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Dendrological and landscape evaluation of the rural park Borek (Lublin province)

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Abstract. This article presents the results of my research conducted in the rural park Borek, which is located in Gardzienice Drugie, Lublin province. The study was comprised of measuring the dendrological value of the park using the Rokosza method and determining the landscape's aesthetic value using the scenic beauty estimation (SBE) method. In order to establish the dendrological and aesthetic values, the park was divided into four sections, which were then compared with each other. It has been shown earlier that results of the scenic beauty estimation method and the dendrological value are only weakly correlated when it comes to park landscapes. It is therefore advisable to test the value of parks, in both categories, dendrological and aesthetic. This approach could form the basis for the development of a new method to classify and evaluate park landscapes.

Keywords: park, dendrological valorisation, landscape aesthetic valorisation, SBE

1. Introduction

Comprehensive evaluation of parkland values is a crucial step towards park conservation and restoration. The development of appropriate methodology so as to correctly judge park values has so far remained an open issue. Methodology of green area evaluation is also used for the estimation of park objects; however, it is somehow limited; thus, it cannot always support accurate appraisal of park values. One of the reasons of park valuation complexity is the fact that the park value taken as a whole does not reflect just financially viable aspects (Kucharska-Stasiak 2000).

Valorisation of renewable natural resources is a key issue in their economics and plays a crucial role in natural resource management. Natural resources constitute an integral component of the common goods and fulfil a variety of human needs at an individual and societal level. The goods as such cannot be actively traded at market value; thus, their appraisal poses a lot of difficulties. Parklands represent common goods that meet various individual and public needs (Woś 1995, 2010). The parks are inseparable components of spatial arrangement, unique public goods extremely difficult to reinstate and, hence, priceless assets of local communities. The park is a complex association with complicated functions, the realisation of which depends on plant biomass quantity and especially, that of trees (Olaczek 1974). Nonexistence of tree substitute determines the value of trees. This means that no mechanical device or pharmacological means can replace the beneficial effects of the parks on human health and well-being (Urbańska 2001; Kosmala 2005). The fact that trees are indispensable park components gives a basis for undertaking the evaluation of their value as an important aspect in park valorisation.

In Poland, a necessity of nature resource protection has been emphasized for a long time, and recently much attention has been paid to the implementation of rational spatial politics based on sustainable development principles . The rules and regulations of sustainable development support economic and social progress, as well as guard conservation of native species which are indicators of the status of natural environment and landscape (Szyszko 2004). Decision-making processes on spatial arrangements affecting humans and environment should be anchored in precise analyses and estimation of landscape, taking into account all the pertinent aspects (Szyszko, Rylke 2001).

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Numerous attempts to assess and valorise rural landscape have been already made in an array of studies on ecology, geography and spatial management (Senetra, Cieślak 2004). Related research has been carried out by landscape architects from various research centres in Poland and abroad. The main goal of these has been to determine the most objective and repeatable methodology for valuation of landscape and spatial arrangement (Bajerowski 2007). In such studies, extremely important are modes of evaluation, perception of landscape and recognition of the processes that determine the study object and methodology in view of expectations and potential research results (Badora 2008; Wycichowska 2008).

The aim of the present study was to evaluate the values of the rural park Borek by means of dendrological and landscape estimation methods as well as to justify the purposefulness of adopting these methodological procedures as a basis to create a new, more effective way to determine the park value.

2. Study object

The palace-park complex Borek is located in the Gardzienice Drugie village (Świdnik County, Lublin Voivodeship, eastern Poland) and was established at the end of the 1800s, on formerly forested grounds. The park covers an area of 5.6 ha and has considerable landscape values, as it is situated on land elevation that gently falls towards the river Giełczew. Park contour is of rectangular shape and comprises a northerly directed lime tree alley. Native tree species characteristic for deciduous sites prevail (Kopycińska, 2000). The most abundant deciduous species are *Tilia cordata*, *Fraxinus excelsior*, *Betula verrucosa* and *Acer platanoides*. The only representatives of coniferous species are *Picea abies* and *Larix decidua* specimens. Magnificent trees such as two *Populus alba* specimens with diameter at breast height (DBH) of 160 and 170 cm, *F. excelsior* with DBH of 104 cm and *Fagus sylvatica* with DBH of 75 cm grow in the park. *Ulmus glabra* and *F. excelsior 'Pendula'* represent rare tree species.

