

Planting of Disease-resistant Elm Cultivars for Lepidoptera and the Biosecurity Implications

Policy Summary

- Butterfly Conservation supports the planting of disease-resistant elm (DRE) under specific circumstances and when strict biosecurity measures are implemented, as part of a wider strategy to conserve native and naturalised elm.
- Butterfly Conservation will preferentially use UK sourced and grown trees and would support nurseries to propagate native, naturalised and DREs within the UK.
- Biosecurity is the primary consideration when procuring trees.
- Conserving and enhancing native and naturalised elm in rural and urban areas should be an integral part of any elm management strategy.
- Areas that are considered suitable and unsuitable for native, naturalised and DRE planting are listed in Table 1.
- Plant native and naturalised elm derived from local provenance as part of the elm species mix if there is no natural seed source or if native and naturalised elm is not present in a range of different age classes.
- Planting DREs should be undertaken only where locally appropriate whilst meeting strict biosecurity measures. DRE planting sites should be chosen strategically to provide connectivity between colonies and act as refuges, should Dutch Elm Disease (DED) occur, for Section 41 and Section 7 species of Lepidoptera such as the White-letter Hairstreak *Satyrrium w-album* and White-spotted Pinion *Cosmia affinis* (NERC, 2006; Environmental (Wales) Act 2016).
- Planted elms should be monitored for breeding White-letter Hairstreak and White-spotted Pinion if within or near the species current distribution (Appendix 1-2).

Background Information

- The outbreak of DED in the UK during the 1970s led to the loss of mature elms throughout the UK. Elm is an important tree in woodlands and the wider countryside (Rackham, 2006).
- Many elm-obligate species experienced declines after the outbreak of DED. The White-letter Hairstreak experienced a decline in occurrence of 45% between 1976 and 2014 (Fox *et al.*, 2015).
- Since the devastating consequences of DED there has been an increase in the planting of DREs, which have a higher level of resistance to DED than native and naturalised elm. There has been a significant amount of work to examine the suitability of various DREs to different geology and growing conditions, as well as some evidence that at least three of these DREs can be utilised as a larval foodplant for the White-letter Hairstreak.

Biosecurity

- Biosecurity is the primary consideration when procuring trees to prevent a planting project being responsible for the introduction of another pest or disease. Biosecurity now features in DEFRA's 25 year Environmental Plan Goals so is of integral importance in any conservation project where tree procurement is undertaken. Elm epidemics have become more common,

largely due to international trade (Rackham, 1986). This was highlighted as recently as 2017 with the discovery of the Zig-Zag Elm Sawfly *Aproceros leucopoda* in Southern England, a serious defoliator which could go on to spread throughout the UK. It is more practical and cost effective to prevent a disease entering the UK than trying to eradicate it. Accidentally introducing a novel pest or disease whilst planting imported DREs undermines current conservation actions and could cause serious reputational damage to Butterfly Conservation.

- Butterfly Conservation will preferentially use UK sourced and grown trees (UKSG) wherever available and would support nurseries to sign up to the UKSG assurance scheme and to propagate native, naturalised and disease-resistant elm (Woodland Trust, 2018). BC would welcome non-commercial local propagation of non-imported elm, through BC branches, community school projects and working with tree planting conservation bodies such as the Woodland Trust, in order to achieve conservation objectives for elm-obligate species. In the long term BC aspires for all planted elm to be UKSG and for no imports of elm to be undertaken.
- In the short term it is recognised some DRE imports may be required, but only if it is for specific research trials. DRE imports are notifiable to Animal and Plant Health Agency (APHA) and meeting high biosecurity standards and sourcing from reputable suppliers is essential. When importing trees a quarantine period, for a minimum of one full growing season, including regular checks for pests and disease should be the default option. A list of DRE suppliers are available in Brookes *et al.* (2016).
- Butterfly Conservation recommends annual monitoring of planted elm trees as part of a disease-monitoring plan. Suspected cases should be reported to the relevant plant health agency and/or Forestry Commission by the Tree Alert tool <https://www.forestry.gov.uk/treealert>. For more information on pathogens and diseases, see Appendix 3-6.

