Primer for Ecologists, Planners, Naturalists & Universities

The Ecology of Aspen Woodlands

Ryebank Fields on the Manchester-Trafford border

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prepared at the request of

Friends of Ryebank Fields NGO
www.saveryebankfields.org

THE EURASIAN ASPEN – *Aspen tremula*

A fine example in Central Asia

Dmitry Politov and colleagues 2017. Molecular Identification and Karyological Analysis of a rampant Aspen *Populus tremula* clone. [Turkmenistan, Russian Federation]. International Journal of Plant Genomics, volume 2017, Article ID 5636314, Open Access. Hindawi Press https://doi.org/10.1155/2017/5636314

Aspen forest arising from the rampant clone

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1 INTRODUCTION

The pandemic makes face-to-face teaching at our local universities difficult, and far-flung fieldwork nigh impossible. A whole generation of students in environmental sciences and ecology are suffering due to insufficient fieldwork and consequent reduced employment opportunities. In their wake, students at school are often denied sufficient field courses and field trips.

The Friends of Ryebank Fields are conscious of such difficulties. Indeed, close to Ryebank Fields is the vast higher education corridor of Manchester, Salford and Trafford. Fortunately, the owner of Ryebank Fields is **Manchester Metropolitan University (MMU)**, a leading international university in critically important global topics such as climate crisis and global warming, and is a partner of the world-famous **Field Studies Council (FSC)** **www.field-studies-council.org**

At the request of the Friends of Ryebank Fields, the authors investigated the ever-expanding Aspen Copse. It is driven by some of the fastest growing trees in the country, making Ryebank Fields an inspiring place to see at first-hand how the right trees can rapidly lock-up greenhouse gases as solid timber. Not only by rocketing upwards, but also spreading underground as 'ramet' suckers that pop up time-and-time again as closely-packed new trees. The woody ramets are plain to see in a pair of tree tunnel paths skillfully created and maintained by The Friends of Ryebank Fields. (**Enjoy your trip, but do be careful not to trip over a sturdy ramet**).

The speed of growth makes such trees unrivalled for carbon sequestration above-the-ground; and unrivalled for carbon sequestration under-the-ground. Indeed, the underground sequestration is by durable wooden ramet suckers capable of thriving for centuries. By this means, **PERMANENT sequestration is achieved**, unsurpassed by normal trees. With apology to William Shakespeare, ***"Trees may come, and Trees may go, but we go on forever"***.

The authors penned this primer for ecologists, planners, naturalists and universities. If you are an undergraduate, graduate or postgraduate tackle the climate emergency then this is the primer for you. The Aspen Copse has double the sequestration rate of normal woodland.

Foresters are proud of the sequestration they achieve. But no cash comes from ripping out the underground wooden ramets that, left alone, thrive for centuries. Each ramet is up to fifty metres long. It flings up a string of suckers and each sucker erupts as a young tree reaching for the sky. The trees, young and old alike, remain connected underground by ramets for life. The climate emergency is upon us, so it makes good sense to plant the fastest growing trees capable of locking up carbon not only above ground but underground too. The tree tunnels in the Aspen Copse on Ryebank Fields teach us how to do this nationally. Our literature search reveals the fastest above-and-below-ground trees belong to closely related species of the Aspen-Poplars:

A few words about the pandemic. Poplars secrete resins to protect vulnerable bud cells from bacteria and viruses. Honey Bees take the resin to make **propolis** to protect themselves from diseases. For centuries humans have followed suit. Do be careful! https://medlineplus.gov/druginfo/natural/390.html. Read the primer to learn a little about the ongoing race by scientists to find compounds in **propolis** that might help to blunt some diseases. Especially for most of the world population who cannot afford perfect drugs.

2 EXECUTIVE SUMMARY

2.1 The General Picture

- Eurasian Aspen ***Populus tremula*** is the world's second most widespread tree.
- Eurasian Aspen ***Populus tremula*** is Manchester's only native Aspen.
- European White Poplar ***Populus alba*** is a close relative of our native Aspen.
- American Aspen ***Populus tremuloides*** is an extremely close relative of our Aspen.
- Aspen trees are incredibly important for Manchester's biodiversity.
- No less than 50 different insects depend on Aspen for their survival.
- Aspen was abundant as an early coloniser at the end of the Ice Age.
- Aspen is our fastest growing native tree.
- Aspen have outstanding potential for Short-Term Coppicing STC.
- Aspen STC assists biodiversity, and produces biofuel for space heating.
- Aspen woodlands are now extremely rare in Manchester.
- Aspen woody sucker networks (ramets) can survive for thousands of years.
- Aspen trees are an indicator of Ancient Woodland.
- Nonetheless, individual Aspen trees usually live for only 50-150 years.
- Aspen woodlands are lost by shading out by oak, sycamore, conifers etc.
- When shaded, the Aspen fail to make suckers and the Aspen die out.
- Nevertheless, some Aspen 'Giants' survive but shaded out and rotting.
- Rotting Giants can make excellent homes for Bat Nurseries.
- Rotting Giants survive in woodlands by the Mersey Way in Chorlton.
- Futile to plant Aspen inside forests as the Aspen die when shaded out.

2.2 The Aspen Copse in Ryebank Fields

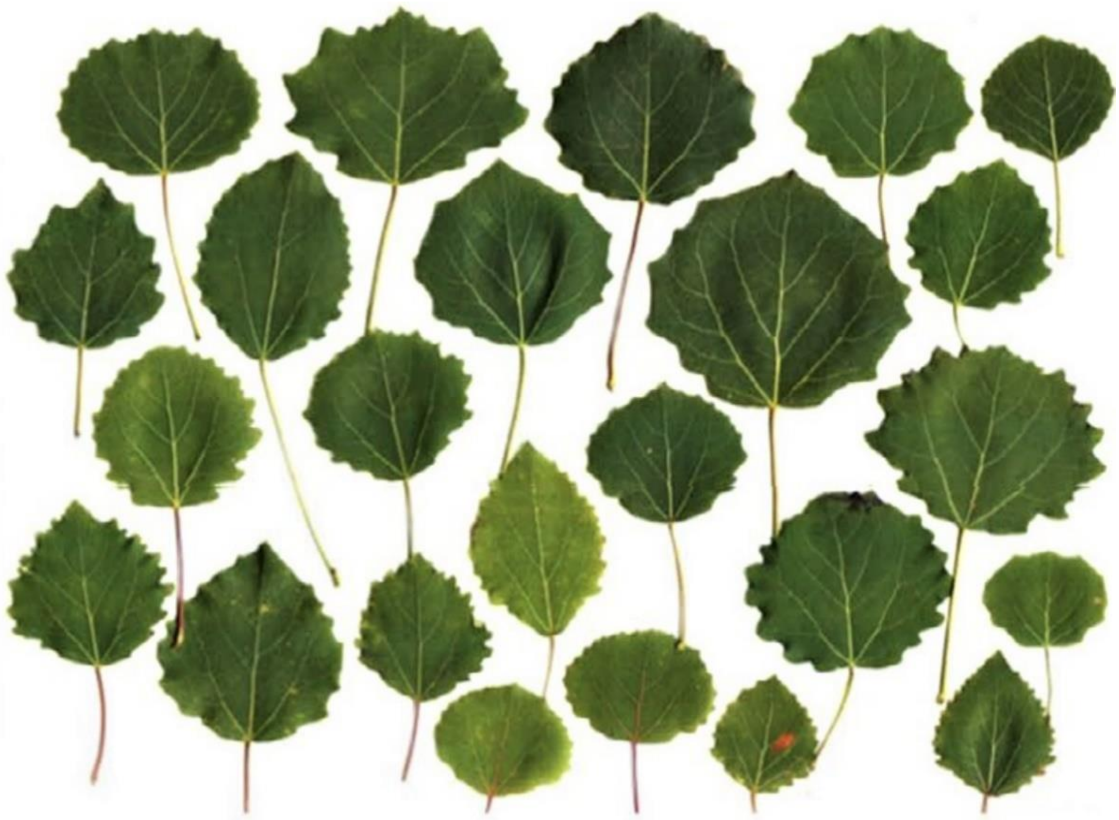
- Aspen ***Populus tremula*** is a remarkable tree, with quivering leaves.
- White Poplar ***Populus alba*** is present, again with quivering leaves.
- Quivering leaves are stunningly beautiful in autumn.
- Grey Poplar ***Populus x canescens*** is a hybrid of Aspen and White Poplar.
- The Aspen Copse is an active training site for learning the differences.
- A pair of walk-through tree-tunnels cross the dense Aspen Copse.
- Tree-tunnels are a fascinating experience for young and old alike.
- Tree-tunnels are the focus of learning games for many children.
- Tree-tunnels enable ecologists to explore deep inside the Aspen Copse.
- A dramatic example of seral change from open Grassland to dense Woodland:
  - Invasive tree suckers ➲ saplings thicket ➲ tall trees ➲ Giants.
  - In due course, Rotting Giants will be present: ideal for Bat Nurseries.
- The seral change is achieved by more than a thousand young trees.
- Most of the trees, young and old alike, are interconnected underground.
- Most of the Ryebank thicket is thus a single organism.
- In theory, it has the potential to be the biggest living thing in Manchester!
- It is a major community asset of regional importance for learning.
- It is a scientific asset for research on subsurface sequestration.
- Closely related species are present – Aspen, White Poplar and Grey Poplar.
- Such trees secrete antiviral resins to help protect their buds from viruses.
- Honey Bees know this, and harvest the resin to make **propolis** to protect the hives.
- **Propolis** may mitigate some diseases due to SARS-CoV-2 and COVID-19.
- Ryebank Fields are a perfect place for MMU and UoM to study **propolis** resins.

3 WHAT DOES AN ASPEN LEAF LOOK LIKE ?

3.1 Photo of an Aspen Leaf

A remarkably crisp and clear photograph of a leaf of **native Aspen, *Populus tremula* by Marcus Webb FLPA**, is illustrated in an article in the British Wildlife magazine:
Alan Stubbs 2014. Aspen: The disappearances. volume 26, number 2. December 2014, pages 87-95. Back copies @ £4 each. Order online at www.britishwildlife.com

3.2 Aspen Leaves are extremely variable



Nicklas Mähler and colleagues 2020. **Leaf shape in Eurasian Aspen (*Populus tremula*) is a complex, omnigenic trait.** Introducing Nature Notes, volume 10, November 2020, pages 11922-11940. SHAREWARE.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7663049/pdf/ECE3-10-11922.pdf

3.3 Avoid doubtful sources

It is important to maintain the integrity of native British Aspen and so help ensure survival of the many native British species of insects that depend on this tree.

You will need to be careful to be sure you ***"don't get what you didn't ask for"***. Indeed, the North American Aspen is a close relative of the native British species but, in fact, is a different species. The only safe way to source native British Aspen is to take cuttings of root suckers from a trusted supplier of root suckers from a long-established clone of native British Aspen, ideally from a site close to where you wish to plant it.

Otherwise, a risk exists of unwittingly planting an alien clone of Scandinavian Aspen. This risk is real, for the Forestry Commission has begun importing Scandinavian clones of Aspen in order to hybridise with native British Aspen to produce clones which grow trees taller and faster than native British Aspen. But the role of root suckers is ignored.

4 INTRODUCTION TO ASPEN POPLARS

Two main divisions of Poplars exist, both of considerable importance to biodiversity in the northern hemisphere. Of interest, many of the poplar-dependent invertebrates belong to one Poplar division or the other.

4.1 The Aspen division of Poplars

One major Poplar division is named after the Aspen

The **Aspen (*Populus tremula* = Trembling Poplar)** is a native tree of the British Isles, including England, Wales, Scotland, Northern Ireland and the Republic of Ireland. Aspen is 'widespread though only locally common in woods and, importantly on the fringes of heathland'. The Aspen is particularly important in the Scottish Highlands. Remarkably, about 60 species of insects, fungi and lichens depend on the Aspen, and a further 79 are partly dependent on the Aspen.

