



THE LAKES IN ROMANIA - AN ACTUAL SYNTHESIS

Petre GÂȘTESCU

Hyperion University of Bucharest, Department of Geography

Bucharest, Romania

gastescu_petre@yahoo.com

Abstract

The article offers a synthesis of the lakes of Romania. We addressed the following questions: genetic types of lakes, geographical distribution and their use in various fields of activities. Thus, in the territory of Romania is a large genetic diversity of lakes distributed on all major forms of relief and recovery in many economic areas. Romania is particularly present fluvial lakes, glacial lakes and anthropogenic lakes (especially reservoirs).

Keywords: Romania, lakes, genetic types, dams.

Romania, with a varied relief – mountains, hills, plains, delta and sea coast – holds an almost complete array of **genetic lake types**, according to the origin of the basin, and in all these geographic units (from the lakes situated on the Black Sea Coast and those from the Danube Delta to the glacial lakes from the alpine realm). The natural lakes are joined by those made by man – **the anthropic dam lakes** – beginning with the Antiquity and continuing through the 15th-19th centuries (the ponds of the Moldavian Plain, the Romanian Plain and the Transylvanian Plain), until 6-8 decades of the last century (lakes built for water-power, water supply, fish-farming and recreation (Fig. 1).

The total number and surface of lakes has varied in time because many floodplain lakes have disappea through damming and drainig, while others (storage-lakes) have been planted on the rivers.

In the 1970s, an estimate of the lake number recorded the number of **3 450 lakes**, of which **1 150 (27%)** were anthropic, summing up an area of **2 620 km²**. The creation of numerous lakes for different social and economic purposes, increased the total lakes area to **4 620 km²**.

