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Discrepancies in legal classifications as a hindrance to implementing water policy, on the example of Lake Wysokie

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Abstract. This article deals with the difficulties that arise at the intersection of three areas: the application of law, the need to ensure water environment sustainability, and the need to take into account social interest. The reason behind such a situation is the imprecise lake classification criteria adopted in Polish law. The legal division of lakes has an artificial character and reflects the Polish water management policy, according to which every lake is classified as stagnant or flowing water. This study aims to determine the hydrological type of Lake Wysokie and its legal status, in order to allow proper application of water policy. The methodology included, among others: field hydrological investigations, geodetic measurements, calculation of evaporation and study of historical cartographic documentation. According to the research results, all the features of the lake and its catchment area clearly indicate the standing nature of the waters.

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Contents:

1. Introduction

Pursuant to the Polish Water Act of 1922 (Journal of Laws 1922, No. 102, item 936), the water in lakes is the property of the landowner in accordance with the *superficies solo cedit* principle. Despite the possible classification of the lake as flowing water, each lake could be subject to a private property title. Such a possibility changed in the Polish People's Republic period. At that time Poland was a socialist country and for this reason the law in force was based on socialist principles. In 1962 the Water Law statute (Journal of Laws 1962, No. 34, item 158) was adopted. This act, following the postulate of the nationalisation of property, introduced the rule according to which only lakes classified as stagnant water were allowed to constitute private property. As a result of the lake division criteria adopted in 1962, the number of privately owned lakes was significantly reduced. Moreover, these criteria were ambiguous and, causing interpretation doubts, resulted in difficulties in the process of applying the law (Kubiak-Wójcicka and Marszelewski, 2012). The legal classification of lakes initiated by the act of 1962 and division-related difficulties – despite the adoption of subsequent acts (the Water Law of 1974, 2001 and 2017) – continue until the present day.

Polish law classifies lakes as either flowing or standing waters. A lake is considered to be flowing water when it has a natural inflow or outflow that is either continuous or periodic. In the absence of natural inflow or outflows, the lake is classified as "standing water". This is an artificial distinction that derives from the state's water management policy. Lakes classified as flowing waters (and the land they cover) are not covered by civil law. As a result, they are the property of the State Treasury, and other entities (including natural persons) are not permitted to own such lakes.

The existing distinction in legal regulations does not map to the specifics of lakes, nor to their role in the hydrographic network. This results in discrepancies and uncertainties with regard to the status of individual lakes (as flowing or standing water). Moreover, these uncertainties are increased when there are inaccuracies (or even errors) in the land and mortgage register, or in geodetic and cartographic documentation (Kubiak-Wójcicka and Marszelewski, 2012; Marszelewski and Marszelewski, 2013; 2014a).

This situation is exemplified by Lake Wysokie in north-eastern Poland. The real-estate constituting this lake is described in the land register as "land under standing surface waters" (Poviat Office in Gołdap, 2019), but in the land and mortgage register as undeveloped property constituting "land under flowing surface waters" (Land and mortgage register, 2019). Land and mortgage registers – which are open, public real-estate registers – are kept in order to establish the legal status of real estate (articles 1 and 2 of the Act of 6 July 1982 on land and mortgage registers, consolidated text Journal of Laws 2019, item 2204). Hence, it is particularly important that the information contained therein should concord with the actual state of affairs. In the case of Lake Wysokie, the discrepancy neither legally nor substantively affects ownership, which is shown in land and mortgage registers. However, no such discrepancy should exist. The classification of the lake should be unambiguous and beyond doubt. For this reason, this study aims to determine the hydrological type of the lake and its legal status, in order to allow the water policy to be properly applied.

Due to the fact that the discussed problem is caused by Polish legal regulations, it is unique on the international field. Therefore, it is hard to indicate similar studies. Each country has its own legislation concerning lake ownership as part of its internal water policy and there is no uniform concept. In consequence, case studies like this paper can be conducted in other countries but will be based upon the different legislation adopted in particular countries (water law, property law or environmental law).

