

# Bumble.

*Inspired by the beauty of nature*



*Issue three*

# Bumble.

*Autumn 2019*

Welcome to *Bumble*, a bi-annual magazine that focuses on the beauty of nature whilst spotlighting the wonderful wildlife we are surrounded by in the United Kingdom.

*Bumble* highlights particular species that are struggling and identifies the challenges they face. We delve deep into problems caused by our changing climate and focus on some of the organisations and individuals fighting to protect our wildlife.

We also feature artists and authors who take inspiration from the natural world. Ultimately, we aspire to create a magazine which makes information about wildlife and its importance accessible to all.

If you have any questions or would like to contribute or collaborate with *Bumble*, please get in touch via our website.

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# The Behaviour of Trees

If you have ever spent time in a woodland, you might have felt a certain sense of 'otherness' from the trees; an unmarked feeling of connection or company from these stoic figures.

*Megan Humphreys*

**We can experience sensations of being watched or listened to, and even attribute a human-like semblance to their gnarled finger-like branches and their wrinkled, fissured bark.**

Yet of course, this is nothing new. The idea of sapient trees has long existed as a figure in worldwide folklore, mythology and literature; captivating even today's modern audiences. Think, for example, of J.R.R Tolkien's 'Treebeard' in *The Lord of the Rings* trilogy; one of many animated tree-like beings who occupy ancient forests in Middle Earth, or of J.K Rowling's animated flora; the ferocious 'Whomping Willow' and the folkloric foetus-like 'Mandrakes'.

Though these figures are bold caricatures of the human-like attributes we assign to trees, they are not as far removed from reality as you might think. Over recent years it has become increasingly understood that trees and other forms of plant life are far more sentient than we have generally come to accept. The emerging concept of 'talking trees' suggests our woodland residents are actually complexly sophisticated organisms with social strategies and ongoing relationships with one another.

Beneath the soil, trees communicate through an underground 'social network' of roots and fungi that combine to form what is known as a *mycorrhiza*. Exclusively, these hyphal structures work beneath the soil to absorb water, carbon, nitrogen and other key nutrients into the plant, but on a greater scale they connect with neighbouring mycorrhiza to create a collaborative, symbiotic 'network'.

The idea of 'talking trees' suggests a level of heightened sentience in trees and other forms of plantlife and considers them as beings who are capable of feeling, perception and responsiveness. It even accredits them with the ability to form relationships and familial ties to those of the same species, as more established 'mother trees' have been shown to share their own nutrients with shaded saplings who are failing to thrive.

In acts suggestive of social awareness, trees use this 'wood wide web' to warn one another of threats like predation or disease. By releasing chemical signals into the soil, they can encourage nearby flora to heighten their defences and in an altruistic final gesture dying trees may even offload their stored resources into the network to be absorbed by others.

While trees may seem to be socially aware to their very roots, this behaviour is seen mirrored in the lofty heights of their canopies through a process known as 'crown shyness'. Crown shyness refers to the tendency of certain species of trees to distance themselves from one another as they crown, and their leaves reach full spread.

Despite such proximity, these trees adapt with a sense of personal space to leave open channels in the canopy where their leaves evade contact with one another, resulting in a beautifully intricate and idiosyncratic web of skylight in the overhead canopy.

The existence of such behaviour stands as somewhat of a contrast to the idea of competitive evolution we are accustomed to, whereby trees inherently seek to optimise their space and exposure to light, often outcompeting their neighbours for survival. Crown shyness however, suggests a more social form of evolution.

Though originally thought to be the result of abrasion, the current perspective suggests these consciously created channels work as part of a collective bid to maximise light exposure and to limit the spread of harmful insect larvae – a sort of evolutionary ceasefire to protect the collective, as well as the individual.

Though there remains no widely accepted consensus on the social behaviour of trees, the level of their sentience or even the definitive cause of phenomena such as crown shyness and the wood wide web, it's fascinating to consider the complexities of evolution and the ways in which our flora has adapted to collectively bolster species survival.

While the current rate of climate change, deforestation and habitat destruction illustrate the devastating impact of our species, it stands as somewhat of a comfort to know our woodlands are adapting their own collective strategies to thrive.





# *The Great British Badger Cull*

The largest destruction  
of a protected species  
in living memory.



*Dominic Dyer*

On Wednesday 11th September, as the controversy over the suspension of Parliament raged across the nation, the Department for Environment, Food and Rural Affairs (DEFRA) announced that 11 new badger cull licences will be issued in England in 2019, from Cornwall to Cumbria. This will take the total number of cull zones in operation across England to 42 and will result in the largest destruction of a protected species in living memory.

Since 2013, the government have licensed the killing of just under 68,000 badgers as part of its Bovine Tuberculosis (TB) eradication strategy, but we could now see up to 50,000 more badgers killed in 2019 as a result of the cull expansion, taking the total to nearly 120,000. To put this hideous and pointless slaughter of a protected species into context, the total badger population of Scotland is estimated to be in the region of 34,000. This effectively means that within a six-week period between September and October this year, the government will allow cull contractors, funded mainly by the taxpayer, to completely wipe out the Scottish badger population.

The total public cost of the badger cull to date is estimated to be in the region of £50 million and Defra has estimated the cull expansion of 2019, will cost an additional £20 million. What the government promoted as a farmer-led and paid-for policy in 2013 has now become the most expensive publicly funded wildlife cull in history, with bills stacking up in Whitehall for equipment, training and monitoring, policing costs and legal challenges to the policy.

Despite these huge public costs, the government has provided no reliable evidence to prove that badger culling is having any significant impact in lowering bovine TB in cattle in or around the cull zones. In fact the latest data on TB rates in cattle herds obtained under a Freedom of Information request, show a 130% increase in the Gloucestershire cull zone between 2017-2018.

→ Estimated cost to the UK taxpayer (per badger)

- To kill
- To vaccinate



Of all the badgers killed to date, DEFRA has tested just over 900 for TB and only around 15% of these animals were found to carry the disease. This means that if 120,000 badgers killed by the end of 2019, only around 18,000 are likely to have been TB infected, the other 102,000 will have been disease free and slaughtered for no justifiable reason.

By the end of 2019 more than 50,000 badgers will have been killed by a controlled shooting method that has resulted in many badgers taking more than five minutes to die of multiple bullet wounds, blood loss and organ failure. This is condemned as inhumane by the British Veterinary Association and the government's own independent expert panel.

As the cost of killing badgers has risen to tens of millions of pounds, the cost of vaccinating them against TB has fallen rapidly. It now costs the taxpayer an estimated £900 to cage-trap and shoot a badger, but it costs the Wildlife Trusts and other volunteer badger vaccination groups only around £100 to trap and vaccinate a badger against the disease.

Badger culling is hugely complicated, controversial, cruel and costly, but badger vaccination is humane, has strong public backing, is far cheaper and brings farmers and conservationists together in a spirit of mutual respect and trust. We also know from DEFRA funded research that vaccinating a badger without TB can result in a 73% reduction in the risk of the animal catching the disease and this benefit is also passed down to new born cubs.

# 68,000

*Number of badgers licenced to be killed by the government since 2013*

# 50,000

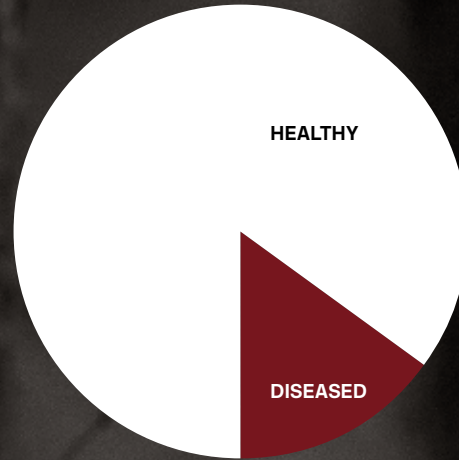
*Number of badgers licenced to be killed by the government by the end of 2019*

# 34,000

*Estimated number of badgers currently in Scotland*

→  
**Of the 900 badgers tested by DEFRA, only 15% were found to have the disease.**

- Diseased — 15%
- Not diseased — 85%



The Welsh government has shown what can be achieved in reducing bovine TB by focusing on cattle-based measures. Through a combination of improved TB testing regimes, tighter cattle control and biosecurity measures, the spread of the disease in cattle has been significantly reduced without any indiscriminate cull of badgers.

The government could kill every badger in England and TB would still remain in the cattle herds, due to inaccurate TB testing methods, poor bio security concerns and cattle movement controls.

The badger cull is probably one the worst examples of incompetence, negligence and deceit at the heart of the government. To spend more than £70 million of public funds killing tens of thousands of badgers without any reliable evidence that it will lower TB rates in cattle is a national disgrace. The badger cull is not a disease control strategy: it is a politically motivated, publicly funded wildlife eradication policy, which is pushing badgers to the verge of extinction in parts of England where they have lived since the last Ice Age.

This is why the Badger Trust, with the support of other leading wildlife protection organisations and politicians from all political parties, is now calling for a public inquiry into the disastrous, cruel and costly badger cull policy.

Never again should a government be able to declare war on our wildlife for short-term political and economic interests. All politicians, civil servants and representatives of the farming and livestock veterinary industry, who are responsible for this disastrous and ineffective policy, must be held to account.

