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# Oak Processionary Moth: 2013 Control Programme Review Report

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## Introduction and background

[Appendix 1](#) provides a brief summary of the lifecycle of OPM, its impact and its spread since 2006

[Appendix 2](#) provides a summary of the control strategies employed since 2006, and the basis for the pilot enhanced control programme in 2013

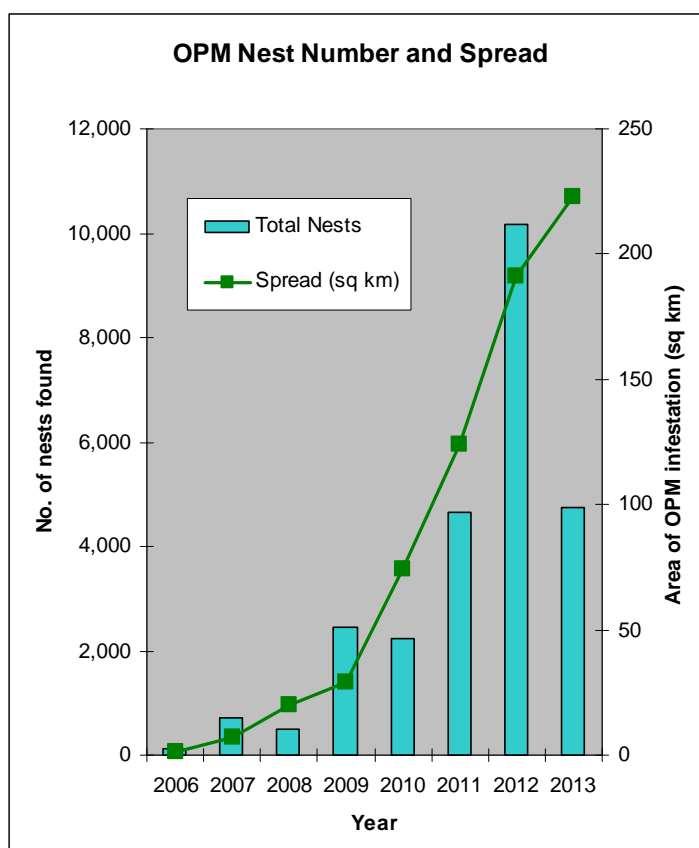
## What has been achieved in 2013

### 1 Nest numbers and spread of OPM in 2013

Figure 1 provides a summary of the number of nests and spread in 2013 compared with previous years.

*Figure 1 – table and graph showing the number of nests and extent of OPM in England since 2006*

Year	Number of nests	Area of spread (sq km)
2006	~115	-
2007	708	7
2008	506	20
2009	2450	29
2010	2222	74
2011	4645	124
2012	10,163	191
2013	4,756	223



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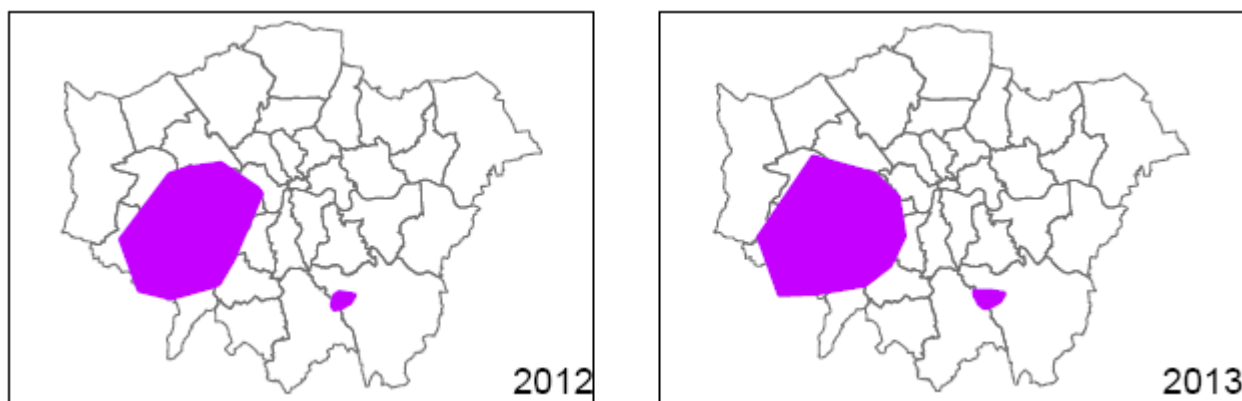
## 1.1 Nest numbers

After years of largely exponential increases in nest numbers, this year there has been a 53% decrease with 4,756 nests compared with 10,163 in 2012. Contractors with years of experience of treating OPM have also observed that nests were significantly smaller this year. A combination of prophylactic spraying and an extended winter (i.e. a colder than usual spring) are believed to be factors in reducing the size and number of nests.

## 1.2 Rate of spread

Figure 2 indicates the difference in spread between 2012 and 2013 in London. The rate of spread of OPM in 2013 was 17%, compared with a 54% increase last year. OPM has spread in a Westerly direction towards Heathrow airport and into Elmbridge District in Surrey. Confidence in the mapped spread of OPM in 2013 is also greater due to an increase in intensity of survey over previous years.

*Figure 2 – maps indicating OPM extent in London in 2012 and 2013*



## 1.3 Distribution of OPM in 2013

The following maps show the distribution of OPM in the outbreak areas – west London, Croydon/Bromley and Pangbourne. It is important to note that each dot represents a 'site', which could be anything from a single tree, a group of trees or woodland, to a whole site such as a golf course.

Map key:

- Green dots = no OPM was found
- Red dots = OPM found
- Blue squares = sites sprayed in spring 2013

### West London

[Appendix 3](#) shows the distribution of OPM and the areas treated in 2013 in West London.

The spread of OPM eastward (with prevailing wind) has been quite limited this year, with even some shrinkage back in spread compared with last year. It continues to establish a population in a south easterly direction, towards the Croydon/Bromley

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outbreak which is a concern. Similarly, there has continued to be a westward spread with outermost infestations found near Heathrow airport and the reservoirs of south west London. The total number of nests found in West London is 4,584 - 3,534 were found in Richmond Park and 1050 found elsewhere across a variety of land ownerships.

### **Bromley / Croydon**

[Appendix 3](#) shows the distribution of OPM and the areas treated in 2013 in the Bromley / Croydon area. A key achievement has been the major reduction in nest numbers at Bethlem Hospital, where there were thousands of nests last year. This year only 100 nests were found on the hospital site, and 72 nests elsewhere in the outbreak area.

OPM has been found to have spread in a north easterly direction towards South Norwood Country Park. Out of 50 pheromone traps, only 3 adult male moths were detected - the locations of those are shown in Appendix 1

### **Pangbourne**

[Appendix 3](#) shows the distribution of OPM and the areas treated in 2013 in the Pangbourne area.

No OPM nests were found in 2013 – the first time since the outbreak was discovered, and a success compared with 46 nests in 2010, 61 nests in 2011 and 4 nests found in 2012. The pheromone trapping programme detected 5 male moths as shown on the map.

The distribution of males captured in pheromone traps suggests that whereas numbers are very low in the village and perhaps zero in parts of it, there has been a shift east and south compared with previous years, possibly into woodland blocks not known to be occupied previously.

## **1.4 Pheromone Trap Results**

Out of 173 traps deployed across Croydon/Bromley, Pangbourne and the surrounding area, only 8 male moths were captured. The information is not complete for all sites. Where no information was received from a site for the trapping period, it was assumed that the catch was nil.

*Figure 3 – summary of pheromone trap results*

<b>Location</b>	<b>Total pheromone traps</b>	<b>Number of OPM caught</b>
Croydon area	50	3
Basildon Park	6	-
Englefield Estate, Berks	24	-
Hardwick Estate, Berks	15	-
Moor Copse, Tidmarsh, Berks	3	-
Sulham Woods, Pangbourne	15	2
Yattendon Estate, Berks	27	-
Pangbourne, Berks	33	3
<b>Total:</b>	<b>173</b>	<b>8</b>

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The low number of moths trapped reflects the intensive control programme employed in Croydon/Bromley and Pangbourne, though it should be noted further investigation is needed to determine the relationship between pheromone trap results and associated nest numbers.

## **2 Other Achievements**

### **2.1 System and Process Improvements**

The new field app for smart phones and tablets enabled FC and all other surveyors to access a variety of benefits. It enabled easy and instantaneous collation of survey results from multiple surveyors to give a regular up to date picture of OPM distribution. It helped speed up the production and issue of SPHNs to landowners so that control could be executed far more quickly. The central database collected vastly more exhaustive survey information to improve overall intelligence of OPM distribution, with over 2,250 sites now recorded. Within 3 weeks, 275 newly worded plant health notices were issued to all affected landowners - giving Forestry Commission the legal remit to enter sites.

Crucially, for the first time there is a thorough database of all potential host trees in the survey areas (not just the infested ones) which will inform re-survey in future years and decisions regarding potential risk/spread.

### **2.2 Stakeholder Collaboration**

The level of engagement with landowners has increased significantly. In 2012, 53 SPHN's were issued in 2013 this increased to 275. SPHN's were issued to all known sites of infestation with a new information leaflet on OPM that explained the context and contribution of work on each site. Landowner feedback has been minimal, with a far higher level of cooperation enabling implementation of a thorough control programme; a key factor supporting this was the control costs not falling upon the SPHN recipient. One site had a particular concern regarding chemical spraying adjacent to water and the possible impact of toxic hairs being eaten by prize fish; this was resolved and control was implemented.

The new app and FC led surveyor training has enabled other stakeholders to become more involved in survey work. This has helped build a far clearer picture of survey effort by others and enabled FC to concentrate on surveying the distribution of OPM outside the buffer area. There is a more thorough knowledge of survey effort and OPM distribution.

### **2.3 Communications**

This year's additional communications has significantly raised awareness of OPM and its potential impact on tree and human health. In addition to the timely news releases, new communications material has helped assert the need for OPM control and coordinated effort.

Due to significant media interest in the control programme, we have been able to highlight OPM to a wider audience and the level of broad penetration has significantly increased. It is interesting to note that the media interest in the Pangbourne aerial spraying work (which was tiny relative to the overall programme) created a lot of

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public interest but also deflected attention from the far larger spraying programme taking place in London.

## **2.4 Research**

Much of the recently commissioned research on OPM associated with this pilot, is in early stages, so initial data and evidence requires further analysis, extra data and peer review. With existing research calls in place and new ones set up in 2013, OPM research will over the coming years provide valuable evidence on a range of issues:

- Understanding the population dynamics of OPM in a woodland environment
- Assessing the effectiveness of natural predators to control OPM populations and the potential impact on other species
- Regular monitoring and review of OPM control effectiveness to inform the following year control programme
- Early detection of OPM larval development
- Effectiveness of different types of chemical control and application methods

## **2.5 Biodiversity Monitoring**

A five year monitoring programme is being implemented in the Pangbourne area. The initial impact of chemical spraying on biodiversity cannot be assessed until further surveys (moth trapping etc) are carried out next March/April when data can be collected on the relative population of other susceptible species of caterpillar.

