

| Indicator name   |  |                                      | Version  |
|--|--|--------------------------------------|----------|
| NF10 Forest area infected by <i>Phytophthora ramorum</i> ( <i>Pr</i> ) |  |                                      | 25/03/16 |
| Indicator type:  | Risk/opportunity   | Impact                               | Action   |
|  |  | X                                    |          |
| SCCAP Theme  | SCCAP Objective  | CCRA risk/opportunity                |          |
| Climate Ready Natural Environment                                      | N3: Sustain and enhance the benefits, goods and services that the natural environment provides | FO1: Risk of tree pests and diseases |          |

### At a glance

- The *Phytophthora ramorum* (*Pr*) pathogen has spread rapidly in recent years and is causing significant damage and loss of Japanese larch
- With climate change projections indicating wetter, milder conditions on average there is an enhanced risk of damage to forests and biodiversity
- This indicator monitors the extent of forest affected by *Pr*

| Latest Figure |  | Trend            |
|---------------|--|------------------|
| <b>Year</b>   | <b>Forest area infected with <i>Pr</i></b>   | Increasing trend |
| 2013          | Circa. 5000 – 6000 ha of larch within south west Scotland, sporadic infections elsewhere |                  |

Source: Forestry Commission Scotland

### Why is this indicator important?

*Phytophthora ramorum* (*Pr*) is a fungus-like pathogen which is causing serious damage and mortality to trees and other plants, particularly in Scotland's wetter west (Forestry Commission Scotland, 2014a). Japanese larch, an important timber species in Scotland, is particularly susceptible to *Pr* and can die within one to two seasons (Forestry Commission Scotland, 2014b). Clearance of infected larch is operationally challenging and will impact forest landscapes significantly (Forestry Commission Scotland, 2014c). Japanese larch infected with *Pr* represents a risk to biodiversity as other tree species and heathland plants, such as blaeberry, are susceptible. Culturally, important gardens and designed landscapes also contain vulnerable plants. *Pr* therefore has economic, environmental and amenity

impacts (Forestry Commission Scotland, 2014b).

Climate change projections indicate milder and wetter winters in Scotland; this could exacerbate the risk of *Pr* infection becoming more widespread, as it thrives in mild, damp conditions (Forestry Commission, 2015). There is no cure for *Pr* and therefore actions to tackle the disease are focussed on preventing the spread and reducing the impacts of the disease (Forestry Commission, 2015).

This indicator monitors the extent of *Pr* infection in forests in Scotland with a view to providing a gauge of the likely impacts of the disease on the forestry sector, and in turn, to provide a context for understanding the scale and effectiveness of actions to reduce the spread of *Pr*.

