European and Mediterranean Plant Protection Organisation
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

Guidelines on Pest Risk Analysis

Decision-support scheme for quarantine pests Version N°3

Pest Risk Analysis for *Saperda candida*

Pest risk analysts:	Expert Working group for PRA for ***Saperda candida (met in 2009-11)*** ANDERSON Helen (Ms) - The Food and Environment Research Agency (GB) AGNELLO Arthur (Mr) - Department of Entomology New York State Agricultural Experiment Station(USA) BAUFELD Peter (Mr) - Julius Kühn Institut (JKI), Federal Research Centre for Cultivated Plants, Institute for National and International Plant Health (DE) GILL Bruce D. (Mr) - Head Entomology, Ottawa Plant Laboratories, C.F.I.A. (CA) PFEILSTETTER Ernst (Mr) - Julius Kühn Institut (JKI), Federal Research Centre for Cultivated Plants, Institute for National and International Plant Health (DE) (core member) STEFFEK Robert (Mr) - Austrian Agency for Health and Food Safety (AGES), Institute for Plant Health (AT) (core member) VAN DER GAAG Dirk Jan (Mr) - Plant Protection Service (NL) (core member) The Section on risk management was reviewed by the EPPO Panel on Phytosanitary Measures in 2010-02-18.

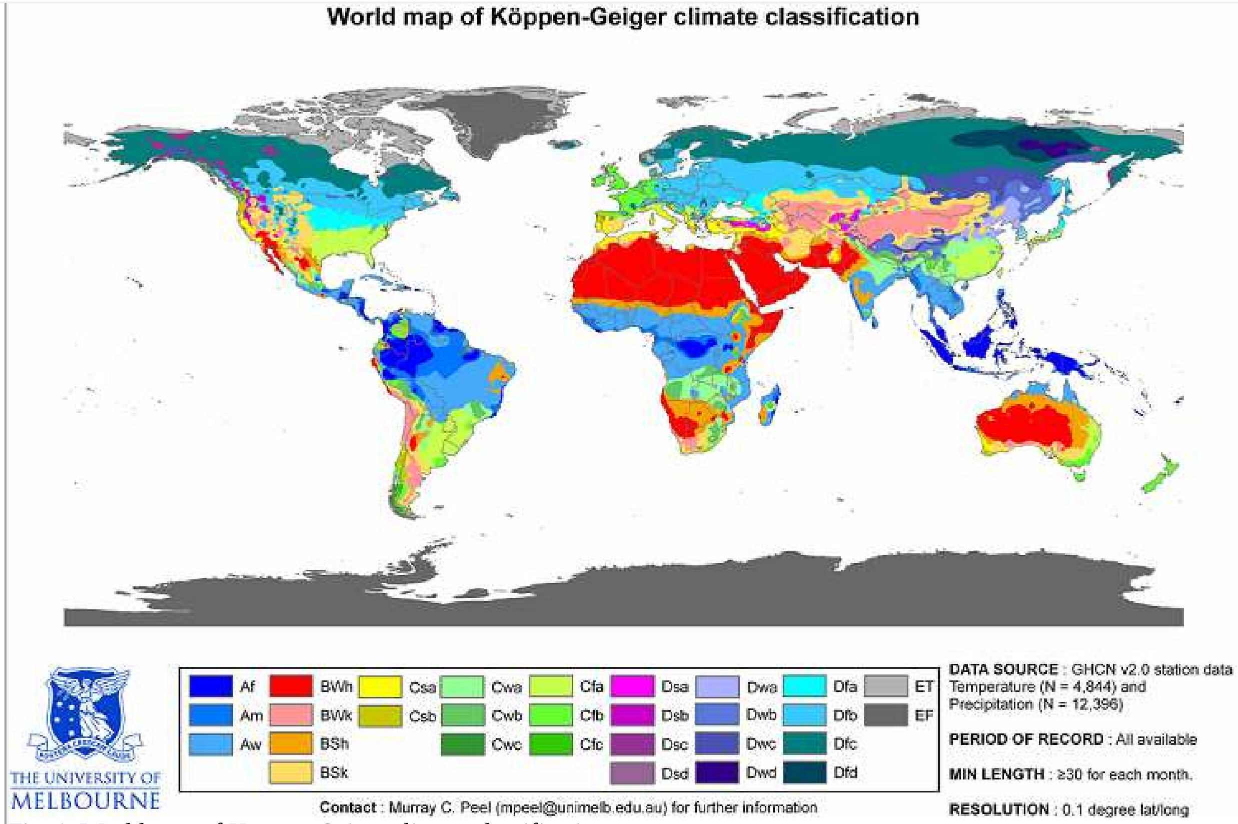
Stage 1: Initiation

1 Give the reason for performing the PRA	Identification of a single pest	In summer 2008, the presence of *Saperda candida* was detected for the first time in Germany and in Europe (Nolte & Krieger, 2008). This wood boring insect was observed on the island of Fehmarn on urban trees (*Sorbus intermedia* and other host plants) and eradication measures were taken against it. *S. candida* is considered as a pest of apple trees and other tree species in North America. *S. candida* is a regulated pest in Quebec (Canada) (Quebec, 2009), in the Republic of Korea (Korea, 2006) and in China (as *Saperda* spp. non Chinese) (China, 2007). Considering the risk it may present to fruit trees and ornamental trees in Europe, the EPPO Working Party on Phytosanitary Regulations recommended that a PRA should be performed.
1b If other reason, specify		
2a Enter the name of the pest Pest name (what you enter here will appear as a heading)		*Saperda candida* Fabricius, 1787 There is a single valid taxon, *Saperda candida* Fabricius 1787. Both *Saperda bivittata* Say 1824 and *Saperda bipunctata* Hopping 1925 are synonyms. *Bipunctata* was synonymized by Linsley & Chemsak (1995). This is reflected in the on-line catalogue of the Cerambycidae of the Western Hemisphere (Monne & Hovore, 2005) Common names: Roundheaded apple tree borer; Saskatoon Borer; Saperde du pommier; Rundköpfiger Apfelbaumbohrer
2b Indicate the type of the pest	arthropod	wood boring beetle
2d Indicate the taxonomic position	Coleoptera: Cerambycidae	Taxonomic Tree Domain: Eukaryota Kingdom: Animalia Phylum: Arthropoda Class: Insecta Order: Coleoptera Family: Cerambycidae Genus: *Saperda* Species: *candida*
3 Clearly define the PRA area	EPPO member countries	The PRA area is the EPPO region (see map www.eppo.org).
4 Does a relevant earlier PRA exist?	yes	A preliminary PRA was performed in Germany (Baufeld *et al*., 2009) and forms the basis of the present PRA. A PRA on *Anoplophora chinensis* was also used for reference, as both pests have similar biology (Van der Gaag *et al*., 2008)
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)?	not entirely valid	
5b Explain		The preliminary PRA has been performed mainly for Germany. Where applicable, relevant information from the German PRA on *S. candida* and from the PRA on *A. chinensis* has been used in this PRA.
6 Specify all host plant species (for pests directly affecting plants) or suitable habitats (for non parasitic plants) present in the PRA area.		*Malus* (apple, also wild apple), *Prunus* (cherry, plum, peach), *Pyrus* (pear), *Cydonia* (quince), *Sorbus* (mountain ash, beam-tree, rowan berry), *Crataegus* (hawthorn), *Amelanchier* (serviceberry, shadbush), *Cotoneaster*, *Aronia* (chokeberry or black mountain ash). All known host plants are Rosaceae. (Brooks, 1915; Hess, 1940; Johnson & Lyon, 1991; Solomon, 1995). Linsley & Chemsak (1995) also include *Amydalus*, *Araria* and *Pyracantha*. Quince, apple, and pear are preferred in this order, and are the most important cultivated hosts. Serviceberry and

		hawthorn are the most important native wild hosts. A few other species – including peach, cherry and plum- have been casually mentioned as hosts (Solomon, 1995) In the EPPO region *Sorbus intermedia* was found infested in the German outbreak (Baufeld *et al*., 2009). This host plant is not present in North America.
7 Specify the pest distribution		**EPPO region**: Germany (isolated findings on urban trees, *Sorbus intermedia, Malus* sp. and *Crataegus* sp., on the island of Fehmarn (Schleswig-Holstein) in the villages of Johannisberg and Mattiasfelde. Pest status: under eradication (Nolte & Krieger, 2008). **North America**: - Canada: Manitoba, New Brunswick, Nova Scotia, Ontario, Quebec, Saskatchewan. (Linsley & Chemsak, 1995; Arnett, 2000; Bousquet, 1991; Webster *et al*., 2009) - USA: reported to be present in the USA, East of the Rocky Mountains; recorded at least in part of the following states: Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia , Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Vermont, Virginia, Western Virginia, Wisconsin (Hess, 1940; Linsley & Chemsak, 1995; Morris, 2002; Peck & Thomas**,** 1998) A population is established in Edmonton and in nearby Elk Island National Park (Alberta - Canada) and appears to be the western-most locality for this species in North America (Linsley & Chemsak, 1995). This isolated population is established there since at least 1915 but according with the available literature and contacts with local entomologists it has not spread further and the prevalence is very low (Gill, pers. comm. 2009). It seems that *S. candida* can only survive but not thrive because of the climatic conditions (cold stress in particular). **Denied records:** In 1971 Melville Hatch published Part V of "The Beetles of the Pacific Northwest". He included *S. candida* as present in British Columbia presumably on the basis of a specimen found in Creston, which appeared to have been misidentified (pers. comm. with Karen Needham, curator of the Spencer Entomological Museum, 2009). Concerning records from the western United States, Hess (1940) indicated that the presence of this beetle in Colorado was questionable (Fig.1, page 8). Heffern (1998) published a survey of the Cerambycidae of Colorado and did not include *S. candida*. Nolte & Krieger (2008) mention that it is endemic also in Costa Rica, but this is from a personal communication which was then considered doubtful by the author, and there is no further reference in available literature. Larry Bezark (California Dept. of Food & Agriculture, co-author of the "Checklist of the Cerambycidae and Disteniidae (Coleoptera) of Costa Rica" (Swift *et al*., 2010) confirmed that *S. candida* is not found in Costa Rica nor in any of the other Central American countries.

