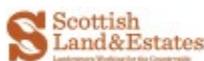


Research report

# The state of Scotland's rainforest

April 2019



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## Executive summary

Scotland's rainforest, also known as Atlantic woodland or the Celtic rainforest, is a unique habitat of ancient and native woodlands, open glades, boulders, crags, ravines and river gorges dappled by sunlight, dripping with moisture and garlanded with rare lichens, mosses, liverworts, fungi and other plants – some found nowhere else in the world. Scotland is the last stronghold of this globally important and rare habitat that once spread along the Atlantic coastline of Europe. But even here there is as little as 30,325 hectares left. These remnant oak, birch, ash, native pine and hazel woodlands are small, fragmented and isolated from each other. They are over mature and often show little or no regeneration. They are in danger of being lost for ever.

- Almost all of the rainforest is over grazed to a degree that will prevent it from re-growing;
- Invasive rhododendron can be found in 40% of rainforest sites where it threatens to choke the woodlands and prevent the distinctive rainforest flora from surviving;
- 21% of sites have been planted up with exotic conifer plantations which lower their value as rainforest habitat;
- Ash dieback threatens the future of our northern and western most ash woods; and
- Climate change and air pollution are set to decimate the last refuge for the rare plants that make the rainforest so special to us and the rest of the world.

**But it is not too late to save Scotland's rainforest.**

The **Atlantic Woodland Alliance** is a voluntary partnership of organisations and individuals with a shared interest in the conservation and sustainable development of Scotland's temperate rainforest. Alliance Partners have worked together to compile this research report that shines a light on the condition of our rainforest. And we are continuing to work together to develop a strategy to Save Scotland's Rainforest.

## What is Scotland's rainforest and why is it so important?

Scotland's temperate rainforest, also known as Atlantic woodland or the Celtic rainforest, is a unique habitat of ancient and native woodland, open glades, boulders, crags, ravines and river gorges. Dappled by sunlight and dripping with moisture, almost every surface is covered with lichens and other fungi, mosses, liverworts and ferns. The woodlands at the heart of the rainforest are alive with bird song – the wood wood warbler and the redstart flit through the canopy and the air is filled with insects like the chequered skipper.

Temperate rainforests thrive where there is high annual rainfall occurring over many days in the year, including during the summer season. That means that they are rarely dry. The climate also shows relatively little temperature variation over the seasons and a low incidence of frost or snow (Worrel and Long, 2010). These conditions occur because of the influence of the Atlantic ocean; where the effect is strongest it is termed 'hyper-oceanic'. Such conditions occur over less than 1% of the planet and in Europe are concentrated on the Atlantic coastlines of Britain, Ireland and Norway. We think of

the UK as wet and mild, but in reality only 8% is hyper-oceanic and this is restricted to the central part of north-west Scotland and some areas of the Borders, the Lake District, north Wales and south-west England (DellaSalla, 2011). Besides these climatic conditions, the rainforest also needs very clean air for the oceanic bryophytes and lichens to thrive, which is one reason why the west coast of Scotland still holds on to its rainforest.

Along with the climate and the clean air, people have also shaped these ancient woodlands through managing, and sometimes removing them, over thousands of years. Temperate rainforest used to occur more widely along the Atlantic coastline of Europe, but now only fragments of the original habitat persist in areas where it has been valued as woodland or where there has been less pressure to clear the forest for other purposes. The wildlife it holds is significant to our own history, culture and economy. It is also one of the world's rarest habitats, which we have a global responsibility to look after.

Hyper-oceanic climates, and therefore the extent of temperate rainforest, are very limited globally as illustrated in this map from Averis et al. (2012).





*Pyrenula* species growing on Atlantic hazel.

Britain is home to more than 1,000 species of bryophytes (mosses and liverworts) (Natural History Museum, 2018). This makes up around 60% of Europe's flora and 5% of the global flora (Gibby, 2003). Within this diverse group, bryophytes found in the temperate rainforest are of particular importance in international terms. UK rainforest bryophytes rival those found in the tropical montane cloud forests of Latin America, Africa, south-east Asia and the Caribbean.

Britain also hosts 2,000 species of lichen (Natural History Museum, 2018), which is about 40% of the European lichen flora (Gibby, 2003). This includes species that are restricted to the temperate rainforest, such as *Graphis alboscripta* (globally restricted to Scotland), *Pyrenula hibernica*, and *Pseudocyphellaria* spp.

The demands of some of these rainforest species are very particular. While they all need high humidity, mild temperatures and clean air, oceanic bryophytes favour damp, shaded rocks and banks and the trunks and branches of certain trees and shrubs. The lichens of interest grow mainly on trees and shrubs and many thrive in better-lit conditions.