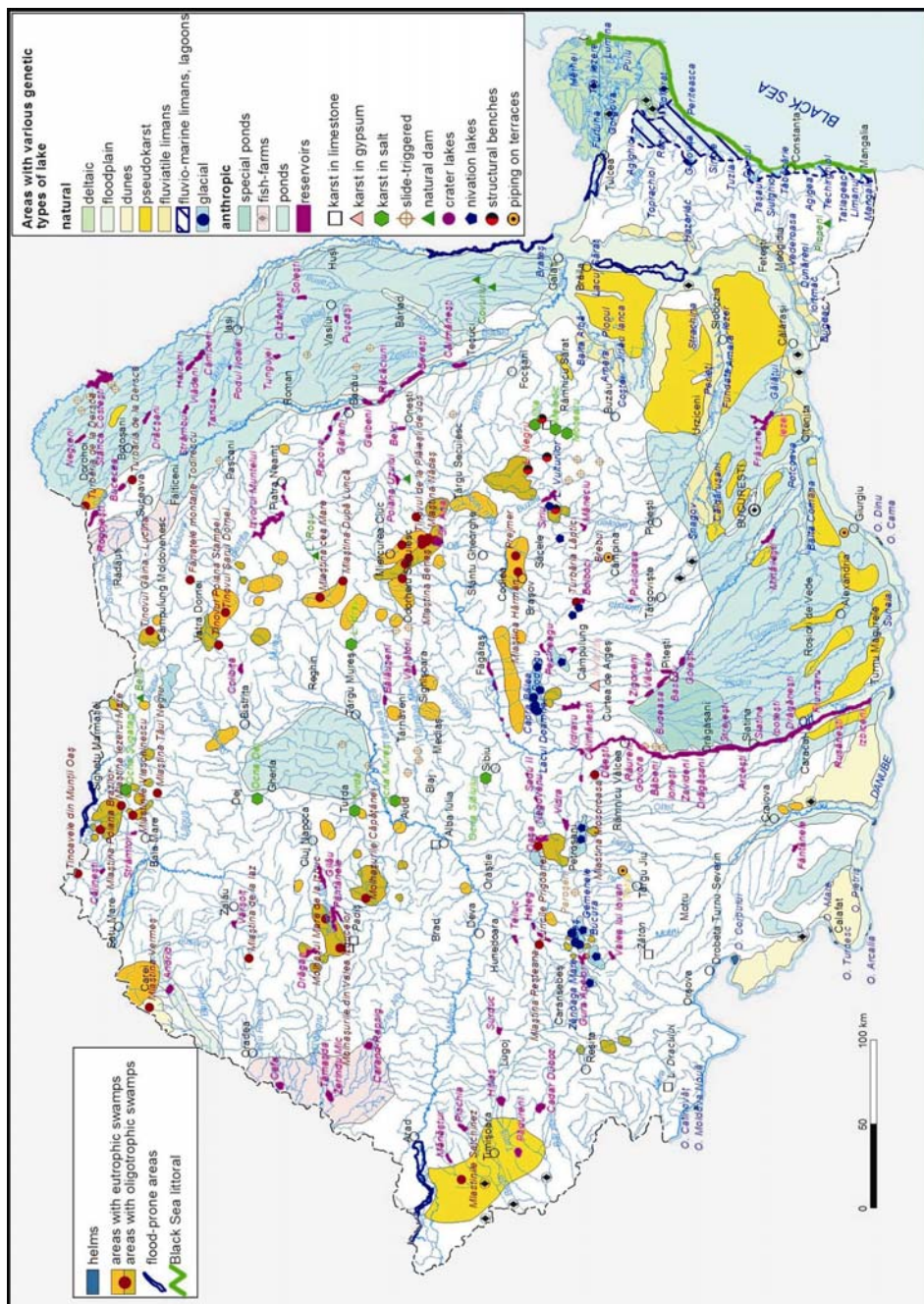


Fig. 1. Romania - map of the genetic types of lakes

Although today's Romanian lakes are small, by the end of the Tertiary and during the Quaternary (the Pliocene-to-Quaternary transition) there were a number of large and deep lakes-**paleolakes**, which are drained today. The orogenic movements that occurred resulted in the formation of the Carpathian mountains, through the folding of the deposits accumulated in the existing seas, the fall of other marginal areas and the appearance of certain volcanic eruptions (that triggered the individualization of the longest volcanic mountain chain in Europe), and in the creation of closed deep depressions in-between these mountain summits, which were then occupied by waters. All the depressions of the mountain chain that the local people often call "țări" (countries) (such as: Făgăraș, Bârsei, Ciucurilor, Giurgeu, Bilbor, Borsec, Dornelor and others) represent traces of the paleolakes (Villafranchian), drained later on and which we can call tectonic and of volcanic dam. Their flat surface, like that of a plain, can still be seen today, only fragmented by the river network, while back then it constituted the bottom of the paleolakes.

On the flat bottom of these depressions, one can find up to this day swampy areas, and inside them small waterholes. Such swamps, with small waterholes, can be found in the depression Ciucurilor – near Ciceu locality –, in the depression of Giurgeu and others.

Coming back to the actual picture of the **genetic lake types**, we shall mention that to their formation contributed numerous factors, but of all these we will recall, according to their size, only the most important: **fluvial processes, climate, the action of the sea on the coastline, the petrographic variety of the rocks, the vertical movements of the Earth's shell, wind processes, landslides and others.**

Analyzing a map of the genetic lake types in Romania, most of them – and we could also say the biggest, too (an exception is the Razim-Sinoie lake complex) – are floodplain lakes generated by the fluvial network. Moreover, these lakes appeared in connection to the rivers, are dominant in the plain region because of the larger floodplain and of the bigger flows, and lead to frequent flooding.

In the floodplain of the main rivers from the plain area, including the Danube floodplain and the Danube Delta used to be found the most numerous **floodplain lakes** of Romania.

Only in the Danube floodplain, along more than 1000 km, the river used to be accompanied, from Drobeta-Turnu Severin downstream, by over 800 lakes, of which we shall mention: Fântâna Banului, Gârla Mare, Maglavit, Bistrețu, Nedeia, Potelu, Suhaia, Mahâru, Greaca, Boianu-Sticleanu, Călărași, Căbăl on the Balta Ialomiței, Șerban on the Balta Brăilei, Jijila, Crapina etc. In the Danube Delta, through the agricultural arrangements achieved during the period 1960-1989, several lakes were drained in the areas of Sireasa and Pardina, more important being Tatanir, Țigaiu Mare, Baci, Lăpușna, Costin Mare and Costin Mic, Șerbănoiu Mare, Pojareț etc. Obviously, here, too, some important lakes have been

preserved, such as: Furtuna, Obretinul Mare, Trei Iezere, Bogdaproste, Babina, Merheiu Mare, Matia, these being situated in the Letea Unit; Gorgova, Isac, Uzlina, Roşu, Puiu, Lumina, situated in the Caraorman unit; Dranov in the unit bearing the same name.