Monitoring work on Wimbledon Common, as part of the SSSI consent conditions, found Purple Hairstreak butterflies (a priority species and considered at particular risk with chemical spraying) were present on both treated and untreated trees. The sample size for this survey was small and further work is required to be confident in this years results.

The initial impression from fieldwork is that a similar range of species have been caught in both sprayed and non-sprayed woods. At present it is too early to say if there are significant variations in numbers. Annual monitoring of patterns is required before any meaningful conclusions can be made.

The results of Richmond Park biodiversity monitoring work will be available in 2014.

## **2.6 Human & Tree Health impact**

During 2013 there has been the normal observation of minor defoliation of outermost leaves during larval development, but there has been no record of major defoliation as was seen at Bethlem Hospital in 2012. Affected trees appear to have coped with the minor attacks and the canopy has largely recovered due to summer lammas growth. It is difficult to determine direct causal links between OPM defoliation and tree mortality overall, but it has been noted that OPM impact has occurred alongside Acute Oak Decline (AOD). In Kidney Wood, Richmond Park, OPM infestation was found in 2013 and symptoms of Acute Oak Decline also noted, though a direct link between the two has not been established.

A review of the literature around the health impacts of OPM exposure is underway and preliminary evidence suggests that the related health effects are predominantly dermatitis, with eye and respiratory problems occurring more rarely. There is a

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recognised risk of sensitisation among people with repeated exposure, especially tree-workers. During 2013, there were a small number of anecdotal reports of affected arborists experiencing skin complaints. The evidence from other countries where OPM is endemic suggests that efforts to control OPM in trees are beneficial to human and animal health.

### 3 Factors Influencing Achievements

The following factors are likely to have had an influence on the overall achievements. The +/- symbols indicate which way it is likely to have affected the achievements (+ = factor that increases confidence in success of the programme; - = factors that may reduce our confidence in success of the programme)

#### **1 year is insufficient to draw conclusions**

Due to the life cycle of OPM, we are applying control measures based on the known distribution of OPM in the previous year. The work done in 2013 is based on 2012 data. It will be interesting to observe the distribution of OPM in 2014, as it will reflect the impact of the 2013 programme. (+/-)

#### **Weather**

It is difficult to differentiate between the impact of weather and the effect of the control programme. There is a collective view that the wet summer of 2012 and extended winter of 2013 will have helped to depress the OPM population, so weather could be a contributory factor in reducing nest numbers and rate of spread. (-)

#### **Increased Survey Effort**

The apparent reduction in nest numbers and rate of spread is heightened by the four fold increase in survey effort – one would expect this to lead to an increase not decrease in the level of infestation. (+)

#### **Pheromone Trap Effectiveness?**

The total number of OPM caught (7) is low, but is probably a reflection of the intensive control operations carried out in 2013. There is no reason to suspect that the traps or lures were ineffective, although whether lures were stored correctly or were changed over on the appropriate date was not always clear from the information provided. (+)

#### **Continental Experience re: Cyclical Population**

Continental experience of OPM over many years indicates a population cycle where infestation levels vary naturally from year to year. Where OPM has been unchecked by control programmes in Europe, experience suggests there is a major peak in population numbers every 7 years, after which there is a reduction and trough before the next peak. It is difficult to know whether such cycles may occur in Britain because of (a) the limited time OPM has been in the country and (b) the control programme employed since 2006 which may affect this natural population cycle. (+/-)

#### **Operational Challenges of OPM Control**

The following operational challenges make OPM control difficult:

- It is extremely difficult, perhaps impossible, to locate all OPM caterpillars and larval nests in areas where the population is at very low density, particularly in the outer zone of the known distribution area and outside this area where the

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moth may be colonising. Small nests and isolated caterpillars, especially those high in the canopy, are likely to escape detection. Finding all of the caterpillars or nests is even more difficult in closed woodland where it is not possible to see or reach the canopy of every tree

- The tight timescale of survey and control during the summer is a challenge for resource allocations, and as a result the identification and control of nests before the moths have flown is difficult
- Ground conditions can restrict access for control work. Dense undergrowth, uneven or wet ground can restrict access for the control machinery and make survey difficult
- The social-geographic nature of the outbreak sites are difficult, with thousands of landowners potentially affected from private gardens to large institutions. In West London, the potentially affected population within the core and buffer zone is in the region of 2-3 million people. Achieving a full survey, notice issue to landowners of infested sites and control implementation before moths emerge is difficult within the 4-8 week window of opportunity. The range of ownerships also presents communication challenges.

That said, the 2013 programme sought to minimise these issues e.g. by spraying a 50m radius from infested trees (based on known behaviour of OPM female moths). Further operational adjustments and continued evidence gathering will help minimise these challenges in future.

## 4 Scientific Analysis of Results

[Appendix 5](#) provides Nigel Straw's (Forest Research Senior Entomologist) analysis of the data from this year. Key points to note are:

- The control programme has reduced the pest population substantially. At the same time, the average rate of spread has been held at  $\leq 1$  km per year, the rate at which the long-term benefits of the increased control greatly outweigh the current, short-term costs.
- In Pangbourne, systematic survey and control treatments were started in 2011 and has almost eliminated OPM from the locality
- The reduction in nest numbers in 2013 might also be due, in part, to the poor weather in 2012 and spring 2013, which appears to have reduced nest numbers in Richmond Park, but it also reflects the effectiveness of the current survey and control
- Assuming the trees sprayed with insecticide this year would otherwise have had the same number of nests as found on the newly infested trees, or at least the same number of larval nests as they had in 2012, then the current enhanced programme of control has reduced nest numbers on the known infested trees by more than 80%
- The full impact on total nest numbers will not become apparent until 2014, when new sites of infestation discovered this year are brought into the wider control programme. The data from Pangbourne illustrate how the results of a control programme against OPM do not become fully apparent until the second

year, and that a sustained programme of control over 2–3 years is necessary if the population is to be driven down

## 5 Expenditure

Figure 4 provides details of the actual budget spend versus what was originally expected. In summary, the full programme of control work (and more) was achieved at significantly lower costs than originally expected. Survey work budget was increased to gather as much OPM distribution intelligence as possible, but the overall budget spend was significantly lower than the original £2M forecast.

*Figure 4: Original budget versus actual spend in 2013*

Operation	Original Budget (£k)	Actual Spend (£k)	Variance (£k)
Pre-spray survey	0	17	-17
Post-spray survey	91	212	-121
Winter Survey	0	70	-70
Administration	52	64	-12
Forest Research	69	75*	-6
Prophylactic Spraying	1,010	411	599
Nest Removal	756	149	607
Communication	5	10	-5
<b>Total</b>	<b>1,983</b>	<b>1,008</b>	<b>975</b>

\* £300k of OPM research funding will actually be funded through this budget over 3 years

At the end of this financial year we predict an under-spend of approx £975,000. This can nearly all be attributed to a reduced cost of control.

### 5.1 Variance Analysis

When the pilot programme funding was secured, the primary focus was direct action through spraying and nest removal. Initial estimates suggested this would absorb the majority of the control budget.

#### Control Costs

The original control budget was largely based on extrapolation of previous contractor and surveyor experience. This estimated that 64,800 trees would need spraying at an average cost of £15.58 per tree, whereas just over 40,000 trees were sprayed at an

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average cost of £10.50 per tree. A £17k pre survey was introduced this year to improve landowner liaison and operational planning (marking of trees to be treated etc).

Until 2013 manual nest removal was the most common method of control, and if employed across all infested trees (40,000) at an average cost of £250/tree, this would equate to £10M per year. This year's budget estimated that manual nest removal would reduce to 5% of all trees requiring treatment, some 3,024 trees at a cost of £250/tree. In reality just 1.5% of trees outside Richmond Park were treated through manual nest removal 627 trees (1,303 nests) costing £237.64 per tree. The number of nests found after spraying was significantly less than expected. A further 3,543 nests were removed manually in Richmond Park by the Royal Parks.

### **Survey Costs**

Cost savings on control allowed more resource to be invested in understanding the distribution of OPM. Additional FC survey effort was focussed on the outer edges of the buffer zone and a winter survey has been scheduled to help inform the control programme for 2014.

## **5.2 Analysis of Efficiency**

Implementing a landscape scale control programme with preparatory landowner liaison and consistent control methodology generated significant savings through batching of work and applying economies of scale. The original budget was based on spraying 53 sites yet 163 were treated.

Work was distributed geographically to fit with local contractor knowledge and commitments. e.g. Gristwood & Toms took on the control work in Bromley/Croydon as they were already appointed by the Borough as their arboricultural contractors; this meant they had knowledge of many of the sites and knew who the key contacts were.

Planning meetings ensured that the most appropriate and hence efficient control method was employed for each site. By using and sharing previous site knowledge contractors could select the most appropriate equipment for the circumstance and switch sites to ensure the most efficient use of resources e.g. smaller machinery where operational access is difficult.

### **Average Spraying Costs**

The cost per tree for spraying varied from £0.60 to £1,184. Much of the variation is dependent on the number of trees per site.

The direct cost of the aerial application by helicopter in Pangbourne was £13,000. This does not take into account the time and resources spent on landowner liaison, permissions, media liaison, freedom of information requests, which this operation generated more than anywhere else.

*Figure 5 – table showing decreased cost per tree of chemical spraying, depending on the number of trees on site*

Number of trees on site	Average cost of treatment per tree
1	£289.81
2-10	£134.90
11-50	£55.64
51-100	£30.86
101-500	£12.51
501-1,000	£9.02
1,001-5,000	£10.24
5,001-10,000	£2.89

### Survey Costs

The cost of survey was more than planned as it was more thorough and extensive. By simply employing a 2km radius from outermost infestations compared with 500m in the past, this immediately increased the survey area.

As with control, the survey work was more efficient due to the economies of scale. Additional effort included a pre-spray survey and surveying many sites twice to ensure infestations were detected. The cost of follow up survey for treated sites had been under estimated.

### 5.3 Total OPM budget spend and contribution of other stakeholders

The total spend for the 2013 OPM programme is at least £1.7M, comprising more than £1.15M in Defra funding and the remainder through other stakeholders including Forestry Commission, Local Authorities and major landowners.