'Old growth' native and ancient woodland, which has been in existence for long periods of time, offers a wide variety of suitable micro-habitats and conditions and can support populations of these demanding species. In some instances, managed habitats such as wood pastures also maintain appropriate conditions, especially the well-lit trunks of open-grown trees. Even woodland that has been heavily managed in the past, like many of the oak woods on the west of Scotland that were used for charcoal production in the 17th and 18th centuries, retain some of the characteristics of the rainforest. Other sites, such as small wooded ravines, crags and boulders, also offer suitable sites for rainforest species, but often they are too small to register in surveys.

All habitats on the west coast of Scotland need to be looked after to ensure a future for our rainforest.

Atlantic oak wood pasture



# How much rainforest is there in Scotland?

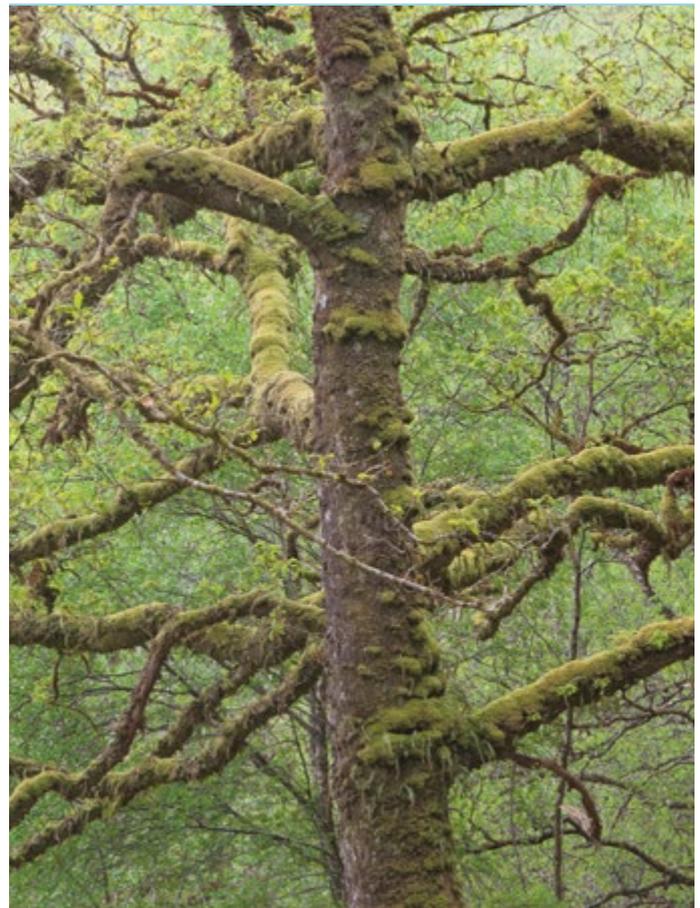
Map © Crown Copyright 2015. All rights reserved. Ordnance Survey



Rainforest zone of the west coast of Scotland

Our working definition of Scotland's rainforest is any native woodland within the 'hyper-oceanic' or rainforest zone of the west coast of Scotland (see map above). The Native Woodland Survey of Scotland (Forestry Commission Scotland, 2014), conducted between 2006 and 2013, shows that there are 92,863 hectares of native woodland (individual blocks larger than 0.5 hectare) within the area where conditions are right for the rainforest. The real conservation value of a rainforest lies in the communities of oceanic bryophytes and lichens that live there. But only some woodlands can support them. In particular remnant ancient woodlands that have been in continuous existence for centuries.

In 2010, Plantlife modelled the extent of the Atlantic woodland on the west coast of Scotland and on some of the inner isles (Fraser and Winterbottom, 2010). This is still the most comprehensive estimate of how much rainforest there is in Scotland, based on historic maps of ancient woods as well as more recent data showing sites known and/or likely to contain a range of oceanic bryophytes and lichens. By combining these findings



Peter Cairns/scotlanddigitalculture.com

Atlantic Oak wood, Tainish National Nature Reserve, Argyll.

with the results of the more recent Native Woodland Survey of Scotland we estimate Scotland is currently home to 30,325 hectares of rainforest (mainly ancient woodland with known populations of oceanic bryophytes or lichens). These are a priority for protection, expansion and management. But, gaps in the data, and the lack of a comprehensive survey to help identify woodlands that do contain distinctive oceanic biodiversity in particular, means we don't yet know how many more west coast woodlands contain rainforest biodiversity. Better estimates could be included in future national surveys and expanded to include trees outside woods and woodland smaller than 0.5 hectares. See appendix 1 for more details on how much native woodland and rainforest there is in Scotland.