In the floodplain of other rivers it was possible to find such floodplain lakes, too, for example in the case of the floodplain Jiu, Olt, Argeş, Ialomiţa, Buzău, Siret, Prut etc. It can be noticed, within this lake type, not just their significant number, but also the variety of their subtypes. So, in the floodplain it was possible to encounter either large lakes, each being 20 km long, 6 km wide, 74 km² like the lakes Potelu, Greaca, Brateş, or narrow and long lakes, shaped like a horseshoe, a ring and in other ways. The lakes situated in abandoned meanders, with more significant depths (5-9 m), could not be desiccated, and the ones preserved are Bentul Lătenilor, on the Balta Ialomiţei, Japşa Plopilor and Dunărea Veche, on the Balta Brăilei etc. Even their denomination reflects the genesis of the depression. In this sense, we will provide a few more limnonyms: Belciug (that is, "Ring") in the Danube Delta, Siretul Stătător ("The Stagnant Siret"), La Ruptură ("At the Breakage"), in the floodplain of Siret, Pruteţ ("The Small Prut"), in the floodplain of Prut etc.

The largest floodplain lakes occupy the lower areas of the edge of the external floodplain, being supplied with water by floods and phreatic waters, while the narrow and long ones represent former water courses or in abandoned river meanders.

Axed on the less large valleys tributaries of the rivers, but to whose formation actively participated the eustatic movements, including those of rise of the Black Sea level, are the **fluvatile and maritime limans**. These lakes are situated at the boundary of the most important rivers in the Romanian Plain and along the Black Sea Coast.

In these categories we shall mention the lakes: Mangalia, Techirghiol, Taşaul, along the Black Sea Coast, Amara - Buzău, Jirlău, Balta Albă - along Buzău, Strachina, Amara - Slobozia, Fundata, Snagov, Căldăruşani, along Ialomiţa, Oltina, Mârleanu, Bugeac, Mostiştea, Gălăţui, along the Danube. These lakes are extremely important from the viewpoint of their fishing potential and of the recreational activities.

The variations of the Black Sea level during the Quaternary influenced both the Black Sea Coast and the Romanian Plain. When the sea level was rising, it flooded the mouths of these small rivers, and when it was going down, the waters withdrew. It is only like this that these small valleys were enlarged at their mouths, as is for instance the case of Mangalia, Tatlageac, Techirghiol, Taşaul, Babadag, and the sea coast lakes or the lakes along the fluvatile banks from the area of the Romanian Plain, which we have mentioned above, appeared.

Also on the seashore, beside the maritime limans, which are the work of both the hydrographic network and of the sea, one can find **lagoons**. These are

marine gulfs barred by offshore bars and totally or partially isolated from the marine aquatory. This is how the entire Razim-Sinoie lake complex, Siutghiol Lake and the Swamp of Mangalia appeared.

The colder climate of the Pleistocene, which generated the alpine glaciation – a very significant geological event - , led to the formation of the glacial relief, as a result of which we can highlight cirques and valleys. In the Carpathians situated on the Romanian territories the last two glacial phases – Riss and Wurm – affected the heights over 1800m. In the glacial cirques and valleys, after the melting of the glaciers, water gathered, leading to the formation of the **glacial lakes**, which, in the mountainous massifs - Maramureș, Rodna, Căliman, Făgăraș, Parâng, Retezat-Godeanu – include a number of over 200 lakes. Of these lakes, we shall mention Lala Mare and Buhăescu, in the Mountains of Rodna, Bâlea, Capra, Podragu, in the Făgăraș Mountains, Gâlcescu, in the Parâng Mountains, Bucura, Zănoaga, in the Retezat Mountains.

