Trees in focus

APN 10

Arboricultural Practice Notes

Ivy - Boon or Bane?

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Summary

Common Ivy, a native evergreen climber, has many detractors who believe that it is spreading through the British countryside and killing increasing numbers of trees. What is the evidence to support these allegations? This Note reviews the status of Ivy in the British landscape and highlights a need for objective information.

Introduction

Common ivy (*Hedera helix*) is the only evergreen shrub native to Britain that will both trail over great distances and, provided it can find a suitable support, climb to considerable heights. It occurs throughout Britain in woodlands and hedgerows where it can have a significant effect on the landscape. It is also indigenous to Europe, North Africa and Asia (Rose 1996). Although not native to North America *H. helix* is recorded as being present since 1731, and it has become coveted as an ornamental house and garden plant.

The appearance of walls, buildings and trees clothed with Ivy makes this shrub one of the most readily recognised plants in the British landscape. However, not everybody sees an attraction in the native Ivy; to some people an Ivy-clad tree is an anathema. But what is its significance and how should it be managed?

Characteristics of Ivy

Common Ivy is a broadleaved species that has two distinct types of foliage. The prolonged juvenile stage of growth, that may persist for decades, is followed by development of distinct flowering (adult) branches. Until 1750, the two stages were regarded as separate species of plant - the creeping/climbing barren ivy *Hedera helix*, and the non-climbing berried ivy *Hedera arborea corymbosa* (Threlkeld 1726).

