

DUTCH ELM DISEASE AND ITS EFFECT ON THE ARBORICULTURE OF A
WESTERN SUBURB OF CORK CITY

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The aim of this article is to study Dutch Elm Disease and to observe how it affected the arboriculture of three study areas within the western suburbs of Cork City. The data was collected during the winter and spring of 1986-87, as part of a wider research project concerning the general treescape of the three study areas. This paper, presents a brief history and synopsis of the disease as well as a short resume of the impact of Dutch Elm on the urban arboriculture of the study areas.

The disease was first identified in Holland in 1919, hence its title "Dutch Elm". However, it had been present in France as early as 1818. Though the disease has attained global notoriety in modern times, Wilkinson (1978) believes that the main pathogen Ceratocystis ulmi originated in Asia. It was recorded in Britain in 1927 and had reached the shores of Baltimore three years later. During the early decades after the Dutch discovery, the disease occurred in localised pulsating attacks. Just as the trees began to recover from one attack, another outbreak would occur. Thus, during the period 1928-37, twenty per cent of Britain's Elms were killed. A similar onslaught hit Belgium between 1930 and 1946 where five million Elm trees were lost. The epidemic attack which emerged in Europe and North America during the 1960s was due to a combination of factors, mainly the emergence of an aggressive strain of ceratocystis ulmi and the increasing quantity of transported diseased Elm logs.

The disease affects all Elms including Chinese Elm which up to recently was thought to be immune. When the pathogens are introduced into an area, they are conducive towards catastrophic epidemics, because when the trees develop in the absence of a pathogen, they have no opportunity to select resistance factors specific against this pathogen. These trees are, therefore, highly susceptible and extremely vulnerable to such an attack. This factor contributes greatly to the dramatic suddenness with which the disease can strike. The first noticeable feature of the disease is a yellowing and wilting in the upper crown during late Spring/early Summer. The once fast-growing twigs curve downwards as they die, forming "Shepherds Crooks". The discoloration spreads to other parts of the tree and, although some

trees may die gradually branch by branch over several years, some may die within a few weeks. The season plays an important role in determining the effect of the disease on a tree. Those infected in late Spring tend to die rapidly while those which develop the disease during late Summer may recover unless re-infected by a succeeding attack. This is due to the inability of the fungus to spread laterally from one annual growth ring to the next.

When the pathogen Ceratocystis ulmi reproduces in dead or dying trees during winter, perithecia develop within which are formed sticky substances known as asci. These are transferred to other trees by bark beetle of which two European and one American species are fundamental in the spread of Dutch Elm Disease. The adult female beetles lay their eggs in larval galleries which have been tunnelled through the bark. If fungus is present in the tree, spores are produced in these tunnels and when the new generation of adult beetles emerge in Spring, they carry thousands of these spores in and on their bodies. The young beetles feed in the crotches of nearby healthy Elms where they eat a small tunnel-like hole and thereby expose the trees vascular tissues. The spores are deposited in the wounded tissues of the tree where they eventually cause a blockage in the water-conducting vessels. These are responsible for the further restriction of the upward flow of sap. The breakdown of the transpiration system results in the wilting and sometimes death of the upper branches. If vascular invasion becomes general, the trees resistance may only last a few weeks. The beetles only feed on living Elms for a few days before the segregation process of the fungus repeats itself. Not alone are the adult beetles inspected, but also all their off-spring and this is an important factor in considering control of the disease. In the years following the discovery of Dutch Elm Disease, the attacks were kept under control by the environment's natural response. Bird populations increased and curtailed the breeding success of the beetles. However, the increasing rate of interaction between infected and healthy areas through increased transportation of Elm logs resulted in the major transcontinental epidemics of Dutch Elm Disease.

The number of control and preventative measures taken in combating Dutch Elm are as numerous and varying as their results. The most effective spray is Methoxychor and although this is lethal to fish, it was considered the safest alternative to D.D.T. which had

severe ramifications on the surrounding landscape, as is seen in Rachel Carson's book Silent Spring.

An original method in attempting to control Dutch Elm was tried in Basildon (England) when species of Austrian wasp which was reputed to be a predator of the beetle's larvae was imported. Unfortunately, such efforts were not successful. Trenching to prevent the disease being passed via the root tapers was another method considered. However, the most practical form of control is by felling. Despite its death, an Elm is still suitable as a breeding ground nearly two years later. Burning the bark and trunk immediately is therefore imperative, otherwise the diseased logs may be transferred into other perhaps non-infected areas. In such a fashion was Dutch Elm Disease introduced into North America fifty-eight years ago.

