

ENGLAND BEFORE AND AFTER THE HURRICANE OF 1987¹

by Andrew William Graham, Jr.

Abstract. The October 1986 hurricane that struck southern England was the first of its magnitude since 1703. Extensive destruction and damage occurred to numerous old trees in forests and gardens. Morris Arboretum arborists traveled from Philadelphia to Sussex County, England to help the staff of Wakehurst Place (an outpost of Royal Botanic Garden, Kew) restore their garden. While there we observed damage patterns, and tree species wind tolerance while noting significance tree losses to the scientific collections and garden landscapes. The Royal Botanic Garden's data collection forms may prove useful to American arborists in collecting and analyzing storm damage data. The Morris Arboretum team cleared debris from a winter interest garden, removed overhead hazards from a half mile of walking paths, and made life-long friends of grateful Wakehurst staff.

Résumé. L' ouragan d'octobre 1986 qui a frappé le sud de l'Angleterre était le premier d'une telle ampleur depuis 1703. Une destruction et des dommages considérables se rencontraient sur de nombreux vieux arbres dans les forêts et les jardins. Les arboriculteurs du Morris Arboretum se déplacèrent de Philadelphia vers le Sussex en Angleterre pour aider le personnel de Wakehurst Place (un avant-poste du Royal Botanic Garden de Kew) à remettre en état leur jardin. Là-bas, tandis que nous observions les patrons des dommages et les espèces d'arbres tolérantes aux dommages par le vent, nous notions l'importance des pertes en arbres pour la collection scientifique et les jardins ornementaux. Les données, sous forme de collections, du Royal Botanic Garden peuvent s'avérer utiles aux arboriculteurs américains pour la collecte et l'analyse de données sur les dommages par les tempêtes. L'équipe du Morris Arboretum enlevèrent des décombres d'un jardin d'hiver d'intérêt, éliminèrent les dangers aériens d'un demi mile de sentiers de marche et se firent des amis de toujours du personnel reconnaissant de Wakehurst.

When hurricane winds in excess of 100 mph came ashore in southern England at approximately 3 a.m. on October 16, 1987, they caught the British completely off guard. These severe winds were the first of this magnitude to challenge the strength of England's magnificent old trees since the channel storm of 1703. Although twenty-one hurricanes were spawned in the Atlantic Ocean in 1987, until that October, England had been spared. In the absence of severe winds, many British forest and landscape trees had reached a stage of over-maturity that made them particularly vulnerable. Fifteen million trees were lost to the

storm throughout England.

This article contains observations of tree damage from the hurricane and describes an unusual offer of aid from an eastern North American arboretum, the Morris Arboretum of the University of Pennsylvania, to its wind-blown British counterpart, The Royal Botanic Garden—Wakehurst Place. This "hands-across-the-sea" effort was important because of the severe damage to a cherished old garden and a scientifically significant tree and shrub collection, and because of the Royal Botanic Garden's remarkable effort to glean scientific information from the tree wreckage.

The storm's broad destructive wake swept from the English Channel through the English counties of Hampshire, Sussex (where Wakehurst Place is located), Kent, Surrey, London, Essex, and Hertfordshire. The windward coastal areas of Hampshire and Kent sustained the greatest damage. London, inland and leeward of the Hampshire and Kentish coast, sustained substantial damage: its public transportation system was shut down and stock market trading was suspended.

Despite only a brief report on American TV, news of the tragic loss of tree specimens at the Royal Botanic Gardens at Kew spread across the Atlantic to the Morris Arboretum. Here the staff learned that five hundred specimen trees were destroyed and another five hundred were severely damaged. This misfortune of a sister institution prompted our director, Dr. William Klein, to call the director of the Royal Botanic Garden at Kew, Dr. Arthur Bell, to offer support. Klein, aware of the shortage of specialist arborists to conserve specimen trees, volunteered the assistance of four Arboretum staff members to travel to England to assist in their clean-up and restoration effort. Richard Orth, chief arborist; Doug Soliday, arborist; Stephen Emery, arborist intern; and I comprised the Morris Arboretum arborist team. "We simply had to help," Klein said. "A Botanic garden

1. Presented at the annual conference of the International Society of Arboriculture in St. Charles, Illinois 1989.

like Kew is similar to a great museum or library. The trees are like basic scientific documents, living manuscripts."