2. Research area and methods

Lake Wysokie is in north-eastern Poland, close to the limit of the Pomeranian Phase of the Vistulian glaciation (Fig. 1). It occupies a deep depression in a subglacial channel. The lake's western shore is bordered by the subglacial channel's edge, and the northern and eastern shore are surrounded by an extensive kame. A little further away, but still within the subglacial channel, there are an esker, a frag-

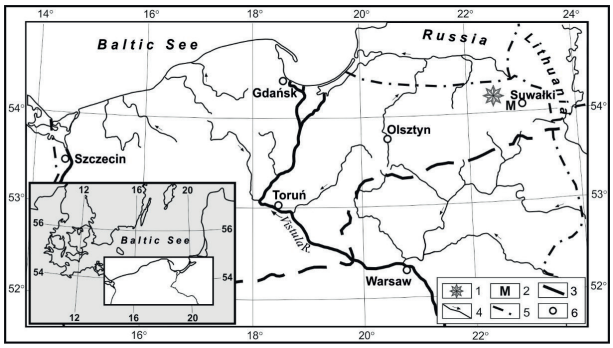

Fig. 1. Location of Lake Wysokie in Southern Baltic Region and Northern Poland. Explanations: 1 – Lake Wysokie; 2 – meteorological station in Suwałki; 3 – maximum extent of Vistulian glaciation; 4 – rivers; 5 – country borders; 6 – towns

ment of outwash, numerous steps and depressions, and other lakes. On either side of the subglacial channel there extends an undulating moraine plateau featuring numerous glacial forms (Krzywicki, 1990). The area is highly diversified in terms of relative heights, which exceed 30 m within 300–400 m stretches (Fig. 2).

Lake Wysokie's origins are related to the oscillation of the ice sheet edge during the last ice age. The Vistulian glaciation was characterised by high-speed movement, which resulted in the ice front fragmenting into lobes and tongues (Ber, 2000). The relief of the area around the lake was influenced by the Rospuda Lobe, which separated from the Masurian Stream. Powerful glacitectonic movements shaped the relief around Lake Wysokie and neighbouring lakes (Marks, 2005). Lake Wysokie's basin was created after dead ice melted in a deep depression. The present-day Lake Wysokie lies at 186.2 m a.s.l. (measured in July 2019) and has an area of 16.5 ha according to the land register. According to bathymetric studies, the lake area is smaller (14.26 ha). The maximum depth of the lake is 31.1 m, and its drainage basin is of only 0.33 km^2 (Table 1). Hydrographically, Lake Wysokie is in the upper part of the Netta River catchment. This river flows from Lake Niskie (178 m a.s.l.), which is in the immediate vicinity of Lake Wysokie.

The analysed lake is located in the transitional zone of the temperate climate (between maritime and continental climates), approximately 30 km from the meteorological station in Suwałki. Mean annual (1961–2020) air temperature in this area was

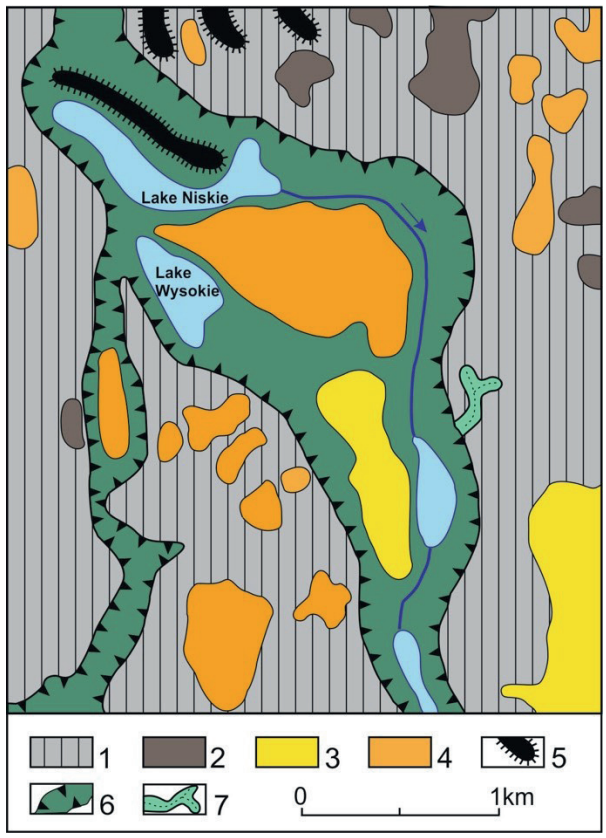

Fig. 2. Geomorphological sketch of Lake Wysokie area. Based on 1:50,000 Geological Map of Poland, Żytkiejmy sheet (Krzywicki, 1987). Explanations: 1 – undulating moraine plateau; 2 – moraine hill; 3 – outwash; 4 – kame; 5 – esker; 6 – subglacial channel; 7 – erosional side valley (after Krzywicki, 1990, slightly modified)

the lowest in Poland and amounted to 6.6 °C. The lowest mean annual temperature (4.3 °C) occurred in 1987 and the highest (8.9 °C) in 2020 (according to the Institute of Meteorology and Water Management – National Research Institute in Warsaw). Similarly, as at other sites in Poland (Marszelewski and Pius, 2016), an evident, statistically significant, positive trend of air temperature was recorded, averaging 0.36 °C·10 years^{-1}. Mean annual precipitation amounted to 595 mm without any significant trends in 1961–2020.

