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THE NEED FOR HYDROLOGICAL AND SOIL RESEARCH IN HISTORICAL PARK-PALACE COMPLEXES AS ILLUSTRATED BY THE CASE OF THE PARK-PALACE COMPLEX IN PODWILCZE, BIAŁOGARD MUNICIPALITY (NW POLAND)

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Abstract

Negative alterations of hydrological conditions connected with transformations of physical and chemical soil properties are important problems affecting condition of historic parks and gardens. Consequences of those alterations are noticeable in deteriorating condition of old trees, their dying and falling and also in destruction of compositive arrangement of park and garden.
In the research results of complex hydrological, soil and dendrological experiments carried out in the years 2011-2013 in the area of historic park in localities Podwilcze (commune Białogard) were considered.
In the park of Podwilcze as a result of drainage ditches neglect and rise of water level in no-flow artesian-fed pond water table rise took place within the park limits. Soil erosion, surface and underground flows, local inundations were also observed. It affected many fallen old trees, development of fungous diseases and natural succession of plants of wet habitats.
Urgent hydrotechnical and meliorative works should be conducted in the analyzed park to regulate water-air relations meeting the optimal requirements of precious primary afforestation.

Key words: trees, health status, groundwater, soil, park, degradation

INTRODUCTION

One of the reasons behind degradation of historic park-palace complexes is the change in aquatic conditions. Most frequently, the changes concern decline of groundwater level on the area of the park, however, unregulated water relations and resulting flooding is just as damaging to old trees (Majdecki 1993). Negative effects of the changes in hydrological conditions result in transformation of physical and chemical properties of soil. It is manifested in worsening of health status, dieback and windthrow of old-growth of trees which contributes to the ongoing degradation of the compositional structure of the park-palace complex (Kubus 2008a, b, Kubus et al. 2012).

The origins of the construction of the palace in Podwilcze (palace complex entered in the Register of objects of cultural heritage, No. A464, dated 27/07/1954) date back to approximately the second half of 14th century, when the locality was first mentioned as the ancestral seat of the von Podewils family. Since then, no mention has been made in historical sources regarding the reconstruction of the residence. Soon after the locality was bought in 1890 by Max von Hewald, the construction and modernisation works of the palace started and new utility buildings were erected in the vicinity of the manor. The completion date of the neo-gothic reconstruction is assumed to be 1895 (Wierzchowiecki et al. 1976).

The last pre-war owner of the complex was Maria von Holtzendorf née Podewils who took over the estate in 1905. Following nationalisation of the complex in 1945, it became an orphanage (1954), the seat of Territorial Defence Force (1960's) and a holiday resort (1972). When in 1981 the Municipal Office in Białogard took possession of the complex, the palace was sold and the land leased to a private owner (Janyszek et al. 1996).

The palace garden was established in the early 19th century. After completion of the modernisation works of the palace, the park was enlarged by incorporating, among others, a wet meadow located to the west of the palace and several hectares of beech forest stand. The species composition of the park stocking near the palace was supplemented by exotic species (Wierzchowiecki et al. 1976, Grecki 1992).

The park covers an area of 21.77 ha, and includes ponds, view hill, the von Podewils family cemetery, building complex of the palace, the living quarters for the servants, coach house and icehouse. The pond in the vicinity of the palace is fed by deep waters of the artesian well (Grecki 1992).

The aim of the present paper was determination of the observed negative changes in forest-stand of the palace-park complex in Podwilcze with respect to hydrological and soil changes in that area. The study is a complex synthesis of the hydrological and soil research as well as dendrological analysis conducted in the period 2011-2014.

MATERIALS AND METHODS

The field studies were conducted in the period 2011-2013, in two stages. During the first stage, the hydrogeological conditions of the area surrounding the palace and the park were assessed by means of the following analyses and field works:

– identification of study transects and locating geological survey boreholes (Fig. 1) on the basis of cartographic materials and preliminary field studies;
– geological borehole drilling along the transects, describing the geological structure and the existing level of free groundwater table;
– identification of the accumulation area of water flowing from upland;
– determination of the existing gradient of the Potok Młyński stream;
– assessment of stream sedimentation and existing drainage ditches.

The second stage included the assessment of conservation and health status of the park tree-stand according to scales by Pacyniak and Smólski (1973), Roloff (2001) and Kasprzak (2005). As a part of the second stage of studies, piezometers were installed in the selected parts of the park, and groundwater level was regularly monitored.

RESULTS AND DISCUSSION

Characteristics of geological-soil conditions

The park-palace complex in Podwilcze was established in the area of high topographic diversity – post-glacial dead-ice valley, which was additionally anthropogenically transformed (artificial pond, drainage ditches, artificial islands). The valley slopes are from 1.1% to 4.5%, and locally there are very steep scarps, particularly along the banks of the so-called moat.