Stage 2: Pest Risk Assessment - Section A : Pest categorization

8 Does the name you have given for the organism correspond to a single taxonomic entity which can be adequately distinguished from other entities of the same rank?	yes	It is a single taxonomic entity. See also question 2a.
10 Is the organism in its area of current distribution a known pest (or vector of a pest) of plants or plant products?	yes (the organism is considered to be a pest)	It is an economic pest of apple orchards and other hosts in USA and Canada [Agnello *et al.* (2006), Hogmire (1995), Johnson & Lyon (1991), Metcalf & Metcalf (1993), Slingerland & Crosby (1922)]
12 Does the pest occur in the PRA area?	yes	*S. candida* has been only detected locally in Germany [island of Fehmarn in the villages of Johannisberg and Mattiasfelde (Schleswig-Holstein)] where it is under eradication (Nolte & Krieger, 2008).
13 Is the pest widely distributed in the PRA area?	not widely distributed	No other records of *S. candida* being present in (parts of) the EPPO region apart from those mentioned in question 12 are known.
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	Host plants are widely distributed in the EPPO region: *Malus*, *Pyrus*, *Prunus* and *Cydonia* are widely cultivated in commercial orchards as well as in private gardens; *Sorbus*, *Crataegus*, *Amelanchier* as well as ornamentals of *Malus* and *Prunus* are widely found in parks and gardens, but also in the wild (see Appendix 4).
15a Is transmission by a vector the only means by which the pest can spread naturally?	no	The pest is a free living organism.
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 climatic conditions in the EPPO region are favourable for the pest, as the climatic conditions in infested regions of the USA and Canada are comparable to those in a large part of the EPPO region (see Fig. 1).

		 Fig. 1. World map of Köppen-Geiger climate classification
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	Host plants on which damage is recorded are present in the EPPO region (e.g. apple trees, ornamentals). Effects on plant health are likely.
18 Summarize the main elements leading to this conclusion.		*Saperda candida* is a known pest. Host plants and suitable eco climatic conditions are present in the PRA area.

Stage 2: Pest Risk Assessment - Section B : Probability of entry of a pest

1.1 Consider all relevant pathways and list them (one by line)	Plants for planting with roots of host plants Wood of host plants with bark	***Possible pathways*** • Plants for planting with roots of host plants from countries where the pest occurs Cuttings/budwood of host plants are not likely to be infested as larvae are usually found at the stem base and cuttings/budwood are young shoots of the growing season taken in the crown of the tree. These are consequently excluded. • Round wood of host plants with bark (including firewood) from countries where the pest occurs *S. candida* is prevalent in forests in the area of origin. There is export of wood from Canada and USA to the PRA area. Firewood: wood of fruit trees is considered as a good wood for fire. Export of firewood from North America to the PRA area exists but it is difficult to know the proportion of host species wood in this trade. Nevertheless, local movement of infested firewood could be a pathway for further spread within the PRA area. ***Pathways considered less likely*** • Wood without bark, sawn wood: after removal of bark or sawing, larvae will be more exposed to desiccation, which they probably cannot survive. • Wood packaging: Wood of host plants is not typically used for packaging material, but may be used as dunnage. In any case ISPM No. 15 *Regulation of wood packaging material in international trade* would apply and treatments required in this standard will kill the pest. • Wood chips: the process of wood chipping will destroy the larvae unless the chips are relatively big (e.g. McCullough et al., 2007). ***Pathways identified but not studied further*** • Movement of individuals, shipping of live beetles: *S. candida* is a beautiful insect and might be sent to hobbyist entomologists. This pathway is difficult to regulate as such but could be covered once the pest is regulated. • Natural spread: reports on spread capacity indicate that transcontinental spread is impossible. Literature reports only short distances of flight activity by the beetles (ca. 9 m), when host plants are nearby; however beetles are also capable of flying over distances of ca. 200 m in a single flight (Hess, 1940). However, natural spread between countries in the EPPO region and neighbouring countries could be possible if the pest establish in the PRA area. ***Impossible pathways*** • Bark: does not support life cycle • Hitchhiking: the biology of the pest shows that this pathway is not relevant and no examples are known of spread by hitch-hiking in North America. Adults do not overwinter and adults might only hitchhike during summer (Gill, pers.com,. 2009) • Cutting/budwood (see above). • Fruit, seeds, soil (no part of the pest life cycle occurs in these commodities).

1.3 Pathway:		Plants for planting with roots of host plants from countries where the pest occurs
1.3a Is this pathway a commodity pathway?	yes	
1.3b 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 *uncertainty: low*	The pest attacks healthy trees (Hanks, 1999). When the pest is present in an area, the pest may be associated with the pathway if no management measures are applied. The risk is increased when tree size increases. This judgment is extrapolated from the situation recorded in orchards in North America before 1950s when no pesticides were applied [Felt & Joutel (1904), Brooks (1915), Hess (1940) Johnson & Lyon (1991)] Couper (1862) considered that introduction of *S. candida* in Quebec was due to the import of infested young apple trees coming from US nurseries. The pest is now established there as well as in other parts of Canada. Another hypothesis is that the insect may have been already present (native) on wild plants and became noticeable as a pest when apple orchards were newly planted at that time (Gill, pers.com,. 2009).
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 *uncertainty: low*	In Canada and USA, nurseries are sprayed with broad spectrum insecticides which also impact *Saperda candida* [Couch (2009); Ontario Ministry of Agriculture, Food, and Rural Affairs (2009)]. The pest occurs sporadically in nurseries [Réseau d'Avertissements phytosanitaires (2008), Helms *et al*. (2004), MacRae (1993), Solymár (2005)]. Regulation of the shipment of nursery and greenhouse stock exists in USA to minimize the spread of harmful insects, diseases, and other pests. Some states have adopted tolerances for certain pests that are established in the state (e.g. in Kansas incidence of *S. candida* in nursery stock should be less than 1%; Kansas, 2009)
1.5 How large is the volume of the movement along the pathway?	Minor *uncertainty: medium*	Relevant data is difficult to retrieve. Species of plants for planting are not always specified on the Phytosanitary certificates and would consequently not show up in export/import databases. This explains some of the inconsistency between data of export from Canada and import into Germany and The Netherlands. Concerning fruit trees, the only available data from Eurostat is import of fruit trees and shrubs in general from Canada and USA and includes all fruit bearing trees and shrubs also *Vaccinium*, *Rubus* and other non hosts). Trade of such plants for planting appears limited (see Table 1.1 in Appendix 1). In weight, import of fruit plants for planting from Canada and USA varied between 1 and 6% of the total import in EU in 2005-2007. Nevertheless, it reached over 20% in 2008 (see Table 1.5 in Appendix 1). Export records from Canada were negligible or nonexistent for all hosts except *Amelanchier*. Since December of 2000, over 39000 *Amelanchier* plants were exported to six EU countries (see Table 1.2 in Appendix 1). While the bulk of these shipments went to Finland, 615 plants were imported to Germany between 2003 and 2009. Approximately 60% of all exports to the EU originated from areas in Saskatchewan within the range of *Saperda candida*. This includes all of the material exported to Germany. Detailed data provided by the NPPO of Germany for the period 2003-2009 (see Table 1.3 in Appendix 1) shows that imports are quite variable, with no import at all in some years, and large imports of some species in other years (e.g. more than 12000 plants in 2003). Concerning ornamental plants for planting, no detailed data is available on host species but aggregated data of all kind of plants for planting show that import from USA and Canada is limited (see Tables 1.4 a, b, c in

		Appendix 1). In weight, import of all species of ornamental plants for planting coming from USA and Canada represent about 2% of the worldwide import of such plants in EU. Detailed data from the Dutch NPPO (Van der Gaag, pers. comm. 2009) shows that import of ornamental host species from USA and Canada is very limited: in 3 years, total import from these 2 countries was 7200 Amelanchier, 100 Cotoneaster and 50 Prunus. Detailed data provided by the NPPO of Germany for the period 2003-2009 (see Table 1.3 in Appendix 1) shows a large import of *Prunus avium* in 2009.
1.6 How frequent is the movement along the pathway?	Occasionally/rarely *uncertainty: high*	Data from Germany (Appendix 1, Table 1.3) shows that imports of host species in this country vary between 0-3 consignments each year.
1.7 How likely is the pest to survive during transport /storage?	very likely *uncertainty: low*	Larvae live in the trunk for 2-4 years, eggs are laid in the bark, pupae are in the trunk as well as adults before emergence (Hess, 1940). Plants are stored cool during transport. Larvae inside plants can survive temperatures around zero for prolonged period of times. *S. candida* is present in areas with minimum temperatures during winter far below zero (Linsley & Chemsak, 1995). Transport conditions are not detrimental to the plants and are therefore not detrimental to the pest, which can survive during transport/storage. Other Cerambycidae with a similar biology (e.g. *Anoplophora* spp.) are regularly intercepted in Europe in plants for planting from Asia (Van der Gaag *et al*, 2008). In addition, transport time for plants from North America will be shorter than that from Asia (about 2 weeks instead of 4-5 weeks), which will favour survival.
1.8 How likely is the pest to multiply/increase in prevalence during transport /storage?	impossible/very unlikely *uncertainty: low*	Larvae (as well as eggs, pupae and adults pre-emergence, depending on the time of the year) can be transported in the trunk. Larvae and pre-adults might continue their development but will not be able to multiply.
1.9 How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	Likely *uncertainty: low*	Requirements exist in at least 30 EPPO countries but are not considered sufficient: • Following EU Directive 2000/29 (EU, 2000), Plants, intended for planting, other than seeds, of *Amelanchier* Med., *Cotoneaster* Ehrh., *Crataegus* L., *Cydonia* Mill., *Malus* Mill., *Prunus* L., other than *Prunus laurocerasus* L. and *Prunus lusitanica* L., *Pyrus* L. and *Sorbus* L must be accompanied by phytosanitary certificate (or a plant passport for internal movement). • Phytosanitary requirements that must be fulfilled before the issuance of the phytosanitary certificate are described in Annex IV (Part A, section I, point 39) of EU Directive 2000/29 which stipulates that "Trees and shrubs, intended for planting, other than seeds and plants in tissue culture, originating in third countries other than European and Mediterranean countries" should "have been inspected at appropriate times and prior to export and found free from symptoms of harmful bacteria, viruses and virus-like organisms, and either found free from signs or symptoms of harmful nematodes, **insects**, mites and fungi, or have been subjected to appropriate treatment to eliminate such organisms." • In addition, annex IV (Part A, section I, point 40) stipulates that deciduous trees and shrubs, intended for planting, other than seeds and plants in tissue culture, originating in third countries other than European and Mediterranean countries should be "dormant and free from leaves". Detection of oviposition slits and bore holes is considered possible (Solomon, 1995) but requires careful examination and can be easily overlooked during the early stages of the infestation. Recent experience with inspection of imported plants for planting for *Anoplophora chinensis* has shown that such organisms are very