Field studies were conducted in July 2019. They aimed to establish the hydrological type of the lakes. Determining a lake's type as endorheic would classify it as standing water according to the Polish Water Law. Otherwise, it would be classified as flowing water. The study included hydrographic mapping, water level measurements in Lake Wysokie and the neighbouring Lake Niskie, and observations and

Table 1. Basic morphometric data of Lake Wysokie (Konecki, 1996). Explanations: S – surface area; L_{max} – maximum length; W_{max} – maximum width; Lc – length of coastline; D_{max} – maximum depth; D_{mean} – mean depth; V – volume.

Coordinates	S (ha)	L_{max} (m)	W_{max} (m)	Lc (m)	D_{max} (m)	D_{mean} (m)	V ($m^3 \times 10^6$)
54°25'N 22°50'E	14.26	700	320	1770	31.1	11.9	1.71

measurements of all landforms that might facilitate the final classification of Lake Wysokie according to the Polish Water Law act of 2017. Geodetic measurements of a gorge between Lake Wysokie and Lake Niskie were also performed.

The amount of vertical water exchange was assessed based on the results of research on water evaporation from the surface of Lake Rajgrodzkie, approximately 53 km from Lake Wysokie. These results covered the summer months (May–Oct) from 2013 to 2019. Evaporation from the water surface was measured using a floating evapometer and converted into actual evaporation according to the equation:

$$E = 0{,}8 \; E^* \frac{e_0 - e_2}{e_0^* - e_2}$$

where: E* – instrument coefficient of GGI-3000 evapometer; eo – vapour pressure determined on the basis of lake water temperature; e* – vapour pressure determined based on water temperature in the evapometer; e2 – vapour pressure at an altitude of 2 m above water level. Evaporation for the cold half-year (Nov–Apr), during which no measurements were conducted from the water surface, was calculated using the Penman–Monteith method (Penman, 1948; Monteith, 1973; Howell and Evett, 2004).

In order to properly classify Lake Wysokie, information from geodetic and cartographic documentation was essential, including the following maps:

- the 1:100,000 Reichsamt fur Landesaufnahme Map, Mehlkehmen sheet, 1893 (https://www.davidrumsey.com/luna/servlet/view/all/who/Reichsamt%2Bfur%2BLandesaufnahme/where/Germany?sort=pub_list_no_initialsort%2Cpub_date%2Cpub_list_no%2Cseries_no),
- the 1:25,000 Topographische Karte Map (Meßtischblatt), sheet 17101 – Dubeningen, 1938, (http://igrek.amzp.pl/details.php?id=7557),
- the 1:50,000 map of the General Staff of the Polish Armed Forces from 1951, Przerośl sheet,
- the 1:25,000 map of the Gołdap district from 1965, sheet 5,
- the 1:10,000 topographic map from 1993, Dubeninka sheet.

3. Results

Lake Wysokie has a small catchment area of 0.33km^2. The land management is dominated by meadows and pastures. The eastern shores of the lake are covered by mixed forest with a predominance of alder, and the western shores by coniferous forest with alders. Both shores are steep. In many places, the slopes exceed 40%. The west bank rises to about 15 m above the water surface, and the east bank to about 14 m. The southern shore is flat, and used for recreation. The northern shore is slightly lower. It rises to about 3–5 m above water level along the watershed between Lakes Wysokie and Niskie. Here, there is a deep gorge, suggesting the flow of water from Lake Wysokie to Lake Niskie. The edges of the gorge are high and usually rise about 4–6 m above its bottom (Fig.3).

At the bottom of the gorge, 90 m from the shore of Lake Niskie, there is a small spring with a capacity of <1 $dm^3 \cdot s^{-1}$. The water from the spring flows to Lake Niskie. This means that the inflow of water to Lake Niskie comes from the spring, and not directly from Lake Wysokie. Were this not the case, the erosion caused by the outflow of water from Lake Wysokie would deepen the gorge and stabilise the flow between the two lakes. The level of the

