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DIVERSIFICATION OF CONDITIONS FOUND IN BIRCH STANDS ON FORMERLY ARABLE GROUNDS IN THE DRETYŃ, MIASTKO AND NIEDŹWIADY FOREST DIVISIONS

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Abstract. Fourteen birch stands at the age of 55-60 years, in the Dretyń, Miastko and Niedźwiady forest divisions, were investigated as well as diversity of environmental conditions of their occurrence with reference to the requirement of conversion into beech, beech-oak or oak forests. It was stated that variation of natural conditions of the analysed birch stands includes three forest site types (deciduous mesic forest, deciduous mixed mesic forest and coniferous mixed mesic forest), five soil types and subtypes (podzolic soils, rusty soils, brown rusty soils, brown lessive soils, pseudogley lessive soils), five different surface geological formations (outwash sands, fluvioglacial sands of crack formations, moraine sands, moraine clays, tertiary clays), four site moisture content levels (sites with a very poor inflow of ground water, sites with a very poor inflow of precipitation water, sites with a small inflow of ground water, sites with a small inflow of precipitation water), six current vegetation communities (birch communities with no distinct phytosociological classification, communities from the group of acidophilous communities representing *Trifolio Geranietea sanguinei* and *Rubetum idaei* class, a community related to *Calamagrostio arundaceaea-Quercetum petraeae*, community related to *Fago-Quercetum petraeae*, a community related to *Galio odorati-Fagetum*) and four communities of potential vegetation (*Galio odorati-Fagetum*, *Fago-Quercetum*, *Calamagrostio arundinaceae--Quercetum petraeae, Potentillo albae-Quercetum*).

Key words: birch stands, *Betula pendula*, formerly arable lands

INTRODUCTION

Silver birch (*Betula pendula* Roth.) is commonly found in most of Europe. It is an essential element of the Polish landscape and for ages it has been loved by Poles for its decorative and medicinal value.

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It is a typical pioneer species. Thanks to its limited site and climatic requirements it frequently is the first to enter unforested, degraded areas, clearing the way for other, more demanding species [Brzoza... 1979]. At present its role as a forecrop has been increasing. Under the birch canopy in open areas species sensitive to frost and excessive insolation may be introduced.

In forestry it is treated not as a tree species forming monocrop stands, but rather as an admixed and nurse species. Birch is especially desirable as an admixture in sites of dry coniferous forest (Bs), fresh coniferous forest (Bśw), moist coniferous forest (Bw), boggy coniferous forest (Bb), moist mixed coniferous forest (BMw), where it is introduced in order to make pure pine or pine-spruce stands more resistant [Zasady hodowli lasu 2000].

Silver birch plays a considerable role in fire protection. It is the main species used in the creation of belts preventing the spread of fires, planted along forest roads and compartment lines.

Birch wood is a valuable raw material for chemical processing. It is also widely applied in furniture making and other branches of industry.

Włoczewski and Ilmurzyński [2003], taking the point of view of silviculture, negatively evaluated the effect of pure birch stands on soil. In their opinion early increment felling of stands leads to fast and strong weed infestation, while intensive transpiration accelerates the process of drainage and sterilization of soil. Moreover, in pure birch stands self-pruning of this species deteriorates and less valuable wood is produced.

The opinion on the role of birch is opposite when this tree is found in stands as an admixed species. It improves resistance of pure pine stands, since its presence promotes the development of insects parasitizing on pine pests. It also promotes faster decomposition of litter, especially coniferous. When it is found mixed with other species its stems undergo self-pruning and yield valuable wood [Brzoza... 1979].

THE AIM OF THE STUDY

The aim of the study was to analyse the diversification of conditions under which birch stands are found on formerly arable land in the Dretyń, Miastko and Niedźwiady forest divisions in view of their future conversion into beech forests.

REVIEW OF LITERATURE

Birch enters abandoned formerly arable land as one of the first deciduous species. It modifies both soil and climatic conditions [Bernadzki and Kowalski 1983].

According to Alekseev [1967] birch crowns during the vegetation season at maximum leaf development transmit up to 37% full light. Moreover, light spectrum in a birch forest differs from that outside the forest.

Birch is a pioneer species in the transformation of compact soil layers thanks to the fact that soil is penetrated actively and promptly by its roots. Roots of three-year old birch trees, which aboveground part are slightly more than 10 cm high, reach the depth of up to 1 m [Lyr et al. 1967]. In comparison to pine, birch forms a stronger system of

lateral roots growing in surface layers [Kalinin 1978], thanks to which it more effectively utilizes supplies of water and nutrients from a large volume of soil.

It results from studies on the revitalization of soils on formerly arable land that birch prevents soil degradation, holding nutrients, nitrogen, calcium and potassium in surface layers better than it is the case in red oak, larch or spruce. Moreover, birch has a positive effect on the formation of reaction in formerly agriculturally utilized soils and the formation of the absorbing complex. After 30-40 years humus produced in the upper layers of formerly arable land does not differ significantly from forest soil humus and the trend is most advantageous under the canopy of birch trees [Podrázský and Ulbrichová 2004].