		difficult to detect during their hidden stages (Van der Gaag *et al*, 2008).
1.10 How widely is the commodity to be distributed throughout the PRA area?	widely *uncertainty: medium*	There is no precise data available to answer this question. Data on export of trees and shrubs (of all species) from USA to the EPPO region (Table 1.6 in Appendix 1) shows that countries in different parts of the region may import such plants although the biggest importer is the EU. Exports of *Amelanchier* from Canada (Table 1.2 in Appendix 1) went to the Czech Republic, Finland, France, Germany, Netherlands, and Sweden. Additionally host plants are widely distributed in the PRA area, so one can assume that there is consumer demand in all EPPO countries and consequently consignments might be distributed throughout the PRA area.
1.11 Do consignments arrive at a suitable time of year for pest establishment?	yes *uncertainty: low*	Climatic conditions do not affect the life stages of the pest that are hidden in the trunk (larvae as well as eggs, pupae and adults pre-emergence)
1.12 How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	likely *uncertainty: medium*	Larvae can complete their life cycle in the host plant, and adults will emerge from infested plants. Several eggs may be laid by each female on the same tree (Hess, 1940), thus there is a possibility that both male and female emerge from a single infested tree. Hanks (1999) notes that females of *S. candida* may oviposit on their natal host. Plants for planting from the same lot will be planted in orchards or nurseries. If several plants are infested, this will increase the probability of mating. No information is available about the number of female and male beetles that is needed to start a new population. The presence of only one male and one female beetle at the same location and at the same time may be sufficient to start a new population. **Uncertainty**: the number of male and female beetles needed to start a new population.
1.13 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 *uncertainty: low*	Imported plants for planting are planted in orchards, nurseries, private gardens, amenity areas. If infested they may be a source of infestation for neighbouring host plants.

1.3 Pathway:		Wood of host plants with bark (including firewood)
1.3a Is this pathway a commodity pathway?	yes	Hess (1940) notes that in USA the favoured hosts are apple, pear and quince; occurrence in plum and cherry is much less common. Alden (1995) list *Malus* and *Prunus* as species used for production of wood in North America. He notes that the wood of wild apple trees is said to be better than that of cultivated varieties. *Pyrus* wood is also sold in Europe but no data is available for this species. Kuhns & Schmidt (2003) list wood of apple and cherry trees as good firewood. *Malus*, *Pyrus* and *Prunus* are listed in the Canadian Phytosanitary Requirements for the Importation and Domestic Movement of Firewood (CFIA, 2006).
1.3b 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 *uncertainty: low*	*Saperda candida* is prevalent in the wild, including forests, in Eastern North America. Nevertheless it is not very abundant (Gill, pers. comm, 2009; Decker *et al*., 2008; Stanton *et al*, 2003). *Prunus serotina* is grown for wood throughout Eastern USA, where the pest is present. Main commercial areas are Pennsylvania, Virginia, West Virginia and New York State (AHEC, 2009). Larvae live in the wood for 2-4 years, so the pest may be present in the wood when harvested.
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 *uncertainty: low*	When the pest is present in an area, the pest may be associated with the pathway because no management measures are applied. The risk of infestation is increased with large trees as they are longer exposed to infestation and can support more larvae (Hess, 1940). Up to 25 larvae per tree were recorded by Hess (1940). In Europe, up to 12 exit holes on one tree have been observed in the German outbreak (Baufeld, pers. com. 2009).
1.5 How large is the volume of the movement along the pathway?	Minor *uncertainty: medium*	Import of wood with bark of host species is difficult to quantify as very few data are available for host species of *S. candida*. This trade is very low compared to the total trade volume of wood. In Eurostat, there is no specific data on the import of wood with bark for host species as there is no specific custom code. Nevertheless, there is a category "*wood in the rough, whether or not stripped of bark or sapwood, or roughly squared (excl. rough-cut wood for walking sticks, umbrellas, tool shafts and the like; wood cut into boards or beams, etc.; wood treated with paint, stains, creosote or other preservatives, tropical wood of subheading note 1 to this chapter and coniferous wood, oak, beech, poplar, eucalyptus and birch wood)*" which will cover import of host species. Import of such species (i.e. non coniferous species excluding oak, beech, poplar, eucalyptus and birch) in EU is 7% from worldwide imports of all kind of rough wood. Export data from USA to EPPO countries is presented in Appendix 2. From the host plants, only *Prunus* is currently significantly traded as wood, the commercial name being “cherry wood”. *Prunus serotina* is considered as one of the top 22 commercial species by the American Hardwood Export Council (http://www.americanhardwood.org/resource-centre/species-guide.html). Wood of *P. serotina* is used for furniture, instruments and specialty items (Alden, 1995). *Malus* and *Pyrus* wood is also being used for furniture (http://www.thewoodexplorer.com/maindata/we1004.html; Alden, 1995) and might be imported from North America for this purpose but there is currently no information of such trade. Tables 2.1 and 2.2 in Appendix 2 present all commodities of cherry wood for which statistics are available in USA. Both logs and lumbers may have bark. Veneer sheets are the largest trade in volume but are not considered as a possible entry pathway. Table 2.3 presents export of logs of other types of temperate wood which will cover potential export of *Malus* and *Pyrus* wood.

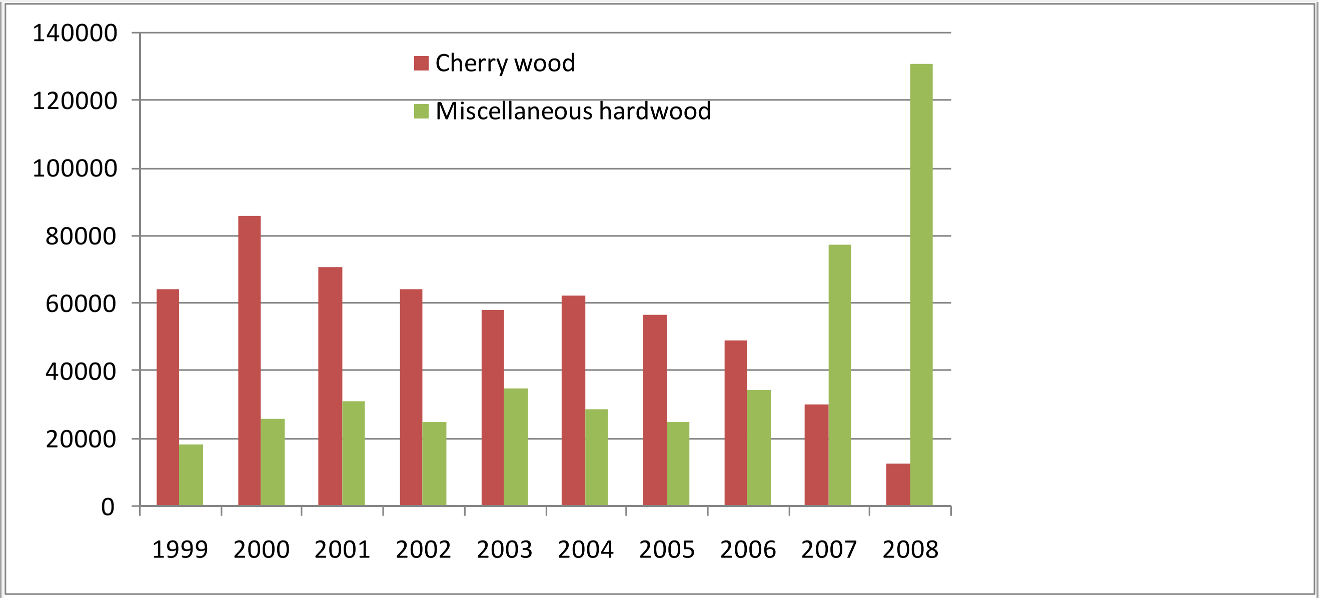
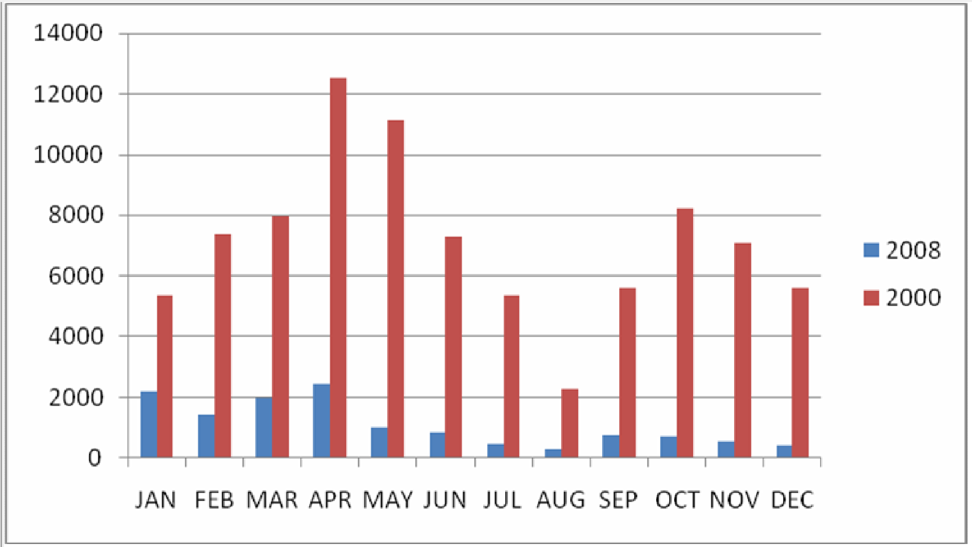