Also in the glacial climate, but in the periglacial area, which continues to be present today in the actual climatic conditions of the subalpine area, there appeared as well **nival lakes**, in the case of which the depression that shelters the lakes appears following the grinding off of certain slopes or structural shelves by the snow avalanches or through the suffusion of the water resulted from the melting of the snow, exerted on the layer of eluvial deposits on which it persists for a longer period of time. Among the lakes with depressions resulted following the excavation of certain structural shelves we shall mention: The Vultures' Lake (Lacul Vulturilor) - Siriu, The Red Lake (Lacul Roșu), a clogged lake in Penteleu Massif, The Black Lake (Lacul Negru) situated under the Piciorul Caprei Peak, from the same massif, created through the nival damming of the glacial cirques from Cibinului Mountains - Iezerul Mare and Iezerul Mic, through the sinking / suffusion of the eluvial deposits present on the interfluvies - Tăul Mare and Tăul Mic from Cucurbăta, Bihor, Baia Vulturilor from Semenic, Țepeleica Lake from the Iezer-Păpușa Mountains. The persistence of these lakes is ephemeral because of the lack of a hydrographic basin.

Despite the fact that in our country one can find the longest volcanic chain in Europe, however, the intact preservation of the **volcanic craters** to store the water was only possible in the south-eastern extremity of this chain, in the Harghita Mountains, where one can actually find as well the only lake of volcanic origin, in the crater, Saint Ana Lake (Sfânta Ana), near Tușnad (this origin is disputable).

On the mosaic of the rocks that make up the superficial part of the Earth's crust in Romania are present lakes formed on easily soluble rocks (**klastokarst**), for instance on **calcareous stones** – Ighiu Lake in the Apuseni Mountains, Zăton Lake, with a temporary hydro-regime, in the Mehedinți Plateau, on **salt** (Ursu - Sovata and other smaller ones at Ocna Sibiului, Ocna Dej, Ocna Mureș, Ocna Șugatag, Coștiui etc.), on **gyps** (Învărtita Lake, Nucșoara - Argeș), on **loess** (Ianca, Plopu, Movila Miresii, Leul Sărat, in the Romanian Plain). Some of these lakes have been used for

balneary treatment (for instance the Salty Lake/ Lacul Sărat-Brăila, Amara-Slobozia).

In the alpine and hilly area, through the processes of earth fall and **landslide** there appeared **natural dam lakes** (The Red Lake / Lacul Roșu - Bicaz, Bălățau - Vrancea), in the sliding-triggered relief. In this category we shall mention different lakes from the Plain of Transylvania, from the Subcarpathians of Transylvania – the Rath Lake (Porumbenii Mari), from the Subcarpathians of Buzău (Manta, Hânsaru), from Petroșani Depression (Tăul/”The Mire” from Paroșeni), from Bârlad and Suceava plateaus, etc.

Due to **wind action**, in the relief among the dunes there appeared small lakes both in the floodplains and in the plains. So, we shall mention the lakes situated between the dunes of the Plain of Nir (but they are drained now), between the sand dunes from Reci (the Depression of Bârsa), between the dunes from Apele Vii (the Plain of Romanați), or those from the Danube floodplain, Calafat Ciuperceni and Vânju Mare.

Man has been the one who, a long time ago, when he settled in the plains, plateaus and mountains, if nature was hostile to him, he tried to create his own lakes. This is how **ponds** (Rom. **iaz**) started to appear, which are lakes formed with anthropic dams, the most numerous being used in traditional fish breeding and also for local irrigations. Documentary mentions can be found since the 15th century for some lakes of the Transylvanian Plain and probably for those of the Moldavian Plain. Dimitrie Cantemir in *Descriptio Moldaviae* (written during the second half of the 18th century) notices the high number of the ponds of this historical province. Actually, by inventorying the rudimentary dams that can be found on old lakes, it has been appreciated that there were 660 ponds. In the Transylvanian Plain, compared to the several hundreds of ponds mentioned during the Middle Ages, there were only about 150 left in the 20th century, and at the beginning of the 21st century there are just 20 lakes left.

So, in some geographic regions, lakes continue to be a characteristic landscape, namely in the Moldavian Plain – the true land of the ponds in Romania, in the Transylvanian Plain, where the plains are actually plains not through their morphological features, but only through their vegetation, the Romanian Plain. At the same time, ponds can also be found in the Western Plain, the Moldavian Plateau and even in Dobrogea. In the Moldavian Plain, ponds are abundant along the rivers Volovăț, Bașeu, Jijia, especially along the tributaries Sitna (the biggest pond being Drăcșani), Miletin (Hălceni) and Bahlui (Tansa). In the Transylvanian Plain, the most significant ponds are along Pârâul de Câmpie (Zău de Câmpie, Tăureni etc.) and Fizeș (Țaga Mare, Tăul Popii, Sântejude, Cătina etc.). In the Romanian Plain, ponds can be found along most of the small rivers / valleys, such as Călmățui-Teleorman, the tributaries of Vedea, Argeș, Ialomița, Danube. The Basin of Mostiște is the most representative, as it has been turned into a chain of ponds (142 totaling an

area of about 4 400 ha and 230 mil. m³ water). In the basin of Vedea, too, there are about 110 ponds, used mainly for fish breeding.