Under the canopy of birch stands natural regeneration of species with bigger ecological requirements may be initiated. It results from studies on root development of beech trees coming from natural regeneration that they develop better in birch stands than in pine stands. Since roots of birch and beech trees occupy different fragments of the soil profile, competition between these two species is smaller than between beech and pine. Thus, roots of beeches growing under the shelter of the birch stand are bigger and better developed, while the root system is heart-shaped, typical of the species [Curt and Prévosto 2003].

Literature data on birch in formerly arable land is scarce, which emphasizes the need for further studies on the subject.

AREA OF THE STUDY

Investigations were conducted in the Szczecinek Operation Area of the State Forests, in three forest divisions: Miastko, Dretyń and Niedźwiady. Table 1 presents the share of the area taken by birch and its volume in the above mentioned forest divisions.

Birch is found in the above mentioned districts primarily in formerly arable land. In the Miastko forest division this land accounts for over 65% area and stands with an at least 70% share of birch grow on over 32% area formerly utilized by agriculture.

Table 1. The share of birch in the Miastko, Dretyń, Niedźwiady forest divisions in terms of area and volume
Tabela 1. Zestawienie powierzchniowego i miąższościowego udziału brzozy w nadleśnictwach Miastko, Dretyń, Niedźwiady

Forest division Nadleśnictwo	Share in area, ha Powierzchnia zajmowana przez drzewostany brzozowe w nadleśnictwie, ha	Share in volume, m^3 Miąższość drzewostanów brzozowych w nadleśnictwie, m^3	Percentage by – Procentowy udział	
			area powierzchniowy	volume miąższościowy
Miastko	2 091.34	340 270	10.5	9.8
Dretyń	593.42	101 439	4.4	3.9
Niedźwiady	357.83	59 619	1.5	1.3
Total – Ogółem	3 042.59	501 328	5.3	5.1

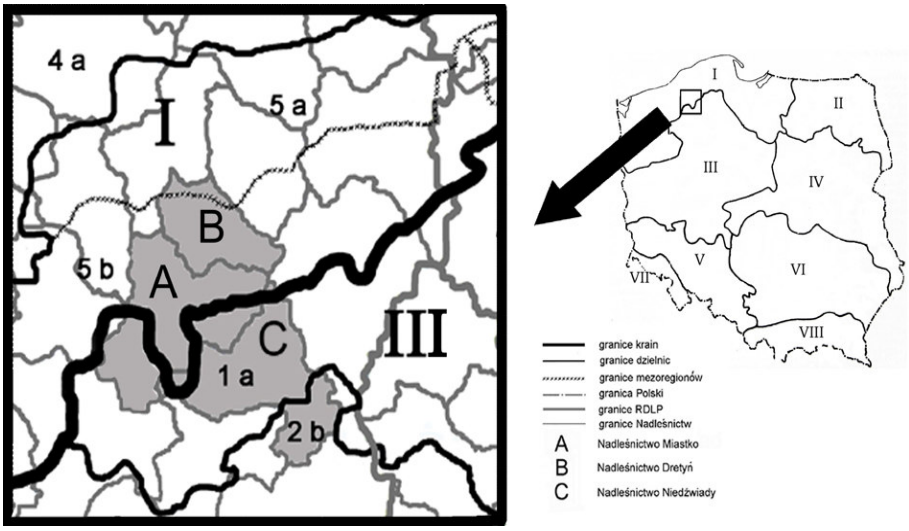

Fig. 1. The area of the study in terms of the division into natural and forest regions [Zielony et al. 2004]
Rys. 1. Obszar badań na tle krain przyrodniczoleśnych [Zielony i in. 2004]

The Dretyń forest division Dretyń, a vast majority of the area in the Miastko forest division and a small north-western fragment of the Niedźwiady forest division are located in Region I – Baltic, province 5 – Drawsko-Kaszubskie Lake District (Fig. 1). The remaining, south-western and south-eastern part of the Miastko forest division and almost the entire area of the Niedźwiady forest division are located in Region III – Great Poland – Pomerania, province 1 – Tuchola Coniferous Forests. The southern part of the Niedźwiady forest division is an exception here, as it belongs to Region III, province 2 – Krajeńskie Lake District 0. Figure 1 presents the location of the area of the study in terms of the division of Poland into natural and forest regions.

METHODS

A total of 14 plots were selected for analyses. Their specific locations are presented in Figs. 2-9, showing at the same time with a dotted line the former boundary separating forest areas from areas utilized for agriculture. Plots nos. 1-5 are located in the Miastko forest division, locality Biały Bór. Plots nos. 6-12 are situated in locality Miastko, in the forest division of the same name. Plot no. 13 was established in the Dretyń forest division, while no. 14 – the Niedźwiady forest division.

When establishing experimental plots those locations were included, on which the Dretyń, Miastko and Niedźwiady forest divisions conducted birch stand conversion. The age of analysed birch stands ranged from 55 to 60 years, while the age of beech introduced under the canopy of birch trees ranged from 5 to approx. 30 years.