I can only hope that as we head into 2020 we all wake up to what we are now facing when it comes to protecting our wildlife. They come for our badgers today, but it will be our otters, raptors, beavers and seals next. The battle to protect the badger is far more than just a fight to protect a shy nocturnal mammal most of us never see: it is a fight for the very future of our countryside and the wildlife that inhabits it.

Let us hope we all realise this before it is too late.

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 To find out more about this issue visit [badgertrust.org.uk](http://badgertrust.org.uk)



# *Improving upon Nature*



We are now able to control almost every aspect of the world we live in, ‘improving’ at will. Writer and nature interpreter, *Fran Halsall*, uncovers the way we can alter nature and wonders if it’s even right to do so.

**Western culture has fed us a peculiar myth: we are both *of* nature and yet *apart* from it thanks to the clever ways in which we have learned to exploit the environment. Since we began clearing trees and taming wildflowers to become crops, humans have bent plants to their will in the name of survival. With each success nature was recast as a force to be overcome.**

This narrative now falters. It has become only too apparent that the checks and balances that we thought we had outrun were there all along, if only we had remembered how to read the environmental cues. In my own work, I get to unpick some of the thinking we hold about plants, the habitats they form and our role in reversing the damage we have inflicted.

For decades horticulture has been focused on the idea of improving upon nature, producing ever more complex flowers with many petals and unusual forms. These blooms are great theatre and vividly signal the skills required to manipulate plants to this degree, yet they have little to offer hungry pollinators. Double-flowers are sometimes so over-engineered that insects struggle to access the pollinating parts, and even if successful they are rewarded with far less nectar. This raises an ethical question, who are flowers for if not for insects?

The pursuit of perfection has placed distance between us and the real purpose of plants. Where our ancient ancestors had a practical relationship based on necessity, we now host unsustainable flower shows each year and only in recent times has a plant's ecological value been included as a topic of conversation. Plants will always be pleasing – what is required of us at this critical point in time is to look beyond beauty and get to grips with functionality.

Gardens are a synthesis of nature and culture, and are open to both influences. The balance is tipping in favour of nature as the role gardens play in supporting wildlife is more widely appreciated. This reappraisal has led to a softening in attitudes towards naturalistic vegetation, the processes of decay, and a new-found recognition that soil is not 'dirt'. Sadly, this awakening has yet to reach the many gardens with astroturf lawns and borders festooned with bedding plants that are thrown out after flowering.

Is it even acceptable for retailers to keep selling products that undermine the potential of gardens to support wildlife?

National campaigns have stimulated public appreciation of wildflowers and 'weeds' are undergoing a rehabilitation process. Even ragwort, the tabloid's number one plant enemy, is experiencing a renaissance. In particular, the wildlife potential of roadside verges has caught on.

Now fault lines are drawn through communities between those who are outraged when verges are mown down in their prime (rather than cut once flowers

have set seed) and those who think that tall vegetation is unsightly and attracts litter. Yet unmown areas are now the norm and those responsible report receiving fewer complaints than in previous years. Better communication with the public through signage no doubt helps.

This notable shift in favour of nature doesn't always translate to where it matters. Local Authorities are caught between biodiversity commitments, conflicting messages from residents and the obligation to keep lines of sight on highways clear. With limited budgets it is little surprise that mowing regimes do not always follow conservation guidelines and that herbicides are still routinely used where grasses meet hard surfaces. However, it is encouraging that chemical spraying for the sake of neatness now triggers public concerns about both the loss of biodiversity and the risk to human health.

Whenever my sense of optimism runs high I am tempered by the hardened hearts and narrowed visions I encountered during my activism to help save Sheffield's street trees. It is difficult to find common ground with residents who believe that trees do not belong in cities. Fallen leaves and kerbstones pushed out by wayward roots are an affront to those who prefer the ordered world of concrete and tarmac. Yet some of those same people see the value of woodlands and will visit them for leisure and relaxation. They might even agree that trees are generally a good thing, just not when they are located outside their home.



A cloud of collective amnesia has settled upon us and we have forgotten that our towns and cities were carved from fields and woodlands. Plants made way for us and in return we struggle to make any room for them.

Another key battleground for nature's right to live amongst us is located in England's green fields. The 'rewilding' of agricultural land is, unsurprisingly, not universally popular. One of the more ambitious projects,

the Knepp Estate in West Sussex, has adopted an almost entirely 'hands-off' approach that allows nature to find its own way. While the dramatically improved outcomes for wildlife have won many sceptics, there is still much resistance.

Permitting land 'improved' to within an inch of its life to be recolonised by agricultural weeds, such as nectar-rich thistles, and scrub species, like hawthorn and willow, is the ultimate act of neglect for those that would have dominion over nature.

Rewilding is a huge leap forward in a landscape revolution that demands that we live differently. Having managed the land so intensively, it is difficult to acknowledge that human interference is a large part of the problem.

It is even harder to admit that the solution is not necessarily more human ingenuity. Instead we must take a step back and accept that nature is more competent in these matters. What remains to be seen is whether we can allow enough nature

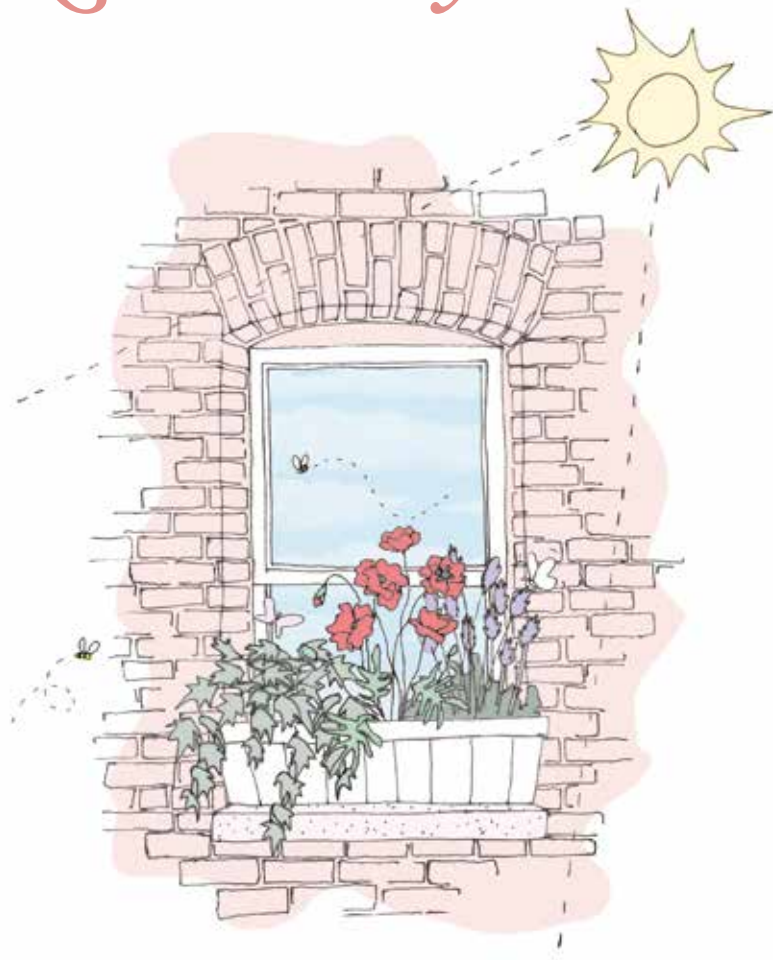
back into our lives before reaching the tipping point at which plants can no longer survive in the places where we have given them permission to grow.

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To find out more about work Fran does visit [naturallyfocused.co.uk](https://naturallyfocused.co.uk)



“We have forgotten that our towns and cities were carved from fields and woodlands. Plants made way for us and in return we struggle to make any room for them.”

# Rewild my Street!



An urban rewilding campaign seeks to address the biodiversity crisis by inspiring residents to re-green their streets.

—  
*Siân Moxon*

**Our city streets are going grey. London alone loses the equivalent of 2½ Hyde Parks of green space each year, as residents pave over front gardens, fell street trees and lay artificial back lawns.**

This is a disaster for wildlife, at a time when over half of UK species are in decline and many are at risk of extinction. Managed appropriately, gardens can provide significant wildlife habitat, covering one quarter of many cities and forming corridors connecting wider green spaces, such as allotments and parks. The rich mosaic of habitats urban gardens provide means some species, including frogs, hedgehogs and song thrushes, are doing better here than in farmland.

Loss of urban greenery is also bad news for humans: greener cities have better air quality, are more resilient to flooding and overheating, and harbour less crime. Besides, contact with nature boosts our health and wellbeing, providing a welcome antidote to frenetic city life by lowering our heart rate, blood pressure and stress levels.

However, it is not too late to re-green cities, for ourselves and our wildlife, if neighbours work together. Increases in some urban bat populations following targeted conservation measures attest to the effectiveness of our efforts.

So let's imagine we take a typical residential street and adapt its houses, gardens and streetscape to transform it into a haven for wildlife. Just add wildflower meadows, patio ponds, bird boxes and feeders, and insect hotels. Puncture the fences to link up back gardens, forming mammal corridors.