The **White Poplar (*Populus alba*)** is non-native but naturalised and belongs to the . Aspen division of Poplars. It has been widely planted as parkland and landscape tree.

The **Grey Poplar (*Populus alba* x *tremula*)** is a natural hybrid in the Aspen division of Poplars, and has also been widely planted as a parkland and landscape tree.

4.2 The Black Poplar division of Poplars

Anothers major Poplar division is named after the Black Poplar

The **Black Poplar (*Populus nigra subspecies betulifolia*)** is a native tree of the British Isles and is believed to once have been widespread on river floodplains but is now much reduced to single trees and small groups. It includes the famous **Manchester Poplar**, a smoke-resistant clone.

4.3 Suckering and Aspens

Poplars are capable of suckering, ***"this being especially the case with the Aspen, which forms colonial stands"***. Its close relatives, the **White Poplar** and **Grey Poplar** both do the same.

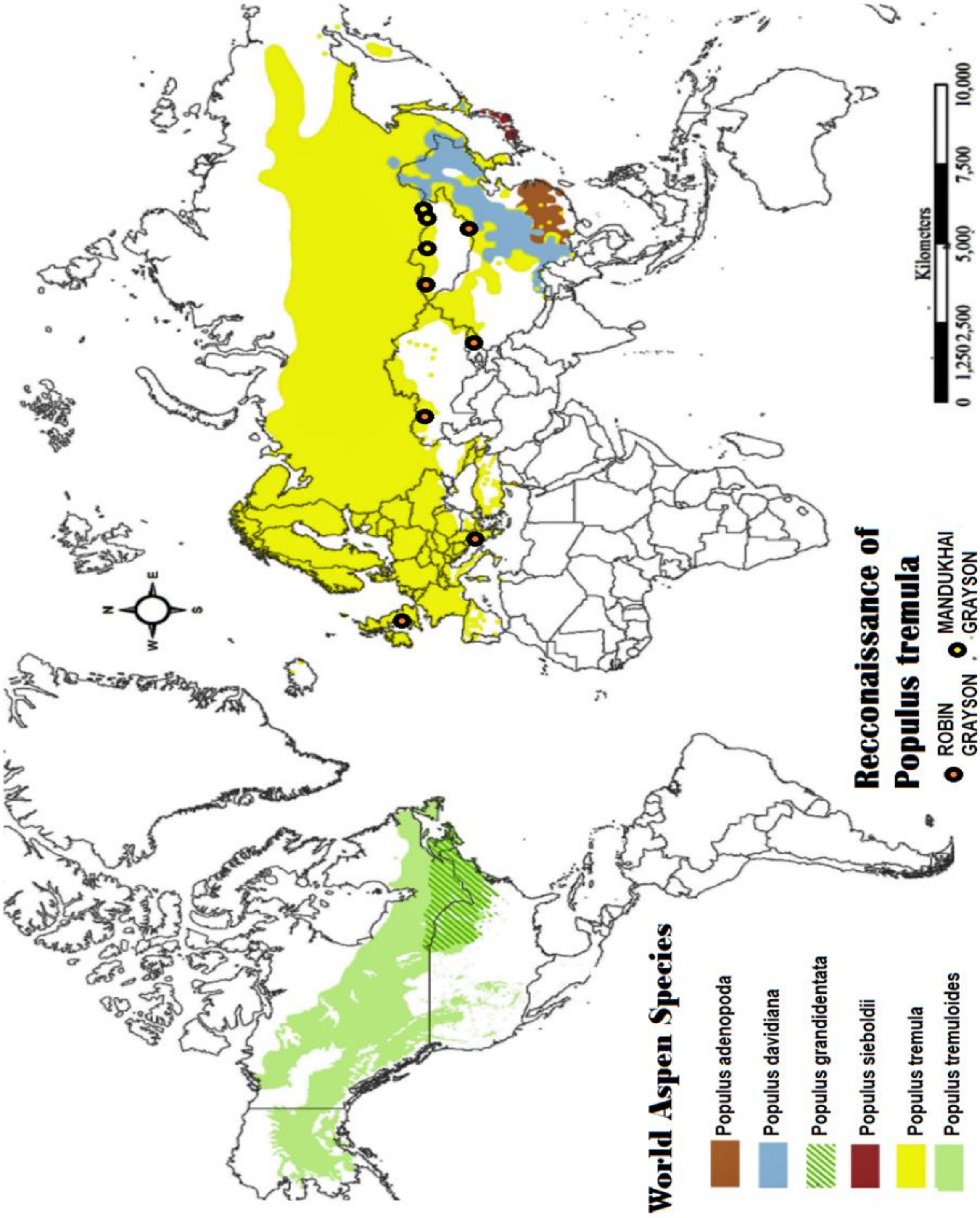
Although Aspen is a relatively short-lived tree, ***"only exceptionally lasting more than 100-120 years, in principle some of these stands may be thousands of years old"***.

Each Aspen clone ***"differs from others, most easily evidenced by differing bud-burst date in the spring or leaf fall in the autumn"***. This affects the life cycles of Aspen-dependent insects. Likewise, differences in plant chemistry between clones may result in some clones being more suited than others to Aspen-dependent invertebrates.

Remarkably, Aspen can survive as underground woody root-stock known as **'ramets'** for about 50 years without above-ground growth, enabling it to withstand intense forest fires and temporary shading by other woodland trees, whereas ***"no invertebrates can undergo such prolonged dormancy"***.

*NOTE: Text partly from: Alan Stubbs 2014. **Aspen: The disappearances.** British Wildlife, volume 26, no.2. **£4 from** www.britishwildlife.com*

5 ASPEN POPLARS GIRDLING THE EARTH



Paul Rogers and colleagues 2020.

A Global View of Aspen: Conservation science for widespread keystone systems.

Global Ecology and Conservation, volume 21, March 2020, e00828.

EURASIAN ASPEN ***Populus tremula*** IN YELLOW

*The Atlantic – **Ryebank Fields** – The Pacific*

6 IS THIS TREE REALLY AN ASPEN TREE ?

6.1 How to decide if a tree is an Aspen Tree

Begin by studying this set of photos, sufficient to give a provisional identification:

Anon 2020. **The Eurasian Aspen (*Populus tremula*).** The Woodland Trust.
Aspen (*Populus tremula*) - British Trees - Woodland Trust

To improve your identification, try this pair of keys:

John Poland & Eric Clement 2009. **The Vegetative Key to the British Flora: A new approach to naming British vascular plants based on vegetative characters.** £24.99 from: https://www.nhbs.com/the-vegetative-key-to-the-british-flora-book
John Poland 2020. **The Field Key to Winter Twigs: A Guide to Native and Planted Deciduous Trees, Shrubs and Woody Climbers Found in the British Isles.** £19.99 from: https://www.nhbs.com/the-field-key-to-winter-twigs-book

To be quite certain a tree is indeed the Eurasian Aspen, a genetic test is required.

6.2 Eurasian Aspen: *Populus tremula*

- ❖ It resembles the **North American Aspen (*Populus tremuloides*}**, and the two species are often interbred to produce Aspen trees displaying hybrid vigour.
- ❖ It shares some features with the closely related **White Poplar (*Populus alba*).**
- ❖ It shares features of the **Grey Poplar**, a hybrid of **Aspen** and **White Poplar**.

Quick Clues

1. **Leaf with 9-14 teeth per side, without stomata on the top side of the leaf.**
2. **Leaf Petiole does not have any glands.**
3. **Trunk has diamond-shaped lenticels.**

Handy Terms

cordate = appearing heart-shaped, with base rounded and prominently notched.
dentate = toothed, with acute teeth facing outward.
glands = organs that produce secretions.
obtuse = blunt; with a more-or-less rounded apex (with angle greater than 90 degrees.
orbiculate = more-or-less circular in outline.
ovate = egg-shaped, less than 3 times as long as wide, widest below the middle and tapering to apex.
sinuate = wavy at margin only (two-dimensional, unlike undulate).
sucker = vigorous vegetative shoot of underground origin that persist for many years. Known as 'ramets'
stomata (singular stoma) = pores on the leaf or stem used for respiration during photosynthesis (hand-lens x20).
teeth = shape reminiscent of teeth and cogs.
truncate = leaf appearing as if transversely cut-off.

Aspen – Leaf

4. **Leaf dull dark green above, but paler underneath.**
5. **Leaf 1.5 to 8cm, sometimes as long as 12cm.** Don't include the stalk!
6. **Leaf orbiculate to broadly ovate, usually obtuse.**
7. **Leaf truncate to shallowly cordate at base.**
8. **Leaf occasionally silky-hairy when young, but soon hairless.**
9. **Leaf coarsely sinuate-dentate.**

Aspen – Leaf Stalk (Petiole)

10. **Petiole length 1.5 to 4 cm, sometimes as long as 7 cm.**
11. **Petiole hairless or sparsely hairy.**

Aspen – Twig – first year shoot

12. **Twig greyish and persistently hairy.**
13. **Twig round with longitudinal lenticels.**

Aspen – Bud

14. **Bud shiny brown, sticky when opening. Hairless.**
15. **Bud size 5 to 10 mm, sometimes as much as 14 mm. Conical and acute.**

7 BUT COULD IT BE A WHITE POPLAR ?

7.1 How to decide if a tree is a White Poplar

Begin by studying this set of photos, sufficient to give a provisional identification: Anon 2020. The **White Poplar (*Populus alba*)**. The Woodland Trust.
[White Poplar (Populus alba) - British Trees - Woodland Trust]

To improve your identification, try this pair of innovative keys:

John Poland & Eric Clement 2009. **The Vegetative Key to the British Flora: A new approach to naming British vascular plants based on vegetative characters.** £24.99 from: https://www.nhbs.com/the-vegetative-key-to-the-british-flora-book
John Poland 2020. **The Field Key to Winter Twigs: A Guide to Native and Planted Deciduous Trees, Shrubs and Woody Climbers Found in the British Isles.** £19.99 from: https://www.nhbs.com/the-field-key-to-winter-twigs-book

To be quite certain a tree is indeed the White Poplar, a genetic test is often required.

7.2 European White Poplar – *Populus alba*

- **White Poplar** is a species closely related to the Eurasian Aspen (***Populus tremula***)
- It is native to central and southern Europe, Morocco and the Iberian Peninsula.

Quick Clues

1. **Leaf white-felted on both sides. [very typical of White Poplar]**
2. **Trunk white/yellowish; dark diamond-shape lenticels. [confuse with Aspen]**
3. **Capable of producing suckers from ramets. [confuse with Aspen]**

Handy Terms

adpressed = lying flat; closely pressed against a surface.
cartilaginous = tough and without chlorophyll; resembling cartilage in consistency.
dentate = toothed, with acute teeth facing outward.
fastigiate = branches erect and more-or-less adpressed to the vertical.
felted = covered in fine hairs.
orb = orbiculate, more-or-less circular in outline.
ovate = egg-shaped, less than 3 times as long as wide, widest below the middle and tapering to apex.
sucker = vigorous vegetative shoot of underground origin.
tree = a tall woody plant with a single main trunk.