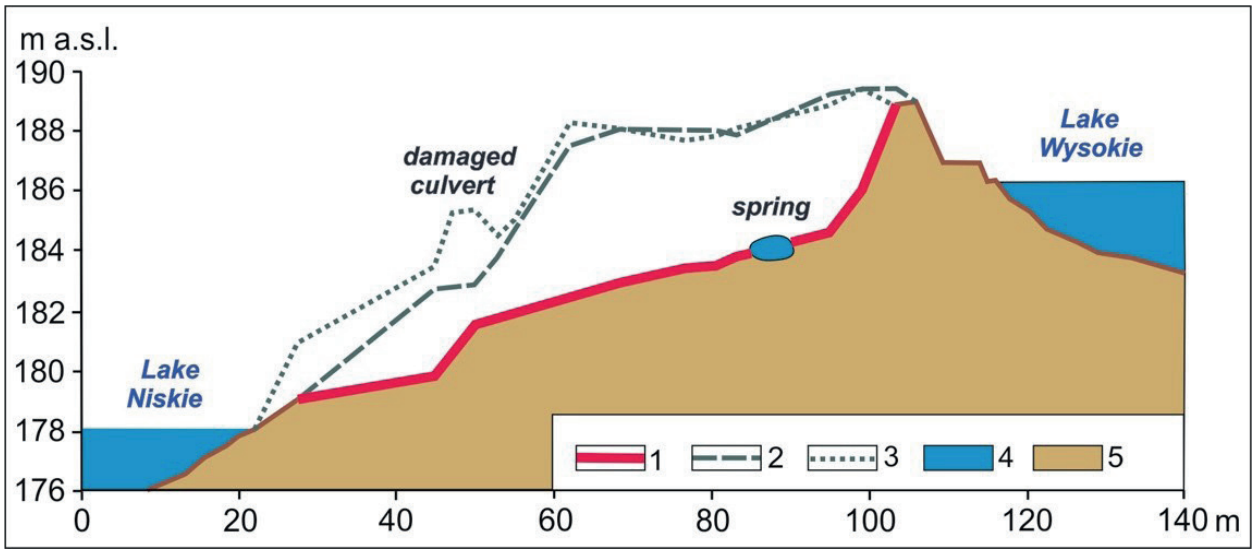

Fig. 3. Longitudinal profile of gorge and its edges. Explanations: 1 – gorge bottom; 2 – right edge of gorge; 3 – left edge of gorge; 4 – lakes; 5 – kame embankment between lakes

lakes would be equalised, and the slope of the watercourse would be approx. 0.2‰, not 84.2‰ as it is now (Fig. 3).

As results from the authors' previous research, the supply of watercourses and lakes in young glacial zones is complicated, and largely dominated by groundwater. This is especially true of deep lakes, which can be fed by several aquifers. Such studies have been conducted on, for example, Lake Rospuda in the same catchment area of the Netta River (Dąbrowski, 2013). As with the nearby Rospuda lake, the analysed lake is a typical example of the dominance of underground supply over surface supply. With a very small direct catchment area (0.33 km2), the water level in the lake could not be kept relatively constant, because of the negative balance of the vertical water exchange. This negative balance is confirmed by direct measurements of the amount of evaporation from the surface of Lake Rajgrodzkie (Fig. 4). In 2013–19, the annual sum of evaporation from water in the research area far exceeded the sum of precipitation, except in 2017. The biggest difference (378 mm) occurred in 2018. In 2013–19, the total loss of water from the lake due to evaporation exceeded the total sum of precipitation by 1,345 mm. With such a significant excess of evaporation and a small catchment area, it appears obvious that the relatively constant water level in the lake depends on underground supply.

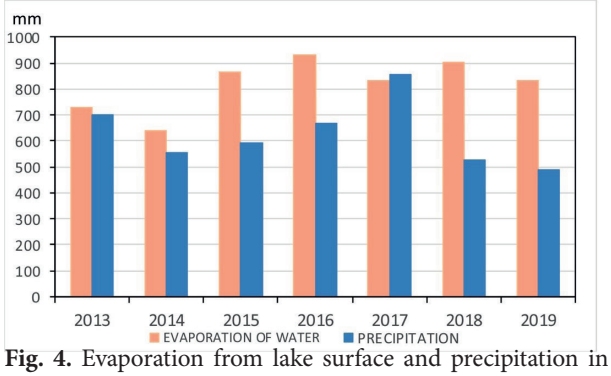

Fig. 4. Evaporation from lake surface and precipitation in 2013–2019.
Based on data from Institute of Meteorology and Water Management - National Research Institute in Warsaw

In deep lakes, the location of a first aquifer, and sometimes a second, directly affects the water level. The amount of groundwater inflow to the lake depends mainly on meteorological conditions. An aquifer's response to these conditions is delayed. The response time depends on many factors and ranges from several months to several dozen years or even longer. In the second decade of the 21st century, the water table fell in this part of Europe. This has resulted in, among other things, a decrease in groundwater supply. This manifests as, among other things, the low capacity of the spring at the bottom of the analysed gorge. The last time groundwater supply to lakes increased (and thus the water table was high) was at the turn of the 1980s (Dąbrowski, 2019). As a result of favourable meteorological conditions, most lakes reached maximum water levels in the years 1979–82 (Dąbrowski, 2002). It is cer-

tain that in those years the spring in the gorge had a far greater capacity, and the stream flowing from it eroded the gorge and fed Lake Niskie. In the 21st century, increasingly frequent droughts and increased evaporation caused groundwater resources to drop and the spring to almost disappear. The much higher capacity of the spring around 40 years ago (and earlier) is confirmed by its vast hollow. It lies at 183.5 m a.s.l., i.e. about 2.7 m below the level of Lake Wysokie and about 5 m below the edge of the gorge. The stream flowing from the spring towards Lake Niskie in those years was considered to be a stream connecting the two lakes. Based on this, it was then assumed that a watercourse flowed

