FORMAT FOR A PRA RECORD (version 3 of the Decision support scheme for PRA for quarantine pests)

	European and Mediterranean Plant Protection Organisation		
	Organisation Européenne et Méditerranéenne pour la Protection des Plantes		
	Guidelines on Pest Risk Analysis		
	Lignes directrices pour l'analyse du risque phytosanitaire		
	Decision-support scheme for quarantine pests Version N°4		
PEST RISK ANALYSIS FOR			
Pest risk analyst:			
Stage 1: Initiation			
1 What is the reason for performing the PRA?			*Rhagoletis cingulata* (Eastern cherry fruit fly) is spreading in Europe. It's potential to spread to the UK poses a risk to the cherry industry, but also of concern is the risk posed to international trade, as the UK does not currently have any fruit flies that cause economic damage to orchard grown fruit.
2 Enter the name of the pest			*Rhagoletis cingulata* (Loew) Commonly known as the Eastern cherry fruit fly, North American cherry fruit fly, White-banded cherry fruit fly or Cherry maggot. Synonyms: *Trypeta cingulata* Loew and *Zonosema cingulata* (Loew).
2A Indicate the type of the pest			Insect
2B Indicate the taxonomic position			Order: Diptera Family: Tephritidae

3 Clearly define the PRA area		This PRA considers the UK
4 Does a relevant earlier PRA exist?		Yes: an earlier assessment was made of *Rhagoletis cerasi* (European cherry fruit fly) (Baker, 1991a).
5 Is the earlier PRA still entirely valid, or only partly valid (out of date, applied in different circumstances, for a similar but distinct pest, for another area with similar conditions)?		PRA is partially valid, being for a similar, but distinct pest.
Stage 2A: Pest Risk Assessment - Pest categorization		
6 Specify all the host plant species (for pests directly affecting plants) or suitable habitats (for non parasitic plants). Indicate the ones which are present in the PRA area.		**Major hosts**: *Prunus avium* – Sweet/wild cherry *Prunus cerasus* – Sour, pie or tart cherry *Prunus salicina* – Japanese plum *Pyrus communis* – European pear, species from which most orchard cultivars in Europe, USA and Australia are developed **Minor hosts**: *Prunus serotina* – Wild black cherry, normal wild host in USA *Prunus virginiana* – Common choke cherry tree *Prunus mahaleb* – Mahaleb cherry **Incidental**: Other *Prunus spp.* N.B. there are mentions of other minor or incidental hosts in the literature, but uncertainty as to whether the authors refer to the correct fruit fly species have led to their exclusion from the above list. There is some suggestion in the literature that of the commercially produced cherries (sweet and sour) it is *Prunus cerasus*, sour cherries, which is particularly hard hit (Compton *et al*., 1998) and this is borne out by reports from Germany where *R. cingulata* occurs mainly in sour cherry orchards and areas where *P. mahaleb* and *P. serotina* are present (Vogt *et al*., 2008)). In the USA the pests' distribution largely follows that

		of its most important native host, *Prunus serotina* (Teixeira *et al.*, 2009). CABI-CPC, 2011; Compton *et al.*, 2005; EPPO PQR, 2010; White and Elson-Harris, 1992.

7. Specify the pest distribution		**Geographic Distribution of *Rhagoletis cingulata*** *Rhagoletis cingulata* is a non-European Tephritidae, 1A1 listed in the EU Plant Health Directive and A2 listed by EPPO. It's pathway into Europe from North America is unknown. The earliest findings were in Switzerland.	
		North America	Canada: present in – Nova Scotia, Ontario, Quebec and Saskatchewan, with an unconfirmed report in New Brunswick (CABI – CPC, 2011). USA: distribution concentrated in the eastern states – Arizona, Connecticut, District of Columbia, Florida, Georgia, Illinios, Indiana, Iowa, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, New Jersey, New Mexico, New York, Ohio, Pennsylvania, Tennessee, Texas, Virginia, and Wisconsin, with unconfirmed reports from Alabama, Arkansas, North Carolina, South Carolina and West Virginia (CABI – CPC, 2011).
		Central America	Mexico (CABI - CPC, 2011).
		South America	No records – assume absent
		Europe	Introduced to and spread in Switzerland (Merz, 1991; Boller & Mani, 1994; Mani *et al.*, 1994), the Netherlands (Aartsen, 2001; EPPO Reporting Service, 2004) (in both cases misidentified as *R. indifferens* initially, (Norrbom, A.L., 2003 pers. comm.; EPPO Reporting Service, 2010b)), Germany (Dahlbender *et al.*, 2006; EPPO Reporting Service, 2006; EPPO Reporting Service, 2010e), Hungary (Kálmán, 2006), Slovenia (Groznik, 2007) and Croatia (Bjeliš, 2007; EPPO Reporting Service, 2010a). Records have also been confirmed in Belgium (EPPO Reporting Service, 2010c), Austria (Egartner *et al*., 2010; EPPO Reporting Service, 2010d) and France (EPPO Reporting Service, 2010f). Its presence in Italy is also mentioned in some sources, but this has not been confirmed. Details of these findings and of the current status of this pest within these countries is given in Annex III.
		Africa	No records – assume absent
		Asia	No records – assume absent
		Oceania	No records – assume absent

8. Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?	Yes	*Rhagoletis cingulata* (Loew) (Diptera: Tephritidae). The morphologically similar eastern and western cherry fruit flies were, in the past, considered sub groups of the same species. This confusion in nomenclature has now been resolved and, based on their geographic distributions (although there is a slight overlap (CABI – CPC, 2011)), and consistent morphological differences they are now considered separate species, the western cherry fruit fly being *Rhagoletis indifferens* Curran. Most pre-1966 literature, however, does not make a distinction between the two species and misidentification of individuals captured in Europe has led to some confusion as to the distribution of the two species (AliNiazee, 1973; Lampe *et al.*, 2005).
9. Even if the causal agent of particular symptoms has not yet been fully identified, has it been shown to produce consistent symptoms and to be transmissible?	N/A	
10. Is the organism in its area of current distribution a known pest (or vector of a pest) of plants or plant products?	Yes	*Rhagoletis cingulata* adults feed on the leaves and fruits of their hosts, leaving small punctures on the surface. The larvae cause more severe damage. The females oviposit just below the skin of the fruit, leaving a small scar on the surface. On hatching, the larvae burrow directly into the fruit, and feed around the pit and later the pulp of the fruit. An infested fruit may appear normal until the maggot is nearly full grown when sunken spots will appear. The larval feeding can cause the pit to separate from the pulp, the pulp to turn brown, the fruit to ripen earlier and may make it more susceptible to brown rot (Smith, 1984; Compton *et al.*, 2005). *Rhagoletis cingulata* is considered one of the most significant direct pests of cherries in eastern USA and eastern Canada (Compton *et al.*, 2005).
11. Does the organism have intrinsic attributes that indicate that it could cause significant harm to plants?	N/A	

12 Does the pest occur in the PRA area?	No	The pest is currently absent in the PRA area and no interceptions have been reported. *Rhagoletis cingulata* has an EPPO quarantine status of A2, having been removed from the A1 list in 2005. It still has a 1A1 status in the EU Plant Health Directive (EPPO, 2005; EU Plant Health Directive 2000/29/EC, 2000).
13. Is the pest widely distributed in the PRA area?	N/A	
14. Does at least one host-plant species (for pests directly affecting plants) or one suitable habitat (for non parasitic plants) occur in the PRA area (outdoors, in protected cultivation or both)?	Yes	The UK has a large number of *Prunus* species that could be affected by this pest, including known hosts: *Prunus avium, P. cerasus, P. mahlab* and *P. serotina*. Some species are particularly widespread, such as the wild or sweet cherry, *Prunus avium*, common in gardens or parks as an ornamental or fruit tree, as well as in deciduous woodland and hedges; and the native *Prunus spinosa* (blackthorn), common in hedgerows, has the potential to act as a wild host. The UK also has *Pyrus communis*, the cultivated pear, and *Pyrus pyraster*, the wild pear (Preston *et al*., 2002). Sweet cherry (*Prunus avium*) cultivars dominate the cultivated cherry industry in the UK. These and the plum and pear growing industries could also be at risk from this pest (Wermund & Fearne, 2000; Brown *et al*., 1989; Lovelidge, 2009).
15. If a vector is the only means by which the pest can spread, is a vector present in the PRA area? (if a vector is not needed or is not the only means by which the pest can spread go to 16)		No vector is required for this organism to spread.
16. Does the known area of current distribution of the pest include ecoclimatic conditions comparable with those of the PRA area or sufficiently similar for the pest to survive and thrive (consider also protected conditions)?	Yes	The pest has a wide distribution range and is found in eastern Canada and north-east USA as well as Germany and coastal areas of the Netherlands, all of which have broadly similar climatic conditions to the UK.

17. With specific reference to the plant(s) or habitats which occur(s) in the PRA area, and the damage or loss caused by the pest in its area of current distribution, could the pest by itself, or acting as a vector, cause significant damage or loss to plants or other negative economic impacts (on the environment, on society, on export markets) through the effect on plant health in the PRA area?	Yes	The UK has widespread potential hosts for *Rhagoletis cingulata*: in the wild, in woodlands and hedgerows, in gardens and parks as ornamental or fruit trees and the commercial fruit growing cherry, plum and pear orchards. Given the nature of the damage caused by *Rhagoletis cingulata* the fruit growing industries would be more at risk than native plantlife. In addition to physical damage the presence of *Rhagoletis cingulata* in the PRA area could have far reaching effects on UK export markets. The UK currently does not have any economically damaging orchard fruit fly pests (Chandler, 1998) and the introduction of one would have a detrimental effect on trade with countries wary of introducing such a pest to their own country.
18. This pest could present a phytosanitary risk to the PRA area.		*Rhagoletis cingulata* could present a risk to the UK. It is a major pest of cherries in the USA and has also established in areas of Europe climatically similar to the UK. It has the potential to infest natural, ornamental and commercial fruit trees in the PRA area and its spread to the UK could not only economically damage fruit crops, but also pose a threat to international trade as no similar orchard fruit fly pests are currently present in the PRA area.
19. The pest does not qualify as a quarantine pest for the PRA area and the assessment for this pest can stop.		

Section 2B: Pest Risk Assessment - Probability of introduction/spread and of potential economic consequences

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		Note: If the most important pathway is intentional import, do not consider entry, but go directly to establishment. Spread from the intended habitat to the unintended habitat, which is an important judgement for intentionally imported organisms, is covered by questions 1.33 and 1.35.
1.1. Consider all relevant pathways and list them		1. **The pest enters the UK in infested fruit from EU – in its larval stage.** 2. **The pest enters the UK in infested fruit from North America – in its larval stage.** 3. **The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from Europe.** 4. **The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from North America.** 5. **The pest enters the UK in fruit associated with a traveller from an area where the pest is known e.g. in a person's bag** 6. **The pest enters the UK on vehicles from an infested area –** unlikely that adults fruit flies would remain on a moving vehicle or that pupae would survive in a wheel tread. 7. **The pest enters the UK on infested plants** – unlikely, as plants are unlikely to be imported when fruiting and any adults on the leaves will have been disturbed by the movement of the plant. 8. **The pest arrives in the UK by natural spread by flying** – unlikely. Rhagoletis species are generally are not known to fly more than a short distance as suitable hosts are normally available in the vicinity of emergence sites (Fletcher, 1989b). Research on the related species *R. indifferens* showed that flight distances were related to adult crowding and that individuals were capable of flights of 3km (Senger *et al*., 2007). However, the closest known establishment of the pest to the UK is on the coast in the Netherlands (Aartsen, 2001), with the North Sea acting as a natural barrier to gradual natural migration. The related European

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		cherry fruit fly, *Rhagoletis cerasi*, has not spread from mainland Europe across this natural barrier.
1.2. Select from the relevant pathways, using expert judgement, those which appear most important. If these pathways involve different origins and end uses, it is sufficient to consider only the realistic worst-case pathways. The following group of questions on pathways is then considered for each relevant pathway in turn, as appropriate, starting with the most important.		The pathways of greatest risk are: 1. **The pest enters the UK in infested fruit from EU – in it's larval stage.** 2. **The pest enters the UK in infested fruit from North America – in it's larval stage.** 3. **The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from Europe.** 4. **The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from North America.** 5. **The pest enters the UK in fruit associated with a traveller from an area where the pest is known e.g. in a person's bag**
Pathway n°: This pathway analysis should be conducted for all relevant pathways	**1.**	**The pest enters the UK in infested fruit from Europe – in its larval stage**
1.3. How likely is the pest to be associated with the pathway at origin taking into account factors such as the occurrence of suitable life stages of the pest, the period of the year?	**Likely – low level of uncertainty**	Cherries are imported into the UK from all over Europe, including from Germany, Hungary and the Netherlands, all of which have reported populations of *Rhagoletis cingulata* (re:Fresh Directory, 2010). Cherries are widely reported to be the pests main hosts and larvae remain inside the fruit for just over a month, emerging when the fruit is ripe to over-ripe. With female *R. cingulata* favouring unripe fruit (Smith, 1984) and fruit being harvested just prior to ripeness, imports of fresh cherries from countries where this pest has been reported are likely to occur when the pest is inside fruit in its larval stage.
1.4. How likely is the concentration of the pest on the pathway at origin to be high, taking into account factors like cultivation practices, treatment of consignments?	**Moderately likely – medium level of uncertainty**	On mainland Europe there are established Integrated Pest Management programmes in place against the native European cherry fruit fly (*Rhagoletis cerasi*). These are concentrated early on in the season, when *R. cerasi* emerges and when the length of effect of the chemicals may be longer. *R. cingulata* emerges later and is active for longer than its European counterpart, reducing the armoury of treatments available as the fruit nears harvest and possibly increasing