*Figure 6: Total 2013 spend on the OPM control programme*

Organisation	Spend (£k)
Defra funding	1,150
Local Authorities	135
Forestry Commission	242
Royal Parks	226*
Other Major Landowners	174
<b>Total</b>	<b>£ 1,927</b>

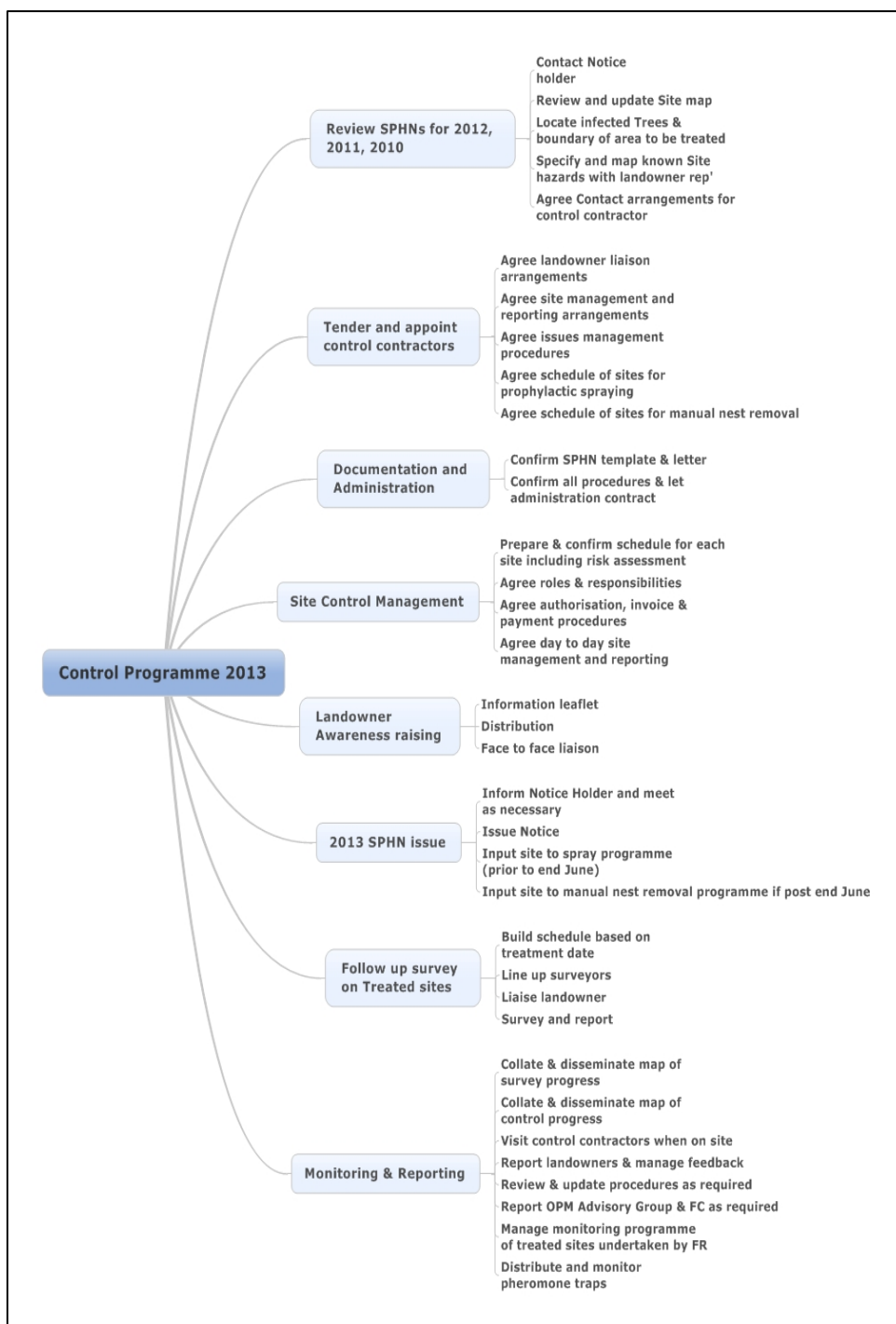
\*incl £36k in kind e.g. volunteers

These figures include not only cash but other costs such as staff time and work in kind e.g. volunteer input and their management. We did not receive a response from all other stakeholders and know that some estimates of their resource input are underestimates, hence our judgement that the minimum spend is £2.0M in total.

## What we did in 2013

The diagram below summarises the wide range of activities undertaken during the 2013 control season. The crucial factor determining the success of the 2013 programme was fast speed of response to known infestations, and maximising control effort during the critical window of opportunity

*Figure 8 – Diagram showing the range of activity employed as per the OPM 2013 Control Plan*



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In summary, work was implemented in line with the 2013 OPM Control Plan which had objectives agreed by stakeholders and was based on the known level of resources including Defra funding.

For the first time, the Forestry Commission took direct action alongside the issue of Statutory Plant Health Notices to control OPM across London. Prophylactic spraying was undertaken with landowner consent as a co-ordinated landscape scale programme.

## **6 Planning and Coordination**

### **6.1 Control Plan**

The 2013 control plan was signed off in May 2013, as soon as possible after Defra funding had been confirmed. Crucially, the spraying programme was based on known previous OPM infestations, so a priority was site identification using historic data.

### **6.2 Advisory Group and Other Meetings**

The OPM Advisory Group met regularly throughout the summer to monitor progress against the plan and offer support on issues arising. Terms of Reference for the Advisory Group are in Appendix 7, showing the wide range of stakeholders involved.

Regular meetings were held with the control and survey contractors, as well as ad hoc meetings with other stakeholders. Various senior officials were taken to OPM sites to understand the issue and see work on the ground.

### **6.3 FC legislative Process**

The wording of Plant Health Notices and operating practice was updated and standardised. This enabled work to be carried out directly and tightened up conditions in line with the 2013 control plan, whilst remaining within the bounds of FC legislative powers.

### **6.4 New Database**

All aspects of data management were reviewed. A "site" was re-defined as an area of individual ownership, (e.g., one tree in a private garden or all the Oak trees on a golf course). Data was captured in the newly created GIS database with functionality to monitor and report past, present and future site activity.

The new database for OPM was modelled on that currently used for the control of *Phytophthora ramorum*. An evaluation of the current attributes captured by the existing FC surveillance contractors was undertaken. These were then standardised for the new system so that all data could be compared and presented in a consistent format.

#### **Collating Historic Data**

Historical data from FC and other sources was cleansed and migrated into the new database of infested trees. This included information from the OPM survey contractor

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such as infested trees, and issued SPHNs. Datasets from other landowners were also collated and migrated where possible to build up the best ever picture we've had of OPM distribution. Maps showing the distribution of OPM since 2006 were produced to show the rate of spread over the past 6 years. Using the historic data, we were able to produce maps to accompany SPHNs.

## **6.5 Field App**

The old system of data collection was reviewed and deficiencies found; crucially, the timescale between data collection and producing a collated report was too long for management decisions to be made in a timely way. It was also necessary to ensure data collation was consistent and included uninfested as well as infested trees.

A new app using 'doForms' was developed that would feed field information into a central system. The app can be used on a range of devices, such as tablets, mobile phones or iPod touch or similar, so various organisations could use existing resources to collect data and feed it in. The system connects to a wireless network so that data can be uploaded onto the doFORMS website at the end of the survey day. The data on the doForms website is extracted and put into the Plant Health database and/or exported into other file formats and GIS.

Using doForms was a relatively simple process that is well established in other businesses e.g. parcel delivery. The cost was low, approx £4/month for each user licence. 25 licences were required for three months. The total cost of using this app was less than £1,000. It would not have been practicable or cost efficient to develop a bespoke app; time constraints meant that we had to use something 'off the shelf'.

## **6.6 Administration**

Additional administrative resource was employed to manage the issuing and monitoring of SPHNs. They also managed operational process information such as recording completion of site control work.

## **6.7 Procurement**

To deliver the new control programme, several very rapid procurement processes were implemented to ensure compliance with EU procurement rules etc. Procurement included control contractors, survey contractors, database development, field app development, administrative resource and research contracts. The extended cold weather in spring 2013 aided the procurement process, giving an extra 2 weeks or so of lead in time.

# **7 Survey**

## **Pre-Spray**

Landowner liaison and site preparation: A systematic site survey by FC contractors obtained landowner permissions, identified trees to be treated and site accessibility. This enabled control contractors to focus on spraying during the narrow control window.

With minimum delay spraying commenced once the first instars of OPM emerged. Some sites needed vegetative management to make them accessible; e.g., Ham

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Common. The late Spring enabled the full spraying programme to be completed prior to the fourth instar of the OPM caterpillar when spraying would not have been as effective.

Permissions and major landowner liaison: Some major landowners are members of the OPM Advisory Group, early liaison with other landowners such as Transport for London helped ensure the programme aims and plans were understood, and they were committed to assist the work.

Some sites needed additional permissions, for example site access on network rail land or permission from Natural England for designated sites. Natural England support enabled early permissions in appreciation of the tight timescales; whilst still meeting their statutory functions by for example requesting additional monitoring work.

## **Post Spray**

All treated sites were resurveyed by FC contractors at least once after spraying to check for re-infestation. This survey was recorded using doForms App, was fed into the database and triggered instructions for manual nest removal.

## **Surveying OPM Extent**

There was a four fold increase in FC survey effort to find the OPM 'frontier' of spread. FC focussed on the Croydon/Bromley outbreak area, the Pangbourne outbreak area and the buffer zone of the West London outbreak.

Survey effort was extended from the previous 500m from known outermost infestations to 2km, in recognition that the average spread in England to date has been less than 1km per year.

The doForms App was the main method of data collection. The overall OPM survey was a collective effort between FC and stakeholders. For example, Richmond Park used a team of over 40 volunteer surveyors plus Park staff and contract gardener input.

## **Pheromone Trapping**

New guidance 'Monitoring the Oak Processionary Moth with Pheromone Traps' was issued. A major pheromone trapping programme was employed in 2013, particularly in Croydon/Bromley and Pangbourne, in line with the good practice using lures sourced from Pherobank. At Pangbourne, traps were placed 1km to 12km from the village. Traps became operative in the week of 15<sup>th</sup> July and were checked fortnightly until late September. The identity of moths caught in the traps was confirmed by specialists at Alice Holt.

## **Winter Survey**

Winter survey work will take place after leaf fall when it is easier to see some nests (albeit they will be empty). This will identify where additional spraying should be employed in the coming year, and if considered a human health risk, the nest will be manually removed e.g. infested trees in school playground.

## **Biodiversity Survey/Monitoring**

Monitoring of purple hairstreak populations was performed on Wimbledon Common, to assess whether the spraying programme has an effect on this priority species.

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A 5 year biodiversity monitoring programme was started in 2013 at Herridge Copse, Pangbourne, to assess the impact of the aerial spraying used there.

Richmond Park is carrying out biodiversity monitoring to assess the impact of the spraying programme, particularly on non-target Lepidoptera.

### **Training events**

Three survey training events took place, one in Pangbourne in West Berkshire, one in Richmond Park and one in Bromley. Over 80 people were trained in the surveying of OPM.

## **8 Control**

To deliver the spraying programme the Forestry Commission deployed virtually all known available equipment for spraying large trees within the country. The distribution of OPM infested sites was more fragmented, the complexity of landownership was far greater and certain aspects of on site liaison were more challenging than envisaged. Overall, collaboration and commitment from all stakeholders, team work, 24 hour a day deployment of control contractors and Natural England support in obtaining necessary permissions all helped to ensure that the full programme was delivered.

Sustained commitment by The Royal Parks, Richmond Borough Council and other partners to ongoing survey and control initiated in previous years was also critical to success.