Responding to our offer of assistance, John B.E. Simmons, curator at the Botanic Gardens, wrote: "The main problem is acquiring skilled arborists who can work intelligently and safely amongst a botanical collection. It is good to know that we have such good friends whose common commitment can reach across cultural and geographic divides." Anthony D. Schilling, deputy curator of Wakehurst Place, also expressed his appreciation: "It goes without stating that we are both flattered and pleased by your tremendous empathy regarding this tragedy to the Gardens, and it is all the more obvious that the words 'thank you' are quite inadequate at such times. Hands across the sea has taken on a whole new meaning."

With donations from SmithKline Consumer Products, the Pennsylvania Horticultural Society, and the Massachusetts Horticultural Society, we boarded a plane from Philadelphia to London on November 13th with plans to return on November 24th. Wakehurst Place arranged meals and lodging at the quaint Ardingly Inn located a mile from the Wakehurst Place's entry gates.

Wakehurst is a scientific, conservation, and research outpost of the Royal Botanic Gardens located south of London in West Sussex County with approximately 2,000 acres under management. I spent two weeks there as part of a nine week study tour of British gardens in 1986. Formerly, Wakehurst Place had been the home of the Loder family, avid azalea and rhododendron collectors and breeders. A National Trust Property since 1963, it was brought under the Royal Botanic Garden's management in 1965. The Royal Botanic Garden recognized both the advantages of the site's favorable climate and the significance of the nucleus rhododendron collection and established garden setting.

A series of garden and collection areas are concentrated at Wakehurst under the high shade of a mixed European beech (*Fagus sylvatica*) and English oak (*Quercus robur*) forest in a deep, crescent-shaped valley formed by two small brooks. The formal, walled Sir Henry Price Memorial Garden (named for a former owner) features perennials and herbs. The Mansion Pond

is a masterpiece reflecting weeping thread-leaf Japanese maples (*Acer palmatum dissectum* var. *atropurpureum*), rhododendrons, and the Manor House. Water and groundcover plants are skillfully combined in several small gardens emphasizing foliage texture and flower color. My favorite area is a bog garden displaying Japanese primroses and other wet soil plants. A winter interest garden, heather garden, and pinetum are other garden collections. Miles of paths and woodland trails follow and criss-cross the stream valleys among the azaleas and rhododendrons.

Damage Observations

Nothing could have prepared us for our first glance at the damaged garden scenes. Along both roadsides near the Wakehurst entrance lay logs, branch wood, and brush from what had been once a splendid alley of European beech. At the maintenance road entrance, a spruce log lay across the middle of a gardener's sports car, bending both roof and carriage frame.

Reeling from these dramatic scenes, we surveyed the groomed lawns and gardens near the Manor House. Huge tree trunks, many already stripped of brush and branch wood, lay where they had fallen. A downed Coast redwood (*Sequoia sempervirens*) measured over six feet in diameter. The Mansion Pond was filled with toppled trees. Entire canopies of upper story growth lay crushing plants beneath them that had previously thrived under their sun filtering protection. Approximately fifty percent of the trees around the mansion were destroyed. Of the standing trees, most were badly damaged and many were essentially worthless.

In forestry, trees are said to be over-mature when the wood quality declines due to defects and insect attack. In landscapes, concern about over-maturity has to do with the effect of wood quality on the tree's vulnerability to breakage. Tree over-maturity not only increases susceptibility to storm related damage, but also increases the amount of labor needed to remove debris. More work is required to cut and haul brush from expansive crowns, and wood from heavy trunks and scaffold limbs.

