

## 2. PHYSIOGRAPHIC SETTING OF THE GOSTYNIŃSKIE LAKE DISTRICT



### 2.1. LOCATION OF LAKE GOŚCIAŻ AND THE GOSTYNIŃSKIE LAKE DISTRICT

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Lake Gościąg is located in a wide section of the Vistula Valley between Płock and Włocławek called the Płock Basin (Fig. 2.1). Because of the presence of over 60 lakes in this region, its other name is the Gostynińskie Lake District (Lencewicz 1929). Lake Gościąg (52°35'N, 19°21'E) is in the northwestern part of the lake district.

The region lies at the boundary between the east-European structural platform and younger tectonic units of central Europe. At the margins of these units are faults of the Teisseyre-Tornquist zone, which affected sedimentation processes and lithological differentiation as well as the groundwater system.

During the main Leszno stage of the Vistulian Glaciation the entire Płock Basin was filled with ice as well as during the Poznań phase, when a distinct lobe formed (Fig. 2.1). Location of the lobe in the valley favoured os-

cillations, when the ice fractured and the substratum was subjected to glacitectonics. Intensive activity of subglacial waters resulted in formation of troughs, crevasse forms of relief (eskers and kames), and eversion hollows (Mojski 1960, Skompski 1969). These forms were preserved by dead ice or winter ice, which protected them from destruction after the draining of the Vistula, triggered by the ice-sheet retreat.

The ice melted when the Vistula cut down to the level of supraflood terrace, and crevasse forms emerged and numerous lakes formed. Lake Gościąg is one of the lakes created when the protective ice melted. It is located in the Vistula terrace at 64.3 m a.s.l. The bottom of the lake basin lies in Neogene (Miocene) sedimentary rocks.

Hydrologically the region belongs to the Vistula drainage basin (at present to the Włocławek Reservoir). The network of streams drains excess water from lakes, swamps, and bogs, which are mainly groundwater-fed.

According to Gumiński (1948) the region is assigned to the central agricultural-climatic province, which com-

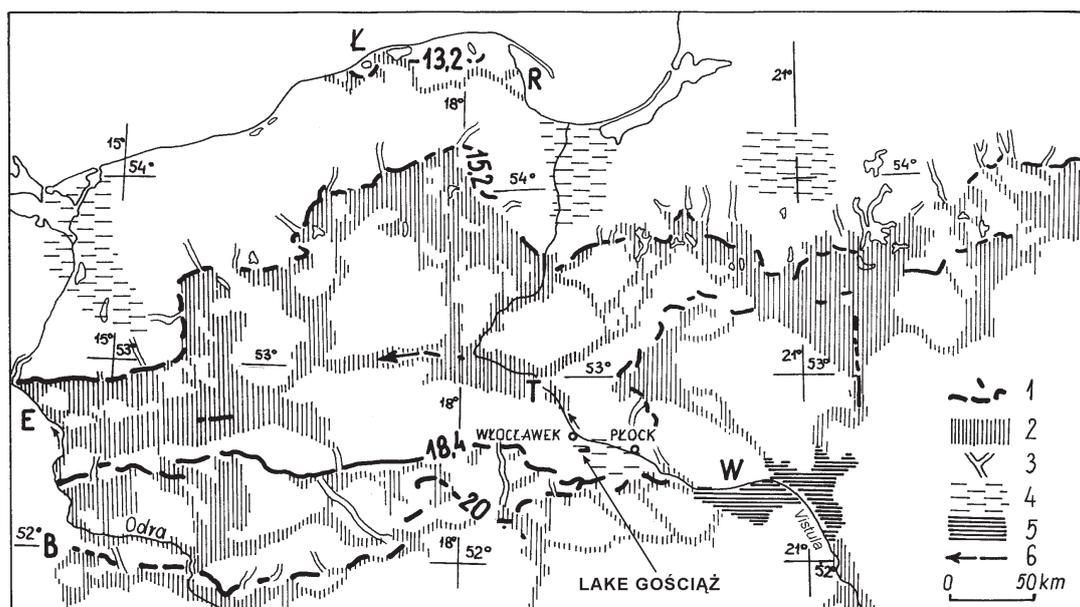


Fig. 2.1. Location of Lake Gościąg on the background of the Vistulian Glaciation in the Polish Lowland (Mojski 1993). 1 – maximum extent of the Scandinavian ice-sheet and its phases in radiocarbon years BP  $\times 10^3$ ; 2 – sands and alluvial plains; 3 – major troughs; 4 – marginal depressions; 5 – periglacial ice-dammed lakes; 6 – direction of outflow of extra-glacial waters. W-B – Warsaw-Berlin pradolina, T-E – Toruń-Eberswalde pradolina, R-Ł – Reda-Łeba pradolina (pradolina is an ice marginal streamway).

prises the eastern part of the Wielkopolska and Mazowiecka Lowlands, and according to Romer's (1949) classification it belongs to the climatic region called the Land of Great Valleys. Precipitation there is the lowest in Poland, below 500 mm/year. The growing season lasts from 200 to 220 days a year.

The Płock Basin is situated at the boundary between two major ethnic-cultural regions. The western part belongs to Kujawy, and the eastern to Mazowsze. Because of the scattered layout of settlements and the dense vegetation cover, this boundary is not very pronounced. Large differences are apparent in rural and agricultural management.