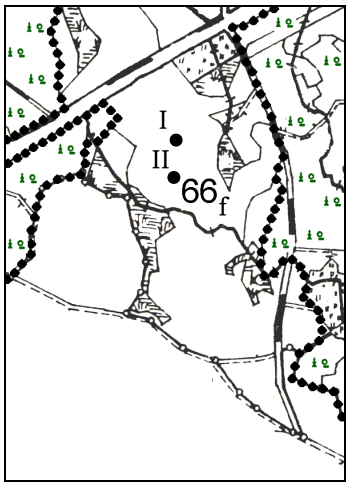

Fig. 2. Location of experimental areas no. 1 and 2. Miastko Forest Division, locality Biały Bór, compartment 66 f
Rys. 2. Lokalizacja powierzchni badawczych nr 1 i 2. Nadleśnictwo Miastko, obręb Biały Bór, oddział 66 f

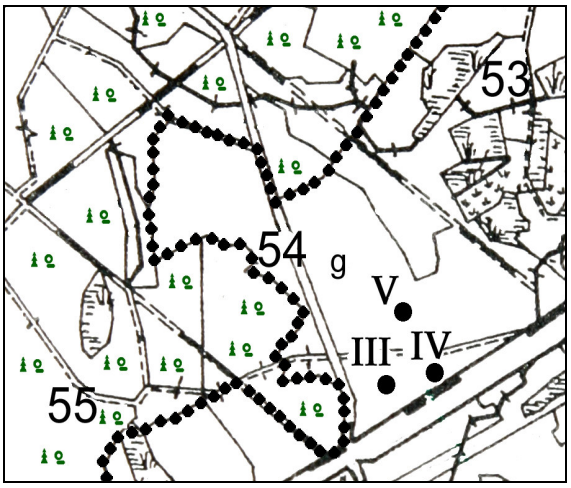

Fig. 3. Location of experimental areas no. 3-5. Miastko Forest Division, locality Biały Bór, compartment 54 g
Rys. 3. Lokalizacja powierzchni badawczych nr 3-5. Nadleśnictwo Miastko, obręb Biały Bór, oddział 54 g

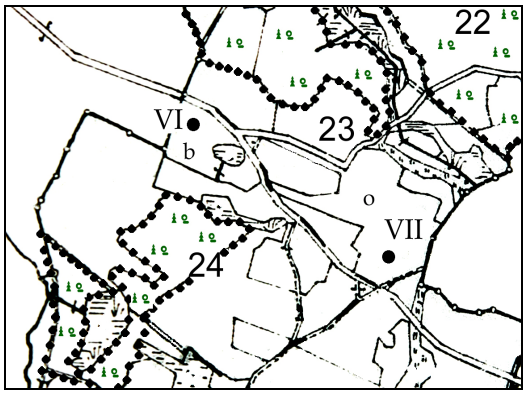

Fig. 4. Location of experimental areas no. 6 and 7. Miastko Forest Division, locality Miastko, compartments 23 o, 24 b
Rys. 4. Lokalizacja powierzchni badawczych nr 6 i 7. Nadleśnictwo Miastko, obręb Miastko, pododdziały 23 o, 24 b

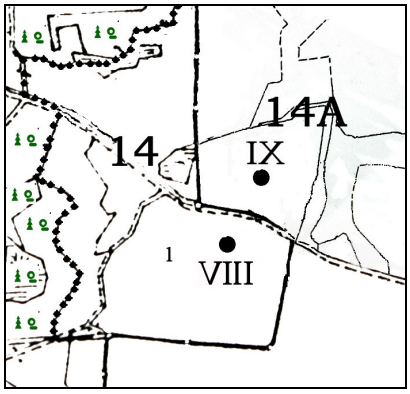

Fig. 5. Location of experimental areas no. 8 and 9. Miastko Forest Division, locality Miastko, compartment and subcompartments 14 l, 14 Aa
Rys. 5. Lokalizacja powierzchni badawczych nr 8 i 9. Nadleśnictwo Miastko, obręb Miastko, 14 l, 14 Aa

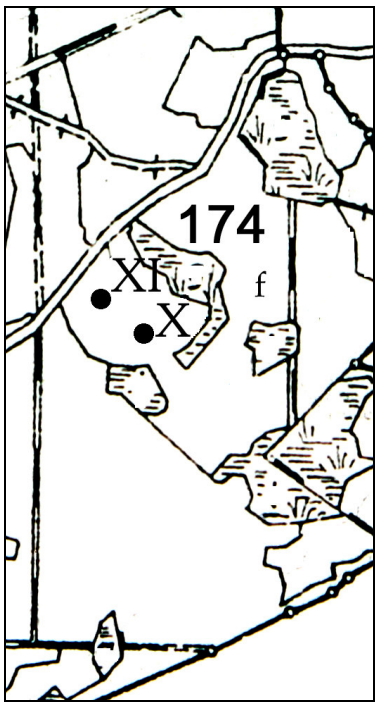

Fig. 6. Location of experimental areas no. 10 and 11. Miastko Forest Division, locality Miastko, compartment 174 f
Rys. 6. Lokalizacja powierzchni badawczych nr 10 i 11. Nadleśnictwo Miastko, obręb Miastko, oddział 174 f