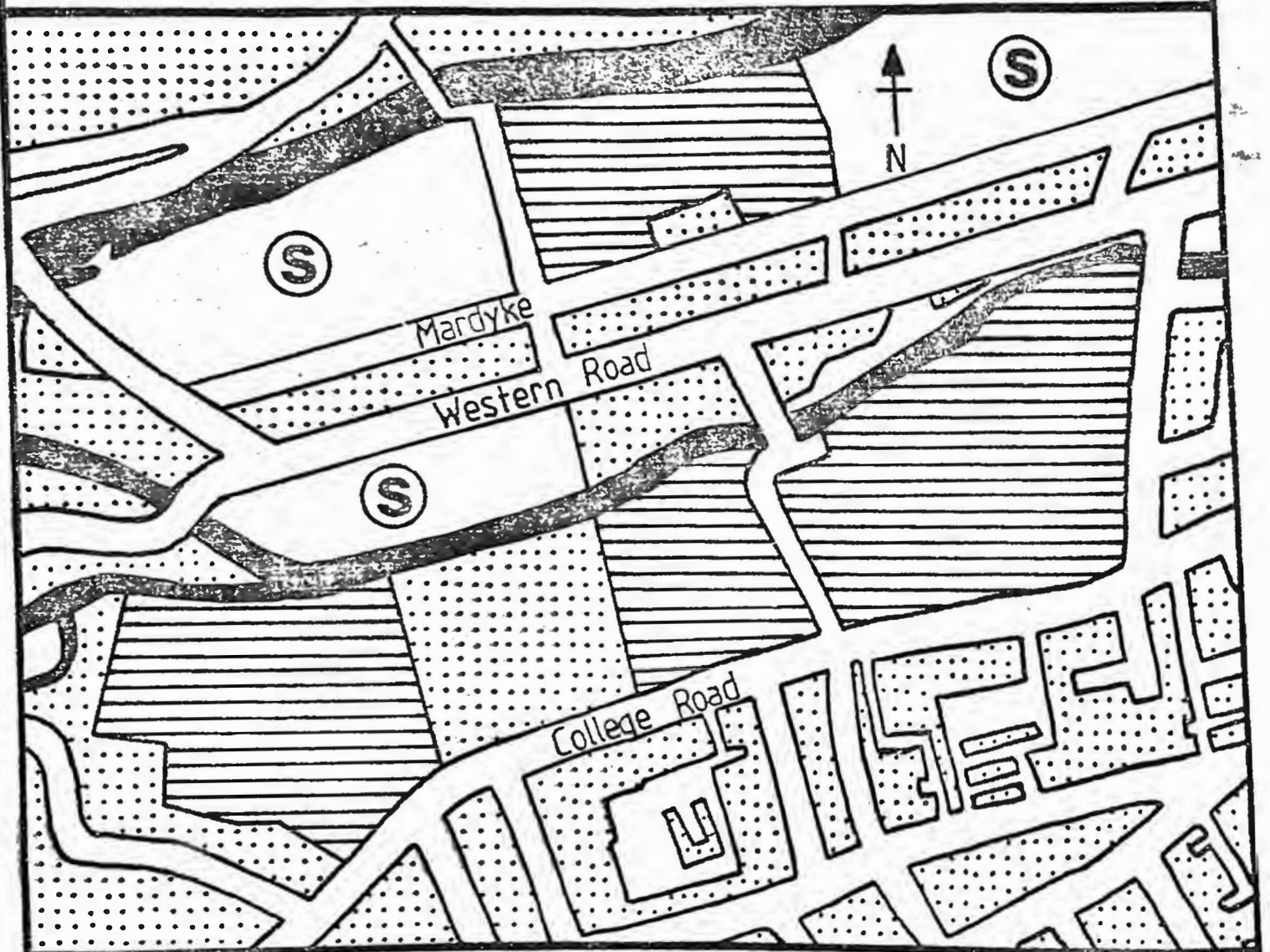
A national survey was conducted by Mangan and Walsh in the late 1970s to examine the occurrence of Dutch Elm Disease in Ireland. The results proved to be quite illuminating as they showed the presence of the aggressive strain of Ceratocystis ulmi. However, in a situation unique to Ireland and Germany, it was found that this strain had two points of origin. In Dublin, the North American strain is prevalent whilst in the Munster area it is the Eurasian race which predominates.