White Poplar – Leaf

4. **Leaf 4 to 8cm, x 3 to 8 cm –** Don't include the stalk!
5. **Leaf ovate to orb.**
6. **Leaf white-felted on both sides, soon shiny dark green and hairless above.**
7. **Leaf below: whitish (much paler than above)**
8. **Leaf below: strongly contrasting green veins**
9. **Leaf has weakly dentate lobes.**

White Poplar – Leaf Stalk (Petiole)

10. **Petiole length 3 to 6 cm.**
11. **Petiole laterally flattened.**
12. **Petiole white-felted.**

White Poplar – Twig – first year shoot

13. **Twig becoming hairless and dark brown after first year.**

White Poplar – Bud

14. **Bud wooly especially near base, soon hairless and reddish-brown.**
15. **Bud ovoid and acute. 4 to 5 mm.**

White Poplar – Crown of Tree

18. **Crown spreading: White Poplar *Populus alba***
19. **Crown fastigiate: variety of White Poplar *Populus alba var 'Pyramidalis'***

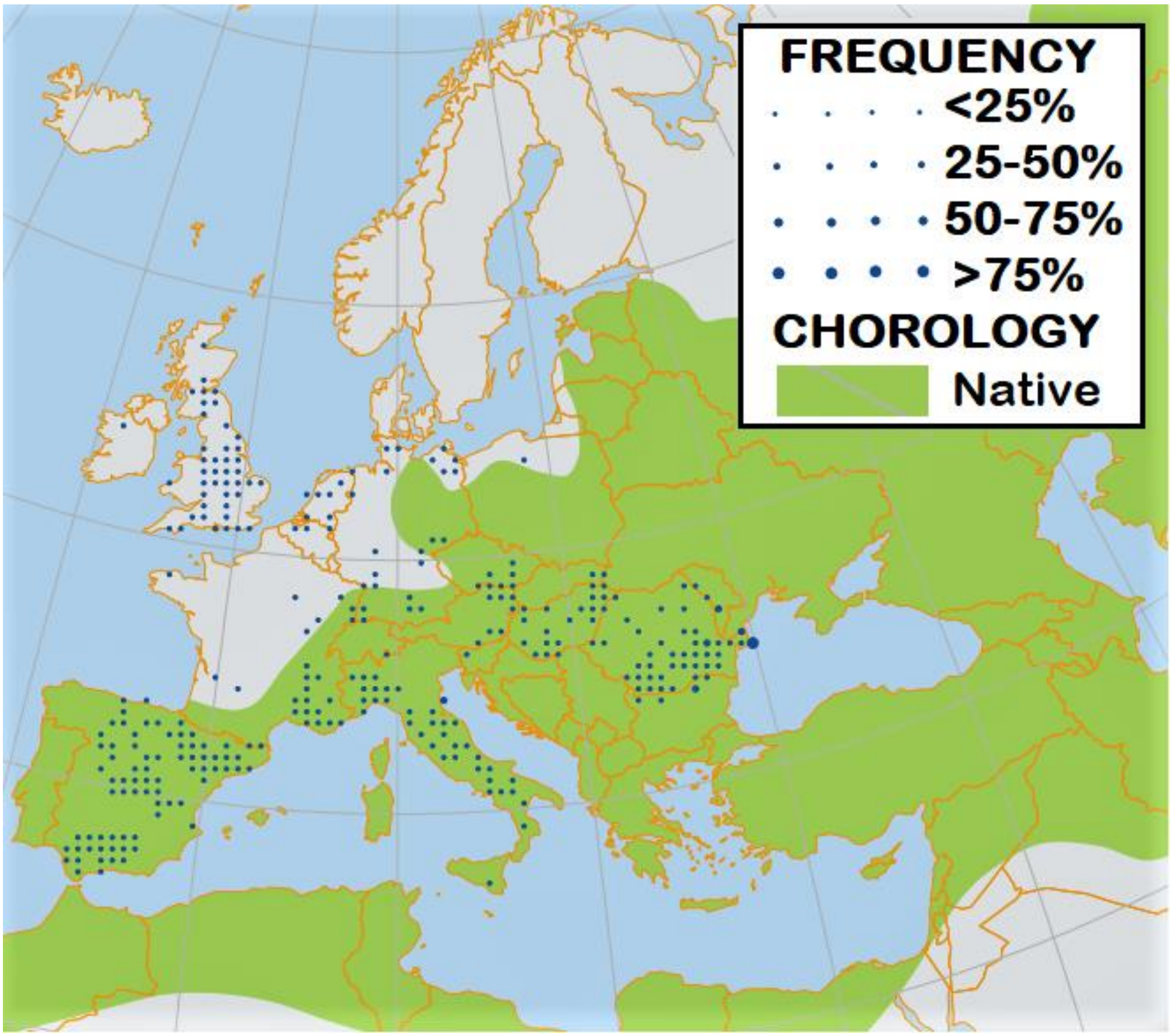
7.3 White Poplar – Distribution

7.3.1 British Isles

The **European White Poplar** is widespread in most of the British Isles, including North-West England. Click the link to inspect detailed distribution maps for England: Biological Records Centre 2021. ***Populus alba*, Online Atlas of the British and Irish Flora.** https://www.brc.ac.uk/plantatlas/plant/populus-alba

*'There is no certain evidence for the presence of **Populus alba** in Britain before 1500. It is usually said to have been brought from Holland in the 16th century, and was certainly recorded from the wild by 1597. It is now much planted, sometimes as distinct cultivars.'*

7.3.2 Europe



Distribution map of European White Poplar *Populus alba*.

Giovanni Caudullo & Daniele de Rigo 2016.
***Populus alba* in Europe: distribution, habitat, usage and threats.**
Pages 134-135 in: Jesús San-Miguel-Ayanz, Daniele de Rigo, Giovanni Caudullo, Tracy Houston Durrant & Achille Mauri (editors): **European Atlas of Forest Tree Species.** Publications Office of the European Union, Luxembourg, 200 pages.
Download: https://ies-ows.jrc.ec.europa.eu/efdac/download/Atlas/pdf/Populus_alba.pdf

8 BUT COULD IT BE A GREY POPLAR ?

8.1 How to decide if a tree is a Grey Poplar

Begin by studying this set of photos, sufficient to give a provisional identification:
Anon 2020. **The Grey Poplar (*Populus canescens*)** a hybrid of **White Poplar x Aspen**.
Nature Spot UK [Grey Poplar | NatureSpot]

To improve your identification, try this pair of innovative keys:

John Poland & Eric Clement 2009. **The Vegetative Key to the British Flora: A new approach to naming British vascular plants based on vegetative characters.** £24.99 from: https://www.nhbs.com/the-vegetative-key-to-the-british-flora-book
John Poland 2020. **The Field Key to Winter Twigs: A Guide to Native and Planted Deciduous Trees, Shrubs and Woody Climbers Found in the British Isles.** £19.99 from: https://www.nhbs.com/the-field-key-to-winter-twigs-book

To be certain a tree is indeed the Grey Poplar, a genetic test may be required.

Quick Clues

1. **Buds pointed.**
2. **Trunk white/yellowish; dark diamond-shape lenticels. [confuse with Aspen]**
3. **Capable of producing suckers from ramets. [confuse with Aspen]**

Handy Terms

acute = sharply pointed
dentate = toothed, with acute teeth facing outward.
felted = covered in fine hairs.
lobe = a division of an organ; cut to more than halfway to the midrib.
lobed = having one or more lobes.
obtuse = blunt; with a more or less rounded apex (at an angle greater than 90 degrees.
orb = orbiculate, more-or-less circular in outline.
ovate = egg-shaped, less than 3 times as long as wide, widest below the middle and tapering to apex.
sucker = vigorous vegetative shoot of underground origin.
toothed = projections reminiscent of teeth or cogs.
tree = a tall woody plant with a single main trunk.

Grey Poplar – Leaf

4. **Leaf length 3 to 8cm, sometimes as long as 10cm.** Don't include the stalk!
5. **Leaf ovate to orb-ovate.**
6. **Leaf usually deeply toothed.**
7. **Leaf above: hairless and dark green.**
8. **Leaf obtusely dentate with 4 to 7 teeth per side.**
9. **Leaf occasionally shallowly lobed.**
10. **Leaf below: white-felted when young, soon ± hairless.**

Grey Poplar – Leaf Stalk (Petiole)

11. **Petiole length to 3 cm and laterally flattened.**
12. **Petiole white-felted.**

Grey Poplar – Twig – First year shoot

13. **Twig soon hairless and dark grey-brown.**
14. **Twig smooth.**

Grey Poplar – Bud

15. **Bud size 6 to 10 mm. Shape ovoid and ±acute (pointed).**
16. **Bud wooly at base.**
17. **Bud slightly viscid.**

Grey Poplar – Branches

18. **Branches often drooping**

8.2 Grey Poplar – Distribution

8.2.1 British Isles

The **Grey Poplar** is widespread in most of the British Isles, including North-West England. Click the link to inspect detailed distribution maps for England:
Biological Records Centre 2021. **Grey Poplar, Online Atlas of the British and Irish Flora.**
https://www.brc.ac.uk/plantatlas/plant/populus-alba-x-tremula-p-x-canescens
*'There is no certain evidence for the presence of **Populus x canescens** in Britain before 1700. Perhaps **Populus x canescens** was imported to our area as a hybrid, and was formerly planted for timber. The first certain record was made around 1700. It is now much planted, but rarely becomes naturalised and probably rarely arises anew from the parents. It has increased in Scotland and Northern Ireland since the 1962 Atlas, but seems stable elsewhere.'* **How does the Grey Poplar clone survive and spread?** In Britain, it is assumed to due to the clone being favoured by humans for planting timber and these days for beauty.

In our opinion such assumptions are open to debate. Wherever both the two parental species – Aspen Poplar and White Poplar – overlap **(= 'sympatric')** then genetic interchange might occur, so creating the hybrid ***Populus tremula x Populus alba***, known as the **Grey Poplar (*Populus x canescens*)**.

For decades this was deemed highly unlikely due to the belief that the Aspen rarely seeded. This belief persists, in spite of it being debunked by copious observations in England and Scotland by Gray 1949, Worrell 1999, Chantel 2007, and Bunting 2017.

8.2.2 Europe

Click the link to check the brief mention of its distribution in Europe:

Biological Records Centre 2021. **Grey Poplar, Online Atlas of the British and Irish Flora.**
'A hybrid which occurs naturally within the native range of Populus alba, and has been spread beyond by planting'.
https://www.brc.ac.uk/plantatlas/plant/populus-alba-x-tremula-p-x-canescens

In Mainland Europe, large areas exist where **Aspen** and **White Poplar** overlap **(= 'sympatric')** along with their hybrid, the **Grey Poplar**. This has been intensively researched and published by Marcela Van Loo and colleagues in 2007.

In their words, **"the aim was to fill this gap for natural hybrids between two diploid, ecologically divergent European tree species with mixed sexual/asexual reproduction, *Populus alba* and *Populus tremula*."**

The focus was on ***Populus × canescens*** and its **backcross parent *Populus alba***, as these two genotypic classes **"co-occur and interact directly".**

Their many findings included:

i. Sexual recombination by seeds is more prominent in both taxa than thought.
ii. Grey Poplar builds larger clones extending over larger areas than White Poplar.
iii. By building larger clones, the Grey Poplar hybrid is more likely to survive.

Such findings, and many others by Marcello van der Loo and team, lead us to speculate that in Manchester wherever **Aspen** and **White Poplar** are within range of mutual wind-blown pollen dispersal, new **Grey Poplar** may arise as natural hybrids.

Furthermore, any such new **Grey Poplar saplings** are probably able to rival **Aspen** and **White Poplars** in terms of clonal spread by means of ramets and their thickets.

9 FINALLY, COULD IT BE A BLACK POPLAR ?

9.1 How to decide if a tree is a Black Poplar

Begin by studying this set of photos, sufficient to give a provisional identification: Anon 2020. The **Black Poplar (*Populus nigra*)**. The Woodland Trust.
[Black Poplar (Populus nigra) - British Trees - Woodland Trust]

To improve your identification, try this pair of innovative keys:

John Poland & Eric Clement 2009. **The Vegetative Key to the British Flora: A new approach to naming British vascular plants based on vegetative characters.** £24.99 from: https://www.nhbs.com/the-vegetative-key-to-the-british-flora-book
John Poland 2020. **The Field Key to Winter Twigs: A Guide to Native and Planted Deciduous Trees, Shrubs and Woody Climbers Found in the British Isles.** £19.99 from: https://www.nhbs.com/the-field-key-to-winter-twigs-book

British Native Black Poplar belong to the subspecies *betulifolia*, "***otherwise known as the Atlantic race of European Black Poplar***" (Joan Cottrell 2004) and "***its young expanding leaves of the Atlantic race have hairy petioles***".