The field studies and analyses of hydrographic, topographic and soil-agricultural maps show that Pleistocene foundations, predominantly stratified glacial sands, are prevalent in this area. On the surface there are loamy sands, which at various depths transfer to loose sands (from fine to coarse), at times stratified with loam and generally located on glacial till. Such geological structure of the area as well as existing plant communities resulted in formation of soil classified according to Soil Classification of Poland (2011) as rusty soil type sometimes podsolic in upper layers. The soils are very light, strongly acidic or acidic in the surface layer, turning into slightly acidic and neutral in the deeper layers. Due to their physicochemical properties, the soils are clearly separated from brown soils and, in terms of trophic conditions, are better than podsolic soils. In terms of habitat classification, the area can be classified as mixed forest. The soils are mostly mesotrophic or oligotrophic. Mesotrophic types of rusty soils favour acidophilic oak-beech forest (*Fago-Quercetum petraea typicum*) and more diverse mixed-species coniferous forest (*Querco roboris-Pinetum typicum*). *Oligotrophic types of rusty soils mostly favour less diverse coniferous forest with sessile oak* (*Quercetum petraeae-Pinetum*) and acidophilic oak forest (*Calamagrostio-Quercetum petraeae*).

The area surrounding the park is used for agricultural purposes – there are sandy deposits, locally lined with loam.

In the central part of the park-palace complex, on the area adjacent to the Potok Młyński stream there are shallow Holocene foundations with thickness of up to 0.70 m b.g.l., marked by very high groundwater level – at times reaching the ground level.

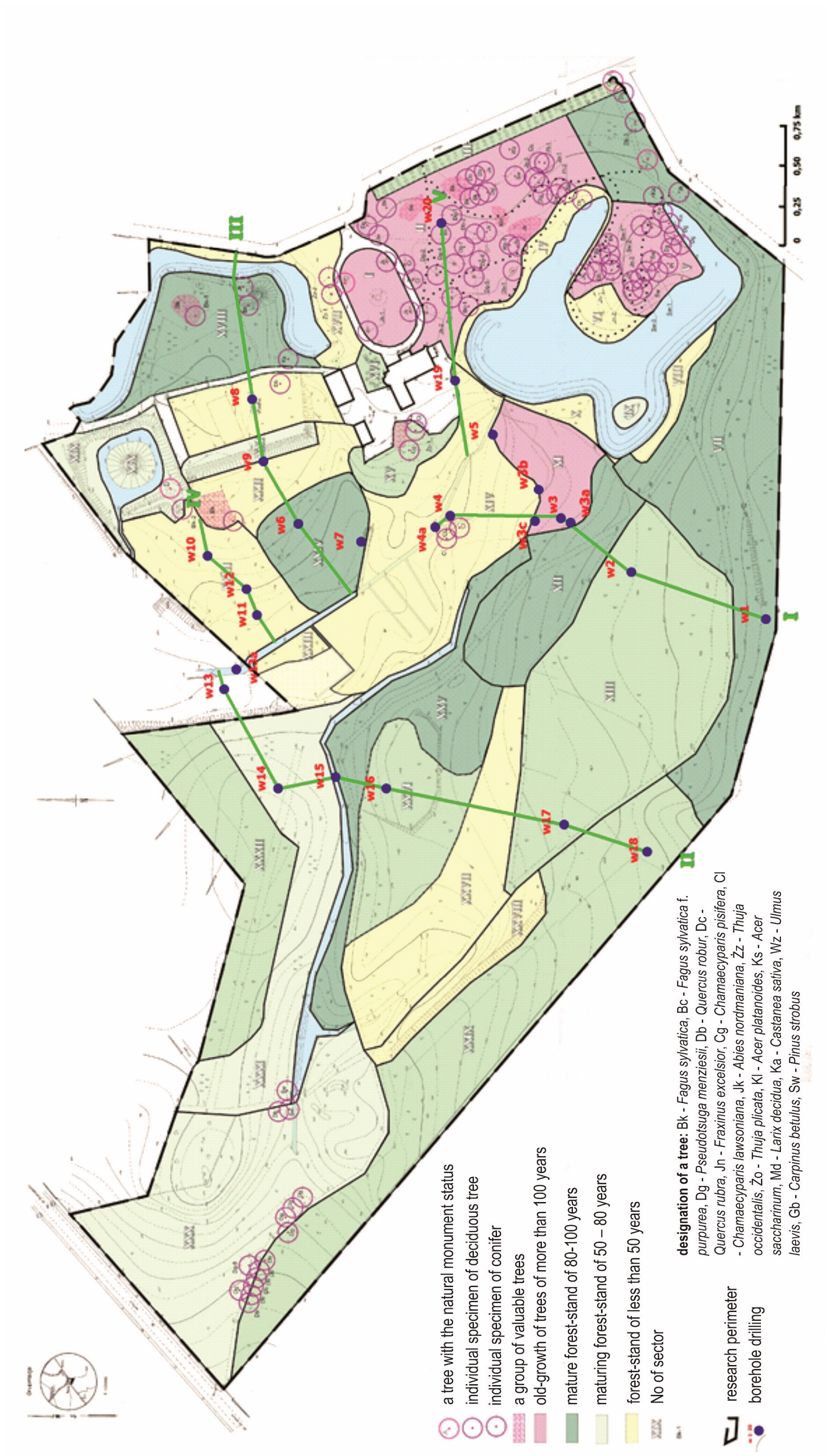
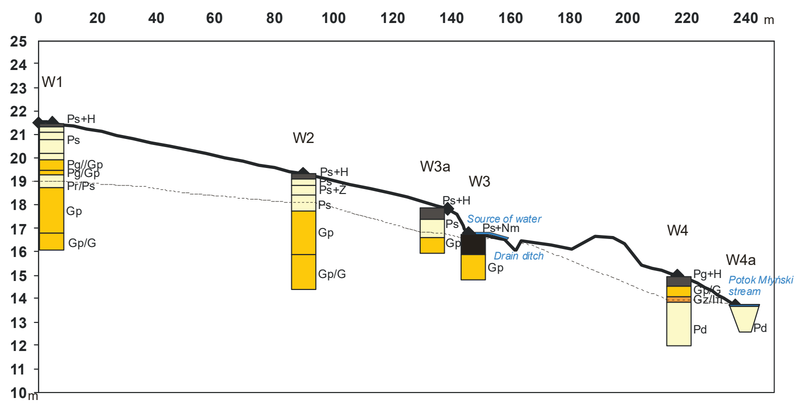