Fig. 1

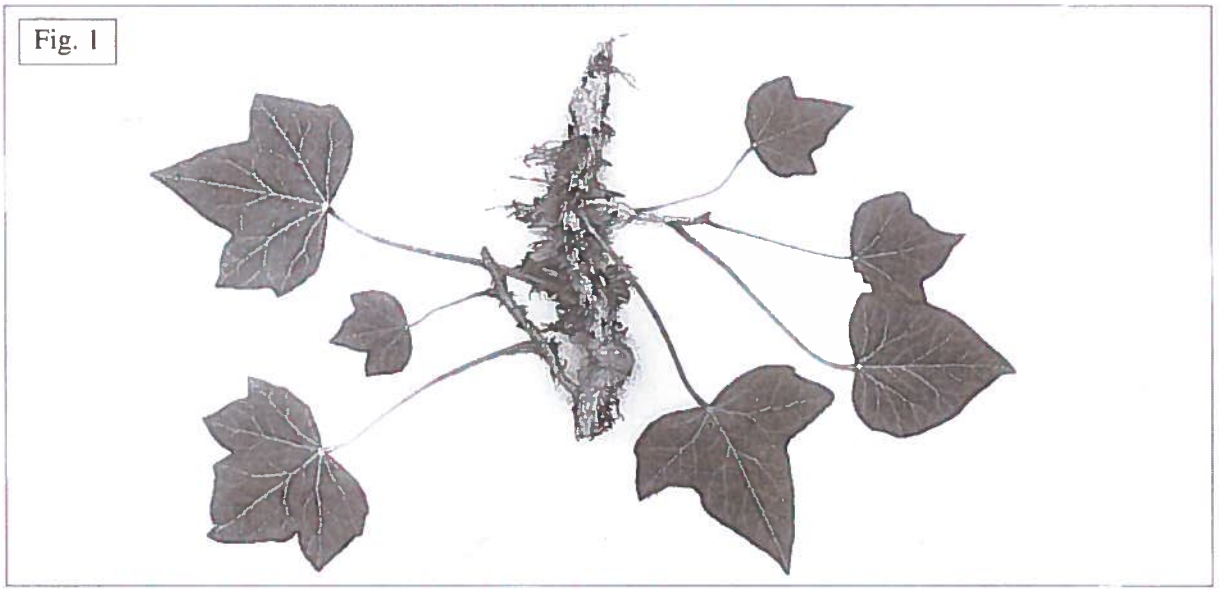

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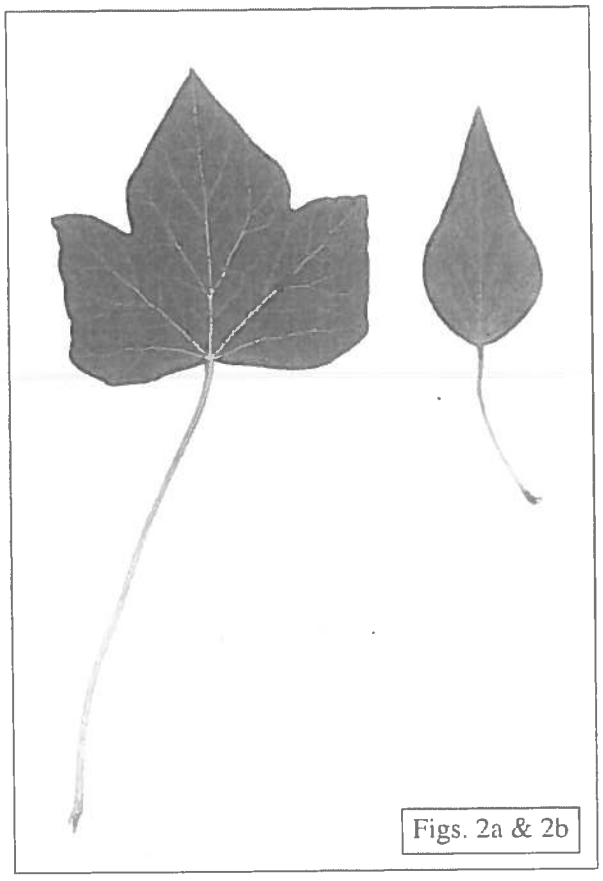
Table 1 Characteristics of Ivy shoots.

Characteristic	Shoot Type	
	Juvenile	**Adult/Reproductive**
Shoot habit	Trail or climb	Erect, free standing
Leaves - on climbing shoots	Deeply lobed - up to 5 lobes (Figure 2)	Lanceolate to ovate with wavy edge (Figure 2b)
Leaves - on trailing shoots	Large shallowly lobed (Figure 2a)	
Petiole length - climbing shoots	Variable	Equal to leaf blade length to very short
Petiole length - trailing shoots	2 x leaf blade length	
Arrangement of leaves on the shoot	Alternate	Spiral
Veination	Net	Semi parallel



Figs. 2a & 2b

The shoots of Ivy bear either lobed leaves (juvenile shoots) or non-lobed leaves (adult/reproductive shoots). The characteristics of the two types of shoot and their leaves are given in table 1 (Plates 1 and 2).

Ivy leaves are alternate, spirally arranged, simple, thick leathery and evergreen. Those of trailing or immature shoots are ovate to triangular and variously three to five lobed. The veins are often lighter in colour than the interveinal areas (fig 2a). The leaves of the bushy, erect mature shoots are entire, occasionally with wavy margins and they are more narrowly ovate in shape (fig 2b).

The subspecies Common Ivy - *Hedera helix* ssp. *helix* and Atlantic Ivy - *Hedera helix* ssp. *hibernica* are differentiated by the size and depth of lobing on the leaves of trailing shoots and the appearance of the stellate hairs on the leaves and young stems. Ssp. *helix* tends to have smaller leaves with deeper lobing than ssp. *hibernica*.

Ivy is adapted to growing in low light intensities where juvenile leaves are produced which lie in one plane facing the light. These, juvenile leaves are dark, glossy green above with distinct very pale veins. The undersides are paler and not glossy. Where juvenile foliage is in full light it often has a purplish or crimson tint because there are fewer chloroplasts (plant cells containing chlorophyll) present.

Erect, free standing flowering (adult) branches develop only in full light and these branches cannot revert to a juvenile form. Growth of flowering branches is slow but continues for many years - usually until the plant becomes so dense and heavy that it falls over or its support collapses under the weight of Ivy foliage. This occurs particularly when there is a strong wind or snow.

