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ENGLISH ELM REGENERATION

by B.J.W. Greig, Forest Pathologist, Research Division, Forestry Authority

Abstract

Following the Dutch elm disease epidemic of the 1970's, there has been prolific regeneration of English elm in many parts of southern England. Up until 1991 there was generally only a low level of disease in these young elms, but over the past two years there has been an upsurge in the disease in some areas. The reasons for this increase- are discussed.

Introduction

1. In the 1970s, Dutch elm disease, caused by the fungus *Ophiostoma novo-ulmi*, killed most of the English elms (*Ulmus procera*) in southern England. However, the root systems survived and produced large numbers of suckers which, in many areas, have become noticeable features in the landscape. These young elms are genetically identical to their parent trees and are therefore vulnerable to re-infection by the disease. Thus Note describes the current status of this regeneration. General information on the biology of the disease can be found in Gibbs, Brasier & Webber (1994).

Elm regeneration

2. English elm rarely, if ever, sets viable seed in Britain and reproduces by means of coppice shoots and root suckers. It may well comprise a single clone, stretching back to its introduction into Britain from mainland Europe during the pre-Roman period.

3. Suckers are stems arising from roots. They can be found some considerable distance from the "parent' tree (up to 50 metres), often invading adjacent open ground. Coppice arises from adventitious buds on the stumps of felled trees. Where diseased trees have been felled promptly, profuse coppice and sucker growth occurs; delayed felling results in sparser growth. The young trees can grow in height at the rate of up to 1m per year.

Disease in the elm regeneration

4. Two mechanisms of infection can be identified:

   i. The fungus surviving in the stump and existing root system can break out to kill the new coppice shoots and suckers. This becomes increasingly less likely with time as the old infections become buried more and more deeply under the healthy wood which is laid down each year.

   ii. The fungus can be reintroduced to a locality on elm bark beetles (*Scolytus* spp.). This can be the result of unaided flight or via the transport of logs with infested bark

5. Once a young tree has been infected, disease transmission through the common root system to other trees can occur. In addition if the affected trees are big enough to allow the beetles to breed in the bark, they can become centres of beetle-borne disease also.

Survival and growth of elm regeneration between 1977 and 1993

6. Some information on the survival of elm regeneration is provided by a series of plots set-up in Surrey and Hampshire and the Severn Valley in 1977. In the first three years almost 15% of the suckers became infected and died. Over the next ten years, however, only about 1 % of the trees were killed annually, and in 1990 almost 80% of the trees were still healthy. By this time many of the oldest suckers were over 15m tall and exceeded 30cm stem diameter at breast height.

7. These data can be explained, at least in part, in terms of a fall in bark beetle populations as suitable breeding material became very scarce in the early 1980's. Some evidence for this decline is provided by counts of feeding wounds made by elm bark beetles on plot trees. In 1978, 3.5% of the twig crotches had recent feeding wounds, but this figure had fallen to less than 1 % by the early 1980s. No feeding wounds were found in any of the plots between 1986 and 1990.

8. Any suckers which were killed in the 1980s were generally too small to provide breeding sites for the large elm bark beetle (*S. scolytus*), and the only successful breeding seen in the plots was by *S. multistriatus*, the small elm bark beetle which has been shown to be a poor vector of the disease (Webber, 1990).

The current situation

9. In 1991 Dutch elm disease first reappeared on a significant scale in the regenerating elms. Two factors were largely responsible: firstly, the hot summers of 1989 and 1990 created favourable conditions for beetle flight and reproduction, and secondly the oldest of the suckers were now large enough to be successfully used for breeding by *S. scolytus*.

10. This situation is illustrated in Fig. 1 which shows the disease levels in the plots during the decade 1984-1993. In some of these plots between one-third to one-half of the suckers have been killed in the past two years mostly as a result of root transmission. All the trees have been felled in a plot in Surrey in which over 90% of the trees were dead.

Figure 1. Percentage of trees with Dutch elm disease in 20 plots of English elm distributed across Southern England

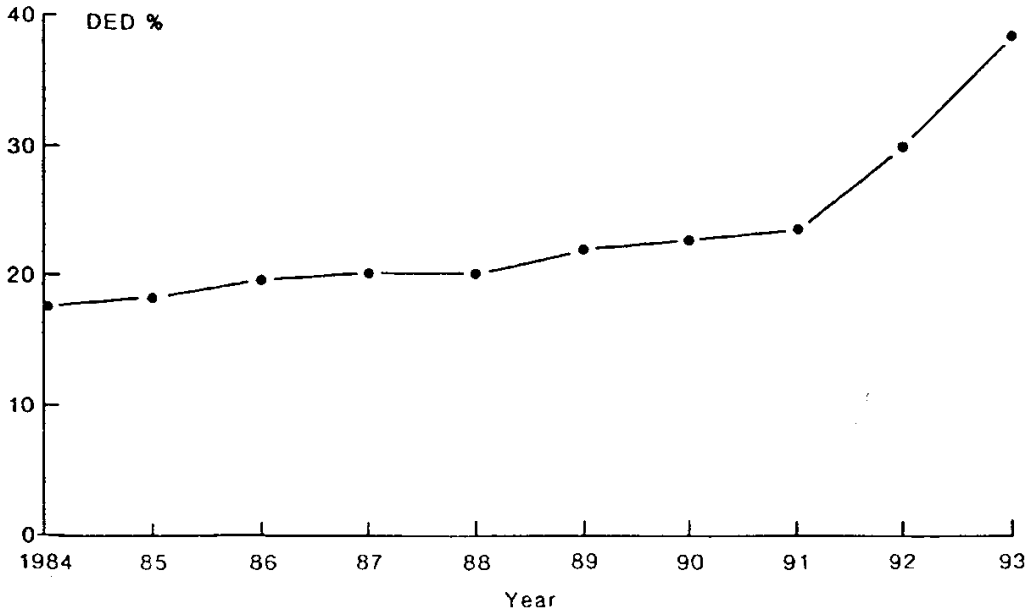

Fig. 2 shows the situation in two of the plots. At Southampton, Dutch elm disease has increased from 30% in 1991 to 79% in 1993, and in a plot in Droitwich, Worcestershire, the level has climbed from 10% to 36% over the same period.

Figure 2. Percentage of trees with Dutch elm disease in 2 plots in Southern England.

11. In some areas there has not yet been an upsurge in the disease. This tends to be the situation in areas with only scattered elm populations.

Conclusions

12. This new wave of Dutch elm disease in the regenerating elms was predicted some years ago (Brasier 1983). Unless some significant change occurs in the pathogenic ability of the fungus itself, for example through the effect of a virus-like disease (see Gibbs, Brasier & Webber, 1994) it seems certain that the English elm population will continue to be subject to periodic waves of infection as new suckers develop and survive for some years before succumbing again to the disease.

13. At present there is no case for spending large amounts of time or money in managing or encouraging elm regeneration. However, when old elm sites are replanted some of the regeneration can be left to provide extra stocking.

References

Brasier, C.M. (1983). The future of Dutch elm disease in Europe. Forestry Commission Bulletin 60. *Research on Dutch elm disease in Europe.* H.M.S.O. London.

Gibbs, J.N., C.M. Brasier and J.F. Webber (1994). The Biology of Dutch elm disease. Research Information. Note No. 252.

Webber, J.F. (1990). Relative effectiveness of Scoyltus scolytus, *S. multistriatus* and S. *kirschi as* vectors of Dutch elm disease. European Journal of Forest Pathology 20 pp. 184-192.

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Arboricultural Advisory & Information Service
Alice Holt Lodge
Farnham
Surrey GU10 4LH

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