Fig. 1. General dendrological inventory of the park in Podwilcze and the location of geological-soil study drills

The soils are mostly muck and silted, highly decomposed peat (H8-H9 according to von Post scale), lined with sandy formations. According to Soil Classification of Poland (Systematyka gleb Polski 2011), those are shallow muck-peat soils and, in slightly more elevated areas, shallow muck soils and Gleyic Phaeozem. On soil-agricultural maps, all the aforementioned soil types are marked as Gleyic Phaeozem and classified as 2z medium quality grassland category. However, at present, due to lack of drainage ditch maintenance and natural plant succession (now the area is overgrown with willow, hornbeam and alder sapling), the area is overly moisturised and should be classified as 3z category of poor and very poor quality grassland.

Characteristics of hydrological conditions

According to hydrographic map (1:50000) sandy soils of the park-palace complex are mostly classified as belonging to class 2 – medium soil permeability (permeability coefficient from $10^{-3}m{\cdot}s^{-1}$ to $10^{-5}m{\cdot}s^{-1}$), and in some parts along the Potok Młyński stream in the low ground to class 3 – poor soil permeability (permeability coefficient from 10^{-5} to $10^{-8}m{\cdot}s^{-1}$). The level and extent of the first level of groundwater is marked by three hydro isobaths – the groundwater table on the upland surrounding the park is at the depth of 2-5 m. b.g.l., on slopes from 1 m. to 2 m. b.g.l., and in the central part of the valley 0-1 m. b.g.l. Such distribution was confirmed by hydrogeological studies (transects I, II, IV and V – Figs. 2, 3, 4, 5). The recorded level of groundwater (from about 2.40 to 0 m. b.g.l.) corresponds approximately to the upper layer of loamy formations which gradually show higher locations from the upland to the centre of the valley and occur closer to the ground surface.This results in the groundwater table occurring increasingly closer to the surface, the flow of groundwater towards the bottom of the valley and outflow on the slopes of the Potok Młyński stream (numerous sources available).



H – humus, Pd – fine sand, Pr – coarse sand, Ps – medium sand, Pg – loamy sand, Gp – sandy loam, G – loam, Iπ – silty clay, Gpπ – sandy silt loam, π – silt, I – clay, Ż – gravel, Nm – mud, T – peat, nN – anthropogenic material

