

# Historical timber rafting in the Guadalquivir river (south of Spain)

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## Background

The Guadalquivir, one of the main rivers of the Iberian Peninsula, originates in the Cazorla Mountains (south of Spain) and flows into the Atlantic Ocean at more than 400 km to the west from its source (Fig. 1). Since the Middle Ages, written sources report the transport of wood from the Cazorla and Segura Mountains down this river to cities such as Cordoba or Seville, to be used as construction timber in buildings and ships. In the 20th century, these mountains were intensively harvested for wood for railroad crossbeams. The transport of loose logs from the forests high up in the mountains down to the Guadalquivir valley has been well documented in the mid-20th century (Fig. 2). However, no detail accounts or evidence of further transport as rafts along the broad valley to the main cities had ever been provided.

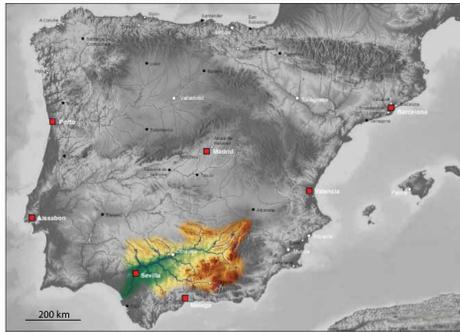


Fig. 1. Location of the Guadalquivir River and the Cazorla and Segura Mountains in the eastern part of the catchment area.

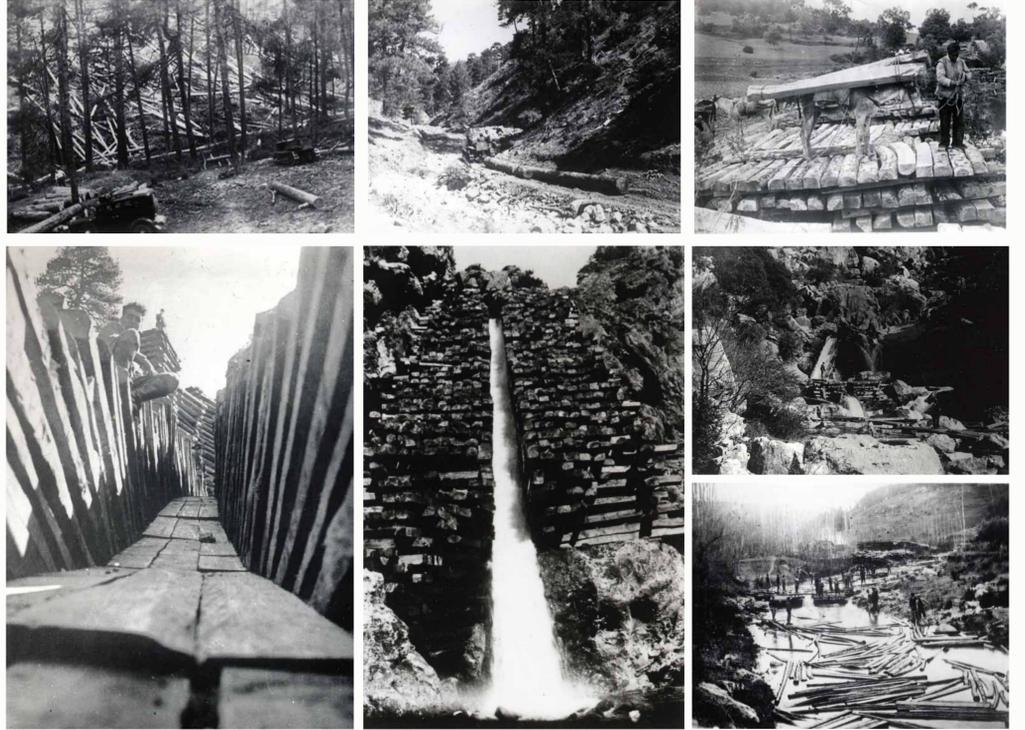


Fig. 2. Transport of logs and processed railroad beams in the mid-20th century from high up in the Cazorla Mountains down to the Guadalquivir river valley (source photos: Archivo Histórico del Museo del Ferrocarril de Madrid - Fundación de los Ferrocarriles Españoles).