The hurricane damaged trees in a variety of ways. With soil waterlogged after weeks of rain and with the addition of the storm's downpours, a

majority of trees were easily uprooted (Fig. 1). In many instances, wind acted as a trigger on tree faults and weak areas such as decay spots and v-shaped limb crotches. Trees who challenged the storm suffered the worst. Twisted and torn limbs hung limply against the trunks of those whose roots and trunks held fast. English oak, a tree reputed for its wood strength, held tenaciously to its splintered, decay-free limbs with a few stringy wood fibers.

Ocean salt spray, blown over eighteen miles, damaged broad-leaf evergreens such as the Chilean firebush (*Embothrium coccineum*) which I had photographed in glorious scarlet profusion in June of 1986. Many of the largest specimen trees were destroyed or severely damaged. A three-foot-diameter Scots pine (*Pinus sylvestris*), the largest in the collection, was lost. Many other unusual trees, such as a Monkey puzzle tree (*Araucaria araucana*) succumbed. Identified by the attached label, a six-inch-diameter rhododendron log, near the Horticultural Offices, was a painful reminder that important old plants of scientific value were lost. For me, the broken stump of a sweet gum (*Liquidambar styraciflua*) a Philadelphia area native plant, was a grim boyhood reminder of Hurricane Hazel which had caused widespread damage in my hometown in October 1954.

Many Coast redwoods fell, including the second tallest tree in Wakehurst's collection reaching about 137 feet tall. The tallest tree, a giant fir (*Abies grandis*), lay beside it. Coast redwoods and giant sequoia (*Sequoiadendron giganteum*) are found frequently in gardens throughout Britain. Many North American plants from the Pacific Northwest grow well in Great Britain because of the similar climate. Giant sequoias through the collection withstood the wind, apparently well adapted to high winds. Only one lodged over onto its neighbor. Some retained a slight bend, evidence of their struggle against the fierce wind.

Wind damaged individuals and groups of trees in interesting patterns. One area's mixed hardwood species appeared as though cleared for a major road right of way, while the same species stood in adjacent areas unscathed. Winds, skipping across the top of a deep stream valley, topped all the trees thirty feet above the ground. In some places, five acre patches of forest were blown flat.



Figure 1. Three views of storm damage and damage clean up at Wakehurst Place. Photos by the Royal Botanic Garden.

We found several cable installations in trees which remained intact, presumably due to the cable. In other instances, a cable protected a crotch, but the tree failed lower on the trunk. These observations support use of cables to protect weak branch crotches.

Clean-up Efforts Begin

At Wakehurst, the staff had worked feverishly and had accomplished a tremendous amount during the month before our arrival. It had taken three days just to slash through debris from the public road into the maintenance storage buildings. Most fallen trees near the Manor House had been already stripped of brush and limb wood.

Staff morale was surprisingly good as they had begun to accept the reality of the event. In proper British style and determination, the Royal Botanic Garden staff at both Kew and Wakehurst Place were making the best of things. Already they looked to the future and were eager to begin replanting. Areas where woodlands once stood, were now viewed as sites for planting more extensive and diverse tree collections. Some gaps, left by fallen trees, were seen as opportunities to plant trees more appropriate to a landscape theme. Tony Schilling pointed out, "We are going to end up with views that even in our wildest management dreams we would not have had the guts to do."

At Wakehurst and throughout the local communities devastated by the storm, chainsaws were at a premium. In one community, local police broke the lock on a chainsaw distributor's door and commandeered chainsaws in the Public interest to facilitate road clearing. Chainsaw accidents were commonplace as the inexperienced and the uninitiated took cleaning up into their own hands. Hospitals had treated literally hundreds of hurricane clean-up related injuries.

Disposing of tree debris was a major problem. Local governments designated public disposal sites where huge bonfires blazed continuously during the month before our arrival and, no doubt, for many months after our departure. Such a burn-site was designated adjacent to Wakehurst Place. Public crews and contractors primarily used this site. The fire brightened the darkening sky each evening on our return to our lodging. Once, we stopped to watch a hydraulically controlled

machine heap brush and wood upon the fire and send showers of bright embers skyward.