Fig. 2. Lithological-soil profile along transect I

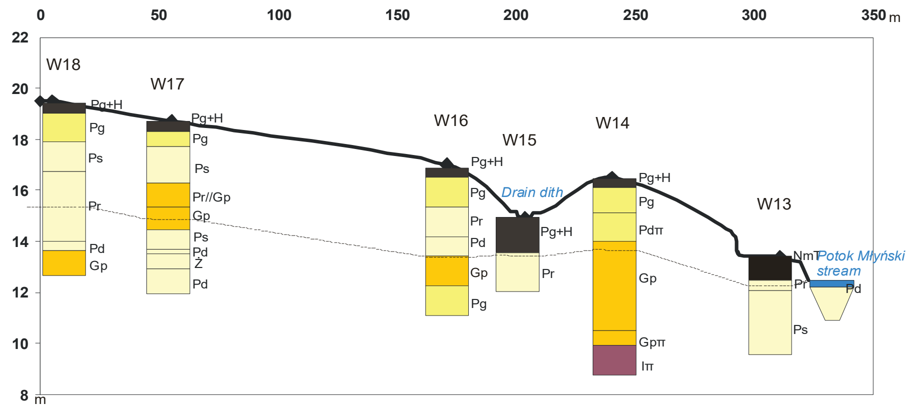


Fig. 3. Lithological-soil profile along transect II

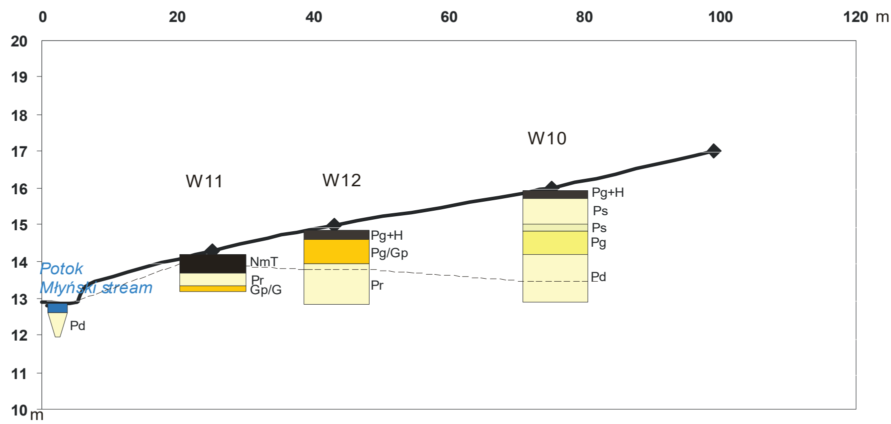


Fig. 4. Lithological-soil profile along transect IV

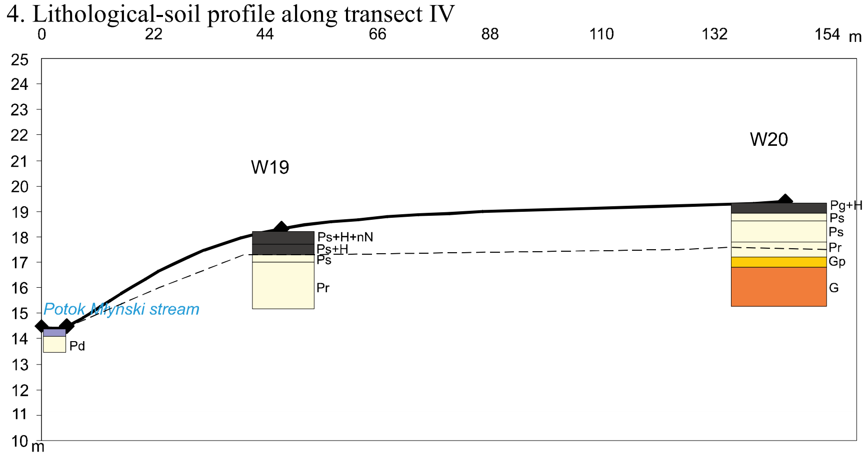


Fig. 5. Lithological-soil profile along transect V

Other water-soil conditions were found in the most athropogenically transformed and topographically diverse north-east area (transect III – Fig. 6). The high hills found in this transect are mostly comprised of permeable sandy formations. On top of the hill, groundwater level is located at the depth of 4.60 m b.g.l. and was similar to the level of water in the so-called moat.