## What is the scale of the challenge?

- 30,325 hectares of Scotland's native woodland contains rainforest biodiversity.
- The other 63,000 hectares of native woodland on the west coast is potentially rainforest and would benefit from safeguarding and management to ensure its survival.

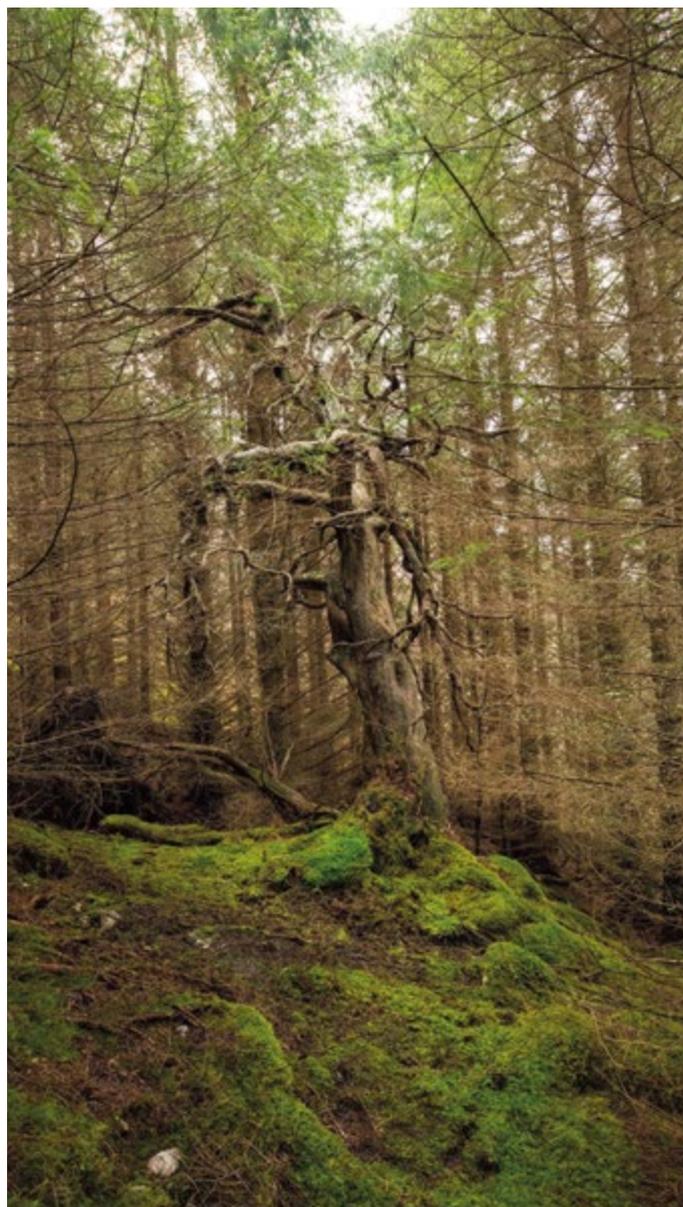
## What types of woodland make up Scotland's rainforest?

Of the 30,325 hectares of rainforest that we estimate exists today:

- Three quarters are native (with at least 50% native tree species in the canopy) or nearly-native woodland (with between 40% and 50% native species in the canopy).
- Less than 5% of the area is made up of open land, which is described in the native woodland survey as 'woodland with less than 20% tree cover but which is usually next to closed woodland'.

Open areas in and around rainforest woodland provide well-lit but sheltered conditions that are important for some rainforest species. The rainforest is not just woodland. River banks, boulder fields and crags, as well as individual trees and small groups of trees outside woodland altogether, are important elements of the wider rainforest landscape. This is because they offer safe havens and stepping stones for some lichens, mosses and liverworts to allow them to persist and colonise new areas.

- One fifth of Scotland's rainforests (6,500 hectares) are ancient woodland sites that have been planted with non-native species, usually conifers (known as plantations on ancient woodland sites or PAWS).
- PAWS make up a similar proportion of the rest of the 63,000 hectares of native woodlands across the whole rainforest zone.
- There are 15,000 hectares of PAWS on the west coast in total.



Phil Formby/WTML

Veteran pine amongst Sitka plantation, Loch Arkaig pine forest, Lochaber.