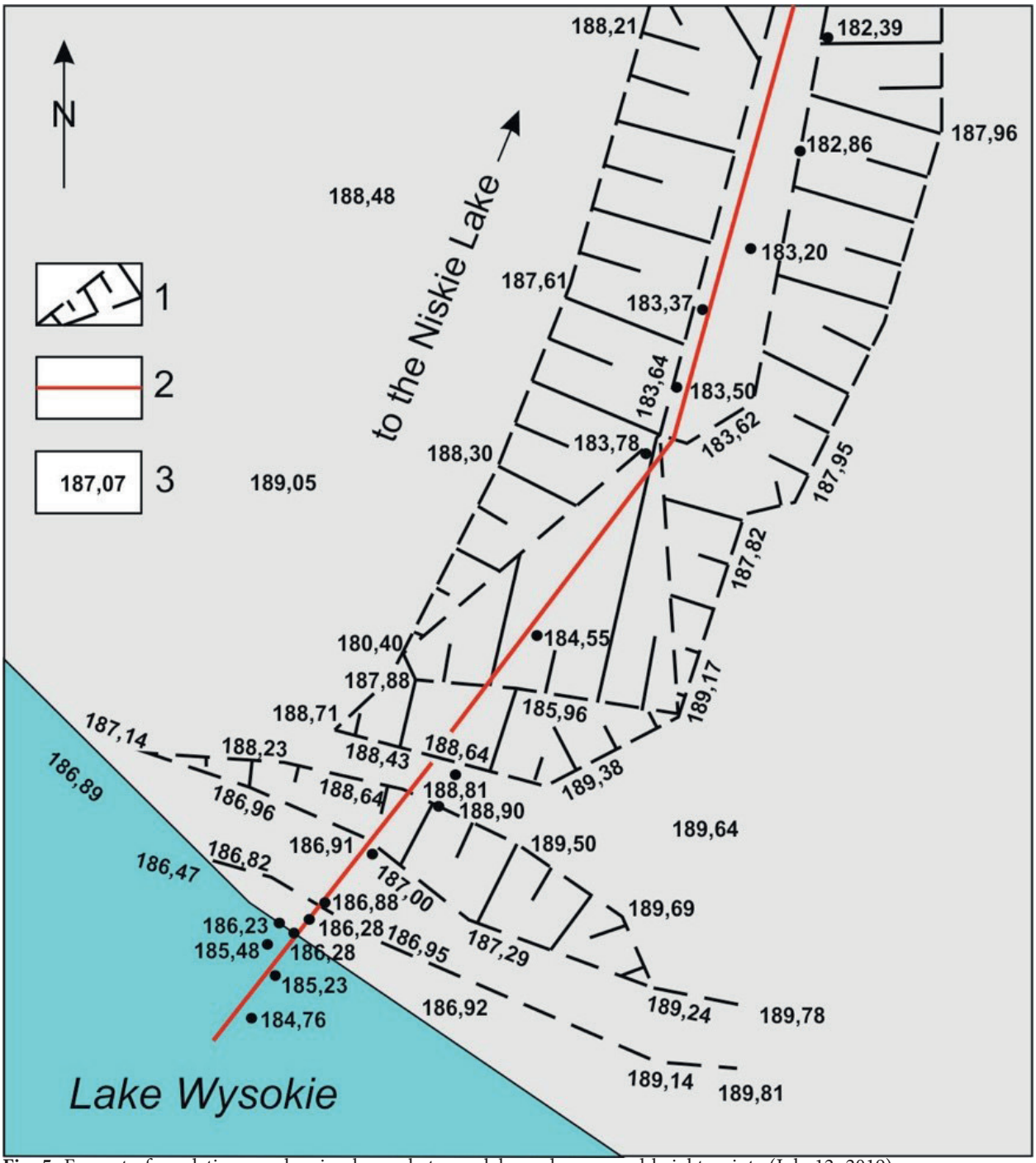

Fig. 5. Excerpt of geodetic map showing hump between lake and gorge and height points (July 12, 2019).
Explanations: 1 – edge and slope; 2 – longitudinal profile line as in Fig. 3; 4 – height points in m a.s.l. Source: GEOPLAN (Geodetic and Cartographic Services in Gołdap)

Photo 1. Destroyed culvert on dirt road between Lake Niskie and Lake Wysokie. Foreground: scattered concrete culvert rings (July 2019).

from Lake Wysokie into Lake Niskie, and the lake was thus classified as flowing water.