The Borek estate was owned by the Lemański family until 1907. At that time, *P. alba*, *T. cordata* and *F. excelsior* oldest specimens growing now in the park possibly were planted. In 1907, the estate became the property of the Rzewuski family – noble Artur Wacław and Felicja Marcelina Rzewuski who used the Krzywda coat of arms. The married couple managed the land for decades and changed the manor and the park around into a comfortable and stylish residence. Most probably, in this period, the park was enriched with newly planted trees. After the death of Artur Wacław Rzewuski, the estate was managed by his children Jerzy, Adam and Hanna – also during the World War II. In 1944, the whole property was nationalised by a Soviet-backed administration under then proclaimed the Manifesto of the Polish Committee of National Liberation (PKWN). The property was allotted to previous staff and smallholder farmers. The manor was turned into primary school premises, afterward it stayed abandoned, and finally, in the 1980s, it was taken over by the Gardzienice Producers' Cooperative. The estate went into ruin as a result of the lack of proper care and funds for renovation. Not only the manor was devastated, but also the park was degraded and its several trees were cut down (Soćko 1998; Teodorowicz-Czerepińska, Michalska, Studziński 1999; Świetlicki 1999, 2000, 2008). Currently, actions towards restoration of the manor and the park have been undertaken by the new owner of the assets, in cooperation with the Inspector of Heritage Conservation in Province of Lublin.

3. Methods

Dendrological valorisation of the park was performed using the method described by Rokosza (1982). During a detailed inventory, each tree was examined in terms of species, health status, DBH and crown diameter. Tree maturity was evaluated based on the pertinent tables for tree and bush species prepared by Rokosza (1982). Age limits and related maturity indexes were determined for each tree, and tree age classes had the following numerical values:

- youngest trees: 1
- mature trees: 1.5
- oldest trees: 2

Also, in line with the Rokosza method, point estimates of tree health status were determined. The examined trees were divided into three health classes with the following health indexes:

- 0.1 – healthy trees, with appropriate growth and no damage;
- 0.5 – trees with minor mechanical damage, with fungal infection or with insect infestation at a level not threatening tree growth;
- 1 – diseased trees, infected by fungi or infested by insects at a life-threatening level, with detrimental mechanical damage.

The inventory was conducted in April and May 2014. Tree age evaluations were based on the age table by Majdecki (1980–1986). The potential dendrological value (PWD) was assigned to each tree examined, depending on a given species potential dendrological value, which was determined based on the sum of the criteria described in the following.

The used method assumed the three-point scale (1, 0.5, 0) for meeting the following criteria:

1. Longevity:
   - trees older than 200 years 1
   - 100–200 years old trees 0.5
   - trees less than 100 years old 0
2. Leaf holding period:
   - all year round 1
   - longer than 6 months 0.5
   - shorter than 6 months 0
3. Value in use:
   - direct-use value for humans and animals 1
   - direct-use value for animals 0.5
   - no direct-use value 0
4. Tree growth rate:
   - 1 m annual increment 1
   - 0.5–1 m annual increment 0.5
   - annual increment is less than 0.5 m 0
5. Ornamental value of foliage and tree shape:
   - uniqueness of both features 1
   - uniqueness of one of the features 0.5
   - commonness of the features 0
6. Attractiveness of flowers and fruits:
   - species with decorative flowers and fruits 1
   - species with decorative flowers or fruits 0.5
   - species with not attractive flowers or fruits 0
7. Resistance to anthropogenic factors:
   - no visible signs of response 1
   - evident response 0.5
   - considerably reduced longevity 0
8. Resistance to diseases and pest insects:
   - treatments not required 1
   - sporadic treatments required 0.5
   - frequent treatments required 0

When the respective numerical values of the above eight criteria were assigned to the examined trees of a given species and summed, three classes of the potential dendrological value (PWD) were set up:

- class I – highest (in total 5.5–8.0 points) – assumed index: 5,
- class II – medium (in total 2.5–5.0 points) – assumed index: 3,
- class III – lowest (in total 0.0–2.0 points) – assumed index: 1.