		Fig. 2. Export of logs of cherry and miscellaneous hardwood from USA into the EPPO region (m3) – Source Foreign Trade Statistics, Department of Commerce US (2009) Fig 2. shows that trade of logs of cherry wood has decreased over the last 10 years (import from USA to EU reached 85118 m3 in 2000 but decreased to 12627 m3 in 2008) whereas other types of hardwood increase. Import volume is quite variable but generally import of cherry wood seems to decrease whereas import of other types of hardwood seems to increase: in 2004, cherry logs counted for 25% of hardwood logs exported by the USA to EU whereas they decrease to 3% in 2007 (see Table 2.5 in Appendix 2). Eurostat gives also figures of import of firewood from USA and Canada to EU countries: in 2007, about 2200 tons of firewood were imported in EU from USA and Canada (see Table 2.6 in Appendix 2). Sánchez & Barberena (2009) noted that import of firewood in European countries from outside of the region is limited (less than 8% of the wood used). It is not possible to know the species imported for this purpose but *Malus*, *Pyrus* and *Prunus* are listed in the Canadian Phytosanitary Requirements for the Importation and Domestic Movement of Firewood (CFIA, 2006), which demonstrate that these species are traded for firewood in North America.
1.6 How frequent is the movement along the pathway?	rarely *uncertainty: medium*	Import of Cherry wood from USA into the EPPO region occurs every month, they vary in volume over years (2000 being the year with the largest trade volume over the last 10 years and 2008 with the smallest volume) and during the year (Fig. 3 below and Table 2.4 in Appendix 2).

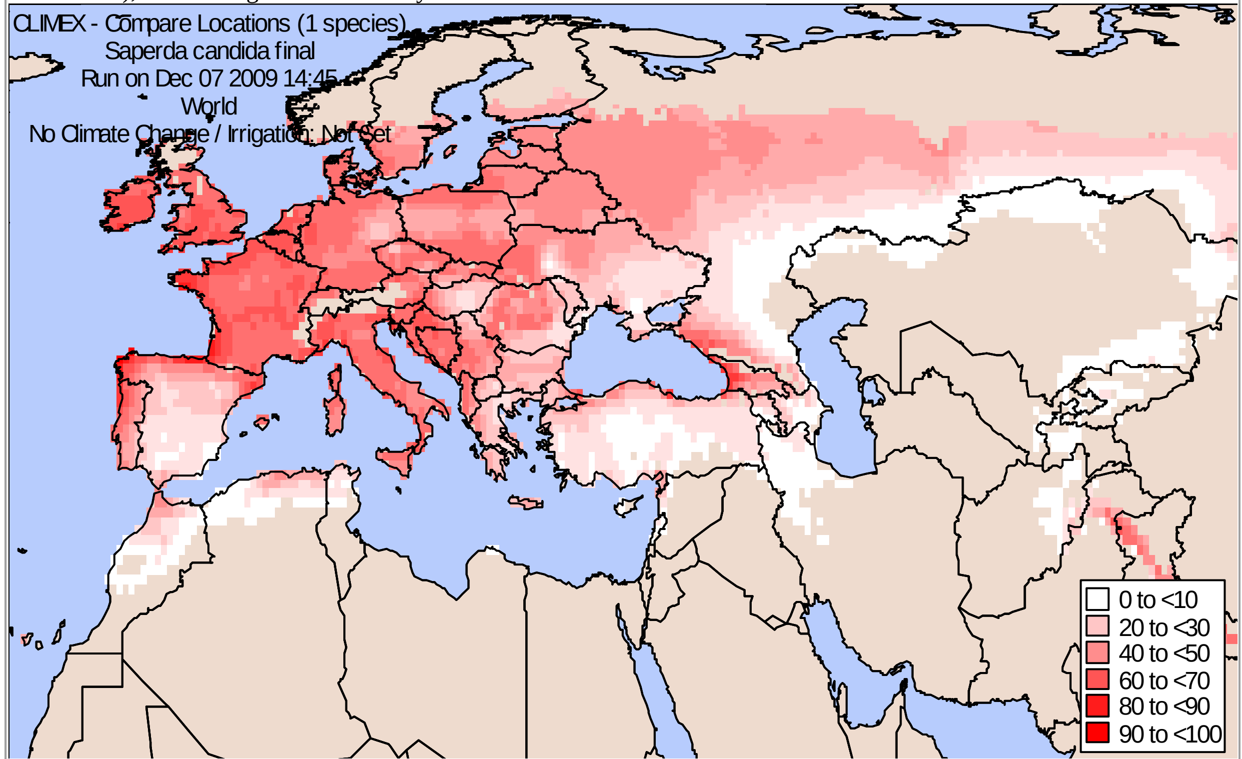
		 Fig. 3. Monthly export of cherry logs from USA into the EPPO region (m3) in 2000 and 2008 – Source Foreign Trade Statistics, Department of Commerce US (2009)
1.7 How likely is the pest to survive during transport /storage?	Likely *uncertainty: low*	Early instar larvae will probably not survive in cut wood, but late instar larvae may complete their life cycle and emerge from wood (Hess, 1940, Gill, pers. comm., 2009). One tree can support larvae at different development stages (observations from the German outbreak, Baufeld pers. comm., 2009), as well as adults prior to emergence (Hess, 1940).
1.8 How likely is the pest to multiply/increase in prevalence during transport /storage?	impossible/very unlikely *uncertainty: low*	*Saperda candida* prefers live healthy trees to reproduce (Hanks, 1999).
1.9 How likely is the pest to survive or remain undetected during existing management procedures (including phytosanitary measures)?	Likely *uncertainty: high*	There are currently no specific phytosanitary measures for these species of wood. Galleries may be detected when cutting the trees depending on the level of infestation, stages of larvae, and height of the cut. The EWG had no information if wood with bore holes would systematically be excluded from trade.
1.10 How widely is the commodity to be distributed throughout the PRA area?	Widely *uncertainty: medium*	In the EPPO region, the biggest importer of cherry logs from USA is the EU. For cherry wood, biggest importers are Germany, Portugal and Italy (Table 2). Nevertheless, free movement of wood is allowed at least within the EU and consequently consignments might be distributed throughout the PRA area.
1.11 Do consignments arrive at a suitable time of year for pest establishment?	yes *uncertainty:*	Imports might be all year round (see answer to question 1.6) but are lower in summer. Storage can be so long that larvae can complete their cycle.

	medium	

1.14c The overall probability of entry should be described and risks presented by different pathways should be identified		*S. candida* is present as low prevalence in North-eastern America. There are moderate chance that the pest is associated with plants for planting but infestation would be at very low level. Trade of plants for planting is minor but if infested plants are traded, they could move undetected and would be planted in suitable environment. Import of host wood is minor, but it is likely that the pest could survive and remain undetected in trade. Probability of entry appears low but the pest did enter in the PRA area.

Stage 2: Pest Risk Assessment - Section B : Probability of establishment

1.15 Estimate the number of host plant species or suitable habitats in the PRA area.	moderate number *uncertainty: low*	*Saperda candida* is only recorded on host plants of Rosaceae in its native range (*Amelanchier, Amydalus, Aronia, Cotoneaster, Crataegus, Cydonia, Malus, Prunus, Pyracantha, Pyrus, Sorbus*). There are several species for each genus, e.g. in Europe about 25-30 species of *Malus*, 25 species of *Pyrus*, 200 species of *Prunus*, 100 species of *Crataegus* (Cullen, 1995).
1.16 How widespread are the host plants or suitable habitats in the PRA area? (specify)	very widely *uncertainty: low*	**Fruit species** About one third of European orchards are planted with apple trees, and 8% with pear trees. In 2007, in the EU: • 485 100 ha of table apple (including 4850 ha -about 1%- of organic production in 2007). Note that organic production of apple is increasing and reached about 12000 ha in 2008, see Table 3.4 in Appendix 3) • 112 258 ha of table pear (including 1520 ha -about 1%- of organic production in 2007) (Eurostat, 2009) In all 50 EPPO countries in 2007, according to FAOSTAT (http://faostat.fao.org/), there were - 1 655 011 ha of apple trees - 297 909 ha of pear trees - 35 004 ha of quince In 2007 the largest surfaces (in ha) are found in the following countries: - for apple production: Russian Federation, Poland, Turkey, Ukraine, Uzbekistan, Belarus, Moldova, Italy, Romania, France - for pear production: Italy, Turkey, Spain, Algeria - for quince production: Turkey, Uzbekistan, Morocco, Azerbaijan (see Appendix 3, Tables 3.1, 3.2, 3.3 for details) Additionally all these species are frequently planted in gardens throughout the temperate parts of the PRA area. **Ornamental species** *Malus, Pyrus, Prunus, Amelanchier, Sorbus, Cotoneaster, Aronia, Crataegus* are widely grown and used for ornamental purposes in the PRA area (Cullen, 1995). **Wild species** Wild species of host plants are widely distributed in the wild in the PRA area (EUFORGEN, 2009, see maps for *Malus sylvestris, Pyrus pyraster, Prunus avium* and *Sorbus terminalis* in Appendix 4)
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 with such species?	N/A *uncertainty: low*	
1.18a Specify the area where host plants (for pests directly	.	Host plants are present in the entire PRA area although fruit trees are frequently grown in specialized production areas (Eurostat, 2009).