### What is the scale of the challenge?

- 6,500 hectares of PAWS within the core area of rainforest could be restored to native woodland that, with time, would become high conservation value rainforest itself.
- A further 8,500 hectares of PAWS elsewhere on the west coast could also be restored to native woodland.
- Careful management of potentially invasive plantation species, like Sitka spruce, within the rainforest zone will reduce the risk of impacts on rainforest habitat. These species may need to be controlled where they threaten key rainforest sites.

At the same time, the native and ancient woodland on the west coast sits within a wider landscape which often contains plantations of exotic species such as Sitka spruce. The National Forest Inventory (2015) shows that there are 352,600 hectares of woodland within the 'rainforest zone' on the west coast.

- This is approximately 19% of the land there.
- 45% of this is conifer woodland (mainly exotic plantations).
- Only 14% is broadleaf woodland.
- The rest is mostly recently felled or newly established woodland and non-woodland areas.



Ballachuan Hazelwood, Seil, Argyll



Birch woodland, Wester Ross.

Atlantic oak woods are often considered the archetype of Scotland's rainforest, but it is clear from the data that in fact birch trees and birch woodland dominates. Birch woods make up a third of the area whereas oak woods make up only a fifth. Birch dominates because it is a prolific seed producer, and the seedlings are less palatable to grazing animals than those of oak or ash, so they are more likely to develop into saplings and young trees. The rainforest also includes other native woodland types like wet woodland, ash woods and native pine woodland. The western-most native pinewoods are under-represented in known rainforest sites, but that may be because we have less knowledge of the sorts of oceanic wildlife they support. There are also almost 500 hectares of hazel wood within the known rainforest area and a further 1,500 hectares on the west coast that might contain rainforest wildlife. Until recently, hazel wood was not widely recognised as a distinct woodland type, but it is a significant component of the rainforest because of the diverse epiphytic communities that it sustains. See appendix 2 for some of the data used in this analysis.

### What is the scale of the challenge?

- A greater understanding of the wildlife value of native pinewoods on the west coast would help put them into context of the wider rainforest habitat.
- 2,000 hectares of hazel wood rainforest would benefit from being safeguarded, managed and expanded to better connect what remains of this unique habitat.



Bryophyte-rich ravine, Beinn Eighe National Nature Reserve, Wester Ross

## How valuable is Scotland's rainforest for conservation?

The woodland types that make up our rainforest are recognised in the Scottish Biodiversity List as important habitats that need protection in their own right. They are home to many characteristic mosses, liverworts, lichen, ferns and fungi that make the rainforest a unique habitat of the very highest conservation importance. Often these species are of international importance and some are found only in Scotland. Many of these need particular surfaces to thrive on. The texture, chemistry and acidity of the rock or bark where they grow is important to their survival and each type of boulder, crag, or species of tree or shrub will offer different 'homes' to different species. To support a wide range of biodiversity, thriving rainforest woodland also needs a variety of trees and shrubs of different ages and stages of development, from seedlings through to saplings, veterans and eventually to deadwood.

Scotland's rainforest woodland is diverse – in total it contains 60 different species of trees and shrubs. A wide range of species offers a variety of micro-habitats that can support rainforest wildlife. But the number of tree species alone is not the best measure of woodland conservation value, because some species are more

important than others as habitat for rainforest biodiversity. In particular, half of the tree species found in the rainforest are exotic, and many of these are likely to be of very limited value as habitat, and in some cases may be invasive. In fact Sitka spruce is already the second most common tree species found in the 'rainforest zone' and in total there are more exotic trees in the rainforest than there are oaks. So while diverse woodland may offer a range of habitats and a strong foundation upon which to improve how the sites are managed, the fact that exotic conifers are very common within the rainforest and the wider west coast could present a threat.

Like most native woodland in Scotland, our rainforest is dominated by mature trees. This may indicate it currently has a high value for biodiversity, since woodland with older trees holds more diverse micro-habitats for epiphytes. There are however few veteran trees – the individuals that offer the most diversity.

Worryingly, almost all rainforest shows little, and sometimes no, regeneration. Low regeneration and exotic species re-growing pose a risk to the long-term survival and conservation value of the rainforest.

Furthermore, our remaining rainforest patches tend to be quite small, with a mean size of 92 hectares but a median of only 25, showing that the majority are in fact smaller than the average. While small woodlands seem to hold as many species of trees and shrubs as larger woodland, they offer smaller reservoirs for wildlife, are more easily damaged or cleared completely and are more open to being affected by the (less humid and more variable) climate outside of the woods.

