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OCCURRENCE OF MID-FIELD PONDS IN THE AREA OF GEN. DEZYDERY CHŁAPOWSKI LANDSCAPE PARK

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Summary. Small mid-field ponds, although they play important functions in agricultural landscape, are exposed to very strong anthropogenic impact. Recently, disappearance of those important ecological sites is observed. The study was carried out in the gen. Dezydery Chłapowski Landscape Park. Inventory and ecological valorization of 68 small mid-field ponds is presented. The ecological valorization was based on: amount and inflow of water, appearance of plants in reservoirs, buffer zone, existence of fowl, and enabled the grouping of the reservoirs into four categories. It was found that only 12% of the ponds belong to the highest category – I, whereas in 15% of ponds prompt revitalization activities such as restructuring and deepening are necessary.

Key words: small mid-field ponds, inventory, ecological valorization, water retention

INTRODUCTION

Natural mid-field ponds belong to typical components of the agricultural landscape. These reservoirs, characteristic for the postglacial period, with areas of several are to 1 ha, are not very deep (to 3 m), with permanent or periodical water [Drwal and Lange 1985]. The characteristic features of mid-field ponds are their changeability and astaticity. As a result of the developing eutrophication of the water ecosystems, the natural succession in this kind of reservoirs is strongly destroyed and replaced by anthropogenic succession [Paczuska and Paczuski 1997].

In the observed high pressure of civilization on the environment, these mid-field ponds belong to those landscape elements which are exposed to very strong anthropogenic impact. During the last several tens of years a gradual decrease in number and surface areas of natural mid-field ponds is observed. As Paczuska and Paczuski [1997] noted on the southern border of Świecie Height (Bydgoszcz area), out of eighty-one field reservoirs only fifty-five remain as small ponds. Also in Krotoszyn area (Wielkopolska Region), during 20 years, out of 1130 ponds which were present in 1986 only 775 small reservoirs still exist. If the pace of changes remains on the same level, during the next 10-20 years also the remaining ponds and those field-depressions which are filled by water after heavy rainfall will disappear from the agricultural landscape [Markuszewska 2002]. The problem of gradual disappearance of the

ponds was also studied by Kaniecki [1991] who concluded that now in the Wielkopolska Lowland only 22.5% of ponds remain, as compared to the 1890s. The extent of ponds disappearance is supported by the fact that large reservoirs of surface areas above 5000 m^2 have also disappeared. The causes of this phenomenon are complex, both natural and anthropogenic. The most common reason is undoubtedly the drainage works carried out in an inappropriate way. They are based on draining the terrain, and filling up or deepening the natural leaks. Such works are conducted to increase the efficiency and surface of arable land.

The increase of degradation of small mid-field ponds in agricultural landscape indicates that active protection of these elements is necessary to help maintain the important natural, hydrological and economical function played by mid-field ponds in the agricultural landscape. One of the possibilities of stopping the degradation and disappearance of field reservoirs is to make an inventory and comprehensive ecological valorization of small mid-field ponds which are situated in agricultural landscape. This procedure enables not only the estimation of the amount of reservoirs and of the degree of their degradation, but also is suitable for presenting the direction of efficient activities which could stop disappearance of these important landscape ponds. Estimation of such elements as pond area, changes of water table, flora and fauna in ponds, shaping, coastal zone, help to protect these reservoirs and permit their use according to the purpose.

STUDY AREA

The study of mid-field ponds was carried out in 2005 year in the gen. Dezydery Chłapowski Landscape Park with the area of 17 200 ha. In this area forests constitute 2494 ha, waters 61 ha and arable lands 12 334 ha. A characteristic feature of this terrain is mosaic landscape which can be recognized as a model agricultural landscape for modern intensive farming. It ought to be emphasized that in this area environmental engineering activities such as establishing shelterbelts or a hydro-botanical sewage treatment plant are introduced [Karg 1998].

According to European Community standards, this Park belongs to three overlapping zones: an area particularly exposed to water pollution by nitrates of agricultural origin (whole Park area), an area of unfavorable farming conditions (Krzywiń district), and a priority zone (comprising Kościan and Krzywiń district). For the purposes of this paper, the Park area was divided into two parts – western (9000 ha) and eastern (8000 ha). The results presented in this paper concern the western part of the Landscape Park.