The study areas are all located in a western suburb of Cork city, although very close in proximity, each is an intact entity having a clearly defined boundary. The first area covers the recreational grounds of Fitzgerald Park on the Mardyke Parade. Designed in 1720, it contains a thirteen acre site. The present layout was initiated in the 1940s and exhibits a wonderful collection of both native and exotic trees. To the south lies the University campus, U.C.C., formerly Queen's College, which was built in 1849 and despite several modifications, with the addition of the Science building and Boole Library Complex, there has been a strong emphasis on preserving as many trees as possible. Tree management and maintenance in College is the responsibility of both the gardeners and those in the Planning department. The trees vary in size, shape and colour; having an educational value as well as complementing the landscape planning. The final area selected is situated along College Road. 'Brookfield House' was a former estate owned by Thomas Jennings in the nineteenth century. Several thousand trees were planted by his tenants and these, by law, were recorded in the Cork Registry of Trees. Though the estate has been severely reduced in size since then, many of the trees are still

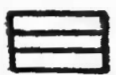
FIGURE 1

1987

LOCATION OF STUDY AREAS



LEGEND



STUDY AREA



RIVER LEE



HOUSING



ROADS



SPORTING FACILITIES

SCALE

0 0.17



miles

alive. Several of the trees are of oriental origin but the overwhelming majority are native species. The area is now considered to be a natural woodland by 'An Taisce' due to its rapid rate of regeneration and is often brought to public attention because of its role as a heronry.

The actual tree population of the study areas is quite considerable; these three areas containing a total of 1025 trees. In the individual areas, Fitzgerald Park contains 235 specimens, U.C.C. a total of 374 trees and 'Brookfield House' 416 trees. The definition of a tree used was that of a plant with a woody trunk and a canopy at least six feet above the ground, (Tyrrell, 1986, pers.com.).

Despite evidence dating from 1846 to as recently as 1972 indicating the presence of several hundred Elms in the study areas, none survive to the present day. Fig.2 shows the recorded number of Elms present around the turn of the century. It does not, however, take into account any regenerated young trees, but simply the numbers that had been planted by then. When conducting this survey, one Elm was alive in the region encompassing the study areas. However, as it became infected during Spring, it was only a matter of weeks before it was dead. In Fitzgerald Park, there is no record of Elms being planted. This is rather surprising as the Mardyke Parade was renowned for its avenues of Elms. In Ferry Walk alongside the western boundary of the Park, there were 20 Elms. It is, therefore, all the more unusual that in a park of 33 species, not one of them should be that of Ulmus campestris, the most common of all Elms. The 1972 survey of trees in U.C.C. reports the presence of 66 Elms. A combination of three factors has resulted in their elimination. According to the gardeners, a particularly bad storm during the Winter of 1973 was responsible for knocking down at least 15 trees. Development of the former Quarry into the Boole Library Complex also led to the demolition of most trees in this general area, and finally Dutch Elm Disease infected the remainder and the survival rate was nil.

Of the 476 Elms planted in the grounds of 'Brookfield House' between 1846-53, and of the numerous regenerated Elms, only the skeletal trunks remain. Within the present boundaries, 50 dead Elms are still standing, while within the former area of the estate, a great majority remain erect despite their death some ten years ago. The fact that they remain standing reflects the public's unawareness of prevention of the spread of Dutch Elm. Unlike the British situation