With just over 30,000 hectares remaining, there is very little rainforest left in Scotland. Only about 21% of the land on the west coast where conditions are right for for the rainforest actually hosts it. The remaining rainforest is fragmented, broken into small parcels and separated from nearby woodland. It is also sometimes isolated in a wider landscape that is farmed, planted with exotic conifers and/or is open hill and populated by deer and livestock. See appendix 3 for some of this analysis.

### What is the scale of the challenge?

- The remaining rainforest fragments are small, over-mature and have little or no regeneration.
- There is no room to expand and many are overgrazed and threatened by exotic regeneration.
- This may indicate there is not enough rainforest protected or managed in Scotland to ensure its long-term survival.



A rare veteran holly in the rainforest.



Oak wood displaying little natural regeneration – Hell's Glen SSSI, Cowal, Argyll.

## The condition of protected areas

Some of Scotland's rainforest habitats are already recognised for their biodiversity value and designated to support their conservation. Despite this added level of attention and protection, these woodlands do not seem to be faring much better than others. There are 125 Sites of Special Scientific Interest (SSSI's) designated for their woodland features within the rainforest zone along the west coast of Scotland and almost half (46%) of the woodland features identified are in unfavourable condition. The west coast is also home to 19 of the 26 Special Areas of Conservation (SACs) that have Western acidic oak woodland, the one rainforest type that receives official recognition at European level, listed as a designated feature. Of these 19 sites, Scottish Natural Heritage estimated that over half (58%) are in unfavourable condition.

Considering all native woodland on the west coast, less of Scotland's rainforest is in satisfactory condition than the national average for native woodland. Only 30% of the rainforest area (9,217 hectares) is in satisfactory condition, compared to a national average of 46% according to the Native Woodland Survey of Scotland.

The relatively poor condition of Scotland's rainforest is based on multiple factors. The Native Woodland Survey of Scotland (FCS 2014) shows that the rainforest is much like other native woodland in Scotland for canopy closure and the proportion of native species it holds. But it suffers more than other native woodlands in Scotland from two very significant threats – **overgrazing** and **invasive non-native species** (particularly *Rhododendron ponticum*.)

## What do we know about the threats to Scotland's rainforest?

**Grazing** impacts are the most significant and widely observed threat to the rainforest. The Native Woodland Survey of Scotland indicates that all the rainforest shows some grazing pressure and 41% (more than 12,000 hectares) shows high or very high levels of grazing impact that will prevent or limit its long-term survival. Another 45% (almost 13,500 hectares) is being grazed at a level that might allow it to survive, but which will inevitably restrict its diversity and regeneration in the long run. Across the west coast 72,000 hectares of native woodland is being over-grazed. 80% of the impact within the rainforest, that could be attributed to particular herbivores, was seen to be by deer and 20% by livestock.



## What is the scale of the challenge?

- More than 12,000 hectares of Scotland's rainforest would benefit from urgent protection from overgrazing. Grazing here is at such a high level that Scotland's rainforest has little or no chance of surviving long term.
- In total, 25,500 hectares of the rainforest would benefit from more work with landowners and managers to develop sustainable grazing management to ensure the long-term survival of their biodiversity.
- Across the west coast, sustainable grazing over at least 72,000 hectares of native woodland would benefit the maintenance, expansion and creation of Scotland's diverse rainforest resource.

## What is the scale of the challenge?

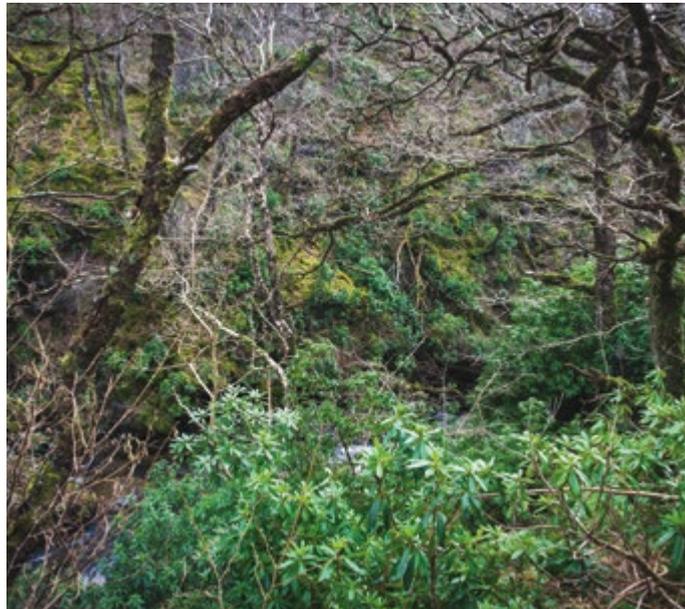
- Almost 13,000 hectares of the rainforest needs to be cleared of invasive rhododendron that we are already aware of.
- A further 24,000 hectares around these sites needs to be surveyed and possibly cleared to prevent reinvasion.
- Across the whole of the west coast, rhododendron needs to be cleared from at least 30,000 hectares of woodland.
- An additional 80,500 hectares needs to be surveyed and possibly cleared to prevent reinvasion.