Based on PWD as well as maturity and health indexes attained, the real dendrological value (RWD – factual natural value of a given specimen) was calculated in line with the following equation:

$$RWD = \frac{A \cdot B}{C}$$

where

A – index of the potential value of a given tree species,
B – index of tree maturity,
C – index of tree healthiness.

Based on the values obtained, the evaluated tree specimens were divided into three RWD classes:

- class I – trees that achieved more than 50 points,
- class II – trees that achieved 15–49 points,
- class III – trees that achieved 7–14 points,
- class IV – trees that achieved 4–6 points,
- class V – trees that achieved less than 3 points.

Next, the dendrological value (WDP) of the park was calculated, that is, the value of the current status of its nature, expressed as the ratio of the number of trees in RWD class I to the total number of trees in the park. The following equation was used in WDP calculation:

$$WDP = \frac{D_I}{D_P}$$

where:

D_I – number of trees in RWD class I,
D_P – total number of trees in the park.

The last step in park valorisation involved classification of the park into one of the three dendrological value classes based on the results of WDP calculations.

Landscape valorisation was conducted using the SBE (*Scenic Beauty Estimation*) method (Daniel, Boster 1976). First, the analysis of landscape physiognomy was performed and the area examined was divided into landscape units (Dmitryszyn 2010). In line with this approach, the park was treated as an individual landscape unit, which was divided into four sub-units. The number of sub-units selected depended on the park landscape diversity, which was determined based on the collocation of natural and anthropogenic objects in the park (Solon 2002). Each landscape analysed was photographed by a viewer during a walk taken within sub-unit areas in randomly selected directions (in total 20 photos/park, i.e. 5 photos/sub-unit). All the photos were taken for every 15–20 m at the level of eyes with the use of FujiFilm FinePix XS25EXR camera. The photos were taken in May 2014, under very similar weather conditions. Lens with a focal length of 1:5 were used (Gąsowska, Rylke 2007). Next, the photos were numbered and randomly arranged in a prepared multimedia presentation. The presentation was shown with the use of a projector to a group of 107 observers gathered in a darkened room. Every photo was presented for 8 s. During the presentation, the observers estimated landscape beauty and scored landscape scenes in accordance with the 10-step scale, where 1 is the lowest, and 10 is the highest aesthetical landscape value. The results of the questionnaire were statistically analysed using SBE mean scores per one photo image, sub-unit and entire park. The dendrological value (WDP) of every sub-unit was determined. Relationships between WDP and aesthetic value were tested using the Pearson's correlation coefficient. The results of SBE and

dendrological valorisation are presented in the following text, a graph and a map with park division into sub-units.

4. Results

The results of the dendrological inventory of the Borek park showed the presence of 226 trees, growing at the average density of 40.4/ha. Five tree species were recorded, the proportion of which in the total number of park trees was higher than 5%: *A. platanoides* L., *F. excelsior* L., *T. cordata* Mill., *Betula pendula* Roth. and *Carpinus betulus* L. A part of trees (34 specimens) started off their growth in the period of park creation. On the whole, trees that are 80–131 years old constituted the most abundant age group. The structure of the tree development stages was as follows: (1) juvenile trees, with high growth rate and just shaping natural features of a given species/variety – 18 specimens (8% of the total number of park trees); (2) fully mature trees, with optimal growth parameters that already shaped natural features of a given species/variety – 119 specimens (52.7%); (3) senescent trees, with gradually vanishing natural features of a given species/variety – 89 specimens (39.4%). The trees graded as PWD class I were most abundant in the park (Table 1).

In accordance with the determined tree health indexes, the healthiness structure of park trees was as follows: (1) healthy trees with appropriate developmental patterns, with no damage – 162 specimens (71.7% of the total number of park trees); (2) trees with minor mechanical damage, pathogen infected or insect infested at a level not threatening life – 51 specimens (22.6%); (3) diseased trees, infected by pathogens or infested by insects at a life-threatening level or seriously mechanically damaged – 13 specimens (5.8%). The trees graded as RWD I class were most abundant in the park (Table 2).