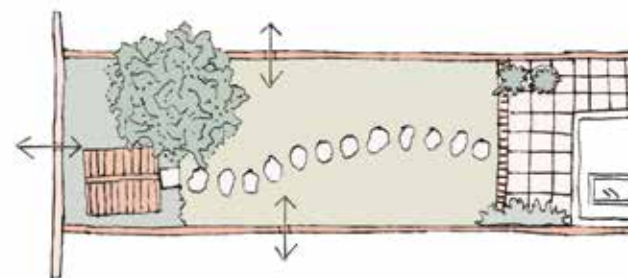
The street will come back to life: the bees will be buzzing, the birds will be singing, the frogs will be hopping and the owls will be hooting. The changing seasons will enliven every living room, children growing up on the street will have nature on their doorsteps and people of all ages will spend more time in their community.

The Rewild my Street campaign was set up to help residents envisage and realise this urban idyll. A team of architects and ecologists created vision drawings of a notional street transformed for wildlife to inspire people to adapt their own homes and gardens.

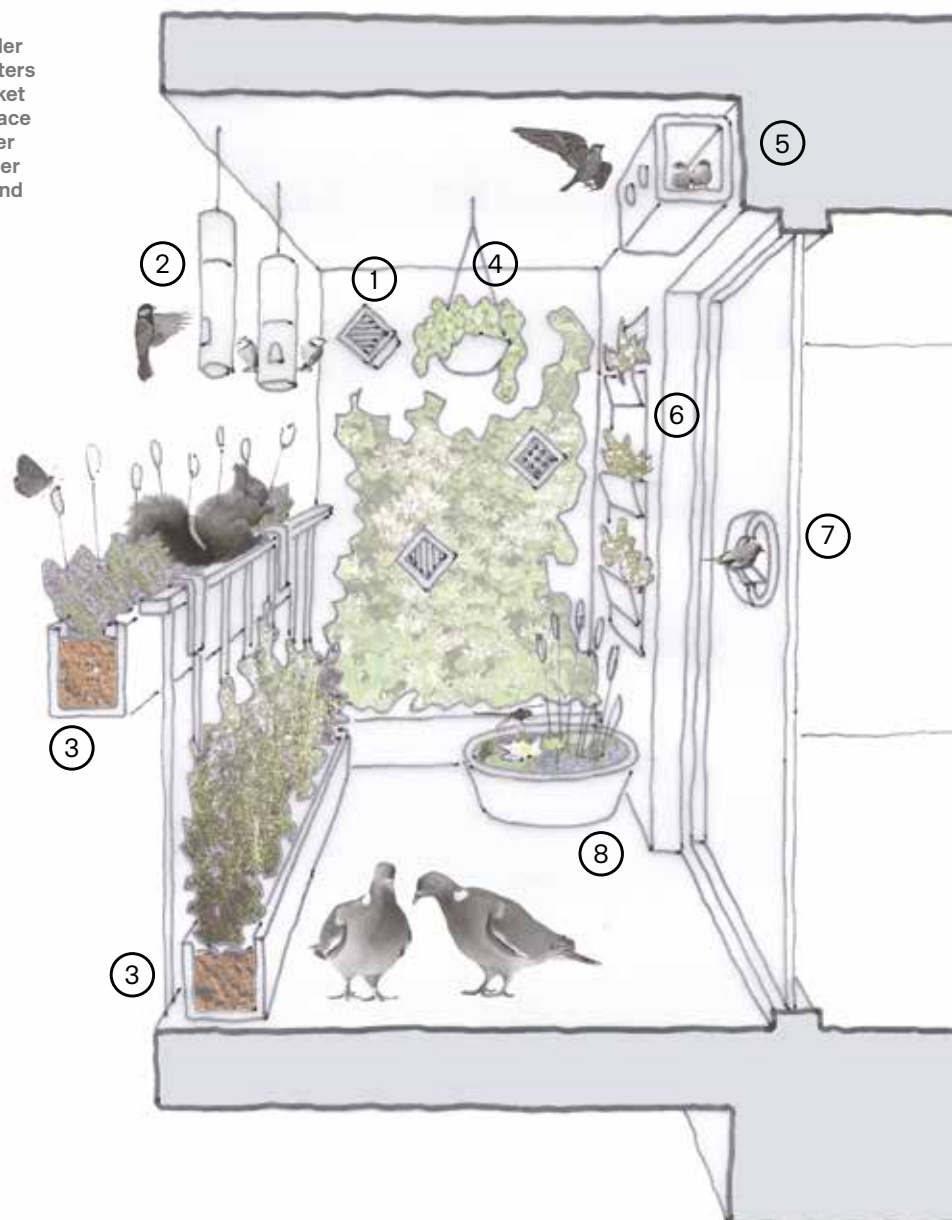
These drawings sought to make rewilding aspirational, showing its potential to create a leafy, colourful and vibrant streetscape that is a delight to spend time in. They demonstrate that wildlife gardening can be tidy by following some basic design principles: for example, using mown paths to define meadow areas, and clipped hedges to offset wilder planting.

Above all, the drawings aim to show residents that even the small actions they take could contribute to a street-scale transformation when repeated across other homes. The drawings, and the encompassing project, highlight the scope for individual expression with different homes incorporating different wildlife features, alongside the potential for collaboration between neighbours, for instance, using a hedge to form a consistent front garden boundary.

Rewild my Street illustrate that simple individual actions could combine with radical measures, such as a car-free street park, which residents could lobby their council or local community group to implement.



- 1 – Insect hotel
- 2 – Hanging feeder
- 3 – Balcony planters
- 4 – Hanging basket
- 5 – Sparrow terrace
- 6 – Pocket planter
- 7 – Window feeder
- 8 – Container pond

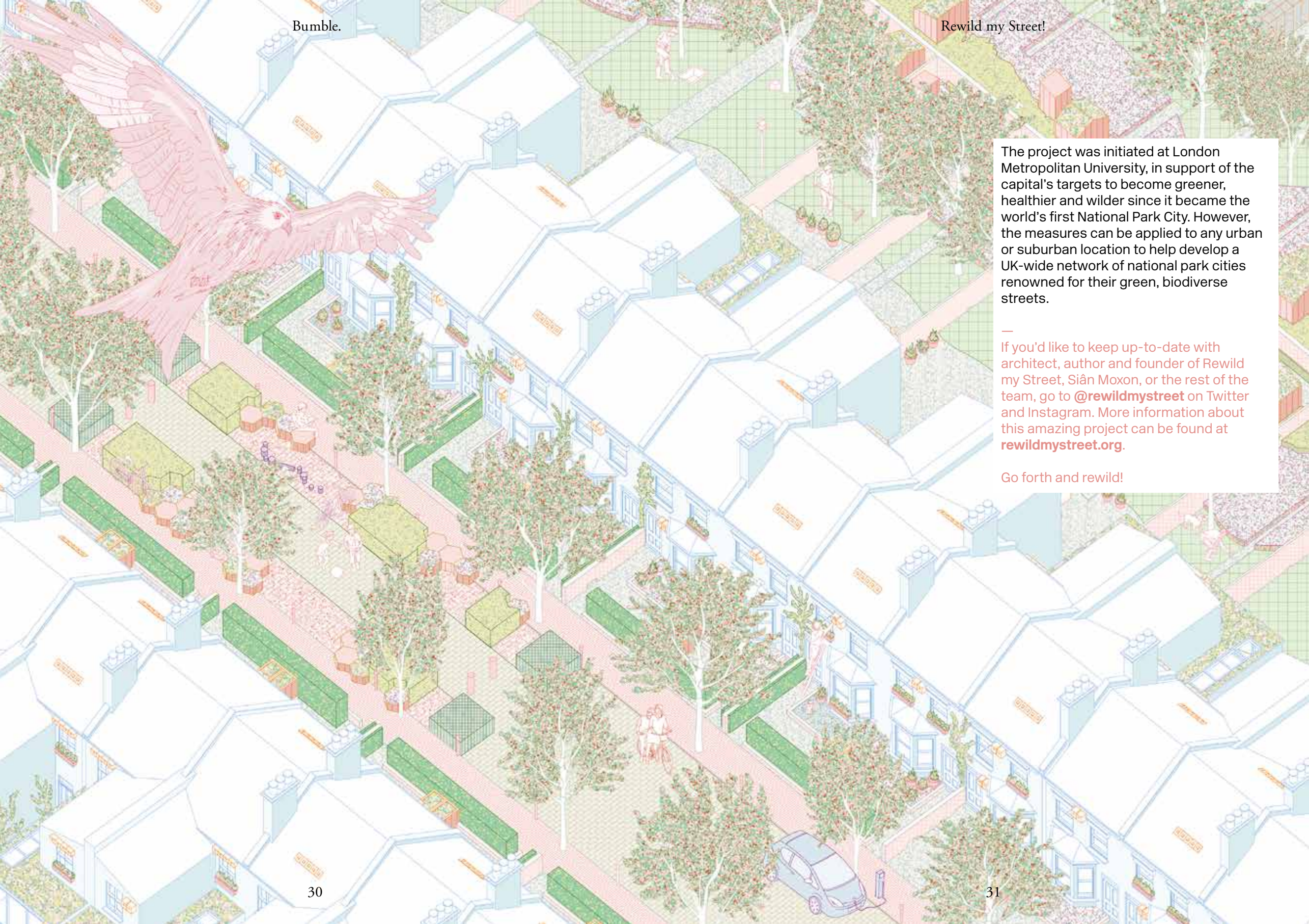


The drawings are available to the public through [rewildmystreet.org](http://rewildmystreet.org), where they organise links to products and step-by-step activities to help people implement wildlife features, and expert guidance on urban species and habitats to highlight the value of doing so. Those who sign up to the website receive an illustrated 'Wild Makeover Guide', featuring five key activities to get started: a log pile, window box, mini pond, bee hotel and wildlife gap.