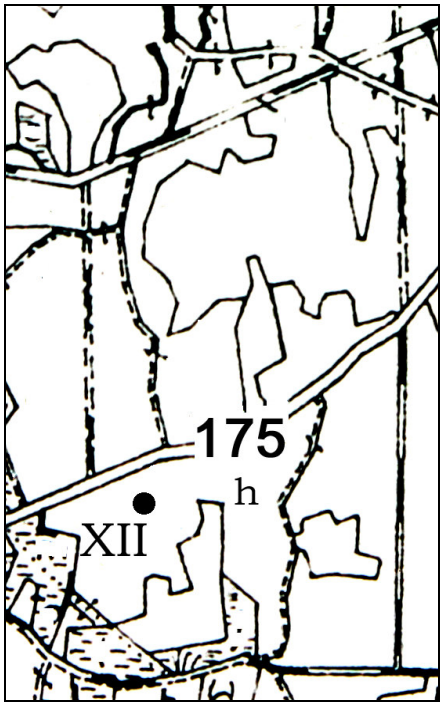

Fig. 7. Location of experimental areas no. 12. Miastko Forest Division, locality Miastko, compartment 175 h
Rys. 7. Lokalizacja powierzchni badawczej nr 12. Nadleśnictwo Miastko, obręb Miastko, oddział 175 h

Each plot was documented with a stand table, in which layers "a" and "b" were described in the area of 2500 m^2, while layers "c" and "d" in the area of 400 m^2. Names of vascular plant species were given following a study by Rutkowski [2004], names of bryophytes following Ochyra et al. [2003], while systematic classification of plant communities is given following a study by Matuszkiewicz [2001].

After vegetation was described, a soil pit was prepared in the central point of each stand table. Samples were collected in each pit from surface and subsurface layers and subjected to physico-chemical analyses following the methodology used in site studies [Zielony et al. 2004] for primary typological plots. The analysis of soil conditions made it possible to determine the type and subtype of soil, geological formation, ground water level, soil texture and its reaction. For each analysed plot the site type of forest was established on the basis of an analysis of vegetation and soil.

Field investigations were conducted in July and November 2005.

Within the framework of research studies on the base map composed of historical maps (Wojskowy Instytut Geograficzny, Warszawa 1938), location sketches of each experimental plot were prepared using Adobe Photoshop Elements 2.0 (Fig. 2-9). Thus, the agricultural character was documented for soils, on which the analysed birch stands are growing at present.

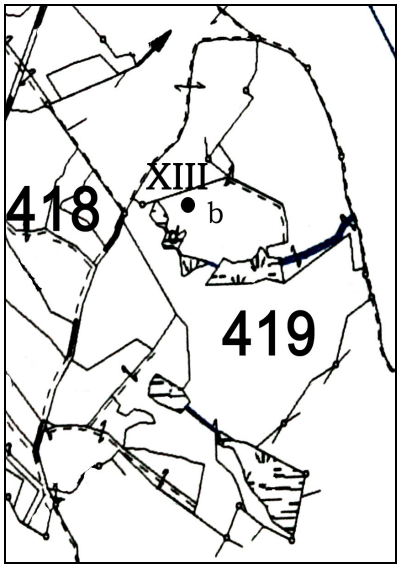

Fig. 8. Location of experimental areas no. 13. Dretyń Forest Division, locality Dretyń, compartment 419 b
Rys. 8. Lokalizacja powierzchni badawczej nr 13. Nadleśnictwo Dretyń, obręb Dretyń, oddział 419 b

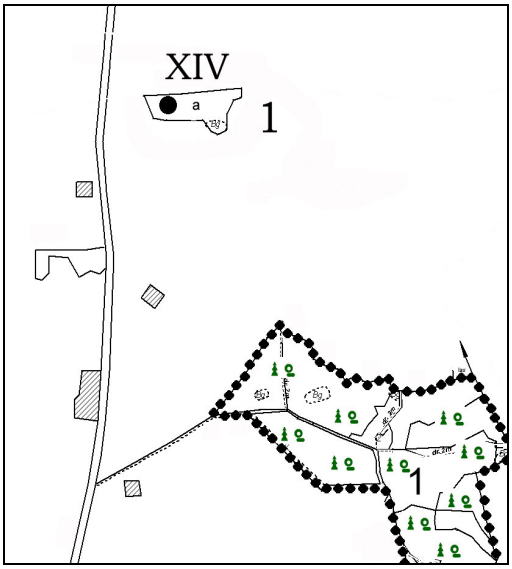

Fig. 9. Location of experimental areas no. 14. Niedźwiady Forest Division, locality Niedźwiady, compartment 1 a
Rys. 9. Lokalizacja powierzchni badawczej nr 14. Nadleśnictwo Niedźwiady, obręb Niedźwiady, oddział 1 a

RESULTS

Results are presented in Tables 2 and 3. Table 2 constitutes a synthetic presentation of all the analysed elements characterizing individual experimental plots. Table 3 groups all birch stands in individual experimental plots in terms of the number of their occurrences in a given combination of natural conditions, including the variation of soils, current and potential vegetation, the dominant species in forest floor vegetation and the forest site type. This table shows considerable diversification of features characterizing individual stands. Apart from one exception (marked in grey in the table), each tree stand constitutes a unique combination, which should be connected with an individual approach to the problem of their conversion.

