

# A FLOATING STRONGHOLD

In the Middle Ages, nature influenced human settlements, which in turn affected the surrounding landscape. Experts have turned to an early medieval village in Santok to learn more about this intricate relationship.

View of the "island" – the stronghold in Santok, during the spring 2011 flood.

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**E**nvironmental conditions and the relationship between man and nature in the early Middle Ages have been of interest to archaeologists for a long time. Research on this issue has been carried out in the north-west region of Greater Poland. The site of the early medieval village in Santok is located in the Gorzów Basin, at the confluence of the Warta and Noteć rivers. This hamlet, due to its characteristic location and the centuries-long (eighth-fifteenth centu-

ries) history of fortified settlements found in archaeological and written sources, may become a key site for our understanding of life in the Middle Ages.

Analyzing the historic landscape requires a wide range of studies in the fields of geology, geomorphology, hydrology and paleogeography. Geological fieldwork was carried out in addition to archaeological research, including 2D and 3D geophysical sequences and 60 boreholes and trenches. Hundreds of samples were taken from the obtained drill cores for laboratory analyses, such as grain-size analysis to determine the strength of the river current, as well as paleontological and pollen analysis providing information about the environmental conditions at that time, including the temperature and water depth, vegetation, and floods. Radiocarbon dating (AMS method) was used for absolute dating of archaeological artifacts and geological samples.