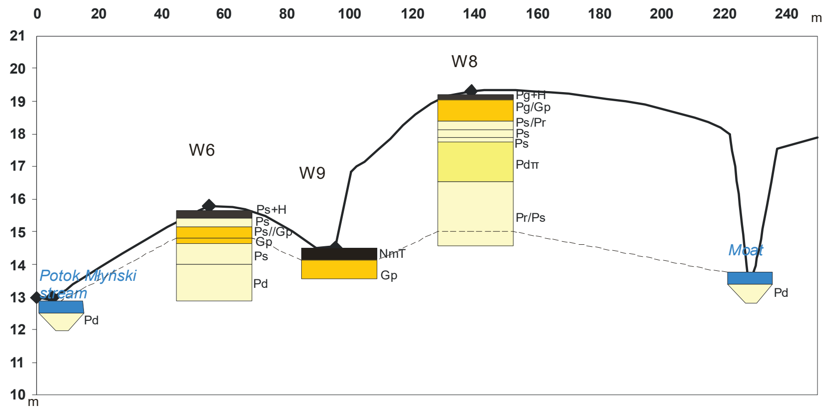


Fig. 6. Lithological-soil profile along transect III

The fact that the valley of the Potok Młyński stream is also topographically varied results in highly diverse moisture conditions. There are numerous depressions, both closed as well as connected with drainage canals which are extremely silted (at times, siltation thickness exceeds 0.60 m), which in turn contributes to retention and hinders water runoff. It is also the case with drainage ditches which need clearing as they are overgrown with bushes and trees, which additionally prevent water runoff. At present there are two water courses in the valley: the Potok Młyński stream which allows water outflow from the central part of the valley, and drainage ditch located in the north-east part of the valley allowing water outflow from the so-called meat. The waters from the ditch supply the Potok Młyński stream outside the park. On the area of the park-palace complex there is an artificial pond of an area of approx. 1 ha. The pond is fed by artesian waters mainly by means of hydrostatic pressure (intensive water outflow in the location of the former artesian fountain is observed in spring). The excess water from the pond is drained into the Potok Młyński stream.

The study shows that the park-palace complex in Podwilcze is located in a difficult terrain of high topographic, geological and hydrological diversity which, additionally, is anthropogenically transformed. It is a deep dead-ice valley fed by groundwater from the upland. The double-layered geological formations (sands on clay) contribute to periodic, intense groundwater flow just below the ground level. Land use of such an area required detailed design of hydrotechnical works followed by gardening. Furthermore, maintaining the good condition of the entire park-palace complex required constant monitoring and maintenance of hydrotechnical appliances as well as melioration network. Regulation of water conditions was essential for preserving the valuable dendroflora planting in good condition.

Dendrological study

In the eastern and southern part of the park adjacent to the palace, the tree stocking is of park nature with trees of foreign origin, i.e.: London plane (*Platanus ×hispanica* 'Acerifolia'), Nikko fir (*Abies homolepis*), Lawson and sawara cypress (*Chamaecyparis lawsoniana* and *Ch. pisifera*), western red cedar (*Thuja plicata*). The western and northern part of the park is typically forest-like.

There are 32 taxa of trees and shrubs in the park, including 29 species of more than 40 years old. European beech (*Fagus sylvatica*) is the predominant species in the forest stand, yet there is a significant number of European hornbeam (*Carpinus betulus*). Conifer trees constitute a considerable share of the forest stand (12 taxa). The valuable old-growth of trees is of monumental size – four trees are entered into the Register of nature monuments (two European beech trees, common oak and silver fir), and the size of 15 of the trees by far exceeds the nature monument classification criteria by Kasprzak (2005).

The tree-stand of the park is diverse in terms of age. The trees of exotic species located in the eastern part of the park, i.e. in sectors I-III (Fig. 1) are generally the oldest. In these sectors there are also European beech trees, purple-leaf European beech trees, common oak trees and single European ash trees which are more than 120 years old. Most of the trees in the park are 40-80 years old, there are also numerous trees of 20-30 years old.

Health status

The condition of the tree-stand is varied in particular areas of the park (Fig. 1). The health status of the trees in sectors I, II, III, V, XIII, XV and XXIX is considered good and satisfactory, whereas in sectors XI, XIV, XVII, XXIII as poor or unsatisfactory (Table 1). The phytosanitary status of most of the trees is unsatisfactory. There are numerous instances of bough and branch deadwood. Most of the crowns are highly elevated and lack lower boughs. Due to spontaneous shedding of the lower branches within the crown, the centre of the gravity of the trees has been raised.

Each new gap in the tree-stand might lead to significant damage due to windsnap and windthrow of nearby trees.

There are traces of lost old-growth of beech, i.e. the remains of stump wood or fallen tree-trunks. Single, older European beech trees in sector VII are affected by parasitic fungi belonging to the family *Polyporaceae*. According to Janyszek et al. (1996), one of the most significant elements which play an important role in losing mature trees is honey fungus.

In the last 40 years there has been a significant quantitative change in the share of particular tree species in the tree-stand of the park. Lost beech, oak and spruce trees were spontaneously substituted with maple, ash and beech trees. As a result of maintenance negligence, the wet meadow located to the west of the palace and covered with the network of drainage ditches is now overgrown with mixed-species understory.

