

Plastic-free Forests

According to legend, Sir Ewan Cameron of Lochiel shot the last wolf in Scotland in 1680. At the time it was considered a heroic act, saving livestock and people from these ferocious beasts. There are many foresters today, however, who wish that Sir Ewan, along with countless others, had missed...

A long history of predator persecution and habitat destruction has resulted in big gaps in our food chains and huge ecosystem imbalances in the UK. We now have unsustainable numbers of wild herbivores, especially deer, since their populations go largely unchecked. All those hungry, tree-eating mouths prevent our last remaining woodlands from regenerating and make it very difficult to establish new ones.

But in 1979, along came a wonder solution, or so we thought: the tree tube, invented by a Scotsman called Graham Tuley. Tree tubes seemed like the perfect answer: an individual guard for each new tree would protect our saplings from both herbivores and the elements. Since then, millions of them have been used (particularly for broadleaves which are more palatable than conifers) to help us create new woodlands across the country. They work. They keep the deer, rabbits, hares and voles away, allowing trees to grow to a size where herbivores are no longer a risk. Without tree tubes we would not have some of the fantastic new woodlands that we enjoy today and so, for that, we should thank Mr. Tuley.



Left: Tree tubes helping young, native woodland to establish.



Right: the damage that voles can cause when tree tubes are not used.

We have known for some time, however, that tree tubes aren't perfect. Here are just a few of the problems they cause:

- Tree tubes act like mini greenhouses, causing trees to grow rapidly within them. Often once the tree emerges from the top, it is thin and fragile and not prepared for the harsh winds and cold air that greets it. Trees can snap or die of shock at this point.
- Tubes shelter young trees from the wind meaning that they do not develop the strong root plates they need to withstand the wind for themselves. This can result in trees leaning over or falling completely once they grow beyond the height of the tube.
- Tubes often do not break open and, unless the forest has a very attentive manager with an excellent memory (or management plan), plenty of time and money, they are often forgotten about and left on the trees for too long, strangling them.
- Tree tubes are warm and damp inside, which some species such as beech and pine hate. The moisture can also cause moss and other plants to grow around the trunk of the tree allowing the wood to rot.
- Some tree species are poorly suited to growing in narrow tubes. Take shrubs like hazel or juniper for example: naturally they would grow with bushy forms but the tubes prevent this and can cause strangely shaped or unstable plants.
- Tubes only protect individual trees. They don't solve the wider problem of overgrazing or allow natural regeneration, which is generally preferable to planting, both financially and ecologically.
- Tree tubes are *expensive*: saplings cost around 50p each whereas a 1.2 m tube will set you back around £1.30. It's an incredibly cost-inefficient way to protect trees.
- Tree tubes are difficult to recycle since they are usually covered in moss and mud, which recycling facilities can't handle. Many of them are also made of more than one type of plastic, which makes them difficult to reconstitute into useful raw materials.





*Top left: A tree tube constricting its tree.
Top right: Damp moss and rot caused by tree tube.*



*Bottom left: Moss growing within a tube.
Bottom right: A constrained and unhappy juniper.*

Up until very recently we have been able to justify most of these problems by saying that the less than ideal growing conditions are worth it since, without the tubes, the trees wouldn't grow at all. Or, we've overcome some of the problems with changes to the design such as the addition of pre-perforated split-lines to help the tubes break open, mesh tubes that allow greater air flow and prevent the greenhouse effect or shrub shelters which are slightly wider and allow shrubs to spread out a little. In the last decade, however, we've become aware of a new problem and, this time, it's not so easy to fix – plastic pollution.

We've always known that plastic pollution wasn't great but in the last few years we've been forced to face the facts about the scale and impact of the problems it creates. Whether it was first brought to your attention by Blue Planet 2 or by a personal encounter with a plastic strewn beach, the plastic issue has firmly permeated our global consciousness now, and presents us with a problem that all of us, including foresters, have a responsibility to do something about.