When young shoots are growing in full light the bark is olive-brown, while shoots that are shaded have bright green bark. As the shoots grow and thicken, with age, the bark becomes silvery grey with a hint of yellowish brown. Young stems are brittle, but with increasing thickness they become more woody, with finely and

evenly fissured bark.

Young shoots produce groups of root-like growths along their length. These occur mainly on the shaded side of the Ivy shoot and they persist as the shoot grows in diameter (Plates 3 and 4). On shoots that trail along the ground these growths, particularly those occurring at a node, penetrate into the soil so that the plant becomes layered. Water and nutrients can then be absorbed from the soil by them, that is they function like normal roots.

Where shoots climb the root-like growths have an anchoring role only - they do not absorb either moisture or nutrients from the substrate to which they are attached. When growing up trees, the 'holdfast' roots adhere only to the dead outer bark and the ivy shoot does not have contact with the phloem (the tissue conducting synthesised products from the host's leaves to its roots); nor does it exert a direct physical pressure on the cambium (the layer of cells responsible for the increase in trunk and branch diameter growth) of the supporting tree. Ivy is able to maintain a position on the outside of the host tree because the holdfast roots grow basally rather than at their tips. As a result they are always associated with the outer dead bark of the host.

Ivy flowers only when the mean temperature of the warmest month is greater than 13°C and that of the coldest month remains higher than -1.5°C. (Rose, 1996). The flowers, which are generally produced in the autumn (October/November), consist of more or less spherical branched heads (umbels) of up to 25 florets each of which is about 30mm diameter. The florets are hermaphrodite and have yellowish green petals; the base of each is richly supplied with nectar.

Ripe berries, are commonly dull, inky black, and 4 - 7mm diameter (Plate 5). However, in *H. helix* f. *poetarum* and *H. nepalensis* the berries are a dull orange. Each berry contains up to five seeds.

Ivy seedlings, which have two pale yellow green, spear shaped first leaves, will be familiar to gardeners but Ivy aficionados usually exploit the ease with which Ivies can be rooted from cuttings.

Distribution of Ivy

Ivy may be found throughout Britain where it appears to find the moist and insular climate much to its liking (Rose 1996). It will grow to an altitude of about 600m above sea level in a range of situations on all but the most acid, very dry and waterlogged soils.

Its natural habitat is shady woodlands where it trails over the ground and climbs up trees, whether they are dead or alive, and outwards along branches towards the light. Tansley, (1968) records "*Ivy (Hedera helix) is just as common* [in a beech wood on shallow chalk soils] *as in oakwoods, either climbing the trees or creeping on the ground, where it may be locally dominant in the field layer.*"

The presence of Ivy on a site has been suggested as an indicator of the status of a woodland. For example "*.....an abundance of ivy in the field layer of an Oak wood* [succession on abandoned land] *seems to indicate a recently created woodland.*" (Steele 1974).

Ivy appears to grow equally well over rocks, buildings and preservative treated transmission poles (Plate 6).

Conservation Benefits of Ivy

As ground-cover Ivy is very effective in protecting the woodland floor from much snow cover and hard frost is generally unable to penetrate to the soil, so enabling ground foraging birds (e.g. blackbirds, thrushes, robins and dunnocks) to continue to feed. Ivy also provides a habitat for small mammals (e.g. voles). However, the dense shade cast by Ivy's persistent leaves prevents full development of many woodland herbaceous species of flowering plants.

Ivy stems, whether on walls, rocks or tree trunks and branches, provide nesting opportunities for a wide range of birds (e.g. tree creeper, wren and spotted fly catcher, blackbird, song-thrush, dunnock and robin). Tawny owls and numerous other woodland birds find sheltered roosting sites among Ivy foliage.

With Ivy flowering in autumn, developing fruits are generally present throughout the winter. In March/April the berries are ripe and, because of their high fat content, are amongst the most nutritious of any wild fruit in Britain. They are eaten by many species of birds (e.g. woodpigeon, starling, resident and migrant thrushes and newly arrived summer migrants such as blackcap) (Snow and Snow 1988). Birds are also the major dispersers of Ivy seeds, which may germinate more easily after having been subjected to the digestive processes within a bird.