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		the chance of adults being able to oviposit and infest the fruit (Kálmán, 2006). This may increase the likelihood of the pest on a pathway into the UK from Europe compared to the European cherry fruit fly. Once infested the fruit shows little change until fully ripe, by which time it may have been picked and graded. However, it is unclear how high the densities of *R. cingulata* are in European orchards. In the Netherlands in 2003 the densities found in orchards were low, while in the natural unmanaged environment they were much higher (EPPO Reporting Service, 2004). In Germany *R. cingulata* has mainly been found in sour cherry orchards and areas where *Prunus mahaleb* and *P. serotina* are present. In some locations it has been estimated that *R. cingulata* has caused more than 20% damage in sour cherries (EPPO, 2010e; Vogt *et al.*, 2008). The concentration may therefore be higher in sour cherries than sweet. The preference for sour cherries however does reduce the chance of the concentration in fresh fruit being high as these are primarily sent for processing.
1.5. How large is the volume of the movement along the pathway?	**Moderate – low level of uncertainty**	See Tables 1 and 2 in Appendix 1. The Eurostat data provided shows that the volume of cherries imported by the UK from the EU varies year on year. In 2009 23.7% (2066 tonnes) of the EU sweet cherry trade was from countries where *R. cingulata* is known to be present as of 2010 (12.1% of total imports for 2009). The volume of sour cherries imported from the EU is much lower, but in 2009 41.7% (328 tonnes) of this came from countries where *R. cingulata* is known to be present as of 2010 (33.5 % of the total imports for 2009).
1.6. How frequent is the movement along the pathway?	**Occasional – low level of uncertainty**	Imports of cherries from abroad coincide with their growing season in the country of origin. From France the period is from May to July, from Hungary June and July, from Germany and the Netherlands from June to August and from Belgium June to September. Supplies during the winter months are sourced from southern hemisphere countries, such as Argentina, Australia, Chile, New Zealand and South Africa, none of which have this particular pest (re:Fresh Directory, 2010). Frequency on the pathway over the whole year must, therefore, be deemed “occasional”, with a peak period over the summer.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.7. How likely is the pest to survive during transport/storage?	**Unlikely to survive in sour cherries, but likely to survive in sweet cherries. Low level of uncertainty**	As cherries are highly perishable handling by marketing companies and distribution to retail depots is rapid, measureable in hours (Wermund & Fearne, 2000). The larvae of some Rhagoletis species are known to be killed when the fruit are stored under cold or controlled atmosphere conditions (Boller & Prokopy, 1976). The shelf life of fresh cherries is only a few days at room temperature so most cherries will either be chilled to extend shelf life (sweet cherries) or processed or frozen within a few hours of harvest (sour cherries), this may limit the survival of the pest even if not discovered (Rieger, 2006). The difference in treatment suggests the larvae are less likely to survive in sour cherries than sweet. Investigations of imported cherries from Europe in the past have shown large numbers of *Rhagoletis cerasi* (the European cherry fruit fly) larvae may enter the UK on imported fresh fruit (Baker, 1991a), so survival in sweet cherries despite procedures during transport does seem likely.
1.8. How likely is the pest to multiply/increase in prevalence during transport /storage?	**Impossible. Low level of uncertainty**	*Rhagoletis cingulata* produces just one generation per year (Compton *et al*., 2005). The pathway does not involve the movement of adults to increase the population during transport and the time spent in transport / storage is of insufficient duration to allow larvae to pupate and pupae to develop into a mature adult, even if conditions allowed this development.
1.9. How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	**Likely – Low level of uncertainty**	There is free movement of produce originating within the EU, so cherries imported from countries where *R. cingulata* is present would not be checked by the UK Plant Health Seeds Inspectorate. In the past the European cherry fruit fly (*R. cerasi*) was intercepted in cherries from mainland Europe (Reid & Malumphy, 2009), but the inspections were reduced and eventually ceased, due in a large part to evidence provided by Charles Baker in his PRA on *R. cerasi* (Baker, 1991a and b) and there have been no recent interceptions.
1.10. In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area?	**Very widely – Low level of uncertainty**	Imported fruit is very widely distributed throughout the UK, to packing houses, wholesale markets, supermarkets and end consumers.
1.11. In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest	**Yes**	The fruit production season in the UK is similar to that in mainland Europe (peak mid July). When larvae in the fruit have completed their development they emerge, dropping to the ground to bore into the soil and pupate. The majority of

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
establishment?		pupae enter diapause and overwinter, developing into adults the following season, with a few pupae remaining dormant for one or two years before emerging, suggesting they could survive even if conditions are not immediately favourable (Compton *et al.*, 2005).
1.12. How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	**Moderately likely – Medium level of uncertainty**	The disposal of unsound fruit gives the highest likelihood of transferring the pest to suitable hosts, with larvae then being able to emerge from the fruit and pupate overwinter in soil. This is highly unlikely to occur at UK packing houses as imported cherries are packed in the country of production and from there distributed to the different retail depots (Wermund & Fearne, 2000). Disposal by retailers or end consumers to either landfill or composting is therefore the most likely route for this pest to transfer. *Rhagoletis spp*. have been documented flying for 3km (Senger, *et al.*, 2007) and given how widespread and common *Prunus spp*., including *Prunus avium* and *P. cerasus* (Preston *et al*., 2002), are in the UK, both in the wild and in parks and gardens, hosts for *R. cingulata* may readily be found throughout the UK. Disposal in the vicinity of orchards would additionally have potential hosts in the cultivated Prunus and Pyrus crops nearby.
1.13. In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	**Moderately likely – Medium level of uncertainty**	The end use of imported fruit would be either processing or consumption, neither of which is likely to aid the transfer of the pest to a suitable host, and both of which make its destruction, even without detection, likely. However, in the UK we do throw away a significant percentage of food without consumption and disposal of fruit into a garden compost heap, or amenity landfill, near to cultivated or wild hosts could allow the transfer of the pest to a suitable host. This disposal may aid transfer of the pest, as discussed in 1.12.
1.14. Do other pathways need to be considered?	**Yes**	
Pathway n°: **This pathway analysis should be conducted for all relevant pathways**	**2.**	**The pest enters the UK in infested fruit from North America – in its larval stage**

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.3. How likely is the pest to be associated with the pathway at origin taking into account factors such as the occurrence of suitable life stages of the pest, the period of the year?	**Likely – Low level of uncertainty**	Cherries are imported into the UK from Canada, the USA and occasionally Mexico all of which have reports of *Rhagoletis cingulata* (see Appendix 1). At peak times of the year for imports the pest is likely to be in its larval stage within the fruit (re:Fresh Directory, 2010), the fruit being harvested either ripe (for sour cherries intended for processing – with ethylene being used about two weeks before harvest to increase the percentage of ripe fruit) or just prior to ripe (for sweet cherries) (Rieger, 2006)
1.4. How likely is the concentration of the pest on the pathway at origin to be high, taking into account factors like cultivation practices, treatment of consignments?	**Unlikely – Low level of uncetainty**	*Rhagoletis cingulata* is one of the most significant direct pests of cherries in the eastern USA and eastern Canada. There is a zero tolerance approach to damage on fruit for the fresh market and processed cherries, with most growers applying preventative sprays to control the pests (Compton *et al.*, 2005). There are no known UK or EU interceptions of *Rhagoletis cingulata* from North America. In fact EUROPHYT has no records of EU interceptions of North American *Rhagoletis spp.*, the first notifications being 1994 (Reid & Malumphy, 2009; EUROPHYT PHY, 2011).
1.5. How large is the volume of the movement along the pathway?	**Moderate – Low level of uncertainty**	See Tables 1 and 2 in Appendix 1 In 2009 the UK imports of sweet cherries from North America (3189 tonnes) made up 38.2% of the import trade from outside of the EU (18.6% of the total imports for 2009). By contrast UK imports of sour cherries from North America were only 1.2 tonnes, 0.62% of the import trade from outside of the EU (0.12% of the total imports for 2009).
1.6. How frequent is the movement along the pathway?	**Occasional – Low level of uncertainty**	From the USA cherry imports occur from April till August, from Canada imports occur from June till August and on the recorded occasion of import from Mexico this was in August. Frequency on the pathway over the whole year must, therefore, be deemed “occasionally”, with a peak period over the summer (re-Fresh Directory, 2010).
1.7. How likely is the pest to survive during transport/storage?	**Moderately likely – Medium level of uncertainty**	Few sour cherries are imported from North America and those that are are likely to be processed or frozen (Reiger, 2006). Sweet cherries are likely to be chilled to extend shelf life (Rieger, 2006) and the duration of transport of cherries from the North America is likely to be longer than that from Europe. This extended period of refrigeration may have an effect on the survival of larvae within the fruit, with larval mortality known to occur in other Rhagoletis species when infested fruit is

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		stored under cold or controlled atmosphere conditions (Boller & Prokopy, 1976). How much longer this period of transport may be and how significant the extra time spent refrigerated is unclear, but as cherries are highly perishable handling by marketing companies and distribution to retail depots is rapid, (Wermund & Fearne, 2000).
1.8. How likely is the pest to multiply/increase in prevalence during transport /storage?	**Impossible – Low level of uncertainty**	*Rhagoletis cingulata* produces just one generation per year (Compton, *et al.*, 2005). The pathway does not involve the movement of adults to increase the population during transport and the time spent in transport / storage is of insufficient duration to allow larvae to pupate and pupae to develop into a mature adult, even if conditions allowed this development.
1.9. How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	**Unlikely – Low level of uncertainty.**	Cherries, being *Prunus spp*., originating from third countries like those in North America, are subject to Additional Declarations on the Phytosanitary Certificate and are checked at point of entry into the EU (pers comm. from UK PHSI). There are no records of North American *Rhagoletis spp.* being intercepted in the EU since EUROPHYT records began in 1994 (EUROPHYT PHY, 2011) and only one unidentified Tephritidae. UK records of *Rhagoletis spp*. show interceptions of the apple maggot fly (*Rhagoletis pomonella*) from the USA in 1926, 1927 and 1929, but nothing since (Reid & Malumphy, 2009).
1.10. In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area?	**Very widely – Low level of uncertainty**	Imported fruit is very widely distributed throughout the UK, to packing houses, wholesale markets, supermarkets and end consumers.
1.11. In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest establishment?	**Yes**	The fruit production season in the UK coincides with imports from North America. When larvae in the fruit have completed their development they emerge, dropping to the ground to bore into the soil and pupate. The majority of pupae enter diapause and overwinter, developing into adults the following season, with a few pupae remaining dormant for one or two years before emerging, suggesting they could survive even if conditions are not immediately favourable (Compton *et al.*, 2005).

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.12. How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	**Moderately likely – Medium level of uncertainty**	The disposal of unsound fruit gives the highest likelihood of transferring the pest to suitable hosts, with larvae then being able to emerge from the fruit and pupate overwinter in soil. This is highly unlikely to occur at UK packing houses as imported cherries are packed in the country of production and from there distributed to the different retail depots (Wermund & Fearne, 2000). Disposal by retailers or end consumers to either landfill or composting is therefore the most likely route for this pest to transfer. *Rhagoletis spp*. have been documented flying for 3km (Senger, *et al.*, 2007) and given how widespread and common *Prunus spp*., including *Prunus avium* and *P. cerasus* (Preston *et al*., 2002), are in the UK, both in the wild and in parks and gardens, hosts for *R. cingulata* may readily be found throughout the UK. Disposal in the vicinity of orchards would additionally have potential hosts in the cultivated Prunus and Pyrus crops nearby.
1.13. In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	**Moderately likely – Medium level of uncertainty**	The end use of imported fruit would be either processing or consumption, neither of which is likely to aid the transfer of the pest to a suitable host, and both of which make its destruction, even without detection, likely. However, in the UK we do throw away a significant percentage of food without consumption and disposal of fruit into a garden compost heap, or amenity landfill, near to cultivated or wild hosts could allow the transfer of the pest to a suitable host. This disposal may aid transfer of the pest, as discussed in 1.12.
1.14. Do other pathways need to be considered?	**Yes**	
Pathway n°: **This pathway analysis should be conducted for all relevant pathways**	**3.**	**The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from Europe.**
1.3. How likely is the pest to be associated with the pathway at origin taking into account factors such as the occurrence of suitable life stages of the pest, the period of the year?	**Moderately likely – Medium level of uncertainty.**	*Rhagoletis cingulata* larvae mature when the fruit is either ripe or over ripe and when this occurs they drop to the ground to pupate. Plants for planting may, therefore, potentially carry the pupae with them in associated soil or packaging. Soil associated with plants from the EU is unregulated in Plant Health legislation. Italy and the Netherlands are among the biggest exporters of fruit trees to the UK (Peter Reed, Fera, pers. comm.). The pest is known to be established in the Netherlands, and although reports in Italy itself have not been confirmed, it is