**Mismanagement** or neglect can undermine the value of rainforest woodland for some of the characteristic rainforest species as well as limit its regeneration. Damage to trees and boulders during felling can degrade micro-habitats, the removal of dead wood can limit the value of sites to some fungi and coppicing of hazel woods removes long-established lichen populations while preventing them from recolonizing the regrowth. Improving the protection of the rainforest from grazing and invasives, as well as its wider management, would increase its conservation value as well as its potential contribution to sustainable development.

But there is also huge untapped potential to increase how much rainforest we have. Creating a strip of only 50 metres of new woods around existing rainforest woodland, through a judicious mix of natural regeneration and planting, would create another 21,000 hectares. A 100-metre strip would almost double the area of rainforest we have.

## What is the scale of the challenge?

- All 30,325 hectares of Scotland's rainforest would benefit from being protected and well-managed to ensure its diversity, conservation value and long-term regeneration. We need to build up our knowledge, skills and capacity to manage our rainforest better.
- Creation of more native woodlands, by planting and encouraging natural regeneration around and near to existing rainforest sites on the west coast, will result in a larger, and therefore more resilient, national rainforest resource.



**Invasive rhododendron** is widespread throughout the rainforest, although sometimes at low density. It poses a threat because it can colonise rainforest woodland, out-compete native trees and shade out important lichens, bryophytes and other characteristic flora. Although our rainforest only contains some 612 hectares of invasive rhododendron (rhododendron that is actively expanding) it was observed over a total area of 12,290 hectares of the core rainforest woodland. The Native Woodland Survey of Scotland showed that almost 30,000 hectares of native woodland within the oceanic zone had some rhododendron. This is likely to be an underestimate of prevalence of invasive rhododendron in the rainforest landscape because the survey did not include land outside of native woodland, such as open moorland, which is also susceptible to rhododendron invasion.



Ash trees with chalara

**Pests and diseases** also pose a threat to the health and resilience of the rainforest. Ash is an important part of the west coast landscape. It has a less acidic bark than many other trees, and is therefore favoured by a subset of characteristic rainforest epiphytes, especially cyanolichens. Its importance as a host tree for epiphytes has been increased by the widespread loss of elm. Ash is now threatened itself by Chalara dieback. A level of resistance has been found in all populations studied, but

resistant seedlings and saplings must be able to grow into mature trees to ensure that the woodland as a whole is resistant. By encouraging the regeneration of ash, and protecting it from other threats, we can give it the best chance of developing resistance to the disease in the long term. Other tree species, such as hazel, rowan and aspen, support many of the lichens that occur on ash, so promoting regeneration of these species will help to safeguard epiphytic species as ash declines.

Rassal Ashwood National Nature Reserve, Wester Ross



### What is the scale of the challenge?

- Closely monitoring ash dieback within rainforest sites will help prioritise locations for responsive management.
- Promoting the regeneration of ash, and other tree species, through careful grazing management within rainforest woodland would maximise opportunities for Chalara-resistant woodland to develop.
- We must ensure that where ash dieback takes hold the rainforest is protected and managed to allow other important species to replace it.

**Climate change and pollution:** Lichens and bryophytes are non-vascular, which means that they absorb water from the atmosphere across their surfaces rather than from the soil through roots. Because of this they can be highly sensitive to atmospheric pollution, such as nitrogen deposition, as well as to changes in environmental conditions.

Lichens and bryophytes will be affected by the changes in humidity and temperature that result from climate change. Predictions are that lichens currently found in northern oceanic woodland, like those in Scotland, will show a loss in habitat by 2050 due to a contraction in the eastern extent of their suitable range (Ellis et al, 2007). The future of our rainforest is further jeopardised by the fact that there is nowhere for species to 'migrate' as the climate changes.

Rainforest species will also continue to be affected by nitrogen in areas where critical deposition loads are exceeded. Sources include energy generation and manufacturing, but also local transport and agriculture.

Increasing renewable energy will help reduce the magnitude of climate change and some sources of nitrogen pollution. However, development of renewable hydropower itself can threaten the wider rainforest habitat, through changing the flow and local humidity in rivers where rainforest species are found. So, it is important to recognise and support such renewable energy schemes while also informing their sustainable development to minimise their direct impact on our richest rainforest sites.