The variation of current vegetation communities, presented in Table 2, in the analysed stands results from at least two reasons. One of them includes variable site conditions, whereas the other, currently the more important one, is the share of beech in different development stages, with a varying cover degree. The conversion of the analysed birch stands by the introduction of beech occurred at various times, whereas in places where beech already forms the dense canopy under the birch stand the species composition of the forest floor vegetation is similar to the typical composition of forest species for the fertile Pomeranian beech forest.

Table 2. A synthetic presentation of all analysed elements characterizing individual experimental plots

Number of plot Numer powierzchni	Forest division Forest district Nadleśnictwo obręb	Compartment, subcompartment Oddział, pododdział	Soil type, subtype Typ, podtyp gleby	Geological formation Utwór geologiczny	Site moisture content rate Stopień uwilgotnienia siedliska	Sampling depth Głębokość pobrania próbki	Textural group Grupa mechaniczna	pH H_2O	pH KCl
1	Miastko Biały Bór	66 f	Pog	Qg	og 5	0-31 31-40	gp gl	3.6 4.7	3.4 3.9
2	Miastko Biały Bór	66 f	Pog	Qg	og 5	0-42 42-47	pg gp	4.3 4.9	3.9 4.1
3	Miastko Biały Bór	54 g	RDbr	Qp	g 5 (–185)	0-30 30-50	pg pg	4.0 4.5	3.6 4.1
4	Miastko Biały Bór	54 g	RDbr	Qp	g 5 (–180)	0-37 37-52	pg pg	4.1 4.2	3.7 3.8
5	Miastko Biały Bór	54 g	RDbr	Qp/Qg	g 6, og 6	0-23 23-46	psg pg	4.7 4.7	4.2 4.2
6	Miastko Miastko	24 b	Pbr	Qg	og 6	0-20 20-25	pg gp	4.6 4.7	4.0 4.0
7	Miastko Miastko	23 o	Pbr	Qg	og 6	0-21 21-40	pg gp	4.5 5.2	3.8 4.2
8	Miastko Miastko	14 l	Pbr	Qg	og 6	0-22 22-40	pg gp	4.8 5.0	3.9 4.1
9	Miastko Miastko	14 Aa	RDbr	Qp	g 6	0-16 16-30	pg pg	5.0 5.2	4.0 4.3
10	Miastko Miastko	174 f	Pbr	Qg	og 6	0-24 24-34	pg gp	4.7 5.2	4.1 4.4
11	Miastko Miastko	174 f	Pbr	Qg	og 6	0-30 30-70	pg gs	4.9 4.9	4.0 4.0
12	Miastko Miastko	175 h	Pbr	Trpi	og 6	0-22 22-45	gs i	4.5 4.6	3.9 3.9
13	Dretyń Dretyń	419 b	Bw	QZp	g 6	0-32	ps	4.7	4.0
14	Niedźwiady Niedźwiady	1 a	RDw	QFp	g 6	0-22 22-45	pl pl	4.9 5.5	4.0 4.7

Tabela 2. Syntetyczne zestawienie wszystkich analizowanych czynników na poszczególnych poletkach badawczych

Present vegetation Roślinność rzeczywista	Fagus share in layer a2 Udział Bk w warstwie a2	Fagus share in layer a3 Udział Bk w warstwie a3	Fagus share in layer b Udział Bk w warstwie b	Oak share in layer a3 Udział Db w warstwie a3	Oak share in layer b Udział Db w warstwie b	Currently dominant species in layer c Gatunek aktualnie dominujący w warstwie c	Potential vegetation Roślinność potencjalna	Forest site type TSL
TGs	0	0	4	0	0.6	*Agrostis capillaris* (3)	GoF	Lśw
Ru	0	0	4	0	1	*Rubus idaeus* (3)	GoF	Lśw
CQ/FQ	0	0	0.6	0	4	*Deschampsia flexuosa* (5)	FQ	LMśw
CQ/FQ	0	0	0.6	0	4	*Deschampsia flexuosa* (5)	FQ	LMśw
CQ	0	0.2	0.2	5	0	*Holcus mollis* (3)	CQ	LMśw
GoF	5	0	2	0	0	*Oxalis acetosella* (3)	GoF	Lśw
GoF	5	1	1	0	0	*Galium odoratum* (0, 6)	GoF	Lśw
GoF	0	0	5	0	1	*Atrichum undulatum* (1)	GoF	Lśw
TGs	0	0	0	0	0.6	*Agrostis capillaris* (4)	PaQ	LMśw
FQ	0	0	5	0	1	*Deschampsia flexuosa* (4)	FQ	Lśw
CQ/FQ	0	0.6	0.2	0	4	*Deschampsia flexuosa* (4)	CQ/FQ	Lśw
GoF	0.6	0	4	0	0	*Agrostis capillaris* (3)	GoF	Lśw
ZbBrz	0	0	0	0	1	*Deschampsia flexuosa* (3)	FQ	LMśw
ZbBrz	0	0	0	0	1	*Deschampsia flexuosa* (4)	FQ	BMśw

