ECOLOGICAL VALORIZATION OF SMALL WATER RESERVOIRS IN POLAND
THE WYSKOĆ CATCHMENT AREA CASE STUDY

RADOSŁAW JUSZCZAK

DEPARTMENT OF AGROMETEOROLOGY

Faculty of Land Reclamation and Environmental Engineering

AUGUST CIESZKOWSKI AGRICULTURAL UNIVERSITY OF POZNAŃ IN POLAND

Witosa 45, 60-667 Poznań, Poland, e-mail: radjusz@wp.pl

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The method of ecological evaluation of small water reservoirs in an agricultural landscape was the main result of our study. It was worked out experimentally with cooperation of many scientists of natural field of study. Although the method was used only to evaluate the ecological value of ponds in Wyskoć catchment area, there is not any restriction to use it to estimate the value of ponds in the whole central Poland.

INTRODUCTION

Small water reservoirs are essential elements of an agricultural landscape, typical for post-glacial areas. From natural, hydrological and economic point of view they play many important functions. On the over hand, considerable decrease both numbers and surface of the water bodies can be observed in a few last dozen. Therefore, we ought to undertake activities that could be conducive to protection and natural reconstruction of ponds in our environment. Inventory control and ecological valorization of ponds in an agricultural landscape are one step to reach that goals.

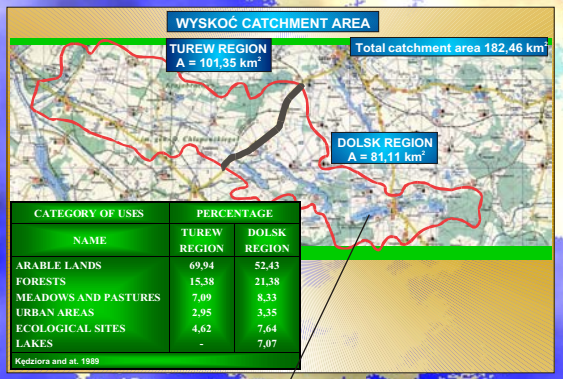
AIM AND RANGE OF WORK

- Work out the inventory and valorization methods of small water bodies in an agricultural landscape,
- Ecological valorization of small ponds in the Wyskoć catchment area,
- Define the possible ways of protection and reconstruction of small water bodies in an agricultural landscape.

HYPOTHESES

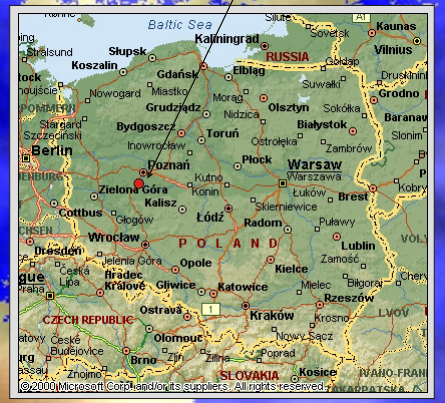
- Firstly, we assume that in spite of a strong antropogenic pressure put on ponds in an agricultural landscape many water reservoirs have still high ecological and landscape values.The water bodies should be protected e.g. as ecological sites.
- Secondly, there is an assumption that the number and ecological value of water reservoirs depends on the structure of the use of an agricultural grounds. That is, the more arable lands and urban areas the fewer ponds and the lower ecological value.

WYSKOĆ CATCHMENT AREA

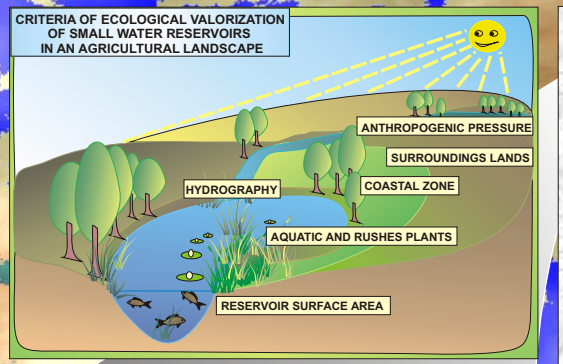


CATEGORY OF USES	PERCENTAGE	
NAME	TUREW REGION	DOLSK REGION
ARABLE LANDS	69,94	52,43
FORESTS	15,38	21,38
MEADOWS AND PASTURES	7,09	8,33
URBAN AREAS	2,95	3,35
ECOLOGICAL SITES	4,62	7,64
LAKES	-	7,07