Tree tubes are bulky, awkward and expensive to collect and so are frequently left amongst the trees they helped to protect. They do not biodegrade. Several models were on the market a few years ago that claimed to be 'degradable'. This is not the same as biodegradable; it simply means that they gradually break down into smaller pieces of plastic. Fragments of plastics like this end up in waterways and eventually the ocean where they are ingested by marine mammals, fish and sea birds. They can even enter our food chain.

In the midst of a climate and biodiversity crisis, we need more trees now than ever before. But we *have* to plant them in a way that doesn't inadvertently cause further harm to the environment. So what are our options?

Biodegradable tree tubes

Some companies are trying to develop biodegradable alternatives that can be left on trees, eventually breaking down into organic matter. Borders Forest Trust have been testing some of them out over the last year and I thought it would be useful to share some of our findings.

Ezee Tree - Tree Guard



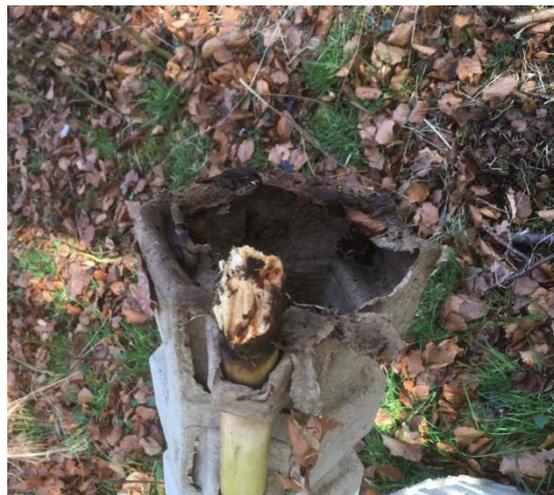
These guards are made from moulded card fiber and are completely biodegradable. According to the producers, they also have *“a special biodegradable additive in them which makes them water proof”*. They are supplied with a *“sustainable eucalyptus”* cane that is used to hold the tube together and secure it in to the ground. No cable ties or other fixings are required thanks to the clever design that includes slots for the cane. The guards are 0.6 m tall but two can be stacked to make a 1.2 m tube.

Pros:

- Clever, robust design that requires no cable ties and is easy to install.
- Card fibre can be made from recycled materials and sourced in the UK. It is a timber product and so using it to protect new trees creates a self-sustaining supply chain.
- They come flat packed so aren't too bulky for transporting to planting sites.
- Fairly lightweight.
- Invented by a UK, family-owned businesses that supply a range of 'eco' products and strive to reduce waste. They supply their products without plastic packaging.

Cons:

- Borders Forest Trust and one of their supporters put over 100 of these to the test and the results were mixed. After 10 months, some were still intact but many had started to disintegrate already, offering no protection.
- It is dark inside the tubes which will be a problem for light-demanding species. Most trees did survive in the 0.6 m tubes that we trialled but growth was slower than in standard plastic ones. Stacking two together for a 1.2 m tube would create a very dark environment.
- Some canes started to snap after less than a year. They appear to be untreated and do not have pointed ends making them difficult to drive in to the ground.



*Tree Guards and stakes degrading quickly after only 10 months outside. Image Credit: Edward Hurst.
Bottom left: dark conditions inside the guard*

Summary: An innovative design that shows a lot of promise and is certainly a step in the right direction but unfortunately these tubes biodegrade too quickly in Scotland's wet winter conditions leaving the trees exposed to herbivores. These may be a good solution in drier areas and for small-scale applications such as gardens and parklands where deer numbers are not as high.

Ezee Tree – Hedge Guard



Ezee Tree also produce a simple, fold-flat hedge guard made from recycled card. The standard plastic spiral guards widely used for hedging are one of the worst plastic polluters; they shatter into fragments making them difficult to collect, so these card alternatives are a welcome invention.

Pros:

- Made from recycled card.
- Come flat packed and so are easy to transport to planting site.
- Lightweight.
- Clever design with slots for a bamboo cane.

Cons:

- These broke down in less than 6 months, providing very little protection.



No longer serving a purpose after only one winter.

Summary: A nice concept but not a practical solution just yet.