The number of trees graded as RWD I class against the total number of park trees was a factor deciding on the dendrological value of the park studied. In 2014, the dendrological value of the park (WDP) was

$$WDP = \frac{129}{226} = 0{,}57$$

The obtained WDP value graded the Borek park's dendrological value as class II. The dendrological values obtained for individual landscape sub-units are presented in Figure 1.

Park sub-unit 1 (1.12 ha) obtained the lowest score in landscape beauty estimation. It is situated in the northeastern part of the park on a flat top of land elevation. Sub-unit 1 borders on the manor's frontage, which faces the main alley and the driveway. In sub-unit neighbourhood, there are noticeable remains of buildings of abandoned point of sugar beet collection. Park trees are evenly distributed in this sub-unit, and the average tree density is 45 specimens/ha.

Park sub-unit 2 (1.51 ha) is situated in the southwestern part of the park. This sub-unit embraces slightly undulating terrain, gently inclined towards the south. Its central part is covered with grass and surrounded by individual trees growing on park borders. In the northern part, in between trees, there remain visible walking paths. In immediate proximity, buildings of a farm holding are situated. In this park sub-unit, the average tree density is 19 specimens/ha.

Park sub-unit 3 (1.93 ha) is situated in the southeastern part of the park. Here, the terrain is flat and gently inclined southeasterly, towards the glacial valley of the river Giełczew. The majority of trees grow in sub-unit northern part, and only a few trees occur along park borderline. Park sub-unit 3 is characteristic of the lowest tree density when compared to other sub-units studied, that is, 14 specimens/ha. Such tree arrangement allows admiring the view of river meadows that adjoin the park.

Park sub-unit 4 (1.04 ha) was scored the highest with regard to landscape beauty. It is situated in the northeastern part of the park. This area is flat, slightly inclined easterly towards the meadows along the river Giełczew. In this sub-unit, trees grow in evenly distributed groups. Walking paths

Table 1. Number of trees found in the park Borek by class of potential dendrological value (PWD) in 2014

Class of potential dendrological value	Number of trees	Share [%]
I	128	56.6
II	98	43.4
III	0	0.0

Table 2. Number of trees found in the park Borek by class of real dendrological value (*RWD*) in 2014

Class of real dendrological value	Number of trees	Share [%]
I	129	57.1
II	55	24.3
III	35	15.5
IV	7	3.1
V	0	0

are present in its western part. The average tree density is the highest in the park and amounts to 114 specimens/ha.

The results of landscape beauty estimation of park sub-units are presented in Figure 1. The aesthetic value of the whole park was 5.82. Three (no. 2, 3 and 4) of the four estimated sub-units achieved scores higher than the average value of whole park beauty. The photo with the highest beauty estimate came from park sub-unit 2 and received 6.69 points. The lowest estimate (4.41 points) was given to a photograph taken in park sub-unit 1. With reference to the dendrological value, park sub-unit 4 showed the value equal to that of the whole park, whereas park sub-unit 3 showed the higher dendrological value when compared to that of the whole park. As presented in Figure 2, relationships between dendrological value and respective sub-unit aesthetical value of each sub-unit showed a weak correlation – not statistically significant ($r = 0.514$, $p = 0.05$).

5. Discussion

The assessment of the dendrological value of a given parkland is a tool that allows to judge its value against other park objects. The dendrological value provides the basis to determine the extent of conservation treatments in a given park and, consequently, allows to approximate its reconstruction costs (Budnicka-Kosior 2010). The results of the study conducted in the Borek park show that numerous valuable trees grow there, the proportion of young specimens is relatively small and several trees in the park are damaged to some degree. Tree species composition is analogous to that in other parks established in the region (Sandomierz Basin) (Fornal-Pieniak, Wysocki 2010). The valorisation of the Borek park showed that the park could possibly achieve the status of class I of dendrological value – after undertaking several revalorisation activities and future development of trees of younger age classes.

