangula alnus* Mill. (4d, g, 5b, 7b, f, 8d), *Galium odoratum* (L.) Scop. (4r, 8b), *Hedera helix* L. (8b), *Menyanthes trifoliate* L. (4d, h, l, n, 7a, b), *Nuphar lutea* (L.) Sibth. & Sm. (5a), *Primula veris* L. (4m, 7g, 8d), *Ribes nigrum* L. (4d, n, 5a, b, 7a, b, f), *Viburnum opulus* L. (4d, g, m, 5a, b, 8d), *Vinca minor* (8b, d).

Among rare species and species regionally endangered in the Wielkopolska region (Żukowski and Jackowiak 1995) the following were found in the reserve: *Actaea spicata* L. (V), *Alchemilla gracilis* Opiz (V), *Cephalantera rubra* (L.) Rich. (E), *Conium maculatum* L. (R), *Corydalis solida* (L.) Clairv. (R), *Dactylorhiza maculata* (L.) Soó (V), *D. majalis* (Rchb.) P.F. Hunt & Summerh. (V), *Daphne mezereum* L. (R), *Epipactis palustris* (L.) Crantz (V), *Equisetum telmateia* Ehrh. (R), *Taxus baccata* L. (R), *Trollius europaeus* L. (V), *Valeriana dioica* L. (V), *Viola mirabilis* L. (R).

Categories of threat in the Wielkopolska region include: E – endangered species, V – vulnerable species, R – rare species and thus potentially endangered.

A species from the Polish red book of plants (Kaźmierczakowa and Zarzycki 2001) is *Cephalantera rubra* EN (endangered species), while species from the Red list of vascular plants in Poland (Zarzycki and Szeląg 2006) are *Cephalantera rubra* E, *Dactylorhiza maculata* V and *Epipactis palustris* V.

*Fauna*

In 2006 in the reserve the following invertebrate and vertebrate species were recorded: SPONGES: *Spongilla lacustris*; INSECTS: dragonflies: *Aeshna mixta*, *Calopteryx spledens*, *Calopteryx virgo*, *Orthetrum cancellatum*, *O. caerulescens*, *Platetrum depressu*, *Pyrrhosoma nymphula*, *Sympetrum danae*, *S. depressiusculum*, *S. flaveolum*, *S. vulgatum*, *Tarnetrum fonscolombii*, bumblebees: ***Bombus humili***, ***B. hortorum***, *B. lapidarium*, ***B. lucorum***, beetles: ***Carabus auratus***, ***C. coriaceus***, ***C. hortensis***, ***C. nemoralis***, ***C. violaceus***, butterflies: *Nymphalis antiopa*, *N. polychloros*; BIVALVES: *Pisidium subtruncatu*; SNAILS: *Helix pomatia*; FISH: *Anguilla anguilla*, *Cyprinus carpio*, *Gasterosteus aculeatus*, *Leucaspius delineates*, ***Neomacheilus barbatulus***, *Perca fluviatilis*; AMPHIBIANS: ***Bufo bufo***, ***Rana arvalis***, ***R. temporaria***, *R. esculenta*, ***Triturus vulgaris***; REPTILES: ***Natrix natrix***, ***Vipera berus***; BIRDS: *Anas platyrhynchos*, ***Accipiter gentilis***, ***A. nissus***, ***Aegithalos caudatus***, ***Alcedo atthis***, ***Buteo buteo***, ***Carduelis chloris***, ***Certhia familiaris***, ***C. brachydactyla***, ***Ciconia ciconia***, ***Coccotrhaustes coccotrhaustes***, ***Columba oenas***, *C. palumbus*, ***Corvus corax***, *C. corone cornix*, ***C. monedula***, ***Cuculus canorus***, ***Delichon urbica***, ***Dendrocopos major***, ***Dryocopus martius***, ***Emberiza citrinella***, ***Erithacus rubecula***, ***Ficedula parva***, ***Fringilla coelebs***, ***Garrulus glandarius***, ***Grus grus***, ***Hirundo rustica***, ***Jynx torquilla***, ***Lanius collurio***, ***Locustella fluviatilis***, ***Luscinia megarhynchos***, ***Motacilla alba***, ***Muscicapa striata***, ***Oriolus oriolus***, ***Parus ater***, ***P. caeruleus***, ***P. major***, ***Phoenicurus phoenicurus***, ***Phylloscopus collybita***, ***P. trochilus***, *Pica pica*, ***Picus viridis***, ***Prunella modularis***, ***Regulus regulus***, ***Sitta europea***, ***Sturnus vulgaris***, ***Sylvia atricapilla***, ***S. borin***, ***S. curruca***, ***Strix aluco***, ***Troglodytes troglodytes***, ***Turdus merula***, ***T. philomelos***, ***T. pilaris***; MAMMALS: *Apodemus agrariusz*, *A. flavicollis*, *Capreolus capreolus*, *Castor fiber*, ***Erinaceus europaeus***, *Meles meles*, *Neomys fodiens*, ***Sciurus vulgaris***, *Sus strofa*, *Talpa europaea*, *Vulpes vulpes*.