Analysis of topographic maps from the early 20th century and modern ones has shown that none of them indicates a watercourse flowing in the gorge. This may mean that when the area was being mapped the stream from the spring was not functioning. At the same time, each map indicates a gorge that does not begin at the shores of Lake Wysokie. Between the lake and the gorge there is a hump of over 2.5 m high. This situation is presented in detail on the geodetic map. On the day of measurement, the water level in the lake was 186.24 m a.s.l., and the height of the edge constituting the beginning of the gorge was 2.57 m higher and about 60 m away from the lake shore (Fig. 5). This situation is also visible on the longitudinal profile of the gorge (see Fig. 3). Furthermore, the geodetic map documents in detail that the shore slopes towards Lake Wysokie, then there is a narrow step about 2.5 m higher, and only then does the slope break northwards towards Lake Niskie.

The oldest maps also do not mark a culvert on the road crossing the gorge. This means that due to the small amount of water flowing from the source, as well as the low category of road and the low traffic on it, it was not necessary to build one. A culvert was only built at the turn of the 1980s and so is only marked on the latest topographic map, from 1993. Currently, the culvert is utterly destroyed (Photo 1). The extent of the damage attests to a violent cause. It was established that the culvert was washed away in the 1980s during an attempt to lower the water level in Lake Wysokie. This attempt was made without permission and, moreover, by an entity not authorised to perform such tasks. As a result of an improperly executed ditch connecting Lake Wysokie to the gorge, a rapid flow was created that completely destroyed the culvert, including concrete rings of 90 cm diameter.

This reduced the water level in the lake by over 1 m, and after the ditch was filled in, the process of rebuilding the lake's water resources took place over several years.

4. Discussion

The results of the research are entirely sufficient to conduct a legal classification of Lake Wysokie. The fact that a gorge exists is irrelevant from the legal point of view. What is required is to establish how the lake is connected to the hydrographic

network through natural watercourses or through canals. A canal, in accordance with Art. 16 point 21 of the Water Law of 2017, is an artificial channel that carries water continuously or periodically, with a bottom of at least 1.5 m wide at its mouth or intake. Such a normative definition excludes any "layman's" attempts to identify the gorge as a canal. However, the issue of the watercourse remains to be decided. The documented small, periodic inflow of water from the spring to the lake below (Lake Niskie) means that Lake Niskie must be classified as a flowing water body.

In the case of the lake in question – Lake Wysokie – however, the lack of a natural connection with a natural watercourse or canal determines its classification as standing water. In fact, Lake Wysokie depends entirely on precipitation and underground supply. Said classification is not changed by the fact that the Water Law of 2017 includes, among flowing waters, "springs from which [...] watercourses originate" (Article 22 point 1). Lake Wysokie – as mentioned – is supplied directly by precipitation and groundwater. The groundwater supply derives from layers directly below the body of the lake, and not from beyond such range (as in the case of other lakes connected to the surface water network). As a consequence, no situation arises in which a natural connection exists between the waters of Lake Wysokie and flowing surface waters. In this case, the requirement that there be no direct and natural connection with inland flowing surface waters is met (Articles 22 and 23 of the Water Law of 2017, consolidated text, Journal of Laws 2020, item 310). There are no further elements to be assessed from a legal point of view.

The legal classification of a lake should be unambiguous and beyond doubt. This is especially important because of, among other things, the need to apply normative regulations to flowing waters in terms of determining shorelines (Marszelewski and Marszelewski, 2014b) or the admissibility of transferring ownership of real estate that is a lake. The absence of doubt in lake classification is particularly important from the point of view of water policy. The difficulties that arose in relation to Lake Wysokie hinder its proper implementation and, moreover, may pose a threat to the lake in the near future. This conclusion is of particular importance because Lake Wysokie, since it covers less than 50 ha, was not included in monitoring studies under the river basin management plan. The requirement to develop such plans is related to the European Union Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy).