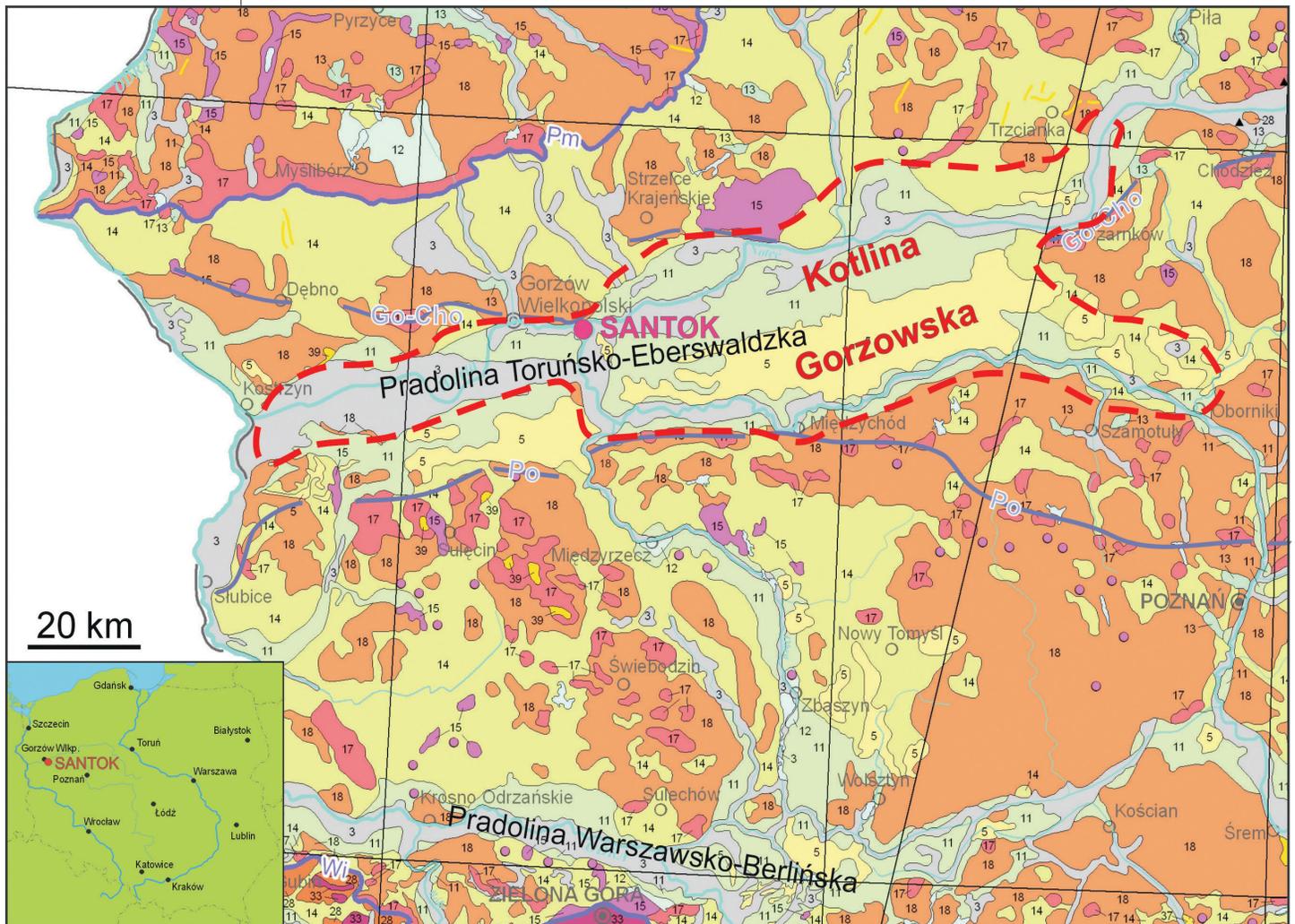
## The Beginning

The geological structure of the area is very important for landscape reconstruction of a given period, as it underpins the development of natural and so-



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Santok on the geological map of Poland on a scale of 1:500,000.

Based on: *Geological map of Poland on a scale of 1:500,000*, Leszek Marks, Andrzej Ber, Waldemar Gogolek, Krystyna Piotrowska (Warsaw 2006).

Explanations of lithology:

- **Holocene:** (3) fluvial sands, gravels and peats;
- **undivided Quaternary:** (5) aeolian sands;
- **Pleistocene:**
  - North Polish Glaciation:
    - (11) fluvial sands and gravels,
    - (12) lake sands and silts,
    - (13) ice-dam clays, silts and sands,
    - (14) outwash sands and gravels,
    - (15) kame sands and silts,
    - (17) end moraine gravels, sandm boulders and tills,
    - (18) tills;
  - South Polish Glaciation: (33) end moraine gravels, sands, boulders and tills;
- **Miocene:** (39) clays, silts, sands, gravels with lignite;
- **Wi** – range of the Leszno Phase of the Vistula Glaciation;
- **Po** – range of the Poznań Phase of the Vistula Glaciation;
- **Go-Cho** – range of the Gorzów-Chodzież Sub-phase of the Vistula Glaciation;
- **Pm** – range of the Pomeranian Phase of the Vistula Glaciation.

cial processes. The landscape sets the backdrop both for interdependent natural processes and for human activity. The multidisciplinary studies carried out so far have helped to recognize the processes shaping the landscape around Santok. Today we know that it was formed after the deglaciation of ice sheet of the Poznań Phase of the Vistulian Glaciation. This is “zero hour” of the Gorzów Basin landscape. The Gorzów Basin itself belongs to an ancient glacial valley, running parallel to it, a vast and longest valley in the European Lowlands, where waters flowed from the Grodno area to the Atlantic. This valley, known as the Toruń–Eberswalde ice-marginal valley, once saw

water flows similar to those of the present-day Volga River – with the width of the river flowing through the glacial valley reaching 24–33 km during the spring flooding period.

Due to its location, for the next several thousand years after the glaciation subsided, the Gorzów Basin, as well as Santok (located at a place where the valley narrows to 17 km across), underwent intensive processes of landscape modification. After the formation of the Oderbruch by the plateaus of the Pomeranian Phase, the Gorzów Basin entered the next stage of landscaping, from then on shaped only by river flows. Preliminary research shows, however, that the

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rising levels of the Ancylus Lake, then the Baltic Sea, at the end of the glacial period influenced erosive and accumulative processes occurring far inland.