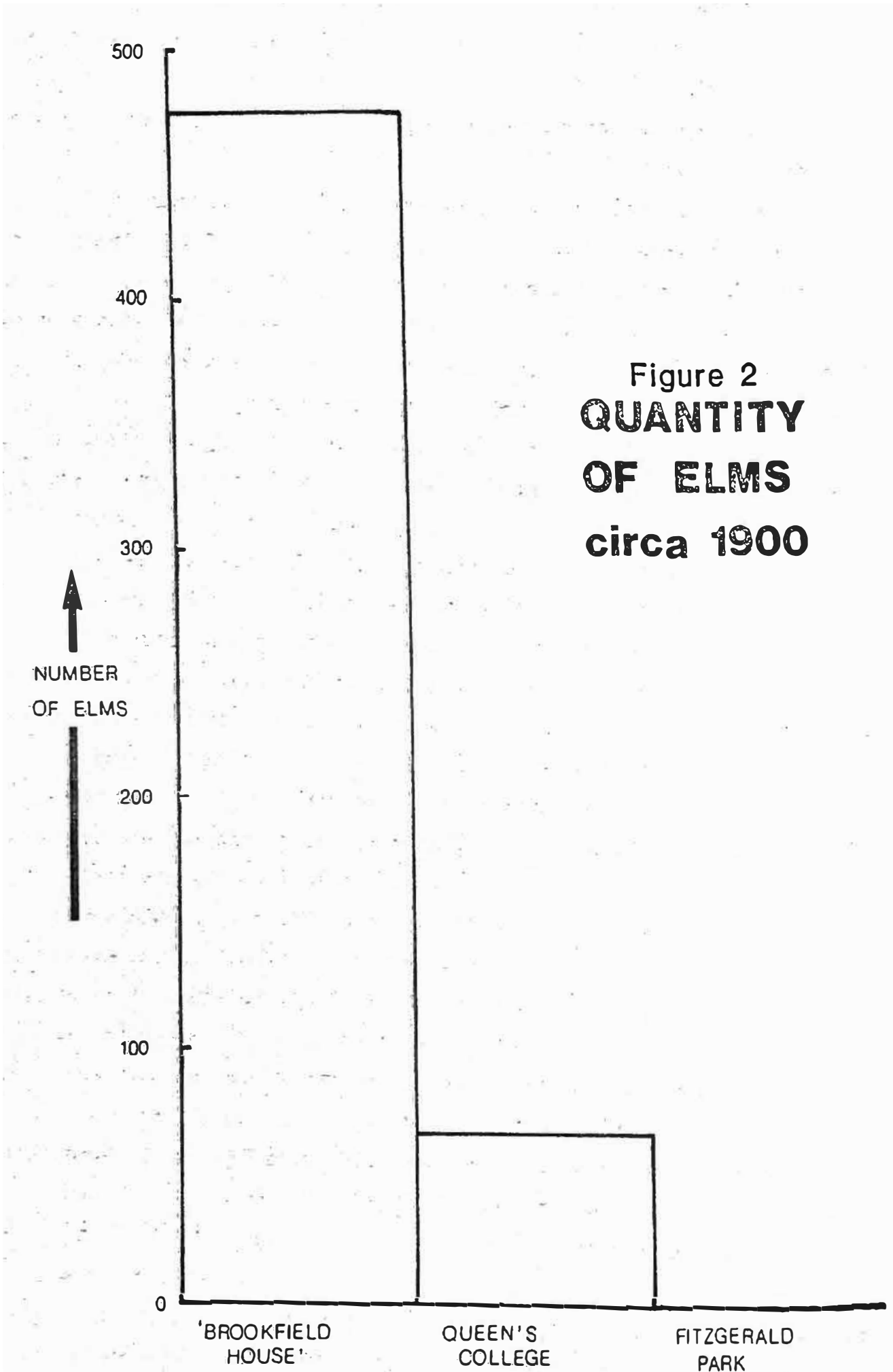


Figure 2
**QUANTITY
OF ELMS
circa 1900**

where dead Elms were of commercial importance, the local timber yard on Western Road never dealt in Elm trading and thus there was no incentive to fell the diseased trees.

In the absence of sufficient resources necessary to carry out experiments to confirm whether the Elms lost in the study areas were of the Eurasian race, but given that the North American strain has not yet been identified in Cork City, it is safe to conclude that these Elms succumbed to the Eurasian pathogen. Noting from other studies that ports and airports played a key role in the spread of the disease, it is likely that this strain entered either Cork or Limerick from the Soviet Union using perhaps air or water or both forms of transportation. The continuous interaction between both cities furthered the provincial diffusion of the disease. Once Dutch Elm Disease was introduced into these areas, the loss was immediate and devastating. Preventative measures were not feasible in 'Brookfield House' due to the expense of control formulas and the vast number of trees. In U.C.C. the reaction to the disease was to replace the barren areas with Chestnuts and Limes.

The study of Dutch Elm disease is important, not alone for control measures but also to prevent widespread fungal epidemics being repeated. At the present time another vascular wilt disease is rapidly establishing itself in North American Oak trees and it is the top Dutch Elm Disease scientists that are heading the investigation. Since Elms qualify as parkland trees, more valuable to the aesthetic landscape rather than of commercial value, replacement trees such as Beech, Lime, Oak and Sycamore are being planted. Although Dutch Elm is often equated with the devastation of vast Elm belts, there are four specimens of semi-resistant Elms available and these are currently being experimented with in the larger parklands of the Irish countryside. The trees that so far have been successful are Ulmus dodoens, groenvald lobel and plantain. If these are successful, perhaps Elms will re-establish themselves in their former numbers. Although the Elms in the study areas succumbed to the fatal fungus, they have been replaced with native species. The impact on the physical arboriculture was devastating but the Elms have been embalmed in the folksongs of the City and are not to be forgotten!

"My heart was as bright as the light wind that blew
Down the Mardyke through each Elm tree"
("On the Banks of my own Lovely Lee")

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