The guidance is sharply focused on urban environments. Species are highlighted that are likely to be attracted to cities, including swifts, foxes and garden birds. Habitats are chosen that can easily be created in an urban setting, comprising green roofs and walls, trees, water, hedgerows, wildflowers and habitat boxes. Recommended measures have been carefully chosen to integrate successfully into an urban setting – being suited to retrofit in small spaces or on vertical surfaces and embodying simple, contemporary design.

Even those with only a balcony can benefit, with one drawing showing how this could accommodate a host of wildlife features, from climbing plants to a container pond. Each wildlife measure can either be achieved through an off-the-shelf product or a DIY solution to suit different budgets and time constraints.





Bumble.

Rewild my Street!

The project was initiated at London Metropolitan University, in support of the capital's targets to become greener, healthier and wilder since it became the world's first National Park City. However, the measures can be applied to any urban or suburban location to help develop a UK-wide network of national park cities renowned for their green, biodiverse streets.

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If you'd like to keep up-to-date with architect, author and founder of Rewild my Street, Siân Moxon, or the rest of the team, go to **@rewildmystreet** on Twitter and Instagram. More information about this amazing project can be found at **rewildmystreet.org**.

Go forth and rewild!



In the winter, when dusk is approaching and the river Lagan in Belfast is flat calm, a huge black cloud buckles and bends above the Albert Bridge. The spectacle stops traffic and causes pedestrians to pause their commute.

This is a startling murmuration.

# *The Murmuration*

*Bethany Joy Dawson*

Starlings are resident to the United Kingdom, however, cold European winters also drive non-native birds to our shores. Here, the starlings roost beneath bridges, in trees, under piers and on cliffs. They form gregarious gangs that are best known for their mesmerising aerial shows. The birds rise to a dizzying height before shifting to the left, then the right, before funnelling to the ground and rising again. They are dextrous and deft, causing many to question how they manage to avoid collision.



Starlings have extremely fast reaction times; a split second is all it takes to change their course. The place of an individual starling in this shapeshifting fog changes constantly during the murmuration. Scientists have suggested that this is in order to avoid air borne predators such as peregrine falcons and sparrowhawks. By minimising time spent on the edge of the flock, and the perpetual movement of the murmuration, starlings are less vulnerable to attack. This is known as 'the confusion effect'. It has also been suggested that the giant wave of starlings acts as a signpost to other birds on the lookout for a tribe.

With hundreds of starlings engaged in elaborate airborne acrobatics, it is hard to believe that the number of these grease-slick birds has declined by 66% in recent years. Increased urban development, fewer eaves on houses, changes in agricultural practices and a shortage of food has led to the species being red listed. It is now a bird of great conservational concern. Our farm in County Down is a perfect nesting ground for starlings. The disused outbuildings are full of cracks and crannies in which the birds make their sloppy nests in April and raise

half a dozen fledglings. They are extremely talkative as the male birds construct the nests. They speak in clicks and whistles like dial-up networking before wireless internet was invented. When the young are fledged and the birds make for Belfast, my daughter collects the little blue eggshells and asks when we can visit them on the Albert Bridge.

Starling roosts can be established as early as September, but most gather in October and November. With European migrants bolstering the numbers, the birds huddle together at night for warmth and a good ole' gossip about the best winter feeding sites. If you were to observe a starling roost at night, you would witness a fascinating pecking order. The oldest male birds occupy the most sheltered, roomy spots with the juveniles sleeping shoulder-to-shoulder in the more exposed sites. They squabble and squawk throughout the night, vying for position, until the sun rises and they leave in search of breakfast.





The optimal time to witness the miracle of starling murmuration is at dusk during the winter months, October to March. Although their roost sites can vary year-on-year, there are a few spots they seem to favour. One of the most iconic viewing platforms is the derelict West Pier in Brighton. You can expect to watch clouds up to 40,000 birds strong. Along the English/Scottish border, even larger flocks can be seen showing off in Gretna Green. The Avalon Marshes at the Ham Hall Nature Reserve draw ornithologists from all over the world to witness the

death-defying performances. The town pier in Aberystwyth is a popular roosting site in Wales; on a clear evening the starlings put on a show worth travelling for. The RSPB Leighton Moss in Lancashire provides a reed bed habitat for the adaptable starling. Huge murmurations can be witnessed above the saltmarshes and reed-flanked wetlands. And if you happen to be in Belfast, you can join me and my children on the Albert Bridge as we try to pick out the starlings who sang love songs in our farmyard in the Spring.

# *Bags for Life*



*Luke Saxon*

**Plastic is a wonder material. Durable, versatile and cheap to produce, plastic dominates our lives, as well as our planet.**

The ease with which plastic can be made makes it even easier to throw away. As of 2015, 8.3 billion tonnes of the stuff has been produced, with 6.3 billion tonnes going to waste. Of that, 9% is recycled, 12% is incinerated and almost 80% goes to landfill or finds its way into the natural environment. The resultant plastic is poisoning habitats and clogging waterways around the world, and has led experts to dub it the next global crisis.

Here in the UK the problem can be seen first-hand on beaches, around lakes and in rivers and canals. After witnessing the vast amount of plastic in Rochdale canal, Manchester-based photographer Luke Saxon decided to lend a hand, as well as his artistic expertise to the clean-up effort.

—  
**Hi Luke, can you tell us a bit about yourself and you work?**

Hello! I'm a photographer based in Greater Manchester. I first started photography around five years ago. I saw a photobook by Martin Parr and just became fascinated with capturing contemporary British life. Most recently I've been experimenting with work responding to pollution.

**We really love the work you've produced, documenting the plastic waste in our waterways. What inspired you to create this body of work?**

The inspiration came after deciding to just take a walk past the canal. I noticed so much plastic waste, particularly plastic carrier bags. I felt a duty to remove as many of them as I could but also a compulsion to photograph them first. This encouraged me to keep on walking by the canal, removing what I could and documenting what I saw.

**It is so sad to see the quantity of waste within our waterways and to imagine all the wildlife that has to live amongst it. Your photographs of the plastic bags in this project are hauntingly beautiful and serve to highlight the growing concern of polluted rivers, canals and lakes in this country. How have people generally reacted to this project?**

It's a terrible thing to see, sadly a lot of us seem oblivious to these things and the impact they have on our wildlife. Thank you. People have responded to the work in a really positive way, but I hope it's inspired people to be more aware of the environmental impact plastic waste has. I've spoken to numerous curators about the project and I'm hoping to put together a show and maybe a workshop.





**Do you see a natural end to this project, or is it something you will continue to develop?**

I think this series will be ongoing. I'd like to build on the theme of plastic waste and develop it further, maybe do more workshops to raise awareness and perhaps some photo walks. I would also like to create a small photobook of the plastic bag images.

**That sounds great, we look forward to seeing it!**

—  
You can see what Luke is currently working on on his instagram [@luke\\_saxon](https://www.instagram.com/luke_saxon).  
To see other projects visit [cargocollective.com/lukesaxondale](https://cargocollective.com/lukesaxondale)



*In* *of*  
*Search* *the*  
*Scottish* *Wildcat*  
*Kieran Lynn*





**In the wild scrublands and fragmented ancient forest of the Scottish Highlands, one of Britain's last apex predators, a creature that has outlasted wolves, bears and lynx, stands on the precipice of extinction.**

You may think extinction has only two categories – extinct or not extinct. But within that term there are actually several possibilities.

One of these is 'functional extinction'. This means that though wild individuals still exist, the population is not large enough or is too dispersed to function as a species. At the end of last year, the Scottish wildcat, Britain's only native cat and one of our last remaining mammalian apex predators, was declared functionally extinct.

This question of category and subcategory, of blurred lines and unclear distinctions, quickly becomes a defining part of the search for the Scottish wildcat.

To begin with there is even doubt over whether the species exists in the first place. The Scottish wildcat, as a distinct species to the European wildcat from which the population would have naturally occurred after the separation of the British Isles, was only first proposed in 1907.

A zoologist noticed that the Scottish strand of wildcat had darker fur around the feet and more pronounced markings than its European equivalent. In 1940, after careful analysis, the subspecies *felis silvestris grampia* was accepted, but the classification has been questioned since.

At the very least, the geography is inaccurate. The word Grampia refers to the Grampian Mountains, which cover a large portion of the Scottish Highlands. But as recently as 1849, wildcats were still present in the north of England, and before that in Wales.

So, at one point it might have been called the European wildcat, then perhaps the British wildcat, before it was finally renamed the Scottish wildcat. If it were named today, it might reasonably be called the Highland wildcat, since it has been relegated to a few remote areas in the far north of Scotland. Although with most of its population now in captivity, it may not even merit the word 'wild'.

Then there is the question of when a Scottish wildcat is actually a Scottish wildcat.

