

Elm Losses and their Causes over a 20 Year Period – A long-term Study of *Ulmus* in Saxony, Germany

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The Elm Project in Saxony 1994 – 2000

A comprehensive study of the genus *Ulmus* in the German state of Saxony was begun in the spring of 1994. The objective was to collect sufficient data to make a reliable estimate of the elm populations in the state.

Elm populations and individuals were recorded in the floodplains of three rivers (Elbe, Mulde, Spree). In a total of 134 plots, each covering an area of 20 ha, 559 elms were found: 378 *Ulmus laevis*, 143 *U. glabra*, 34 *U. minor* and 4 *U. x hollandica*. By extrapolation we concluded that between 110,000 and 140,000 individual elms still exist in the state, the majority of them being *U. laevis*. The full report was published in German (Mackenthun 2000a). Some of the findings were described in a series of papers which were presented in English at the conferences in Chicago (Mackenthun 2000b) and in Segovia (Mackenthun 2004).

The Monitoring Program

Within the framework of the large-scale Elm Project, we started a monitoring program involving a total of 52 elms in 15 separate locations across Saxony. The individually monitored trees were visited on six occasions between spring 1994 and autumn 2013, thus covering a timescale of 20 growing seasons.

Losses

During this time 27 trees were lost. Between 1994 and 2000 three elms died; a further 22 died between 2001 and 2008, and another two in 2013. Nearly one half of the losses, 13 cases, were attributed to Dutch Elm Disease (DED). Four elms were lost due to natural factors, such as storm

damage and diseases other than DED. But more than one third of the losses were due to human influence, mainly construction works (10 cases).

Recent Human Activities

Construction work is a major cause of elm losses in Saxony. In the Erzgebirge, a mountain range in the southern parts of the state, a sewage plant was built between 1998 and the year 2000 in the little town of Schlema. All four elms which existed on the site in 1994 fell victim (fig 1).

Along the River Elbe there is a very popular long distance cycling trail called Elberadwanderweg running from Hamburg to Prague. Construction work on that trail as well as an access road to low-lying fields in the floodplain and the building of a waste water management system led to the destruction of a number of elms in the Elbe floodplain near Dresden. But also, DED was and still is active in the area. With the help of aerial photographs from various years we concluded that out of the original five elms two trees died of DED and two more were felled because they stood in the way of the Elberadwanderweg. One multi-stemmed example is still there and it is healthy.

Some 5 km upstream, a major road – the Bundestrasse 6 – was built and four out of five elms there were completely removed. They stood on a slope leading down to the road (fig 2). One tree was cut down to a height of about 1 m above ground and it re-sprouted shortly afterwards. It is still counted as a loss since it is only a ruin of its former self. Within the next couple of decades it may grow into a mature elm again.

Accounting for 10 out of 27 losses over a 20 year period, i.e. more than one third, construction works of various kinds are the second most important factor in the loss of elm trees.

History of Human Activities

A closer look at the history of two floodplain landscapes in Saxony reveals how human activities have always been major factors in the destruction of elm habitats and individual elms.

The region around Dresden is called the Elbe Basin, a geological rift zone 40 km long and 3 to 8 km wide. Originally this was probably a vast riparian oak-elm-hardwood forest stretching from the foothills of the Erzgebirge to lowland Germany. In the 1830s Dresden was the capital of the

Kingdom of Saxony. It had around 65.000 inhabitants and covered an area of 7.1 km² (Stams 1996). The surrounding area of wetlands and marshes was mainly used as pastures and for small scale forestry. Today, the Dresden metropolitan area covers approximately 80 % of the Elbe Basin's 220 km². Thus, it has grown by a factor of 30 over the last 180 years (RAPIS 2013). It is easy to envision how millions of elms would have been lost over the centuries. All in all maybe around 90 % of natural elm habitats in the Elbe Basin were lost before DED reached Saxony. The spread of towns and cities, the construction of roads and railways, further infrastructure and finally agriculture have destroyed vast areas of natural woodlands. This is especially true for floodplains and their riparian oak-elm-hardwood forest. In England, for example, in the Thames Valley not a single original habitat has survived until today (Rackham 1986).



Fig 1: The sewage plant in Schlema, Erzgebirge



Fig 2: The new Bundesstrasse 6 highway near Dresden

The situation looks different in and around Leipzig, the famous trade and fair city in north-western Saxony. The Leipziger Auwald was a floodplain forest originally irrigated by a number of small streams, brooks and rivulets. Again, this was a typical riparian mixed forest of oak, ash, white and field elm (type 91F0 in the EU-Habitats Directive). Woodlands and forests still exist there today running like a green ribbon through the city from the south to the north-west. But the species

composition has changed. They are oak-forests today, as both elm species are mostly gone, with maple rapidly filling the voids. The original floodplain hardwood forest has degraded to a dry variant of oak-hornbeam woodland (type 9160 in the EU-Habitats Directive). The loss of the original wood cover and its elms is due to extensive water regulation which started in medieval times. What was a network of brooks and rivulets became a well-defined system of canals. In the process, regular flooding came to an end and elm succumbed to the competition pressure from less water-adapted woodland species. Today, the landscape is almost entirely man-made. All in all maybe around 90 % of natural elm habitats in the Leipziger Auwald were lost before DED reached Saxony.

It is estimated that another 90 % of the elm population died in two waves of DED (Plachter 1991).

Conclusions

DED remains the major factor in the loss of elm trees today. But, in spite of all efforts to rescue valuable single trees and groves of remaining elms, wilful destruction is the second greatest factor in their losses. As shown in this study, construction work accounts for more than one third of elm losses.

If it is true that 90 % of the original elms were lost in historical times due to human activities and another 90 % succumbed to Dutch elm disease during the 20th century then today's elms represent just 1 % of the primordial population. This indicates how precious they are and that greater efforts need to be made for their conservation.

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