To be certain a tree is indeed the **native Black Poplar**, a genetic test is required.

Quick Clues

1. **Trunk usually with knobbly burrs.**
2. **Crown spreading, with boughs downcurved, but upswept at tips.**
3. **Flowers either entirely male or entirely female (usually entirely male).**
4. **Buds balsam-scented, sticky when opening.**

Handy Terms

Burr: large knobbly outgrowth on a tree trunk.
Terminal Bud: a bud that is at the very end of a twig.
Lateral Bud: any bud along a twig that is not at the very end of the twig.
Adpressed Bud: lying flat, closely pressed against a surface.
Acuminate Leaf = narrowing gradually to a point.
Cordate Leaf = appearing heart-shaped, with base rounded and prominently notched.
Cuneate Leaf = wedge-shaped, with parallel sides converging at the base of the leaf.
Ovate Leaf = egg-shaped, less than 3 times as long as wide, widest below the middle and tapering to apex.
Rhombic Leaf = having a rhombohedral shape (an equilateral triangle)
Ciliate Leaf = leaf fringed with hairs ('cilia').
Serrate Leaf = saw-toothed, with acute teeth pointing towards the apex of the leaf.
Teeth = shape reminiscent of teeth and cogs.
Patent hairs = spreading widely and straight at about 90 degrees to the surface of the petiole.

Black Poplar – Leaf

5. **Leaf 5-10 cm x 10 cm.** Don't include the stalk!
6. **broadly ovate to rhombic, acuminate, cordate to broadly cuneate at base.**
7. **Leaf green or bronze when young, but soon dark green.**
8. **Leaf above hairy to hairless, often ciliate.**
9. **Leaf obtusely serrate, with weakly hooked teeth.**

Black Poplar – Leaf Stalk (Petiole)

10. **Petiole length 3 to 7 cm.**
11. **Petiole with uneven patent hairs to 0.4mm, soon hairless.**

Black Poplar – Twig – first year shoot

12. **Twig hairy to densely hairy when young.**
13. **Twig round.**

Black Poplar – Bud

14. **Buds shiny dark brown, ovoid and hairless.**
15. **Terminal Bud 8 to 12 mm; Lateral Buds 5 to 10 mm.**
16. **Lateral Buds spreading to adpressed.**
17. **Buds narrowly ovoid.**

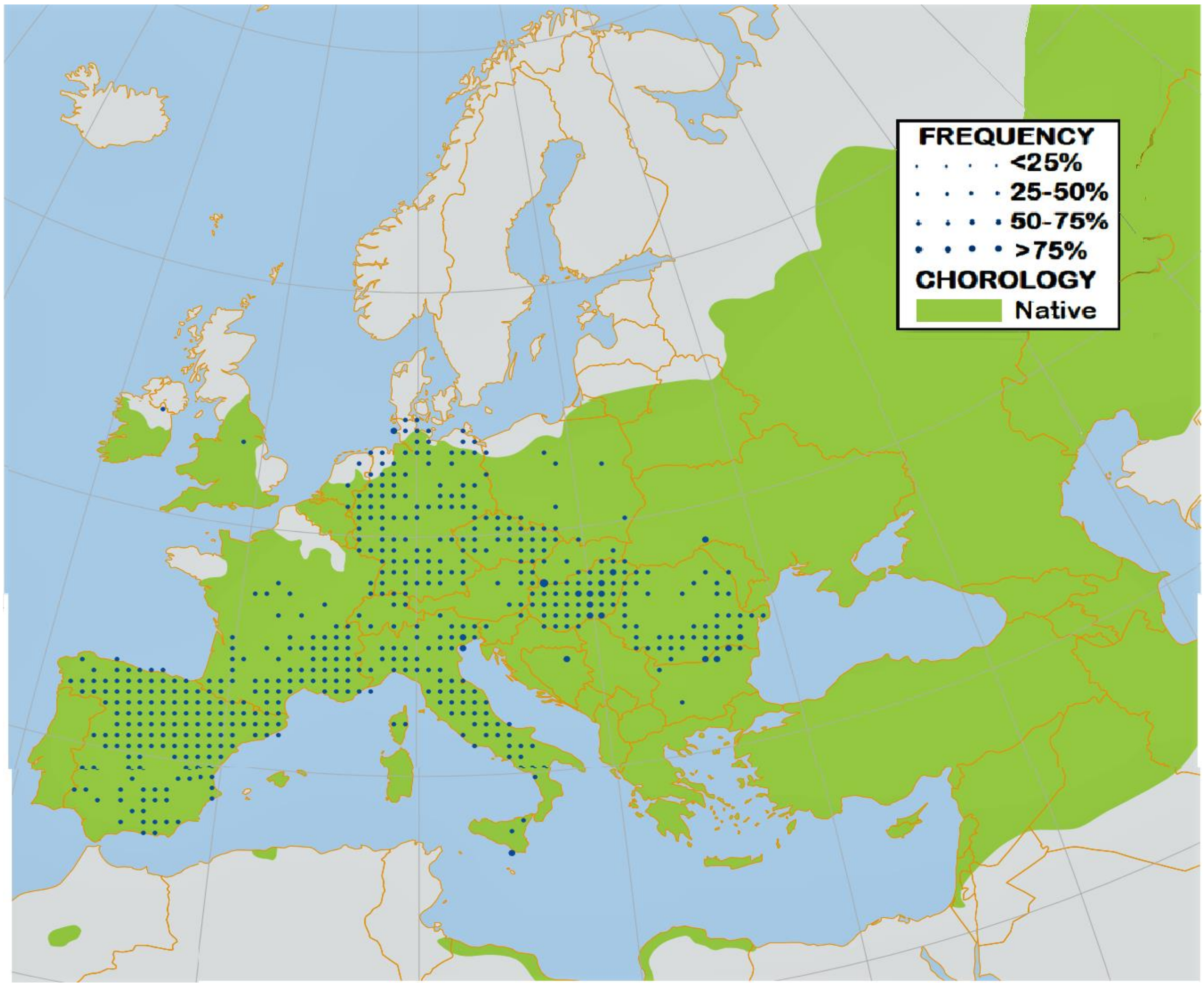
9.2 Black Poplar – Distribution

9.2.1 British Isles

The **European Black Poplar** was once widespread in most of Britain, including North-West England. Click the link to inspect detailed distribution maps for England:
Populus nigra subsp. betulifolia | Online Atlas of the British and Irish Flora (brc.ac.uk)

Biological Records Centre (2020). ***Populus nigra*, Online Atlas of the British and Irish Flora.**
https://www.brc.ac.uk/plantatlas/plant/populus-nigra-subsp-betulifolia
'Although regarded as native, the original habitat of this taxon has long been modified beyond recognition and it is no longer possible to separate native trees from those planted long ago. All records are mapped as if they are native. Many trees are old and in decline, but it is now being replanted in many areas. Urban trees are probably under-recorded.'

9.2.2 Europe



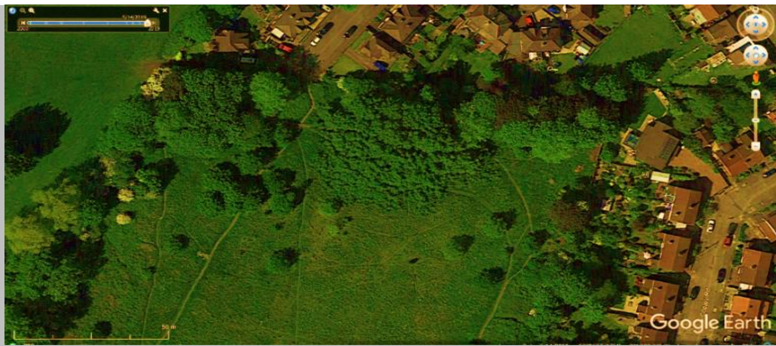
Distribution map of European Black Poplar *Populus nigra*.
Daniele de Rigo, C.M. Enescu, T. Houston Durrant & Giovanni Caudullo. 2016.
***Populus nigra* in Europe: distribution, habitat, usage and threats.**
Pages 136-137 in: Jesús San-Miguel-Ayanz, Daniele de Rigo, Giovanni Caudullo, Tracy Houston Durrant & Achille Mauri (editors): **European Atlas of Forest Tree Species.**
Publications Office of the European Union, Luxembourg, 200 pages.
Download: https://ies-ows.jrc.ec.europa.eu/efdac/download/Atlas/pdf/Populus_nigra.pdf

10 DISTRIBUTION OF NATIVE ASPEN TREES

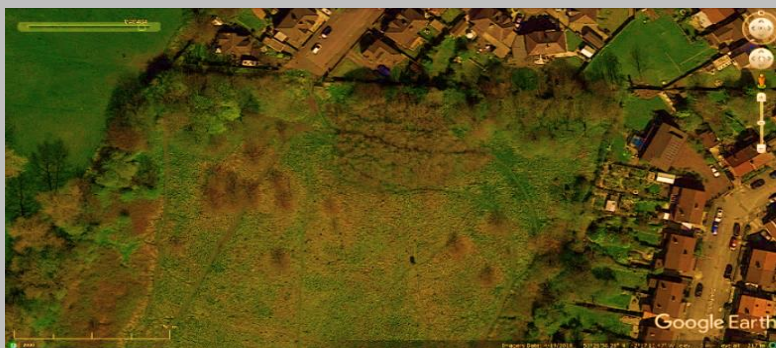
10.1 Native Aspen in Ryebank Fields

A time sequence of Google Earth images is presented below. It displays in remarkable clarity seral change from open grassland to dense woodland by the rapid spread of the dense Aspen Copse. **Field evidence proves that more than a thousand trees have arisen from 'ramet' suckers invading and obliterating the grassland.** This simple explanation contradicts the claim by MMU consultants that the area is ***"with many young trees that have self-seeded along the margins"*** (page 20, Ascerta June 2020).

14th May 2019



19th April 2018



14th March 2016

6th June 2009

10.2 Scarcity of Aspen Trees in Conurbations

The native Aspen is absent or scarce in urban areas. This attractive tree loses its appeal due to its ramet suckers hydraulically lifting, tilting and breaking flagstones, paving stones, and setts. Aspen might be acceptable as trees in parks, but its ramet suckers pose a serious challenge to mowing machines.

10.3 Aspen Copse in Ryebank Fields

The scarcity of stands of native Aspen in the Manchester area merits the Ryebank Aspen stand being classed as **NOTABLE**. Some of the Aspen trees can be classed as **POSSIBLE VETERAN**. Indeed, a paradox exists, for it is natural and normal for all Aspen trees in a stand to remain connected by underground wooden **'ramets'** that feed the suckers. It follows that Aspen can be immortal. As noted earlier, while an Aspen tree may live for only 50 to 150 years, it is a member of a genetic clone that may live for centuries. With apologies to William Shakespeare, ***"Trees may come, and Trees may go, but I go on forever"*** said the clone.

10.4 Records of Native Aspen in local area

Records of native Aspen trees are pinpointed on the Google Earth Image below.

Map of records of native Aspen trees in the local area.

Data kindly provided by Greater Manchester Ecology Unit GMEU.

Red lines: ward boundaries inside Manchester district.
Yellow circles: Aspen trees recorded in Manchester district.
Blue circles: Aspen trees recorded in Trafford district.
Large yellow circle: Ryebank Aspen thicket.

Chorlton has the biggest cluster of Aspen records in the whole of Manchester. The cluster consists of five Aspen records in Chorlton ward plus another five Aspen records in Chorlton Park ward. Nine of the ten are associated with the margins of the floodplain and terraces of the River Mersey, the lone exception being the Aspen Copse in Ryebank Fields. However, there is strong local historical evidence for the name of Ryebank Fields being a corruption of 'Riverbank Fields'. Old maps show Black Brook to the north and Longford Brook running centrally through Ryebank Fields (Anon 2020). The Fields were originally known as 'The Isles'.

