Report on the Forestry Commission Re-Survey of Woodlands 2007 to Assess the Level of Incidence of *Phytophthora ramorum* and *Phytophthora kernoviae* in Woodlands in England and Wales

Forestry Commission
Plant Health Service
Edinburgh
March 2008

Summary

Between June and October 2007, the Forestry Commission (FC) undertook a re-survey of 186 woodlands in England and Wales. These woodlands, in admixture with rhododendron and/or V*accinium*, had initially been originally surveyed between January and August 2004. The 186 woodlands were located in 148 10km grid squares. In 18 of the woods, symptomatic material was tested using Lateral Flow Devices (LFD's) and these showed up positive for Phytophthora. 33 samples were sent to the Central Science Laboratory (CSL) for testing. Nine samples were positive for *P ramorum*, one from a wood in West Sussex, and eight from two sites in Cornwall.

Background

Phytophthora ramorum is a fungus-like pathogen, which has been identified as the causal agent for the condition known as Sudden Oak Death. The first evidence of it in Britain was found during April 2002 on a viburnum but since then it has been found mainly on rhododendrons in nurseries and garden centres. In November 2003 the first evidence of an established tree having the disease was confirmed in Sussex. Further infections were subsequently confirmed on trees in historic gardens in Cornwall. To date (October 2007) a total of 23 trees have bleeding lesions and 75 trees have foliar infections. Infected rhododendrons were present on all of these sites.

Between January and April 2004 the first major FC *Phytophthora ramorum* survey was carried out focusing on locations where rhododendron was found growing in admixture with trees. Britain was divided in to high-risk and low-risk areas based on climate. A total of 1348 sites were identified for the survey of which 1217 were high-risk sites. In England, 395 sites were surveyed, in Wales, 310, and in Scotland 512. This was complemented by surveys on a further 131 low-risk sites in England and Scotland.
A total of 335 samples showing symptoms of the disease were collected. Samples were sent either to the Central Science Laboratory (CSL) in York or the Scottish Agricultural Science Agency (SASA) in Edinburgh. All samples were tested and found to be negative. The results of the survey can be found on the FC website www.forestry.gov.uk/planthealth

Significant areas of infection were identified in Cornwall by Defra's Plant Health and Seeds Inspectorate while carrying out survey work, including surveys in woodlands associated with heritage gardens. It was decided that the FC's survey programme would continue in England and Wales only and during the Summer and Autumn 2004. 109 woods were inspected in 94 10km grid squares. Samples were taken from 73 locations but none proved positive. During August 19 water bait samples were taken of which 3 proved positive for *P. ramorum.* The results of this survey have been published on the FC website www.forestry.gov.uk/planthealth

At this time it was agreed that we would not continue with a formal programme of surveys in Scotland, where Pest Risk Analysis indicated a low level of risk, although ad-hoc sampling would be carried out as part of surveyors' normal duties.

During the latter part of 2004, a second and previously unknown P*hytophthora,* now formally named *P. kernoviae,* was discovered in Cornwall, affecting rhododendron and some trees. A Management Zone was set up to contain the disease and this is defined in the Plant Health (*Phytophthora kernovii*[1] Management Zone) (England) Order 2004.

[1] Prior to formal naming, *Phytophthora kernoviae* was referred to both as *P. kernoivii* and *P*. Taxon *C*

A smaller outbreak was also discovered in South Wales and an infected nursery was also identified in Cheshire although this outbreak was eradicated. During 2005 as a result of intensive surveys by Plant Health & Seed Inspectorate (PHSI) of Defra further outbreaks of both *P ramorum* and *P. kernoviae,* were discovered in Cornwall. In 2006 *P. kernoviae* was found on a single 150-year old *Rhododendron ponticum* in a historic garden in Cumbria. The infected rhododendron has now been destroyed. To date (October 2007) a total of 59 trees have bleeding lesions and 45 trees have foliar infections. Infected rhododendrons were present on all of these sites

In 2005, the Interdepartmental *Phytophthora* Programme Board decided that, in the light of these continuing outbreaks, it was necessary to revisit, over a 5 year period, all those high and low risk sites which were surveyed in 2004, with 20% of the total being inspected annually. This would determine whether they were still disease free. To date surveys have been carried out in 2005 and 2006 and their reports can be found on www.forestry.gov.uk/planthealth.

Objective of the Survey

The objective of the first survey was "to obtain an understanding of the distribution of the fungal pathogen *P. ramorum* on rhododendron growing in admixture with trees in woodlands across Britain, in order to inform policy development on eradication and containment, or alternatively, management of this potentially devastating disease." This objective is still valid. However, in 2005 the increase in the number of *P. ramorum* outbreaks in Cornwall and in other parts of England and Wales, as well as discovery of *P. kernoviae,* prompted the Programme Board to initiate a re-survey of the 2004 sites to ascertain if those sites especially the high-risk sites, were in fact still disease-free.