The first stage was marked by a multi-channel braided river, linked to the low erosion base of the Baltic Ice Lake. Deep erosions dominated at that time, with mobile sand-banks and transient riverbanks. The second stage was a meandering river, formed during the Littorina Transgression, and the third was an anastomosing river, flowing through three or four riverbeds with a very low water descent rate. These types of riverbeds as well as the floodplain were stabilized by vegetation (trees, bushes, turf). This stability created conditions favorable for the establishment of the oldest fortified settlements, on islands between the riverbeds. We now know that Santok was founded against the backdrop of a multi-channel river, in the catchment area of the Noteć and Warta riverbeds. This is not unusual because many early-medieval fortified villages, such as Opole and Wrocław, were founded on islands of this type.

The Noteć and Warta surrounded Santok until the eighteenth century, when a great flood resituated the

Warta to east of the village. The regulation of river channels and the construction of levees at the turn of the eighteenth and nineteenth centuries completed the shaping of the landscape and hydrological conditions.

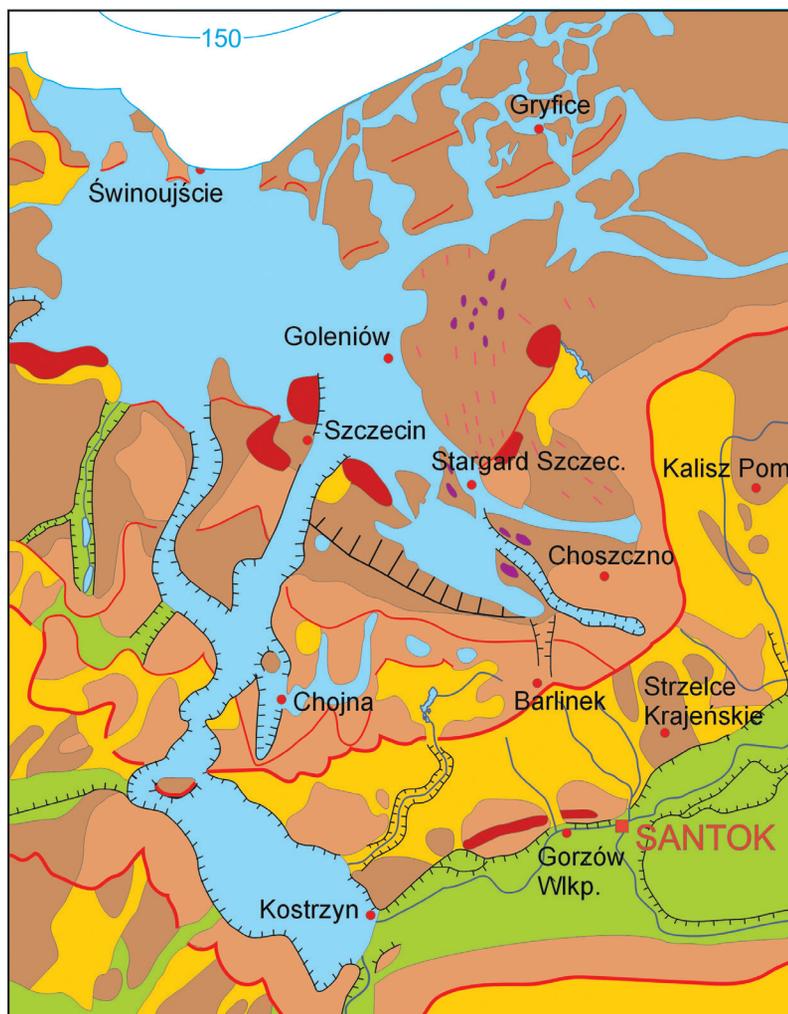
The hydrological conditions in Santok, both then and now, were quite challenging. Santok was established during the mild climate of the Medieval Warm Period. Seasonal floods occurred regularly and lasted up to 2–3 months. The amount of snow and rainfall received by the rivers was similar to present time. The banks of the riverbeds were quite stable, strengthened naturally by vegetation and by man-made embankments of wood and soil with stone-clay lining. Archaeological excavations revealed layers attesting to the great strength of flood waters, which had eroded the foundations of the fortifications and thereby destroyed them.