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		known to be established in Switzerland close to the Italian border (Merz, 1991; Boller & Mani, 1994).
1.4. How likely is the concentration of the pest on the pathway at origin to be high, taking into account factors like cultivation practices, treatment of consignments?	**Unlikely – High level of uncertainty**	The plants of concern would be root balled or potted plants rather than bare root. Prunus plants for orchard planting are most likely to be maidens and will not have fruited, reducing the chance of pupae being associated with them. Ornamental Prunus could, potentially be any age. The levels, if any, of the pest in nurseries exporting to the UK is unknown, as is details regarding the proportions of imports which are maidens compared to older trees.
1.5. How large is the volume of the movement along the pathway?	**Moderate – High level of uncertainty**	There is very little information available for the movement of fruit trees or types of fruit trees into the UK.
1.6. How frequent is the movement along the pathway?	**Occasional – Moderate level of uncertainty**	There is very little information on the movement of fruit trees into the UK, but the primary time of year is likely to be the autumn for autumn / winter planting.
1.7. How likely is the pest to survive during transport/storage?	**Likely – Low level of uncertainty**	Pupae, in the packaging or soil surrounding the roots of an imported plant, would probably survive transport intact.
1.8. How likely is the pest to multiply/increase in prevalence during transport /storage?	**Impossible. Low level of uncertainty**	*Rhagoletis cingulata* produces just one generation per year. The pathway does not involve the movement of adults to increase the population during transport and the time spent in transport / storage is of insufficient duration to allow pupae to develop into a mature adult, even if conditions allowed this development.
1.9. How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	**Likely – Low level of uncertainty**	Imports of Prunus plant material both from outside and within Europe will be subject to plant health inspection at origin before the issue of either a phytosanitary certificate or plant passport respectively. However, material originating within Europe will not be inspected for IAI EU listed pests such as *Rhagoletis cingulata*, and pupae are likely to escape detection in the soil.
1.10. In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area?	**Very widely distributed – Low level of uncertainty**	Imported plants could be very widely distributed: to garden centres, wholesalers, individual gardens (end customers) or commercial orchards.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.11. In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest establishment?	**Yes**	The primary time of year for plant consignments is likely to be Autumn for Autumn / Winter planting. The majority of pupae will be in diapause and overwinter, developing into adults the following season, with a few pupae remaining dormant for one or two years before emerging, suggesting they could survive even if conditions are not immediately favourable (Compton *et al.*, 2005). If plants are planted, either directly outside or into pots there is no reason why the pupae would not be able to complete their development.
1.12. How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	**Very likely – low level of uncertainty**	The pest has travelled with the host and if it survives and emerges from dormancy there will be the imported plant and possibly others planted nearby to act as hosts.
1.13. In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	**Very likely – low level of uncertainty**	The end use of this commodity is the plants being planted, most likely either in a garden, park or orchard. If the plants are planted in suitable conditions and pupae still intact the pest is likely to be able to emerge at the appropriate time of year and find a suitable host. However, there are no records of any outbreaks of *R. cerasi* (European cherry fruit fly), which could potentially be transported by the same pathway.
1.14. Do other pathways need to be considered?	**Yes**	
Pathway n°: **This pathway analysis should be conducted for all relevant pathways**	**4.**	**The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from North America.**

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.3. How likely is the pest to be associated with the pathway at origin taking into account factors such as the occurrence of suitable life stages of the pest, the period of the year?	**Unlikely – low level of uncertainty**	*Rhagoletis cingulata* larvae mature when the fruit is either ripe or over ripe and when this occurs they drop to the ground to pupate. Plants for planting may, therefore, potentially carry the pupae with them in associated soil or packaging. There is very little import of fruit trees from North America (Peter Reed, Fera, pers. comm.). Also the EU Plant Health Directive restricts the import of soil from most non-European countries, including those in North America, to that necessary to sustain the plants vitality, and stipulates measures to ensure any growing medium is free from harmful organisms, such as plants being transplanted from soil into compost.
1.4. How likely is the concentration of the pest on the pathway at origin to be high, taking into account factors like cultivation practices, treatment of consignments?	**Unlikely – low level of uncertainty**	The plants of concern would be root balled or potted plants rather than bare root. The EU Plant Health Directive stipulates measures to ensure any growing medium associated with plants is free from harmful organisms and *Rhagoletis cingulata* is listed as a 1A1 pest as a non-European Tephritidae.
1.5. How large is the volume of the movement along the pathway?	**Minimal – High level of uncertainty**	There is very little information available for the movement of fruit trees or types of fruit trees into the UK, but there is believed to be very little import from North America (Peter Reed, Fera, pers. comm.).
1.6. How frequent is the movement along the pathway?	**Rare – Medium level of uncertainty**	There is very little information on the movement of fruit trees into the UK, but the primary time of year is likely to be the autumn for autumn / winter planting.
1.7. How likely is the pest to survive during transport/storage?	**Likely – Low level of uncertainty**	Pupae, in the packaging or soil surrounding the roots of an imported plant, would probably survive transport intact.
1.8. How likely is the pest to multiply/increase in prevalence during transport /storage?	**Impossible. Low level of uncertainty**	*Rhagoletis cingulata* produces just one generation per year. The pathway does not involve the movement of adults to increase the population during transport and the time spent in transport / storage is of insufficient duration to allow pupae to develop into a mature adult, even if conditions allowed this development.
1.9. How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	**Unlikely – medium level of uncertainty**	Imports of Prunus plant material both from outside and within Europe will be subject to plant health inspection at origin before the issue of either a phytosanitary certificate or plant passport respectively. In North America there is a low tolerance for this pest in produce and material entering the EU will need to

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		have been certified as being free of IAI EU listed pests such as *Rhagoletis cingulata*.
1.10. In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area?	**Very widely distributed – Low level of uncertainty**	Imported plants could be very widely distributed: to garden centres, wholesalers, individual gardens (end customers) or commercial orchards.
1.11. In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest establishment?	**Yes**	The primary time of year for plant consignments is likely to be Autumn for Autumn / Winter planting. The majority of pupae will be in diapause and overwinter, developing into adults the following season, with a few pupae remaining dormant for one or two years before emerging, suggesting they could survive even if conditions are not immediately favourable (Compton *et al.*, 2005). If plants are planted, either directly outside or into pots there is no reason why the pupae would not be able to complete their development.
1.12. How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	**Very likely – low level of uncertainty**	The pest has travelled with the host and if it survives and emerges from dormancy there will be the imported plant and possibly others planted nearby to act as hosts.
1.13. In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	**Very likely – low level of uncertainty**	The end use of this commodity is the plants being planted, most likely either in a garden, park or orchard. If the plants are planted in suitable conditions and pupae still intact the pest is likely to be able to emerge at the appropriate time of year and find a suitable host.
1.14. Do other pathways need to be considered?	**Yes**	
Pathway n°: **This pathway analysis should be conducted for all relevant pathways**	**5.**	**The pest enters the UK in fruit associated with a traveller from an area where the pest is known e.g. in a person's bag**

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.3. How likely is the pest to be associated with the pathway at origin taking into account factors such as the occurrence of suitable life stages of the pest, the period of the year?	**Moderately likely - high level of uncertainty**	The pathway involves the carriage of infested fruit by a traveller into the UK and therefore involves the purchase of this fruit in the country of origin. This fruit is most likely to be fresh sweet cherries, sour cherries usually being frozen or processed (Rieger, 2006). In the USA in particular there is a zero tolerance approach to this pest and the likelihood of the fruit being bought by a consumer being infested is low (Compton *et al.*, 2005), but it is possible that this pathway was the means of entry into Europe at a time when standards were less stringent or that infested fruit bought in Mexico, where some infestation may be tolerated, could still be brought in. In Europe, where fewer chemicals are available to control this pest (Kálmán, 2006) the chance may be higher, but there is currently little data on levels of infestations in sweet cherry orchards in Europe. The information that does exist suggests that sour cherries are more favoured (Vogt *et al*., 2008).
1.4. How likely is the concentration of the pest on the pathway at origin to be high, taking into account factors like cultivation practices, treatment of consignments?	**Unlikely – moderate level of uncertainty**	Despite the few chemicals used in European cherry orchards during the part of the season when *Rhagoletis cingulata* will emerge, concentration of fruit flies on the pathway is unlikely to be high as levels of infestations in sweet cherry orchards are lower than those which have been recorded in wild cherries or sour cherry orchards (EPPO Reporting Service, 2004; Vogt *et al*., 2008). In North America, where more chemicals are available, high concentrations on the pathway are even less likely.
1.5. How large is the volume of the movement along the pathway?	**Minor – high level of uncertainty**	In 2010, the UK received an estimated 29.8 million overseas visitors of which 20.3 million were from the EU27. Of these overseas visitors, 72% arrived by air, 15% by sea and 13% by the Channel tunnel – with the highest numbers travelling between April and September (Barnes & Smith, 2009; Eyre, 2011). The numbers of these travellers bringing in fresh cherries potentially infested with *R. cingulata* is unknown – but is likely to be minor at worst.
1.6. How frequent is the movement along the pathway?	**Occasional – low level of uncertainty**	The frequency of movement will be based on the seasonality of fresh cherries and is likely to be limited to late Spring and Summer (re:Fresh Directory, 2010). Occasional, with a peak period over the Summer.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.7. How likely is the pest to survive during transport/storage?	**Very likely – low level of uncertainty**	Fruit transported by international passengers is not inspected and is transported quickly straight from source. The only danger to the pest during this time may be being accidentally eaten.
1.8. How likely is the pest to multiply/increase in prevalence during transport /storage?	**Impossible. Low level of uncertainty**	*Rhagoletis cingulata* produces just one generation per year. The pathway does not involve the movement of adults to increase the population during transport and the time spent in transport / storage is of insufficient duration to allow pupae to develop into a mature adult, even if conditions allowed this development.
1.9. How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	**Likely – low level of uncertainty**	There are no current management procedures for checking whether fruit or other plant material and associated pests are being brought into the UK by travellers. There may be searches of baggage, but not specifically linked to plant health.
1.10. In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area?	**Very widely – low level of uncertainty**	Fruit brought into the UK with travellers could potentially be taken anywhere within the UK, whether they are UK citizens returning from abroad or visitors.
1.11. In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest establishment?	**Yes**	The fruit production season in the UK coincides with that in countries where *R. cingulata* is known to be present. When larvae in the fruit have completed their development they emerge, dropping to the ground to bore into the soil and pupate. The majority of pupae enter diapause and overwinter, developing into adults the following season, with a few pupae remaining dormant for one or two years before emerging, suggesting they could survive even if conditions are not immediately favourable (Compton *et al.*, 2005).
1.12. How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	**Moderately likely – Medium level of uncertainty**	The disposal of uneaten or unsound fruit to either landfill or composting gives the highest likelihood of transferring the pest to suitable hosts, with larvae then being able to emerge from the fruit and pupate overwinter in soil. *Rhagoletis spp*. have been documented flying for 3km (Senger, *et al.*, 2007) and given how widespread and common *Prunus spp*., including *Prunus avium* and *P. cerasus* (Preston *et al*., 2002), are in the UK, both in the wild and in parks and gardens, hosts for *R. cingulata* may be readily found throughout the UK. Disposal in the vicinity of orchards would additionally have potential hosts in the cultivated Prunus and

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		Pyrus crops nearby.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.13. In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	**Moderately likely – Medium level of uncertainty**	The end use of fruit brought in by travellers would be either consumption or disposal. Disposal of fruit into a garden compost heap, or amenity landfill, near to cultivated or wild hosts could allow the transfer of the pest to a suitable host. This disposal may aid transfer of the pest, as discussed in 1.12.
1.14. Do other pathways need to be considered?	**No**	
Conclusion on the probability of entry. **Risks presented by different pathways.**	**Highest risk: Pathway 1 – import of fruit from EU Moderate likelihood of entry. Moderate level of uncertainty** **Pathway 2 – Unlikely to enter, Moderate uncertainty.** **Pathway 3 Unlikely, high level of uncertainty** **Pathway 4 –**	**Pathway 1: The pest enters the UK in infested fruit from EU – in its larval stage** Moderate likelihood of entry of pest associated with sweet cherries imported from EU, as even though fruit may be chilled to prolong shelf life other cherry fruit flies (*R. cerasi*) have been found on imported cherries in the past. Very unlikely that pest will enter associated with sour cherries due to processing or freezing. Sour cherries from the EU will therefore no longer be considered as part of this pathway. Most risk of transfer to hosts through the disposal of fruit by retailers or consumers. Hosts in UK widespread. **Pathway 2: The pest enters the UK in infested fruit from North America – in its larval stage** Unlikely that pest will enter associated with sweet cherries due to zero tolerance of this pest in North America and cooling for transport. Uncertainty is given as moderate only due to the pest having entered the EU at least once before (see pest distribution), pathway for this being unknown. Very unlikely (low uncertainty) that pest will enter associated with sour cherries due to processing or freezing. Sour cherries from North America will therefore no longer be considered as part of this pathway. **Pathway 3: The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from Europe.** Pest unlikely to enter with an already fruited plant, the risk being higher with

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
	Unlikely to enter, low uncertainty **Highest risk: Pathway 5 – fruit brought in by travellers Moderate likelihood of entry. Moderate level of uncertainty**	ornamentals more than orchard stock which would be maidens, but there are no records of outbreaks of *R. cerasi* which could potentially enter through the same pathway. High level of uncertainty due to the unknowns of quantities and origins of hosts involved. **Pathway 4: The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from North America.** Pest unlikely to be associated with plants for planting from North America due to the status of this pest in the EU and current phytosanitary measures in place controlling the movement of Prunus plant material. Low uncertainty. **Pathway 5: The pest enters the UK in fruit associated with a traveller from an area where the pest is known e.g. in a person's bag.** Pest most likely to be associated with fresh sweet cherries bought in a country where the pest is known to be present and brought into the UK in the baggage of travellers. Greatest risk is likely from countries where tolerance level to damage on the fruit before sale is less stringent than the current zero tolerance approach of the USA. Most risk of transfer to hosts through the disposal of fruit by travellers. Hosts in UK widespread