### What is the scale of the challenge?

- We need to expand the rainforest, safeguard and better manage what we have and ensure that it is healthy, diverse and thriving in order to better face the challenges of climate change.
- Identifying rainforests that are already receiving harmful levels of nitrogen deposition, and detecting these effects, will help us make more informed decisions about development and land use changes that emit nitrogen.
- Early engagement with renewable energy stakeholders and provision of expert advice will minimise direct negative impacts while maximising low carbon energy production.

Taynish National Nature Reserve, Argyll



## What's next for Scotland's rainforest?

Scotland's rainforest has faced, and continues to face, many threats. The end result is that there is now too little rainforest and too much of what does remain is in poor condition. But, it is not too late to take action. Many of the best rainforest sites are being managed by a range of government, private, charitable and community interests. Several of these organisations have come together to form the Atlantic Woodland Alliance, with the aim of seeing Scotland's rainforest thriving once again.

Our vision for Scotland's rainforest is simple: we want it to be bigger, in better condition, more vital and regenerating. We want the best sites to be reconnected to allow the spread of wildlife, and more diverse in terms of trees, shrubs, fungi and flora as well as age and structure. A bigger, more vigorous and better connected rainforest should be more resilient to threats and environmental changes, and better able to survive and thrive in the long term. It will also contribute to sustainable development and economic growth – sites will be visited more, become more productive and will be better championed and supported by businesses, local communities, charities and government agencies.

This is an ambitious vision and the Atlantic Woodland Alliance is developing a long-term strategy that sets out the priorities for action aimed at addressing, in different

ways, the key threats, needs and opportunities facing the rainforest. We need new collaborative approaches to reduce grazing pressure, control invasive species, expand and connect the remaining rainforest sites and restore those sites that have been adversely affected by past management (in particular ancient woodland that has been planted with exotic trees). We also need to make the most of opportunities to reconnect people and businesses to the rainforest to make sure it is contributing, where appropriate, to sustainable livelihoods. By taking these actions we will make the rainforest more resilient to threats such as damaging pests and diseases and climate change.

The first step is to build on what we and others are already doing to demonstrate how our rainforest can be better managed, safeguarded and how threats can be reduced to save it and to help deliver sustainable development. Next, we need to work with others to build the capacity, knowledge and skills to better manage our rainforest. We need to collaborate to raise awareness of, and change attitudes to, the rainforest. We need to support those that fund and manage it and gather the evidence needed to inform policies and programmes – in particular the Scottish Forestry and Biodiversity Strategies – to better support rainforest conservation and sustainable development.

The strategy will explain what we in the Alliance will do and where we are looking to work with others to help us.

West coast pinewood, Ben Shieldaig, Wester Ross.



We are keen to talk to anyone who feels as inspired as we do to

# Save Scotland's rainforest

Please contact [AdamHarrison@woodlandtrust.org.uk](mailto:AdamHarrison@woodlandtrust.org.uk)

The **Atlantic Woodland Alliance** is made up of the following organisations who have contributed to this report: Scottish Forestry and



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## Appendix 1 – How much rainforest is there in Scotland?

Woodland categories used in this report:	Area (ha)
The total area of woodland within the west coast 'hyper-oceanic' zone that appears in the Native Woodland Survey of Scotland.	92,863
Assumed rainforest sites – the area of woodland that overlaps with the Plantlife IPA core area and is therefore highly likely to contain oceanic bryophytes and lichens.	30,325
Possible rainforest sites – other areas of woodland within the 'hyper-oceanic' zone. May be rainforest but there is no indication in the current data that they hold oceanic biodiversity.	62,629

## Appendix 2 – What types of woodland are there in the rainforest zone?

- Area of the hyper-oceanic rainforest zone: c.18,500 km<sup>2</sup> – 23% of Scotland
- Area of woodland within the zone: c.350,000 ha – 19% of the hyper-oceanic zone
- Area of native woodland within the zone: c.93,000 ha – 5% of the hyper-oceanic zone
- Area of assumed rainforest: c.30,000 ha – 2% of the hyper-oceanic zone
- Area of possible additional rainforest: c.63,000 ha – 3% of the hyper-oceanic