Treebio - Biodegradable Spiral Guard



These spiral guards are made from polylactic acid (PLA), which is a 'bioplastic' made using fermented starch from plants such as corn, sugar cane or potatoes. It looks and feels like plastic. They are sold in 60 cm or 20 cm models for rabbit or vole protection.

Borders Forest Trust had concerns about whether these were truly biodegradable and so consulted with polymer scientists at the University of Wolverhampton. They confirmed that PLA is biodegradable and is one of the better options currently available. They did say, however, that most tests are carried out in industrial-scale compost heaps which reach high temperatures. Little is therefore known about how long these tubes will take to fully biodegrade on cold Scottish hillsides with only one small area in contact with the soil. It could take decades. If, however, an animal of fish were to ingest a piece of PLA before it had fully degraded, it would, in theory, be able to break it down, as the body does naturally with lactic acid.

The manufacturer, Rainbow Professional, explains the biodegradation process: *"First the moisture and heat present in a compost pile and to a lesser degree in soil attacks the polymer chains, splitting them into much smaller parts and eventually into pure lactic acid. Microorganisms found in compost and the soil will then consume the lactic acids as a food source. The result is carbon dioxide, water and humus, which is a soil nutrient."*

Pros:

- Translucent material allows some light to reach saplings.
- The 4 samples on trial were still intact after 10 months but were showing hairline cracks.
- Light weight.
- Simple, familiar design.

Cons:

- The spiral design is not ideal: it is difficult to push in to the ground as the tube just compresses, this leaves the sapling at risk from voles.
- At 0.6 m it is only useful against voles and rabbits.
- Lack of evidence about how long PLA takes to fully biodegrade when not in a commercial compost heap.
- Uncertainty about sustainability of the material – is land used to grow corn and potatoes specifically for this material, or are waste products from food production used? No information about where materials are sourced. Still likely to be better than oil based plastic, though.



Still intact after 10 months outside but with some hairline cracks starting to show.

Summary: A very promising material that would benefit from some more field trials and an improved product design.

BioCycle - BioTube Tree Shelter



The BioTube is made from flax and cashew nut oil resin. The manufacturers claim it will fully biodegrade within 8 years. They are made by a small UK start-up inspired by the high cost of removing and disposing of plastic tubes. The tubes are 0.6 m tall and, like the Ezee Tree Guard, can be stacked to make taller tubes.

Pros:

- Very robust design, still intact after 10 months outside.
- Natural string ties are supplied instead of plastic cable ties.
- Comes in two halves for easy stacking and to allow it open around a growing tree.

Cons:

- Very heavy and bulky: only practical for garden use or easily accessible sites.
- Very dark inside.
- Concerns about the sustainability of the materials, e.g. cashews are not always farmed sustainably, so could this product be supporting bad forestry practices or even deforestation in another country?

Summary: Not a suitable replacement for plastic tubes in a forestry setting but may be a useful for gardening and smaller landscaping applications.

So there are some thoughts on a few of the alternatives to plastic tree tubes currently on the market. It is worth emphasizing that although I have highlighted drawbacks for each product, they may well work far better in the less-hostile climates where they were first conceived of and designed. It is also fantastic that businesses are grappling with this problem, using creativity and ingenuity to drive innovation and finesse possible solutions.

That said, at the moment none of the tubes tested could compete with plastic tubes for pure practicality. However, it does feel like we're getting close. Humans are smart and the technology and materials are already out there, it just requires a bit more funding and pressure from the forestry industry. So let's send a strong, united message to tree tube manufacturers, sellers, designers and scientists saying that we both want and need change to come quickly.

Another important step to reducing plastics in our forests would be to tweak the grant system, to disincentivize the use of tubes in favour of fencing, deer stalking or simply over stocking. Final maintenance payments could also be withheld until tree tubes are removed, or fines could be issued when industrial plastic litter is left in forests beyond its useful life.

In the end, though, it comes down to the same old *elaphus* in the room. Until we get a handle on herbivore numbers, either ourselves or by bringing back apex predators to Scotland, we'll be stuck building barriers against nature rather than letting it take care of its self. Tree tubes and the plastic they produce are just one more example of the costs that an excessive deer population is placing on our environment and our society.