affecting plants) or suitable habitats (for non parasitic plants) are present (cf. QQ 1.16-1.18). This is the area for which the environment is to be assessed in this section. If this area is much smaller than the PRA area, this fact will be used in defining the endangered area.		
1.18b How similar are the climatic conditions that would affect pest establishment, in the PRA area and in the current area of distribution?	largely similar *uncertainty: low*	From its biology, the pest is likely to survive in all areas where host plants are grown. A climatic study was performed using CLIMEX (see Appendix 5). Parameters for the model were fixed considering the known geographical distribution in North America and some facts of the pest biology (temperature requirements, length of life cycle). As a result, the map of the potential development of *S. candida* in the EPPO region is presented below. This study should be considered with care as it only considers climate and not other important factors such as presence of host plant or crop practice. *S. candida* spend a large part of their life cycle within the trees and are therefore less susceptible to climate requirements than other pests. In addition, for some countries (e.g. Kazakhstan, Kyrgyzstan, and Uzbekistan), meteorological data used by CLIMEX is scarce.  Fig. 4 Ecoclimatic index (EI) for *Saperda candida* in the EPPO region (EI>35 is very favourable for establishment) From this study, the following EPPO countries appear not at risk because of the dry and/or hot stress caused to the pest: Kazakhstan, Kyrgyzstan, and Uzbekistan. In addition, the following (parts of) countries are not very favourable to the pest: Azerbaijan, South of Algeria, Cyprus, Jordan, Israel, South of Morocco, South and central part of Spain, Turkey,

		Tunisia, East of Ukraine.
1.19 How similar are other abiotic factors that would affect pest establishment, in the PRA area and in the current area of distribution?	no judgement *uncertainty: low*	From the literature available, no other abiotic factors are recorded as playing a role in establishment of *S. candida*.
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 *uncertainty: low*	The pest has never been recorded on protected crops.
1.21 How likely is it that establishment will occur despite competition from existing species in the PRA area, and/or despite natural enemies already present in the PRA area?	likely *uncertainty: low*	The outbreak in Germany proved that presence of potential natural enemies was not sufficient to prevent establishment. Nevertheless, the situation might be different in other parts of the PRA area. Solomon (1995) reports that the hairy, downy and golden woodpeckers and northern flicker (*Picoides villosus, Dryobates pubescens medianus, Melanerpes aurifrons, Colaptes auratus*) are the most important natural controls. Woodpeckers are reported to feed upon all stages of the larvae. Hess (1940) and Brooks (1920) note that woodpeckers can remove 50-90% of larvae and thus control the pest. Apparently woodpeckers are better able to get at and remove borers where clean-culture methods are practiced. Nevertheless, most larvae are removed from their pupal chamber during the winter and early spring, thus the borers have already done the principal injury to the tree. The woodpecker species which are reported to control *S. candida* in North America are not present in the PRA area (Perrin & Cuisin, 1987). Other species of woodpeckers are present in the EPPO region but it is not known if they could be efficient in controlling *S. candida*. Solomon (1995) reports that other predators include spiders, carpenter ants, click beetles, and carabid beetles. Five species of hymenopterous parasites: *Cenocoelius saperdae, Echthrus niger, Monogonogastra agrili (= Digonogastra agrili) and Xylophrurus nubilipennis luctuosus,* and one dipterous parasite *Sarcophaga* sp. have been reported. These hymenopterous species are not reported to be present in the EPPO region but some species of Sarcophaga occur (Fauna Europaea, 2007).
1.22 To what extent is the managed environment in the PRA area favourable for establishment?	highly favourable *uncertainty: low*	Crops are grown in monoculture. The high density of planting in nurseries and orchards favours the establishment of the pest as the pest is of relatively sedentary nature (Hanks, 1999). Susceptible crops are often concentrated in certain areas of the countries: some regions in EU-27 are clearly specialised in the production of certain types of fruit. Mazowieckie accounts for 40% of the apple tree area in Poland. Emilia-Romagna represents more than 60% of the area under pear trees in Italy (Eurostat, 2009). Host plants can be found in the wild or in amenity areas in the vicinity of orchards and nurseries and can therefore act as reservoir of the pest, even if management measures are applied in orchards and nurseries. *Prunus serotina* is considered an invasive plant in the EPPO region (EPPO List of invasive alien plants): such source of infestation is very difficult to control/eradicate. Ground cover management is less favourable for the pest (because it helps predation and help detecting early infestation – Agnello, 2006). This is current practice in nurseries and intensive orchards in Western Europe but large parts of the fruit producing areas are extensively managed.
1.23	likely	Pest establishment did occur in Germany (Baufeld *et al*., 2009). The EWG considered that pest management of urban

How likely is it that existing pest management practice will fail to prevent establishment of the pest?	*uncertainty: high*	trees in Europe is similar to what is done in Germany (amenity trees are largely unmanaged so there are few existing measures to inhibit establishment).

Organic orchards, private gardens and amenity land and forests are more favourable to establishment because fewer pesticides are used there. Agnello *et al.* (2006) note that "this pest can easily become a serious problem in neglected or backyard apple trees".

<u>Pest management in orchards</u>

Johnson & Lyon (1991) noted that with current pest management programs, the pest is now of little concern to fruit growers in North America. In the area of origin *S. candida* is controlled in conventional (i.e. non organic) orchards by insecticide application aimed to control the Plum curculio (*Conotrachelus nenuphar*) and the codling moth (*Cydia pomonella*). Insecticides which are thereby used have a side effect on *S. candida* (Agnello *et al.*, 2009; Cooley *et al*. 2009; Crassweller, 2008).

But practices appear different between North America and EU.

Insecticide active substances used in American orchards and active against *S. candida*	Registered in EU	
Acetamiprid	yes	
Azinphos-methyl	no	
Carbaryl	no	
Chlorantraniliprole	pending	
Chlorpyrifos	yes	
Cyfluthrin	yes	
Diazinon	no	
Dimethoate	yes	
Esfenvalerate	yes	
Fenpropathrin	no	
Flubendiamide	pending	
Imidacloprid	yes	
Indoxacarb	yes	
Kaolin	yes	Can be used in organic orchards
Lambda-cyhalothrin	yes	
Malathion	no	
Methomyl	yes	
Permethrin	no	
Phosmet	yes	
Spinetoram	pending	
Thiacloprid	yes	
Thiamethoxam	yes	

(Status of a.s. in EU checked in 2009-11 in the EU Pesticide Database

		http://ec.europa.eu/sanco_pesticides/public/index.cfm?event=activesubstance.selection) Current pest management in Germany, the Netherlands, and UK suggests that even where chemicals suitable for the control of *Saperda candida* are used (e.g. neonicotinoids like imidacloprid, thiacloprid, acetamiprid; or chlorpyrifos in UK) the timing of the applications does not coincide with when the pest is susceptible – i.e. when adults emerge and are active (pers. comm. 2009 with H. Helsen, Dutch Applied Plant Research and with D. Garthwaite, Fera; Baufeld *et al*., 2009) B. Bourgouin (French NPPO, pers. comm. 2009) considers that pest management in France could control *S. candida* as insecticide programs against *C. pomonella* currently implies continuous insecticide treatments between early May to mid-September with application of broad-spectrum insecticides like pyrethroids (Lambda-cyhalothrin, deltamethrin, cyfluthrin,cypermethrin) or organo-phosphates (Chlorpyriphos ethyl, phosmet). There is a tendency in Europe to more integrated control strategies due to the development of insecticide resistance of *C. pomonella.* Alternative methods targeting specifically *C. pomonella* (e.g. *Bacillus thurengensis*, *Cydia pomonella granulose virus*) have no action on other pests. This could result in secondary pests to become more damaging: Balazs et al.(1996) noted that the apple clearwing (*Synanthedon myopaeformis*, a European borer of apple trees) that has been regarded until the 1960's in whole Europe as one of the secondary pest of apple trees became a significant pest in some orchards because of changes in apple production technology (intensive plantations, rootstocks with low growing capacity) as well as effect of some environmentally friendly preparations applied in the IPM orchard. Insecticide resistance to many different chemical groups is common in some European fruit growing regions. Reduction of the susceptibility of field populations of *C. pomonella* are reported from France, Italy, Switzerland, Spain, Bulgaria and the Czech republic (e.g. Reyes *et al.*, 2007; Stara *et al.*, 2006, Charmillot *et al.*, 2007). Cross resistance between different chemical groups are also reported (Reyes *et al.*, 2007). This explains the widely use of pheromone mating disruption in apple growing regions where control of the codling moth is difficult due to a reduced efficacy of insecticides. Fruit producer surveys were carried out within an EU network project (www.endure-network.eu; Samietz *et al.*, 2008): mating disruption is widespread in some European pome fruit growing regions: in South Tyrol (IT), Switzerland, Rhone Valley (FR), Lleida (ES) and Trentino (IT) mating disruption was found with a high percentage of total use (75%,50%, 40%, 30%, 30% respectively). Organic fruit production uses mating disruption (alone or combined with granulovirus) as the main strategy to control codling moth. In particular in Integrated Production systems the use of growth regulators and of granulovirus is the other dominant strategy widely used in Europe (Samietz *et al.*, 2008). Growth regulators, granulovirus and pheromones have a mode of action which is aimed specific against caterpillars. None of them would have a side effect on *S. candida*. **<u>Pest management in nurseries</u>** According to Garthwaite & Thomas (2007), an average of 3 sprays of insecticides are used per year in nurseries in UK, control of aphids being the major reason for insecticide use. Pirimicarb and Chlorpyrifos were the main insecticides used on fruit stock, average of two applications of each, where used – but both were used on less than half the area of fruit stock in the census area. Pyrethroids were used on a very small area. Pirimicarb was the principal insecticide used on ornamental trees – on just over 20% of those in the census area. Organophosphates Dimethoate and Chlorpyrifos were used on a further 16% and Pyrethroids also on 16%. In France, G. Chauvel (French NPPO, pers. comm., 2009) reports that insecticide treatments in nurseries are very limited and targeted. On the contrary, it seems that in Italy, nurseries are often sprayed, particularly in the year of production