Maintenance and Enhancement of Elm

- Conserving and enhancing native and naturalised elm in rural and urban areas should be an integral part of any elm management strategy (Table 1). Natural regeneration strengthens local adaptations and increases the capacity of elm to cope with disease and climate change. Elm epidemics have a long natural history in the UK (Parker *et al.*, 2002; Rackham, 2003). Even when regenerating from seed or suckering after succumbing to DED, native and naturalised elm, supports a complex ecological community including at least 29 moth species such as the White-spotted Pinion (Young, 1997). It is currently unknown whether DREs are able to replicate these ecological relationships for elm-obligate species.
- Maintaining and enhancing the abundance of elm is desirable in both rural and urban areas and should be the priority when elms are present across all growth stages from saplings to mature trees. If this cannot be achieved, due to the local DED situation then planting DREs can be considered.

Table 1. Locations for conserving, enhancing and planting elm (+ Yes, - No, / depends).

Location	Maintenance and Enhancement of Existing Elm	Suitable for DRE Planting	Suitable for Native and Naturalised Elm Planting	Justification and Extra Information
Any construction projects where trees are planted	+	+	+	Planting elm (native, naturalised or DREs) should be the default recommendation in all new planning developments as a conservation measure for White-letter Hairstreak and other elm-obligate species, as

				well as maintaining existing elm wherever it is present.
Woodland creation schemes	+	/	+	Increases resilience and diversity of new woodlands to climate change and disease. The choice to plant DREs depends on whether native and naturalised elm can be maintained across a range of age classes.
Countryside stewardship schemes	+	+	+	Suitable for plantings in hedgerows and shelterbelts. Elm is an important species in the wider countryside and should be included in planting mixes.
Urban areas such as parks and roadsides	+	+	+	DREs with a three star rating for street planting as listed by Brookes (2016) include New Horizon, San Zanobi and White elm. Other suitable urban trees include LUTECE, Sapporo Autumn Gold and Rebona. Native and naturalised elm should be considered as part of the mix.
Ancient semi-natural woodland (ASNW)	+	-	+	Native and naturalised species should have priority as ASNW contains the best examples of semi-natural woodland features in the UK.
Plantations on ancient woodland (PAWS)	+	-	+	Restoration and native/naturalised species should have priority as PAWS contains remnant features of ancient woodland.
Nature reserves	+	/	+	Only plant if it does not compromise reserve management objectives. DREs should only be considered if native and naturalised elm is not present in a range of age classes.
Designated Areas	+	/	+	Only plant if it does not compromise site objectives and if permission has been sought from the relevant statutory organisation. DREs should only be considered if native and naturalised elm is not present in a range of age classes.

- Elms reproduce either by seed or by suckering, and in some cases both. Wych Elm *Ulmus glabra* reproduces only by seed and English Elm *Ulmus minor* 'Atinia' solely by suckering since

it is female sterile, although it nevertheless produces flower in quantities varying from year to year. Although this does not result in fertile seed, English Elm is known to support the White-letter Hairstreak.

- Active management of non-diseased native and naturalised elm should only occur within the distribution of BC's priority species that are obligate elm feeders, currently White-letter Hairstreak and White-spotted Pinion (Appendix 1 and 2). Techniques for managing non-diseased elm are documented in Table 2.

Table 2. Management techniques for non-diseased native and naturalised elm.

Pollarding	Promotes strong re-growth of elm and initially reduces susceptibility to DED as branches are only suitable for the <i>Scolytus</i> beetle once they reach a certain diameter. The diameter at infection depends on the species of beetle and many other interacting parameters. For more information see http://dutchelmdisease.org/EXPERT/DED/index.html
Halo-release	Reduce shading to the south-facing side of the trees to increase microclimatic suitability for egg-laying Lepidoptera.
Encourage natural regeneration and suckering	Increases the likelihood of elm being present in a range of different age classes, increasing the suitability for Lepidoptera in the long term. Natural regeneration from seed promotes genetic diversity in the elm population. Suckers can be replanted to encourage new native and naturalised elm populations.