On warm autumn days the last foraging bees - both honey and bumble bees - wasps and a host of fly species

are attracted to the abundant nectar and pollen of Ivy flowers. Butterflies, clusterflies and many other insects find safe dry places among Ivy stems and foliage in which to hibernate.

Ivy leaves and berries are eaten by larvae of the Holly blue butterfly.

Herbivorous animals, notably cattle, sheep, deer and horses, will browse Ivy foliage in hard winter weather. For example "*They* [Muntjac deer] *feed mainly on ivy, bramble and grasses but they will browse on hardwood seedlings.*" (Corbet G.C. 1974). "*Some archaeologists have suggested that* [Ivy] *was winter fodder used to feed penned , semi-domestic animals.*" (Rose, 1996).

However, there do not appear to be instances where the bark has been stripped by large, herbivorous mammals. Browsing is usually restricted to the foliage of the plant and can be followed by new growth from the shoots.

The Significance of Ivy for its support

To many people, trees with Ivy stems cladding their boles and blankets of evergreen foliage in their crowns look untidy and threatened (Plate 7). This is particularly the case if the tree is a specimen in a lawn or garden, but Ivy growing in hedgerow trees can generate equal passion and concern. To other people, Ivy can be visually attractive, while conservationists consider the Ivy, whether on trees or buildings, positively as a valuable habitat.

A dislike of Ivy on trees has roots in history. Theophrastus wrote "*If Ivy grows up on trees, then it does damage to them by sucking on them. Occasionally it grows to tree-like dimensions but rarely grows up by itself; but rather grows on another trunk or on walls for which by its nature puts out roots between its leaves by means of which it clings. If it is then chopped off below it can yet continue to live by means of the roots clinging to a tree or wall*" (quoted by Rose 1996).

Even in the mid twentieth century Tansley (1968) wrote " *Ivy climbs by means of adhesive roots and thus needs a broad surface to climb on, such as a rock or the trunk of a tree. In many woods practically every tree is covered with ivy. Foresters destroy it by cutting through the main stem near the base, for it damages the growth of trees by preventing necessary gaseous exchange through the bark and sometimes by smothering and breaking down branches. If ivy cannot find a suitable tree trunk to climb it creeps on the ground, rooting at intervals and often covering considerable parts of the floor of a wood.*"

Today there are entrenched views but probably the most loudly voiced is that Ivy growing on trees is smothering and killing the host tree. This concern goes so far as to credit Ivy with affecting increasing numbers of the remaining hedgerow and woodland trees particularly in lowland Britain.

But are these comments, both historic and recent, valid in today's knowledge?

There appears to have been no scientific research or quantitative investigation of either the distribution of Ivy or its effect on trees. As such there is considerable prejudice but no evidence. It is appropriate, therefore, to review aspects of both Ivy and the trees up which it may grow.

As the root-like structures on the aerial shoots of Ivy do not have the ability to absorb moisture and nutrients from the host tree Ivy is not parasitic. Also, as the aerial root-like structures grow basally they do not penetrate into the wood of the host and no structural defect is formed in the tree. Generally, Ivy shoots do not become engulfed by the radial growth of the host tree. There is, therefore, no direct damage to the tree.

Ivy roots in the soil may compete with those of the support tree for moisture and nutrients but there is no information about either any such interaction or the lateral spread of Ivy roots. However, a tree must be well established and have a substantial trunk before Ivy will use it as support - Ivy will not climb young or whippy stems. By the time a tree trunk is sufficiently sturdy to become a support for Ivy its roots are likely to have extended well away from the base of the trunk which is where the Ivy roots will initially colonise. Once the Ivy has become well established with its shoots extending into the crown of the tree, then competition at the roots for water and nutrients may become critical, particularly if the tree has reached senility and is in decline.