This may seem obvious, until you learn that the biggest challenge faced by the species is not loss of habitat or persecution (though these have taken a toll), the biggest threat is genetic eradication brought on by interbreeding with feral domestic cats.

There are believed to be 11 million cats in the UK. Most of those are domestic pets, but there is also a large population of feral cats that live wild in cities and the countryside.

With the Scottish wildcat populations so fragmented, true Scottish wildcats breed with feral cats, creating hybrids and making the search for the Scottish wildcat even more challenging.

On the first glance, the two species are alike, but the wildcat and its domesticated cousin do differ in a few key ways.





The wildcat is much bigger, up to twice the size of some domestic cat's when fully grown. It has a wider head and a thicker set jaw than the domestic cats narrow, pointed face and the black stripes along the abdomen fur are solid bands, not spots or broken lines. The wildcat's tail is also much thicker and stops bluntly with a solid black tip, while the domestic cat's tail is long and tapers to a fine point.

And then, of course, there is their behaviour. While domestic cats are comfortable around humans and will acclimatise to household behaviour, the wildcat is said to be the one species of cat that it is impossible to tame.

They're solitary, mostly nocturnal creatures that dislike being out in open ground, and never venture into urban environments. Their ideal habitat is a mixture of forest, open pasture and farmland, where their favoured prey, rabbits, mice, voles, and other small mammals, can be found.

This illusiveness has made it difficult for conservationists to determine exactly how big the wild population is. Some estimates have suggested over 100, while others have gloomily said fewer than 35.

Thankfully, there are individuals and organisations working to preserve the species.

Located in the heart of the Scottish Highlands, Alladale Wilderness Reserve is more famous for a type of dog than a type of cat. Owner Paul Lister's plan to release wolves into the Highlands has become one of the most talked about rewilding projects in the UK. However, there is another conservation project happening at Alladale, that is no less important.

Nestled away amongst a forest of replanted Scots pine, just a few hundred yards from the Alladale Lodge that houses paying guests, is a hidden enclosure. Inside are two adult Scottish wildcats, and three kittens that were born earlier this year.

The breeding programme at Alladale is part of Scottish Wildcat Action, a partnership project of 20 key organisations that work together to combat the various problems the species faces. This work includes the capture and neutering of feral domestic cats and the development of habitat suitable for wildcat populations.

It also carefully manages the captive population, which will be a key part of maintaining genetic distinction. Between 2015 and 2018, the captive population increased by over 25% and that success looks to continue with 2019 seeing two litters of kittens, at Alladale and at the Aigis Field Centre, respectively.

However, the challenges still remain. To survive long term, Scottish wildcats will need habitat, where a sustainable population can exist free from the interference of domestic cats. Perhaps then, the search for the true Scottish wildcat will be a little easier than it is now.

—  
Thank you to the Alladale Wilderness Reserve and the Scottish Wildcat Action for all the amazing work you do. For more information, visit [alladale.com](http://alladale.com) and [scottishwildcataction.org](http://scottishwildcataction.org).



“What humans do over the next 50 years will determine the fate of all life on the planet.”

# Tree Identification

## Yew *Taxus baccata*

Alongside the juniper and the Scots pine, the yew is perhaps the most famous of the UK's native conifers. It can be found growing in a range of landscapes throughout Europe and western Asia, although in the UK it prefers the limestone regions of the north and the chalky soils of the south-east of England. You're most likely to encounter the yew in old churchyards, with which the tree has an ancient association.

The yew is a medium-sized, bushy evergreen tree with a reddish-brown to grey bark. It is most easily identified by its glossy green leaves, which grow to be long and narrow with needles arranged in two ranks along the green stem. Fruiting around March and April, the yew produces both male and female fruit; small male cones of a yellowish hue, and female olive-green seeds surrounded by a fleshy 'aril' which swells and ripens to become the distinctive scarlet flesh of the Autumn berry. While this bright red fruit is said to be edible and sweet to the taste, we would not recommend trying this as the seed within, like the rest of the tree, is highly toxic.

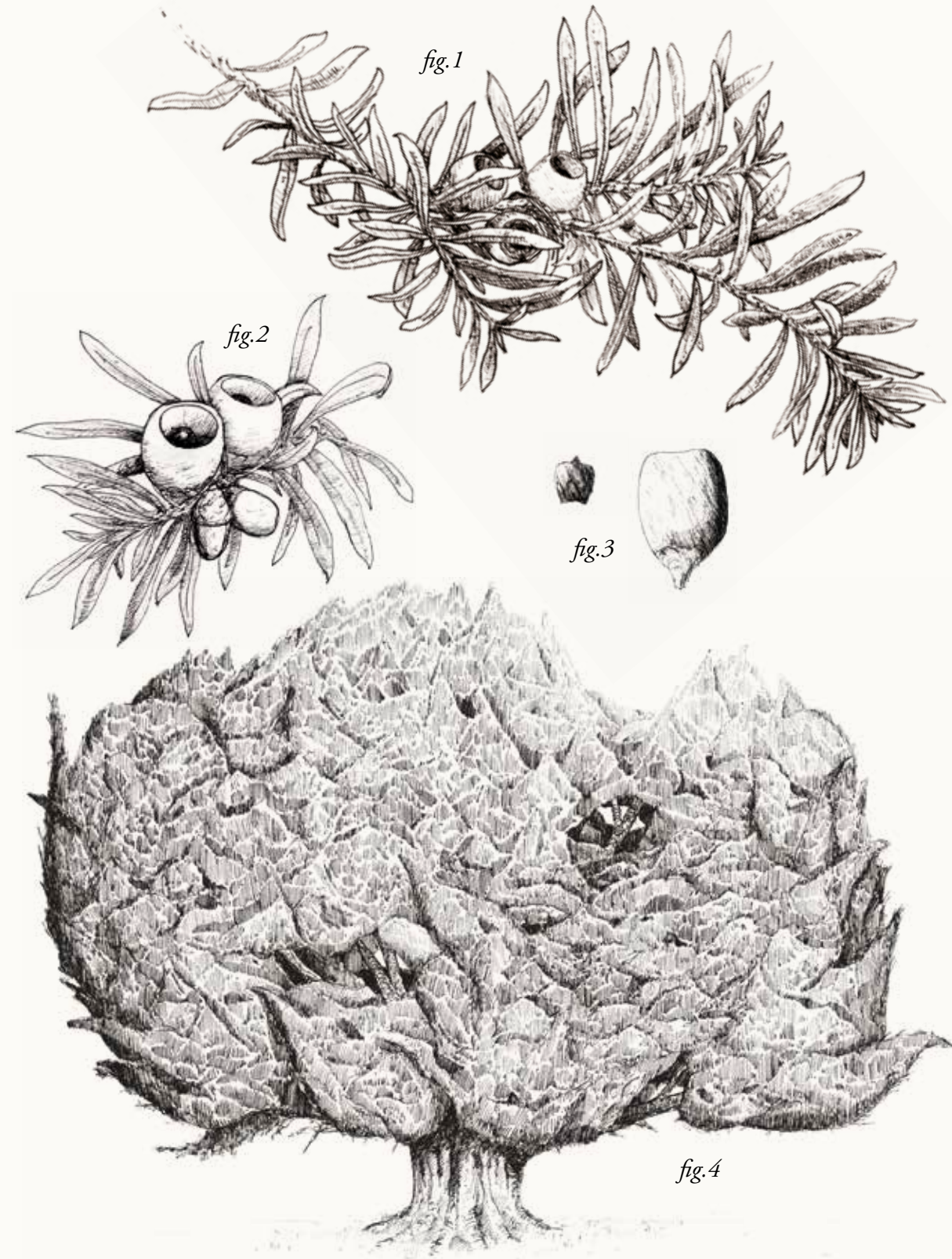
Although yew berries may be digestible by certain species of wildlife such as blackbird, mistle thrush and fieldfare, the toxicity of the yew has been noted throughout history. While the wood of yews was historically used to create weaponry such as longbows, its toxic properties were also harnessed for tipping arrows to ensure a fatal blow. The tree even appears in Shakespeare's *Macbeth* as an ingredient in the witches' potion, laced with 'slips of yew, silvered in the moon's eclipse'.

The yew's toxicity has no doubt heightened its association with death, with which it has been linked for centuries. In pre-Christian Europe, druids would use yew trees to mark burial grounds and sacred sites in the belief they would provide protection against evil. This belief continued well beyond the establishment of the Christian church, when during times of plague yew trees were planted on the graves of victims to protect and purify the dead.

However, sources associate yew with rebirth, regeneration and life. The tree is widely regarded for its longevity, with specimens in Britain thought to predate the 10th century. Yews possess remarkable strategies for survival, such as the adaptive ability to split under the weight of advanced growth and still continue to thrive. Even in its old age, yew's can give rise to new shoots and their drooping branches are able to root to form new trunks where they touch the ground.

This unique dichotomy between life and death has instilled the yew tree with an enduring mysticism, that makes it one of our most fascinating trees here in the UK. While its leaves, sap, and berries may be deadly to humans, the yew's reputation for rebirth and vitality endures as it provides food and shelter for numerous species of wildlife and continues to be a precious part of our wild landscapes.