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.15. Estimate the number of host plant species or suitable habitats in the PRA area (see question 6).	**Moderate number: Low level of uncertainty.**	The commercial cherry growing industry is currently quite small, with the total area covered by cherries in 2009 being 478ha (DEFRA, 2010). However cherry production appears to be gradually expanding, with the increasing planting of dwarf varieties with better yield potential and which are more accessible for fruit picking, and the use of protective covers and anticracking agents to increase fruit quaility (Lovelidge, 2009). Between 2007 and 2009 the area increased by 7% (DEFRA, 2010). It is primarily sweet cherries that are grown commercially in the UK, and suggestions have been made that *R. cingulata* prefers sour cherries, *P. cerasus* (Compton *et al.,* 2005; Vogt *et al.*, 2008), although there may also be a link with the level of insecticide usage (Vogt *et al*., 2008). However, both *P. avium* and *P. cerasus* are widespread in the UK in hedgerows, woodlands and gardens (Preston *et al*., 2002) and there are also other potential hosts for the pest in the UK, in the plum and pear commercial orchards and wild growing *Prunus spp.*
1.16. How widespread are the host plants or suitable habitats in the PRA area? (specify)	**Widely distributed: Low level of uncertainty.**	The main commercial cherry growing area is the south-east, with 80% of the cherry area grown here, of which the majority is in Kent. In addition cherries are grown in the west midlands (9%), south-west (7%) and East Anglia (4%) (Garthwaite, D.G pers. comm.). It is these regions where there would be concentrated pockets of hosts available. *Prunus spp.* including *P. avium* and *P. cerasus* are, however, widely distributed across the UK (Preston *et al.*, 2002). It is unknown how good a host the widely distributed native species *P. spinosa* (blackthorn) is. There is no data from Europe on its infestation. In Germany and the Netherlands the main wild host seems to be the introduced *P. serotina*, its wild host in native North America (Vogt, *et al*., 2008; Steeghs, 2003). This is not widespread in the UK, though it is quite common in the south-east (BSBI, 2010).
1.17. If an alternate host or another species is needed to complete the life cycle or for a critical stage of the life cycle such as transmission (e.g. vectors), growth (e.g. root symbionts), reproduction (e.g. pollinators) or spread (e.g. seed dispersers), how likely is the pest to come in contact		N/A

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
with such species?		
1.18. How similar are the climatic conditions that would affect pest establishment, in the PRA area and in the current area of distribution?	**Slightly similar: High level of uncertainty.**	Initial comparison of the UK and the pests' native north-eastern USA and eastern Canada, as well as established habitats in Germany and the Netherlands, suggest that climatic conditions in the current area of distribution are largely similar to those in the UK (Kottek *et al*., 2006). In particular the establishment of the pest in the natural environment in coastal areas of the Netherlands suggests that areas of the UK would be climatically suitable. These dutch findings, however, are considered to be of very limited distribution and always have a connection with *P. serontina*, the north American native host for this pest (Aartsen van, 2001; EPPO Reporting Service, 2004; Bartlett, 2009) and while this species is found in the UK, it is not widespread, concentrations being highest in the south-east (BSBI, 2010). The European native, *Rhagoletis cerasi*, has a wide geographic range from the Mediterranean to southern Norway (CABI CPC, 2011). *Rhagoletis cingulata,* however, has slightly higher optimum temperatures for egg laying (24°C-29°C for *R. cingulata* compared to 22°C-23°C for *R. cerasi*, Baker, 1991a; Compton *et al.*, 2005). Also, although *R. cingulata* has a lower developmental threshold temperature (Jubb & Cox, 1974) than the range found in different populations of *R. cerasi* (Baker & Miller, 1978; Fletcher, 1989a), the species does require longer periods of raised temperatures to complete development and emerges later in the season (See Annex II). This may restrict its spread into the more northern areas of the range of *R. cerasi*. In terms of the UK, average temperature data from between 1971 and 2000 also suggests a restriction, with maximum temperatures falling short of the optimum temperatures for egg laying for both fruit fly species, even in the south-east (Met. Office, 2011; Baker, 1991b). This factor has been considered key in the failure of the European cherry fruit fly to establish in the UK (Baker, 1991a). Even with recent rises in average temperatures suitable conditions may only be present in the PRA area for short periods of time, the UK having a maritime rather than continental climate. Further climatic changes may alter this.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		Another limiting factor may be precipitation as normally a rainfall sufficient to wet the upper inch of soil is required before *R. cingulata* emerge (Michigan State University, 1998). Extended drought periods are unfavourable and though unlikely to happen consistently in the UK may be simulated by the use of protective covers on cherry crops to protect them from birds and cracking due to rain. These are becoming more popular in the UK with the increase in dwarf cherry varieties (Lovelidge, 2009) and there are suggestions from the USA that tunnels may help prevent cherry fruit fly infestations (Lang *et al.*, 2007). Based on all the evidence the climate in the UK could be considered as suitable for establishment some years and mainly in the south-east.
1.19. How similar are other abiotic factors that would affect pest establishment, in the PRA area and in the current area of distribution?	**Completely similar: Low level of uncertainty**	No other abiotic factors that might limit the pests' distribution have been identified.
1.20. If protected cultivation is important in the PRA area, how often has the pest been recorded on crops in protected cultivation elsewhere?	**Never: Moderate level of uncertainty.**	Cherries are a highly perishable crop, at risk from birds and adverse weather conditions. In the UK dwarf varieties have become more popular and growers have come up with different kinds of protective covers to be used over these smaller trees, including metal poles and hoops and tent systems. These are not protected crops in the strict sense though, usually going on for a few weeks when the fruit begins to ripen (Kendell, 2007). Such systems are also used in the USA and Europe. There are also growers who have started entirely covering their cherry crops, using tunnels or permanent greenhouse like structures (Hansen, 2005). Protected cultivation is, therefore, increasingly important in both the UK and elsewhere. As yet there is no information on *Rhagoletis cingulata* being recorded in protected cultivation, indeed there have been some suggestions from the USA that tunnels may help prevent cherry fruit fly infestations (Lang, *et al.*, 2007). There is no biological reason why the fruit flies could not enter protected cultivation and cause damage, but it is possible the lack of rain may be unfavourable to adult development in the soil.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.21. How likely is it that establishment will occur despite competition from existing species in the PRA area, and/or despite natural enemies present in the PRA area ?	**Very likely that establishment would occur despite competition or natural enemies, low level of uncertainty.**	There would be no competition from other fruit flies in the UK (Reid & Malumphy, 2009). Currently the main insect pests of cultivated cherries are aphids (Garthwaite *et al*., 2008). In the USA, *Rhagoletis cingulata* is attacked by several parasitoids, of which the braconid wasp, *Opius ferrugineus* is considered the most important. Parasitism can reach up to 50% of the flies breeding in native wild cherries, but less than 3% in cultivated cherries, which are larger and afford the larvae better protection (Compton *et al*, 2005). The wasp, therefore, does not provide acceptable control in commercial orchards, but may be of use in reducing populations in wild hosts (Boller & Prokopy,1976). In the UK there are many *Opius* species, though *Opius ferrugineus* is not listed in Kloet & Hinks, (1975), and it is not known if any would parasitise this fruit fly pest. There is less information on predators. The European cherry fruit fly is known to be predated on by ants, which will attack the larvae as they drop from the fruit as well as emerging adults and the pupae may be destroyed in the soil itself by unidentified mites (Boller & Prokopy, 1976). Other potential predators include birds, which are known to cause heavy damage to cherries in northern and central Europe (Baker, 1991a) and which have the potential to reduce fruit fly populations in wild hosts, although cultivated cherries are likely to be more protected. None of these are likely to prevent establishment.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.22. To what extent is the managed environment in the PRA area favourable for establishment?	**Favourable, low level of uncertainty.**	Commercial orchards are mainly sweet cherries (*P. avium*), a documented major host, although experience elsewhere in Europe, suggests not the favourite host (Vogt *et al*., 2008; EPPO Reporting Service, 2004). *P. cerasus*, sour cherries may be more common in gardens, parks and growing wild, as is its wild host from the USA, *P. serotina*. Hosts will all be established plants in many cases with more than one host in the area and with the ground remaining largely undisturbed around the trees, thus facilitating the development of the pupal life stage. The harvest time in commercial orchards in the UK is also largely similar to that in the USA and Europe, mid June – mid July in Kent and mid July – mid August in Hereford (Lovelidge, 2007a). If commercial cherry crops are abandoned due to splitting this would also favour establishment, but this appears to be rare in the UK (Baker, 1991a). The amenity cherries in gardens and parks would be a better source of cherries which are allowed to remain in situ.
1.23. How likely is it that existing pest management practice will fail to prevent establishment of the pest?	**Likely, medium level of uncertainty.**	No fruit fly pests of cherries are known in the UK so there are no existing pest management practices for this pest (Reid & Malumphy, 2009). It is possible that the current use of aphicides (Garthwaite *et al.*, 2008) may have a negative effect on its establishment potential, but not all cultivated cherry crops are treated and trees in parks, gardens and in the wild would certainly not be.
1.24. Based on its biological characteristics, how likely is it that the pest could survive eradication programmes in the PRA area?	**Likely to survive eradication, medium level of uncertainty.**	As there are no other fruit flies which are established on cherries in the UK, if it appeared in commercial orchards the pest is likely to be noticed as unusual, even at low densities. It is less likely to be noticed on wild hosts and so could survive an eradication programme here and may then be able to reinfest commercial orchards. In the Netherlands the presence of *Rhagoletis cingulata* on *P.serotina* in the natural environment has led to the conclusion that eradication is impossible (Steeghs, 2003).
1.25. How likely is the reproductive strategy of the pest and the duration of its life cycle to aid establishment?	**Unlikely to aid establishme nt: Medium level of uncertainty**	*Rhagoletis cingulata* is sexually reproductive and has one generation a year, which means that in order for establishment to occur both males and females would need to enter the UK in the same area and be able to locate each other during the short time the adults are active (16-40 days, depending on temperature, Compton *et al*., 2005). The pupae overwinter in the soil and adult flies emerge late spring, early summer. A small percentage of pupae are known to remain dormant for one or two years before emerging (Compton *et al*., 2005),

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		which may aid establishment if climatic conditions were not favourable one year, but were the next. There is then a preoviposition period of 5-10 days before the eggs are laid when adult flies spend time foraging on the fruit and mating and this would be the period when the flies are most vulnerable to control. Once the eggs have been deposited, the larvae themselves would be hard to eliminate, being in the protection of the fruit and after the larvae emerges it drops to the ground and bores into the soil to pupate where it is again protected (Compton *et al*., 2005).

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.26 How likely are relatively small populations to become established?	**Moderately likely: Medium level of uncertainty.**	If the pest was to enter the UK relatively small populations could become established unnoticed in the wild. If the pest established in a park, commercial orchard or garden it is more likely to be noticed as unusual, there being no similar fruit fly pests in the UK. The uncertainty lies in how big a population would be needed. As discussed above, both males and females would need to be present in the same area at the same time.
1. 27 How adaptable is the pest?	**Adaptability is low: Low level of uncertainty.**	*Rhagoletis cingulata* is known to infest plants other than cherries, but mostly within the genus *Prunus* (See stage 1, no. 6). In North America it did extend its host range from the native *P. serotina*, to the introduced *P. avium* and *P.cerasus* (Teixeira *et al*., 2007), and is known to cause particular damage to *P. cerasus* in Germany (Vogt *et al*., 2008), but reports from Europe suggest it still has a strong preference for *P. serotina* (EPPO Reporting Service, 2004). Its widespread distribution across eastern USA and Canada does suggest it can occur in a wide range of climatic habitats, although this may again be linked to the native host, *P.serotina* (Teixeira *et al*., 2009) and the pest is known to have slightly different flight periods and maturity timings in neglected compared to managed orchards (Teixeira *et al*., 2007; Texeira *et al*., 2009). However, despite the slightly lower threshold temperature the pest also requires a much higher number of degree days for adult emergence than its European counterpart, *Rhagoletis cerasi*, (See Appendix II), and unlike this species, there are no records of separate races (northern and southern for *R. cerasi* (Baker & Miller, 1978) which could increase its adaptability. It has also been noted that extended periods of drought cause irregular fly emergence (Michigan State University, 1998). There is no evidence of pesticide resistance.
1.28. How often has the pest been introduced into new areas outside its original area of distribution? (specify the instances, if possible)	**Very rarely: Low level of uncertainty.**	*Rhagoletis cingulata* is believed to have been introduced only once outside it's native North America, to Europe, and assuming a single introduction, has since spread slowly around central Europe. The first recorded capture was in Switzerland in the 1980's, though this may not be the initial introduction area. The method of introduction is unknown, the most likely sources from the above analysis being imported fruit or fruit carried over by travellers. There is some speculation that the fruit fly was accidentally introduced around the time of the Second World War (Paul Bartlett, pers. comm.).

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
1.29. If establishment of the pest is very unlikely, how likely are transient populations to occur in the PRA area through natural migration or entry through man's activities (including intentional release into the environment)?	**Likely: Low level of uncertainty.**	*Rhagoletis cerasi*, the European fruit fly, has never established in the UK, despite its wide climatic range in Europe. However, *R. cerasi* is occasionally imported into the UK (Dipterists Forum, 2008; Reid & Malumphy, 2009) and it is likely that *Rhagoletis cingulata* could transiently occur in the UK at the same level.
Conclusion on the probability of establishment	**Low – Medium level of uncertainty**	**The overall probability of establishment is currently low.** Environmental conditions are likely to be favourable only in some years and only in parts of the UK where there is the highest concentration of hosts (the south-east). The highest risk of establishment is in the wild and gardens and parks where there are a range of host *Prunus spp.* Cultivated crops are also at risk, but may be less favoured. Transient or small localised populations are the most likely, but are dependent on both male and female fruit flies arriving in the same area and locating each other. The European native cherry fruit fly *R. cerasi*, is an occasional import and has, to date, been unable to establish in the UK. *Rhagoletis cingulata* requires slightly higher temperatures for development and would seem to be less adaptable than the European species. The level of uncertainty is given as medium as in the longer term changing environmental conditions, i.e. warmer summers, may enable this pest to establish more successfully.
1.30. How likely is the pest to spread rapidly in the PRA area by natural means?	**Unlikely: Low level of uncertainty.**	*Rhagoletis sp.* are, in general, not known to fly more than a short distance, as hosts are usually found in the immediate vicinity of emergence sites (Fletcher, 1989b). There are records of some species travelling up to 1.5 km in search of hosts if released outside an orchard (Fletcher, 1989b), but although there may also be potential for wind dispersal, the fact that the pest is known to have been present in central Europe for over twenty years and has not been found more widely distributed suggests this type of movement is uncommon and most likely if there was a lack of suitable hosts on emergence (Boller & Prokopy, 1976).