		(usually the second year from planting). Insecticides are often used against aphids, leaf-miners, psilla (on pears) and scales which endanger the canopy and flowers and may pose the plant's life at risk (R. Bugiani, Italian NPPO Region Emilia-Romagna, pers. comm., 2010) In the Netherlands insecticides that are being used in tree nurseries and that are effective against *S. candida* are deltamethrin, thiamethoxam and thiacloprid. The latter two have a moderate effect (pers. comm. A. Agnello, 2009, Cornell University, USA). In the cultivation of *Malus* and *Pyrus* fruit trees, deltamethrin and thiametoxam are each usually applied twice in the period June - September. In the cultivation of ornamental shrubs and trees fewer insecticides are being used. Deltamethrin is usually applied in June, thiametoxam and thiacloprid in July and September (pers. comm. S. van Houwelingen, Cultus Agro Advies BV, The Netherlands). Considering the expected flight season of *S. candida* in NW-Europe (June - September), the insecticides already applied in the Netherlands against other pests will possibly partially control S. *candida* populations but it is unlikely that the few applications of deltamethrin can prevent establishment of the pest. Conclusion Known effective pest control measures are in use in part of the PRA area, but only a proportion of the plants at risk are likely to be treated. *S. candida* would be unlikely to be controlled based solely on current usage. **Revision of the current EU legislation on pesticides and consequences for crop protection** The EU Directive 91/414 regulation the placing on the market of plant protection products is currently under revision. An assessment performed by the Pesticide Safety Directorate in 2008 of the impact on crop protection in the UK of the 'cut-off criteria' and substitution provisions in the proposed Regulation concluded that pyrethroids and organophosphates could no longer be registered in EU (PSD, 2008). Nevertheless, neonicotinoids could still be used. Based on the information gathered on the crop protection practice in different EPPO countries, it is likely that existing control measures will not prevent establishment.
1.24 Based on its biological characteristics, how likely is it that the pest could survive eradication programmes in the PRA area?	moderately likely *uncertainty: low*	Considering that its life cycle is 2-4 years, natural spread is slow and that efficient plant protection products are available, eradication is possible. Small infestations can be eradicated by destruction of visibly infested trees as well as host plants near to infested ones. Removal of non(-visibly) infested trees around visibly infested trees is needed since trees may be infested without clear symptoms (oviposition slits are very difficult to observe and trees without any visible symptom may harbour eggs and/or early instar larvae). Nevertheless, before eradication can be attempted, an outbreak should first be detected, and as noted above, detection can be very difficult because of hidden life stages of the pest. In addition, host plants are widely distributed, e.g. in private gardens, which makes removal of all host plants in an area quite difficult. Eradication measures applied against *Saperda candida* in 2009 in Germany were as follows (Kehlenbeck *et al.* , 2009; Baufeld, pers. comm., 2009): - A quarantine area (focus zone) of 2 km and a buffer (safety) zone of 2 km around (4 km in total) were demarcated. All host trees and shrubs in the focus and safety zones were visually inspected 4 times a year: twice during the vegetation period (spring and summer) and twice out of the vegetation period (autumn and winter; trees without leafs) by the plant protection service and continuously by road maintenance service (Strassenmeisterei) in their daily work. - In the focus zone, all infested plants (trees and shrubs) in public green <u>and</u> private gardens were destroyed by cutting and (local) burning. Insecticides were applied (alfa-cypermethrin) on each (non-infested) host plant with high pressure application equipment in May.

		- In the safety zone, all host plants were sprayed with insecticide (alfa-cypermethrin) with high pressure application equipment in May - In addition, public information was displayed to explain the problem and the eradication measures and encourage people to report further findings. It is considered that this eradication is possible because the pest occurred in a small area with a limited number of host plants. Nevertheless, it is too early to be sure that this eradication campaign was successful. In 2009 5 dead beetles and 2 live beetles were found on one tree in the infested area (focus zone).
1.25 How likely is the reproductive strategy of the pest and the duration of its life cycle to aid establishment?	moderately likely *uncertainty: low*	*S. candida* only reproduces sexually and its reproductive rate is not high (about 40 eggs laid per female according to Hess, 1940), and its life cycle is quite long (2-4 years). Such characteristics will only moderately aid establishment. Although the life cycle does not include dormancy, it can be prolonged if conditions are unfavourable. In addition in the same location the life cycle can vary between exceptionally 1 to 4 years (Brooks, 1920).
1.26 How likely are relatively small populations to become established?	likely *uncertainty: medium*	No information is available about the number of female and male beetles that is needed to start a new population. The presence of only one male and one female beetle at the same location and at the same time may be sufficient to start a new population.
1.27 How adaptable is the pest? Adaptability is:	moderate *uncertainty: low*	Adaptability is considered moderate. All host plants belong to the same family (Rosaceae) but this family has quite a large number of species and the pest infested a new species in Germany (*Sorbus intermedia*) (Nolte & Krieger, 2008). The geographical distribution in North America (from Florida to Ontario) supports that the pest is adaptable to different climates. Length of life cycle is generally longer in the northern part of its range (maybe up to 5 years according to Hess, 1940). On the other hand the species has no subspecies adapted to specific areas or habitats. It has not developed resistance to insecticides which can be explained by the facts that its biology is not favourable to apparition of resistance (length of life cycle in particular) and treatments are not targeted to this pest.
1.28 How often has the pest been introduced into new areas outside its original area of distribution? Specify the instances if possible in the comment box.	very rarely *uncertainty: low*	The pest was introduced once in Germany (Nolte & Krieger, 2008). A population of *S. candida* is recorded in Edmonton (Province of Alberta - Canada) with multiple captures between the years 1915 and 2008 (Gill, pers. comm., 2009). This appears to be an outlier from the main distribution in eastern North America, and may indicate human-mediated introduction in the late 19^{th} or early 20^{th} century. However, we have no documentation as to how it got to Edmonton. *Amelanchier* is a common host plant in the Edmonton area. Couper (1862) reported that *S. candida* was introduced to Quebec from USA via infested young trees. The pest is nowadays established there. Hess (1940) noted that small isolated populations in Montana and Colorado represented probably infestations shipped in with apple stock. Another hypothesis (Gill, pers. comm., 2009) is that the insect may have been already present (native) on wild hosts and became a pest when apple orchards were newly planted at that time (this is supported by Hess (1940) who noted that "the distribution of *Saperda candida* marks also the distribution of the service berry, *Amelanchier canadensis*.")
1.29a Do you consider that the establishment of the pest is very unlikely?	no	
1.29c		Host plants and suitable habitats with suitable climate are widespread in the PRA area.

The overall probability of establishment should be described.		There is no pest management on many host plants (in the wild, in private gardens, amenity and urban areas, along roads). Pest management in young orchards will not prevent establishment of *Saperda candida* as it is mainly focused against aphids and suitable chemicals are not widely used at appropriate time to kill the adults. **The probability of establishment is considered high.**

Stage 2: Pest Risk Assessment - Section B : Probability of spread

1.30 How likely is the pest to spread rapidly in the PRA area by natural means?	unlikely *uncertainty: low*	Adults are of relatively sedentary nature (Hanks, 1999). They fly very short distances (ca 9 m) when host plants are nearby. However it was observed that they can fly over 200 m in a single flight (Hess, 1940). In the German outbreak it is assumed that the pest may have been present for 5-10 years (according to the symptoms observed) but the area infested is limited as the quarantine area (=focus zone) demarcated around the outbreak is 2 km). However, spread may have been limited by the facts that the outbreak occurred on an island, and that presence of host plants was limited in the area (Baufeld, pers. comm., 2009) Nevertheless, spread might be at a longer distance when pest pressure increases. Hess (1940) report that "*S. candida* is able to migrate actively into new areas where the frequency of orchards and back-yard plantings make conditions suitable for short flight migrations, such as along river valleys in the northwestern portion of its range; however, there appears to be little chance of its extending its range across natural barriers of even a few miles except by artificial transportation".
1.31 How likely is the pest to spread rapidly in the PRA area by human assistance?	very likely *uncertainty: medium*	*S. candida* may be transported over long distances by infested plants for planting, or infested wood, including firewood.
1.32 Based on biological characteristics, how likely is it that the pest will not be contained within the PRA area?	moderately likely *uncertainty: low*	The pest or its symptoms are visible with some effort but may remain unnoticed for some years (e.g. as noted above, it is assumed that the pest has been present for 5-10 years before the outbreak was noted in Germany). Plant protection products are available but restrictions may apply e.g. for private gardens or amenity land. Movement of plants for planting is easy to control but not movement of plant products (e.g. firewood). Host plants are widely distributed. To contain the pest, host plants have to be eliminated or should not be planted in an area around the outbreak.
1.32c The overall probability of spread should be described.		Natural spread is slow. Spread over long distance is linked to transport of infested plants or plant products. **The risk of spread is considered medium.**

Stage 2: Pest Risk Assessment - Section B : Conclusion of introduction and spread and identification of endangered areas

1.33a Conclusion on the probability of introduction and spread.		The probability of entry is considered low. The probability of establishment is considered high: - Host plants and suitable habitats are widespread in the PRA area. - There is no pest management on many host plants (in the wild, in private gardens, amenity and urban areas, along roads). The probability of spread is considered medium. The EWG could not agree on a single rating that would encompass probability of entry, establishment and spread.
1.33b Based on the answers to questions 1.16 to 1.34 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.		The endangered area includes all EPPO countries except Kazakhstan, Kirghizstan, and Uzbekistan. In addition, the following (parts of) countries are not very favourable to the pest: Azerbaijan, South of Algeria, Cyprus, Jordan, Israel, South of Morocco, South and Central Spain, Turkey, Tunisia, East of Ukraine.