Kędziora and at. 1989



CRITERIA OF ECOLOGICAL VALORIZATION OF SMALL WATER RESERVOIRS IN AN AGRICULTURAL LANDSCAPE



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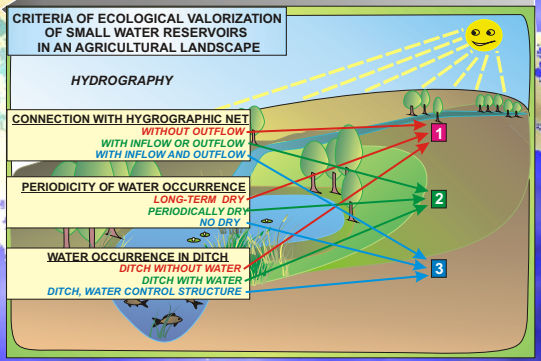


	CRITERIA OF ECOLOGICAL VALORIZATION		SUBCLASSES OF VALORIZATION	EVALUATION
1	Surface of water reservoir (ha)		< 0,02 0,02 – 0,11 > 0,11	1 2 3
2	Hydrography			
	A	Periodicity of water occurrence	Long-term dry (lack of water in summer) Periodically dry (depth of water in ponds < 0,2 m in summer) No dry (depth of water in ponds > 0,2 m in summer)	1 2 3
	B	Connection with hydrographic net	Without outflow With inflow or outflow With inflow and outflow	1 2 3
	C	Water occurrence in ditch	Ditch without water Ditch with water Ditch, water control structures occur	1 2 3
3	Vegetation in reservoir			
	A	Vegetation zones	Lack Occur	0 2
	B	Indicatory assemblages	Lemnaceae Ceratophyllum Potamogeton Chara	1 2 3 4
	C	Species of water reservoir vegetation	Poor (< 3 species) Semi-poor (3-5 species) Rich (> 5 species)	1 2 3
	D	Species of bulrush vegetation of water reservoir	Rich (< 5 species) Semi-rich (5-10 species) Rich (> 10 species)	1 2 3
4	Ecotone			
	A	Occurrence and mean width of ecotone	Lack < 10 > 10	0 1 2
	B	Ecotone length in % of reservoir circumference	< 30 30 – 60 > 60	1 2 3
	C	Types of ecotone	Plane of no-use areas Trees and shrubs Swamps	P 1 2 3
5	Adjoining uses		Buildings, roads, landfill site Arable lands and pasturage Meadows and forests Ecological sites*	1 2 3 4
6	Class of anthropogenic pressure		I class (lack of negative influence). II class (border on country roads, arable lands, or farm buildings). III class (cattle pasturage, areas unfavorable for ecol. values, fish farmings). IV class (Ill-executes drainage, sewage drops, waste storage, border on landfill sites).	

$$O\,[(P_1 \times U\%)+\ldots+(P_3 \times U\%)]/100$$

P – evaluation of each kind of transition zones
U% - % participation of each kind of ecotone occur on ponds circumference

$$O\,[(P_0 \times U\%)+\ldots+(P_3 \times U\%)]/100$$

P – evaluation of each kind of adjoining areas
U% - % participation of each kind of uses occur on ponds circumference