The above-mentioned regions are characterized by a lack of water multiannually, which determines the need to create such lakes for local and complex uses.

A type of anthropic lake, which is no longer created by a dam, from the viewpoint of its realization, is the **fish pond (Rom. eleșteu)**, which is frequently encountered in the Plain of Tisa. The fish pond is created on plane, slightly swampy areas, delimited by embankments and supplied with water from nearby rivers or from the underground, which allows for an intensive fish breeding. The best known fish ponds in Romania are at Cefa, Tămajda, Inand, Ineu, Homorog.

The “bent” structures (“benturile”) used to be characteristic for the Platform Cotmeana from the Gethic Plateau, where the underground water is situated at 50-60 m below the surface. They were small rectangular or square holes, dug in the plane surface of the interfluves with an impermeable clay substratum and used for water supply by storing the water coming from the rain and from the melting of the snow.

The “hait” structures (“haiturile”), another traditional type of anthropic dam lakes, were small temporary water storages along some smaller mountain waters and which were used quite a lot for the transports of the piles of logs shaped as rafts (Bistrița, Iara, Someșul Rece, Sebeș, Lotru, Capra, Buda and Vâlsan along Argeș etc.).

Other lakes began to be built, even since Roman times, in Apuseni Mountains, in order to separate the golden ores (Roșia Montană) and also later on (Cavnic, Baia Sprie), in order to exploit complex and iron ores in Banat (Dognecea, Ocna de Fier, 18th century, Oravița, 19th century), in the Metal-Yielding Mountains/ Munții Metaliferi (Făerag), as the industrial centers developed, to store water for the industrial processes and to supply the population (Baia Mare, Hunedoara, Reșița).

A particular category is constituted by the lakes situated in **salt mines**, some of them formed in bell-shaped mines in which the salt was exploited at the surface, as it happened during the Antiquity (the Dacian and Roman Period), and others created through the fall of the ceiling in underground mines (the actual period). This kind of lakes have a small area, of a few thousands m², and great depths (for instance, Avram Iancu Lake - Ocna Sibiului with 132.5 m). There are about 60 such lakes, which can be found in the area of the diapiric folds, namely in the Depression of Transylvania (Ocna Sibiului, Ocna Mureș, Turda, Cojocna, Sic, Ocna Dejului, Jabenita, Sovata), the Depression of Maramureș (Ocna Șugătag, Coștiui), the Curvature and Gethian Subcarpathians (Telega, Doftana, Slănic, Țintea, Băicoi, all in Prahova County, Ocnița-Dâmbovița, Ocnele Mari-Vâlcea, Săcelu-Gorj). Given their physico-chemical characteristics (high salinity, heliothermal phenomenon, sapropelic mud), most of them are used in spa

treatments, some locations hosting significant spa resorts (Ocna Sibiului, Sovata, Ocna Șugătag, Slănic-Prahova, Ocnele Mari).

A special importance in the use and management of the water resources in Romania goes to the **storage lakes (reservoirs)**, simply called "accumulări" (storages) in the hydro-technical works, which are used not just for hydropower, but also for potable water supply, for irrigations or all these together (complex use).

After the year 1960, with the realization of Izvorul Muntelui-Bicaz Lake, along Bistrița, the number of the storages multiplied, on such hydrographic arteries such as Bistrița, Siret, Argeș, Olt, Someșul Mic, where series of such lakes were completed, some of them in between two dams. At present, it is estimated that there are 1 975 such lakes, of which about 400 store 15.6 billions m³ water. Among the biggest such lakes, we shall mention: Porțile de Fier, along the Danube (2 400 millions m³), Izvorul Muntelui along Bistrița (1 130 millions m³), Stânca-Costești along Prut (735 million m³), Vidraru along Argeș (469 millions m³), Vidra along Lotru (340 millions m³) and others. The installed power is estimated to 5 500 MW, representing 25% of the rivers' potential and 36% of Romania's power production.

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