

Dothistroma needle blight: GB Strategy

(10 April 2012)

Purpose of the Strategy

To propose and coordinate the actions required to minimise the risks of DNB in GB.

Background

Since the late 1990s, the incidence of Dothistroma needle blight (DNB) in Britain has increased significantly resulting in serious loss of yield and extensive mortality of pine in some areas. DNB is caused by the pathogens *Dothistroma septosporum* and *Dothistroma pini*.

D. septosporum has a world wide distribution and currently is the only species that has been found in GB. The range of *D. pini* is more limited having only been reported from north central America, the Ukraine, Russia, and more recently France and Hungary. The main control strategy for *D. pini* is to prevent its entrance to GB. There are two mating types of *D. septosporum*, both of which are present in Britain, and there are high levels of genetic diversity within the pathogen population.

Hosts

A total of 86 pine (*Pinus*) species, 5 (spruce) *Picea* species, European larch (*Larix decidua*) and Douglas fir (*Pseudotsuga menziesii*) have been reported as hosts of the disease (the majority are listed in Watt *et al.*, 2009). In Britain the main species currently affected are Corsican pine (*Pinus nigra* ssp. *laricio*), lodgepole pine (*Pinus contorta* var. *latifolia*), and Scots pine (*Pinus sylvestris*). The total planted areas of these species in Britain are shown below and represent some 15% of the GB woodland resource:

	England	Wales	Scotland	GB
Scots pine (000 ha)	82	5	140	227
Lodgepole pine (000 ha)	7	6	122	135
Corsican pine (000 ha)	41	3	2	46
Total	130	14	264	408

A further 23 *Pinus* species have also been found to be affected in GB, as have young transplants of Sitka spruce (*Picea sitchensis*), Norway spruce (*Picea abies*) and Douglas fir when planted in areas of high inoculum.

Pest status

In 2006, a GB wide survey on the public forest estate (PFE) found the disease to be present within 70% of Corsican pine stands younger than 30 years. There have been no systematic surveys in private forests in GB.

In England, no further assessments of the distribution of the disease on Corsican pine have been made on the PFE. However, in 2009, an assessment of the intensity of the disease in infected stands (>1ha) was undertaken. 85% of stands had less than 50% viable needles remaining and *ca.*90% of stands showed some mortality, although the majority of these (*ca.* 70%) had less than 5% tree death. There are also 47 fixed monitoring plots in Corsican pine in East Anglia Forest District (FD) that are assessed on an annual basis. These have shown that the impact factor of the disease (assessed as a combination of needle loss and crown infection) has almost doubled since the first assessments in 2003, and is now *ca.* 60%.

In 2010, the distribution of the disease on pure Scots pine and lodgepole pine younger than 30 years (190 and 100 stands respectively) in North East England FD was assessed. The disease was found to be present in 10 stands of Scots pine and two stands of lodgepole pine. In the same year, the presence and intensity of the disease on 135 stands of pure Scots pine younger than 30 years was also assessed in the main block of East Anglia FD. The disease was found in *ca.* 80% of the stands and these had a mean impact factor of *ca.* 20%.

There have been annual surveys in Scotland since 2006 to monitor the distribution and spread of the disease. These have revealed DNB to be present in *ca.* 7,500 ha lodgepole pine, 3,300 ha of Scots pine and 250 ha of Corsican pine on the PFE. In 2011, the disease was also found for the first time on native Scots pine regeneration in the RSPB-owned native pinewood, Abernethy. This has brought to the fore the threat to native pinewoods. Many of these areas have until recently had a poor regeneration record, and there is concern that impacts of DNB on young trees could further threaten the age class structure, and hence continuity of these woodland.

In Wales there have been no surveys to monitor disease distribution on any species since the GB wide survey in 2006.

In 2011, the disease was identified for the first time in Northern Ireland on Corsican pine. Currently there is no information available on the extent and severity of DNB in this country.

Plant health status

Dothistroma septosporum is currently listed in the EU Plant Health Directive under the name *Scirrhia pini* (the old name for *Mycosphaerella pini*) with controls being restricted to pine plants for planting. Due to changes in taxonomy, the legislation needs to recognise the change in name from *Scirrhia pini* to *Mycosphaerella pini*. Furthermore, *Dothistroma pini* is not presently listed, and this too needs to be addressed.

For *D. septosporum*, EU controls require that before pine plants can be released for planting without restriction, both the nursery and its immediate vicinity must have been found free of symptoms of the disease since the beginning of the last growing season. In GB, the 'immediate vicinity' has been defined 550m based the limited published data of natural dispersal distances.