Species covered by strict protection are given **in bold**, while species under partial species protection are underlined.

*Threats to the reserve*

Threats for natural value and natural ecological processes in the reserve ecosystems include:

1. soil overdrying as a result of groundwater fall and drying of slope headwaters supplying the river; it is impossible to counteract this threat,
2. excessive nitrification of soil by planted *Robinia pseudoacacia*; elimination of this threat by the removal of this species from well-preserved oak-hornbeam forest sites in compartment 8c, cutting of offshoots, the introduction of *Quercus robur* into gaps after felled trees and fencing of plantings, promotion of natural regeneration of *Q. robur* and *Fagus sylvatica*,
3. a potential threat is soil acidification by planting of *Pinus sylvestris* monoculture in the fresh forest and fresh mixed forest sites (forest subcompartments 4c, f, g, i, j, m, o); recommended periodical monitoring in order to evaluate the state of the

environment in forest ecosystems formed on hydrogenic soils connected with the river valley,
4. penetration of synanthropic vegetation to the reserve; a countermeasure is to leave forest edge ecosystems at the reserve boundary,
5. meadow overgrowing with *Alnus glutinosa* in compartment 5b; it is proposed to cut out meadows, removing cuts outside the reserve,
6. a change of microclimatic conditions as a result of forest economy (clear cuttings) in the vicinity of the reserve; in the areas neighbouring the reserve the application of forest economy eliminating this threat; in the 200 m belt from the reserve boundary no clear cutting.

A reduction of water flow in the Kamionka and its contamination with biogens by users of fishing ponds located south of the reserve should be considered an external threat. The section of the Kamionka running inside the reserve should be incorporated in the reserve and following this decision the level and quality of the Kamionka waters should be monitored, while legal regulations of the water law concerning the management of fishing ponds have to be enforced.

## REFERENCES


Brzeg A., Wojterska M. (2001): Zespoły roślinne Wielkopolski, ich stan poznania i zagrożenie. In: Szata roślinna Wielkopolski i Pojezierza Południowopomorskiego. Ed. M. Wojterska. Przewodnik sesji terenowych 52. Zjazdu PTB, 24-28 września 2001, Poznań. Bogucki Wyd. Nauk., Poznań: 39-110.

Górski P. (2007): Liverworts of the nature reserve in Wielkopolska Region. 4. "Dolina Kamionki". Rocz. AR Pozn. 386, Bot.-Stec. 11: 73-76.

Kasprzak K. (2005): Ochrona pomników przyrody. Zasady postępowania administracyjnego. Wyd. ABRYS Spółka z o.o., Poznań.

Kaźmierczakowa R., Zarzycki K. (2001): Polska czerwona księga roślin. Instytut Botaniki im. W. Szafera PAN, Instytut Ochrony Przyrody PAN, Kraków.

Kondracki J. (2000): Geografia regionalna Polski. Wyd. Nauk. PWN, Warszawa.