### **SPHNs**

275 newly worded Plant Health Notices were issued to all landowners where spraying was planned, even if they already had a notice in place.

### **Chemical Spraying**

Spraying began in May, using both high and low volume application methods with differing equipment. Aerial spraying by helicopter was employed over the top of one woodland in Pangbourne. Most sites were sprayed twice to maximise effectiveness.

The control this year marked a key change towards the most benign of insecticides – Bt – rather than Deltamethrin. On most sites Bt was used, but Dimilin was also used on occasion. Deltamethrin was not applied by the FC control contractors, though other landowners could have legally used it if they wished.

### **Nest Removal**

Manual nest removal of re-infested and newly infested sites was performed where possible before moth emergence. If the nest was not identified until after moth emergence, manual nest removal was only performed if it presented a human health risk.

### **Control Programme Monitoring**

During the control programme, the Forestry Commission used its own staff to monitor the contractors and help gain relevant permissions. This resource was taken from the existing team and reduced the ability to carry out other core FC work.

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## 9 Communications and PR

An OPM control demonstration day took place in East Sheen with 28 attendees at the beginning of the season.

### **OPM Communication Products**

The FC has employed a regular timed communications programme over several years to highlight key points such as larval emergence and nest formation. This year, additional work was undertaken to increase OPM communications.

The FC's PR company, Camargue, were commissioned to produce OPM communications material:

- Banners - Two pop-up banners were produced to help with talks and spread the message regarding OPM
- Leaflet - two leaflets to help communicate what we were trying to achieve with the enhanced programme
- Magnetics - for contractor vehicles and machinery

### **Media Liaison**

Communications around the enhanced control effort increased media interest and engaged FC and other staff in national and local radio and television interviews.

## 10 Research

Two research programmes have been set up to inform the control effort. These are:

### **OPM in Woodlands**

Support for a PhD student at Southampton University to look at population ecology of OPM in semi-natural woodland habitats. This will involve working in collaboration with other researchers on molecular techniques to quantify rates of parasitism and predation.

### **Control Using DNA Analysis**

A research project at Hull University has been set up to use novel DNA-bar coding techniques to identify the full range of parasitoid wasps and invertebrate predators attacking Oak Processionary moth in the UK and the extent to which these natural enemies are shared with other moth species. The project will pilot the use of next-generation sequencing to construct host-parasitoid networks and to quantify rates of parasitism. The work will be carried out over 2 years (Jan 2014 – Dec 2015) by a full-time post-doctoral research assistant at the University of Hull, under the supervision of Dr Darren Evans.

### **Review of OPM Control Effectiveness**

Further work is underway to evaluate current control methodologies and identify any obvious early improvements, based on the data we have collected.

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## What we've learned

### 11 The Enhanced Pilot Programme Worked

The 2013 strategy, plan and its implementation has broadly worked. The principle of spraying all host trees within 50m of an infestation is feasible and monitoring from Pangbourne where this approach was applied previously appear positive. The stakeholder lessons learned workshop held in September (appendix 1) agreed that the joint approach had been a success and noted specific enhancements that could improve performance next year.

### 12 Enhancements Identified

Areas for improvement were largely procedural so as to permit:

Better early planning, management and quality control of operational activity

More extensive/accessible and regular sharing of OPM intelligence/survey data

Faster and more transparent information exchange using clearer processes

#### **Lead in Time**

At least 3-6 months is required to better plan and report on site operations next year. Some stakeholders (e.g. utilities, network rail, TfL) need a very long lead in time as the management of sites needs careful planning. Longer lead in will enable the training of contractors to work on restricted sites such as railway lines. Landowner liaison should occur in advance of SPHN issue, so they are better prepared to comply with the requirements of the notice.

#### **More Survey**

Stakeholders all agreed that finding the outermost extent ('frontier') of OPM outbreaks is the key its containment and eradication. To ensure we are picking up the frontier, it may make sense to increase the distance out from known infestation, though it becomes increasingly unlikely we will find anything. Realistically, pheromone trapping is a more effective way of finding outlying moths. A more enhanced and thorough trapping programme, including improved records management, should be employed across all outbreak sites in future years.

Winter survey in 2012 proved very useful for the following control season and should be used again especially in areas where there is concern that OPM is spreading to the wider woodland environment, for example in Elmbridge District, Surrey.

To improve data management it would help to have all FC survey records input via the app and to establish a clear/simple process for control contractors to upload and receive site information daily. There is scope for even more collaboration between stakeholders to ensure overlaps/gaps in survey effort are minimised

#### **Control Programme**

We can use the experience of the 2013 control effort and knowledge of particular sites to make future year's control even more efficient. Early permission and liaison with landowners will ensure control can be maximised during the critical control window.

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We need to look closely at potential challenges to control e.g. very tall trees – and use the most appropriate control methods. Further research will help determine the most effective control methods.

### **Data Management**

This year has vastly improved the collation of data from surveyors, but highlighted the need for two way information flow. Latest knowledge on OPM distribution probably needs to be disseminated to stakeholders weekly.

The communication with the recipient of the SPHN is important; where possible we need to ensure the landowner is contacted in advance of the notice. With the more comprehensive site dataset it should be possible to liaise more closely and carefully with landowners.

Receiving information on work completed by control contractors needs to be improved and we would recommend contractors employ sufficient resource to do this (probably administrative).

### **Tighten Operational Processes**

More administrative resource is needed to ensure processes are managed effectively. The control programme for 2014 will need to have SPHN's issued for all known sites with OPM – this should be done by the beginning of April 2014 to allow the correct production of job sheets and maps for the control contractors and to communicate effectively to SPHN recipients. During the critical control period a permanent administrative resource is needed so timely new SPHN's, jobsheets, maps etc can be sent out and keep the data flowing smoothly.

There needs to be more quality assurance of control work, there have been anecdotal concerns whether some of the spraying was possible e.g. sites with poor access.

The co-ordination between the surveyors and control contractors needs to be robust. This is especially true where nest removal is taking place; it might be appropriate for the surveyors to work with the control contractors when they are going to do nest removal. The control contractors need to know exactly where the trees are that need work carried out on them.

More regular on-site liaison between surveyors, control contractors and programme managers would improve control effort, quality assurance, daily progress reporting and overall programme management.

### **Communications and Stakeholder Liaison**

The lessons learned workshop identified areas for improvement, and opportunities to develop the communication network further. This includes a more developed communications strategy and greater use of organisations such as Institute of Chartered Foresters and Arboricultural Association.

### **Evidence Gaps**

This year's programme has tested new approaches and helped us better understand what works and what doesn't. That said, we recognise that continued knowledge and evidence building will help inform future effort and increase the chance of full eradication. As well as yielding results from existing research work and ensuring scientific rigour (peer review etc), further research would be of assistance. Importantly, as well as researching enhanced control methods, other research would help ensure the programme is holistic e.g. analysis of non-target biodiversity impact

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for different control methods; social research on attitudes to pests, control methods and public engagement.

## 13 Risk analysis

This update reaffirms the findings of a 2012 analysis of OPM, draws together data on the spread of OPM to date and highlights additional information from Europe that has come to light since the 2012 analysis.

### 13.1 Key Points

- The 2012 OPM economic analysis highlighted significant benefits from delaying the spread of OPM to 1km per year.
- Evidence from Holland where OPM is widespread has shown that annual government spending on OPM is significant at around €8m p.a.
- There are likely to be wider benefits in building government capacity and ability to respond to other plant health threats from the OPM programme. These were not quantified in the 2012 analysis.
- Coordinated action by government has resulted in a more efficient use of resource in treating OPM this year at a reduced cost.

### 13.2 2012 OPM Economic Analysis

A 2012 economic analysis of OPM in England by the FC highlighted that the net present value (NPV<sup>1</sup>) of an increased control programme restricting the spread of OPM to 1km per year over 40 years (and therefore avoiding significant impacts) was £273m, indicating significant benefits to society. These benefits were relative to an uncontrolled spread of 5km per year initially eventually building up eventually to 10km per year. The same analysis highlighted that the NPV of a lesser control programme was minus £357m, indicating significant costs to society. The lesser control programme only reduced spread of OPM to 5km-7.5km per year, relative to the uncontrolled spread. Confinement of OPM to its current area was not modelled in the 2012 analysis. However, the benefits of doing so would be greater than only slowing the spread as the avoided impacts would be greater. The main benefits, which are lower early on but build up quickly, to reducing spread over 40 years were:

#### *1. Reduced impacts on human health*

The reduced spread would mean that 35 million less people would be living in an area infested with OPM, resulting in fewer GP visits and lost work time. This was valued at £126m over 40 years.

#### *2. Reduced treatment costs by landowners*

A smaller infested area by 111,000km<sup>2</sup> (England is 130km<sup>2</sup> approx) resulting in fewer treatments of oak trees, valued at £35M. This is because intensive action over a

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<sup>1</sup> Net present values are a way of expressing results from a cost benefit analysis looking at impacts over many years. Future flows of costs/benefits are 'discounted back' to the present to reflect that society values impacts now more than otherwise equivalent impacts in the future. Costs and benefits across all years are then summed together. Positive totals indicate overall benefits, negative totals overall costs.

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smaller area ultimately resulted in lower treatment costs than uncoordinated non-intensive action over a larger area.

### *3. Reduced impacts on non-market benefits*

The main benefits valued were recreational opportunities, landscape amenity and biodiversity. The avoided loss of these was estimated at £120m.

Sensitivity analysis showed that the tipping point – the point at which the benefits of action equal the costs – was at a spread of around 2km per year over 40 years. If the rate of spread can be kept below this then there would still be positive benefits from coordinated government intervention.

### **Evidence from Europe**

In the absence of 'proactive' coordinated government action to contain OPM it is highly likely that uncoordinated spontaneous treatment by landowners (such as schools, hospitals, local parks) would occur if OPM became widespread. The ongoing 'reactive' treatment costs funded by government in Holland, where OPM is endemic, are in the region of €8m p.a. Given the size of the UK compared to Holland, the population density and the prevalence of oak a similar programme in the UK could be expected to cost 2-4 times as much each year. There would be human health costs in addition to this, for example due to GP visits.

Reactions to the urticating hairs of OPM appear to increase in severity with frequent contact. Workers who treat OPM nests in Holland are no longer allowed to treat OPM after 3 reactions. The human health impacts of OPM are therefore likely to carry a higher risk over the longer term.

*We are awaiting further information regarding biodiversity impact on the continent and will update this report when that information is received.*

### **OPM in London and South England in 2013**

The circa 50% reduction in nest numbers and reduction in rate of spread of OPM intuitively reduces the risk of future OPM spread, provided control effort is continued. Our improved intelligence of OPM distribution through increased survey helps inform future control programmes so the potential effectiveness is maximised.

In addition to the benefits from slowing the spread of OPM, there are likely to be wider capacity and knowledge building benefits to UK plant health as lessons learned from the OPM programme and techniques developed could aid responses to other pest and disease outbreaks.