10.5 Records of Aspen Trees in Manchester

Below is a ward-by-ward Table of native Aspen in Manchester district. The Table shows native Aspen trees are widely scattered, but are not common.

COMMENT	WARDS	ASPEN RECORDS		COMMENT
Only 9 of the 32 wards have records of native Aspen trees 23 wards have no records of native Aspen trees	Chorlton	5	10	Chorlton's pair of wards are Manchester's only known major hub of this important native tree
	Chorlton Park	5		
	Woodhouse Park	2		
	Brooklands	2		
	Miles Platting N.H.	2		
	Harpurhey	2		
	Longsight	1		
	Fallowfield	1		
	Didsbury East	1		

Data kindly provided by Greater Manchester Ecology Unit GMEU

Aspen are nowhere recorded in the city centre and are generally very scarce in north Manchester, as shown on the map below.

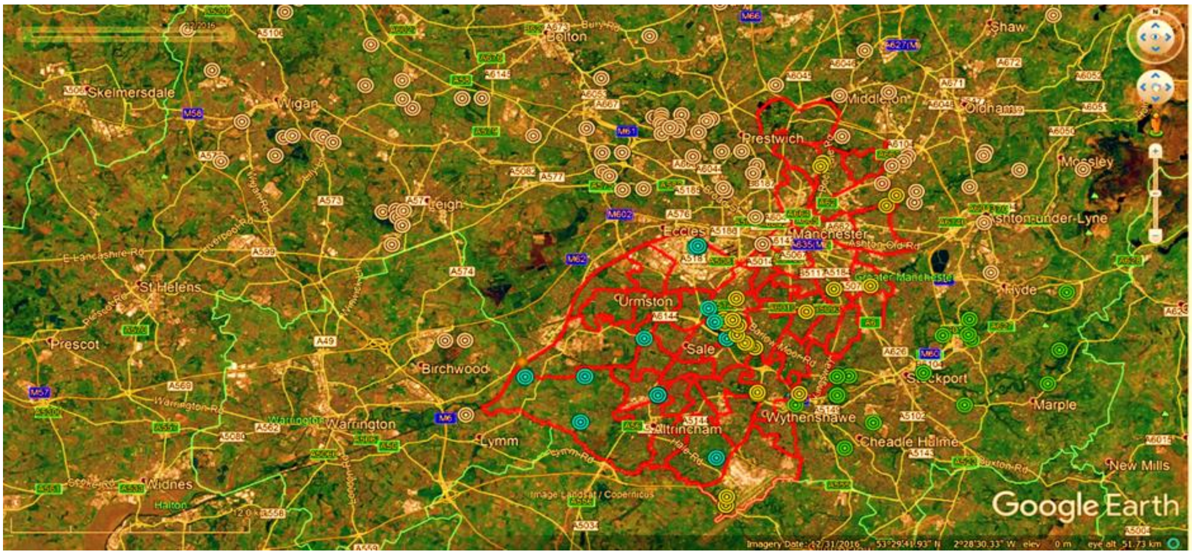
Map of records of native Aspen trees in north Manchester.

Data kindly provided by Greater Manchester Ecology Unit GMEU

Red lines: ward boundaries inside Manchester district.
Yellow circles: Aspen trees recorded in Manchester district.
Blue circles: Aspen trees recorded in Trafford district.
White circles: Aspen trees recorded in other districts.

10.6 Records of Aspen in Greater Manchester

The following map shows the distribution of records of native Aspen in Greater Manchester. To facilitate understanding, the ward boundaries of Manchester and Trafford are highlighted in red.



Map of records of native Aspen trees in Greater Manchester.

Data kindly provided by Greater Manchester Ecology Unit GMEU

Red lines: ward boundaries in Manchester and Trafford districts.
Yellow circles: Aspen trees recorded in Manchester district.
Green circles: Aspen trees recorded in Stockport district.
White circles: Aspen trees recorded in other districts.

Contrary to expectations, the largest known cluster of records of native Aspen is in Manchester district, in Chorlton (Chorlton ward 5, Chorlton Park ward 5) plus several more records close by in Trafford district. The common historical factor of these records is close proximity to streams and brooks associated with the River Mersey as both tributaries and distributaries. As discussed, the Aspen Copse in Ryebank Fields is also part of this historical grouping.

However, there is a difference; for the Ryebank Aspen Copse has been able to grow rapidly by seral change led by a thousand Aspen saplings over the open rough grassland that was a ‘temporary’ climax vegetation over thin unshaded soil cover for a waste dump backfilling a deep clay quarry. ‘Temporary’ that is, until the relentless spread of the Aspen thicket, plus the growth nearby of oak saplings from acorns.

In stark contrast, all the other records of Aspen in the Chorlton cluster seem to be of isolated Aspen ‘Giants’ that are being strongly shaded out and are predicted to die within the next couple of decades.

The fate of these Aspen ‘Giants’ is sealed, not only due to shading out, but also due to them reaching their senile old age. Furthermore, there only limited clearings in the woodlands for planting Aspen.

Therefore, the Aspen Coppice in Ryebank Fields is destined to be a refuge for not only Aspen but also for the substantial number Aspen-dependent species of insects.

11 ASPEN & BAT MATERNITY ROOSTS

Bats are a strictly protected by law. Bat species often rely heavily on tree cavities in woodland, copse, parks and gardens, especially communal maternity roosting.

Aspen thickets are generally unsuitable for bat roosts, as the young trunks are too slender to provide sufficient concealment or insulation, and the trunks rarely have sufficiently deep crevices.

11.1 Bats and Ryebank Aspen Copse

While the young trunks of Ryebank Aspen Copse are expected to be in a good feeding area and perhaps suitable for small roosts, it seems unlikely nursery roosts will be present – but with one important exception. For strong relationships are now known to exist between roosting habitat of bats and decay of Aspen trees in the sub-boreal forests of Northern Alberta (Crampton & Barclay 2008) and British Columbia (Parsons, Lewis & Psyllakis 2003). They demonstrated that bat maternity colonies can be found in naturally formed cavities in live, decadent Aspen in old stands.

Therefore, the long-term sustainability of bats in Ryebank Fields depends on conserving the Ryebank Aspen Copse for a few more decades, by which time there can be expected to be sufficient stock of decadent Aspen trees in which naturally formed cavities will exist, attractive to bat maternity roosts. In the words of Parsons et al.: ***'Forest managers must recognise the importance of old aspen and monitor the availability and quality of bat roosting habitat to ensure populations are not threatened when forests are managed primarily for commercial timber harvesting'.***

Applied to Ryebank Fields, this factual knowhow indicates that the Ryebank Aspen Copse should never be thinned, directly contrary to the MMU proposal. Instead, the factual knowhow is that the thicket should be left intact for its intrinsic ecological value, and but left alone to run its natural course to become dominated by cavity-ridden 'old aspen' ideal for occupancy by bats; not only as temporary roosts but ultimately for bat homes ideal for bat maternity roosts. This is described in detail by Parsons and colleagues 2003 to which the reader is referred.

Older Aspen trees are also larger, have more heartwood than younger trees and may provide larger cavities with thicker walls. These features may contribute to a more stable and warmer microclimate, which accelerates fetal development and juvenile growth.

11.2 Bats & Aspen Giants in Chorlton

Contrary to expectations, there are tall old Aspen in the dense woodland near the Mersey in Chorlton. These ancient giants are hemmed in by normal old trees. The Aspen are in poor condition with rotting, even tumbling; and have few suckers suggesting the ramets have withered.

The most plausible explanation is that in olden times there was dense Aspen here, and these failing giants are the only survivors. If true then there is a high possibility that they might have important bat roosts. Put another way, Aspen are a pioneer species that grows rapidly (tall and sideward by suckers sprouting from ramets) and age very quickly and with rapid ageing become vulnerable to early rotting (see the paper by Parson and colleagues 2003).

12 RYEBANK FIELDS & HEDGEHOGS

Hedgehogs are remarkably frequent in Ryebank Fields and the peri-urban land to both east in Trafford and west in Chorlton. It is reasonable to assume that the hedgehogs are present in Ryebank Aspen Copse, taking advantage of its excellent cover. This is expected to give the hedgehogs some protection from predation by badgers from the Badger Sett also present on Ryebank Fields.

Chorlton is recognised as a major hotspot for a high population of hedgehogs in urban parks and gardens and in the habitat mosaic of the informal Ryebank Nature Reserve. The evidence for this is freely available from not only the well-known BIG Hedgehog Map but also by scrutiny of the predictive maps derived from **'habitat suitability modelling'** by Patrick Wright and colleagues 2020. Ground-truthing by Friends of the Ryebank Fields is ongoing and confirm Ryebank Fields and its surroundings are a regionally important hotspot for hedgehogs. The main threat of hedgehog injury and mortality is from busy roads (Wright and colleagues 2020).

The regionally important hedgehog hotspot was not assessed in the Environmental Assessment by MMU consultants, contrary to Government policy:

Statement by Department for Environment, Food and Rural Affairs October 19th 2000:

*The Government is concerned about the decline in hedgehog numbers in England and the findings of the **Red List for British Mammals**, published earlier this year [2020] by the Mammal Society, which has classified hedgehogs as **'vulnerable'**. As set out in the 25 Year Environment Plan, we are committed to taking action to recover our threatened native species. We are exploring the use of powers in the Environment Bill to strengthen our commitment to improve the status of threatened species, including by setting at least one biodiversity target in law, as well as enhancing duties for public authorities to carry out strategic assessments of the actions they can take to enhance and conserve biodiversity.*

Hedgehogs are protected by the Wildlife and Countryside Act 1981 from being killed using prohibited methods such as crossbows, traps and snares. Whilst the reasons for the decline in numbers of this native species are complex, the Government has not previously moved to protect this species under Schedule 5 as it is not clear that such protection would be of benefit to the species…

The Joint Nature Conservation Committee (JNCC) has, however, recently commenced the seventh Quinquennial Review of Schedules 5 and 8 of the Wildlife and Countryside Act 1981. The JNCC will make evidence-based recommendations to the Secretary of State as to which species warrant additional legal protections to secure their future conservation. The Government will therefore consider any recommendations to add species to Schedule 5 of the Act once these recommendations have been submitted.

Defra commends the work, including research, undertaken by the British Hedgehog Preservation Society and the People's Trust for Endangered Species, such as their Conservation Strategy for Hedgehogs. Additionally, we have published advice on how to help hedgehogs through the creation of hedgehog havens and making gardens as welcoming as possible. This can be accessed at: www.gov.uk/government/news/five-simple-steps-to-transform-gardens-in-to-hedgehog-havens

Further to this, the revised National Planning Policy Framework sets out the Government's policy on planning and states that the planning system should contribute to and enhance the natural and local environment by minimising impacts on, and providing net gains for, biodiversity, including by establishing coherent ecological networks.