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		However, although this means that the expansion of an infested region is likely to be slow, there are widely distributed potential hosts in the UK and no significant natural barriers to the expansion of its range other than climatic conditions.
1.31. How likely is the pest to spread rapidly in the PRA area by human assistance?	**Likely: Low level of uncertainty.**	Unintentional dispersal along transport routes on vehicles or machinery is unlikely to cause the movement of large quantities of pests. The human assisted movement of infested fruit or infested trees around the UK has the potential to be much more damaging in terms of spreading the pest over a wider area and the potential of their being larger numbers and a more consistent process via which the pest could travel. Most likely means of spread in Europe.
1.32. Based on biological characteristics, how likely is it that the pest will not be contained within the PRA area?	**Likely: Medium level of uncertainty.**	*Rhagoletis cingulata* is a flying pest, and although not likely to fly long distances in one go, has the potential to move from host to host throughout fruit growing areas and wild host populations, with no significant natural barriers to the expansion of its range other than climatic conditions. Its larval and pupal stages are more likely to be contained in an area, but because they are associated directly with the host, they are more likely to be inadvertently moved from an infested area.
Conclusion on the probability of spread	**Likely: Medium level of uncertainty**	Overall it is likely that the pest will spread in the UK, the only constraint to the expansion of its range from an introduction site being suitable climate as potential hosts (*P. avium* and *P.cerasus*) are widespread.
Conclusion on the probability of introduction and spread **The overall probability of introduction and spread should be described. The probability of introduction and spread may be expressed by comparison with PRAs on other pests.**	**Unlikely: Moderate level of uncertainty**	The greatest probability for entry is from fresh fruit either shipped in from countries where the pest is present, or carried by travellers in their luggage. The risk of introduction from North America is low. It is assumed that there has only been one such introduction, to mainland Europe and there are few interceptions of this pest due to control measures at source and storage during transport. Fruit being brought in with travellers may be the highest risk, particularly from Mexico, where tolerance of imperfect fruit may be higher than the USA and Canada. With fruit from mainland Europe the risk may be greater – transport and storage time is likely to be less and there is freedom of movement without phytosanitary checks. The highest probability of transfer to hosts is through the disposal of fruit by retailers or consumers. This does mean that establishment is unlikely as it

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		limits the chance of a male and female fruit fly being present in the same place at the same time, unless there was a high level of fruit disposal in one location. Environmental conditions are likely to be favourable only in some years and only in parts of the UK where there is the highest concentration of hosts (the south-east). The highest risk of establishment is in the wild and gardens and parks where there are a range of host *Prunus spp.* Cultivated crops are also at risk, but may be less favoured if *P.cerasus* or *P.serotina* are also present in the vicinty. Transient or small localised populations are the most likely. The European native cherry fruit fly *R. cerasi*, is an occasional import and has, to date, been unable to establish in the UK. Whether this is due to lack of contact with appropriate hosts, the level of pests entering or the environmental conditions needed for its lifecycle is not known, but all have been speculated as possibilities (Baker, 1991a). *Rhagoletis cingulata* requires slightly higher temperatures for development and would seem to be less adaptable than its European counterpart. The level of uncertainty is given as medium as in the longer term changing environmental conditions, i.e. warmer summers, may enable this pest to establish more successfully. If *Rhagoletis cingulata* became established, spread in the UK is likely to follow the same pattern as in mainland Europe, with slow natural spread and faster spread to other areas by human movement of infested fruit. **Although individual stages of the possible pathways into the UK may be moderately likely or likely, with current environmental conditions, introduction and spread of *Rhagoletis cingulata* is judged overall to be low.**

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
Conclusion regarding endangered areas **1.33. Based on the answers to questions 1.15 to 1.32 identify the part of the PRA area where presence of host plants or suitable habitats and ecological factors favour the establishment and spread of the pest to define the endangered area.**		Based on preferred climatic conditions, the location of 80% of the cherry industry, and the location of the pest's North American wild host *P. serotina*, the south-east of England most favours the establishment and spread of *R. cingulata*.
2. Assessment of potential economic consequences		
2.1. How great a negative effect does the pest have on crop yield and/or quality to cultivated plants or on control costs within its current area of distribution?	**Major: Low level of uncertainty.**	Although the adult fruit flies may feed on the leaves it is the fruit to which the major damage is caused and *Rhagoletis cingulata* is one of the most significant direct pests of cherries in eastern USA and Canada (Compton *et al.*, 2005). It has also caused problems in German sour cherry orchards, which are largely untreated, with the harvest having to be broken off in some cases (Dahlbender *et al.*, 2006) and records of more than 20% damage (Vogt *et al*., 2008). There is a low economic threshold for the pest attacking fruit, in that undamaged fruit bring the highest prices, and costs are incurred both through monitoring for the pest, to establish the best time for chemical treatment, and treatment itself.
2.2. How great a negative effect is the pest likely to have on crop yield and/or quality in the PRA area without any control measures?	**Major: Medium level of uncertainty.**	Commercial cherry crops are primarily sweet cherries, *P. avium*, not always the favoured host, but certainly one to which damage can be caused (Compton *et al.*, 2005). Pears (*Pyrus communis*) and other commercial Prunus crops, such as plums may also be at risk, but although noted as hosts there is little information on the impact this pest has on these crops elsewhere. Appropriate environmental conditions being in place, even a small number of fruit flies establishing in a commercial cherry crop are likely to be able to increase their population size and, unchecked by either predation or control measures of some type, they have the potential to build up to major levels of damage to the fruit quality. This was the situation in sour cherry orchards in Germany, where insecticide sprays against

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		fruit flies had not previously been deemed necessary (Dahlbender, *et al.*, 2005; Vogt *et al*., 2008).
2.3. How easily can the pest be controlled in the PRA area without phytosanitary measures?	**Much difficulty: Low level of uncertainty.**	There are at present no fruit fly pests on cherries in the UK. In 2008 only 16% of the area of cherries grown in the UK was treated with an insecticide, primarily against aphids (Garthwaite *et al*., 2010).
2.4. How great an increase in production costs (including control costs) is likely to be caused by the pest in the PRA area?	**Moderate: Medium level of uncertainty.**	To facilitate the most effective use of chemical treatments knowledge of the flies' first appearance in an orchard is important, especially as the most effective time to treat is in the short period between emergence and before sexual maturity when the fruit flies will start to oviposit into the fruit (Compton *et al*., 2005; Boller & Prokopy, 1976). A cost would therefore be incurred by establishing a monitoring programme and a further cost by the additional chemicals needed to control the adults – both in terms of the cost of the chemicals themselves and also of registering products for use. Upon detection of the pest, fallen and infected fruit should be removed and destroyed before the larvae can emerge. There may also be the cost of removal of wild or abandoned host trees in the vicinity of the crop in danger.
2.5. How great a reduction in consumer demand is the pest likely to cause in the PRA area?	**Minimal: Low level of uncertainty.**	The pest's effect on consumer demand for the produce is likely to be minimal in terms of volume. Despite the crops perishable nature, there are already high levels of expectation with regard to quality for the fruit and the consumer would expect these to be met despite the pest's presence, as is the case in North America and mainland Europe.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
2.6. How important is environmental damage caused by the pest within its current area of distribution?	**Minimal: Low level of uncertainty.**	*Rhagoletis cingulata* does attack wild hosts, but affecting only the fruit it causes little damage to these species.
2.7. How important is the environmental damage likely to be in the PRA area (see note for question 2.6)?	**Minor: Medium level of uncertainty.**	*R. cingulata* itself will probably have a minimal effect on the environment within the PRA area. The danger to the environment may come as a side effect of minimising damage to commercial crops, if wild and abandoned cherry trees are removed from cherry growing areas to prevent re-infestation of the crops. If the UK native *P. spinosa* (blackthorn) proved to be a host such removal could be extensive, though localised to the cherry growing areas. It is likely, from experience in other parts of Europe, that this would not be attempted though. In the Netherlands the presence of *Rhagoletis cingulata* on *P.serotina* in the natural environment has led to the conclusion that eradication is impossible (Steeghs, 2003).
2.8. How important is social damage caused by the pest within its current area of distribution?	**Minimal: Low level of uncertainty.**	There is no information on social damage caused by this pest, although in areas where it is already established it does not appear to have prevented growers from continuing to produce a cherry crop.
2.9. How important is the social damage likely to be in the PRA area?	**Minor: Medium level of uncertainty.**	There are currently no fruit fly pests on fruit crops in the UK, whereas in Europe and North America *R. cingulata* is not the only such pest. Learning about such a new pest and how to combat it may therefore have a minor social cost to top fruit growers.
2.10. How likely is the presence of the pest in the PRA area to cause losses in export markets?	**Moderately likely: Low level of uncertainty.**	The presence of this fruit fly pest in the UK may cause problems with export markets, particularly to countries with a similar climate and who grow crops which could be potential hosts to this pest, such as cherries, pears or plums. Data from 2006 – 2008 shows that the UK exports cherries mainly to Ireland (FAOSTAT, 2011), with small amounts also going to Belgium, France, Germany and the Netherlands, which are already known to have the pest and South Africa, Turkey, Norway and Spain which do not. In terms of its current export of cherries the UK is not likely to suffer greatly, the main consumers being in the UK itself. However,

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		as well as being an A2 listed pest in the EPPO region, *Rhagoletis cingulata* is a quarantine pest in Jordan and A1 listed by OIRSA, Argentina, Chile, Uruguay, Ukraine, Turkey and South Africa so current and potential cherry trade with these areas is likely to suffer (EPPO PQR, 2010). Trade with other known host commodities, such as pears and plums may also suffer, cherries often being grown in the UK as small areas of premium crops alongside larger areas of fruit, which increases the chance of spread to these potential hosts (Lovelidge, 2007b). In 2010 plums and pears were worth 11.9 and 16 million pounds respectively. 2007 is the last year for which statistics on cherries on their own is available, with the value of home production being over 2.1 million pounds. Based on the increase in cherry growing area and value of "others" which now includes cherries as well the value in 2010 was similar if not slightly more (Basic Hort. Stats, 2011).
As noted in the introduction to section 2, the evaluation of the following questions may not be necessary if the responses to question 2.2 is "major" or "massive" and the answer to 2.3 is "with much difficulty" or "impossible" or any of the responses to questions 2.4, 2.5, 2.7, 2.9 and 2.10 is "major" or "massive" or "very likely" or "certain". You may go directly to point 2.16 unless a detailed study of impacts is required or the answers given to these questions have a high level of uncertainty.		

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
2.11. How likely is it that natural enemies, already present in the PRA area, will not reduce populations of the pest below the economic threshold?	**Likely: Low level of uncertainty**	See answer to 1.23 for more detail.
2.12. How likely are control measures to disrupt existing biological or integrated systems for control of other pests or to have negative effects on the environment?	**Moderately likely: Medium level of uncertainty.**	The emergence of adult *R. cingulata* and the length of time the adults are active has been noted to be closer to ripening than that of the European cherry fruit fly (Kálmán, 2006). Control within a cherry crop, therefore requires the use of insecticides with a short-term effect, to prevent residues still being present on the fruit at harvest. Insecticides are only used on a small proportion of cherry crops (16% of the total area in 2008) (Garthwaite *et al.*, 2010). The use of additional chemicals always carries a risk, but monitoring and the targeted timing of chemicals should reduce negative effects on the environment and any biological control.
2.13. How important would other costs resulting from introduction be?	**Minor: low level of uncertainty**	The cherry growing industry is a small community and large amounts of research into this pest is unlikely to be funded. The main cost that would be incurred would be through advertising and increasing the industry and public awareness, targeted to the cherry growing areas of the UK.
2.14. How likely is it that genetic traits can be carried to other species, modifying their genetic nature and making them more serious plant pests?	**Very Unlikely: Low level of uncertainty**	There are tephritids native to the UK, including the closely related *Rhagoletis alternata*, which can attack roses (Reid & Malumphy, 2009), but there are none reported on top fruit.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
2.15. How likely is the pest to cause a significant increase in the economic impact of other pests by acting as a vector or host for these pests?	**Very Unlikley: Low level of uncertainty**	Not known to be a vector of any other pests.
2.16. Referring back to the conclusion on endangered area (1.33), identify the parts of the PRA area where the pest can establish and which are economically most at risk.		In terms of economic consequences the establishment of *R. cingulata* would cause most damage to the cherry industry concentrated in the south-east as it is here that the climatic conditions are likely to be most suitable, though still a few degrees below optimum conditions, and that the concentration of orchards would give the largest number of potential hosts. Other fruit growing areas would also be at risk, such as East Anglia, the west midlands or the south-west, especially in warm seasons, but the area grown here is much less, reducing the overall economic impact.
Degree of uncertainty **Estimation of the probability of introduction of a pest and of its economic consequences involves many uncertainties. In particular, this estimation is an extrapolation from the situation where the pest occurs to the hypothetical situation in the PRA area. It is important to document the areas of uncertainty (including identifying and prioritizing of additional data to be collected and research to be conducted) and the degree of uncertainty in the assessment, and to indicate where expert judgement has been used. This is necessary for transparency and may also be useful for identifying and**	**Moderate**	The greatest uncertainties in the assessment lie in the pest's potential impact on sweet cherries, given the presence of other host species, whether the UK native *P. spinosa* (blackthorn) would be a suitable host and how often the climate in the south-east of the UK is likely to be suitable for establishment should entry occur. There is also high uncertainty on the trade in Prunus plant material from the EU – in terms of quantities and species traded. Further research into this pest's host preferences would be useful, particularly in mainland Europe and where established on the coast in the Netherlands, and more information on the climatic and abiotic factors limiting the expansion of the pest's range. Information on the trade in Prunus plant material, particularly ornamentals, in Europe would also be useful