## Settlement

With all this in mind, the question arises as to what motivated the establishment of the Santok settlement, and subsequently stronghold, in such a difficult flood-

Explanations:

-  1 flat and wavy morainic plateau,
-  2 hilly morainic plateau,
-  3 glactectonic disturbed hills,
-  4 eskers,
-  5 drumlins,
-  6 ice-marginal lake plains,
-  7 out-wash plains,
-  8 glacier valleys and river valleys,
-  9 river terraces,
-  10 slope of the plateau,
-  11 phase moraines,
-  12 sub-phase moraines,
-  13 waters,
-  14 ice-sheet thickness (m).



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plain environment, despite the potentially more convenient location on the edge of the nearby plateau. Most likely this was due to cultural and natural factors.

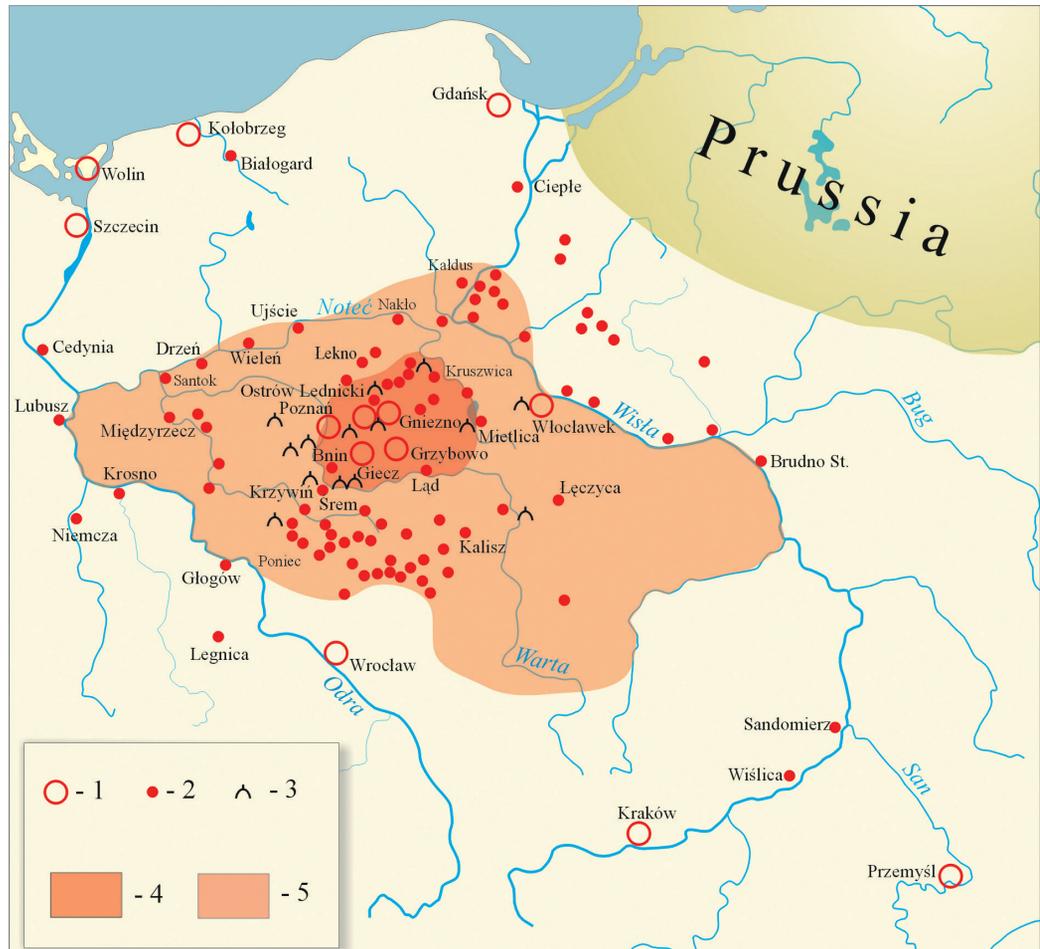
Human settlement of Santok began in the second half of the eighth century, as evidenced by the archaeological material and absolute dating techniques. The sandy "island" that emerged above the water level was used as a settlement site, which initially had an open plan and may have only been inhabited periodically. The fortified site was accessed by numerous channels of the Warta and Noteć rivers, which created direct waterway connections both to the nearest hinterland and to remote territories. This had undeniable significance for transporting goods and trade, making this an excellent location for conducting business, along a river route connecting the Baltic coast to the interior. Evidence of these far-reaching contacts can be seen in objects found in the oldest layers of the settlement, which include antler combs of foreign origin, woolen fabrics, glass beads and amber, as well as Feldberg clay pots. Soon, Santok expanded dramatically, attaining a key role in the region, and in the tenth century it became part of the early Polish (Piast) state. Archaeological findings clearly show that the defensive fortifications were rebuilt at that time to resemble oth-