13 RYEBANK FIELDS & B-LINES

13.1 National Network of B–Lines

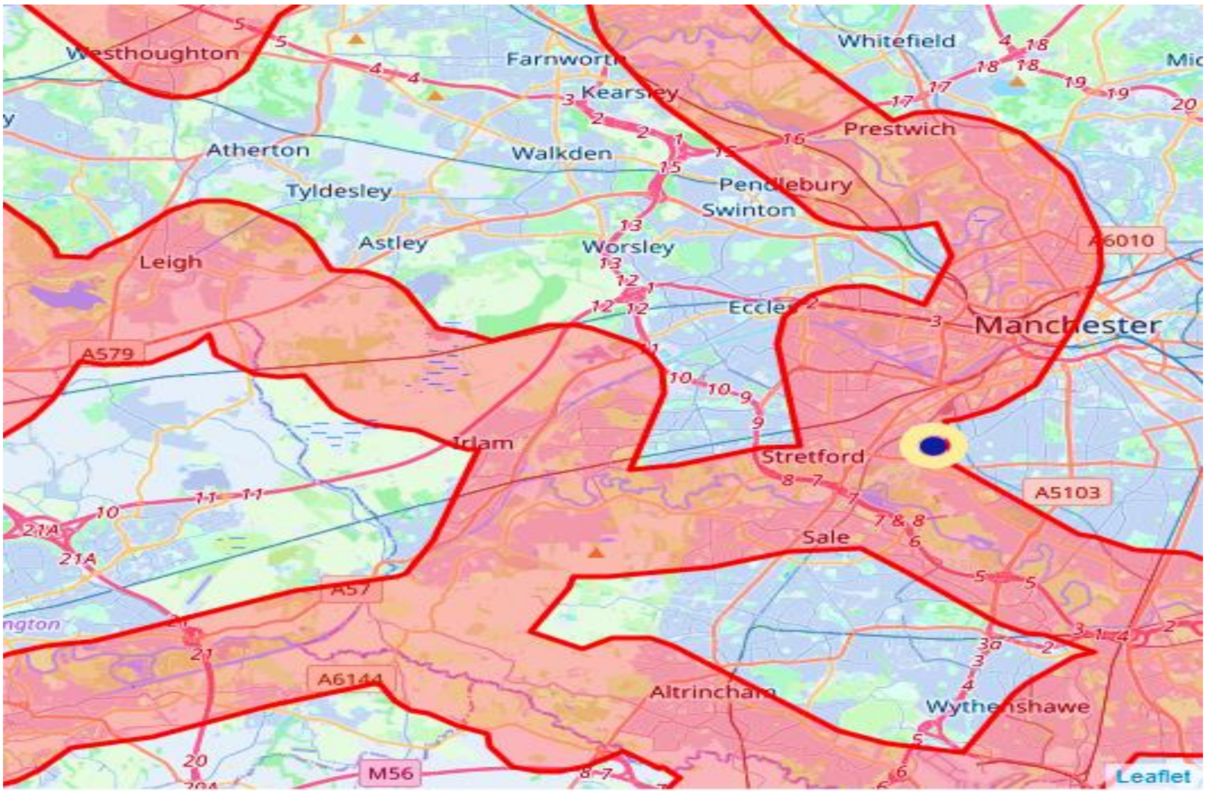
B–Lines are a major initiative of the Invertebrate Conservation Trust aka **Buglife** https://www.buglife.org.uk/about-us/our-history/ of which the senior author is now a member. **B–Lines** are a national initiative, not to be confused with the Bee Line network in Greater Manchester of footpaths and cycleways. The **B–Lines** are corridors for wildlife enhancement to ensure bees, butterflies, hoverflies and other insects have chains of sites for pollinating flowers, and for egg laying, rearing young, hibernating and dispersal to other sites. In particular to ensure no species of bugs become extinct, and all plants that need pollinating are indeed pollinated.

B–Lines of NW England.

Data kindly provided by a member of the Invertebrate Conservation Trust.

Red lines: network of Bee–Lines in NW England, including a Bee–Line through Ryebank Fields.

Blue lines: network of Bee–Lines in Wales.



Aspen Copse at a critical point in the West Manchester B–Line
DOT: Aspen Copse in Ryebank Fields.

The width of the West Manchester B–Line is so urbanised that Ryebank Fields (width 0.1 miles), Longford Park (width 0.24 miles), Park Rd (width 0.17 miles) and Bradfield Rd (width 0.15 miles) are each vital in keeping this vital B–Line properly passable.

14 ASPEN & INSECTS

14.1 Aspen's major role in British biodiversity

Aspen has a major role in maintaining the biodiversity of the British Isles. 38 species across nine groups of insects feed exclusively on Aspen. In addition to these, a dozen species across six insect groups feed mainly on Aspen. A further ten species across five insect groups feed on Aspen and other Poplars. Overall, Aspen plays a key role in the survival of sixty species of native British insects.

Insect Species known feeders on live Aspen in UK (Alan Stubbs 2014)

Insect Groups	feeding only on live Aspen	feeding mainly on live Aspen	feeding on live Aspen & Poplars	totals
Micro-Moths	9 species	2 species	0	11 species
Sawflies	8 species	0	1 species	9 species
Gall Midges	5 species	0	4 species	9 species
Mites	4 species	0	0	4 species
Aphids	3 species	0	2 species	5 species
Weevils	3 species	2 species	2 species	7 species
Heteropteran Bugs	2 species	0	0	2 species
Macro-Moths	2 species	1 species	0	3 species
Leaf Hoppers	2 species	1 species	1 species	4 species
Longhorn Beetles	0	2 species	0	2 species
Leaf Beetles	0	4 species	0	4 species
	38 species	12 species	10 species	60 species

14.2 Insect Groups on Live Aspen in Ryebank

Insect Groups seen on live Aspen in Ryebank Fields (Robin Grayson 2019-2020)

Robin	Present
Sawflies	Present
Gall Midges	Present
Mites	Present
Aphids	Present
Weevils	Present
Heteropteran Bugs	Present
Macro-Moths	Present
Leaf Hoppers	Present
	9 groups

Visits were made to make a preliminary assessment of insect groups present on live Aspen trees and suckers in the Aspen Copse. Access inside the thicket was facilitated by the unique paths that transect the thicket. Visits in 2021 are required to identify to species-level.

14.3 Decline & Extinction of Aspen Insects

This chart indicates the UK decline of Aspen-dependent insects and presents a prediction. Aspen of all growth stages plus deadwood – as exemplified by the Ryebank Aspen Copse – must be conserved, or the insect biodiversity may halve within only a few decades.

	In the Past	Extinct	Current	Priority	Predicted
Macro-Moths	7 species	4	3 species	1	2 species
Micro-Moths	14 species	3	11 species	3	8 species
Longhorn Beetles	3 species	1	2 species		2 species
Leaf Beetles	5 species	1	4 species		4 species
Sawflies	9 species		9 species		9 species
Gall Midges	9 species		9 species		9 species
Weevils	7 species		7 species	1	6 species
Hoverflies	1 species		1 species	1	GONE
Wasps	1 species		1 species	1	GONE
Aphids	5 species		5 species		5 species
Leaf Hoppers	4 species		4 species		4 species
Mites	4 species		4 species		4 species
Heteropteran Bugs	2 species		2 species		2 species
	71 species	9 extinct	62 species	7 near-extinct	51 species

15 POPLAR TREES & PROPOLIS

15.1 What is Propolis?

Resins are secreted by plants, especially trees – to protect themselves and especially their vulnerable buds from infection by viruses, bacteria and other diseases. Honey Bees are aware of this and gather the resin to carry to their hive to protect the colony (Ristivojević and colleagues 2015.)

Bees less than 15 days old collect the resins from trees up to 2 km from the hive from May to November, but most often in late summer. Collection is during the warm part of a day, between 10 am and 15:30 pm, when the resin is still soft and readily available during sunny and warm weather.

A honeybee collects about 10 mg of resin per flight, enabling the colony to produce about 100 grams of propolis per year. The propolis is produced thus:

a) resin first masticated by the bee.

b) resin thoroughly mixed and then transferred to forelegs and thence to the middle legs.

c) resin finally placed into the corbicula on the same side.

d) the bee carries the resin to a hive where propolis is needed.

e) she and waits until other bees take some of the resin from her corbicula.

f) cementing bees immediately attach the resin to a site on the hive wall, often in late afternoon.

15.2 Propolis from Aspen, White & Grey Poplars

Despite pollen being wind-blown, poplar trees attract Honey Bees. The closely-related **Eurasian Aspen** (***Populus tremula***), **European White Poplar** **(*Populus alba*)** and **Grey Poplar** (***Populus canescens***) are amongst the poplars most favoured by Honey Bees, and likewise the **Black Poplar** (***Populus nigra***). Ryebank Fields are a perfect site for public and students alike to appreciate the vital role of resins in protecting poplar trees from bacteria and viruses, especially their vulnerable buds - and to learn that Honey Bees gather the resin to create propolis to protect the health of the thousands of residents in their crowded hives. In doing so, the propolis has been a useful ointment for thousands of years, and is the focus of intensive research worldwide to produce affordable drugs for the whole world.

15.3 Propolis against SARS-CoV-2 and COVID-19

Recent research by Andresa and colleagues (2020) suggests the potential of purified Brazilian-propolis against SARS-CoV-2 infection mechanisms and COVID-19 diseases. Likewise suggested by Dezmirean and colleagues (January 2021) for *Populus*-propolis.

CAUTION: As yet, no trials have confirmed these suggestions.

Owned by MMU, Ryebank Fields is potentially a platform for lecturers and researchers of the MMU landowners and the University of Manchester laboratories at the Christie to examine and collect buds of a wide range of poplars, including **Eurasian Aspen**, **European White Poplar**, **Grey Poplar**, and the **European Black Poplar**. By sampling buds not hives, purer samples of *Populus*-propolis are possible.

Our worldwide literature search failed to find any studies on underground woody ramets for anti-viral secretions. We suggest the tree tunnels made and maintained by The Friends of Ryebank Fields be used to gain easy access for sampling underground woody ramets for possible anti-viral secretions of possible medical value.

15.4 Propolis from the Manchester Poplar

The **Manchester Poplar** is a clone of ***Populus nigra* subspecies *betulifolia***, selected by Manchester Corporation Parks Department in the mid-1800s. It was propagated by male cuttings to avoid masses of fluffy seeds cluttering the ground.

The **Manchester Poplar** was much sought after, being the only tree to thrive in the choking smoke of Manchester and Salford. Robin Grayson has childhood memories of how severe the air pollution was in Gleaves Road in Eccles in the late 1950s and early 1960s.

Looking westward down the street, the sunsets were often glorious, due to the air pollution over Irlam Steelworks. When it snowed, all us kids rushed out to enjoy the white snow before it turned grey with black smutty spots. The black spots warmed up, and melted holes through the snow. There were many privet hedges along the street, and a trick was to shake a privet to cascade a hiding kid with an awful cloud of dust. Clean handkerchiefs looked terrible after a single blow. Ears were soon filthy, and kids teased *"are you growing spuds in your ears?*". Finger nails were black with filth by bedtime. Hard to believe now, but on some days my hair was impossible to comb as it had stuck together due to the filth in the air. As for trees, in my part of Eccles the only big trees were the Manchester Poplar, and a gang of us had to sneak into gardens in Ellesmere Park to find conkers on magnificent Horse Chestnut trees. A Sycamore sapling grew in our tiny front garden but I had to splash water on its leaves and scrub its trunk to keep it healthy. No conifers grew in our part of Eccles and a hundred seedlings of Scots Pine sent to us from the Forestry Commission all failed to grow and died. One day our gang legged it to see the modern Agecroft Colliery and hundreds of trees in the forest near it were dead skeletons. This was doubtless due to local acid rain from Agecroft Power Station fed from the coal mine. When the cooling tower was demolished, the timber inside was bonfired but the smoke from the bonfire killed pigeons as the timber was treated with arsenic. When I was in my teens I had a summer job at Irlam Steelworks, and had the terrible job of going through a porthole with a torch clutching a huge scraper to scratch off in darkness the enormous layer of thick dust that had congealed on the metal plates inside the vast Electrostatic Dust Precipitator. Thanks to the Union, we were only allowed to do this for a couple of hours by which time the three layers of masks were black. We drank tea for the rest of the shift.

The **Manchester Poplar** was one of my favourite trees. Thousands had been planted in and around Manchester by the Corporation giving large cuttings, metal bars as dibbers and bicycles. The **Manchester Poplar** was the only tree capable of thriving in severe smoke pollution. In my first year at Manchester, Clive Stace was my botany professor. He taught us about the **Manchester Poplar** and said he had checked a hundred and without exception they were male trees! (Stace 1981). Many years ago the Parks Department never planted female poplars for to do so would have unleased fluffy seeds to smother the streets in what in Moscow is called 'Stalin Snow'.