- Sanitary pruning can be undertaken if DED infection is caught early, where appropriate, in an attempt to prolong the life of diseased trees. Diseased trees shouldn't be removed as standing dead wood is a valuable resource for dead-wood feeding organisms. Exceptions includes where public safety considerations are required, in which case trees can be felled, but the deadwood should remain on site.

Planting Native and Naturalised Elm

- Plant native and naturalised elm derived from local provenance as part of the elm species mix if there is no natural seed source or if native and naturalised elm is not present in a range of different age classes.
- Plant what grows well in the local climatic and geological conditions. Wych Elm, Field Elm *Ulmus minor* variants and their hybrid Dutch Elm *Ulmus x hollandica* are preferred for planting. Any planting requires landowner permission and should only occur in the recommended planting locations (Table 1).
- The TCV Grow a Tree (2018) page is a useful resource for growing Wych Elm from seed. For Field Elm we suggest replanting suckers in new locations. Ensure suckers are from different trees to increase genetic variability and over time attempt to create a range of age structures.

Planting DREs

- Planting DREs should only be undertaken where locally appropriate, and when strict biosecurity measures are met. Currently it is unknown whether planting DREs will have unforeseen negative consequences on elm-obligate species or if they can support obligate species other than the White-letter Hairstreak. Provided all biosecurity measures are implemented, planting DREs can be undertaken to support the White-letter Hairstreak. Planting will also improve our knowledge about the benefits and drawbacks of particular DREs and their impact on White-letter Hairstreak and White-spotted Pinion. Regular reports such as Brookes (2016; 2018) are encouraged to increase the knowledge base of planting DREs. Planting locations (10 figure grid reference) and DRE type should be recorded.

- The choice of DRE to plant is influenced by the local geological and climatic conditions (Brookes, 2016; 2018 and Resistant Elms, 2018). Currently the DREs known to host the White-letter Hairstreak in the UK include New Horizon, LUTECE and Sapporo Autumn Gold. Due to the plasticity of the larval stage of the White-letter Hairstreak it is likely this species will use a range of DREs. White-spotted Pinion is not currently known to feed on elms other than *Ulmus minor*. In terms of DREs and biosecurity special attention must be drawn to White Elm *Ulmus laevis* which has a higher level of field resistance to DED than native and naturalised elm and can be readily grown from UK sourced seed. White elm is also not preferentially selected as a host by the Zig Zag Elm Sawfly (Blank *et al.*, 2014).
- Areas that are considered suitable and unsuitable for DRE planting are listed in Table 1. Wherever possible, DRE planting sites should be chosen strategically to provide connectivity between and act as refuges for White-letter Hairstreak colonies.

Recording White-letter Hairstreak and White-spotted Pinion

- Recording is an integral component of any BC conservation project. Planted elms should be monitored at regular intervals for breeding White-letter Hairstreak and White-spotted Pinion, if found within or close to that species range.
- For White-letter Hairstreak scan the canopy using binoculars and record the presence of adult butterflies. Male activity is noticeable from mid-June to mid-August with peaks in activity thought to occur in the morning and afternoon in suitable, sunny conditions. In winter, searches for eggs can be carried out on the lower limbs of elm to confirm breeding. Records should be sent to the local butterfly county recorder.
- Larval searches and moth trapping can be used to survey for the White-spotted Pinion. Records should be sent to the local moth county recorder.