Vegetative (juvenile) shoots of Ivy usually grow more or less vertically up the support, but lateral shoots may develop at an angle to the main stems. These secondary shoots may grow across the primary shoots but in the shade of their foliage. Such secondary shoots pose little direct threat of constricting the tree. However, it appears that exceptionally an Ivy shoot may develop in such a way that it does constrict the

Plate 1. *Juvenile foliage on climbing or trailing shoot.*

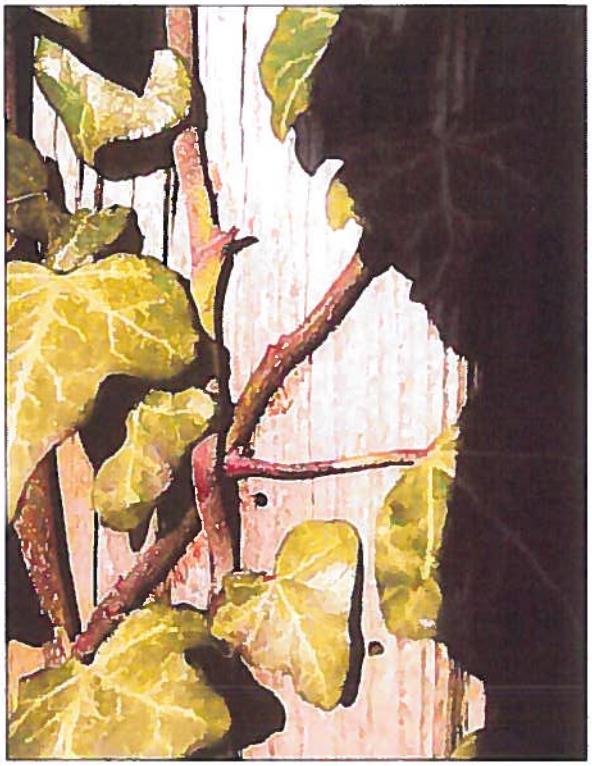


Plate 3. *Young shoots with groups of anchoring roots.*

Plate 4. *Ivy stem unusually with anchoring roots all round.*

Plate 2. *Adult foliage.*

Plate 5. *Ivy fruits developing.*

stem or branch of the support tree. Constriction may then lead to death of the distal part of the branch or trunk, but regrowth should normally occur from the proximal part of the tree. That is unless the shading cast by the Ivy is so intense that tree foliage cannot survive.

Arguably the most adverse effect Ivy can have on a tree arises when the adult/reproductive shoots spread in a dense mass over the host's crown. In a moribund tree, the remaining live crown may become suppressed and the weight of the evergreen foliage can render the tree liable to windbreak or the whole tree being blown over. A healthy tree is normally unaffected - a healthy crown of most tree species will allow insufficient light through in the growing season for the Ivy to grow strongly. Ash (*Fraxinus excelsior*) and Larch (*Larix* species), however, with their sparse canopies, allow enough light to penetrate and a healthy tree may carry a heavy infestation of Ivy. Even then failure of the tree is rare. This is probably because the tree has developed to accommodate the slow, but progressive growth of the Ivy. However, if there are structural weaknesses in the tree, for example as a result of weak forks or wood rotting fungi, failure may occur.

The dense evergreen Ivy foliage combined with the tightly held Ivy stems can obscure structural defects such as cavities, potentially weak forks and fungal fruit bodies on the support tree. Extra care is needed, therefore, when inspecting ivy-clad trees and assessing their structure and safety.

Another undesirable feature of Ivy is the ability of the foliage on the ground to prevent light reaching young seedlings. In this way Ivy may be a factor contributing to an absence of natural regeneration in many woodlands.

Ivy on buildings

Ivy growing over rocks and buildings is identical to that growing on trees. The evergreen foliage, with its waxy upper surface can protect structures from all but the extremes of weather, particularly moisture and temperature. However, the serious problem with Ivy is seen to be *"its rapid growth with aerial roots intruding into joints and displacing stones or bricks. Suckers and tendrils will also contribute to surface decay, especially of mortar, by the secretion of acid substances. ... ... the stability of an entire wall can be threatened."* (Ashurst and Ashurst 1988). This reference to secretions from the aerial roots appears to be unsupported in the botanical literature.