Table 3. The number of occurrences of a given combination of natural conditions among analysed birch stands
Tabela 3. Liczba wystąpień danej kombinacji warunków przyrodniczych wśród badanych drzewostanów brzozowych

Soil type, subtype Typ, podtyp gleby	Present vegetation Roślinność rzeczywista	Potential vegetation Roślinność potencjalna	Currently dominant species in layer c Gatunek aktualnie dominujący w warstwie c. W nawiasie stopień pokrycia zgodnie ze skalą Braun-Blanqueta	BMśw	LMśw	Lśw	Number of occurrences Liczba wystąpień
Bw	ZbBrz	FQ	*Deschampsia flexuosa* (3)		1		1
RDw	ZbBrz	FQ	*Deschampsia flexuosa* (4)	1			1
RDbr	TGs	PaQ	*Agrostis capillaris* (4)		1		1
	CQ	CQ	*Holcus mollis* (3)		1		1
	CQ/FQ	FQ	*Deschampsia flexuosa* (5)		2		2
Pbr	CQ/FQ	CQ/FQ	*Deschampsia flexuosa* (4)			1	1
	FQ	FQ	*Deschampsia flexuosa* (4)			1	1
	GoF	GoF	*Agrostis capillaris* (3)			1	1
			Atrichum undulatum (1)			1	1
			Galium odoratum (0,6)			1	1
			Oxalis acetosella (3)			1	1
Pog	TGs	GoF	*Agrostis capillaris* (3)			1	1
	Ru	GoF	*Rubus idaeus* (3)			1	1
Number of occurrences – Liczba wystąpień				1	5	8	14

DISCUSSION

Taking into consideration results of observations from the oldest of all the analysed, i.e. approx. 30-year old beech stands, growing under the canopy of birch trees, it is difficult to agree with a negative opinion on the effect of birch on the site, expressed by Włoczewski and Ilmurzyński [2003]. The current state of the described stands does not visibly show the effect of drying and sterilization of soil, emphasized by the above mentioned authors. In contrast, conclusions of the study by Podrázský and Ulbrichová [2004] seem more plausible, indicating that birch prevents soil degradation. This is evidenced by a number of features, found in the oldest (approx. 30-year old) beech stands, growing under the canopy of birch trees. These features include the quality and condition of beech in the analysed plots, the disappearance in the forest floor vegetation of species typical of arable land, replaced by plants connected with the forest environment, the formation – within a short time of 30 years – of a natural system relating the analysed forest ecosystems to the fertile Pomeranian beech forest, a very good mull type of humus decomposition, the browning process occurring in the soil, being a conse-

quence of the fast nutrient cycle in deciduous forests and hardly noticeable plough layer, which also indicates a prompt and advantageous soil forming process. However, it is also possible that this situation pertains to the birch – beech relation, occurring in this study and previously shown by Curt and Prévosto [2003]. In turn, the considerable share of sod-forming species, indicated in Tables 2 and 3, seems to question their conclusion that under the canopy of birch stands natural regeneration of species with bigger ecological requirements may occur. Considerable sod formation with common hairgrass, fine bent grass, wood soft grass or raspberry suggests the need for a conscious conversion of stands rather than waiting for the natural introduction of economically valuable forest trees.

When discussing the problem of species dominant in the forest floor of the analysed stands the absence of wood small reed, the most persistent forest weed, needs to be stressed. The absence of this species in case of theoretically advantageous site conditions in the analyzed experimental plots may be the subject of another study.

CONCLUSIONS

1. The variation of natural conditions of the analysed birch stands includes three forest site types, i.e. fresh forest, fresh mixed forest and fresh mixed coniferous forest, five soil types and subtypes (podzolic soils, rusty soils, brown rusty soils, brown lessive soils, pseudogley lessive soils), five different surface geological formations (outwash sands, fluvioglacial sands of crack formations, moraine sands, moraine clays, tertiary clays), four site moisture content levels (sites with a very poor inflow of ground water, sites with a very poor inflow of precipitation water, sites with a small inflow of ground water, sites with a small inflow of precipitation water), six current vegetation communities (birch communities with no distinct phytosociological classification, communities from the group of acidophilous communities representing *Trifolio Geranietea sanguinei* and *Rubetum idaei* class, a community related to *Calamagrostio arundaceaea-Quercetum petraeae*, community related to *Fago-Quercetum petraeae*, a community related to *Galio odorati-Fagetum*) and four communities of potential vegetation (*Galio odorati--Fagetum*, *Fago-Quercetum*, *Calamagrostio arundinaceae-Quercetum petraeae*, *Potentillo albae-Quercetum*).

2. Natural regeneration of deciduous species (beech, oak) under the canopy of analysed birch stands may face an obstacle resulting from considerable sod formation. In the analysed plots the species responsible for sod formation were primarily common hairgrass (*Deschampsia flexuosa*) and fine bent grass (*Agrostis capillaris*). Thus, the artificial introduction of deciduous species, leading to the conversion of tree stands, is considered fully justified. A lack of human intervention, in view of sod formation and a short life span of birch, may lead to the degradation of stands and their replacement by grass formations.