Table 1

General characteristics of park trees condition and water-soil conditions in selected sectors

Sector	Dominant species, location and age structure of trees, according to Pacyniak and Smólski (1973), Roloff (2001) and Kasprzak (2005)	Soil-water conditions	Remarks
Good or satisfactory tree condition			
I, II, III, V	coniferous trees, European beech, London plane / old-growth of trees over 100-140 years	- flat terrain, rusty soil formed from loamy sands of pH 5.0; - lack of $CaCO_3$; - thill profile shows an increase in pH in source rock to 6.5; - lack of $CaCO_3$, at the depth of 2.1 m loose sand lined with sandy loam of 7.3 pH; - presence of $CaCO_3$ – 4%; groundwater at 1.8 m. b.g.l.	- no windthrow
XIII, XV, XXIX	European beech (Southern part) European beech, Norway maple, European hornbeam, common oak (central part, mixed tree-stand)	- steep valley slopes; rusty soil formed from loamy sand of increasing soil pH in deeper soil layers from 5.0 to 6.0; - lack of $CaCO_3$; - at 3.0 m in depth sandy loam of 7.3 pH; - $CaCO_3$ approx. 4%; groundwater lever 2.2 m b.g.l.	- tree loss caused mainly by uncontrolled cutting down trees; - dense understory below dense tree canopy
Poor or unsatisfactory tree condition			
XI	European beech, old-growth of trees over 100 years (on the western side of the pond), Single European beech trees over 100 years old	- highly topographically diversified terrain with numerous valleys, groundwater flows out from valley slopes (springs); - rusty soils on the slopes and hills; in the valley	- heavy tree loss – stumpwood, remains of fallen trees; - tree trunks affected with parasitic fungi;

Sector	Dominant species, location and age structure of trees, according to Pacyniak and Smólski (1973), Roloff (2001) and Kasprzak (2005)	Soil-water conditions	Remarks
		gley soils (organic-mineral) and organic soils; - water on the ground level or just below the ground surface, pH 6.5, lack of $CaCO_3$	- younger generations formed by beech monoculture with mixed-species understory
XIV, XVII, XXIII	Norway maple, European ash, black alder, white willow (along the drainage ditches in the central part of the park), silver birch (locally in groups)	- the valley of Kanał Młyński and moat with adjacent slopes constitutes the main part of the sectors; - the limited runoff valley bottom is formed by organic soils of muck-like character – peat of 0.6 m in thickness lined with compact sediments (sandy loam, gleyed clay) of pH from 6.5 to 7.3 and content of $CaCO_3$ 2%; - in XXIII sector, organic sediments lined at a shallow depth with loose sand of 5.5 pH, lack of $CaCO_3$, groundwater at 0.6 m b.g.l.; - in fragments of Potok Młyński of greater water flow, there are sandy sediments, gleyed of pH 6.5, supersaturated with water; - lack of organic sediments; - on terrain elevation and slopes – rusty soils formed in the upper layer from loamy sands (pH 4.5, lack of $CaCO_3$) formed on clay (pH 6.5, lack of $CaCO_3$); - groundwater level at 1.1 m b.g.l.	- mixed-species understory along watercourses; - health status of three Lawson cypresses is very poor – the trees die due to changes in groundwater level (disturbed water-air relations of soils, root suffocation)
XVII	Norway maple, European ash, European white elm, tree-stands located on the northern side of the courtyard, adjacent to the former moat from the south		- multi-species tree stand with heavy loss in valuable trees; - poor health status of western red cedar and northern white cedar (deadwood, windthrow due to extensive changes in water conditions and heavy density of understory)
XXIII	European ash, Norway maple, European hornbeam and northern red oak; approximately 20 years old		- loose, not too dense mixed-species tree-stand

Most of the spruce, pine oak and beech trees were lost in the last 30-40 years. Moreover, the valuable trees listed by Janyszek et al. (1996) were lost in the last 20 years, i.e. sweet chestnut, silver maple, European ash Pendula cultivar, white fir, rowan, yew, black locust, black and scots pine, blue spruce, balsam and white poplar, eastern white cedar, Virginian juniper and fruit trees. It is believed that a significant number of trees was lost due to diseases or because the trees were snapped or uprooted. Another likely cause of such loss in the tree-stand is looting, or cutting down healthy beech, oak, larch and spruce trees without legal permit.

The park tree-stand is established artificially. Ecological weakness of artificially established tree-stand, even of relative diversity in terms of species, cannot be identified as a disease state. In the life cycle of such tree-stands there are long or short periods of relative stabilisation which may be confused with the actual improvement in the health status. Artificially established tree-stands are characterised by constant predisposition to diseases, which causes numerous and various destructive phenomena. Currently, it is believed that the park tree-stand has reached the relative stability phase which, however, cannot be interpreted as improvement in health status.

The presented changes in hydrologic conditions greatly affect the health status of the park tree-stand. The years of maintenance neglect of the drainage network and obstructed water runoff from upland result in an increase of habitat moisture and poor condition of the park tree-stand. The field studies exhibited that the greatest number of uprooted beech trees of monumental size was identified on the slopes of the valley where groundwater level was found to be shallow (generally less than 1 m). Moreover, lack of maintenance and shrub encroachment has a significant effect on the health status of the trees (numerous fungal infections).