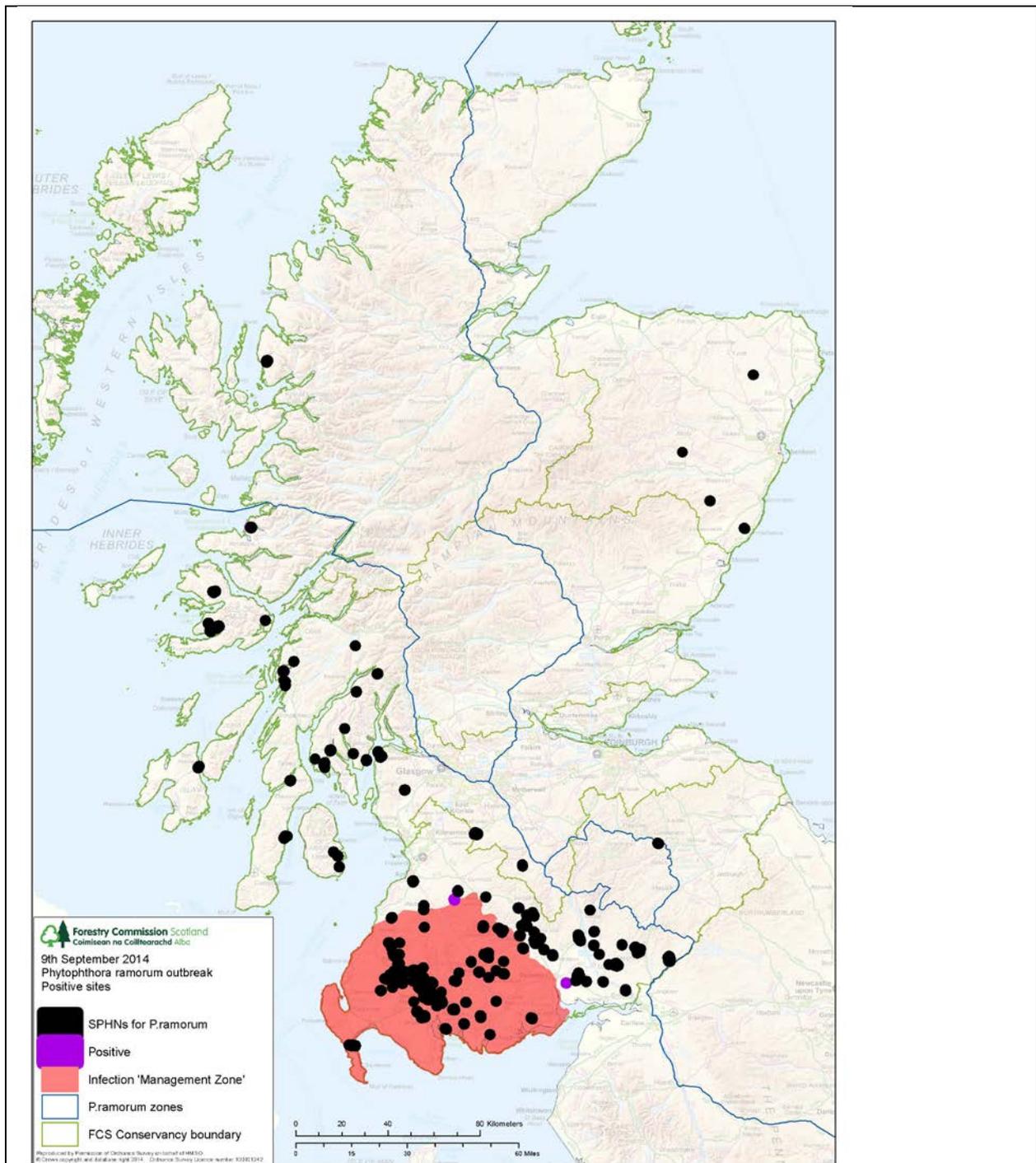
### What is happening now?

The main area of forest affected by *Pr* in Scotland is in the south-west. By the end of 2013, Forestry Commission Scotland estimated that 5000 - 6000 hectares of larch were infected with *Pr* in Dumfries and Galloway (Forestry Commission Scotland, 2014a). Prior to this, aerial surveys in May and early June 2013 revealed around 4,000 – 6,000 hectares of infected larch (Forestry Commission Scotland, 2014b/2014c). The significant expansion of outbreaks in Dumfries and Galloway in 2012 and 2013 followed a wet autumn and mild winter in 2011/2012 then extremely wet and windy conditions in summer and autumn 2013. This expansion in the extent of outbreak has led to the establishment of a *Pr* Management Zone which is subject to statutory controls.

Forestry Commission Scotland observe that 'outside this area, sporadic infections continue to occur, with 76 Statutory Plant Health Notices having been issued during 2013, requiring removal of infected larch covering an area of some 285 ha' (Forestry Commission Scotland, 2014a). Scotland has 65,000 ha of larch woodland (Forestry Commission Scotland, 2014c/2014b), therefore the latest estimated figures show that between 7.7% – 9.2% is currently infected with *Pr*.

The indicator NF11/NF12 'Number of forest sites served with a Statutory Plant Health Notice (SPHN) for *Phytophthora ramorum* / Area of forest felled under Special Plant Health Notices (SPHNs) for *Phytophthora ramorum*' monitors the number of sites served with Statutory Plant Health Notices (SPHNs) for *Pr* and the area of forest felled under such notices.