Sampling Protocol & Timetable

The Principal Statistician at Forest Research randomised all the grids surveyed between January and March 2004 and from this randomisation a spread of sampling points (grids) has been produced for the 5 year period. Those sites surveyed between May and August 2004 have been allocated over the period 2005 -2009 (see Appendix II) and a scatter map produced (see Appendix III)

Surveying was carried out as per the original protocol produced by Dr Steve Lee in December 2003 and subsequently updated by Dave Tracy in 2005. This was included in the Survey Plan 02/06/07, produced by Dave Tracy and which formalised the survey procedures. Woodlands in admixture with rhododendron and/or V*accinium* spp. were to be surveyed. Samples taken from suspect rhododendron and V*accinium* were to be sent to CSL in York for analysis after testing with Lateral Flow Devices, developed by CSL, to ascertain if samples taken were showing the symptoms of *Phytophthora.* To check on the accuracy of the LFD's some negative samples were sent to CSL for analysis. The survey was carried out between June and October 2007

Survey Data Summary

No 10KM GRIDS	No SITES	No sites Vaccinium present	No sites FE managed	No sites sampled	No samples taken	No of positive samples
148	186	22	83	18	33	9 from 3 sites

Conclusion

While there has been little change in the condition of the woods since the 2004 survey, the finding of *P ramorum* in two locations in Cornwall and one in a wood in West Sussex, which had not been surveyed before, is a worrying development. In addition the recent findings (not associated with this survey) of a *P ramorum* outbreak in Argyll, Scotland (the first confirmed case outwith a nursery) and an infected beech in a rhododendron infected wood in Yorkshire, which the CLIMEX maps classify as a low risk area, adds to the concern that the disease is continuing to spread, albeit slowly.

Next Steps

In the area of greatest infection, Cornwall, a *Phythopthora kernoviae* Management Zone (PkMZ) was set up in December 2004. PHSI and the FC have carried out inspection of woodlands in Cornwall since then and where woods, in admixture with rhododendrons and/or *Vaccinium*, are found to be infected they are added to a risk matrix. Those sites with the highest risk of disease spread are cleared in a programme of containment through clearance of rhododendron. This programme of targeted woodland clearance will continue until March 2009 and will be reviewed as part of the overall disease management policy and science review planned to be carried out in 2008. The reports on the surveys carried out by the FC since 2005 can be found on the Forestry Commission's Plant Health website www.forestry.gov.uk\planthealth.

Acknowledgement

The Forestry Commission wishes to acknowledge the full co-operation and support given to its surveyors by woodland owners or their managers who were approached for permission to survey their land.

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Appendix I - Survey Team Details

Assessors from the Technical Services Unit (TSU) of Forest Research carried out the survey. These surveyors had undertaken training from Plant Health staff in January 2004 prior to the commencement of the first *P ramorum* survey or if new to the operation, have been trained by an operator who has had previous experience in this type of survey work.

TSU Survey Team Members:

Wykeham Fieldstation:
Bill Riddick
Lee Cooper

Shobdon Fieldstation
Martin Page-Jones

Talybont Fieldstation
Dai Evans

Alice Holt Fieldstation
Steve Coventry
Kate Harris
Ian Keywood

Exeter Fieldstation
Barnaby Wylder
Alan Ockenden
Tony Reeves

Thetford Fieldstation
Paul Turner

Grateful thanks are also due to Liz Richardson of Fineshade Fieldstation who acted as survey co-ordinator

Appendix II

Randomisation of Grids

In the first sample 141 sites were selected that leaves a further 393 from the Jan-Mar 2004 survey to be sampled over the next four years. This will be 100 for years 2, 3 and 4 and 93 in year 5. The tables below show the allocation by year to area and region.

Sample	1	2	3	4	5
Area					
NX	0	6	0	1	0
NY	7	3	2	1	2
SD	6	6	9	9	8
SE	3	4	5	1	1
SH	14	12	9	9	4
SJ	5	4	5	3	4
SK	1	2	2	2	0
SM	2	1	2	2	1
SN	21	11	11	17	13
SO	13	10	5	12	7
SR	0	0	0	1	0
SS	4	5	1	3	1
SS_E	12	6	5	4	7
ST	6	6	7	0	3
ST_E	10	3	4	7	8
SU	9	7	7	4	4
SW	4	0	2	7	5
SX	11	9	14	3	16
SY	8	1	1	2	3
SZ	2	1	3	2	0
TQ	3	9	6	10	6
Total	141	106	100	100	93
Plus grids from May-Aug. 2004[2]			43	43	43
TOTAL	**141**	**106**	**143**	**143**	**136**