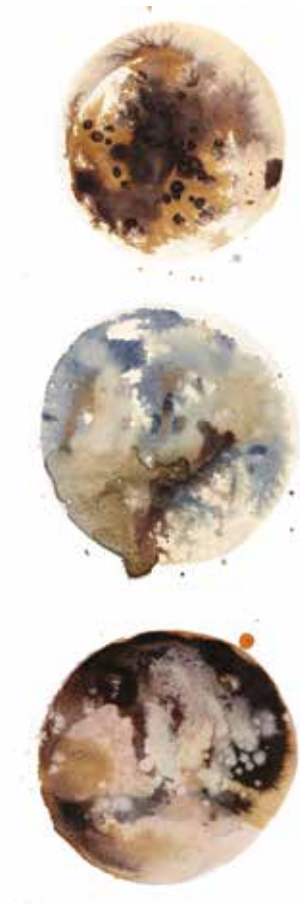
*fig.1* — Leaves — Green, glossy  
*fig.2* — Fruit — Light green, becoming bright red  
*fig.3* — Fruit — The smaller male, the larger female  
*fig.4* — Crown — Broad, low and dense



# *Inkscapes & Landstories*



*Words and illustrations by  
Vivien Martineau*



**The natural world is often seen as a beautiful, living and yet somewhat separate entity to us humans; a thing to observe and admire but no longer to touch or know personally. However, as I have slowly been learning, or some might say remembering, getting to know the land, plants and natural materials around us can greatly benefit our health and happiness and instil within us a deeper sense of care and respect for nature.**

In my experience, as my knowledge of plants has evolved, so too has my relationship with my surrounding environment. Landscapes, both urban and wild, now unfold around me with a different kind of nature, one which beckons me into its leafy undergrowth to explore and enjoy its abundance of wild food, medicines, pigments, dyes and other miraculous materials. It is the realisation that there is far more to be seen in nature than first meets the eye that has led me on my journey of nature illustration, organic farming practices and, more recently, natural inks and paints.



In contrast to my previously detailed, scientific studies of plants and animals, I now revel in the messiness and unpredictability of colour making. As with other natural crafts like woodcarving, where a spoon is almost 'found' within the wood, the colours and paintings I make from plants almost feel as though they have a life of their own, as they brighten, subdue, spread or unfurl in fractals on my page. However, earth pigments, however, are a whole different story, one much older and slower and with a reassuring steadiness - their colours won't fade and the rocks themselves are ever present, just as they have been for thousands of years.



'Colour hunting' can lead you on journeys though parks, beaches, woods and fields. Any green spot on a map is worth investigating and in each landscape a new colour palette waits to be discovered. A day in my 'art studio' now consists of setting off on a meandering walk, regularly diving into hedges or stooping to collect fallen acorns, finally returning home with my finds. I then turn the kitchen into some kind of witches' den, with pots bubbling away, various plants soaking in jars, and sheets of inky paper drying on any available surface.

Natural inks are essentially concentrated natural dyes, which, with their rich and colourful history, are a great place to start when looking for inspiration and information about which plants to use. Making your own ink is really very easy. Find and gather your material, crush, grind or chop it up, boil or soak it in water, then, once you're happy with the colour, strain the ink through a fine cloth or coffee filter paper. Finally, mix in some gum arabic to thicken the ink and help the pigments bind to paper, then bottle it, adding a clove or a few drops of clove oil to prevent mould.



ARTICHOKE, ALDER, GOLDENROD, RUST WATER, YACROW .



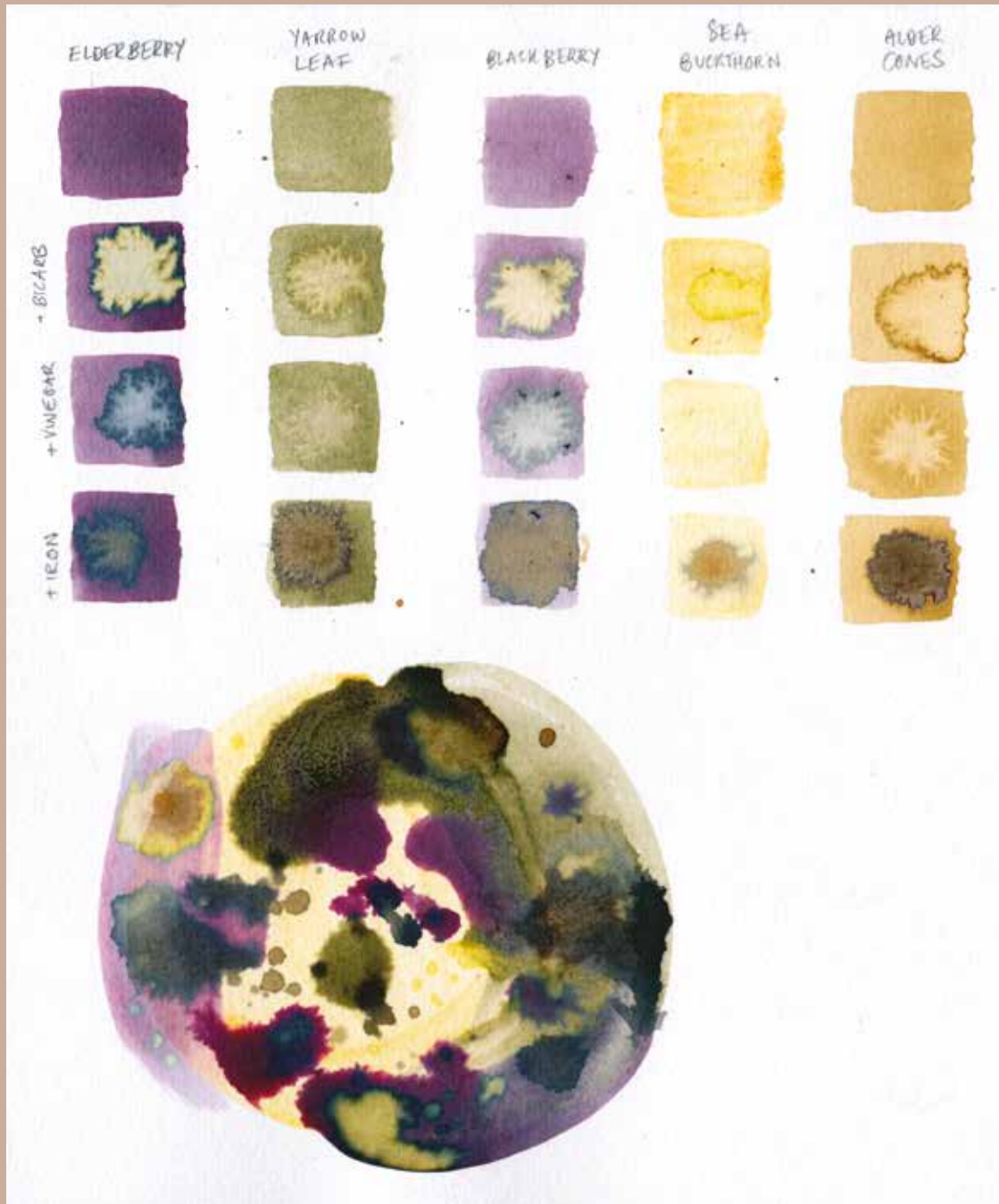


Never has watching paint dry been so enjoyable or satisfying. Artichoke ink changes from a faint brown to a lovely blue-green as it dries on paper, while elderberries go from pink to purple in a matter of seconds. Transformations can occur by adjusting the pH of inks using drops of dissolved bicarb, lemon juice or vinegar, while iron solution (rusty nails stewed in water and vinegar) turns the tannin-rich brown of oak galls into the deep black iron gall ink, used centuries ago for medieval manuscripts.

Making ink is a wild and wonderful process and, though there is lots of information in books and online, the most immersive and satisfying way to learn is to simply go out and explore, experiment and always expect the unexpected.



Autumn brings with it a shift in the land and in ourselves; plants return to soil, sap makes its way to roots and we begin to spend more time indoors. It is still worth venturing out, however, for the mushrooms are emerging, the hazelnuts are browning and the colours are still glowing. Goldenrod flowers make a fantastic yellow, old alder cones a warm brown, and the last of the elderberries and blackberries can be collected to make rich purples and even blues.





OAK GALL INK ON HEATHER FLOWERS, NETTLE, ST JOHN'S WORT,  
GREEN EARTH PIGMENT

Attempting to capture the beauty of the natural world can sometimes seem futile. As the poet Mary Oliver wrote, 'the sunflowers themselves are far more wonderful than any words about them.' Instead, let the plants and rocks make their own marks on your page for a time, allowing nature to demonstrate its own inherent beauty through the complex interactions that occur when different elements of a landscape meet each other in ink form.

I'm not sure if my abstract strokes of colour – I call them 'inkscapes' – are particularly beautiful to anyone else, but I find that each colour is a work of art – or nature – in itself and holds an intricate story of the plant and the land that it came from.

Remember:

**Locate:** avoid foraging where there might be pollution from roads, dogs, pesticides and herbicides. Ask the landowner's permission or use public land.

**Identify:** be 100% certain you have identified what you find correctly, and that it is definitely edible if you plan to eat it.

**Harvest:** pick only what you need, respecting the plant and local wildlife. If digging up roots, take even less and only where there is plenty. Ensure what you pick is not endangered or under protection.

