

Indicator name			Version
NF4 Diversity of tree species ordered for planting in Scotland			24/03/16
Indicator type:	Risk/opportunity	Impact	Action
			X
SCCAP Theme	SCCAP Objective	CCRA risk/opportunity	
Climate Ready Natural Environment	N2: Support a healthy and diverse natural environment with the capacity to adapt N3: Sustain and enhance the benefits, goods and services that the natural environment provides	Cross-cutting BD4 Risks of diseases to biodiversity	

At a glance

- Increasing the diversity of forest tree species is an important adaptation strategy to build resilience to climate change related threats
- This indicator monitors the diversity of tree stock ordered from nurseries capturing information about species planting choices and diversification
- These choices can reflect awareness of risk of monocultures (Sitka spruce), pest/pathogen outbreaks (Larch – affected by *Phytophthora ramorum*) and national policy guidelines

Latest Figure	Trend
24.5 million conifer trees were ordered for planting in 2012. Sitka spruce was the most abundant species at 75%, followed by Scots pine at 8%.	Increasing slightly. The amount and species composition of ordered conifer planting has remained mostly constant, with small increases in the number of novel species. The number of broadleaf species ordered has increased.

Why is this indicator important?

Increasing the diversity of forest tree species grown in Scotland is a key adaptation strategy for building resilience to climate change related threats including pests and pathogen outbreaks, and an uncertain future climate. The area of forest felled and replanted, and area of new woodland created are both small in comparison to total forest area; therefore changes in species choice may not be visible through changes in the composition of all standing forests. Data for tree stock ordered from nurseries can shed light on the current situation regarding species planting choice and species diversification.

Related indicators:

NF5 Planted forest tree species diversity index

What is happening now?

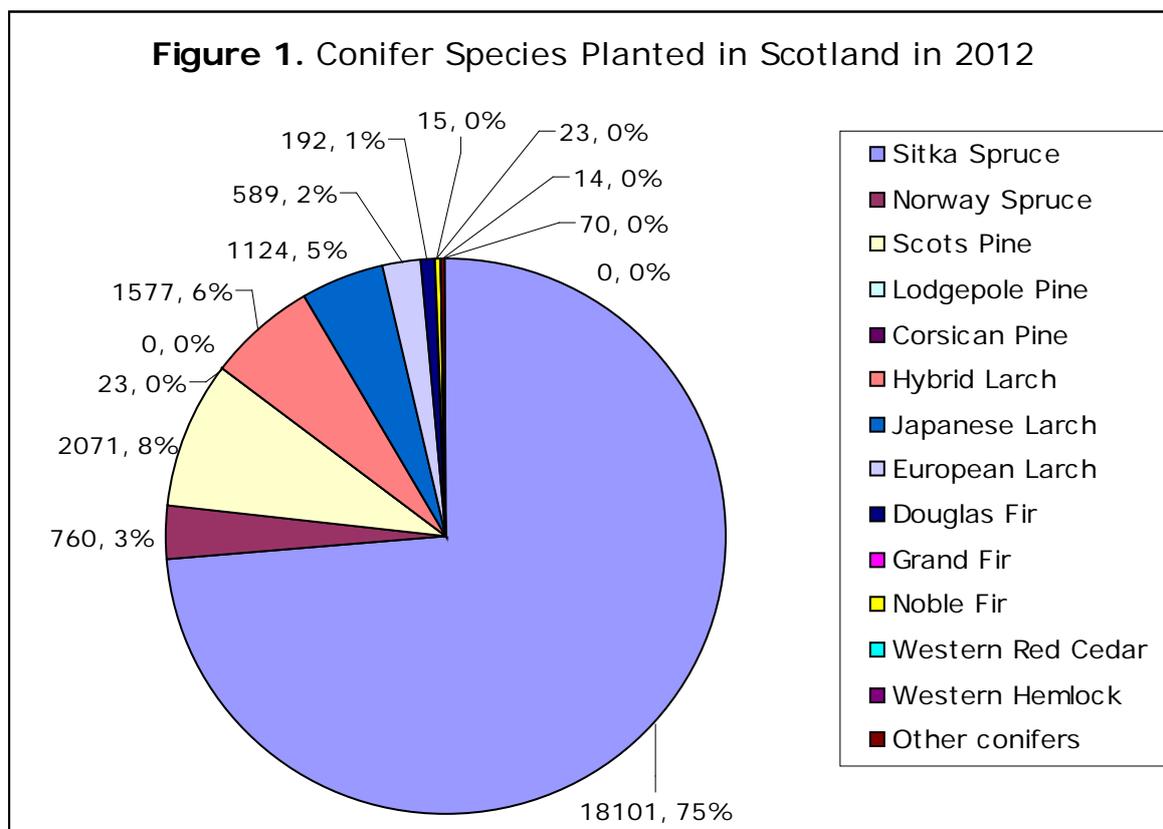
This indicator is based on two datasets:

- A survey of the conifer stock ordered by both the public and private sector in 2012 carried out by CONFOR and Alba Trees (Forestry and Timber News 2012). Data included here are for Scotland only.
- Data provided by Forestry Commission Scotland, including both broadleaf and conifer planting on the National Forest Estate in 2013, and more detailed information about novel conifer species.