Matuszkiewicz W. (2002): Przewodnik do oznaczania zbiorowisk roślinnych Polski. Vademecum Geobotanicum 3. Wyd. Nauk. PWN, Warszawa.

Mirek Z., Piękoś-Mirkowa H., Zając A., Zając M. (2002): Flowering plants and pteridophytes of Poland. A checklist. Vol. 1. Biodiversity of Poland. – Krytyczna lista roślin naczyniowych Polski. T. 1. Różnorodność biologiczna Polski. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

Ochyra R., Żarnowiec J., Bednarek-Ochyra H. (2003): Census catalogue of Polish mosses. Polish Academy of Sciences, Institute of Botany, Kraków.

Plan urządzania lasu Nadleśnictwa Bolewice na okres od 01.01.2006 r. do 31.12.2015 r. Program Ochrony Przyrody. Typescript. Bolewice.

Rozporządzenie Ministra Środowiska z dnia 14 sierpnia 2001 r. w sprawie określenia rodzajów siedlisk przyrodniczych podlegających ochronie. (2001 a). Dz. U. Nr 92 z 3.09.2001, poz. 1029.

Rozporządzenie Ministra Środowiska z dnia 26 września 2001 r. w sprawie określenia listy gatunków zwierząt rodzimych dziko występujących objętych ochroną gatunkową ścisłą i częściową oraz zakazów dla danych gatunków i odstępstw od tych zakazów. (2001 b). Dz. U. Nr 130, poz. 1456.

Rozporządzenie Ministra Środowiska z dnia 9 lipca 2004 r. w sprawie gatunków dziko występujących roślin objętych ochroną. (2004 a). Dz. U. Nr 168, poz. 1764.

Rozporządzenie Ministra Środowiska z dnia 9 lipca 2004 r. w sprawie gatunków dziko występujących grzybów objętych ochroną. (2005 a). Dz. U. Nr 168, poz. 1765.

Rozporządzenie Ministra Środowiska z dnia 16 maja 2005 r. w sprawie siedlisk chronionych w Polsce. (2005 b). Dz. U. Nr 94, poz. 795.

Rozporządzenie nr 30/2004 Wojewody Wielkopolskiego z dnia 18 marca 2004 r. w sprawie rezerwatu przyrody „Dolina Kamionki". (2004 b). Dziennik Urz. Woj. Wielkopolskiego, Nr 41, poz. 1004.

Schubert T. (2004): Dolina Kamionki – nowy rezerwat przyrody PPK. Lato i jesień. Biul. Pszczewskiego Parku Krajobraz. 2: 13-14.

Stefanek W., Antkowiak W. (1994): Dokumentacja Techniczno-Naukowa uzasadniająca utworzenie rezerwatu przyrody o nazwie „Dolina Kamionki". Typescript. Zlecenie Urz. Woj. w Gorzowie Wlkp.

Stefanek W., Kicińska-Nabzdyk J. (1974): Roślinność doliny rzeki Kamionki. Typescript. MSci. thesis. AR Poznań.

Stefanek-Pańczuk W., Antkowiak W. (1997): Flora i roślinność projektowanego rezerwatu „Dolina Kamionki" w zachodniej Wielkopolsce. Bad. Fizjogr. Pol. Zach. Ser. B – Botanika 46: 43-64.

Zarzycki K., Szeląg Z. (2006): Red list of the vascular plants in Poland. In: Red list of plants and fungi in Poland. Eds Z. Mirek, K. Zarzycki, W. Wojewoda, Z. Szeląg. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

Żukowski W., Jackowiak B. (1995): Lista roślin naczyniowych ginących i zagrożonych na Pomorzu Zachodnim i w Wielkopolsce. In: Ginące i zagrożone rośliny naczyniowe Pomorza Zachodniego i Wielkopolski. Eds W. Żukowski, B. Jackowiak. Pr. Zakł. Takson. Rośl. UAM Pozn. 3: 9-92.


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