## An unexpected find

In December 2010, during the inspection and sampling of roof timbers for dendrochronological research at the *Colegial del Salvador* church in Seville, a series of round holes filled with wooden pegs and twigs was found in several timbers from the dome over the southern transept (Fig. 3). According to literature references, this baroque temple was built from a previous mosque, in the second half of the 17th century, with wood from the Cazorla and Segura Mountains. The holes we found did not appear to be the result of the use of the timbers in a previous building, but instead, they seemed to be related to the assemblage of rafts in some way. The wooden pegs were identified in situ as deciduous oak (*Quercus subg. Quercus*) and samples from the twigs were taken for further wood identification at the laboratory.



Fig. 3. Left to right: outer and inner roof of the dome above the southern transept; oak wooden pegs held by twigs in different beams. Photos: M. Domínguez Delmás and S. van Daalen.

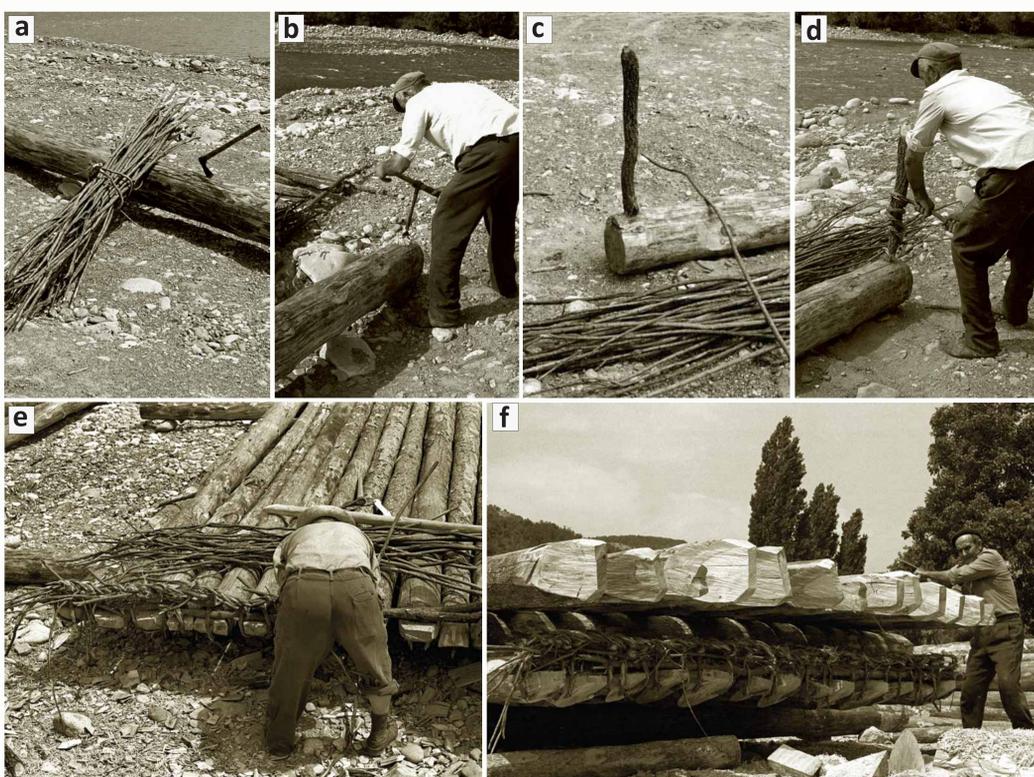


Fig. 4. a) Willow shoots cut in spring; b,c,d) Process of making the willow shoots more flexible in order to use them as rope; e,f) assembling the raft. Photos courtesy of S. Pallaruelo (source: Pallaruelo, S. 2008: Navateros. Edit. Prames, 268 p.).

## The process of assembling a raft explained

The sample of the wooden twig was identified as *Salix sp.* A thorough literature research confirmed that these finds are related to the construction of rafts. It is documented that in the Ebro River (largest river of Spain) rafts were constructed by tying the logs together using willow (*Salix sp.*) twigs or shoots (Fig. 4a). These shoots were collected in spring, when sap flow had already started, and the thin willow branches were easy to bend. To make them yet more flexible, they were stuck by one end with an oak branch or a piece of an oak stem into holes made with borers on some of the timbers (Fig. 4b,c). The oak branch would be pressed deep into the hole to hold the shoot-end and the rest of the shoot would be wrapped around the oak branch to increase its suppleness (Fig. 4d). The flexible shoots would be used to tie the timbers together as shown in Fig. 4e,f. The holes we found containing not only oak bits, but also the willow twigs, are leftovers from this process. The fact that some of the beams were sawn right through the hole implies that the log was processed into its final shape after being used to prepare the willow twigs (probably after the raft was disassembled at its final destination). This is the first evidence ever provided about timber rafting in the Guadalquivir River.