Particularly, old deeply rooted beech trees are prone to damage due to exposure to sun and cold in such unfavourable habitat conditions. However, such conditions are ideal for the beech splendour beetle which, together with fungi, contributes to dieback of beech trees (Janyszek et al. 1996). Moreover, some trees i.e. old beech trees, are negatively affected by beech scale causing slime flux and necrosis of bark of beech trees.

The changes in the level of groundwater constitute one of the greatest threat especially to the old trees and greatly affect vitality and health status of old-growth and mature trees-stands. Changes in hydrologic conditions particularly affect old oak and beech tress, pine, spruce or exotic species such as white fir and eastern white cedar. The results presented in this research are in line with those obtained by Janyszek et al. (1996). The younger trees, however, have greater tolerance as to the changes in habitat moisture due to less developed and shallow root system.

The specific habitat conditions of the park-palace complex in Podwilcze show the importance of monitoring of the conditions as well as the need of early intervention and addressing the threats appropriately. In the case of the park-palace complex in Podwilcze, clearing and restoring patency of drainage network as well as sanitary thinning is recommended.

CONCLUSIONS

In the park-palace complex in Podwilcze, the groundwater level has increased significantly due to obstructed flow in drainage ditches and increased water level in a closed flow pond fed with artesian water.
Erosion of soil material, surface and subsurface flow as well as local flooding were observed.
The negative hydrological changes in the park resulted in degradation of the tree-stand and numerous windthrows of old-growth of trees, development of fungal diseases and natural succession of plants of moist soil habitats.
The effect of hydrological conditions on the health status of the park tree-stand is difficult to establish. Due to years of neglect, some drainage ditches are clogged, dried or overgrown. Significant loss of trees, mainly beech, caused an increase of groundwater level which, in turn, resulted in local ponding and paludification. The changes in groundwater level are particularly dangerous to old trees and negatively affect vitality of old-growth and mature trees. Changes in hydrologic conditions particularly affect old oak and beech tress, pine, spruce or exotic species such as white fir and eastern white cedar.
It is recommended to initiate urgent hydrotechnical and irrigation activities in order to regulate water and air relations and restore the optimum conditions for the valuable original tree-stand.

REFERENCES

Grecki H., 1992. Park pałacowy Podwilcze, gmina Białogard, woj. koszalińskie. Ewidencja ogólna dendrologiczno-techniczna 1/91. (Park-palace complex in Podwilcze, Białogard municipality, Koszalińskie voivodeship. General dendrological-technical records 1/91). Pracownia Zieleni Zabytkowej, manuscript, (in Polish).

Janyszek S., Małys L., Skompski M., Strzeliński P., Węgiel A., Wilanowski P., 1996. Ekspertyza zabytkowego parku w Podwilczu, gmina Białogard, woj. koszalińskie. (Study on the historical park-palace complex in Podwilcze, Białogard municipality, Koszalińskie voivodeship), manuscript, (in Polish).

Kasprzak K., 2005. Ochrona pomników przyrody. Zasady postępowania administracyjnego. (Preservation of nature monuments. Administrative procedure). Wydawnictwo Abrys, Poznań, (in Polish).

Kubus M., 2008a. Przejawy zniszczeń założeń parkowych i ogrodowych w województwie zachodniopomorskim oraz możliwości działań konserwatorskich. W: Dendrologia w badaniach środowiska przyrodniczego oraz dziedzictwa kulturowego historia, stan obecny i wizja przyszłości. Materiały Zjazdu Sekcji Dendrologicznej Polskiego Towarzystwa Botanicznego. (Damage in park-palace complexes in Zachodniopomorskie voivodeship and possible maintenance actions. In: Dendrology in studies on natural environment and cultural heritage: history, state of the art and future Materials of the Congress of Dendrological Section of Polish Botanical Society). (Ed.) W. Danielewicz, ProDruk, Poznań, 137-141, (in Polish).

Kubus M., 2008b. Stan zachowania wybranych założeń rezydencjonalno-ogrodowych w województwie zachodniopomorskim. W: Założenia rezydencjonalno-ogrodowe, dziedzictwo narodu polskiego (na tle europejskich wpływów kulturowych). Materiały XV konferencji naukowej 6-7 listopada 2008 r. (Preservation status of selected garden-manor complexes in Zachodniopomorskie voivodeship. In: Garden-manor complexes, Poland's cultural heritage (against European cultural influences). Materials of the 15th Conference, 6-7 Nov. 2008). (Eds) A. Mitkowska, Z. Mirek, K. Hodor, Zakład Sztuki Ogrodowej i Terenów Zieleni i Zespół Dendrologii Instytutu Architektury Krajobrazu Politechniki Krakowskiej, Sekcja Sztuki i Architektury Ogrodowej Komisji Urbanistyki i Architektury O/PAN w Krakowie, Instytut Botaniki im. Wł. Szafera PAN w Krakowie, Kraków, 121-127, (in Polish).