Key Risks

Given the changing environment and the recent upsurge in new pests, the effective management of DNB, i.e. how we learn to live with it, should be an exemplar of the approaches necessary to develop greater forest resilience. However, there are two crosscutting key risks:

- The potential lack of buy-in to this strategy from all areas of the forestry sector.
- Lack of complete information on DNB as detailed in Annex 1.

In addition, there are specific risks to both plantation forestry and ancient semi-natural pinewoods which will require mitigation:

1. The potential loss of a significant proportion of GB's forest resource: 227k ha of Scots pine; 135k ha of lodgepole pine; 47k ha of Corsican pine; the loss of associated ecosystems; and the risk to other conifer species, particularly other known hosts, including Sitka spruce, Norway spruce and Douglas fir

- 1.1 Economic impacts due to reduced yield and early felling, lowering returns for growers.
- 1.2 Fluctuations in pine timber supply, with medium to long-term adverse effects on the processing sector.
- 1.3 Reduced investor confidence leading to negative impacts on the nursery and establishment sectors, including social impacts on, for example, employment.
- 1.4 Decrease in overall forest resilience due to the reduction in species choice for climate change adaptation.
- 1.5 Risk of deforestation due to a lack of replanting, particularly on sites where productive conifers other than pine would be unsuitable.

- 1.6 Silvicultural impacts, such as more intensive techniques required for the establishment of Sitka spruce on nutrient poor sites, these having cost and carbon implications.
- 1.7 The potential loss of other tree species due to changes within the pathogen population and high inoculum build-up on the highly susceptible pine species.
- 1.8 Increasing fire risk due to the build up of fuel loadings in the form of dead trees and needles, and increased ground vegetation.
- 1.9 Reduction in pinewood habitat and the species dependent on it, this significantly reducing the wider biodiversity value of the coniferous woodland resource.
- 1.10 Significant cultural and landscape impacts, leading to public concern, particularly where pinewoods are currently highly valued by society .
- 1.11 Reputational risk to the forestry sector if it cannot demonstrate competence in managing the disease.
- 1.12 Potential public health issues related to dothistromin (a toxin) produced by *D. septosporum*, although in New Zealand this is not regarded as a human health risk.

2. The potential loss of GB's iconic Caledonian pinewoods

- 1.13 Weakening or loss of Caledonian pinewood ecosystems (for there are international responsibilities). Many such sites are already vulnerable because of a lack of structural continuity and this would be exacerbated by disease impacts on regeneration.
- 1.14 Significant cultural and landscape impacts, particularly where pinewoods currently have an iconic status.
- 1.15 Public concern and the reputational risk to the forestry sector of not managing the disease.

3. An increase in dead trees leading to a build up of other pests and diseases, in particular bark beetle attacks.

Objectives of the Strategy

Set against the key risks, the objectives of the strategy are:

- 1. Maintaining pine as a silvicultural option to protect the social, economic and environmental functions of pinewoods, and avoiding impacts of DNB on other conifer species.**
- 2. Conserve GB's iconic Caledonian pinewoods¹.**
- 3. Reduce collateral damage from other pests and diseases (e.g. bark beetles).**

Achieving the Objectives

- 1. Maintaining pine as a silvicultural option to protect the social, economic and environmental functions of pinewoods, and avoiding impacts of DNB on other conifer species.**
 - 1.1 Surveillance and monitoring to understand the extent, severity, progression and evolution of the pathogen in pinewoods, on the PFE and private sector woodlands.
 - 1.2 To reduce the risk of introducing *D. pini*, and to reduce the speed of spread or rate of introduction of new mating types/genotypes of *D. septosporum*: undertake competent and consistent inspections/sampling procedures for forest tree nurseries; consider introducing a sampling protocol for retail outlets in GB; pay closer attention to planting stock quality and source (chain of custody requirements via support mechanisms and public procurement processes); maintain moratorium on planting Corsican pine on the PFE and encourage the private sector to do the same; review the moratorium on planting lodgepole pine on the PFE in Scotland; recommend a moratorium on planting highly susceptible species on the PFE and encourage the private sector to do the same; and raise biosecurity awareness.
 - 1.3 Where the disease is already established and impacts are unacceptable or progressing: manage pine to facilitate significant reduction of high inoculum

¹ Defined here as ancient semi-natural pinewoods and 600m buffer

loading e.g. clearfelling, respacing, thinning, brashing/pruning, herbicides, fertiliser and fungicide application.