Ivy shoots will grow through dry stone walls and other unbonded or weakly bonded structures. Once within a structure the shoots may extend in darkness for considerable distances before they die. As the shoots growing in and through a structure increase in diameter they can exert a wedging action capable of eventually destroying the structure.

For building surveyors Ivy is as much a handicap to thorough inspection of a structure as it is for the tree manager because it obscures the view of potential defects.

Control of Ivy

It is only rarely that Ivy will cause significant direct damage to a supporting tree. Management of trees covered with Ivy should, therefore, give consideration to tree safety, conservation and aesthetics.

Where it is considered preferable to remove Ivy, whether from a prized ornamental tree for example or from a building, the main Ivy stems should be severed just above ground level. Two cuts at least 150mm apart should be made in each stem and the severed pieces of stem removed (Pate 8). This will cut off the water supply through the Ivy and the aerial parts of the climber will wither and die. Extreme care should be taken when removing Ivy stems on a tree because over zealous or careless cutting will damage the tree allowing entry of pathogens that could accelerate the demise of the tree.

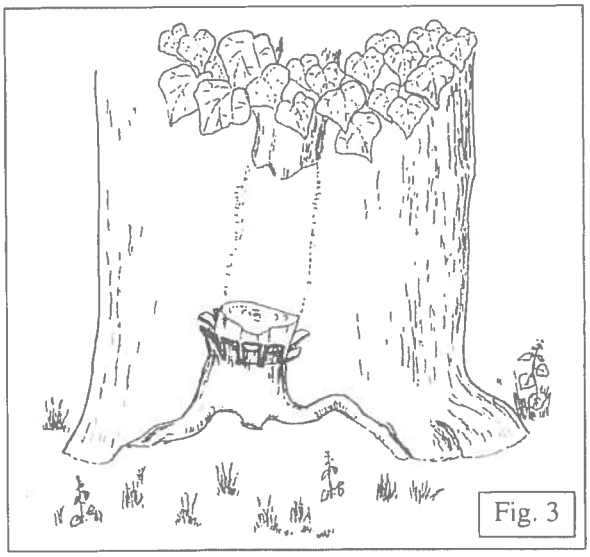


Fig. 3

A mass of dead Ivy leaves and shoots up the trunk and through the crown of a tree can be unsightly and may persist for many years. Although they will eventually fall off the support, it may be possible, with care, to pull some of the dead material out of the tree, or off a bonded wall. (Ivy growing over dry stone or other unbonded walls should be cut off rather than being pulled off the structure.) Where there is a dense 'rope' of Ivy stems (Plate 9) the shoots may not fall away naturally and mechanical assistance may be unavoidable. On some trees, particularly those with thin bark (e.g. Beech and Rowan), sudden exposure of the stem and main branches to strong sunlight by removal of Ivy may result in cambium death and formation of areas of dead bark open to being colonised by pathogens that kill tissue. In the long term strip cankers may result.

Chemicals applied directly to Ivy foliage may appear an attractive option, but such a treatment is likely to be very difficult not only because of the practical problems of reaching all the leaves in the crowns of trees, but also because liquids do not 'stick' to the glossy upper surface of the leaves.

To be effective, treatment of uncut Ivy stems by direct application of chemical is likely to require considerable quantities of the chemical. This will inevitably make contact with the bark of the support tree and could cause damage to the tree because both Ivy and trees will be damaged by the same chemicals.

With care chemicals may be applied as crystals or as a paste to the cut stumps of Ivy stems. For greatest effect the chemical should be applied after the ivy stems have been frill girdled (figure 3). Any chemical should be applied in accordance with manufacturers' instructions and taking care to avoid contact with the bark of the tree. Such treatment should inhibit production of regrowth shoots, but it may need repeat applications to kill the stump and roots.