MATERIALS AND METHODS

Estimation of small mid-field ponds situated in the gen. Dezydery Chłapowski Landscape Park consists in inventorying the 68 small mid-field ponds and in their ecological valorization. Among these ponds, 9 reservoirs are now rebuilt and were not taken into account. The ecological valorization of the ponds was based on: amount and inflow of water, appearance of plants in reservoirs, buffer zone, existence of birds. This procedure allowed the reservoirs to be grouped into four categories: category I – ponds in the best condition with the presence of water level and water plants, category II – occurrence of at least group

shelterbelts, category III – presence of partly biogeochemical barrier, category IV – existence of birds, negative effect of anthropogenic processes. In the valorization the following rule was accepted: the highest pond category IV – the highest degree of degradation.

RESULTS AND DISCUSSION

Estimating mid-field ponds by taking into account water amount, occurrence of *Lemna minor* (L.) and garbage, 13 ponds were classified in category I, 14 ponds in category II, 11 ponds were typical for category III, whereas 21 ponds were numbered among category IV in which repair treatments are necessary.

In the examined Landscape Park one can observe a huge shortage of water. Because of light, easily permeable soils, storage of water supply could not be done by technical means [Kędziora and Palusiński 1998]. Therefore, particularly important are all activities which lead to increase of the water retention and small retention of water by retaining and maintaining water for the longest possible time in small mid-field ponds and/or in various field-depressions.

Table 1. Occurrence of water and of *Lemna minor* (L.) and garbage in water reservoirs
Tabela 1. Występowanie wody i rzęsy drobnej oraz odpadów stałych w zbiornikach wodnych

Factor Czynnik	Occurrence Występowanie	Number of reservoirs Liczba zbiorników
Water Woda	Permanently – Trwale	14
	Seasonally – Okresowo	21
	Lack – Brak	24
Lemna minor (L.)	Occurrence – Występowanie	25
Dumping grounds Wysypisko śmieci	Garbage Śmieci	22

Another studied parameter which was used for ecological valorization of mid-field ponds was the occurrence of water plants such as *Phragmites australis* (Cav.) and *Typha latifolia* (L.), and also the appearance of fowl (wild and domestic) and buffer zone (Tab. 2).

Table 2. Occurrence of water plants, fowl and buffer zones around water reservoirs
Tabela 2. Występowanie roślin przywodnych, ptactwa i stref buforowych wokół zbiorników wodnych

Factor Czynnik	Occurrence Występowanie	Number of reservoirs Liczba zbiorników
Plants Rośliny	Common-place reed – Trzcina pospolita	33
	Reed maces – Pałka szerokolistna	18
Fowl Ptactwo	Wild fowl – Dzikie	32
	Domestic fowl – Domowe	8
Buffer zones Strefa buforowa	Distinctly marked – Wyraźnie zaznaczona	27
	Slightly – Nieznaczna	19
Category Kategoria	I	7
	II	26
	III	17
	IV	9

Ecological value of water ponds depends on the presence of buffer zones, i.e. areas which separate reservoirs from arable lands. In the buffer zone, which is also called the

biogeochemical barrier, many physicochemical, biochemical and biological processes take place. These processes accelerate the transformation of inorganic and organic allochthonic matter and decrease nutrient flow in the direction of the pond. In the examined western part of the Landscape Park, 46% of the ponds possess distinctly marked buffer zones, in 32% of the ponds such zones exist to a slight extent, whereas 22% of the reservoirs do not have any biogeochemical barriers (Tab. 2).

Another criterion which permits ecological valorization is separation of examined reservoirs into flowing (open) and without drainage (closed) ones (Tab. 3).

Table 3. Characteristic of water reservoirs and occurrence of shelterbelts near reservoirs
Tabela 3. Charakterystyka zbiorników wodnych i występowanie zadrzewień przy zbiornikach

Factor Czynnik	Occurrence Występowanie	Number of reservoirs Liczba zbiorników
Reservoirs Zbiorniki	Open – Otwarty	26
	Closed – Zamknięty	33
Shelterbelts Zadrzewienia	Point – Punktowe	28
	Group – Grupowe	17
	Whole – Pełne	14

In the absence of water flow, reservoirs, because of small water exchange and intensive evaporation in the summer season, are more exposed to negative effect of eutrophication caused by increased content of nutrients in the water. Therefore, in the presented estimation of ponds, reservoirs without water flow are classified in the lower category.