The valorisation of landscape, of which rural parks are noteworthy elements, as a general rule involves professional methods for the evaluation of physiognomic landscape values. One of these is SBE proposed by Daniel and Boster (1976). The method was elaborated for the designation of land fragments as landscape parks and is based on the evaluation of landscape aesthetic values, where landscape beauty is estimated through determination of a scale of the observer's impression. It allows to select landscape fragments with unique values at both a local and regional level (Gąsowska 2008). In keeping with the principles of sustainable development and legal regulations, landscape valorisation for the purpose of spatial planning should include socio-cultural aspects. Landscape estimation is the process of concluding a judgment on landscape value, where the estimate does not exist by itself but has its inventor and recipient (Myga-Piątek 2007).

The use of SBE method is reasonably simple, involves the assessment of the observer's aesthetic judgment and at the same time, takes into account the role of the collective recipient, as an important aspect in the process of landscape estimation. SBE was used in the present study for all these reasons. The obtained results showed substantial landscape

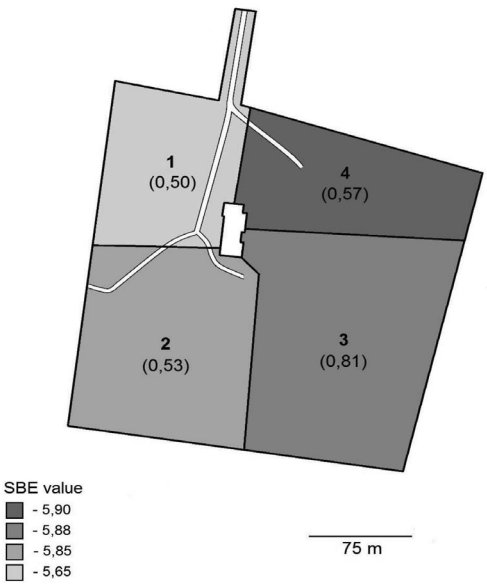

Figure 1. Location of landscape sub-areas of park Borek with marked results of scenic beauty evaluation ("SBE value") ; in parentheses are the results of dendrological indexation

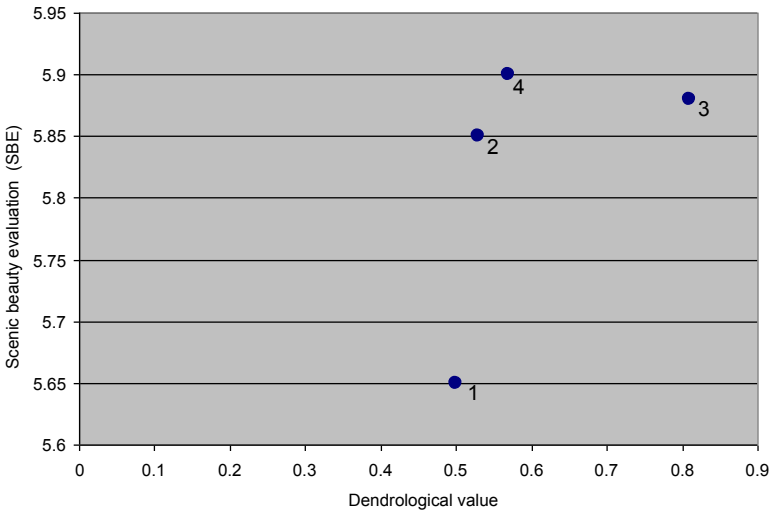

Figure 2. The relationship between results of scenic beauty evaluation (SBE) and the dendrological value of the individual landscape sub-areas of park Borek

values of the park studied, which can be translated into realisation of educational and cultural functions by the park and encouragement of passive or active leisure. Historical palaces or manors and surrounding parks are valuable components of cultural heritage of Lublin Province (Dudkiewicz, Dąbski 2013). In the present study, the result of park beauty estimation, performed based on the evaluation of park sub-units, is most likely associated with the abundance of cultural components in the landscape studied, which is visibly influenced by human activity. All over the world, unique landscapes with distinctive beauty and cognitive values were formed as a result of harmonious cooperation of humans and forces of nature (Wojciechowski 1997). Natural landscape and aesthetically suitable cultural landscape can exist as a result of appropriately selected management practices in agricultural lands (Litwin et al. 2009).