Reactions to the urticating hairs of OPM appear to increase in severity with frequent contact. Workers who treat OPM nests in Holland are no longer allowed to treat OPM after 3 reactions. The health impact of sensitisation on tree workers is therefore likely to have an economic burden on them as they are excluded from this type of work

### **13.3 Spread into Surrey**

At present this is one of the biggest concerns – Surrey is the most wooded county in England with a high proportion of oak, so OPM spread into this area would make even containment very difficult, let alone eradication.

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### **13.4 Spread into new areas with major recreation sites**

The risk of spread westwards could result in major recreation sites being affected such as Legoland Windsor, Thorpe Park and Windsor Great Park. OPM infestation in these sites, which generally contain a significant host tree population, would result in crucial control effort. Without this, infestation could have massive economic impacts on these sites and reduce recreation opportunities in London and the South East.

### **13.5 Public Relations**

Whilst most people are supportive of our efforts and reduction of tree and human health impacts, there are some areas of public concern:

- Potential collateral damage to other Lepidoptera or invertebrates
- Potential health risk associated with use of insecticides
- Proportionality of our efforts versus the perceived and/or real risk; whether the spread can be controlled

### **13.6 Experience of OPM on the Continent**

The cyclical nature of OPM populations seen on the continent suggest that if a sustained control programme is not employed, there is a high likelihood of a peak infestation year. If this were allowed to occur in England, it would become extremely difficult to contain OPM. This experience supports our efforts to contain and eradicate outbreaks.

#### **Continental Efforts and Experience in 2013**

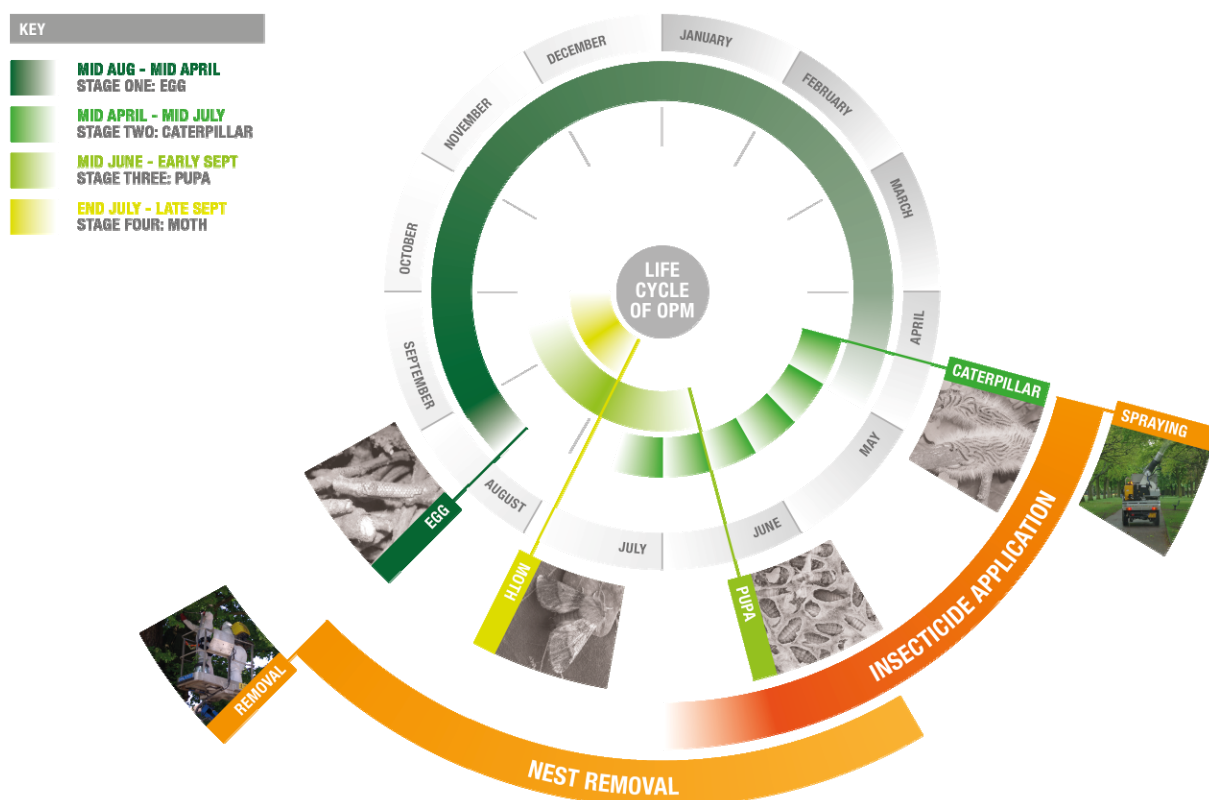
*We are awaiting further information regarding continental experience of OPM infestation levels/spread this year and will update this report when that information is received.*

## 14 Appendix 1: Brief summary of OPM

### Lifecycle

Oak Processionary Moth (OPM) occurs naturally in central and southern Europe, but is an introduced species in Britain. Figure 1 shows the lifecycle of OPM and indicates when different methods of control can be employed.

#### *OPM lifecycle and control methods*



### Impact

The moth is considered a pest in Britain for 2 reasons: (a) the caterpillars defoliate the trees leaves that can weaken the tree and render it more vulnerable to other pests and diseases, potentially resulting in tree death; (b) the hairs of the later stages of the caterpillar contain irritating hairs that can cause rashes and respiratory problems; the threats are not only to human health but animals too

### Introduction and spread in Britain

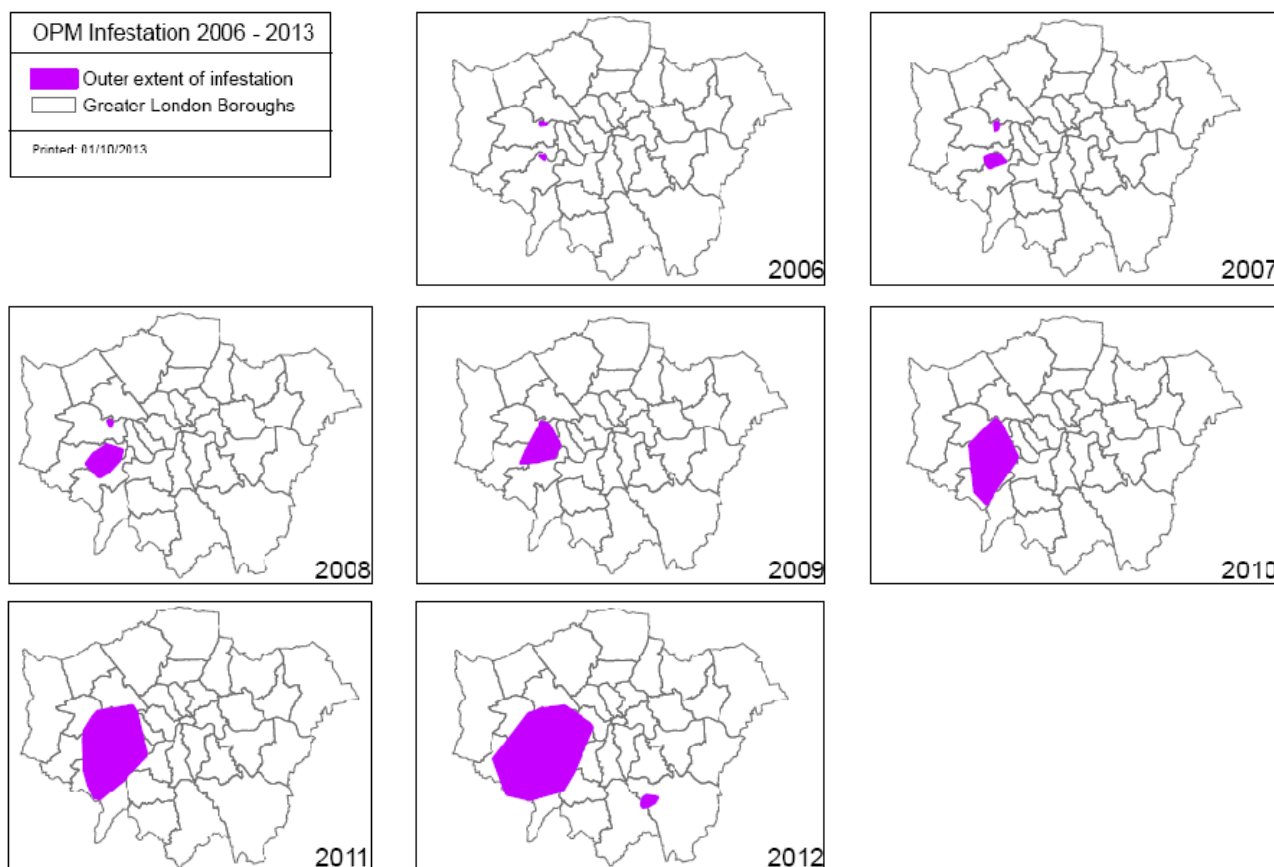
OPM was first found in Britain in 2006 in West London. People living near a new development reported health problems and the cause was traced back to imported oak trees that were infested with OPM. Since that outbreak, the pest has spread steadily across west London, affecting 10 Boroughs and also going into Elmbridge, Surrey. In addition, there have been other isolated outbreaks across England:

- Sheffield/Leeds – first found in 2009, the outbreak has been eradicated

- Pangbourne (Berkshire) – first found in 2010, the outbreak has been significantly reduced and is near eradication; control work continues
- Croydon/Bromley – first found in 2012, efforts to eradicate this outbreak continue

The maps in figure 2 show the rate of spread of OPM spread since 2006 in London, including the west London and Croydon/Bromley outbreaks

*Distribution of OPM in London between 2006 and 2012*



## 15 Appendix 2: OPM Control strategy

### Available Control Options

The crucial first stage of OPM control is to identify infestations through physical surveys and pheromone traps. Once found, there are 2 main ways that OPM can be controlled:

- Spraying with insecticides – applied in the spring to the early larval stages as soon as possible after the eggs hatch. There are 2 main insecticides approved for use, Dipel-DF, a biological insecticide based on the naturally-occurring bacterium *Bacillus thuringiensis*, and Dimilin, a growth-regulating chemical. These insecticides work rather differently and have different operational issues to consider, but both are highly effective against moth caterpillars and have a relatively low environment impact.

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- Manual nest removal – later in the summer, the caterpillars build silken nests and these can be collected in by hand or vacuumed up for safe disposal. Ideally, this work should take place before the caterpillars have pupated and moths flown. The removal of empty nests is used where there remains a risk to human health.

Chemical control is generally more effective than manual nest removal. Removing a high proportion of nests can suppress moth numbers, but unlike chemical control, it cannot eliminate an infestation completely. There are a number of operational challenges associated with all forms of OPM control.

### **2006-2011 - Eradication**

Between 2006 when OPM was first found and 2011, Government policy was to eradicate all OPM outbreaks that occur in Britain. Where infestations were found, Statutory Plant Health Notices (SPHNs) were issued to landowners and they were expected to control the infestation by approved methods; the cost of the control work fell to the landowner.