Currently, Lake Wysokie is owned by the State Treasury. In accordance with the applicable regulations, it was given over to fishing purposes by a permit for use as a fishery district (Article 6d (1) of the Act of 18 April 1985 on inland fishing, consolidated text, Journal of Laws 2019, item 2168). Such rendition is made by legal contract (i.e. through a civil law transaction) for a specified period of not less than 10 years. Pursuant to Article 6d paragraphs 2 and 4 of the above Act, the parties to the contract are the director of the Regional Water Management Authority of the National Water Management Polish Waters [*Gospodarstwo Krajowe Wodne Polskie Wody*] and an entity selected by tender – e.g. a natural person, an entrepreneur, or the Polish Angling Association. In the case of Lake Wysokie, this entity is a natural person. By giving the lake over to fishing via a permit for use as a fishing district, this person became entitled to run a fishery (i.e. breeding, farming or catching fish). Regardless of the use agreement, Lake Wysokie is still public property and is therefore covered by the right of universal use of its waters. Such use is aimed at, among other things, meeting the needs of private recreation or tourism (Article 32 of the Water Law of 2017).

In such a situation, complications arise in the event of the intention that Lake Wysokie be purchased by private entities. The argument raised by such entities is the fact that the lake in question can, as standing water, feature without obstacle in civil law transactions. This argument was based on an entry in the land register kept by the Poviat Office in Gołdap, in which the lake is classified as standing water. From the economic point of view, the Poviat Office is interested in selling the lake, especially since the area it administers is one of the poorest in Poland. However, no decision can be made until the formal discrepancies in the classification of the lake are resolved. Polish Minister of Marine Economy and Inland Navigation, as a competent authority and after conducting the proceedings, in July 2020 issued the decision in which Lake Wysokie was clas-

sified as a body of inland standing water. This decision, however, is still not final and a motion for reconsideration of the case has been submitted by an interested party. Conducting reasonable water policy, also with a view to global warming, is necessary in almost every country (e.g. McCulloch 2009; Paerregaard, 2019). However, it is important to conduct such a policy without additional complications such as occurred in the case of Lake Wysokie.

Due to the indicated formal and legal discrepancies, settling the legal status of the lake requires appropriate actions and goodwill. This is not changed by the fact that all the features of the lake and its catchment area clearly indicate the standing nature of the waters. A change in legal classification of a lake needs to be disclosed (i.e. the lake needs to be recognised as standing water) in the land and mortgage register. These books are a public register serving the purposes of record-keeping and registration, and contain information on the legal status of real estate. Regardless of the change being made in the land and mortgage register, the lake will still be in use as a fishery district. The concluded agreement is valid for over ten more years. Any termination will probably result in the current user claiming for compensation. Hence, the other party to the contract may not be interested in early termination. At the same time, the user, being aware of the possibility of losing the right to use the waters for fishing, will not necessarily be interested in managing the fishery in all the ways appropriate to protecting the lake ecosystem. This may significantly worsen the ecological condition of the lake.

Polish water policy in the fields of lakes ownership and classification – as seems – is more complicated than in other jurisdictions For example, in the state of New York (United States of America) the division is based upon the size of lake. In case of small lakes, the title to lake beds is allowed to constitute private property. However, title to large lakes is generally granted to the state of New York. Another example is the state of Minnesota, in which three legal categories of lake can occur. First is "navigable lakes" (particularly large lakes important in terms of transport or travel on water); second – "meandered lakes" (all lakes with an area of 50 acres or more, whose lake bed is jointly owned by all landowners surrounding the lake); and third – "non-meandered" lakes (private entities are allowed to own beds of such lakes). One important fact is that water in Minnesota is public, due to a distinction from ownership of land. Only land can constitute private property. A European example is Finland, with more than 187,000 lakes. Most inland waters in this country belong to private entities (Marszelewski and Marszelewski, 2018). Finally, it should be noted that at the level of the European Union there is no common policy in the field of lake division or ownership. The main source of law in the discussed issues is the European Union Water Framework Directive, which establishes community action in the field of water policy. In this act, a lake is classified as a "body of standing inland surface water" (article 2 point 5). However, due to the nature of the directive as a source of law, Member States are only bound in relation to the goals established by the directive. Such goals can be achieved using different means and – therefore – States are not obliged to classify lakes as bodies of standing waters. As long as the goals are achieved, there is no violation of the law of the European Union.

5. Conclusion

The research results presented in this study indicate the possible consequences of discrepancies in the classification of waters. The discussed discrepancy makes it difficult to properly pursue water policy with regard to lakes. At the same time, the causes of the discrepancy are difficult to establish. It is necessary to undertake complex and sometimes costly efforts to make the actual formal status accord with the Water Law. In the case of lakes, such situations are not uncommon. This is the result of the significant difference between hydrological and legal classifications of lakes. The criteria adopted in the Polish Water Law are complicated and inadequate to various situations occurring in lake catchment areas that cannot even be predicted. Additional complications arise in times of rapid climatic and hydrological changes. Despite their complexity, these criteria ignore one of the most important elements connecting lakes with the hydrosphere – underground supply. Thus, a lake that legally meets the criteria of standing water will never be distinguished from other types of water (as expected by

the legislator), especially in glacial areas. Hence, the authors suggest changing the Polish Water Law act of 2017. The lawmaker should repeal the existing criteria for determining lake classification and make them less complex. For example, when assessing the possibility of lakes being privately owned, according to the authors it is better to take into account the size of the lake, the volume of the lake, or its role in inland navigation. Such solutions, as mentioned, exist in other legal systems.