On the basis of the presented estimation of mid-field ponds, taking into account all the above mentioned parameters, it was noted that only 12% of the reservoirs belong to category I, 29% of the ponds meet the requirements of category II, 44% of the ponds fall in category III, and 15% of the ponds require prompt revitalization activities such as restructuring and deepening (Fig. 1).

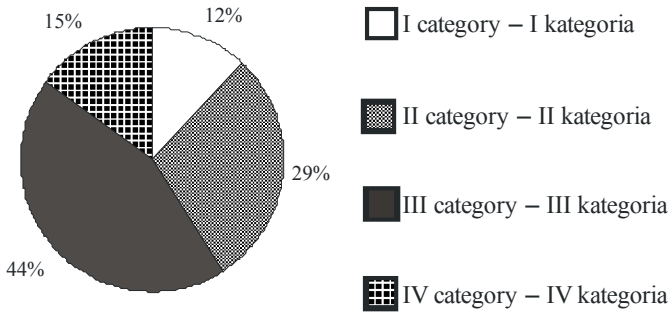

Fig.1. Categories of mid-field ponds deterioration
Rys. 1. Kategorie degradacji zbiorników śródpolnych

The presented simplified valorization of mid-field ponds, after taking into account detailed faunistic and floristic studies, can be useful not only for active protection of water ponds, but can also be important for their classification as ecological sites. Such activities are necessary because, as follows from studies by Juszczak [2001], who examined anthropopressure and potential threats to small ponds situated on the western part of Wyskoć channel catchment flowing through the studied Landscape Park, in as much

as 65% of ponds such threats as drainage works, sewage discharge, rubbish dump, cutting down the trees or fishing were observed.

Mid-field ponds in agricultural landscape, existing as ecological units, besides protection by law can be protected by using them as an efficient recipient of drainage water. As shown by studies by Koc and Cymes [2004], the inclusion of mid-field ponds into drainage network provided permanent water table even in dry periods and improved their retention ability. The retention ability of mid-field ponds is strongly affected by their morphometric parameters and meteorological conditions. Juszczak [2001] indicated that increase in the water level in ponds leads to an increase of ponds and groundwater retention of adjoining areas more than four times than in present retention of ponds. On the other hand, because of the possibilities of enhancing eutrophication processes in the ponds by the flow of huge amounts of nutrients with drainage water, it is recommended that retention of water in mid-field ponds should be provided in units with low ecological values such as overgrown, dried reservoirs exposed to very strong anthropogenic impact.

CONCLUSION

Multi-functionality of mid-field ponds, particularly precious in the monotonous and simple structure of agricultural landscape, ought to be taken into consideration. Because of long-lasting threat, the inventory and ecological valorization of mid-field ponds can be useful in taking protective activities towards these reservoirs as an important link of water cycling in the catchments.

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WYSTĘPOWANIE MAŁYCH OCZEK ŚRÓDPOLNYCH NA TERENIE PARKU KRAJOBRAZOWEGO IM. GEN. DEZYDEREGO CHŁAPOWSKIEGO

Streszczenie. Pomimo że małe oczka śródpolne pełnią istotne funkcje w krajobrazie rolniczym, są one narażone na silne oddziaływania antropogeniczne. Zwłaszcza ostatnio obserwuje się zanikanie tych ważnych użytków ekologicznych. Przedstawione badania prowadzone były na terenie Parku Krajobrazowego im. gen. Dezyderego Chłapowskiego. Inwentaryzacją i ekologiczną waloryzacją objęto 68 małych zbiorników śródpolnych. Ekologiczna waloryzacja oparta była na: ilości i przepływie wody, obecności roślin w zbiorniku i strefy buforowej, obecności ptactwa. Stwierdzono, że jedynie 12% oczek należy do najwyższej I kategorii, podczas gdy w 15% zbiornikach należy podjąć szybkie działania rewitalizacyjne, takie jak zmiana struktury czy pogłębienie zbiornika.

Słowa kluczowe: małe zbiorniki śródpolne, inwentaryzacja, ekologiczna waloryzacja, retencja wodna