Both datasets are utilised to provide a more detailed picture.

Figure 1 shows the species composition and number of planted conifer species in 2012 for both the public and private sector (CONFOR members). The survey found that 24.5 million conifer trees were planted. Sitka spruce was the most abundant species at 75%, followed by Scots pine at 8%, Hybrid Larch at 6%, and Japanese Larch at 5%. 0.5% can be considered novel species.

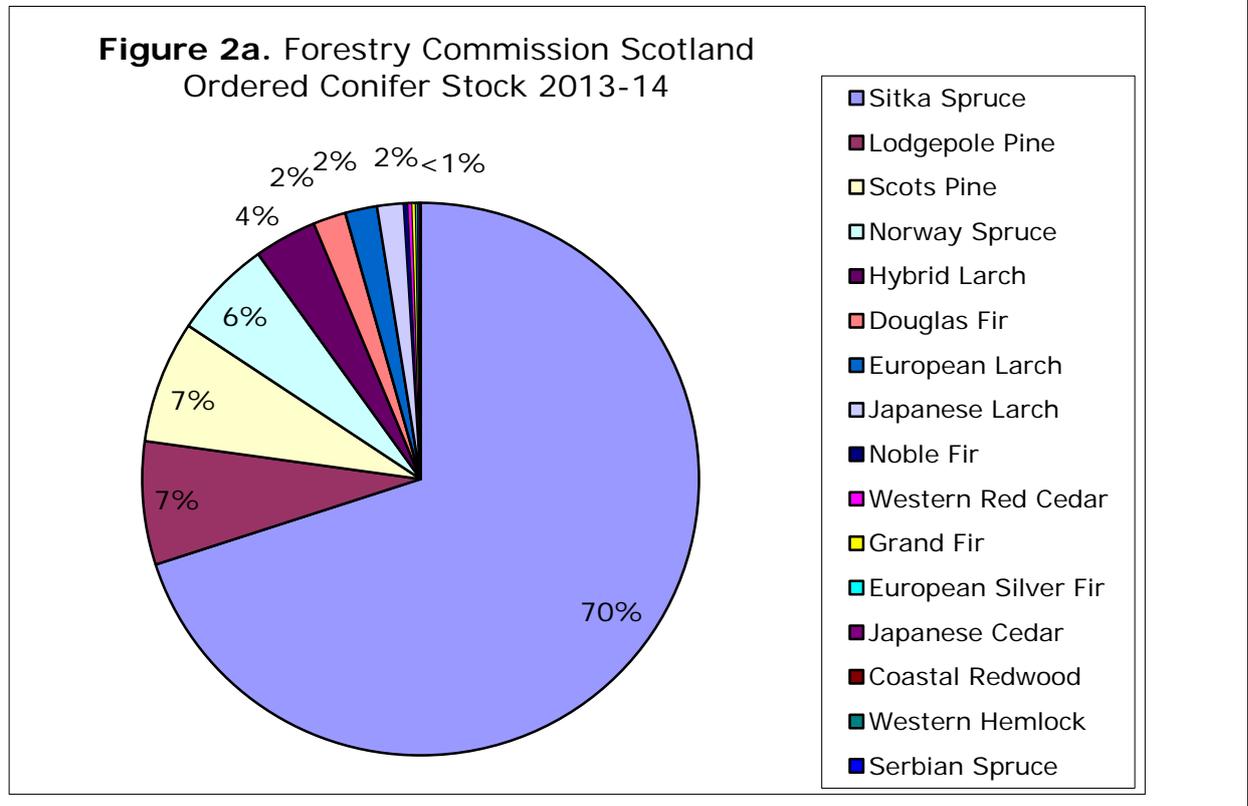
Survey results show that stock ordered by Forestry Commission Scotland was more diverse, with only 68% Sitka spruce and 0.7% novel species, compared to 84% Sitka spruce in the private sector and 0.2% novel. The results may be affected by the survey respondents asked, primarily CONFOR members, and also the lack of data for broadleaf species.