Caution

Contact with Ivy sap can cause both skin irritation and allergic dermatitis in humans (Mitchell and Rook 1979; Cooper and Johnson 1998). Care is needed, therefore, when working on Ivy-clad trees or when removing Ivy from buildings and walls, to avoid contact of sap with skin.

Both foliage and the fruits of Ivy are poisonous to birds and mammals if eaten in large quantities (Cooper and Johnson 1998). However, complete recovery usually follows ingestion of small quantities. Even when dead, Ivy removed from trees and walls is a potential danger to animals. Disposal of Ivy shoots removed from trees and buildings should, therefore, be on a site secure from domestic animals. Burning may be desirable although provided Ivy shoots and foliage are chipped and thoroughly composted (Webber and Gee 1994) the toxins should be broken down and so the resultant material can be used safely as a mulch or soil improver.

The berries, which are reported to be the most poisonous part of the plant, may be attractive to small children (Cooper and Johnson 1988; North 1967). However, because of the habit of Ivy flowering only in full sunlight the berries are generally out of the reach of children.

Is Ivy Advancing

Today most people regard Ivy growing in the countryside as having no commercial value. To those people with an extreme view, ivy should be destroyed so that trees are not 'choked' and killed.

Historically, Ivy was used in medicine for treatment of such varied complaints as headaches, dysentery, ulcers and bladder stones (Rose 1993).

Today, apart from the conservation value - shelter and food - what value does Ivy have? The larger stems have a fine grained, pale coloured timber that can be used for wood carving and turning. Otherwise, the wood burns well when dry! As a result of their being no significant economic use for Ivy today there is no incentive to cut the stems and remove the climber from trees or buildings.

Historically the stems of Ivy would have been cut as part of hedge management. For example, when laying a hedge woody species unsuitable for, or even detracting from formation of a stock-proof 'fence', would have been cut back to ground level. Ivy would have been included in this category. If regrowth occurred many years would then pass before there would be competition with the hedgerow trees.

Today, few hedges experience the luxury of being layed. Cutting with a tractor mounted flail is unselective and will treat Ivy shoots in the same cavalier way as any other plant. But a flail cannot operate very close to the trunk of a mature tree without causing damage. As a

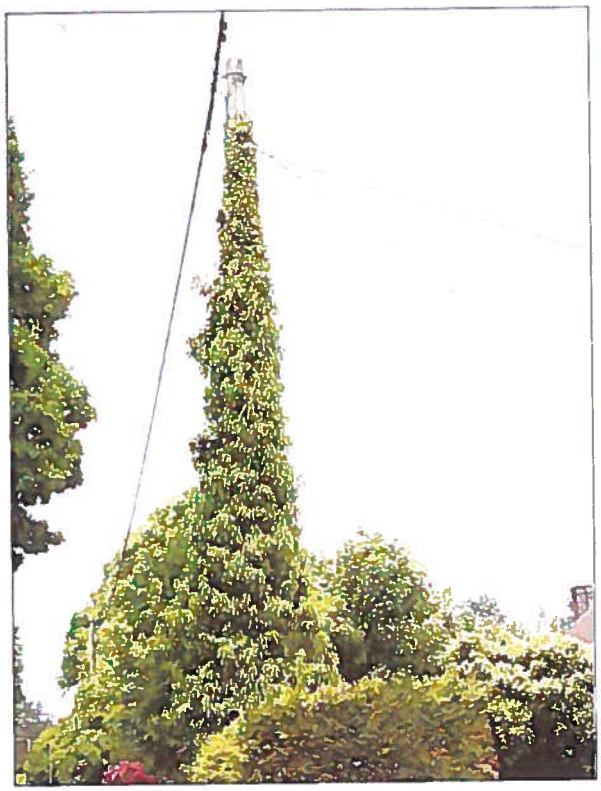


Plate 6. *Ivy growing over a transmission pole.*

Plate 7. *Hedgerow tree clothed in Ivy and showing dieback in the crown.*

Plate 8. *Dead Ivy.*

Plate 9. *Old stems of a well established Ivy plant.*

result Ivy stems closely adhering to the trunk of the supporting tree continue to grow unchecked inspite of the hedge receiving regular 'maintenance'! Similarly, active management of small woodlands has declined which means that Ivy and other colonising species are able to grow unchecked.