Today a few **Manchester Poplar** still exist, all male cultivars of ***Populus nigra* subspecies *Populus betulifolia*.** Consensus exists this subspecies is the westernmost form of ***Populus nigra***, species highly important for honey bees harvesting sticky resin of the right type of propolis in commercial quantities in much of Central Europe. **Manchester Poplar** may do likewise. More importantly, being a subspecies, its sticky buds may produce propolis resins with slightly different beneficial properties to that produced by ***Populus nigra*** in mainland Europe.

This possibility merits investigation, for the propolis resins produced by the **Manchester Poplar** may have special ingredients to help the tree to survive infections by bacteria and viruses associated with chronic air pollution.

16 CONCLUSIONS & RECOMMENDATIONS

	Aspen Stands: UK Conclusions (Alan Stubbs 2014)	Aspen Stands: Ryebank Conclusions (Robin Grayson 2020)	Aspen Stands: Ryebank Recommendations (Robin Grayson 2020)
1	Scottish Highlands have the UK's most important Aspen-dependent insects, fungi and lichens.	Manchester's most important Aspen stand for naturalness and potential biodiversity.	Declare Ryebank Aspen stand and 100 metres distant from youngest suckers as a Grade B Site of Biological Importance SBI, sustainable for a century without recourse to coppicing.
2	Ascertain Aspen resource and age structure, including dead wood.	Manchester's most important Aspen stand in terms of age structure and seral change.	
3	Check for the presence of the more obvious Aspen fauna, e.g.: conspicuous ladybird-sized beetles & light trapping for moths	Study required.	Potential to Declare Ryebank Aspen stand and 100 metres distant from youngest suckers as a Grade A Site of Biological Importance SBI, but only if justified by insect biodiversity.
4	Check for the presence of the more obvious Aspen flora, e.g.: fungi and lichens		
5	On sites with Aspen, ensure that management policies are positive towards Aspen, especially when young and old growth is likely to have been continuously available throughout the last 50 years.	Young and old growth of Aspen has been continuously available for 50 years. Ecological value, naturalness and educational value exceeds Aspen stands elsewhere in NW England which have been compromised by grazing, felling, pruning, thinning, pollarding, coppicing, mowing; and uprooting suckers.	Retain the internal footpaths of the Aspen stand as a unique experience for public enjoyment of being inside a dense thicket, and an intact transect for research, unlikely to exist elsewhere in England. Retain dead Aspen trees *in situ*. Retain fallen Aspen trees *in situ*. Retain fallen Aspen branches *in situ*. Retain fallen Aspen twigs *in situ*. Retain fallen Aspen leaves *in situ*.
6	Maintenance of young growth may require some coppice rotation of 3-5 years.	Young growth is vigorous into open grassland and so coppice rotation is not required.	The natural seral change at Ryebank is clear and of merit.
7	Significance of Aspen on heathland needs emphasizing, especially allowance for continuity of young growth.	Significance of Aspen on grassland needs emphasizing, allowance for continuity of young growth via seral change.	The seral change is reminiscent of the invasion of NW England by forests including Aspen at end of the last ice age.
8	Natural browsing on Aspen by rabbits and deer is possible and needs to be considered.	Natural browsing on Ryebank Aspen is low, partly due to the dense saplings forming barriers.	Deer rarely visit Ryebank Fields, but vigilance is advisable.
9	If livestock grazing is introduced the impact of browsing on Aspen must be minimal (breed of animal and stocking level relevant).	Grazing is not being introduced, so impact of browsing on Aspen by livestock is zero.	Aspen is very palatable to grazing by livestock.
10	New planting of trees should include Aspen of local provenance (preferably local via root-stock propagation) especially at ride, glade and woodland edges where young growth is easier to cater for.	Ryebank Aspen are local and a therefore a future source of root-stock cuttings for planting in Trafford and Manchester. For instance, copses at intervals in 8 miles of ride, glade and woodland edges of the Fallowfield Loop of the N60 National Cycle Network, if Floop and Sustrans wish.	Urban forests tend to be dominated by attractive but alien species of trees, such as Horse Chestnut, Lombardy Poplar; and naturalized trees such as Sycamore. In contrast, Ryebank Aspen is a British tree supporting native wildlife.
11	The Forestry Commission is now contaminating UK native Aspen with selected Scandinavian clones to give faster growth rates.	Ryebank Aspen trees predate the Forestry Commission and so likely a British clone rather than a foreign hybrid.	Managed tall forests have no place for Aspen as competitive trees sooner or later smother it.
12	Aspen is estimated to be England's fasted growing tree, far outstripping other tree planting for responding to the climate emergency. *(see McHugh et al 2015)*	Ryebank Aspen Copse offer a unique opportunity for detailed research into not only above-ground carbon sequestration but also the below ground sequestration by the network of ramets feeding suckers.	Measuring the underground sequestration of carbon by Aspen at Ryebank Fields will establish Aspen as 'the tree of choice' for mass tree planting in NW England for regional carbon management.

17 SITES OF NATURE CONSERVATION VALUE

17.1 Principles and Criteria for Selecting Sites

The principles for selection of sites of high nature conservation value are well recognised and established within the Nature Conservation Review (NCR Ratcliffe 1977). Download from Bainbridge and colleagues 2013.

The criteria have been used both within the **Selection Guidelines for Sites of Special Scientific Interest SSSI** (NCC 1989) and in many second-tier site selection systems including the **Sites of Biological Importance SBIs** of Greater Manchester. These criteria are still the principles on which Defra (Defra LSS paragraph 50 & Annex C) recommends second tier site systems are based:

<table>
<tr><th colspan="2">CRITERIA FOR SELECTING SSSIs</th><th colspan="2">CRITERIA FOR SELECTING SBIs</th><th>COMMENTS</th></tr>
<tr><td>1</td><td>Size/extent</td><td colspan="2">Size/extent</td><td rowspan="8">Bainbridge and colleagues 2013. Guidelines for the Selection of Biological SSSIs - Part 1: Rationale, Operational Approach and Criteria for Site Selection, Joint Nature Conservation Committee. JNCC.
Download PDF:
https://hub.jncc.gov.uk/assets/dc6466a6-1c27-46a0-96c5-b9022774f292</td></tr>
<tr><td>2</td><td>Diversity</td><td colspan="2">Diversity</td></tr>
<tr><td>3</td><td>Naturalness</td><td colspan="2">Naturalness</td></tr>
<tr><td>4</td><td>Rarity/ exceptional features</td><td colspan="2">Rarity/ exceptional features</td></tr>
<tr><td>5</td><td>Fragility</td><td colspan="2">Fragility</td></tr>
<tr><td>6</td><td>Typicalness/ representative value</td><td colspan="2">Typicalness/ representative value</td></tr>
<tr><td>7</td><td>Recorded History</td><td colspan="2">Recorded History</td></tr>
<tr><td>8</td><td>Connectivity within the landscape</td><td colspan="2">Connectivity within the landscape</td></tr>
<tr><td rowspan="4">Additional Criteria following Defra Guidance: INTRINSIC APPEAL</td><td>9</td><td colspan="2">Appreciation of Nature</td><td>Assessed by the number of formal or informal access point, formal public rights of way and informal desire lines, provision for less able users (e.g. push chairs, wheel chairs etc) and evidence of ‘nature play’ (e.g. children’s dens, rope swings). The term ‘informal’ can be clarified as the use of the area which gives an indication that de facto public access actively occurs.</td></tr>
<tr><td>10</td><td colspan="2">Value for Learning</td><td>Education – This can be assessed from usage by school groups for study, provision of onsite or roving Ranger staff who undertake events on the site, facilities to help understanding/appreciation of the site (e.g. interpretative panels, leaflets, guided walk maps etc) and links with the community to undertake management work (e.g. TCV, local authority clean-ups or tree planting sessions).</td></tr>
<tr><td>11</td><td>Social Criteria</td><td>Accessibility and Usage</td><td>Accessibility and usage – Assessed by the number of formal or informal access points, formal public rights of way and informal desire lines, provision for less able users (e.g. push chairs, wheel chairs etc.</td></tr>
<tr><td>12</td><td colspan="2">Sense of Ownership</td><td>The presence of ‘Friends of Groups’, community action events or voluntary wardening of the site.</td></tr>
</table>

17.2 Intrinsic Appeal – appreciation of nature and value for learning

Defra Guidance suggests that the '**value of sites for the appreciation of nature'** and **'value for learning'** be considered as criteria for selecting sites. These two criteria can be considered to provide an assessment of the '**intrinsic appeal' of a site's wildlife**.

The importance of **'intrinsic appeal'** is well documented within the Defra LSS Guidance (Defra LSS paragraph 51 & 58).

The Districts in Greater Manchester have programmes for the designation of Local Nature Reserves, which embody the characteristics of intrinsic appeal. Some of these sites are also selected as SBIs for their ecological value.

However, given this change of emphasis in the Defra LSS Guidance, it was agreed that **social criteria should be incorporated into the Greater Manchester SBI Guidelines.** Some work in this area has already been undertaken in other counties including Leicestershire and Rutland and it is this work that has formed the basis of the approach in this guidance by **Greater Manchester Ecology Unit GMEU 2016**.

Intrinsic appeal – GMEU 2006 state this does not form a primary reason for site selection, as SBIs must support wildlife of substantive nature conservation value.

GMEU 2006 state the following attributes can be used as supplementary characteristics to support the selection of a site which is on the cusp of selection, by almost qualifying under Guidelines within Part 2 or Part 3 of this document.

Intrinsic Appeal must include a significant number of the following elements:

Accessibility and usage – According to GMEU 2006, assessed by the number of formal or informal access point, formal public rights of way and informal desire lines, provision for less able users (e.g. push chairs, wheel chairs etc) and evidence of 'nature play' (e.g. children's dens, rope swings etc). The term 'informal' can be clarified as the use of the area which gives an indication that de facto public access actively occurs.

Education – According to GMEU 2006, this can be assessed from usage by school groups for study, provision of onsite or roving Ranger staff who undertake events on the site, facilities to help understanding/appreciation of the site (e.g. interpretative panels, leaflets, guided walk maps etc) and links with the community to undertake management work (e.g. TCV, local authority clean-ups or tree planting sessions).

Sense of ownership – According to GMEU 2006, this can be assessed by the presence of 'Friends of Groups', community action events or voluntary wardening of the site.

According to GMEU 2006, it is not possible to set quantitative values to the features above. GMEU will work with its Key Partners and/or other representatives of the Local Authorities to further refine these attributes. The elements outlined above will provide the framework for the future development of this Guideline.

Where a site is selected with Intrinsic Appeal as supplementary criteria the SBI Designation will clearly identify this, both within the site description and the statistics sheets (see below Section 5 SBI Citation).

18 POTENTIAL STATUS OF THE ASPEN COPSE

The Aspen Copse is an important component of Ryebank Fields.

The ecological unit is the complete sere from the oldest Aspen to the youngest Aspen suckers that are currently invading the grassland, together with the grassland that it will be invading in the following decades; together with the adjacent grassland being invaded by oak trees grown from acorns.