Removing and hauling whole stumps with roots not only compounded clean-up problems but proved a troublesome disposal problem, as their massive size and mud-covered roots resisted burning. As we passed by one evening, a "Danger Explosives" sign announced a Corp of Engineers attempt to reduce stump size and shake loose fire retardant mud.

The Wakehurst Place supervisory staff considered selling salvaged logs as a way to reduce staff effort and to fund the clean-up. Unfortunately, salvage logs were worth very little in the glutted local markets.

At Kew, the Royal Botanic Garden research staff were quickly gathering root and trunk samples for scientific study of mycorrhizae associations and root diseases. This was an unusual opportunity to study tree root systems, which are normally difficult to study and hard to sample. Differences in thickness of annual growth rings measured from trunk cross-sections may correlate with episodes of air pollution, and climate changes. The Royal Botanic Garden scientists soon designed a storm survey form to analyze damage and map out each species root type. These were widely circulated to tree companies, public gardens, and scientists to increase the size of the data base.

Arborist Team Accomplishments

Our first task was to take down the wreckage of two large Atlas cedars (*Cedrus atlantica*) to create additional planting spaces in the winter interest garden beneath them. Size proved deceiving when growth ring counts established that the two-foot diameter and the five-foot diameter trees were approximately the same age.

Rigging, lowering, and felling took one day for the smaller tree and three days for the larger. We carefully derricked all branches and limbwood over the top of the winter garden beds and lowered them by ropes onto planking laid upon the manicured bentgrass lawn to prevent soil compaction and divots. A 36-inch chainsaw bar was needed to cut through the larger leaders before it was possible to swing the log pieces, weighing up to a ton and a half, onto the planks with a new inch-and-a-quarter polypropylene bull rope.

Chippers and heavy-duty flatbed trucks with hydraulic log loading cranes were unavailable at Wakehurst and were considered unfeasible on the bentgrass type lawns near the Manor House. Work proceeded slowly since all the brush and wood had to be transported to bonfires with small golfcart-size utility carts by the gardening staff. Brush had to be cut to cart length and wood to fireplace length. The thicker wood had to be hand split to a liftable weight.

The slow work of rigging and lowering seldom required more than a climber and a groundman, and allowed the other two men time to limb, buck, prune, and tidy-up fallen trees and debris from the entire winter garden. Miraculously, some trees in the area survived the winds without substantial damage. Doug Soliday target pruned broken branch stubs from one European beech. This important tree should recover to enhance the garden.

During the clean-up efforts, Wakehurst Place administrative staff vowed to keep the garden open to the public. Their staff installed miles of safety limit ropes along both sides of paths and trails after they were cleared of debris and overhead hazards. Morris Arboretum arborists removed hazards from more than ½ mile of trail during the remaining 2½ workdays. Throw weights, with 1/8 inch chainsaw starter cord attached, were used to dislodge many small hangers. Some larger hangers were dislodged by using the throw-line to place stronger ropes capable of withstanding more pulling force. Throw weights not only saved time and energy but provided useful work during turns as groundman. Although our priority was trail safety, we frequently removed deadwood and broken stubs from the entire tree.

All members of our arborist team were experienced climbers, therefore, we were adaptable to various storm damage clean-up situations. Each person climbed for a day, or a portion of a day, during the cedar removals. During path clearing, three men climbed while the fourth was groundman. After a climber finished his tree, he then took a turn as groundman until relieved by the next climber.

British Arboricultural Equipment and Techniques

At Wakehurst, we made use of the French manufactured, hand operated, portable Tirfor LTD winch. There are several models designed for pulling capacities from 500 to 5,000 kilograms (½ ton up to 5½ tons). The construction and design allowed several winches to be used in series to increase the pulling force beyond the capacities of single units. The winch body is first anchored, then one end of a high tensile strength winch cable is threaded into it. The load is secured to the other cable end before using a long handle and a jacking action to pull cable through the winch.