References

Anczewska, M. Świtaj, P. and Roszczyńska, J. (2002). Wypalenie zawodowe. *Postępy Psychiatrii i Nerologii*, 14(2): 67-77.

Arches, J. (1991). Social structure, burnout, and job satisfaction. *Social Work*, 36(3): 202-207.

Ber, A. (2000). The Pleistocene in North-East Poland in relation to its underlying substrate and neighbouring areas (in Polish). *Prace Państwowego Instytutu Geologicznego*, 170

Dąbrowski, M. (2002). Changes in the water level of lakes in northeastern Poland. *Limnological Review*, 2: 85-92

Dąbrowski, M. (2013). Groundwater supply to lakes (in Polish). Paper presented at the XVII National Limnological Conference, Olsztyn-Ryn, Poland, 24–27 September 2013

Dąbrowski, M. (2019). The origin and course of the Narew River's greatest floods (in Polish). *Gospodarka Wodna*, 6: 29-33

Howell, T.A. Evett, S. (2004). The Penman-Monteith Method, pp. 1-14. Bushland, Texas, US. https://www.researchgate.net/publication/241492864_The_Penman-Monteith_Method (accessed 28 December 2020)

Konecki, S. (1996). Bathymetric map of Lake Wysokie. Unpublished material. March 1996

Krzywicki, T. (1987). Geological Map of Poland 1:50 000. Żytkiejmy sheet. Warsaw, Poland: The Polish Geological Institute – National Research Institute

Krzywicki, T. (1990). Explanations to the 1:50,000 detailed geological map of Poland (in Polish). Warsaw, Poland: The Polish Geological Institute – National Research Institute

Kubiak-Wójcicka, K. Marszelewski, M. (2012). Definitions and evolutions of the terms "flowing and stagnant waters" in the context of proprietorship of the lakes in Poland. *Limnological Review,* 12(4): 189-195. DOI: https://doi.org/10.2478/v10194-012-0059-z

Land and mortgage register. (2019). https://ekw.ms.gov.pl/eukw_ogol/menu.do (accessed 28 December 2020)

Marks, L. (2005). Pleistocene glacial limits in the territory of Poland. *Przegląd Geologiczny*, 53(10/2): 988–993

Marszelewski, M. Marszelewski, W. (2013). The problems concerning proprietorship of lakes in Poland (in Polish). *Przegląd Prawa Ochrony Środowiska*, 3: 29-45. DOI: http://dx.doi.org/10.12775/PPOS.2013.013

Marszelewski, M. Marszelewski, W. (2014a). Lake Radodzierz – one lake, two mutually exclusive types of ownership (in Polish). *Przegląd Prawa Ochrony Środowiska*, 1: 103-119. DOI: http://dx.doi.org/10.12775/PPOS.2014.004

Marszelewski, M. Marszelewski, W. (2014b). The right of common access to public waters and problems with its exercise with particular emphasis of lakes (in Polish). *Przegląd Prawa Ochrony Środowiska*, 4: 131-159. DOI: http://dx.doi.org/10.12775/PPOS.2014.004

Marszelewski, W. Marszelewski, M. (2018). Effects of the Concept of the Dualist Division of Lakes in Polish Law on Shaping Lake Water Policy form the Hydrological Perspective. *Water*, 10(11): 1495. DOI: https://doi.org/10.3390/w10111495

Marszelewski, W. Pius, B. (2016). Long-term changes in temperature of river waters in the transitional zone of the temperate climate: a case study of Polish rivers. *Hydrological Sciences Journal*, 61(8): 1430-1442. DOI: https://doi.org/10.1080/02626667.2015.1040800

McCulloch, C.S. (2009). The Water Resources Board: England and Wales' venture into national water resources planning, 1964-1973. *Water Alternatives,* 2(3): 461-475

Monteith, J.L. (1973). Principles of environmental physics. New York, US: American Elsevier Publ. Co.

Paerreggaard, K. (2019). Liquid Accountability: Water as a common, public and private good in Peruvian Andes. *Water Alternatives*, 12(2): 488-502

Penman, H.L. (1948). Natural evaporation from open water, bare soil and grass. *Proceedings of the Royal Society of London. Series A, Mathematical and Physical Sciences,* 193(1032): 120–145

Poviat Office in Gołdap. (2019). Land register

.