The UK has been divided into 3 risk zones depending on level of risk from *Pr* infection (the Management Zone subject to statutory controls is within Zone 1) (Forestry Commission Scotland, 2015). The area of larch within the area at highest risk is monitored in Indicator NF8 'Proportion/area of larch within *Phytophthora ramorum* Risk Zone 1'.



**Figure 1:** Map of known outbreaks of *Phytophthora ramorum* in Scotland (Source: Forestry Commission Scotland, 2014c)

### What has happened in the past?

Prior to 2009, *Pr* was limited in its extent and impact in the UK. However during 2009 it was found infecting and killing large numbers of Japanese larch trees in South West England. In 2010 it was found on Japanese larches in Wales, Northern Ireland and the Republic of Ireland, and in Scotland at one site on the Craignish peninsula. During 2011 further infection sites were found on Mull and in Dumfries and Galloway.

**Table 1. Forest area infected with *Pr* 2010-2012**

| Year | Forest area infected with <i>Pr</i>   |
|------|---|
| 2010 | 1.5ha of Japanese larch at one site on the Craignish peninsula in western Scotland. |
| 2011 | Infected sites detected on Mull and at several locations in Dumfries & Galloway.    |
| 2012 | A significant extension to the existing outbreak in Galloway detected.              |

Source: Forestry Commission Scotland, 2014a

Since 2012 *Pr* has continued to progressively expand, most significantly in south west Scotland.

### What is projected to happen in the future?

Forestry Commission Scotland state that ‘eradication of *Ramorum* on larch in Scotland is no longer achievable and the aim now is to contain and slow down new outbreaks’ (Forestry Commission Scotland, 2014c) through biosecurity measures and supporting legislation. An example is the use of SPHNs; see the action indicator NF11/NF12 ‘Number of forest sites served with a Statutory Plant Health Notice (SPHN) for *Phytophthora ramorum* / Area of forest felled under Special Plant Health Notices (SPHNs) for *Phytophthora ramorum*’ for further information.

There are concerns about the potential for *Pr* infection of other species, both in commercial forestry and affecting wider biodiversity. Sitka spruce may be susceptible and a small number of cases have been reported. An infected European larch was found in England in 2011; however it is not yet known how susceptible this species is. While no infections have been found in hybrid larch, its biological similarity to Japanese and European larch means it may well be susceptible to *Pr* (Forestry Commission, 2015).

Shrub species such as *Rhododendron* and *Viburnum*, along with woodland and heathland plants such as blaeberry are all susceptible to *Pr* infection. *Rhododendron ponticum* is of particular concern because of its extent in woodlands, and because *Pr* sporulates when on *Rhododendron* (produces spores that can then spread infection to other shrubs and trees) (Forestry Commission, 2015). There is also special concern about the infection of blaeberry, due to its ecological importance in heaths and woodland (Forestry Commission, 2015).

### Patterns of change

The most extensive area of forest affected by *Pr* in Scotland is in Dumfries and Galloway; other infected sites are in Argyll and Aberdeenshire (see Figure 1 for a map of known *Pr* outbreaks in Scotland).

### Interpretation of indicator trends

The expansion of the area of forest infected by *Pr*, particularly in Dumfries and Galloway, is thought to be a result of wet autumnal conditions and a mild winter in 2011/12 (being a fungal pathogen it favours damp and mild conditions) (Forestry Commission Scotland, 2014c). The considerable spread of the disease in Dumfries and Galloway may also reflect the genetic characteristics of *Pr* in that area (Forestry Commission Scotland, 2014c). The outbreak of *Pr* on larch in the UK has been linked to two

genetically distinct lineages, known as EU1, which is widespread, and EU2, which was identified relatively recently and has been found only in south-west Scotland and Northern Ireland (King et al, 2015).

### Limitations

The figures presented are estimates of the area of forest infected by Pr but do relate mainly to the core area of Pr infection in Scotland in Dumfries and Galloway.