Kubus M., Malinowski R., Sammel A., 2012. Negatywny wpływ zmian warunków hydrologicznych na właściwości gleby i zadrzewienie zabytkowych parków w miejscowościach Brzoza i Podwilcze. W: Drzewa i krzewy w krajobrazie i kulturze materialnej Pomorza Zachodniego i Brandenburgii. Materiały konferencyjne Międzynarodowego Zjazdu Polskiego Towarzystwa Dendrologicznego i Konferencji Naukowej 6-8 września 2012 r. (Negative effects of the changes in hydrological conditions on soil property and tree-stand of historical parks in Brzoza and Podwilcze locality. In: Trees and shrubs in the landscape and material culture of Western Pomerania and Brandenburg. Conference materials of the International Congress of Polish Dendrological Society 6-8 Sept. 2012). (Ed.) W. Bacieczko, Przedsiębiorstwo Produkcyjno-Handlowe Zapol, Dmochowski, Sobczyk, Szczecin, 36-37, (in Polish).

Majdecki L., 1993. Ochrona i konserwacja zabytkowych założeń ogrodowych. (Preservation and maintenance of historical garden complexes). Wydawnictwo Naukowe PWN, Warszawa, (in Polish).

Pacyniak C., Smólski S., 1973. Drzewa godne uznania za pomniki przyrody oraz stan dotychczasowej ochrony drzew pomnikowych w Polsce. (Trees to be classified as nature monuments and state of the art of monumental trees in Poland). *Roczniki AR w Poznaniu*, 57, 41-65, (in Polish).

Roloff A., 2001. Baumkronen. Verständnis und praktische Bedeutung eines komplexen Naturphänomens. (Tree crowns – understanding and practical significance of a complex natural phenomenon). Verlag E. Ulmer, Stuttgart, (in German).

Systematyka gleb Polski, 2011. (Eds) J. Marcinek, J. Komisarek, series: „Roczniki Gleboznawcze. Soil Science Annual", 62, 3, Wydawnictwo „Wieś Jutra", Warszawa, (in Polish).

Wierzchowiecki W., Wierzchowiecka K., Grębowicz J., Witkowska B., Sycz O., 1976. Ewidencja parku Podwilcze gmina Białogard. Katalog parków woj. koszalińskiego. Ewidencja parków i ogrodów na terenie województwa koszalińskiego. (Record of Podwilcze park in Białogard municipality. Catalogue of parks in Koszalińskie voivodeship. Catalogue of parks and garden on the area of the Koszalińskie voivodeship). Urząd Wojewódzki w Koszalinie – Wydział Kultury i Sztuki, Wojewódzki Konserwator Zabytków, mps nr inw. 2282, (in Polish).

POTRZEBA BADAŃ HYDROLOGICZNO-GLEBOWYCH W ZACHOWANIU HISTORYCZNYCH ZESPOŁÓW PAŁACOWO-PARKOWYCH NA PRZYKŁADZIE ZAŁOŻENIA W MIEJSCOWOŚCI PODWILCZE, GMINA BIAŁOGARD (PÓŁNOCNO-ZACHODNIA POLSKA)

Streszczenie

Jednym z problemów wpływających na stan zachowania historycznych założeń parkowych i ogrodowych są negatywne zmiany warunków hydrologicznych, pociągające za sobą przekształcenia właściwości fizycznych i chemicznych gleb. Skutki tych zmian uwidaczniają

się w pogarszającym się stanie zdrowotnym, zamieraniu i wykrotach cennego starodrzewu oraz w zniszczeniu układu kompozycyjnego parku i ogrodu.

W pracy przedstawiono wyniki kompleksowych badań hydrologiczno-glebowych i dendrologicznych prowadzonych w latach 2011-2013 na terenach zabytkowego parku w miejscowości Podwilcze (gmina Białogard). W parku w Podwilczu na skutek zaniedbania rowów melioracyjnych i podniesienia poziomu wody w bezprzepływowym stawie zasilanym wodami artezyjskimi, nastąpiło wyraźne podniesienie poziomu wód gruntowych w obrębie założenia parkowego, jak również obserwowano erozję materiału glebowego, przepływy powierzchniowe i podziemne oraz lokalne podtopienia terenu. Spowodowało to liczne wykroty starodrzewu, rozwój chorób grzybowych i naturalną sukcesję roślin siedlisk wilgotnych.

W analizowanym parku należy podjąć pilne prace hydrotechniczne i melioracyjne w celu uregulowania stosunków wodno-powietrznych, spełniających optymalne wymagania cennego pierwotnego zadrzewienia.