[2] still to be allocated to grid square area

The numbers of sites per year per region are

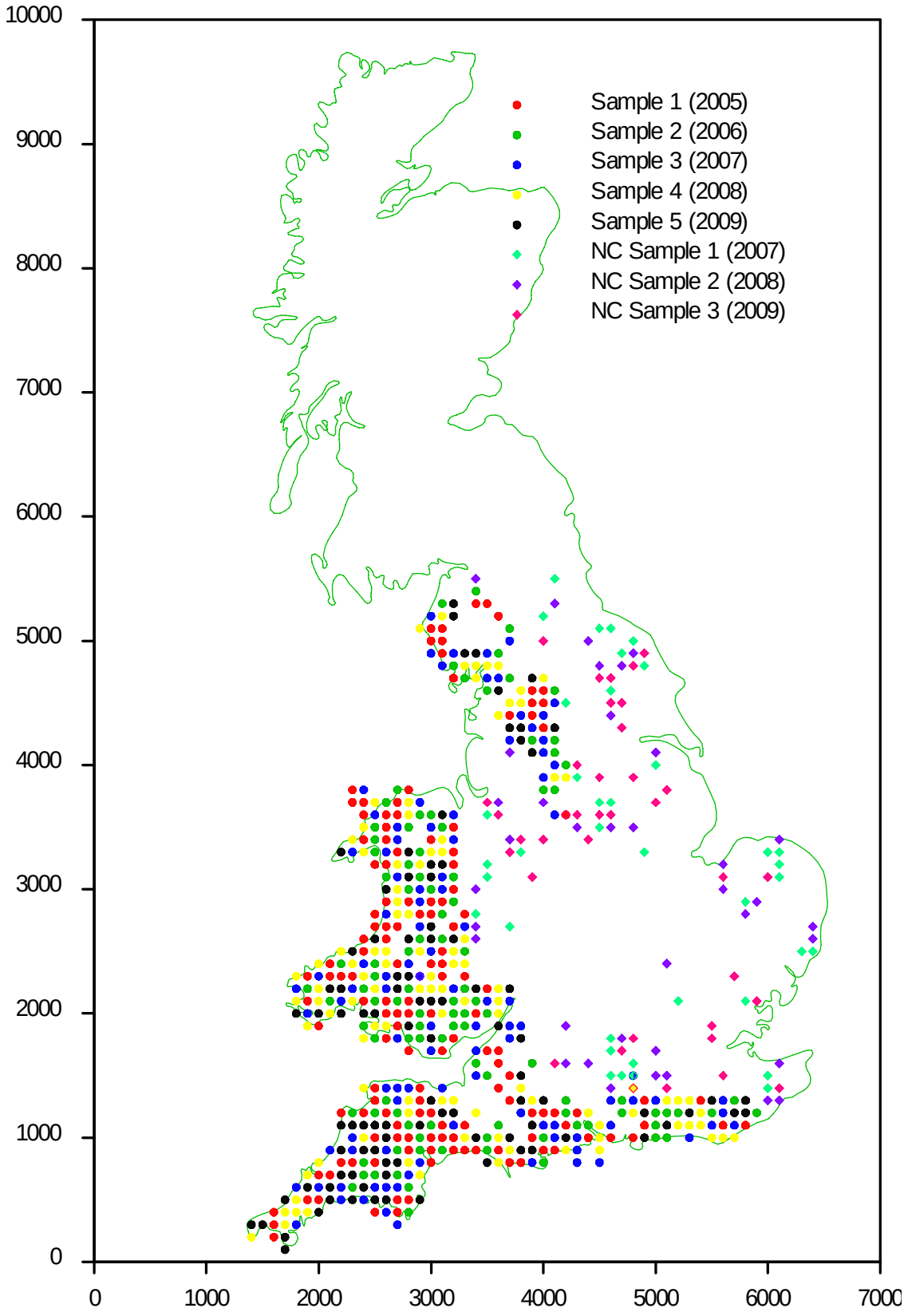
Sample	1	2	3	4	5
Region					
1	30	25	25	21	15
2	58	39	31	44	33
3	53	36	44	35	45

Expressed as a percentage of the regional sample

Sample	1	2	3	4	5
Region					
1	26	22	22	18	13
2	28	19	15	21	16
3	25	17	21	16	21

Indicates a reasonably uniform spread with no significant differences. A plot of the samples is given below.

Appendix III


Sample 1 (2005)
Sample 2 (2006)
Sample 3 (2007)
Sample 4 (2008)
Sample 5 (2009)
NC Sample 1 (2007)
NC Sample 2 (2008)
NC Sample 3 (2009)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0
1000
2000
3000
4000
5000
6000
7000

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