Stage 2: Pest Risk Assessment - Section B : 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?	minor *uncertainty: low*	Effect in fruit orchards Huge damage was recorded in orchards in North America before plant protection products were used (Couper 1862; Brooks, 1915; Becker, 1918; Hess, 1940; Campbell *et al.*, 1989). Johnson & Lyon (1991) state that "*In the mid-1880s it was a serious problem for apple producers in the north-eastern United States. Next to the codling moth, it was the worst enemy of the apple tree. With current pest management programs, however, it is now a little concern to fruit growers*". Currently, *Saperda candida* is an incidental pest in orchards as it is managed by plant protection products applied against other more important pests (e.g. codling moth, plum curculio in apple orchards) (Hill, 1983; Agnello *et al.* 2009) Production of Amelanchier berries is challenged by *Saperda candida* in Canada (Quebec and Saskatchewan), as no insecticide is registered for this minor crop (Harris,1988, Legaré, pers.com., 2009; CRAAQ, 2008). *S. candida* is recorded as a minor pest in apple organic production in USA (Earles *et al.*, 1999) but such production is mainly in Western part of USA where the pest is not present. Ames (2001) explains that production of organic apples in the East of USA is complicated by the "plethora of pathogens, arthropod pests, and weeds". Absence of pests in Western USA is mainly due to the climate and the absence of semi-wooded areas with host species that can harbour populations of certain tree fruit pests (apple orchards are located in dry areas and are irrigated) (Agnello *et al*., 2009). Nevertheless, it is worth noting that *S. candida* is not mentioned as a pest in the Organic Apple Production Guide for Atlantic Canada (Braun & Graig, 2008) and H. Martin (OMAFRA, pers. comm., 2009) stated that *S. candida* does not appear to have a significant economic impact in organic orchards in Ontario (CA) either. Effect in tree nurseries Johnson & Lyon (1991) state that *" the insect remains a major pest of several ornamental trees and shrubs, including hawthorn, mountain ash, quince, shadbush, cotoneaster and flowering crabapple"*. Problems are occasionally reported (Réseau d'avertissements phytosanitaires 2008; Decker *et al*, 2008; Helms *et al*, 2004; MacRae, 1993; Wohlers, 1990). Hoover & Moorman (2006) list *S. candida* as destructive for crabapple, hawthorn and moutain ash in Pennsylvania (US). Couch (2009) list *S. candida* as destructive for flowering apple, cherry, peach and almond in New York (US).
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 *uncertainty: low*	With no control measures, situation could be similar to the one in North America in the early 20th century, when the pest was considered as the most serious insect pest of young apple trees (Hess, 1940). It could also be worse because in North America *S. candida* is controlled by natural enemies which are not recorded in the PRA area. Apple orchards of the EPPO region are treated with insecticides, in particular against codling moth, which could incidentally control *S. candida*. However, data from the Netherlands and UK suggests the timing of these applications is not currently suited to the time of year adults of *Saperda candida* would be active (see answer to question 1.23). In nurseries (both for ornamental and fruit host plants) impact can be very high because the pest can attack young plants. Solomon (1995) cites Haseman (1936) "a young tree may be killed as the result of the feeding of only one or two larvae, and trees under 10 years of age may suddenly break near the ground from earlier borer injury". Solymár (2005) note that young non-bearing blocks of apple trees are particularly susceptible. Galleries bored by larvae may be entry points for pathogens and may therefore increase disease incidence (Hess, 1940).
2.3	with some	see answer to question 1.23.

How easily can the pest be controlled in the PRA area without phytosanitary measures?	difficulty *uncertainty: low*	Efficient plant protection products exist but additional sprays to control *S. candida* would be necessary in many fruit growing regions. Moreover the general tendency with treatments in orchards in the EPPO region is to use less plant protection products, with narrow range or non chemical methods (e.g. mating disruption, Bt, etc.) that are pest specific (PAN, 2007; Samietz *et al.*, 2008). In addition, organic production is increasing: the surface of orchards in organic production in the EU for apple was 4850 ha in 2007, and 12000 ha in 2008 (2.5% of total area); for pear, it was 1521 ha in 2007 and 1870 in 2008 (1.6% of total area) (see Appendix 3, table 3.4). In fruit tree nurseries, treatments are limited because the trees do not bear fruits (i.e. they are not yet in commercial production) and mainly target aphids and spider mites. Such treatments are generally not efficient against *S. candida*, either because the active substance is only aphicide or acaricide or because the timing of treatment is not appropriate. Insecticide treatments may be more frequent in ornamental nurseries, but not all plants will be treated. *Saperda candida* is unlikely to be controlled based solely on current usage in managed environments. In addition, host plants are present in the wild and in garden and amenity land where no measures are applied.
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 *uncertainty: medium*	Production costs will increase due to increased crop protection costs at least for fruit tree cultivation. In Western Europe, crop protection cost is limited compared to the overall production cost in orchards and nurseries. According to de Lauwere & Bremmer (2006) crop protection cost in the Netherlands represented 4.3% of overall production costs in orchards, and 0.8% in tree nurseries. Even if crop protection cost increases, this will not greatly impact on overall production cost. Still, if margins are very low, such small increase might challenge the profitability of fruit production. If availability of broad spectrum insecticides is limited in future (e.g. as a consequence of the revision of registration of insecticides), treatments targeting specifically *S. candida* would be needed, and this would involve developing forecasting and scouting to help producers controlling the pest. Development of biocontrol is possible (e.g. use on entomopathogenic nematods) but will need time and resources. In organic production, production cost will increase greatly if such pest occurs as effective insecticides may not be available, and control (e.g. by worming, removal of host plants in the surrounding of the orchard) requires high labour input. If young trees die they should be replaced. If host plants are destroyed in amenity areas because of an infestation by the pest, they will have to be replaced. In the outbreak which occurred in Germany, the cost for monitoring, administration and diagnostic of the plant protection service was about 30200 Euros for 2008 and 2009. The trees have not been replanted so far, so the costs for replacement of host plants have not been evaluated (Baufeld, pers. comm. 2009).
2.5 How great a reduction in consumer demand is the pest likely to cause in the PRA area?	minimal *uncertainty: low*	Presence of the pest may affect production price, in particular in organic production and therefore affect consumer demand for organic host fruits.
2.6 How important is environmental damage caused by the pest within its current area of distribution?	minimal *uncertainty: low*	Host plants of *S. candida* include *Crataegus*, *Amelanchier* and *Sorbus*, which can be found in the wild as can wild species of *Malus*, *Pyrus* and *Prunus.* Nevertheless, no major environmental damage within its current area of distribution has been reported in the literature probably because *S. candida* is native in North America, and is probably controlled there by natural enemies.

2.7 How important is the environmental damage likely to be in the PRA area?	moderate *uncertainty: high*	Host plants of *S. candida* include *Crataegus*, *Amelanchier* and *Sorbus*, which can be found in the wild in the endangered area as can wild species of *Malus*, *Pyrus* and *Prunus* (see Appendix 4). *S. candida* is native from North America; as this species is new in the PRA area, it might not be controlled efficiently by natural enemies. *S. candida* might affect new plant species in the PRA area: *Sorbus intermedia* was affected in the German outbreak but it was not known as a host plant in the native area because it is not present there. *S. candida* may also attack historic collections of fruit trees – of particular importance to some gardens which may have particularly rare varieties, of which there may only be a couple of known specimen trees.
2.8 How important is social damage caused by the pest within its current area of distribution?	minimal *uncertainty: low*	No social damage recorded currently in conventional orchards and nurseries.
2.9 How important is the social damage likely to be in the PRA area?	moderate *uncertainty: high*	Presence of the pest may limit the availability of organic fruits in the PRA area. It may destroy host trees in amenity areas and private gardens, and in the wild, which will affect recreational and social value of these places. Specialist growers of rare varieties of fruit trees may be affected.
2.10 How likely is the presence of the pest in the PRA area to cause losses in export markets?	unlikely *uncertainty: low*	*S. candida* is a regulated pest at least in Quebec (CA) (Quebec, 2009), in Republic of Korea (Korea, 2006) and in China (as *Saperda* spp. non Chinese) (China, 2007). *S. candida* is listed as a "pest of export concern" in Mississippi (http://mississippientomologicalmuseum.org.msstate.edu/Pest.species/ExportPests.html) but the EWG could not get more information on which trade from Mississippi is affected. There will be no effect on export of fruit of host species as the pest is not present on fruit. Theoretically, there may be potential effect on export of plants for planting and on wood but according to Eurostat (2009) export of wood from EU to China and Korea is non-existent and export of plants for planting is minimal.
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?	very likely *uncertainty: medium*	*S. candida* is recognized as a pest in its native range, which demonstrates that natural enemies are not always sufficient to reduce pest population below the economic threshold on their own even within its native area. Most of the natural enemies noted in the native area are absent from the PRA area. Therefore it is very unlikely that natural enemies present in the PRA area would reduce the pest population below the economic threshold.
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?	likely *uncertainty: low*	Broad spectrum insecticides (pyrethroids, organo-phosphates, neonicotinoids) will negatively affect natural enemies and disrupt IPM systems. Wild host plants are widely distributed in the EPPO region (Appendix 4). Thus in case of an outbreak, eradication of the pest on wild hosts which may act as a reservoir for it would have a negative effect on the diversity of the wild flora in this area..
2.13 How important would other costs resulting from introduction be?	moderate *uncertainty: low*	Additional costs include cost for research to find appropriate control methods (e.g. biological control), extension (advice to producers), monitoring of the pest to target treatments and evaluate its spread, public awareness.
2.14 How likely is it that genetic traits can be carried to other	Impossible/very unlikely	There are no known examples of such event on long-horned beetles in the available literature.

species, modifying their genetic nature and making them more serious plant pests?	*uncertainty: low*	
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?	unlikely *uncertainty: low*	Hess (1940) reports that "borers have commonly been associated with the occurrence of collar blight, a phase of fireblight, which is caused by *Erwinia amylovora*". Nevertheless such statement is not supported by experience with *E. amylovora* in North America or in Europe since then.
2.16 **Referring back to the conclusion on endangered area (1.35) :** **Identify the parts of the PRA area where the pest can establish and which are economically most at risk.**		The pest can establish throughout the PRA area except in the drier areas in the East and the South of the EPPO region. The entire zone where the pest can establish is at risk.