Kondracki (1994) in his physico-geographical division of Poland (in decimal system) assigns the Płock Basin to the mezoregion no. 315.36, being a part of the Toruń-Eberswalde Pradolina Macroregion.

In the Płock Basin the sandy terraces have dunes overgrown with forest, and numerous meltwater depressions are commonly filled with water. The lakes form a unique landscape-floristic assemblage called the Gostynińskie Lake District. In order to protect this landscape the Gostynin-Włocławek Landscape Park was established in 1979. The Park comprises 14,195 ha. Cities of Płock, Włocławek, and Gostynin are at the margin of the basin. Lake Gościąż is located in the area of the Landscape Park, 18 km SSW of Włocławek and 4 km S of the Włocławek Reservoir. The lake area is now 41.7 ha, and it is drained by the Ruda River, which discharges to the Włocławek Reservoir near Dobięgniewo.

Lake Gościąż and other lakes in the Płock Basin are located at an elevation of only 60–70 m a.s.l. Groundwaters draining the Kujawy Upland bring a permanent supply of water to the lakes and thus ensure small oscillations of water table, regularity of seasonal changes in water temperature, and continuous sedimentation during the entire period of the lake existence. Therefore laminated sediments filling the basin of Lake Gościąż can also occur in other deep lakes of the Gostynińskie Lake District. The position of Lake Gościąż with respect to the water table of the Włocławek Reservoir and the Vistula is presented in Fig. 2.2.

## 2.2. THE GEOLOGICAL STRUCTURE OF THE LAKE GOŚCIAŻ REGION

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The geological structure of the Płock Basin has been studied by Lenczewicz (1927, 1929), Baraniecka (1979), Baraniecka et al. (1978), Baraniecka and Skompski (1978), Skompski (1968, 1969, 1971) and Mojski (1960). The geomorphological evolution of the Vistula Valley between the Warsaw and Toruń Basins was studied by Wiśniewski (1976, 1982, 1987, 1990), Starkel (1990) and

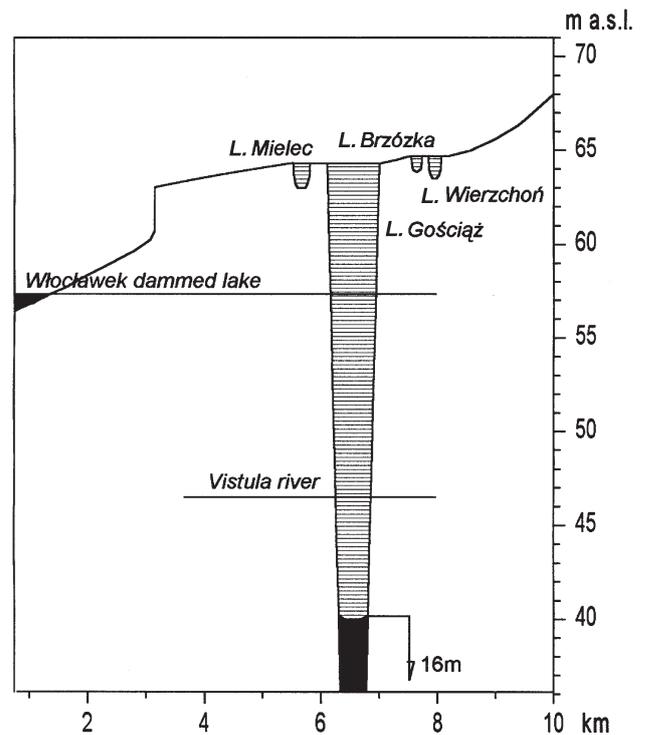


Fig. 2.2. Location of Lake Gościąż and adjacent lakes with respect to the levels of the Vistula River and Włocławek Reservoir (after Glazik 1978).

others. Close examination of several boreholes in the Płock Basin has increased knowledge of these deposits.

The thickness of Quaternary sediments in the Płock Basin is low because of its situation on the Quaternary basement elevation called "the Płock Elevation" and attributed to deformation of the plastic Tertiary deposits by the oldest (Podlasie) ice-sheet as well as by younger ice-sheets (Lamparski 1983). Such activity has made deep depressions (e.g. Mochowo Depression situated NE of the Płock Basin) and high elevations, with relief reaching 200 m. The Płock Elevation includes the Płock Basin and a strip of the morainic plateau more than 10 km wide, NE from the Vistula Valley. In the earlier part of the Quaternary a thick series of glacial and interglacial deposits accumulated in the depressions, while denudation prevailed in the elevation zones; as a result, the surface became less uneven. The ice-sheet of the Last (Vistulian) Glaciation covered an already smoothed surface, with the depressions filled up to the level of the elevations. At the site of the present Płock Basin, the result was the emergence of a new depression, conducive to the accumulation of Last Glaciation deposits (Kopczyńska-Lamparska & Piwocka 1981).

Skompski (1969) thought that the glacitectonic activity influenced the formation of the Płock Basin in another way. He maintained that the older South Polish ice-sheet from the NE formed the Płock Basin depression and provoked the uplift of clays along the northern and southern edges of the Basin. Glacial deposits from that period