er Piast forts in the country's key towns. The Warta, which was the communication axis of the country at the time, provided access to regions more central, and Santok played a strategic role as a watchtower on its northern border.

## Resources

Although, as previously mentioned, hydrological conditions in this location can be described as unfavorable, the available geological resources helped in building the settlement. The construction of the village on Santok's even terrace surface in the tenth century was a great engineering undertaking. Santok was built on the fluvial fine sand that is typically found in slow-flowing rivers. This sand is of little use as building material, but are somewhat useful for stronghold reinforcements, despite the shallow groundwater level and seasonal floods. The sand used for building the embankments of wood and soil that surrounded the settlement was probably taken from the neighboring plateau, but also from the nearby floodplain terrace. Natural resources, such as gravel, boulders, clay, layered till (for making ceramics), bog iron (for iron production), peat (fuel) and wood were all obtained

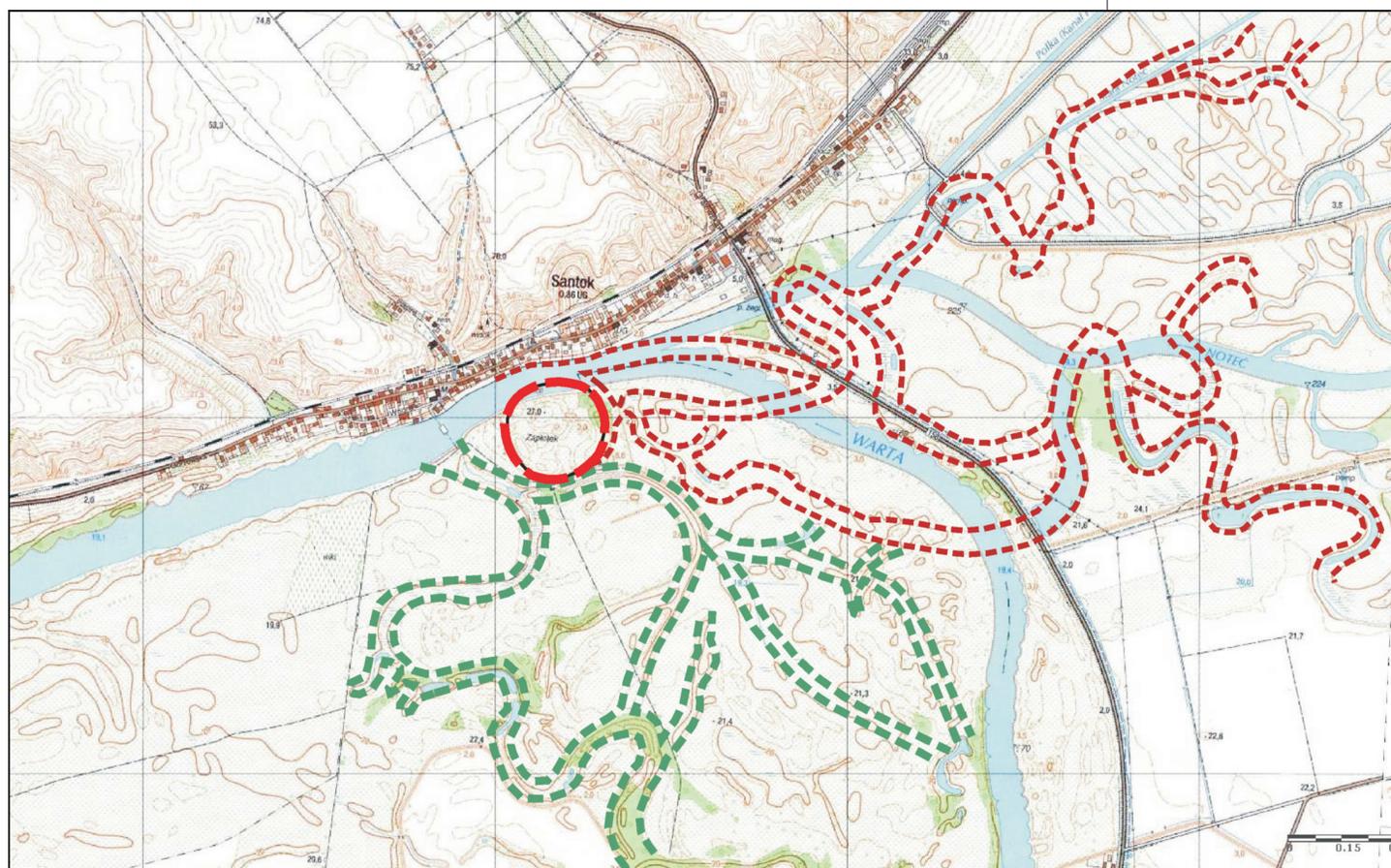
The Santok stronghold as part of the Gniezno state at the end of the tenth century. Based on Kurnatowska (2008: 326).