**Share:** teach others to respect nature and about their local environment.

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To see more of Vivien's experiments, visit her on Instagram [@veemartineau](https://www.instagram.com/veemartineau) or head over to [vmartineau.com](https://www.vmartineau.com) to see more of her beautiful illustrations.

*Animal Identification*

*Grey Seal*

Halichoerus grypus



**A familiar sight up and down the coast of Britain, seals are one of the country's best-loved sea creatures. Alongside the smaller common seal, the grey seal is one of only two seal species native to Britain. Although clumsy and awkward on land, they are fast and sleek beneath the waves, making them excellent hunters.**

Grey seals hold the title of being Britain's largest native carnivore. Male seals, or 'bulls', can weigh up to 300kg whilst the females, or 'cows' can reach 200kg. The fluffy, white pups, weighing around 15kg, are born between September and December, extending into January in some locations.

Only after tripling their birth weight and moulting their fur (which can easily become waterlogged) will they enter the sea to hunt, their mother's fat-rich milk having given them a valuable supply of insulating blubber. A pup's bond with its mother is strong during the first weeks of life, with its call and scent being easily recognised and distinguished amongst hundreds, sometimes thousands of others. The mother will not feed herself during these early stages and can lose up to a quarter of her body weight.

**Best time to see:** To give birth, grey seals return to shore, finding a flat, sandy beach or cove in a process known as 'hauling out'. You're most likely to see this animal when they are nursing a pup, although they will often 'haul out' to digest a catch after a long hunt.

**What do they eat?** A grey seal's diet can vary from place to place, but their favourite food tends to be sand eels as well as cod, haddock, flatfish and herring. That said, they will eat almost anything they find, including lobsters and octopuses.

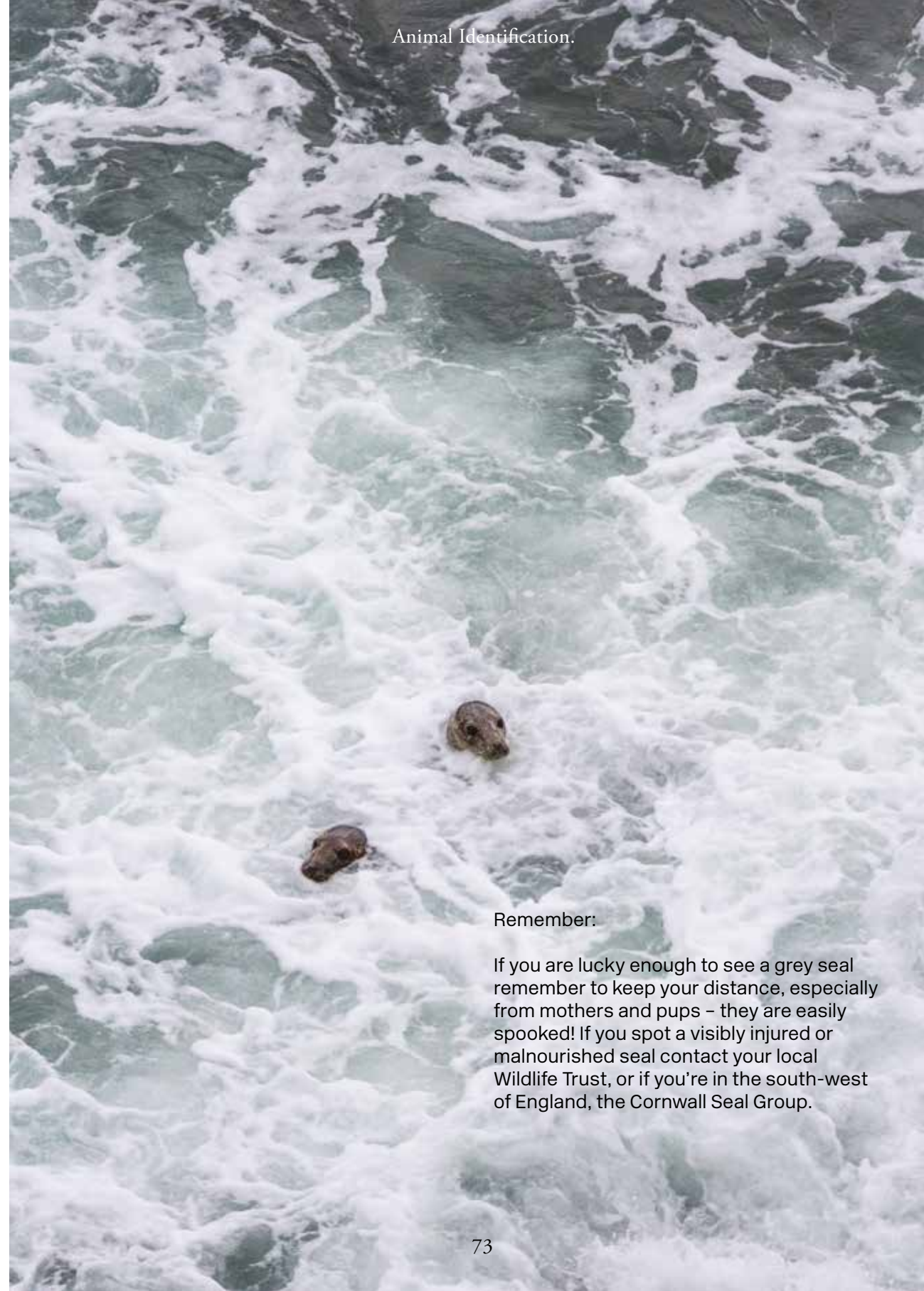
**Where to see:** Although grey seals can be found on both sides of the Northern Atlantic, the British Isles boast almost half of the global grey seal population with large colonies breeding on beaches and islands up and down the UK and Ireland. Notable gatherings include the Farne Islands off the Northumberland coast, North Rona off the northern coast of Scotland and Lambay Island off the coast of Dublin.

**How are they doing?** In the early 20th century the British grey seal population was estimated to have reached its lowest number; only 500. Today however, the species is thriving. There are said to be more than 120,000 grey seals in Britain, despite widespread persecution from groups who claim that they are having a detrimental effect on fish stocks. This claim has led many to back a proposed cull of all seals, including the common seal, whose numbers have plummeted in recent years due to a fatal disease called phocine distemper. It is also common practice for fish farms to employ professional marksmen, with one reported supplier of Waitrose and Sainsbury's admitting to killing over 100 seals annually.

**Average lifespan:** 30–40 years

**Length:** Up to 2.6m

**UK population:** 112,000



**Remember:**

If you are lucky enough to see a grey seal remember to keep your distance, especially from mothers and pups – they are easily spooked! If you spot a visibly injured or malnourished seal contact your local Wildlife Trust, or if you're in the south-west of England, the Cornwall Seal Group.

# *An Inbetween Place*

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A skylark levitates from the grassy tussocks, ascending with its song above the steady buzz of traffic on the main road. In front of me sprawls a seemingly inhospitable landscape. Wind-battered hawthorns with branches and twigs stretching away from prevailing winds, patches of wild uneven grass, and a puzzle of blackthorn and bramble, clambering over one another, punctuated by clusters of coppiced hazel.

An inbetween place – wild in an unexpected location; a mix of bird song and modern-day living.

A scrubland.

*Words and photographs by  
Jeni Bell*

A habitat that exists beyond the well-manicured nature reserve, at the edge of the farmer's field and the wood where the beech trees grow tidily in organised lines. This is the place where wild seeps through the edges. Where dumped, rusted-out cars, oil cans and bikes are now entangled in grasping vines. Fresh green shoots forcing their way through flaking metal as nature claims it for its own.

Nothing here grows in an orderly fashion; the scattered shrubs seem sparse in comparison to the dense thickets that twist and tangle, snarling at one another. Stumps and deadwood lie like skeletons, bones covered in moss.

Scrublands have a mind of their own. They're always growing, transitioning, changing into something wilder. If left to their own devices they'll grow into a fairytale forest, full of dark spaces, thorns, and paths that only the wildest of creatures know. Here, on my patch, it seems like parts of it are turning already, and it's in the denser parts I catch fleeting glimpses of fallow deer before they are swallowed back into their otherworldly realm. It is managed though, tidied in places to open it up and give nature some breathing space.

Past the sunshine yellow of gorse, and delicate clusters of blackthorn blossom, in a man-made clearing, butterflies float amongst wild flowers. The shaded rides, and scruffy edges are perfect for small mammals and reptiles to go about their business in relative safety. Although I've often seen a kestrel poised on telegraph poles, or been engulfed by the musty scent of foxes, so safety isn't guaranteed.

Persistent calls of birds ring out; chiffchaffs, great tits, blue tits, and wrens – every so often interrupted by the jay’s gravelly laugh, they hide in the peripheral, just flashes of blue, blush and white as they delve into cover.

There’s so much life here, in a place that on first appearance seems lifeless. In a habitat that looks lost, unruly and uninviting, things flourish. A managed scrubland creates a thriving environment for some of the UK’s most vulnerable species.

There is colour in the birds and butterflies that make their home here, in the pattern on the adder’s back as it basks in the sunshine. There is noise beyond the rush of traffic; there is bird song, and rustling in the undergrowth, the flapping of wings and the sharp barks of deer. For me this is wildness at its best; a solid ecosystem that acts as a safe haven for nature. It’s in these scrublands that dormice hide, the turtle dove rests and where nightingales are safe to sing from thickets.