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
prioritizing research needs. **It should be noted that the assessment of the probability and consequences of environmental hazards of pests of uncultivated plants often involves greater uncertainty than for pests of cultivated plants. This is due to the lack of information, additional complexity associated with ecosystems, and variability associated with pests, hosts or habitats.**		
Evaluate the probability of entry and indicate the elements which make entry most likely or those that make it least likely. Identify the pathways in order of risk and compare their importance in practice.	**Moderately likely: Medium level of uncertainty**	It is possible for *Rhagoletis cingulata* to enter the UK on a number of different pathways. The pathways in order of risk are: **Pathway 1:** The pest enters the UK in infested fruit from EU – in its larval stage **Pathway 5:** The pest enters the UK in fruit associated with a traveller from an area where the pest is known e.g. in a person's bag. **Pathway 2:** The pest enters the UK in infested fruit from North America – in its larval stage **Pathway 3:** The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from Europe. **Pathway 4:** The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from North America. The greatest probability for entry is from fresh fruit either shipped in from countries where the pest is present, or carried by travellers in their luggage. The risk of entry from North America is low compared to that from the EU. It is assumed that there has only been one such introduction, to mainland Europe and there are few interceptions of this pest due to control measures at source and storage during transport. Fruit being brought in with travellers may be the highest risk, particularly from Mexico, where tolerance of imperfect fruit may be higher

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		than the USA and Canada. With fruit from mainland Europe the risk may be greater – transport and storage time is likely to be less and there is freedom of movement without phytosanitary checks. Interceptions of the related *R. cerasi* have been made in fruit from the EU. Entry with an already fruited plant is much less likely due to the type of plants which are traded as orchard stock. Ornamentals may be of higher risk, but there is no information on their trade available. Again the risk is higher from the EU than North America, due to the current phytosanitary measures in place controlling the movement of Prunus plant material. The highest probability of transfer to hosts is through the disposal of fruit by retailers or consumers.
Evaluate the probability of establishment, and indicate the elements which make establishment most likely or those that make it least likely. Specify which part of the PRA area presents the greatest risk of establishment.	**Low: Medium level of uncertainty**	*R. cingulata* has a range of potential hosts, mostly *Prunus spp.*, though also *Pyrus communis* (European pears). It's main hosts are known to be cherries, and wild species of both *P. cerasus* and *P. avium* are found commonly across the UK. They are also common in gardens and parks. The North American wild host *P. serotina* is mainly found in the south-east. Cultivated crops (*P. avium*) are also at risk, but may be less favoured if *P.cerasus* or *P.serotina* are also present in the vicinty. Transient or small localised populations are the most likely and the area most at risk the south-east. The highest probability of transfer to hosts is through the disposal of fruit by retailers or consumers, however this does limit the probability of a male and female fruit fly being present in the same place at the same time, unless there was a high level of fruit disposal in one location. The climate in the UK initially appears similar to areas of both Europe and North America where *R. cingulata* is established. However, when studied in more detail, maximum temperatures, even in the cherry growing heartland in the south-east, are likely to be favourable only in some years, the UK having a maritime and not continental climate. Also, despite being intercepted in the UK, the European cherry fruit fly (*R. cerasi*) has never established here. Whether this is because there are low numbers on the pathways, no contact with suitable hosts

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
		once it arrives or the conditions here do not suit aspects of its lifecycle is unknown. In all cases this is good news for the risk of *R. cingulata* establishing as it is likely to follow the same pathways into the UK as the European species, but requires slightly higher temperatures for development and would seem to be less adaptable. The level of uncertainty is given as medium as in the longer term changing environmental conditions, i.e. warmer summers, may enable this pest to establish more successfully
List the most important potential economic impacts, and estimate how likely they are to arise in the PRA area. Specify which part of the PRA area is economically most at risk.	**Low: Medium level of uncertainty**	The main economic impact of *R. cingulata* would be on the commercial cherry orchards. The area of cherries grown commercially in the UK is small, but it is a premium crop and the area is gradually expanding with alterations to the traditional growing methods and varieties (see 1.15). There is a small export market for this produce in the UK, but a growing one at home as premium locally grown fruit. There may be an impact on export, however, with other countries being unwilling to import fruit such as plums and pears as well as cherries from a country which has a pest that could potentially cause major damage to their own fruit industries. A large part of the costs would also be in monitoring and control as there are currently no similar pests in the UK and very few insecticides applied to cherries. The fruit in the UK is primarily sweet cherries and evidence elsewhere suggests that the presence of sour cherries or other wild hosts may reduce the impact on the commercial crop as these are more favoured. The area of the UK most at risk is the cherry orchards of the south-east, but the other fruit growing areas, the west midlands, East Anglia and the south-west, could also be at risk and alternative host crops such as plums and pears may also be at risk. However numbers of fruit flies entering would need to be sufficient to establish a population and climatic conditions would need to be favourable. Overall the economic risk to the UK is very low, but to growers who struggle to produce this premium crop the importance will be higher. Probability of these impacts arising however is low.

Question	Rating + uncertainty	Explanatory text of rating and uncertainty
The risk assessor should give an overall conclusion on the pest risk assessment and an opinion as to whether the pest or pathway assessed is an appropriate candidate for stage 3 of the PRA: the selection of risk management options, and an estimation of the associated pest risk.	**Low risk: Medium level of uncertainty**	Overall assessment of pest: It is possible for it to enter the UK along the pathways discussed, but unlikely that it would transfer to hosts, find a suitable environment and establish. More information on host and environmental preferences would be required to reduce the level of uncertainty. If it did establish, however, the pest would be difficult to eradicate as it could easily survive in untreated and unmonitored wild host populations. The pest is likely to be detected early in the UK though, due to our lack of other fruit fly pests on cherries with which it may be confused. The area most at risk is the south-east, where conditions are most likely to be favourable and where the largest concentration of hosts (commercial and other) are found. The pest is an appropriate candidate for stage 3 of the PRA.

This is the end of the Pest risk assessment	

Stage 3: Pest risk Management

Question	Y/N	Explanatory text
3.1. Is the risk identified in the Pest Risk Assessment stage for all pest/pathway combinations an acceptable risk?	**No**	
3.2. Is the pathway that is being considered a commodity of plants and plant products? **If yes, go to 3.11,** **If no, go to 3.3**	**Yes**	Both plants and plant products. The pathways are: **1. The pest enters the UK in infested fruit from EU – in its larval stage.** **2. The pest enters the UK in infested fruit from North America – in its larval stage.** **3. The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from Europe.** **4. The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from North America.**
3.3. Is the pathway that is being considered the natural spread of the pest? (see answer to question 1.30) **If yes, go to 3.4,** **If no, go to 3.9**	**No**	
3.4. Is the pest already entering the PRA area by natural spread or likely to enter in the immediate future? (see answer to question 1.30)		

3.5. Is natural spread the major pathway? **If yes, go to 3.29,** **If no, go to 3.6**		
3.6. Could entry by natural spread be reduced or eliminated by control measures applied in the area of origin? **If yes, possible measures: control measures in the area of origin, go to 3.7**		
3.7. Could the pest be effectively contained or eradicated after entry? (see answer to question 1.24, 1.32) **If yes, possible measures: internal containment and/or eradication campaign, Go to 3.8**		
3.8. Was the answer "yes" to either question 3.6 or question 3.7? **If yes, go to 3.38,** **If no, go to 3.44**		

3.9. Is the pathway that is being considered the entry with human travellers? **If yes, possible measures: inspection of human travellers, their luggage, publicity to enhance public awareness on pest risks, fines or incentives. Treatments may also be possible, Go to 3.29** **If no, go to 3.10**	**Yes**	**5. The pest enters the UK in fruit associated with a traveller from an area where the pest is known e.g. in a person's bag**
3.10. Is the pathway being considered contaminated machinery or means of transport? **If yes, possible measures: cleaning or disinfection of machinery/vehicles**	**No**	
3.11. If the pest is a plant, is it the commodity itself? **If yes, go to 3.29,** **If no (the pest is not a plant or the pest is a plant but is not the commodity itself), go to 3.12**	**No**	

3.12. Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest? **if appropriate, list the measures and identify their efficacy against the pest of concern, Go to 3.13**		**Yes: Pathways 3 and 4** The import of *Prunus spp*. for planting is regulated and requires a plant passport or phytosanitary certificate for imports from the EU or a third country respectively. This and inspection in the UK if there is any suspicion that requirements have not been met reduces the likelihood of the pest being imported into the UK on dormant plant material. However, material originating within Europe will not be inspected for IAI EU listed pests such as *Rhagoletis cingulata*, and pupae are likely to escape detection in the soil, which from the EU would be unregulated. EU Plant Health Directive restricts the import of soil from most non-European countries, including those in North America, to that necessary to sustain the plants vitality, and stipulates measures to ensure any growing medium is free from harmful organisms, such as plants being transplanted from soil into compost. **Yes : Pathway 2** Cherries imported directly from third countries such as the USA are subject to checks at point of entry **No: Pathways 1 and 5** Cherries brought into the UK with passengers, or imported from the EU are not subject to checks at point of entry and may remain undiscovered until the larvae emerge or the fruit begins to rot.
3.13. Can the pest be reliably detected by a visual inspection of a consignment at the time of export, during transport/storage or at import? **If yes, possible measure: visual inspection, go to 3.14**	**Yes**	**All Pathways:** the pest may be detected, by either fruit or plant inspection at time of export or import. In the case of fruit inspections this may not be sufficient, however, as the presence of larvae within fruit may be difficult to detect. If a high proportion of the fruit is found to be infested, it is not possible to sort out these cherries from the rest of a consignment and the whole batch may be rejected if infestation exceeds quality limits required by consumers.
3.14. Can the pest be reliably detected by testing (e.g. for pest plant, seeds in a consignment)? **If yes, possible measure: specified testing, go to 3.15**	**Yes**	**Pathways 1, 2 and 5**: Destructive sampling of a consignment may reveal the presence of larvae in fruit which could otherwise be undetected.

3.15. Can the pest be reliably detected during post-entry quarantine? **If yes, possible measure: import under special licence/permit and post-entry quarantine, go to 3.16**		**No: Pathways 1, 2 and 5:** Commodity perishable **No: Pathways 3 and 4**: Plants for planting may be kept to determine if adults emerge from pupae in the soil, but would probably need to be kept for some months and is impractical
3.16. Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)? **If yes, possible measure: specified treatment, go to 3.17**	**Yes**	**Pathways 1 and 2:** Fumigation by methyl bromide is currently still available as a quarantine procedure and this is used in the USA on cherries for export against both the closely related pest *Rhagoletis indifferens* (western cherry fruit fly) and *Cydia pomonella* (codling moth) (USDA, 2010). However alternative procedures are also being used, due to concerns over fruit quality after treatment, worker safety and other environmental issues. These include controlled atmosphere temperature treatment systems (CATTS), which use short duration high temperatures under low oxygen and elevated carbon dioxide atmospheres. Good results have been found for both *Cydia pomonella* and *Rhagoletis indifferens* and methods may be applicable to *Rhagoletis cingulata* (Neven (2005); Neven & Rehfiled-Ray (2006) and USDA 2010). *Rhagoletis spp.* larvae are known to be killed when fruit is stored under cold or controlled temperature conditions (Boller & Prokopy, 1976) so cold treatments could be a possibility and irradiation has been successfully tested as a quarantine treatment against *Rhagoletis indifferens, R. pomonella* and *R. mendax* (Burditt & Hungate, 1988; Hallman & Thomas, 1999; ISPM No. 28, 2009) suggesting that this method may also be used to kill *R. cingulata.*
3.17. Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment? (This question is not relevant for pest plants) **If yes, possible measure: removal of parts of plants from the consignment, go to 3.18**	**No.**	

3.18. Can infestation of the consignment be reliably prevented by handling and packing methods? **If yes, possible measure: specific handling/packing methods, go to 3.19**	**Yes**	**Pathways 3 and 4:** The removal of soil associated with plants for planting would reduce the possibility of contamination with pupae.
3.19. Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice? **If yes, possible measure: import under special licence/permit and specified restrictions, go to 3.20**	**Yes**	**Pathways 1 and 2:** Cherries sent straight for processing.
3.20. Can infestation of the commodity be reliably prevented by treatment of the crop? **If yes, possible measure: specified treatment and/or period of treatment, go to 3.21**	**Yes**	**All Pathways:** Chemical sprays are used in both North America and mainland Europe, but they are reliant on killing the adults during the short period in which they are flying. In North America adult emergence models are used to predict the best time to begin chemical controls (Compton *et al.*, 2005). In Europe this is a relatively new pest and although spray regimes are in place for the control of *R. cerasi*, it has been noted that *R. cingulata* emerges later (Kálmán, 2006) and has been found in larger numbers on sour cherries, which were not always historically sprayed (Dahlbender *et al.*, 2006).
3.21. Can infestation of the commodity be reliably prevented by growing resistant cultivars? (This question is not relevant for pest plants) **If yes, possible measure: consignment should be composed of specified cultivars, go to 3.22**	**No.**	

3.22. Can infestation of the commodity be reliably prevented by growing the crop in specified conditions (e.g. protected conditions such as screened greenhouses, physical isolation, sterilized growing medium, exclusion of running water, etc.)? **If yes, possible measure: specified growing conditions, go to 3.23**	**No**	**All Pathways:** Although there have been suggestions that growing in tunnels can prevent fruit infestation (Lang *et al.*, 2007) so this may be worth exploring.
3.23. Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages? **If yes, possible measure: specified age of plant, growth stage or time of year of harvest, go to 3.24**	**No**	The female *Rhagoletis cingulata* has been documented preferring to oviposit in unripe fruits rather than ripe ones, which means that even if the fruit is picked unripe, infestation may not be reliably avoided (Compton *et al.*, 2005).
3.24. Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)? **If yes, possible measure: certification scheme, go to 3.25**	**Yes**	**Pathways 3 and 4**: This may be possible for plants intended for export. Rootstock, from non-fruiting plants and grown away from areas where fruiting trees are present, may be deemed pest free as the pupae would be associated with plants which have fruited at some point, or in the vicinity of plants which have fruited.
3.25. Is the pest of very low capacity for natural spread? **If yes, possible measures: pest freedom of the crop, or pest-free place of production or pest-free area, Go to 3.28** **If no, go to 3.26**	**No**	

3.26. Is the pest of low to medium capacity for natural spread? **If yes, possible measures: pest-free place of production or pest free area, Go to 3.28** **If no, go to 3.27**	**Yes**	Possible measures, pest free area or pest free place of production
3.27. The pest is of medium to high capacity for natural spread **Possible measure: pest-free area, go to 3.28**		
3.28. Can pest freedom of the crop, place of production or an area be reliably guaranteed? **If no, possible measure identified in questions 3.25-3.27 would not be suitable, go to 3.29**	**Yes**	**All Pathways**: Pest may be monitored and caught with lures and the use of such should mean that an area or place of production can be certified as pest free.