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References

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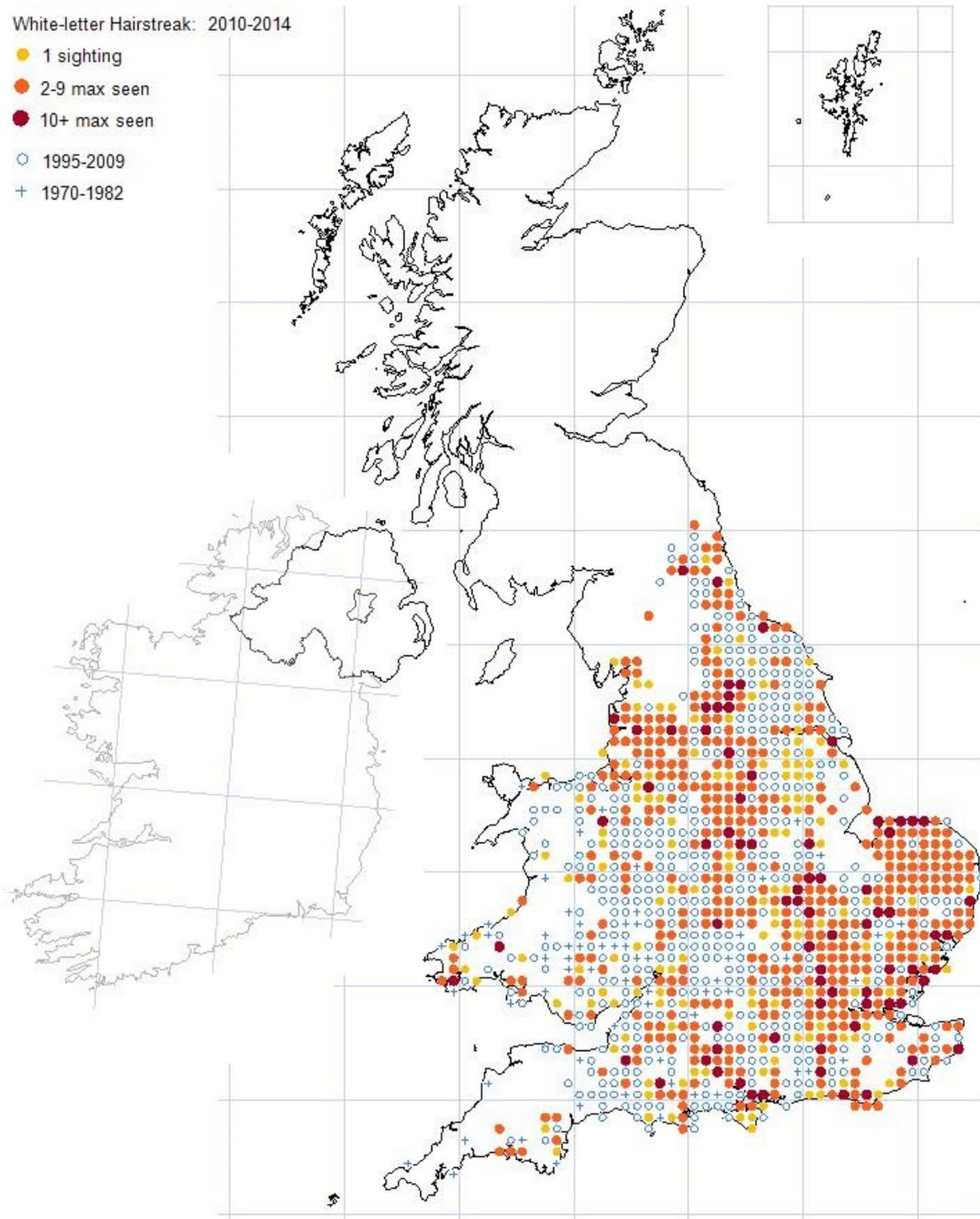
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Appendices

Appendix 1. White-letter Hairstreak distribution map.



Appendix 2. Draft map of White-spotted Pinion distribution.