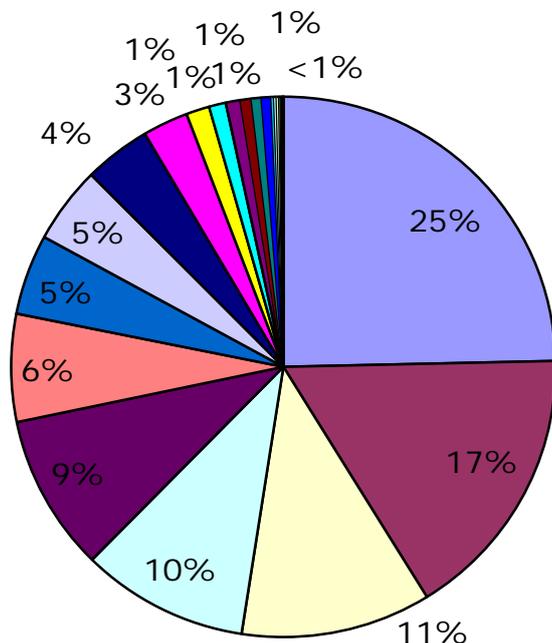
Data provided by Forestry Commission Scotland shows that of 18.3 million trees ordered by the public sector in 2013-14, 88% were conifer species and 12% were broadleaf species. Figure 2a shows the species composition of the conifer stock ordered. 18 different conifer species were ordered. The

dominant conifer species was Sitka spruce with 70% of all ordered stock, followed by lodgepole pine and Scots pine at 7% each.

Figure 2b shows the species composition for all ordered broadleaf stock for the National Forest Estate in 2013. 25 different species were ordered. Broadleaf composition was more evenly distributed than conifer stock. Downy birch was the dominant species with 25%, followed by sessile oak with 17%.



**Figure 2b. Forestry Commission Scotland
Ordered Broadleaf Stock 2013-14**



- Downy Birch
- Sessile Oak
- Common Alder
- Silver Birch
- Rowan
- Willow
- Sycamore
- Hazel
- Aspen
- Hawthorn
- Wild Cherry
- Holly
- Bird Cherry
- Blackthorn
- Other broadleaves
- Juniper
- Small Leaf Lime
- Goat Willow
- Norway Maple
- Wych Elm
- Gean
- Dog Rose
- Guilder Rose
- Horsechestnut
- Elder
- Cherry Plum

What has happened in the past?

In the 2012 CONFOR survey, respondents were asked to provide historic data from 5 years before (2007). Generally the proportions planted were similar, although between 2007 and 2012 there was a decrease in the amount of lodgepole pine from 3% to 0% and an increase in the amount of larch (Hybrid, European and Japanese) from 7.5% to 13.5% in total, and small increases in the amount of noble fir, grand fir and western red cedar.

The area of broadleaf forest area has increased by over 90,000 hectares from 2005 to 2014 (Forestry Commission, 2014) therefore orders of broadleaf stock can be said to have increased, although the data is not detailed enough to allow comparison of species composition.

What is projected to happen in the future?

Survey respondents were also asked to forecast orders 5 years in to the future (2017). The proportion of Sitka spruce and other standard species remained similar, apart from a reduction in Japanese larch from 4.5 to 1.8%, an increase in lodgepole pine to 3.5%, and further increase in the numbers of more novel species.

Additional surveys will be needed to identify trends. It is anticipated that the proportion of broadleaf species might increase in future, and that the proportion of Sitka spruce would decrease as awareness of the risks of monocultures increases. Changes to species suitability and pest and pathogen outbreaks could negatively impact the diversity of tree species ordered, at least in the short-term, by reducing the range of species available. The proportion of Larch is expected to decrease, due to infection by the *Phytophthora* plant pathogen.

Other potential influences on future species diversity include: insect pest outbreaks, changes in national policy on forest tree species diversity; changes to sector guidelines including the UK Forest Standards; availability of stock, changing timber markets; increased awareness of the risks of climate change and pest and pathogen impacts; increased confidence in novel species.

Patterns of change

There are regional differences in the amount of stock ordered and the proportion of different species ordered on publically managed sites across Scotland (Forestry Commission Scotland, data not shown). This is due to regional variation in forest area, species suitability (soil type and climate), management objectives and local management practices. Western and southern Scotland, where large areas are managed for productive forestry, have a higher proportion of Sitka spruce. The loss of Larch species in the West of Scotland due to *Phytophthora* infection may also have an impact.

The proportion of Sitka spruce is significantly lower in both northern and eastern Scotland. In eastern Scotland this is likely due to climatic conditions and soil types, which are suitable for high quality Scots pine, and the drier conditions which reduce the risk of *Phytophthora* infection of larch species, allowing larch to be planted. In northern Scotland this is likely due to the practice of planting self-thinning mixtures, where Sitka spruce is planted together with Scots pine, lodgepole pine or larch species, which will be out-competed by the faster growing Sitka spruce, leaving a pure final crop. This practice is important to consider in assessing the likely future species composition.