- 1.4 To improve longer-term resilience and avoid deforestation: consider species diversification at the stand and/or landscape level (including the provision of advice on alternative species for 'pine' sites); consider the provision of support mechanisms; and improve fire planning.
- 1.5 To minimise the likelihood of introducing DNB to nursery/retail outlets: undertake surveillance and monitoring; review legislative framework for imported pine; and encourage resilience building in forest tree nurseries.
- 1.6 To minimise the impacts of DNB in Christmas tree farms: encourage surveillance and monitoring by Christmas tree growers; consider removal of infected trees; and consider herbicide and fungicide applications.
- 1.7 To prevent introduction of the disease and/or reduce the speed of its spread in the urban environment and its subsequent spread to other pinewoods: increase awareness raising via e.g. Arboricultural Association, Local Authority tree officers; and encourage early action e.g. removal or treatment of infected trees.

2. Conserve GB's iconic Caledonian pinewoods.

- 2.1 Surveillance and monitoring to understand the extent, severity, progression and evolution of the pathogen in these habitats.
- 2.2 To improve the longer-term resilience: consider diversifying conifer element through alternative species that may function as pine proxies; and improve fire planning.
- 2.3 To prevent the introduction of the disease and new mating types and/or genotypes: consider a moratorium on planting pine; consider removal of highly susceptible species/origins; and raise biosecurity awareness.
- 2.4 Where the disease is already present and impacts are unacceptable or progressing, and depending on extent and severity: consider removal of infected trees; consider utilising other methods to reduce humidity/inoculum loading e.g. respacing, thinning, brashing/pruning, and grazing management; and consider aerial fungicide application.

3. Reduce collateral damage from other pests and diseases (e.g. bark beetles).

- 3.1 Manage severely infected pinewoods to reduce impacts on adjacent woodland through secondary pathogens and the build up of insect pests on dead/dying trees.

Recommendations

1. Country Action Plans should be drawn up by FC representatives with input from, and consultation with, the private forestry sector (from nurseries to processors), and other relevant stakeholders to deliver the objectives of this GB Strategy. Certain measures (e.g. those relating to forest tree nurseries) should be standardised across GB, while other measures may need to be country specific (e.g. measures to conserve Caledonian pinewoods).
2. There should be clear direction from the GB DNB Programme Board and Country Working Groups to ensure effective co-ordination and implementation of the GB Strategy through the Country Action Plans.
3. Experience has shown it would be very difficult to provide a realistic cost benefit analysis of management options due to the epidemiological uncertainties and the need to accommodate non-market factors. It will be the responsibility of individual countries, via their Action Plans, to undertake evaluation of the methods to achieve the objectives of the Strategy.
4. The DNB communications strategy must be finalised and updated regularly.

Resources

An increase in corporate capacity and resources is likely to be a pre-requisite of implementing the recommended Strategy through Country Action Plans.

Current uncertainties in both disease epidemiology and the efficacy of control methods will require a significant, front-loaded increase in research investment.

Recognising success

Short term (5yr): Demonstrable progress in Strategy implementation through Country Action Plans which include indicators for measuring success.

Long term (20 yrs): Investor confidence in pine silviculture - as reflected in pine demand from nurseries and the acceptance of natural regeneration of pine.

Review period

Annual until further notice.

Annex 1: Knowledge gaps

Monitoring and surveillance

- Post 2006 DNB distribution on the PFE in Wales, and England.
- DNB intensity on the PFE in Wales and, post 2009 on the PFE in England.
- Private sector DNB distribution.
- Presence of *D. pini* in Britain and its impact overseas.
- Presence of DNB on non-pine species.
- Disease presence in nurseries and other retail outlets across GB.
- Rapid diagnostics tests e.g. as used for *Phytophthora* spp.
- Mating type/genotype distribution and evolution across GB.

Epidemiology

- Spore dispersal – distances, rates and timing and spore persistence under different conditions.
- Weather links to DNB severity, and potential impacts of climate change.
- Future potential for interactions between *D. septosporum* and *D. pini*.
- Interactions of DNB with other pests and pathogens.
- Predicting spread and intensity/severity (particularly *Scots pine*, including Caledonian pinewoods) based on current and future survey data.
- Host resistance mechanisms.

Operational tools

- Alternative species/origins (their susceptibility to DNB and, in the case of Caledonian pinewoods, their suitability as Scots pine 'proxies').
- Effectiveness and wider impacts of management interventions under different climatic/site conditions and on different host species.
- Knowledge of biocontrols.
- Potential of tree breeding and GM.

Other

- Limited knowledge of impact of DNB on timber properties.
- Impact on production forecasts.
- Suitability of potential 'pine proxy' species.
- Health impacts of dothistromin in GB conditions?