What of trees in the rural landscape? Many are now regarded as ancient or veteran because of their age, size and previous management. Historically, hedgerow trees were managed as pollards. While cutting the branches from the top of a pollard trunk (for example to use as fodder etc.) it is likely that some, if not all of the Ivy stems would have been severed. Very little harvesting of branches has taken place over the last century and it is this lack of positive management that has helped trees to develop the characteristics of veterans that are so sought after, not to mention favouring the development of ropes of Ivy stems and a clothing of Ivy foliage!

Furthermore, because the public expect trees to remain 'unchanged' there is a tendency to retain the trees longer than would have been acceptable previously. Landscape trees are, therefore, becoming older, their vigour is declining and intensive agriculture is putting stress on them with the result that Ivy is able to spread through their thinning crowns. The combination of dieback in the crown of the tree and the dense mass of Ivy leads to a belief that the latter is the cause of the former - that is something that has not been demonstrated other than by subjective observations.

Like Ivy and hedgerow trees, small woodlands currently have no or very limited economic value today which means they do not now receive regular management and Ivy is able to continue growing unchecked.

Ivy as a Garden Plant

The very features of Ivy that have set minds against the plant growing on trees have led to its use as a garden plant to cover fences and walls.

In fact there are now many varieties that persist in horticulture for their garden use and as indoor plants.

"There are many varieties of Ivy ... ... In the white variety the colour is seen either on the fruits or also on the leaves" (Theophrastus quoted by Rose, 1996).

There are some 14 species of *Hedera* listed by Lord (2001) many of which have produced sports. There are more than 250 varieties available from the nursery trade and used as ornamental climbers and for ground cover (Rose 1996). The majority of these have *H. helix* as their origin. The best known varieties are probably those with variegated foliage, but there are species with orange berries (e.g. the Himalayan ivy *H. nepalensis*), or with differing leaf shapes, sizes and marginal characteristics.

In Europe interest in Ivy has tended to be directed towards those species and varieties that can survive continental winters, however there is also interest in Ivies grown as house plants.

Some Enemies of Ivy

Apart from man, Ivy has several diseases that can make plants, particularly those grown for ornament, appear very sickly. Probably the most damaging are the leaf spots diseases which may be fungal or bacterial. Severe infections by, for example, *Colletotrichum trichellum* may result in leaf spots which coalesce causing collapse of the whole leaf.

Other diseases include powdery mildew (*Oidium* species) and Honey fungus (*Armillaria* species). Viruses also affect Ivy and they may be responsible for some of the ornamental varieties offered by the nursery trade.

Ivy is also host to mites, aphids and weevils but these appear to only rarely have significance for the well being of the plant.

Ivy - Boon or Bane?

The question remains unanswered, but, overall, the circumstances of reduced management of hedgerows and woodland trees are suitable for Ivy to spread. However, without quantitative evidence the true picture of Ivy's status cannot be confirmed. As such its removal from trees and buildings will continue if only to facilitate safety inspections.

Removal of Ivy from trees, it is claimed, saves the tree! Again there is only subjective observation to support such claims. Some simple objective assessments of tree growth and leaf cover over a number of years could provide a valuable insight into the relationship of Ivy and the host tree. Until more information is available the subjective debate will undoubtedly continue.

Acknowledgements

This text is based on Arboriculture Research Note 80 of the same title. That text has been expanded and added to in order to include a review of concern about the status of Ivy in the landscape.

Thanks to the many users of the Tree Helpline who prompted us to revisit the subject of Ivy and to the many colleagues who have commented on the text at various times.

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ISSN 1358 - 8249

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