Woodland type within the Native Woodland Survey of Scotland	Total area within the hyper-oceanic zone (ha)	%	Assumed rainforest (ha)	%	Possible rainforest (ha)	%
Native woodland	71,115	77	22,350	74	48,765	78
Nearly-native woodland	1,252	1	227	1	1,025	2
PAWS	14,894	16	6,475	21	8,418	13
Open land habitat	5,603	6	1,183	4	4,421	7
<b>Grand total</b>	<b>92,863</b>	<b>100</b>	<b>30,235</b>	<b>100</b>	<b>62,629</b>	<b>100</b>

Priority woodland type	Scotland %	West coast (ha)	%	Assumed rainforest (ha)	%	Possible rainforest (ha)	%
Upland birchwood	26	33,456	36	9,566	32	23,890	38
Upland oakwood	6	11,413	12	6,005	20	5,408	9
Wet woodland	10	11,405	12	4,653	15	7,676	12
Non native	7	10,367	11	3,730	12	5,714	9
Unidentifiable type	9	7,484	8	1,970	7	5,514	9
Native pinewood	24	6,783	7	926	3	5,857	9
Upland mixed ashwood	3	3,916	4	1,383	5	2,534	4
All other	16	7,040	9	1,373	5	6,037	10
<b>Grand total</b>	<b>100</b>	<b>92,863</b>	<b>100</b>	<b>30,235</b>	<b>100</b>	<b>62,629</b>	<b>100</b>

### Appendix 3 – What is the condition of the woodland in the rainforest?

Most of the woodland on the west coast and that are assumed to be rainforest are highly native in species composition. But a significant minority (20-23%) are largely made up of non-native species:

% of native species in canopy	West coast woodland area (ha)	%	Assumed rainforest (ha)	%
90-100	65,467	71	21,697	72
40-85	9,057	9	1,705	6
0-35	18,340	20	6,832	23
<b>Grand total</b>	<b>92,864</b>	<b>100</b>	<b>21,711</b>	<b>100</b>

More than half of the area shows regeneration with native species – but 40-42% of the area shows no regeneration at all:

% of native species in the established regeneration:	West coast woodland (ha)	%	Assumed rainforest (ha)	%
100	49,097	53	15,713	52
91 to 99	1,065	1	195	1
41 to 90	4,798	5	1,117	4
5 to 40	1,078	1	539	2
No established regeneration seen	36,825	40	12,671	42
<b>Grand total</b>	<b>92,863</b>	<b>100</b>	<b>30,235</b>	<b>100</b>

Woodland on the west coast and those that are assumed to be rainforest are dominated by mature trees but with few veteran trees. They show relatively low levels of regeneration and immature trees:

Dominant structure	Area of west coast woodland (ha)	%	Area of assumed rainforest (ha)	%	All of Scotland's native and nearly-native woodlands (%)
Veteran	298	<1	75	<1	<1
Mature	25,676	35	10,704	43	33
Pole immature	24,989	34	8,964	36	46
Shrub	5,824	8	1,764	7	3
Established regeneration	12,918	18	3,334	13	16
Visible regeneration	2,851	4	314	1	3
<b>Grand total</b>	<b>72,557</b>	<b>100</b>	<b>25,154</b>	<b>100</b>	<b>100</b>

Grazing is the most significant and widespread threat to native woodland on the west coast and to the remaining rainforest sites:

Overall herbivore impact	Area in oceanic zone impacted (ha)	Percentage of total area %	Assumed area impacted (ha)	Percentage of total %	National %
Very high	21,865	24	7,872	26	16
High	13,189	14	4,405	15	13
Medium	36,916	40	13,464	45	50
Low	21,865	24	4,494	15	21
<b>Grand total</b>	<b>92,863</b>	<b>100</b>	<b>30,235</b>	<b>100</b>	<b>100</b>

Invasive non-native species (in particular invasive rhododendron) are present in significant amounts and they are widespread – affecting many individual woodland even if at a low level:

Invasive non-native species (INNS) found within the rainforest	Number of polygons affected by INNS in oceanic zone	Estimated area of INNS found in oceanic zone (ha)	Area of polygons with INNS (ha)	Number of polygons affected by INNS in the assumed rainforest	Estimated area of INNS found within the assumed rainforest (ha)	Area of polygons with INNS in the assumed rainforest (ha)
Rhododendron ponticum +	8,232	2,419	29,349	2,415	612	12,290
Other herbs, invasive exotics	828	316		163	107	
Japanese knotweed +	95	37		22	4	
Himalayan balsam	438	25		86	3	
Snowberry +	60	2		5	-	
Giant hogweed	6	1		-	-	
<b>Grand total</b>	<b>9,659</b>	<b>2,801</b>		<b>2,691</b>	<b>727</b>	



Crinan Wood, Argyll

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