3. The domination of common hairgrass was recorded in those plots, in which in the most part in layer b a higher share of common oak was found in relation to beech. In places where beech predominated in layer b, more frequently the dominant species in the forest floor was fine bent grass. This is to a certain degree correlated with soil conditions – covers of common hairgrass were more often recorded on podzolic and rusty soils, while fine bent grass was more common on lessive soils.

4. The varied selection of species for conversion (oak or beech) may be justified by the analysis of current and potential vegetation. In case of analysed plots the selection of oak for conversion would be connected with such plant communities as acidophilous wood small reed oak forest (*Calamagrostio arundinaceae-Quercetum petraeae*) and open oak forest (*Potentillo albae-Quercetum*). The introduction of beech is correlated with the assembly of fertile Pomeranian beech forest (*Galio odorati-Fagetum*). In case of the *Fago-Quercetum* assembly the introduction of both oak and beech is justified. In relation to the analyzed forest divisions a definite determination of potential vegetation, due to the considerable share of formerly agricultural sites, i.e. due to a lack of continuity of the forest formation in the investigated area, seems rather questionable. The introduction of beech, oak or both these species may significantly affect the direction of development for the future forest communities.

5. After the artificial underplanting of beech under the canopy of birch and after a longer influence of beech on the forest floor no problems were observed with the regeneration of the forest community as a result of the influence of birch. Beech, as a consequence of strong overshadowing of the forest floor effectively eliminates grass covers, which as a result leads to the formation of typical forest species combinations, with the participation of such plants as bed straw, wood sorrel or common smoothcap.

6. While analysing the condition of the analysed sites it may be stated that an earlier initiation of conversion when the birch stand is approx. 25 years old, is more advantageous than delaying this measure until the moment when birch enters age class III.

Abbreviations used in the work – Wykaz skrótów użytych w pracy

Soil subtype – Podtyp gleby

Bw	podzolic soils	bielicowa właściwa
RDw	rusty soils	rdzawa właściwa
RDbr	brown rusty soils	rdzawa brunatna
Pbr	brown lessive soils	płowa brunatna
Pog	pseudogley lessive soils	płowa opadowoglejowa

Geological formations – Utwory geologiczne

QZp	outwash sands	piaski sandrowe
QFp	fluvioglacial sands of crack formations	piaski wodnolodowcowe utworów szczelinowych (ozów lub kemów)
Qp	moraine sands	piaski zwałowe
Qg		gliny zwałowe
Qp/Qg	moraine sands underline of moraine clays	piaski lodowcowe na glinach zwałowych
Trpi	tertiary clays	iły trzeciorzędowe

Site moisture concentrate – Stopnie uwilgotnienia siedliska

g6	sites with a very poor inflow of ground water	siedliska o bardzo słabym wpływie wód gruntowych
og6	sites with a very poor inflow of precipitation water	siedliska o bardzo słabym wpływie wód opadowych
g5	sites with a small inflow of ground water	siedliska o słabym wpływie wód gruntowych
og5	sites with a small inflow of precipitation water	siedliska o słabym wpływie wód opadowych

Textural group – Skład mechaniczny gleby

pl	loose sandy soil	piasek luźny
ps	coarse sandy soil	piasek słabo gliniasty

pg	loamy sand	piasek gliniasty
gp	sandy loam	glina piaszczysta
gl	loam	glina lekka
i	clay	ił

Forest site types – Typy siedliskowe lasu

BMśw	Coniferous mixed mesic forest	bór mieszany świeży
LMśw	Deciduous mixed mesic forest	las mieszany świeży
Lśw	Deciduous mesic forest	las świeży

Actual and potential plant communities – Zbiorowiska roślinności rzeczywistej i potencjalnej

ZbBrz	birch communities with no distinct phytosociological classification	zbiorowiska brzozowe bez jednoznacznej przynależności fitosocjologicznej
TGs	communities from the group of acidophilous communities representing *Trifolio Geranietea sanguinei* class	zbiorowiska z grupy zbiorowisk acydofilnych reprezentujących klasę *Trifolio Geranietea sanguinei*
Ru	communities representing *Rubetum idaei* class	zespół *Rubetum idaei*
CQ	a community related to *Calamagrostio arundaceaea-Quercetum petraeae association*	zbiorowisko zbliżone do *Calamagrostio arundinaceae-Quercetum petraeae*
FQ	community related to *Fago-Quercetum petraeae association*	zbiorowisko zbliżone do *Fago-Quercetum petraeae association*
GoF	*Galio odorati-Fagetum association*	zespół *Galio odorati-Fagetum*
PaQ	*Potentillo albae-Quercetum association*	zespół *Potentillo albae-Quercetum*

REFERENCES

Alekseev V.A., 1967. O propuskanii solnečnoj radiacji pologom drevostoev [Transmission of sun radiation under the tree top]. In: Svetovoj režim, fotosintez i produktivnost' lesa [Light regime, photosynthesis and wood productivity]. Izd. Nauka Leningrad [in Russian].