### **2011-2012 – Eradication and Containment**

In March 2011, the policy was adjusted following ministerial direction. All outbreaks outside the west London outbreak will continue to be eradicated, but in West London the policy shifted to containment. This was as a result of expert advice that the moth was now an established insect within the original outbreak area, centred on the London Boroughs of Ealing, Hounslow and Richmond (Parks and Townsend 2010).

The effect of the containment strategy in West London was to focus government resources on survey and control of OPM on the outer edges of the outbreak (called the 'buffer zone') to prevent further spread. Inside the buffer zone (called the 'core' zone), landowners were expected to carry out their own survey work and control OPM infestations that were found. The boundary of the core/buffer zone is reviewed annually based on the survey and control results of the previous year and knowledge of expected rate of spread.

SPHNs continued to be issued to landowners where infestation was found within or adjacent to the buffer zone, and the liability for control continued to be that of the landowner. This approach meant there was often a delay between finding OPM and carrying out necessary control measures. In most circumstances the method of control employed was manual nest removal rather than prophylactic spraying. Often control was either not carried out or occurred too late in the season when the moth was close to pupation or even in the following year when offspring had already hatched and flown.

In 2012 Forestry Commission England (FCE) employed an OPM Project Manager to support the control effort. As well as reviewing how the control programme was employed, a key role was developing more effective working relationships between key stakeholders and landowners. This resulted in the setting up of an OPM Advisory Group, and work to develop an agreed control plan began in autumn 2012.

### **Pilot for Enhanced Control in 2013**

In March 2013, a pilot programme for enhanced control was agreed for 2013/14. The objectives of the enhanced programme were to:

- apply an approximate 5 to 10-fold increase in activity via:
  - Direct action via prophylactic spraying and nest removal on up to 60,000 trees at infested sites across 7 London Boroughs in the key period from April to end of

- 
- June (determined by the moth's lifecycle) by contractors, managed by Forestry Commission.
  - Enhanced stakeholder communications and inputs via volunteer survey.
  - Technical, administrative and scientific support.
  - developing our understanding of how to address OPM and other similar pests

The enhanced programme and funding implementation of landscape scale OPM control. Key to this was direct funding of control work - particularly prophylactic chemical application - alongside enhanced survey, research and communication effort.

The recommendation to Ministers, 27<sup>th</sup> March 2013 stated that:

*"If the pilot is deemed to have been successful and it is therefore agreed that enhanced action should be sustained beyond 2013/14, we would use what we have learned from the pilot to produce robust estimates of the resources required to do so. On the basis of the evidence available now, we estimate that future years' resource requirements would be in the region of £2m per annum for at least the next three years. Longer term funding will be considered as part of the next spending review period."*

### **Government Forestry Policy links**

The Government forest policy statement (31<sup>st</sup> January 2013) recognises the vital importance and high value of England's trees, woods and forests and is committed to securing the maximum economic, social and environmental benefits from both public and private woodlands. With protection as the first policy priority, plant health and the control of OPM is a major commitment for government.

Oak is an iconic tree to the public and oak woodland is a key characteristic of the southeast England landscape. The density of woodland is 15%, equivalent to 1.5 times the national average. According to the GB National Forest Inventory (preliminary report 2013), nearly a third of England's broadleaved woods can be found in southeast England and nearly a third of that woodland has oak as its principal species (53,000 hectares).

### **Plant Health Legislation and Protected Zone status**

OPM was first introduced through the import of large standard oak trees onto a development site. The continued import of tree stock remains a primary potential source of further outbreaks elsewhere in the country. In order to prevent this occurring, we have implemented controls on oak importation, and are seeking additional EU control measures by gaining 'Protected Zone Status'. Gaining PZ status is partly dependant on demonstrating we are controlling the existing OPM outbreaks - therefore the OPM control programme is an important element to support our legislative measures.

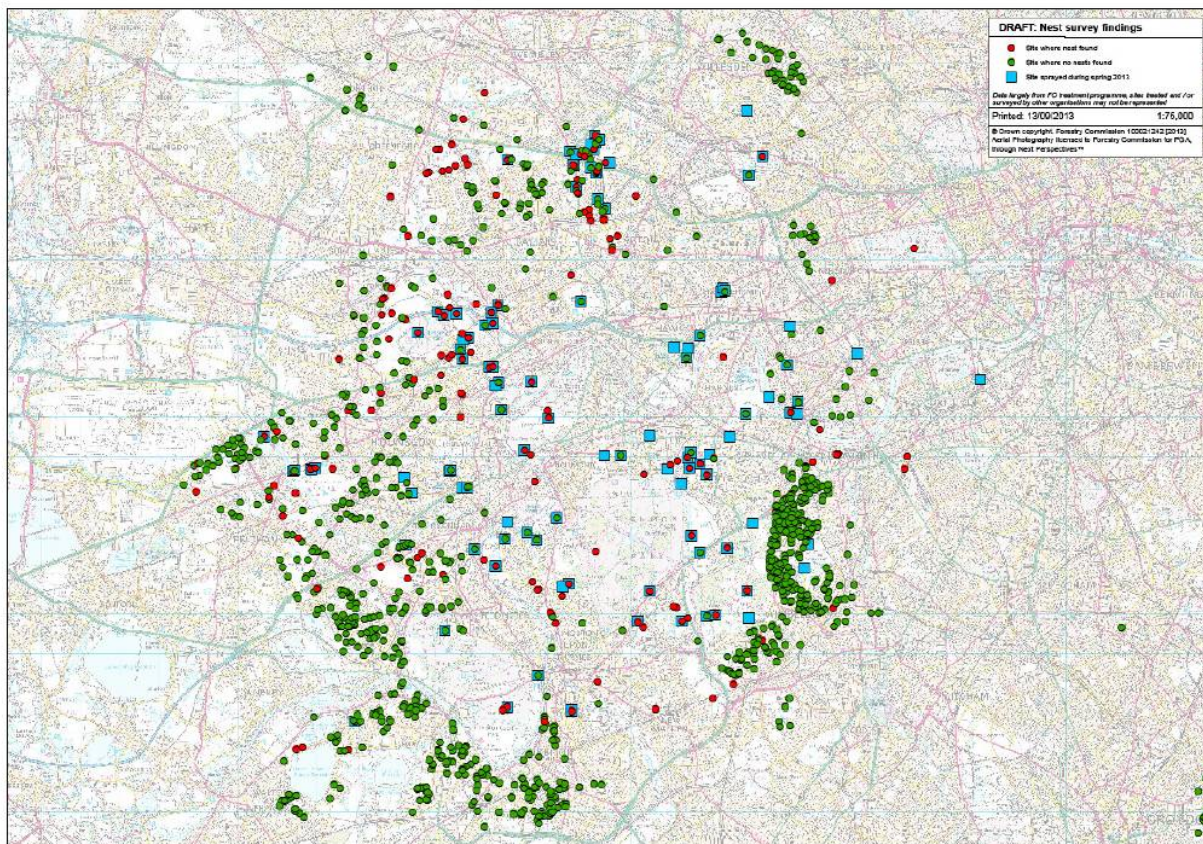
For further details please refer to Appendix 4

### **OPM 2013 Control Plan**

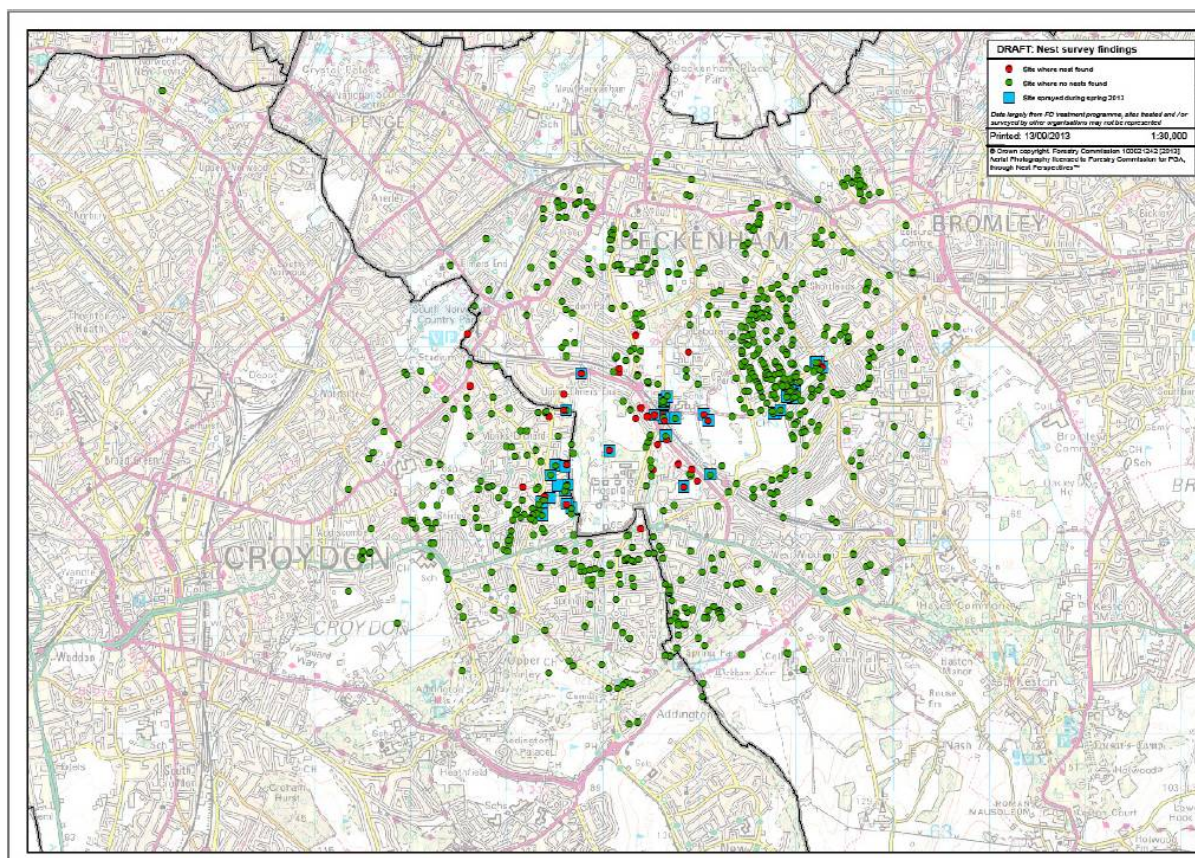
The OPM 2013 Control Plan was agreed by the OPM Advisory Group and sets out the basis for all work undertaken this year. It also provides further background information on OPM.