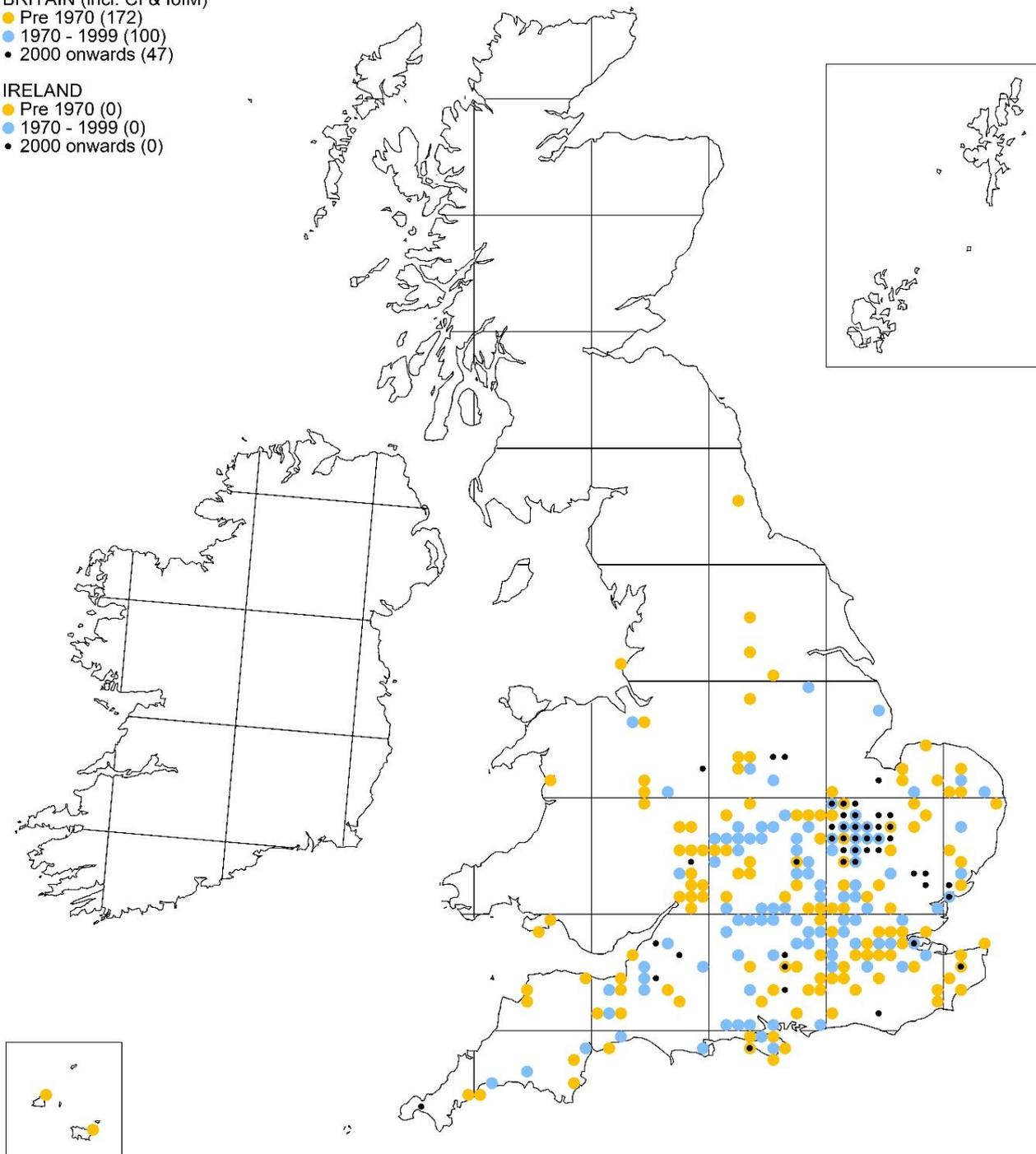
73.214 *Cosmia diffinis* (White-spotted Pinion)

BRITAIN (incl. CI & IofM)

- Pre 1970 (172)
- 1970 - 1999 (100)
- 2000 onwards (47)

IRELAND

- Pre 1970 (0)
- 1970 - 1999 (0)
- 2000 onwards (0)



Appendix 3- Factsheet on Elm Yellows [https://www.forestry.gov.uk/pdf/Elm-yellows-Pest-Alert.pdf/\\$file/Elm-yellows-Pest-Alert.pdf](https://www.forestry.gov.uk/pdf/Elm-yellows-Pest-Alert.pdf/$file/Elm-yellows-Pest-Alert.pdf)

Appendix 4- Information of Dutch elm disease <https://www.forestresearch.gov.uk/tools-and-resources/pest-and-disease-resources/dutch-elm-disease/> and <http://www.dutchelmdisease.org/EXPERT/DED/index.html>

Appendix 5- DEFRA Rapid Pest Risk Analysis of Zig-zag sawfly <https://planthealthportal.defra.gov.uk/assets/pras/Aproceros-leucopoda-PRA-v4.pdf>

Appendix 6. Information on Xylella <https://www.forestry.gov.uk/forestry/bee-h-a3vemx>