The Tirfor winch was effectively used to pull free the entire European beech top that had lodged between its stub and a neighboring oak. From the ground, we set a bull rope safely and efficiently around the base of the 18-inch diameter top with use of a throw ball. The mechanical advantage gained through the Tirfor winch enabled Steve alone to pull the entire top from its mooring. To our amazement, all the hangers fell free making it unnecessary to climb. These winches would be a useful addition to any American tree service's tool set.

Wakehurst's arborist crew's climbing method is unique in both Great Britain and the U.S. They use mountain climbing ascenders; nine millimeter, dynamic, kern-mantle rope; and full-body, mountain climbing harness with a high attachment point. In the United States, I have witnessed ascenders used to climb into the tree top where they are traded for the conventional prussik or tautline hitch. The Wakehurst crew uses ascenders for both ascending and descending. Descending is awkward, but with practice, their arborists have become surprisingly efficient. A throw weight is used to fetch the climbing rope through a substantial tree top branch crotch with a long arching throw from the outside of the tree canopy. The rope is then tied around the tree trunk and the free end is climbed with use of the ascenders. Pruning is accomplished both during ascent and descent.

Aerial rescue is easy with this ascender climbing system. From the ground, another rope or the climber's own rope is tied onto the trunk-anchored end before lowering the injured climber. This aerial rescue method is the great advantage of this climbing system over conventional climbing methods. Even so, ascenders are designed for going up and descending is difficult, while the

prussic and tautline hitches are designed for going down and ascending is difficult.

Conclusion

Our visit created quite a stir with the British Press. Several BBC TV news programs as well as newspapers and magazines covered our visit. Daily, photographers snapped pictures and reporters asked questions. Newspapers headlined, "The Yanks Come to the Rescue". We felt embarrassed by the media's attention. We considered our efforts to be a natural helping hand gesture to our arborist friends in need at a sister botanical institution.

Through our efforts and Wakehurst staff support, we helped make the winter garden area presentable. Once again it is a garden that their staff can take pride in, although it is changed without the large old trees. Staff pride in the garden is significant when you consider that they had worked full time and with many overtime hours since the storm a month earlier.

Much has happened since the Morris team worked at Wakehurst Place. In the short time between our visit and that of a Longwood Gardens crew (from Kennett Square, Pennsylvania) in March 1988, the area around the mansion site was cleared of fallen trees. Work continued in ever-widening circles from the mansion. Better equipment has been procured so that the cleanup is more efficient. Nevertheless, estimates range from two to three years to complete the debris clean-up.

For our crew the most satisfying accomplishment was making life-long friends, and enjoying comradeship that comes from working side-by-side in a common endeavor.

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ABSTRACT

FLEMER, WILLIAM III. 1989. **Correcting pruning mistakes.** *Grounds Maintenance* 24(6):10-12, 13, 16, 20-21.

Too many grounds managers and landscape maintenance firms *inherit* trees and shrubs that have been improperly pruned by their predecessors. Ideally, plantings should be designed so that remedial pruning can be kept at a minimum. Some problems with ill-tended landscape plantings can be corrected and some cannot. Whether better pruning will be effective depends upon the kind of plant that is in bad condition. Deciduous trees and shrubs regenerate much more quickly than broadleaf evergreens and, in most cases, they look quite presentable after the first season's growth following a severe pruning. There are borderline cases when it is hard to decide whether a big old tree should be cut back and shaped, or felled and replaced with a younger tree. There are no hard-and-fast rules. It depends on the condition of the tree. One of the most common shrub pruning mistakes is cutting them into globe or umbrella shapes with hedge shears. If long-time poor pruning has created ornamental shapes that are expensive to maintain, the best solution is to cut deciduous shrubs to the ground, leaving 4-in. stubs from which new canes can regenerate.