## 16 Appendix 3: OPM Distribution maps

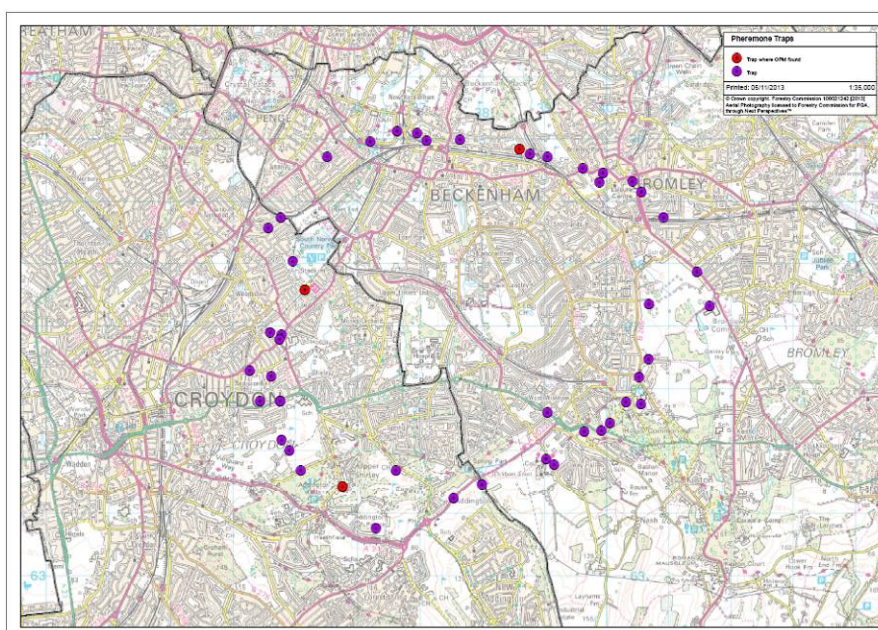
### *OPM distribution in 2013, West London*



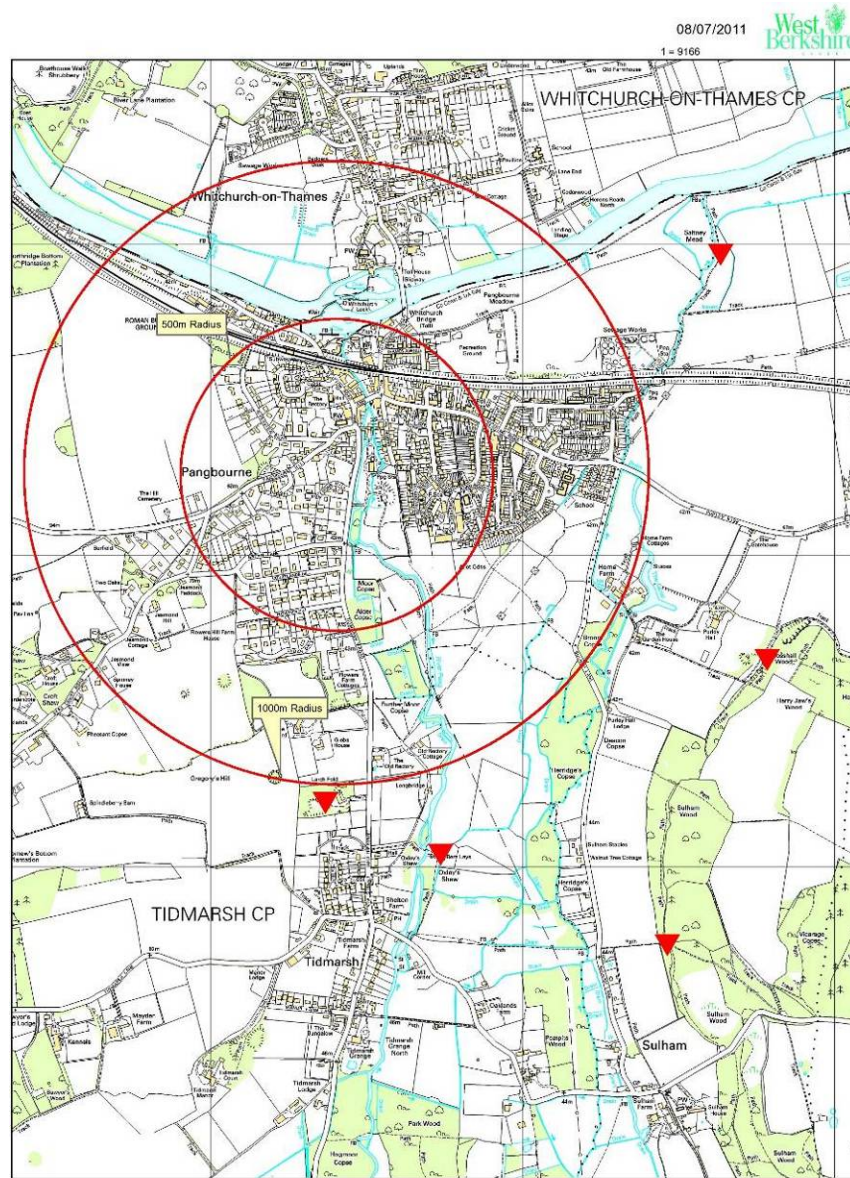
# OPM distribution in 2013, Bromley/Croydon outbreak



Location of pheromone traps deployed in the Bromley/Croydon area in 2013, and the location of captured OPM moths



OPM distribution in 2013, Pangbourne – triangles indicate the location of moths caught in pheromone traps



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## 17 Appendix 4: Protected Zone Status update

### Background

The UK introduced national measures to control OPM in March 2008 on the basis that OPM was a harmful pest and was not normally present in UK. These were temporary measures to allow the UK time to prepare the case necessary to apply for protected zone status.

The phrase “not present” is the key. The European Commission (EC) opinion is that because OPM was first found in 2006 and has expanded its range since then, then it now be that the pest is now present, albeit under official control.

The UK provided a dossier of information to demonstrate that OPM presented a threat and it largely remained free from the pest. This dossier and other supportive scientific opinion were submitted as a request for the establishment of a UK protected Zone against OPM.

During consideration, some member states were concerned that PZ status could impose an unnecessary burden on those wishing to export plants to UK. As part of the legislative proposal, an exporting country would have be obliged to demonstrate place of production (including immediate vicinity) freedom from OPM for at least the last growing season.

Subsequently the EC requested that UK withdraw its national controls as the case that it made for protected zone status was not supported by the majority of other Member States.

A compromise was proposed by the UK and it was agreed that PZ status against OPM would be granted but that control measures would not be specified. Hence, we now expect OPM to be listed and PZ status to be granted in 2014.

### What does the new PZ status mean for the UK?

We will have to revise our legislation to bring it into line with the Directive. This means that we will have to relax our own legislation and will need us to revise the requirement that “all oak plants coming into the UK from another European Union Member State must have a plant passport confirming that the plants have been grown in a nursery where the moth is not present and which has been free of symptoms for at least the most-recent growing season”.

Under the new regulations, material destined for a PZ region will have to be accompanied by a plant passport declaring that it is free from OPM. These regulations will also apply to movement of material within the UK and movement of oak trees from within the infested areas of London will be subject to plant passporting.

The Plant Health (England) (Amendment) Order 2013, which came into force on 17 January 2013, requires that pending landings of oak plants in England must be pre-notified to the plant health authorities. This will remain as is.

### Once the PZ is implemented (likely to be early 2014) what happens if we decide that we can no longer contain OPM?

Historically the European Commission has been reticent about reviewing PZs once they have been implemented. We expect that will be at least 2 years before this would be considered and even then it is likely that the additional areas (i.e. where OPM has spread to) would be excluded from the PZ.

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## 18 Appendix 5: Scientific Analysis of the 2013 results

### Impact of the 2013 programme

The impact of the enhanced control programme against OPM in 2013 can be measured by its effect on the overall population size of the pest (the total numbers of larval nests) and the rate of spread to new areas. The total OPM population in London decreased from 10,163 larval nests in 2012 to approximately 4756 nests in 2013, suggesting that the control programme has reduced the pest population by about half. At the same time, the average rate of spread has been held at  $\leq 1$  km per year, the rate at which the long-term benefits of the increased control effort greatly outweigh the current, short-term costs.

The actual impact of the enhanced control programme is, in fact, greater than these overall figures might suggest. The total numbers of larval nests contain various elements, not all of which are closely related to the control measures that have been applied. Separating out these different elements indicates that the enhanced programme has been more effective than at first sight it might appear, and on treated sites it has reduced infestation by at least 80%. The full impact on total nest numbers will not become apparent until 2014, when new sites of infestation discovered this year are brought into the wider control programme.

### Nest number analysis

The total number of OPM nests is the sum of the number of nests found across west London generally, the number found in Richmond Park, and the number of nests recorded in the two outlying, isolated outbreaks at Pangbourne, in Berkshire, and in Croydon & Bromley.

The outbreak in Croydon & Bromley was discovered in 2012 and was subject to an immediate and intense programme of manual nest removal, which led to the destruction of approximately 4000 larval nests. This was followed in 2013 by spraying, surveys and further nest removal, using the same protocols as employed in the wider control programme and, as a result, only 172 nests were found in Croydon & Bromley this year. The outbreak in Pangbourne is much smaller. A systematic programme of surveying and control treatments was started here in 2011 and this appears to have been highly successful in almost eliminating the OPM population from the locality<sup>1</sup>.

These two outbreaks need to be considered separately from the main area of OPM infestation in west London. Richmond Park also represents a separate element within the main distribution. This is a large site containing 40,000+ oak trees and surveys and control of OPM are carried out by the Royal Parks. Options for control within the Park are limited by its strict nature conservation designations (e.g. the Park is a Site of Special Scientific Interest, Special Area for Conservation and National Nature Reserve), although a limited programme of insecticide spraying was carried out in spring 2013 on about 1000 trees. The number of OPM nests located in Richmond Park increased almost exponentially between 2009 and 2012, but decreased in 2013. The reduction in 2013 is due partly to the control measures carried out in the Park in 2013, but it also reflects poor summer weather in 2012 and the cold spring in 2013, which reduced the numbers of eggs laid last year and disrupted larval development this year, respectively, and perhaps also reduced immigration from neighbouring sites.

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*Total numbers of OPM larval nests found in west London, Bromley/Croydon and Pangbourne, Berkshire, 2006–2013*

Year	Main OPM area in west London:		Isolated outbreaks:	
	All areas excl. Richmond Park	Richmond Park	Pangbourne, Berkshire	Bromley / Croydon
<b>2006</b>	115	-	-	-
<b>2007</b>	708	-	-	-
<b>2008</b>	506	-	-	-
<b>2009</b>	2445	5	-	-
<b>2010</b>	1850	326	46	-
<b>2011</b>	2657	1927	61	-
<b>2012</b>	1971	4188	4	~ 4000
<b>2013</b>	1050	3534	0	172

Removing the larval nests found at Richmond Park, Pangbourne and Croydon & Bromley from the total number of nests found each year, indicates that between 1971 and 2657 nests were found elsewhere in west London during the previous four years, and 1050 were found in 2013. The reduction in nest numbers in 2013 might also be due, in part, to the poor weather in 2012 and spring 2013, which may appear to have reduced nest numbers in some areas of Richmond Park, but it also reflects the effectiveness of the current survey and control programme.