As shown by the results of the present study, the highest scores of landscape beauty were achieved by sub-units with landscape components placed by man, such as manor buildings. Ancient buildings and small architecture (little bridges, gazebos, sculptures, etc.) emphasise park character and allow for the preservation of its specific style (Borcz, Czechowicz 2002).

The results of correlation analysis indicated a weak relationship between the value of scenic beauty and the dendrological value of individual park sub-units. Hence, a considerably high dendrological value of the park is hardly associated with its aesthetic value determined using SBE. This may be due to several park trees with low real dendrological value, which were highly scored by the observers for their landscape value. Good illustration of such approach was a dying ash tree covered with ivy growing on it. The photo of the tree obtained one of the highest landscape beauty estimates, that is, 6.32 points.

6. Conclusion

The results of the study showed that the dendrological value of the park depended on the number of healthy and attractive trees with the finest growth parameters, as well as the presence of fully mature trees in the park. The relationship between the results of landscape beauty estimation and those of the dendrological value of the park indicated a weak correlation. It is, therefore, appropriate to identify the value of a given park in terms of its both dendrological value and aesthetical value. Such approach can provide a basis for the elaboration of a new complex method for valorisation of rural parks.

Conflict of interest

Authors declare no potential conflict of interest.

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References

Badora K. 2008. Stan środowiska przyrodniczego a klasyfikacja krajobrazu, w: Problemy Ekologii Krajobrazu, t. 20. Polska Asocjacja Ekologii Krajobrazu, Warszawa, 219–224.

Bajerowski T. 2007. Ocena i wycena krajobrazu. Wydawnictwo Educaterra, Olsztyn.

Borcz Z., Czechowicz M. 2002. Wybrane elementy małej architektury w parkach dworskich. *Acta Scientiarum Polonorum. Administratio Locorum* 1(1–2): 147–157.

Budnicka-Kosior J. 2010. Drzewa w koncepcji wielozadaniowego katastru parków. Praca doktorska. Wydział Leśny SGGW, Warszawa.

Daniel T.C., Boster R.S. 1976. Measuring Landscape Esthetics: The Scenic Beauty Estimation Method. Fort Collins, USDA Forest Services Research Paper RM-167.

Dmitryszyn I. 2010. Interdyscyplinarna metoda oceny krajobrazu dla celów projektowych, w: Horyzonty architektury krajobrazu. Metoda architektury krajobrazu. Wydawnictwo „Wieś Jutra", Warszawa.

Dudkiewicz M., Dąbski M. 2013. Dendroflora of manor gardens of the early twentieth century in Łęczna county. Lublin. *Acta Agrobotanica* 66(4): 129–136.

Fornal-Pieniak B., Wysocki Cz. 2010. Różnorodność gatunkowa drzew w krajobrazie rolniczym na przykładzie parków wiejskich krainy Kotlina Sandomierska. *Acta Scientiarum Polonorum, Administratio Locorum* 9(1): 29–36.

Gąsowska M., Rylke J. 2007. Atrakcyjność wizualna krajobrazu, w: Przyroda i miasto. (red. J. Rylke) t. 10, cz. 1. Wyd. SGGW, Warszawa.

Gąsowska M. 2008. The SBE and VRM methods as landscape esthetic estimation methods on example of Elbląg Canal. *Horticulture and Landscape Architecture* 29: 185–192.

Kopycińska A. 2000. Szczegółowa inwentaryzacja dendrologiczna, Zespół dworsko-parkowy w Borku koło Gardzienic, gmina Piaski, powiat Świdnik, woj. lubelskie. Biuro Projektów Urbanistyki i Architektury EM Sp. z o.o., Lublin.

Kosmala M. 2005. Po co ludziom drzewa, czyli o roli i znaczeniu drzew w życiu człowieka. Wydawnictwo SGGW, Warszawa.