3.29. Are there effective measures that could be taken in the importing country (surveillance, eradication) to prevent establishment and/or economic or other impacts? **If yes, possible measures: internal surveillance and/or eradication campaign, go to 3.30**	**Yes**	Surveillance may help to discover the pest quickly should entry occur. If detected fallen and infected fruit should be removed and destroyed and if possible wild or abandoned host trees destroyed as these may provide a reservoir for the pest. Commercially grown fruit in the area could be sent for processing to reduce the possibility of further spread (Kálmán, 2006). Total eradication may not be possible if wild host trees remain in an area (Steeghs, 2003). In the USA chemical controls are applied to cover the activity period of the fruit flies, with trapping and degree day modelling being used to predict adult activity. Alternatives such as pheromone sprays have also been tried, but were not sufficient to provide total control (Compton *et al*., 2005). In Europe there are concerns that fewer chemicals may be available for use to combat *R. cingulata* due to its activity later in the season than the European cherry fruit fly, *R. cerasi*, when fruit is closer to harvest (Kálmán, 2006), however bait sprays using Spinosad have shown good results against *R. cerasi* (Köppler *et al*., 2008), and may be a possibility. Work has also been carried out on the use of entomopathogenic fungi against *R. cerasi*, also with positive results (Daniel, 2009).

3.30. Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest? List them. **If yes, go to 3.31** **If no, go to 3.38**	**Yes**	- The Plant passport / Phytosanitary certificate regulations in place greatly reduce the possibility of the pest being introduced on dormant plant material. - Inspections of fruit at point of export and import may reduce the chance of infested fruit entering the UK, though not reliably. - Visual inspection of plants for planting may also reduce the chance of pupae entering in associated soil, though not reliably without in depth examination - Destructive sampling of a consignment may allow the assessment and destruction of heavily infested consignments. - CATTS / chilling / fumigation / irradiation prior to or during transport can kill any larvae present within fruit. - The removal of soil from plants for planting prior to export would reduce the risk of pupae being associated with the plants. This is already required with imports from North America. - Cherries sent directly for processing present little risk to the UK. - Targeted spraying in the original crops would reduce adult populations of fruit flies before eggs are laid and help prevent infestation. - A certification scheme for all possibly affected plants for planting would reduce the possibility of infestation - Fruit and plants brought in from areas or places of production which are pest free would be without risk. - Inspection of human travellers - Enhance public awareness of risk of transporting plant material

3.31. Does each of the individual measures identified reduce the risk to an acceptable level? **If yes, go to 3.34** **If no, go to 3.32**	**No**	
3.32. For those measures that do not reduce the risk to an acceptable level, can two or more measures be combined to reduce the risk to an acceptable level? **If yes, go to 3.34** **If no, go to 3.33**	**Yes**	
3.33. If the only measures available reduce the risk but not down to an acceptable level, such measures may still be applied, as they may at least delay the introduction or spread of the pest. In this case, a combination of phytosanitary measures at or before export and internal measures (see question 3.29) should be considered. **Go to 3.34**		

3.34. Estimate to what extent the measures (or combination of measures) being considered interfere with trade. **Go to 3.35**		Many of the combination of measures considered applicable to *Rhagoletis cingulata* are already in place with regard to import from third countries and do not interfere with international trade. The pathway on which the least measures apply is imports with travellers, which could be inspected or destructively sampled, but are not. Regulation of imports from the EU are less strict and imposing such may cause problems with free trade. Certification of plants for planting coming from an area or place free from the pest would probably not be too restrictive to trade. Fruit trade may be less easy to certify. In the past regulations in the UK restricted the import of cherry fruit from Europe to periods when infestation by the European cherry fruit fly was likely to be low. This is no longer the case due to examination of the biology of this pest and the UK climate (Baker, 1991a and b). Similar restrictions would not be appropriate for *Rhagoletis cingulata*. *Rhagoletis cingulata* is currently a IAI listed pest and as such it is stated in legislation that it is not present in the EU. However, it is now known to be present in 9 European countries, 8 within the EU, including populations in the wild environment where eradication is not considered feasible (see Annex III) and as such it is suggested that its status as a IAI pest is inappropriate and therefore should be considered for review.

3.35. Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences. **Go to 3.36**		The use of chemicals in mainland Europe may need to be expanded due to the necessity of spraying closer to harvest. Control measures are, however, already in place for other similar pests so undesirable social or environmental consequences should be minimal. The spraying of sour cherries in areas where this was previously considered unnecessary would probably not be required as sour cherry imports represent a very low risk. The costs of treating consignments of cherries entering from the EU would be high as this is not currently in practice. For this pest this would not be considered cost-effective. Visual inspection or destructive sampling of fruit from consignments and travellers luggage could be used, but again for this pest alone would not be considered cost-effective. A campaign to raise awareness of the risks of bringing plant material into the UK would be more likely to be feasible and may help reduce the import of other pests also.
3.36. Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with international trade, are cost-effective and have no undesirable social or environmental consequences? **If yes, For pathway-initiated analysis, go to 3.39** **For pest-initiated analysis, go to 3.38** **If no, go to 3.37**	**Yes**	**Current phytosanitary measures in place on pathways 2 and 4 in terms of certification, inspection, treatments and removal of soil** **Chemical controls in European orchards** **Certification of plants for planting coming from a place / area of pest freedom in the EU.** **Campaign to raise awareness of the risks of bringing plant material into the UK**
3.37. Envisage prohibiting the pathway **For pathway-initiated analysis, go to 3.43 (or 3.39),** **For pest-initiated analysis go to 3.38**		
3.38. Have all major pathways been analyzed (for a pest-initiated analysis)? **If yes, go to 3.41,** **If no, Go to 3.1 to analyze the next major pathway**	**Yes**	

3.39. Have all the pests been analyzed (for a pathway-initiated analysis)? **If yes, go to 3.40,** **If no, go to 3.1 (to analyze next pest)**		
3.40. For a pathway-initiated analysis, compare the measures appropriate for all the pests identified for the pathway that would qualify as quarantine pests, and select only those that provide phytosanitary security against all the pests. **Go to 3.41**		

3.41. Consider the relative importance of the pathways identified in the conclusion to the entry section of the pest risk assessment **Go to 3.42**		**Pathway 1: The pest enters the UK in infested fruit from EU – in its larval stage – Moderate likelihood of entry, moderate uncertainty** **Pathway 2: The pest enters the UK in infested fruit from North America – in its larval stage – Unlikely to enter, moderate uncertainty** **Pathway 3: The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from Europe – Unlikely to enter, high uncertainty** **Pathway 4: The pest enters the UK as pupae in soil or packaging associated with an already fruited plant from North America – Unlikely to enter, low uncertainty** **Pathway 5: The pest enters the UK in fruit associated with a traveller from an area where the pest is known e.g. in a person's bag – Moderate likelihood of entry, moderate level of uncertainty** In terms of management pathways 2 and 4 are highly controlled by measures already in place, both in the country of origin and on the pathway. Pathway 3 is also already partially controlled due to phytosanitary measures for *Prunus spp*. There are no measures against the soil and *R. cingulata* itself will not be being looked for, but increased awareness of this pest amongst the industry could help here and production in an area or place free from the pest is possible. Pathway 1, the import of fresh, sweet cherries from the EU, presents a moderate likelihood of entry and there are no specific measures currently in place. There are also no measures in place for the related *R. cerasi* and given that *R. cingulata* is less likely to establish than the European pest no additional measures are likely to be instated on the pathway specifically for *R. cingulata*. Most likely measures to be taken are those in the exporting country to control the fruit flies before oviposition. Pathway 5, the import of fruit with travellers presents possibly the highest risk, as this could occur from any country where the pest is currently present and there are currently no controls in place on this pathway. It is the hardest pathway to control, with again control measures taken in the exporting country to control the fruit flies at origin the most likely to be taken. A campaign to raise awareness on the risks of plant material being brought into the UK would be useful to the prevention of this and other pests entering.

3.42. All the measures or combination of measures identified as being appropriate for each pathway or for the commodity can be considered for inclusion in phytosanitary regulations in order to offer a choice of different measures to trading partners. **Go to 3.43**		
3.43. In addition to the measure(s) selected to be applied by the exporting country, a phytosanitary certificate (PC) may be required for certain commodities. The PC is an attestation by the exporting country that the requirements of the importing country have been fulfilled. In certain circumstances, an additional declaration on the PC may be needed (see EPPO Standard PM 1/1(2): Use of phytosanitary certificates) **Go to 3.44**		
3.44. If there are no measures that reduce the risk for a pathway, or if the only effective measures unduly interfere with international trade (e.g. prohibition), are not cost-effective or have undesirable social or environmental consequences, the conclusion of the pest risk management stage may be that introduction cannot be prevented. In the case of pest with a high natural spread capacity, regional communication and collaboration is important.		

Conclusion of Pest Risk Management. **Summarize the conclusions of the Pest Risk Management stage. List all potential management options and indicate their effectiveness. Uncertainties should be identified.**		**Pathways 1 and 2 – import of fresh fruit** There is a low tolerance in the market for cherry fruit infested with fruit fly larvae and as such, high levels of chemical control are used in the orchards in North America. This low tolerance to pests has also led to the treatment of fruit and the larvae of other *Rhagoletis spp.* are documented to be killed by freezing, CATTS, chilling, or irradiation. These practices, plus inspections and destructive sampling of consignments further reduces the chance of fruit imported from North America presenting a risk to the UK. If infested consignments are detected cherries may be sent for processing. The greatest risks remain with fruit imported from infested cherry growing areas in Europe. With the arrival of this new fruit fly pest in Europe, current spraying regimes are likely to be extended to cover the later emergence of *Rhagoletis cingulata* and its preference for sour cherry orchards. However, pest specific treatment, inspection and destructive sampling regimes are not considered cost-effective as there is low chance of these fruit flies entering the UK in sufficient numbers, mating, transferring to suitable hosts and being able to find a suitable environment in which to establish. More information on host and environmental preferences would be required to reduce the level of uncertainty here. Import of fruit from pest free areas may be not be feasible. **Pathways 3 and 4 – plants for planting** The import of *Prunus spp.* plant material into the UK is highly regulated, with plant passports and phytosanitary certification required from the EU and third countries respectively. Soil from North America is also highly regulated. Similar regulation in the EU is impractical and visual inspection of soil unlikely to be reliable without in depth examination, however production from areas or places of pest freedom should be feasible. The uncertainty with these pathways is the unknown quantity of ornamental *Prunus spp*., which are more likely to have fruited than orchard fruit stock. **Pathway 5 – import with travellers** Inspection of human travellers would be impractical and, for this specific pest, not cost effective. Enhancing public awareness of the risk of transporting plant material is the only other option for this pathway and may help prevent the entry of other pests also.

Rhagoletis cingulata is currently a IAI listed pest and as such it is stated in legislation that it is not present in the EU. However, it is now known to be present in 9 European countries, 8 within the EU, including populations in the wild environment where eradication is not considered feasible (see Annex III) and as such it is suggested that its status as a IAI pest is inappropriate and therefore should be considered for review.

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Appendix I.