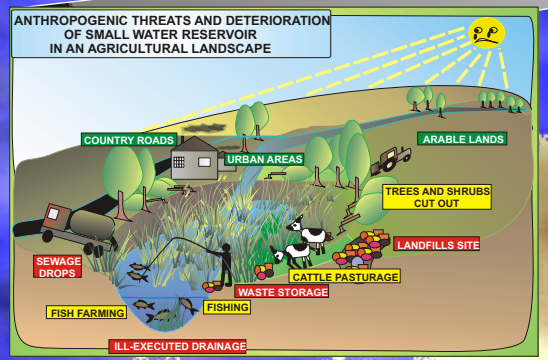
$$[\ \text{P}_i(1,2,3,4,5)/5] + 2$$

$$[\ \text{P}_i(1,2,3,4,5)/5]$$

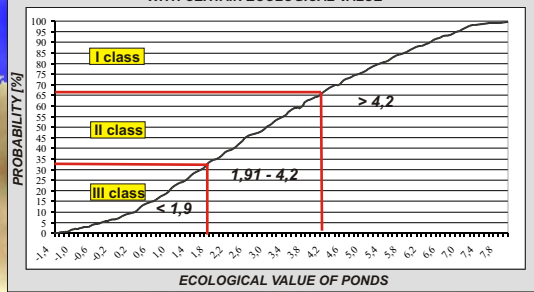
$$[\ \text{P}_i(1,2,3,4,5)/5] - 1$$

$$[\ \text{P}_i(1,2,3,4,5)/5] - 2$$

ANTHROPOGENIC THREATS AND DETERIORATION OF SMALL WATER RESERVOIR IN AN AGRICULTURAL LANDSCAPE



PROBABILITY OF SMALL WATER RESERVOIR OCCURRENCE WITH CERTAIN ECOLOGICAL VALUE



RESULTS

TUREW REGION

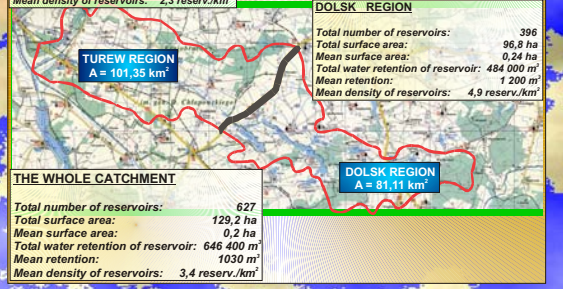
Total number of reservoirs:	231
Total surface area:	32,44 ha
Mean surface area:	0,14 ha
Total water retention of reservoir:	162 200 m³
Mean retention:	700 m³
Mean density of reservoirs:	2,3 reserv./km²

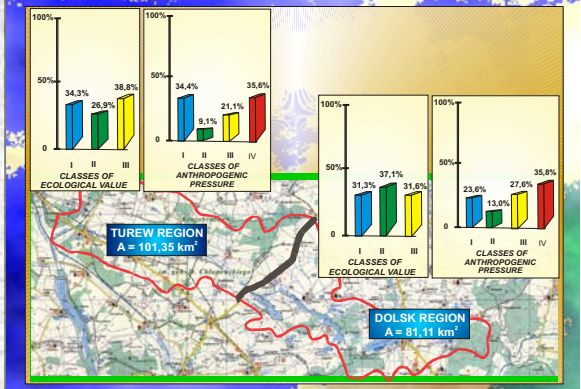
DOLSK REGION

Total number of reservoirs:	396
Total surface area:	96,8 ha
Mean surface area:	0,24 ha
Total water retention of reservoir:	484 000 m³
Mean retention:	1 200 m³
Mean density of reservoirs:	4,9 reserv./km²

THE WHOLE CATCHMENT

Total number of reservoirs:	627
Total surface area:	129,2 ha
Mean surface area:	0,2 ha
Total water retention of reservoir:	646 400 m³
Mean retention:	1030 m³
Mean density of reservoirs:	3,4 reserv./km²





CONCLUSIONS

- In spite of the fact that small water reservoirs located on the Wyskoć catchment are under strong anthropogenic pressure (about 60% of ponds was rated among the third and fourth class of anthropopressure), the large quantity of ponds have still a high ecological value.
- The number of water reservoirs depends on the structure of a land use. The more arable lands and fewer forests as well as urban areas the fewer ponds in an agricultural landscape. There is not any connection with structure of a land use and ecoogical value of water bodies as well as anthropogenic pressure.
- Protection of small water reservoirs in an agricultural landscape should be achieved:
  - firstly, by legal protection as ecological sites,
  - secondly, by extension and protection of coastal zones that play biogeochemical barriers function,
  - thirdly, by direct reclamation of degraded reservoirs,
  - lastly, by an ecological education of catchment inhabitants.