### Key:

- 1 main strongholds of the early Polish state, important stronghold sites, and also trade emporia in other territories,
- 2 smaller fortresses of various ranks,
- 3 cemeteries with burials of armed warriors,
- 4 core territory of the early Polish state,
- 5 the farthest territorial range of the early Polish state.

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from the plateau located “behind the river.” It must have posed a major technical challenge for the people at that time to transport boulders weighing up to 2.5 tons, used to strengthen embankments and build stone buildings.

The area of the former fortified settlement is currently around 5.5 ha, while the volume of all cultural sediments can be estimated at around 200,000 m<sup>3</sup> in total, with a weight of approx. 300,000 tons, of which about 60,000 are imported building materials from nearby plateaus. This illustrates the sheer scale of the undertaking, which included the construction of fortifications and all buildings within the settlement.

The ancient fortified settlement currently stands 8 m above the surrounding terrace and is itself “submerged” in flood sediments dating from the last 1200 years. The flood cycle is repeated every year. A helpful indicator of environmental changes, useful in studying the history of water reservoirs, can be found in diatoms, microscopic algae whose silica valves preserve well in sediments, including cultural ones. Diatom groups are very useful because the distribution of their species is closely related to water quality parameters, including salinity and nutrient status. They also show preferences for specific habitats and ecological requirements, therefore they can be used to reconstruct environmental changes. Diatom analysis

from the layers of the settlement in Santok has helped determine the times when Santok experienced flooding. Correlating these data with archaeological sources makes it possible to explain how the communities of that time tried to defend themselves against the effects of floods and high river water levels.

Over the past two millennia, human activity and settlement in various climatic conditions have strongly influenced the landscape in Santok, but environmental responses are well preserved, especially in paleoecological findings. This project is still ongoing and in the end we hope to get a thorough analysis of the natural conditions in which the inhabitants of the Greater Poland / Pomerania borderland lived, as well as the cultural and environmental transformations that took place in this area in the early Middle Ages.

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Reconstruction of the geology of the confluence of the Warta and Noteć rivers in the early Middle Ages.

Further reading:

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