### References

Forestry Commission (2015) *Phytophthora ramorum*. <http://www.forestry.gov.uk/pramorur> (accessed March 2015)

Forestry Commission Scotland (2014a) *Phytophthora ramorum in Scotland*. <http://scotland.forestry.gov.uk/supporting/forest-industries/tree-health/phytophthora-ramorum> (accessed April 2014)

Forestry Commission Scotland (2014b) *Action Plan for Ramorum on Larch in Scotland (2013/14)*. [www.forestry.gov.uk/pdf/FCSACTIONPLANFORRAMORUMONLARCHINSCOTLAND.pdf](http://www.forestry.gov.uk/pdf/FCSACTIONPLANFORRAMORUMONLARCHINSCOTLAND.pdf) (accessed March 2015)

Forestry Commission Scotland (2014c) *Latest Updates on Phytophthora ramorum in Scotland*. <http://scotland.forestry.gov.uk/supporting/forest-industries/tree-health/phytophthora-ramorum/latest> (accessed March 2015)

Forestry Commission Scotland (2015) *Advice and information on Phytophthora ramorum* <http://scotland.forestry.gov.uk/supporting/forest-industries/tree-health/phytophthora-ramorum/advice-and-information> (accessed March 2015)

King, K. M., Harris, A. R. and Webber, J. F. (2015), *In planta* detection used to define the distribution of the European lineages of *Phytophthora ramorum* on larch (*Larix*) in the UK. *Plant Pathology*. doi: 10.1111/ppa.12345

### Further information

Forestry Commission: [www.forestry.gov.uk/pramorur](http://www.forestry.gov.uk/pramorur)

Latest Updates on *Phytophthora ramorum* in Scotland. <http://scotland.forestry.gov.uk/supporting/forest-industries/tree-health/phytophthora-ramorum/latest>

Forestry Commission Scotland Action Plan for *Ramorum* on Larch in Scotland - [www.forestry.gov.uk/pdf/FCSACTIONPLANFORRAMORUMONLARCHINSCOTLAND.pdf](http://www.forestry.gov.uk/pdf/FCSACTIONPLANFORRAMORUMONLARCHINSCOTLAND.pdf)

### Acknowledgements

Suzanne Martin, RBGE contributed content to this indicator.

This template presents information from the Forestry Commission and from Forestry Commission Scotland.

## Appendix One: Indicator metadata and methodology

**Table 1: Indicator metadata**

|  | Metadata  |
|--|---|
| <b>Title of the indicator</b>  | Forest area infected by <i>Phytophthora ramorum</i>   |
| <b>Indicator contact:</b> Organisation or individual/s responsible for the indicator | Ruth Monfries (Royal Botanic Garden Edinburgh, CXC)   |
| <b>Indicator data source</b>   | Forestry Commission Scotland  |
| <b>Data link:</b> URL for retrieving the indicator primary indicator data.           | <a href="http://scotland.forestry.gov.uk/supporting/forest-industries/tree-health/phytophthora-ramorum">http://scotland.forestry.gov.uk/supporting/forest-industries/tree-health/phytophthora-ramorum</a> |

**Table 2: Indicator data**

|  | Indicator data   |
|--|--|
| <b>Temporal coverage:</b> Start and end dates, identifying any significant data gaps.                      | 2010 - 2013  |
| <b>Frequency of updates:</b> Planned or potential updates  | Annual   |
| <b>Spatial coverage:</b> Maximum area for which data is available  | Scotland   |
| <b>Uncertainties:</b> Uncertainty issues arising from e.g. data collection, aggregation of data, data gaps | Estimated figures mainly for Dumfries and Galloway (the main area of infection). |
| <b>Spatial resolution:</b> Scale/unit for which data is collected  | Hectare  |
| <b>Categorical resolution:</b> Potential for disaggregation of data into categories                        | Dumfries and Galloway, and other areas   |
| <b>Data accessibility:</b> Restrictions on usage, relevant terms & conditions                              | Publically accessible and freely available                                       |

**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.

Estimated figures from Forestry Commission Scotland -

<http://scotland.forestry.gov.uk/supporting/forest-industries/tree-health/phytophthora-ramorum/latest>

<http://scotland.forestry.gov.uk/supporting/forest-industries/tree-health/phytophthora-ramorum>

#### **Table 4 Indicator methodology**

##### **Indicator methodology**

The methodology used to create the indicator data

N/A