Kucharska-Stasiak E. 2000. Wartość rynkowa nieruchomości. Wydawnictwo Twigger, Warszawa.

Litwin U., Bacior S., Piech I. 2009. Metodyka waloryzacji i oceny krajobrazu. *Geodezia, kartografija i aerofotoznimannija* 71: 14–25.

Majdecki L. 1980–1986. Tabela wiekowa drzew. Rkps, Oddział Architektury Krajobrazu SGGW, Warszawa.

Myga-Piątek U. 2007 Kryteria i metody oceny krajobrazu kulturowego w procesie planowania przestrzennego na tle obowiązujących procedur prawnych, w: Waloryzacja środowiska przyrodniczego w planowaniu przestrzennym (red. M. Kistowski, B. Korwel-Lejkowska), Gdańsk – Warszawa, 101–110.

Olaczek R. 1974. Ochrona parków wiejskich. Liga Ochrony Przyrody, Warszawa.

Rokosza J. 1982. Studia dendrologiczne nad waloryzacją zabytkowych parków wiejskich na Mazowszu. Rozprawa doktorska. Wydział Ogrodniczy SGGW/AR, Warszawa.

Senetra A., Cieślak I. 2004. Kartograficzne aspekty oceny i waloryzacji przestrzeni. Wydawnictwo Uniwersytetu Warmińsko Mazurskiego, Olsztyn, 44–48.

Soćko A. 1998. Zespół pałacowy w Gardzienicach. Praca seminaryjna pod kier. prof. dr hab. J. Skuratowicza. Instytut Historii Sztuki UAM, Poznań.

Solon J. 2002. Ocena różnorodności krajobrazu na podstawie analizy struktury przestrzennej roślinności. Prace geograficzne nr 185. Polska Akademia Nauk. Instytut Geografii i Przestrzennego Zagospodarowania im. Stanisława Leszczyńskiego, Warszawa, 253 s.

Szyszko J. 2004. Foundation's of Poland's cultural landscape protection – conservation policy, in: Cultural landscapes and land use (edit. M. Dieterich, J. Van der Straaten). Kluver Academic Publishers, The Netherlands, 95–110.

Szyszko J., Rylke J. 2001. Evaluation of landscape value. *Annals of Warsaw University of Life Sciences – SGGW, Horticulture and Landscape Architecture* 22: 89–100.

Świetlicki L. 1999. Dwory nad Giełczwią. Wydawnictwo Norbertinum, Lublin.

Świetlicki L. 2000. Piaski we wspomnieniach. Regionalne Stowarzyszenie Przyjaciół Piask Lubelskich, Piaski.

Świetlicki L. 2008. Historie, biogramy, legendy i notki znad Giełczwi, Radomirki, Sierotki. Starostwo Powiatowe w Świdniku, Świdnik.

Teodorowicz-Czerepińska J., Michalska G., Studziński J. 1999. Borek. Zespół dworsko-parkowy. Dokumentacja historyczno-konserwatorska. Zespół Dokumentacji Historycznej S.C. Mansarda, Lublin.

Urbańska G. 2001. Wycena zespołów parkowych. Wydawnictwo Wacetob, Warszawa.

Wojciechowski K. 1997. Harmonia krajobrazu jako cel ekorozwoju. Zastosowanie ekologii krajobrazu w ekorozwoju. Polska Asocjacja Ekologii Krajobrazu, Warszawa.

Woś A. 1995. Ekonomika zasobów naturalnych. Wydawnictwo PWN, Warszawa.

Woś A. 2010. Wycena zasobów naturalnych, w: Ocena i wycena zasobów przyrodniczych. Wydawnictwo SGGW, Warszawa.

Wycichowska B. 2008. Specyfikacja krajobrazu wizualnego i jego klasyfikacja, w: Problemy Ekologii Krajobrazu, t. 20. Polska Asocjacja Ekologii Krajobrazu, Warszawa, 257–263.

Authors' contribution

Z. K. – study conception and design, compilation and interpretation of data, statistical, preparation of study results for analyses, collection of literature; D.D. – critical review of paper content, preparation of final manuscript for publication.

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