Scrubland, in all its forms, is worth exploring, whether it’s at the side of a busy road, beyond the woodland or in overgrown gardens on housing estates. Sometimes you need to stray from the path and get stuck into overgrown places, the seemingly un-wild spaces, because there is more than meets the eye. It’s more than a patch of nettles or a dumping ground for burnt-out cars.

The inbetween places are where the wild things live.





*The Return of*  
*Nature's*  
*Engineers*

Once native to the British Isles, beavers are now at the forefront of reintroduction efforts. Environmental scientist *Dr Alexandra Jellicoe* explores the effects of this project on our environment.



**The beaver is a spearhead species for ecological restoration and near Truro, Cornwall, the first measurable breeding pair are being monitored by the University of Exeter. A some might say pioneering but certainly progressive farmer, Chris Jones, is their caretaker and was inspired to introduce them when he discovered that the Victorian style waterways that crossed his farm were contributing to the flooding of a downstream village, Ladock. He had a choice, redesign the waterways with concrete and some expensive civil engineering or introduce nature's engineers and leave them to the essential work of redesigning the ditch themselves.**

Within a year the pair had created a series of dams that managed heavy rains and downstream flooding. Beavers instinctively respond to the sound of running water by building dams. They don't rest until they have slowed the flow of water enough to create a deep and wide pool where they can submerge their winter feed store, willow is a favourite, and to create a cavern of wood and leaves to keep them dry during the colder months.

Beavers only feel safe in water so once their first dam is created, they start work on others until there are a series of pools, each giving them easy access to nearby trees to prevent long overland excursions and vulnerability to predators. Mature beaver dams have a network of canals each ending at a tree. This is when the magic happens. The beaver dams brim with life.

A year after the Cornwall beavers were introduced their pools were filled with fish, amphibians and dragonflies. The water attracts insects which in turn attract birds and bats. These particular beavers are fenced off due to current UK regulations but in Canada other animals that can gain access to the pools make the local area their home, breeding and populating local landscapes.

Beavers, if left to their own devices, could restore biodiversity in the UK in a very short space of time.




The Beaver Trust is a new initiative championing this very special animal with the goal of reintroducing the Beaver into UK catchment areas. They have a difficult task ahead. The British landscape of green rolling hills is something most have come to think of as natural but ask any environmentalist and they will tell you that it is ecologically dead. The UK is the 29th out of 218 most nature-depleted countries.

The lack of tolerance for any species other than human and domestic animals has meant that wildlife is poisoned, shot, trapped or mauled to death, eradicating anything that might intrude on our ability to yield perfect crops or the proliferation of meat stocks. To reintroduce beavers into catchment areas The Beaver Trust must collaborate with many different landowners and their varying attitudes to wildlife.

Yet, there is hope with the awakening consciousness that our attitudes here in the UK are damaging at a planetary level, and the scientific evidence that current climate and ecological breakdown are a result of industrialisation and the global trade of agriculture and consumer goods. We are entering the United Nations Decade on Ecosystem Restoration. For this not to become another exercise in colonialism focusing on the wildlife of Africa, Asia and South America we should begin at home. For the UK this means becoming caretakers of the precious species that can restore our natural wildlife with the added benefit of preventing the global heating induced flooding that we are experiencing more frequently.



A close-up photograph of a beaver sitting in a stream. The beaver is dark brown with wet, matted fur. It is holding a piece of wood in its mouth and gnawing on it. The background is filled with a dense pile of sticks and branches, some of which are partially submerged in the water. The water is dark and reflects some light.

The near collapse of the Whaley Bridge dam in Derbyshire, due to flooding this summer, could have ended in significant loss of life and will cost millions to repair. Beavers may have prevented this by building smaller dams, slowing the flow of water further up in the catchment area. After severe rainfall many dams may be destroyed but the beauty of the beaver is that they're on-site and ready to get to work immediately. This industrious little animal would have rebuilt their walls before a human site surveyor would have even noticed that a man-made structure was broken.

The British beaver was hunted to extinction for their meat, pelts and scent glands and the last had been eradicated from England by the 12th Century. I rather like the irony that reintroducing this powerhouse species can save us from ourselves.

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To learn more about the Beaver Trust visit [beavertrust.org](http://beavertrust.org). To read more of Dr Jellicoe's writing visit [monkeywrench.org.uk](http://monkeywrench.org.uk)



# Rooted

*Megan Humphreys*

**In today's discordant times, though numerous studies have highlighted the irrefutable correlation between nature connectivity and positive mental health, an ever-increasing number of children are experiencing what has been termed 'nature deficit' as the result of increasingly technology-centred lifestyles.**

Thankfully, health professionals, government bodies, and those with influence over public consciousness are slowly beginning to acknowledge the therapeutic power of the natural world and its pivotal importance to the wellbeing of future generations. Schools, communities and educational groups across the UK are embracing learning approaches that prioritise interaction with nature, to ensure our younger generation feel connected, comforted and impassioned by the natural world.

Numbers of Forest School attendees, as well as the number of school's opting to undertake outdoor learning, have seen a dramatic increase over the last few years and offer a promising statistic in a future that can often feel clouded by unhappy news.

Originating in Scandinavia in the 1950s, Forest Schools were introduced to the UK in the 1990s as a new approach to schooling here. This fresh outlook works around the belief that a love of nature is instinctive and therefore can be harnessed as a crucial tool to facilitate a more positive learning experience in children and teenagers.

The Forest School approach centres around fostering a personal connection with the natural world and in doing so equipping children with life skills honed from their time in nature – such as creativity, curiosity and independence.

However, despite its progressive and inclusive ethos to learning, sadly one of the setbacks faced by Forest Schools is its restricted demographic. Parents, carers or even the young people themselves who choose to pursue Forest Schooling generally do so as a result of an already established appreciation of nature. This means that programmes such as these often fail to sufficiently target those who are most disconnected from nature; and who by extension are most likely to benefit from time spent outdoors.



One programme that has worked to overcome the limitations of forest schooling and instead pursue its own brand of nature connectivity is Rooted, a Community Interest Company based in Bradford, West Yorkshire. Founded in 2016 by Beth Webber and Jenny Biglands, Rooted is a woodland-based early intervention programme that aims to upskill and empower young women struggling with self-confidence, relationships, or mental health issues in an approach to wellbeing with nature at its core.

The programme works with secondary schools across the city and its surrounding areas as a supplement to traditional state schooling, meaning Rooted is able to reach and support those who are unlikely to seek out green spaces through their own volition. As part of their mental health approach, green spaces are implicitly connected with the concept of wellbeing.

The peaceful woodland surroundings of the programme help to create a safe, therapeutic space for self-expression and self-reflection and work alongside psycho-educational practices as part of a multi-faceted approach. This holistic blend of both nature and nurture sets Rooted aside from other forest-based practices and has made the programme effective in improving the wellbeing for its young participants.

Throughout weekly sessions, girls are mentored by Beth, a secondary school teacher and Forest Schools practitioner and Jenny, a trained counsellor and member of the BACP (British Association of Counselling and Psychotherapy), who lead participants through hands-on activities to cultivate independence, self-esteem and growth. These activities range from campfire feasts and games to therapeutic crafting and reflective discussions, all of which offer a precious respite from daily worries and serve to equip these young adults with the tools they need to thrive.

Happily, the outcome of Rooted's work has proven consistently positive. Data collected from their first cohort of work highlighted an immediate improvement upon the emotional state of the young women involved, who reported lower levels of anxiety, increased self-confidence and improvements in their mood. Not only did the young women involved develop a more positive outlook, they showed improvements in their schooling, demonstrating better attendance and stronger engagement, amongst other benefits. These improvements showed not only to be present in the short-term but continued to have a significant impact when evaluated six months later.





Hearing about the work Beth and Jenny are carrying out, there is a part of me that feels a pang of envy and frustration for my inner 15-year-old self, who would have loved nothing more than to forget the anxiety of school for a short while and learn her portion of resilience in the freedom of the outdoors. But there is of course a far larger part that feels relief and joy on behalf of these young women, who amidst the turmoil of teenage life (something we so often overlook and belittle) have been offered a small place of refuge.

In providing these young girls with the opportunity to express, explore and recharge in a place of beauty and solace, not only has Rooted helped to equip them with valuable skills and lessons, but allowed them to build their own personal connection with nature. This connection, once established, could provide a lifelong outlet for escapism, self-care and more enduring positive mental health.

While studies show that exposure to nature during our youth is one of the surest ways to cultivate compassion for our planet, programmes such as Rooted show us how nature can likewise help cultivate compassion for ourselves.

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If you'd like to sign up, or want more information, email [hello@rooteduk.com](mailto:hello@rooteduk.com)



## *Artwork accreditations*

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**Viktoria Fenyes**—24, 27, 29, 30  
**Siân and Jon Moxon**—28  
**Alan MacKenzie**—32, 35, 36  
**Terry Bagley**—34  
**Luke Saxon**—38, 40, 41, 42, 43, 44, 45  
**Josef Shaw**—46, 59  
**Terry Whittaker**—48  
**Peter Cairns**—50, 54  
**Vivien Martineau**—60, 61, 62, 63, 64, 65, 66, 67, 68  
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