Bernadzki E., Kowalski M., 1983. Brzoza na gruntach porolnych [Birch in formely arable land]. Sylwan 3, 33-41 [in Polish].

Brzoza *Betula* L. Nasze drzewa leśne. Monografie Popularnonaukowe 7 [Birch *Betula* L. Our forest trees. Popular science monographs 7]. 1979. Ed. S. Białobok. PWN Poznań [in Polish].

Curt T., Prévosto B., 2003. Rooting strategy of naturally regenerated beech in Silver birch and Scots pine woodlands. Plant Soil. 255 (1), 265-279.

Kalinin M., 1978. Modelirovanie lesnych nasaždenij [Projection of forest cultivation]. 5. Izd. Wišša Škola [in Russian].

Lyr H., Polster H., Fiedler H.-J., 1967. Gehölzphysiologie. G. Fischer Jena.

Mapa przeglądowa Nadleśnictwa Miastko, stan na 1.01.1997 r. [Small-scale map of the Miastko Forest division, status of 01.01.1997]. 1997.

Mapa przeglądowa Nadleśnictwa Dretyń, stan na 1.01.2000 r. [Small-scale map of the Dretyń Forest division, status of 01.01.2000]. 2000.

Mapa przeglądowa Nadleśnictwa Niedźwiady, stan na 1.01.2003 r. [Small-scale map of the Niedźwiady Forest division, status of 01.01.2003]. 2003.

Matuszkiewicz W., 2001. Przewodnik do oznaczania zbiorowisk roślinnych Polski [Guide-book to the determination of the Polish plant associations]. PWN Warszawa [in Polish].

Ochyra R., Żarnowiec J., Bednarek-Ochyra H., 2003. Census catalogue of the Polish masses. Pol. Acad. Sci., Inst. Bot. Kraków.

Podrázský V.V., Ulbrichová I.S., 2004. Restoration of forest soils on reforested abandoned agricultural lands. J. For. Sci. 50 (6), 249-255.

Rutkowski L., 2004. Klucz do oznaczania roślin naczyniowych Polski niżowej [Key to the determination of the vascular plants of the Polish lowland]. PWN Warszawa [in Polish].

Włoczewski T., Ilmurzyński E., 2003. Hodowla lasu [Silviculture]. PWRiL Warszawa, 464-468 [in Polish].
Zasady hodowli lasu [Principles of silviculture]. 2000. DGLP Warszawa [in Polish].
Zielony R., Bańkowski J., Cieśla A., Czerepko J., Czępińska-Kamińska D., Kliczkowska A., Kowalkowski A., Krzyżanowski A., Mąkosa K., Sikorska E., 2004. Siedliskowe podstawy hodowli lasu [Site foundations of silviculture]. Ośr. Rozw.-Bad. Las. Państ. Bedoń Warszawa [in Polish].

ZRÓŻNICOWANIE WARUNKÓW WYSTĘPOWANIA DRZEWOSTANÓW BRZOZOWYCH NA GRUNTACH POROLNYCH W NADLEŚNICTWACH DRETYŃ, MIASTKO I NIEDŹWIADY

Streszczenie. Badaniami objęto 14 drzewostanów brzozowych, w wieku 55-60 lat, w nadleśnictwach Dretyń, Miastko i Niedźwiady. Poddano analizie zróżnicowanie warunków przyrodniczych, ich występowanie pod względem potrzeb przebudowy na lasy bukowe, bukowo-dębowe lub dębowe. Stwierdzono, że zróżnicowanie warunków przyrodniczych, w których występują badane drzewostany brzozowe obejmuje: trzy typy siedliskowe lasu (las świeży, las mieszany świeży oraz bór mieszany świeży), pięć typów i podtypów gleb (gleby bielicowe właściwe, rdzawe właściwe, rdzawe brunatne, płowe brunatne, płowe opadowoglejowe), pięć różnych powierzchniowych utworów geologicznych (piaski sandrowe, piaski wodnolodowcowe utworów szczelinowych, piaski zwałowe, gliny zwałowe, iły trzeciorzędowe), cztery stopnie uwilgotnienia siedliska (siedliska o bardzo słabym wpływie wód gruntowych, siedliska o bardzo słabym wpływie wód opadowych, siedliska o słabym wpływie wód gruntowych, siedliska o słabym wpływie wód opadowych), sześć zbiorowisk roślinności rzeczywistej (zbiorowiska brzozowe bez jednoznacznej przynależności fitosocjologicznej, zbiorowiska z grupy zbiorowisk acydofilnych reprezentujących klasę *Trifolio Geranietea sanguinei*, *Rubetum idaei*, zbiorowisko zbliżone do *Calamagrostio arundinaceae-Quercetum petraeae*, zbiorowisko zbliżone do *Fago-Quercetum petraeae*, zbiorowisko zbliżone do *Galio odorati-Fagetum*) i cztery zbiorowiska roślinności potencjalnej (*Galio odorati-Fagetum*, *Fago-Quercetum*, *Calamagrostio arundinaceae-Quercetum petraeae*, *Potentillo albae-Quercetum*).

Słowa kluczowe: drzewostany brzozowe, *Betula pendula*, grunty porolne

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