Table 1: UK imports of sweet cherries from countries with *Rhagoletis cingulata* (2005 – 2009) (EUROSTAT, 2011)

Reporter	Partner	Product	Flow	Period	Quantity in 100kg
UNITED KINGDOM	AUSTRIA	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2005	779
UNITED KINGDOM	BELGIUM (+ LUXBG -> 1998)	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2005	1847
UNITED KINGDOM	CANADA	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2005	2284
UNITED KINGDOM	FRANCE	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2005	16118
UNITED KINGDOM	GERMANY	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2005	1665
UNITED KINGDOM	NETHERLANDS	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2005	5576
UNITED KINGDOM	UNITED STATES	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2005	25835
UNITED KINGDOM	**EU27_INTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2005**	**96742**
UNITED KINGDOM	**EU27_EXTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2005**	**99447**
UNITED KINGDOM	BELGIUM (+ LUXBG -> 1998)	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2006	926
UNITED KINGDOM	CANADA	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2006	4918

UNITED KINGDOM	FRANCE	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2006	12429
UNITED KINGDOM	GERMANY	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2006	1568
UNITED KINGDOM	NETHERLANDS	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2006	5612
UNITED KINGDOM	UNITED STATES	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2006	36227
UNITED KINGDOM	**EU27_INTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2006**	**89930**
UNITED KINGDOM	**EU27_EXTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2006**	**125641**
UNITED KINGDOM	BELGIUM (+ LUXBG -> 1998)	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2007	915
UNITED KINGDOM	CANADA	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2007	5573
UNITED KINGDOM	FRANCE	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2007	5420
UNITED KINGDOM	GERMANY	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2007	881
UNITED KINGDOM	MEXICO	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2007	218
UNITED KINGDOM	NETHERLANDS	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2007	4375
UNITED KINGDOM	UNITED STATES	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2007	38621
UNITED KINGDOM	**EU27_INTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2007**	**55188**
UNITED KINGDOM	**EU27_EXTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2007**	**114438**
UNITED KINGDOM	BELGIUM (+ LUXBG -> 1998)	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2008	946
UNITED KINGDOM	CANADA	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2008	3445
UNITED KINGDOM	FRANCE	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2008	3189
UNITED	GERMANY	FRESH CHERRIES (EXCL. SOUR CHERRIES "P.	IMPORT	Jan.-Dec.	4219

KINGDOM		CERASUS")		2008	
UNITED KINGDOM	HUNGARY	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2008	144
UNITED KINGDOM	NETHERLANDS	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2008	6972
UNITED KINGDOM	UNITED STATES	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2008	31645
UNITED KINGDOM	**EU27_INTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2008**	**69869**
UNITED KINGDOM	**EU27_EXTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2008**	**85800**
UNITED KINGDOM	BELGIUM (+ LUXBG -> 1998)	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2009	844
UNITED KINGDOM	CANADA	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2009	5581
UNITED KINGDOM	FRANCE	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2009	8809
UNITED KINGDOM	GERMANY	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2009	5564
UNITED KINGDOM	HUNGARY	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2009	24
UNITED KINGDOM	NETHERLANDS	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2009	5419
UNITED KINGDOM	UNITED STATES	FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")	IMPORT	Jan.-Dec. 2009	26307
UNITED KINGDOM	**EU27_INTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2009**	**87125**
UNITED KINGDOM	**EU27_EXTRA**	**FRESH CHERRIES (EXCL. SOUR CHERRIES "P. CERASUS")**	**IMPORT**	**Jan.-Dec. 2009**	**83579**

Table 2: UK imports of sour cherries from countries with *Rhagoletis cingulata* (2005-2009) (EUROSTAT, 2011)

Reporter	Partner	Product	Flow	Period	Quantity in 100kg

UNITED KINGDOM	BELGIUM (+ LUXBG -> 1998)	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2005	207
UNITED KINGDOM	FRANCE	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2005	355
UNITED KINGDOM	GERMANY	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2005	448
UNITED KINGDOM	NETHERLANDS	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2005	897
UNITED KINGDOM	**EU27_INTRA**	**FRESH SOUR CHERRIES "PRUNUS CERASUS"**	**IMPORT**	**Jan.-Dec. 2005**	**1994**
UNITED KINGDOM	BELGIUM (+ LUXBG -> 1998)	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2006	196
UNITED KINGDOM	FRANCE	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2006	384
UNITED KINGDOM	GERMANY	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2006	521
UNITED KINGDOM	NETHERLANDS	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2006	1543
UNITED KINGDOM	**EU27_INTRA**	**FRESH SOUR CHERRIES "PRUNUS CERASUS"**	**IMPORT**	**Jan.-Dec. 2006**	**2763**
UNITED KINGDOM	**EU27_EXTRA**	**FRESH SOUR CHERRIES "PRUNUS CERASUS"**	**IMPORT**	**Jan.-Dec. 2006**	**4851**
UNITED KINGDOM	BELGIUM (+ LUXBG -> 1998)	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2007	20
UNITED KINGDOM	FRANCE	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2007	84
UNITED KINGDOM	GERMANY	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2007	1290
UNITED KINGDOM	NETHERLANDS	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2007	1003
UNITED KINGDOM	UNITED STATES	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2007	188
UNITED KINGDOM	**EU27_INTRA**	**FRESH SOUR CHERRIES "PRUNUS CERASUS"**	**IMPORT**	**Jan.-Dec. 2007**	**2416**
UNITED KINGDOM	**EU27_EXTRA**	**FRESH SOUR CHERRIES "PRUNUS CERASUS"**	**IMPORT**	**Jan.-Dec. 2007**	**9112**
UNITED	BELGIUM (+ LUXBG ->	FRESH SOUR CHERRIES "PRUNUS	IMPORT	Jan.-Dec. 2008	481

KINGDOM	1998)	CERASUS"			
UNITED KINGDOM	FRANCE	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2008	47
UNITED KINGDOM	CANADA	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2008	32
UNITED KINGDOM	GERMANY	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2008	2977
UNITED KINGDOM	NETHERLANDS	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2008	818
UNITED KINGDOM	**EU27_INTRA**	**FRESH SOUR CHERRIES "PRUNUS CERASUS"**	**IMPORT**	**Jan.-Dec. 2008**	**5815**
UNITED KINGDOM	**EU27_EXTRA**	**FRESH SOUR CHERRIES "PRUNUS CERASUS"**	**IMPORT**	**Jan.-Dec. 2008**	**3756**
UNITED KINGDOM	BELGIUM (+LUXBG -> 1998)	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2009	96
UNITED KINGDOM	CANADA	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2009	12
UNITED KINGDOM	FRANCE	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2009	31
UNITED KINGDOM	GERMANY	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2009	1163
UNITED KINGDOM	NETHERLANDS	FRESH SOUR CHERRIES "PRUNUS CERASUS"	IMPORT	Jan.-Dec. 2009	1991
UNITED KINGDOM	**EU27_INTRA**	**FRESH SOUR CHERRIES "PRUNUS CERASUS"**	**IMPORT**	**Jan.-Dec. 2009**	**7868**
UNITED KINGDOM	**EU27_EXTRA**	**FRESH SOUR CHERRIES "PRUNUS CERASUS"**	**IMPORT**	**Jan.-Dec. 2009**	**1927**

Appendix II

Comparing development between *Rhagoletis cingulata* and *R. cerasi*.

Temperature data from Wye, Kent - 1971 - 2000 averages (Met Office, 2011)

Table 1

***Rhagoletis cingulata*: Jubb and Cox, 1974. To = 4.4, 950 DD**

Month	Days (D)	Mean monthly temp. (Tmm)	Temp. theshold (To)	Difference (Tmm-To)	(Tmm-To)(D)	Conditional degree days (DD>0)	Cumulative degree days	Month when reach requirement for adult emergence
Jan	31	4.30	4.4	-0.1	-3.1	0	0	
Feb	28	4.25	4.4	-0.2	-4.2	0	0	
Mar	31	6.35	4.4	2.0	60.45	60.45	60.5	
Apr	30	8.20	4.4	3.8	114	114	174.5	
May	31	11.60	4.4	7.2	223.2	223.2	397.7	
Jun	30	14.30	4.4	9.9	297	297	694.7	
Jul	31	16.75	4.4	12.4	382.85	382.85	1077.5	July
Aug	31	16.90	4.4	12.5	387.5	387.5	1465.0	
Sept	30	14.25	4.4	9.9	295.5	295.5	1760.5	
Oct	31	10.85	4.4	6.5	199.95	199.95	1960.5	
Nov	30	7.10	4.4	2.7	81	81	2041.5	
Dec	31	5.30	4.4	0.9	27.9	27.9	2069.4	

Table 2

***Rhagoletis cerasi*: Fletcher, 1989a. To = 5, 430 DD**

Month	Days (D)	Mean monthly temp. (Tmm)	Temp. theshold (To)	Difference (Tmm-To)	(Tmm-To)(D)	Conditional degree days (DD>0)	Cumulative degree days	Month when reach requirement for adult emergence
Jan	31	4.30	5	-0.7	-21.7	0	0	
Feb	28	4.25	5	-0.8	-21	0	0	
Mar	31	6.35	5	1.4	41.85	41.85	41.9	
Apr	30	8.20	5	3.2	96	96	137.9	
May	31	11.60	5	6.6	204.6	204.6	342.5	
Jun	30	14.30	5	9.3	279	279	621.5	June
Jul	31	16.75	5	11.8	364.25	364.25	985.7	
Aug	31	16.90	5	11.9	368.9	368.9	1354.6	
Sept	30	14.25	5	9.3	277.5	277.5	1632.1	
Oct	31	10.85	5	5.9	181.35	181.35	1813.5	
Nov	30	7.10	5	2.1	63	63	1876.5	
Dec	31	5.30	5	0.3	9.3	9.3	1885.8	

Table 3

***Rhagoletis cerasi*: Baker and Miller, 1978; Fletcher, 1989a. To = 6.8, 321DD**

Month	Days (D)	Mean monthly temp. (Tmm)	Temp. theshold (To)	Difference (Tmm-To)	(Tmm-To)(D)	Conditional degree days (DD>0)	Cumulative degree days	Month when reach requirement for adult emergence
Jan	31	4.30	6.8	-2.5	-77.5	0	0	
Feb	28	4.25	6.8	-2.6	-71.4	0	0	
Mar	31	6.35	6.8	-0.5	-13.95	0	0	
Apr	30	8.20	6.8	1.4	42	42	42.0	
May	31	11.60	6.8	4.8	148.8	148.8	190.8	
Jun	30	14.30	6.8	7.5	225	225	415.8	June
Jul	31	16.75	6.8	10.0	308.45	308.45	724.3	
Aug	31	16.90	6.8	10.1	313.1	313.1	1037.4	
Sept	30	14.25	6.8	7.5	223.5	223.5	1260.9	
Oct	31	10.85	6.8	4.1	125.55	125.55	1386.4	
Nov	30	7.10	6.8	0.3	9	9	1395.4	
Dec	31	5.30	6.8	-1.5	-46.5	0	1395.4	

APPENDIX III

Rhagoletis cingulata – Presence and action in EU: Summary

Country	Distribution details	Situation / Action being taken
Austria (Egartner *et*	Reported for first time in 2007 – two specimens caught in	Survey on non-European cherry fruit fly species carried out during growing seasons of 2007 (11 sampling sites) and 2008 (6 sampling sites). Considered

al., 2010; EPPO Reporting Service, 2010d)	different weeks at different locations (Vienna and Steiermark). None at all in 2008.	possible that specimens were from established populations with low densities, but more likely that they were from accidental introductions. **Current situation: present, 2 specimens caught in 2007, none in 2008.**
Belgium (EPPO Reporting Service, 2010c)	Three male specimens were found in 2004 on fruiting *Prunus serotina*: 1 in a pasture near Waluwé-Saint Lambert (Brussels-Capital region) and 2 in a military camp near Arlon (Wallonia region).	Findings were made during faunistic studies. **Current situation: present, 3 specimens caught in 2004 in two locations on wild *P. serotina*. No reports on cultivated *Prunus*.**
Croatia (Bjeliš, M. (2007); EPPO Reporting Service, 2010e)	First found in 2006	Presence of pest was discovered during surveys of pests. **Situation: present, but no details**
France (EPPO Reporting Service, 2011)	Reported for first time in 2010 in one locality in the Provence-Alpes-Côtes d'Azur region. In July 2011 also detected in the Aquitaine region	Investigations are being carried out in the Aquitaine region to identify potential host plants, as it is mainly a cereal growing region. A national monitoring programme has been initiated to better understand the situation. Appropriate phytosanitary measures are being studied by the NPPO. **Situation described as present, under official control.**
Germany (Vogt *et al*., 2008; EPPO Reporting Service, 2010a)	First specimen caught in 1999 in Rheinland-Pfalz. Few specimens caught in 2003, but since 2004 number of insects caught in cherry growing areas increased considerably and species started to be found in other parts of the country. High abundance has been found in some regions	Noted that *R.cingulata* mainly occurs in sour cherry orchards (*Prunus cerasus*) and areas where *P. mahaleb* and *P. serotina* are present. It emerges 3-4 weeks later than the European cherry fruit fly and in some years and locations it is estimated that *R. cingulata* has caused more than 20% damage in sour cherries. Cherry fruit fly control is now necessary in sour cherries, which was not the case before and late sweet cherry varieties are also threatened. Severe problems for control in Germany as no insecticide registered for chemical control of cherry fruit fly. **Situation 2010: Present in Baden-Württemberg, Brandenburg, Bayern, Hessen, Hamburg, Niedersachsen, Nordrhein-Westfalen, Rheinland-Pfalz, Scahsen, Sachsen-Anhalt and Thüringen, mainly on *P. cerasus*.**
Hungary	First reported in 2006 in Fejér	Emergence of *R. cingulata* is later than European cherry fruit fly, which means

(Kálmán, S. (2006))	county. The fruit fly was then noticed in other counties as well. Note on discussion group site that had been seen since 2002, but no further detail.	protection of crops is more difficult. During ripening only insecticides with short-term effect can be used. Measures taken: infected areas under quarantine. Continuous protection against it compulsory. Growers monitor emergence using yellow sticky cards in infected areas and surroundings. Distribution of fresh fruit prohibited, harvest for industrial processing only. Producers must transport produce under quarantine via shortest route to cold store of packing premises. Opening load during transport prohibited. No fruit left on soil or on trees at harvest. Refuse and infected fruit to be destroyed. **No official notes on status**
Netherlands (EPPO Reporting Service, 2004 ; Steeghs, M. (2003))	In 2001 occurrence of *R. indifferens* on naturalised *P. serotina* was published. Since confirmed that this was *R. cingulata.*	Dutch NPPO started survey in 2003 – in wild environment and cherry orchards. 3204 flies were trapped, mostly in coastal dune area and sometimes with high densities. Only found in cherry orchards at low densities. Conclusion after survey that widespread occurrence indicates that eradication not feasible. **Status in 2004: Present widespread in natural environment in coastal area.** 41st meeting of EPPO panel on Phytosanitary measures (2009): Of very limited distribution. Life cycle in north Europe out of synchrony with cherry fruit production. Risk elsewhere.
Slovenia (Groznik, 2007)	June 2007 - 276 specimens found in sour cherry orchards in a rather restricted area in eastern part of Slovenia. Single specimen also caught near Slovene-Hungarian border.	Monitoring intensified in 2008 to determine extent of infestation in Slovenia. **Status in 2007: Present at low prevalence in eastern part of Slovenia.** NPPO suggested EU should reconsider the listing of *R. cingulata* as well as other species from Tephritidae family known to occur in the EU.
Switzerland (EPPO Reporting Service, 2010b)	First caught in 1983 in Ticino, initially reported as *R. indifferens*, it has since been shown that it was *R. cingulata*. There have been further findings since in southern Switzerland.	**Current status: Present, first trapped in 1983 in Ticino, established in southern Switzerland.**