Interpretation of indicator trends

There is a small increase in the proportion of novel species being ordered by Forestry Commission Scotland, which may or may not be evident in the private sector. The species diversity of planted stock, especially in the private sector, is likely underestimated by the data shown (see Limitations section). Additional surveys will be needed to identify any trends and to survey a wider range of forest managers and forest types. There has been an increase in the area of broadleaf planting in recent years (Forestry Commission, 2014) and this is expected to continue to increase in future.

Although historical data are not provided in this template, the composition of ordered stock is likely to have changed in recent years due to the effects of forest tree pathogens. Recently there have been planting restrictions on Ash (*Fraxinus excelsior*) as a result of the *Chalara fraxinea* outbreak, and a reduction in the planting of Larch (*Larix* species) in Western Scotland, as a result of the *Phytophthora ramorum* outbreak.

When assessing species composition, it is important to consider the wide range of business and policy objectives which are provided by Scotland's forests, which including biodiversity, recreation, productive forestry, carbon sequestration, and supporting a strong forest industry.

Limitations

The CONFOR survey was only sent to CONFOR members, therefore a proportion of private sector woodland owners aren't represented. The private sector response rate for Scotland was over 80%, and 100% of Forestry Commission districts replied. Broadleaf species choice was also not accounted for in the survey.

Regional data aren't available from the survey; therefore data on national variation are only available for forests managed by Forestry Commission Scotland, which only accounts for around one third of forest area in Scotland.

Ordered stock data also includes 'beat-up' stock, where previously planted sites are topped up with additional plants to maintain the required stocking density in areas that have failed to establish. As

there is a higher proportion of Sitka spruce already planted, this will lead to higher proportions of Sitka spruce being ordered in subsequent years.

The data don't include other methods of regeneration, such as natural regeneration, continuous cover forestry and direct seeding. Therefore the diversity of future forests will be underestimated.

Both datasets are included to provide a more detailed picture of both public and private ordering and conifer/broadleaf planting. It should be noted that conifer planting by the public sector is included in both datasets, albeit for different years.

References

Forestry and Timber News <http://www.confor.org.uk>

Further information

Forestry and Timber News <http://www.confor.org.uk>

Acknowledgements

Indicator analysis and primary document author: Kate Beauchamp (Forest Research)

Forestry Commission Scotland

James Hepburn Scott (CONFOR survey)

Appendix One: Indicator metadata and methodology

Table 1: Indicator metadata

	Metadata
Title of the indicator	Diversity of tree species ordered for planting in Scotland
Indicator contact: Organisation or individual/s responsible for the indicator	Ruth Monfries, CXC/RBGE Kate Beauchamp, Forest Research
Indicator data source	Forestry Commission Scotland, CONFOR survey
Data link: URL for retrieving the indicator primary indicator data.	Not available online. Contact Forest Research

Table 2: Indicator data

	Indicator data
Temporal coverage: Start and end dates, identifying any significant data gaps.	CONFOR survey 2007, 2012 Forestry Commission Scotland 2013-14
Frequency of updates: Planned or potential updates	FCS data potentially available annually.
Spatial coverage: Maximum area for which data is available	Scotland
Uncertainties: Uncertainty issues arising from e.g. data collection, aggregation of data, data gaps	These data represent ordered stock, which in some cases may be different to available and therefore delivered stock. Data for the entire range of private sector woodlands are not available.
Spatial resolution: Scale/unit for which data is collected	CONFOR survey - Scotland Regional data - National Forest Estate in Scotland only
Categorical resolution: Potential for disaggregation of data into categories	Forestry Commission Scotland data can be divided in to Forest Districts, and Conifer and broadleaf species
Data accessibility: Restrictions on usage, relevant terms & conditions	Available on request from Forest Research.

Table 3 Contributing data sources

Contributing data sources

Data sets used to create the indicator data, the organisation responsible for them and any URLs which provide access to the data.

Data provided by Forestry Commission Scotland.
CONFOR survey results provided by James Hepburn-Scott

Table 4 Indicator methodology

Indicator methodology

The methodology used to create the indicator data

Data for Forestry Commission Scotland 2013-14 were collected from district staff for the 10 districts in Scotland. Data were totalled to provide ordered stock data for Scotland.
The CONFOR survey was carried out in 2012. Surveys were sent to all CONFOR members across the UK, and all Forestry Commission districts. Only responses for Scotland are included in these results. Respondents were asked to provide details of current planting stock, details for 5 years previously (2007) and to predict 5 years in future (2017). Data were collated for the private and public sector in Scotland, and private sector results adjusted (upscaled) to the area of private sector forest in Scotland. Results were then combined.