	CRITERIA FOR SELECTING SSSIs	CRITERIA FOR SELECTING SBIs	ASPEN COPSE & ADJACENT GRASSLAND IN RYEBANK FIELDS	
1	Size/extent	Size/extent	**Compact** Grayson & Grayson 2021	Compact Seral Change
2	Diversity	Diversity	**High** Grayson & Grayson 2021	Invertebrate Biodiversity
3	Naturalness	Naturalness	**Excellent** Grayson & Grayson 2021	Ancient Woodland Indicators (ramets)
4	Rarity / exceptional features	Rarity	**Excellent** Grayson & Grayson 2021	Complete Seral Change Grassland ➲ Dense Woodland
		exceptional features	**Excellent** Grayson & Grayson 2021	Two tree tunnels display ramets feeding suckers
				POPLAR PROPOLIS research Grayson & Grayson 2021
5	Fragility	Fragility	Robust but Vulnerable	Vulnerable to severe degradation
6	Typicalness / representative value	Typicalness/ representative value	**Excellent** Grayson & Grayson 2021	Outstanding typicalness & representative Value
7	Recorded history	Recorded History	**Good** Grayson & Grayson 2021	More than 20 years
8	Connectivity in the landscape	Connectivity in the landscape	**Moderate** Grayson & Grayson 2021	West Manchester B – Line
9	Additional Criteria following Defra Guidance: INTRINSIC APPEAL	Appreciation of Nature	**Excellent** Refs: Dr Jenna Ashton 2020 Grayson & Grayson 2021	FRIENDS OF RYEBBANK FIELDS Vibrant NGO on both sides of the Manchester-Trafford border
10		Value for Learning	**Very High Value** Refs: Dr Jenna Ashton 2020 Grayson & Grayson 2021	
11	Social Criteria	Accessibility and Usage	**Very High Accessible** Ref: Dr Jenna Ashton 2020	
			Very High Usage Ref: Dr Jenna Ashton 2020	
12		Sense of Ownership	**Exceptionally High** Ref: Dr Jenna Ashton 2020	

19 SBI SELECTION PROCESS

19.1 Which sites are considered?

The Greater Manchester Ecology Unit (GMEU 2006 Chapter 4, page 11) explains sites may be brought forward for consideration against the Selection Guidelines by a number of mechanisms, including:

- ❖ **identification as a result of other survey work** (E.g. Phase 1 surveys, pond surveys, surveys associated with development and/or Environmental Assessment)
- ❖ **recommendation by other skilled individuals** (E.g. local authority nature conservation staff/rangers, ecologists working for other agencies or local field naturalists)
- ❖ **suggestions from local residents and other non-skilled individuals.**

GMEU 2006 explained all sites will be logged and brought forward for survey as soon as possible within constraints of the field season and GMEU's work programme.

19.2 Ryebank Aspen Copse and Grassland

The Aspen Copse in Ryebank Fields may be the only intact example of woodland in Greater Manchester displaying decades of vigorous seral advance into unmown, unploughed, ungrazed grassland. It displays a high degree of naturalness of intrinsic ecological interest. The tree tunnel paths transect the Aspen Copse enable the interior of the thicket to be accessible to the public for enjoyment, and to ecologists for study.

The Aspen Copse fills the need for a natural outdoor laboratory to investigate the potential of native Aspen and its close relatives in combatting the climate emergency. Aspen is Britain's fastest growing native tree. Theoretical modelling based on Leicester by Nicola McHugh and colleagues 2015 suggests Short-Term Coppicing STC of 1km^2 of Aspen can yield 500 tonnes of carbon in *above-ground* harvested biomass per year; and that the harvested biomass can avoid carbon emissions of 1,170 tonnes of carbon when compared to heating by natural gas.

The Aspen Copse, its earthen paths, and the grassland being invaded by suckers meet the exacting requirements as a potential candidate for being declared a **STATUTORY LOCAL NATURE RESERVE**; and as a potential candidate for being designated a **GRADE 'B' SITE OF BIOLOGICAL IMPORTANCE (SBI)**.

A feature is the presence of fallen deadwood: twigs, branches and even a few decaying trunks. This illustrates the titanic struggle of natural thinning, and supports designation as a potential **GRADE 'B' SBI** by exhibiting the full suite of niches which endangered invertebrate species need to survive.

Ryebank Fields constitutes a natural outdoor laboratory for the public to appreciate the role of Honey Bees in gathering antiviral resins from the poplar buds to produce propolis to protect their colonies. Likewise for researchers from Manchester Metropolitan University who own Ryebank Fields, to collect resins from the poplar buds in the hope of discovering antiviral medicinal compounds for mitigating symptoms of diseases triggered by the pandemic. Likewise researchers from the world-class laboratories of the University of Manchester next door to Christie Hospital to discover drugs that might prove to be of some benefit during cancer treatment.

Of late, peer-reviewed papers about poplar-propolis are being published worldwide at more than ten a week. Little wonder, for poplar buds are a front runner in the race to find ready-made natural drugs. Certainly NOT as efficacious as purpose-made drugs from pharmaceutical giants but much more affordable to all the peoples of the world.

20 COMMENTS ON ECOLOGICAL APPRAISAL

The Ecological Appraisal conducted for MMU has some shortcomings:

TOPICS		SHORTCOMINGS
1	**Aspen Copse**	The EA failed to recognise the national, regional and local ecological importance of the Aspen Copse, as a remarkably intact thriving example of a self-thinning thicket with its ramet suckers actively encroaching the adjacent grassland as a classic example of relentless seral change from open grassland to dense woodland documented over several decades.
2	**Biodiversity**	The EA overlooked the key role of Aspen and its relatives in maintaining the biodiversity of many endangered British invertebrates.
3	**Carbon Sequestration Above-the Ground**	The EA overlooked Aspen and its relatives in doubling the sequestration of other trees due to very rapid growth.
4	**Carbon Sequestration Under-the-Ground**	The EA overlooked the Aspen Copse having visible woody ramets underground, clear evidence of permanent sequestration.
5	**Natural Self-Thinning of the Aspen Copse**	The EA presented recommendations on thinning of the Aspen Copse. This would damage the value of the Grassland to dense Woodland Seral Change.
6	**West Manchester B-Line**	The EA failed to recognise the role of Ryebank Fields as a vital part of the West Manchester B-Line.
7	**Regional hub for hedgehogs**	The EA failed to recognise Ryebank Fields and its surroundings as a regionally important hotspot for hedgehogs, a protected species that is classed as in decline and this is of particular concern to DEFRA.
8	**Root Protection Areas**	The Arboricultural Impact Assessment presented a Tree Survey & Preliminary Constraints Plan, displaying Root Protection Areas (RPAs). However, it failed to show the extensive RPA essential for the thousand trees of the Aspen Copse and its extensive network of ramets.
RECOMMENDATION		**The Local Planning Authority should REJECT the Ecological Assessment on the grounds that it is too inaccurate to be a baseline document for briefing government officers, statutory consultees, residents, wildlife NGOs, council officers and elected members.**

21 ACKNOWLEDGEMENTS

Special thanks to the Greater Manchester Ecology Unit, for providing records on the known distribution of the **native Aspen *Populus tremula*** in Greater Manchester, including a record of native Aspen being in Ryebank Fields.

Special thanks to **Friends of Ryebank Fields**, for sharing their intimate knowledge of the biodiversity of the Aspen Copse, gathered over a period of more than twenty years.

Special thanks to **Steve Silver of Friends of Ryebank Fields** for sharing his many years of visiting Ryebank Fields on a weekly basis; observing acorns grow into oak trees on Ryebank Fields, and the spread of the Ryebank Aspen Copse into the rough grassland.

Thanks to **Alan Stubbs, a Vice-President and Co-founder of Buglife**, for his inspiring paper **'ASPEN – THE DISAPPEARANCES'**, on which part of this primer is based.

Thanks to **Ludovic Tolhurst-Cleaver** for valuable assistance in preparing this primer.

Thanks to **Heather Turner, Botanist** for guidance on Native Aspen and related Poplars.

Thanks to **Steve Garland, Fellow of the Royal Entomological Society**, for reviewing the insect fauna dependent on ***Populus tremula*** and related poplars.

Thanks to **Andy McGrandle of Big Anomaly** for reviewing an early draft.

Special thanks to **Google Inc**, for making Google Earth Pro freely available, including the time series of remote sensing images that confirmed the growth of the Aspen Copse over the last twenty years by invasion of the grassland, and confirmed the meticulous maintenance of public footpaths via tree tunnels through the thicket.

Special thanks to the **Union of Soviet Socialist Republics (USSR)** for making available detailed cartography showing water-filled clay pit that existed, before being buried under a toxic rubbish tip now concealed by land reclamation on which the Aspen Copse thrives.

22 ABOUT THE AUTHORS

Relevant experience of the lead author Robin Grayson MSc FGS:

i. 5 years elected councillor of Greater Manchester (GMC).
ii. 5 years member of GMC Planning & Development Committee.
iii. 5 years member of Greater Manchester Wildlife Advisory Group.
iv. 4 years elected councillor of Wigan Metropolitan District.
v. 4 years member of Wigan MBC Planning & Development Committee.
vi. 4 years member of WIGWAG Wigan Wildlife Advisory Group.
vii. Founder member of Wigan Civic Trust.
viii. Author of ecology articles, papers and reports for the World Bank.
ix. Expert witness in ecology at Denton Golf Course inquiry.
xi. Expert witness in ecology and geology at Manchester Airport Second Runway inquiry.
xi. Expert witness in geology at Ellesmere Port Borehole inquiry.
xii. Fieldwork for designating Bollin Ox-Bows as Site of Biological Importance.
xiii. Fieldwork for designating creating SBIs in Greater Manchester, Cheshire & Lancashire.
xiv. Fieldwork for designating the Fallowfield Loop Regionally Important Geodiversity Site.
xv. Fieldwork instrumental creating Salthill SSSI and Local Nature Reserve in the Ribble Valley.
xvi. Conducted EAs/ESAs/EcAs in UK and in the vast taiga forests of Mongolia.
xvii Mapped felling of 30,000 trees over 20 years with approval of Manchester City Council.
xviii. Studied local tree canopy cover of Chorlton and the City Centre.
xix Remapped shallow geology of Chorlton from borehole data.
xx. Remapped deep geology of Chorlton from geophysical data.
xxi. Remapped surface of major aquifers under Chorlton, Trafford, Salford and Stockport.
xxii. Mapped NO_2 air pollution in Chorlton using bioindicators detecting illegal hotspots.

Relevant experience of the joint author Mandukhai Grayson:

i. Mapped 220 miles of Aspen forest-steppe transition in North East Mongolia.
ii. Recognised the native British Eurasian Aspen (*Populus tremula* for the entire 220 miles.
iii. Recognised extensive damage to Aspens and steppe by natural wildfires.

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23.17 Essential Reading – Aspen and Isoprene VOC

Purser, Gemma; Julia Drewer, Mathew R. Heal, Robert A.S. Sircus, Lara K. Dunn & James I.L. Morison 2021 [*Review status: this preprint is currently under review for the journal Biogeosciences Discussions*]. **Isoprene and monoterpene emissions from Alder, Aspen and Spruce short rotation forest plantations in the UK.**
BGD - Isoprene and monoterpene emissions from alder, aspen and spruce short rotation forest plantations in the UK (copernicus.org)

Andrea Ghirardo and colleagues 2014:

Some plants, including poplars (*Populus* spp.), produce large amounts of the **hemiterpene** VOC isoprene. Worldwide **isoprene emissions from plants are estimated to be 600 teragrams per year and to account for one-third of all hydrocarbons emitted to the atmosphere.** Isoprene has strong effects on air chemistry and climate by participating in ozone formation reactions, by **prolonging the lifespan of methane, a greenhouse gas and by taking part in the formation of secondary organic aerosols.**

Poplar leaves invest a significant amount of recently fixed carbon in isoprene biosynthesis to cope with abiotic stresses , although there are indications that other protective mechanisms can partially compensate the lack of isoprene emission in genetically transformed poplars. It has been suggested that in isoprene-emitting (IE) species, most of the carbon that passes through the MEP pathway is used for isoprene biosynthesis . However, a recent study using pulse-chase labelling with 14C has shown continuous synthesis and degradation of carotenes and Chl a in mature leaves of Arabidopsis, and the amount of flux diverted to carotenoid and Chl synthesis compared with isoprene biosynthesis in poplar leaves is not known.

Isoprene emission is temperature, light, and CO_2 dependent . It has been demonstrated that isoprene biosynthesis depends on the activities of IDP isomerase, isoprene synthase, and the amount of ISPS substrate, DMADP. In turn, DMADP concentration has been hypothesized to act as a feedback regulator of the MEP pathway by inhibiting 1-deoxy-d-xylulose-5-phosphate synthase, the first enzyme of the MEP pathway. Understanding the controlling mechanism of isoprene biosynthesis is not only of fundamental relevance, but also necessary for engineering the MEP pathway in various organisms and for accurate simulation of isoprene emissions by plants in predicting atmospheric reactivity.

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