The number of larval nests found across west London in 2013, excluding Richmond Park, is made up of two components, however: (1) 501 nests found on trees that had been sprayed in spring as part of the control programme and, (2) 549 nests found on trees that were not known previously to be infested. The latter are trees on which eggs were laid in 2012, but could not be recognised as infested until the larvae hatched and formed nests in 2013. The presence of larvae on these trees could not be anticipated in advance and, as a result, these trees were not recognised as needing to be sprayed in the spring. In contrast, the number of nests found on trees that were sprayed in the spring, reflects the numbers of larvae surviving the control treatments and indicates the actual efficacy of the individual control measures. Assuming that the trees sprayed with insecticide this year would otherwise have had same number of nests as found on the newly infested trees (2, above), or at least the same number of larval nests as they had in 2012, then the current enhanced programme of control has reduced nest numbers on the known infested trees by more than 80%.

### **New trees with infestation**

The appearance of new trees with larval nests, especially in peripheral areas around the main outbreak area, is inevitable given that infestation cannot be recognised until

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late in the summer when the larval nests are formed, a year after the eggs are laid. The number of new trees found to be infested in 2013 is probably higher, in proportion, than in previous years, but this is a reflection, at least in part, of the much greater survey effort that it has been possible to carry out in 2013 and the larger area over which surveys have been conducted. On the one hand, this has increased the total number of nests found and has made the control programme look less effective than it actually has been, but on the other hand, it has identified a higher proportion of the infested trees, which will be sprayed next year, and this should eventually result in a greater reduction in total population size. The main impact of this year's enhanced control programme will not become apparent therefore, until 2014.

### **Efficacy of this years methodology**

The difficulty of detecting and treating oak trees that only have eggs of OPM is addressed in the pilot by spraying all other oak trees within 50m of each infested oak. Adult females of OPM generally do not disperse very far and most lay their eggs either on the tree on which they emerged or within 50 m. Consequently, spraying all oak trees within this radius results in the majority of OPM larvae being treated and killed. This strategy has proved to be highly effective at Pangbourne. The first infested trees at this locality were discovered at the end of the season in 2010 and a systematic control programme, based on spraying all of the known infested trees and other oaks within 50 m, was introduced in 2011. By 2012, only 4 larval nests could be found in the village and surrounding area, and in 2013 there were none (see Table above)<sup>1</sup>.

### **Importance of sustained control**

It is important to note that the number of OPM nests at Pangbourne did not decrease in the first year that the control programme was applied (in fact, the number increased), because of the carry over of eggs from the previous year (2010) and inability to detect these trees until late in the 2011 season when nests started to form. However, by maintaining the control programme at the same level of intensity, and incorporating these new trees into the programme, the number of nests was reduced significantly in the second year and even more so in the third year.

The data from Pangbourne illustrate how the results of a control programme against OPM do not become fully apparent until the second year, and that a sustained programme of control over 2–3 years is necessary if the population is to be driven down to a low and manageable level. The same principles apply to the main area of infestation in west London.

Nigel Straw, Senior Entomologist, Forest Research

<sup>1</sup> 5 x adult male OPM were caught in pheromone traps at Pangbourne in August 2013, indicating that the moth has not been completely eliminated from the area. These captures however, do not necessarily mean that a viable breeding population is still present.

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## 19 Appendix 6: Case studies

### Case Study: Kew Gardens experience in 2013

Kew Gardens experienced a sharp increase in the number of *nests* (*awaiting precise number, will be added to this report when we receive it*) on site this year after deciding not to carry out prophylactic spraying in spring 2013. In recent years they had carried out spraying and not experienced any nest formation.

For the first time in 4 years the team at Kew Gardens chose not to carry out any chemical control of OPM in 2013. This was done due to financial restraints and a perception that OPM was under control. The plan was to carry out bi-annual control of OPM and to see how quickly OPM returned without the spray programme. However as OPM appeared across the Richmond area it became apparent that the lack of control at Kew for 1 season meant there was an explosion of numbers on this iconic site, this even led to one of the employees at Kew having to go to hospital to be treated for the effects of rash from OPM (figure 10).

Tony Kirkham from Kew says 'Our major lesson from this year is that we have to keep on top of OPM, it has been a false economy to do nothing. The cost of the possibility of having to close down Kew to visitors because of OPM infestation far outweighs the control measures that have to be done.'

*Rash on a Kew Gardens employee caused by OPM caterpillars in 2013*



### Case Study: Royal Bethlem Hospital – reduction in nest numbers in 2013

The outbreak of OPM in Bromley/ Croydon was first found at Royal Bethlem Hospital, where infestation was at 'plague' levels with at least 4,000 nests found. The control programme implemented this year, on top of last years nest removal efforts, have resulted in a significant reduction in nest numbers in 2013 – only 100 were found this year.

*Oak defoliation in 2012*



*Large nest numbers on oak trunk and the ground in 2012*

### **Case Study: Ham Common, Richmond – clearing access for control work**

The extra funding provided by DEFRA for the enhanced control of OPM has meant that there has been a much more proactive approach in trying to contain the spread of OPM. This has meant that in the past where control work has been difficult due to site conditions it has been possible to carry out site maintenance work to allow machinery onto the site

Richard Trippett from Bartlett Tree Experts said: 'This year with the extra funding has been very useful for getting more sites controlled, In the past landowner would never have contemplated carry site works due to the cost involved. It is places such as Ham Wood due to the dense vegetation that meant we could not physically get to all the Oak trees in the woodland, now we have the means to carry out more effective control. Hopefully we can take this programme forward so that we are able to see a step change in reducing OPM numbers'

### **Case Study: Richmond Park**

Gillian Jonusas, the park arboriculturist said "Richmond Park is a 2500 acre Site of Special Scientific Interest, a National Nature Reserve and a Special Area of Conservation and balancing the impact of OPM on human, animal and tree health with the potential effect of management options on its internationally recognised biodiversity, has been a priority. To this end, manual nest removal, with its minimal impact on biodiversity, has been the preferred option. In 2013 the park management team worked with Natural England to obtain consent for and carry out a carefully targeted pesticide spraying programme in previously heavily infested and high public use areas of the park. This was very successful in reducing the OPM population in these areas from 1547 nests found and removed in 2012, to 60 in 2013. However, it was noted that numbers in some other previously heavily infested areas that weren't sprayed were also significantly reduced, indicating there are also other factors influencing the population dynamic in the park. In Isabella Plantation numbers went

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from 108 nests in 2012, to 16 in 2013. In Conduit Wood the numbers went from 58 in 2012 to zero.

The Royal Parks is also carrying out a study on the effect of spraying Bt on non-target Lepidoptera and the wider impact this may have on the park ecology. The results of this will be available in 2014. We are also hoping to facilitate research in the future into the role that natural parasites and predators may have to play in the control of OPM."

### **Case Study: Collaboration between control contractors**

The control companies worked with the FC to find solutions to make sure that the relevant skills and geography of the control contractors was employed in a way that meant the large programme in a very tight timescale was completed.

Dominic Blake of Advanced Trees Services said 'This programme was something that had to be delivered with very little lead in time, we were one of three contractors who were successful in carry out the control of OPM. It became apparent that we'd all have to work collaboratively to make sure we got the contract completed on time'

*OPM spraying of Bt*



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### **Case Study: Enhance survey effort to increase our intelligence of OPM distribution**

The extra funding has enabled a more extensive and exhaustive survey programme to be carried out in 2013. Our knowledge and confidence in OPM distribution and control has been vastly increased and helps inform the following years programme far more effectively.

Gordon Purdie and/or Simon Levy say 'The surveying for OPM that we've been carrying out for OPM has been greatly enhanced with the extra funding that has been made available. It has meant that large challenging sites such as Langley Park Golf Club have been able to have a full assessment of all the trees, over 1000 in number. Working with landowners we have been able to survey so much more and use new technology to deliver our survey information quickly to the Forestry Commission for their database.'

#### *Training of OPM surveyors*



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## 20 Appendix 7: Oak Processionary Moth Advisory Group - Terms of Reference

### Strategy

The group is working towards a strategy of containing the disease (i.e. no further spread) within a timescale that is yet to be defined. Over time this strategy will be reviewed, in the hope that containment will enable further science to come up with more effective control solutions, perhaps leading to eradication.

### Aims & Objectives

- Advise / inform policy makers, decision makers & research on strategic issues
- Facilitate surveillance and control across all stakeholders so its effectiveness is maximised
- Coordinate OPM communication

### Geographic Scope

The geographic scope will be primarily London and South East focussed, to reflect the current distribution of OPM, but also considering the potential spread in the medium term. Whilst the scope is restricted, the group envisages its activity will be of national relevance

### Membership

- Members are selected as senior representatives that have strong networks and have influence
- Membership reflects the spectrum of stakeholder interests – landowners, policy makers, budget holders, health sector, strategic operational management

Name	Organisation
Sue Ireland	Head of Open Spaces, City of London
Andrew Hoppit	FC London
Stewart Snape	FC GB
Tony Leach	London Parks & Green Spaces Forum
Colin Buttery	Royal Parks
Dave Lofthouse	LTOA
Mike Robinson	FERA
Adam Wallace	Natural England
Jane Carlson	GLA
Dave Allister	Richmond Borough Council
Barry Walsh	HPA
Mark Townsend	Gristwood & Toms
Dougal Driver	ConFor & SE Regional Advisory Committee
Greg Vickers	SE Regional Advisory Committee
Richard Trippett	Bartlett's

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## **Roles & Responsibilities**

FC staff will work closely with the Chair and provide a secretariat service to the group:

- Arrangement of meetings and coordinating group correspondence
- Production of agenda and meeting papers in good time before meetings
- Production of meeting minutes

Group members are expected to play an active role:

- Reading meeting papers in advance and liaison with colleagues/stakeholders before the meeting where appropriate
- Advice on sector needs and interests and wider operating context
- Support delivery of actions where appropriate
- Promote the role of the group and disseminate its work amongst colleagues and stakeholders

## **Operation**

- Inaugural meeting to be held in September 2012
- 2 regular meetings a year expected to be held:
  - Pre OPM season – to prepare plans for the season (survey, control, communications etc)
  - Post season – to review survey results and control success
- Meetings normally held in central London for ease of travel for members
- Meetings agenda led but normally 1-2 hour duration max
- Group actions are likely to take place between meetings and correspondence by email; ad hoc meetings or telephone conferences may be held as required

## **Interactions**

- FC internal OPM group – which oversees the FC's role in OPM management
- LTOA OPM group – which shares knowledge and seeks to coordinate Local Authority resources / communication
- Pangbourne OMT – which oversees the collective management of OPM in the outbreak area so it is eradicated
- Bromley OMT - which oversees the collective management of OPM in the outbreak area so it is eradicated
- Ad hoc meetings of the above groups or extraordinary ones as required
- The results of Advisory Group activity will be sent to senior staff in FC GB and England, which in turn will feed into groups such as the Biosecurity Steering Group and other wider groups e.g. Defra, research

## 21 Appendix 8: Map of woodland distribution in Surrey