Stage 2: Pest Risk Assessment - Section B: Degree of uncertainty and Conclusion of the pest risk assessment

2.17 Degree of uncertainty : list sources of uncertainty		Origin of the German outbreak. Volume of trade of host plants for planting from North America. Volume of trade of wood of host plants with bark from North America. Number of adults needed to begin a population. Possible increase of host range. Possibility of survival or remaining undetected during existing management procedures. Possibility of survival and establishment with existing pest management practices. Environmental damage in PRA area. Social damage in PRA area.
2.18 Conclusion of the pest risk assessment		Fruit tree species such as *Malus*, *Pyrus* and *Prunus* are widely grown across the EPPO region. *Cotoneaster*, *Crataegus*, and *Sorbus* are widely planted in parks and gardens for ornamental purposes and also occur in the wild as well as wild *Malus*, *Pyrus* and *Prunus*. *S. candida* is an incidental pest in nurseries and young plantations. Because of the hidden behaviour of *S. candida*, the pest is likely to be moved undetected inside infested host plants. Control is difficult as the insect spends most of its life cycle inside the trees. Considering its host plants and its area of origin, it is likely that *S. candida* can establish in the EPPO region. The economic impact if introduced in the EPPO region is evaluated as medium by the EWG.

Stage 3: Pest Risk Management

3.1 Is the risk identified in the Pest Risk Assessment stage for all pest/pathway combinations an acceptable risk?	no	

3.2a Pathway :		Plants for planting with roots of host plants from countries where the pest occurs
3.2 Is the pathway that is being considered a commodity of plants and plant products?	yes	
3.12 Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest? (if yes, specify the measures in the box notes)	no	<u>Countries from the European Union, Norway and Switzerland</u> Annex III point 3 of the EU plant health directive 2000/29 (EU, 2000) stipulates that the import of Plants of *Chaenomeles* Ldl., *Cydonia* Mill., *Crataegus* L., *Malus* Mill., *Prunus* L., *Pyrus* L., and *Rosa* L., intended for planting, other than dormant plants free from leaves, flowers and fruit is prohibited from non European countries. A general prohibition also exists for Plants of *Cydonia* Mill., *Malus* Mill., *Prunus* L. and *Pyrus* L. and their hybrids intended for planting, other than seeds but this prohibition does not apply for Mediterranean countries, Australia, New Zealand, Canada, and the continental states of the USA. Consequently import of dormant plants of *Cydonia* Mill., *Crataegus* L., *Malus* Mill., *Prunus* L., *Pyrus* L., is allowed. These measures do not prevent the introduction of the pest. In addition import of other hosts of *S. candida* is not restricted in Appendix III. As already mentioned in question 1.9 requirements exist for host plants of *S. candida* in the plant health directive 2000/29 • Plants, intended for planting, other than seeds, of *Amelanchier* Med., *Cotoneaster* Ehrh., *Crataegus* L., *Cydonia* Mill., *Malus* Mill., *Prunus* L., other than *Prunus laurocerasus* L. and *Prunus lusitanica* L., *Pyrus* L. and *Sorbus* L must be accompanied by phytosanitary certificate (or a plant passport for internal movement). • Phytosanitary requirements that must be fulfilled before the issuance of the phytosanitary certificate are described in Annex IV (Part A, section I, point 39) of EU Directive 2000/29 which stipulates that "Trees and shrubs, intended for planting, other than seeds and plants in tissue culture, originating in third countries other than European and Mediterranean countries" should "have been inspected at appropriate times and prior to export and found free from symptoms of harmful bacteria, viruses and virus-like organisms, and either found free from **signs or symptoms** of harmful nematodes, **insects**, mites and fungi, or have been subjected to appropriate treatment to eliminate such organisms." • In addition, annex IV (Part A, section I, point 40) stipulates that deciduous trees and shrubs, intended for planting, other than seeds and plants in tissue culture, originating in third countries other than European and Mediterranean countries should be "dormant and free from leaves".

		These requirements are not sufficient as signs of infestation may be very difficult to find in the early stages. Other requirements exist for host plants of *S. candida* but concern other pests (such as viruses and bacteria) and are not appropriate for *S. candida.* <u>Other countries</u> North African countries members of EPPO apply a general prohibition for the importation of Rosaceous plants for *Erwinia amylovora*. In Israel import of Rosaceae is prohibited. In Russia and most CIS countries import of plants for planting is subjected to an import permit. (source: PQR, EPPO, 2009)
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?	no	Detection of oviposition slits and bore holes is considered possible (Solomon, 1995) but requires careful examination and can be easily overlooked during the early stages of the infestation. Recent experience with inspection of imported plants for planting for *Anoplophora chinensis* has shown that such organisms are very difficult to detect during their hidden stages (Van der Gaag *et al.*, 2008).
3.14 Can the pest be reliably detected by testing (e.g. for pest plant, seeds in a consignment)?	no	Development of acoustic systems to detect the presence of boring insect in wood is underway but further development is necessary before practical tools are available. Further details are provided in Farr & Chesmore (2007). However larvae of *S. candida* are quite small, which does not seem appropriate to such a technique (Gill, pers. comm., 2009).
3.15 Can the pest be reliably detected during post-entry quarantine?	no	The Panel on Phytosanitary measures considered that post-entry quarantine should not be allowed as a sole phytosanitary measure. The risk to introduce potentially infested plants was not acceptable in general. Post-entry quarantine should only be considered within a systems approach (e.g. with pest-free areas). The Panel suggested including pre-entry quarantine as an option.
3.16 Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?	no	No practical treatment is available to destroy all possible stages of the pest in plants once infested. In addition, treatments could only be made once the pest is detected, which is difficult. Chemical treatment Treatment with fumigants is probably not effective since the larvae are protected inside woody stems and fumigants will probably not be able to enter the larval tunnels to kill the larvae. Treatment with methyl bromide using in vacuum might kill the larvae inside the woody material (T201-a-2 in USDA Treatment Manual, 2009). Research will be needed to determine the efficacy of this method. This method cannot be recommended from an environmental point of view as the use of methyl bromide should be abandoned in the future due to negative effects of this substance on the ozone layer (Montreal Protocol). Thermal treatment Incubation of woody plants (dormant) in hot water might kill the larvae inside the stem. Larvae are present in the woody stem of the plant and plants need probably to stay in a hot water for a relatively long time to achieve lethal temperatures inside the wood that will kill the larvae. It is, therefore, expected that temperatures and exposure time needed to kill the larvae will negatively affect the viability of the plants. Heat treatment is accepted as a Phytosanitary procedure to kill larvae of *Anoplophora glabripennis* (another long-horned beetle) in wood packaging material. In that case the internal core of the material should reach a minimum of 56°C during 30 min.

		[Dumouchel, 2004; EPPO Standard PM 10/6(1) *Heat treatment of wood to control insects and wood-borne nematodes*, EPPO (2008)]. Such a treatment will likely have negative effects on the viability of the young trees and will, therefore, not be a good option. Irradiation Insects need an absorbed dosage of 1000 Gy. Effects on plants can be seen on a dosage of more than 1 Gy; 1000 Gy will lead to negative effects on the viability of the plants. Lower dosages may be sufficient to sterilize the larvae inside the plants. Experimental research will be needed to test that hypothesis. When it works, methods will have to be developed to be able to check that the treatment has been properly performed and larvae are innocuous. Physical treatment Larvae can be destroyed by worming (i.e. by inserting a stiff wire into the larva burrow to reach and impale the borer) once detected but this is highly labour intensive and relies on detection being made (Agnello, 2006). As another example of physical control, Hess (1940) noted that pupae can be destroyed in young trees by "jarring" ("when heavily infested trees are struck sharply 10 times with a large padded wooded mallet, no beetles emerged from these trees. This physical treatment should be applied shortly before the season of emergence"). But such methods do not seem very easy to implement for consignments.
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)	no	
3.18 Can infestation of the consignment be reliably prevented by handling and packing methods?	no	
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?	no	
3.20 Can infestation of the commodity be reliably prevented by treatment of the crop?	No	In North America, spraying the trunk to prevent oviposition with specific insecticides (e.g. chlorpyrifos) at appropriate moment (generally twice in the growing season) is considered as efficient to prevent infestation by *S. candida*. (Kain & Agnello, 1999; Cooley *et al.*, 2009, Hoover & Moorman, 2006). Surveillance and forecasting should be in place to detect first emergences and be sure to cover the entire oviposition period taking into account persistence of insecticides. The Panel on phytosanitary measures considered that such treatment was appropriate to manage the pest in a area where it is present but that treatment of the crop alone could not guarantee crop freedom of the pest.
3.21 Can infestation of the commodity be reliably prevented by growing resistant cultivars? (This question is not relevant for pest plants)	no	No resistant cultivar to this pest is recorded in literature.
3.22		Growing the host plants in insect proof facilities will prevent infestation. However this is not common practice for

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.)?	Yes	the nurseries of fruit and ornamental trees. Another option is as follow: Infestation can be prevented by growing plants under fine mesh nets. Nets should be in place for the entire flight periods of the adults to prevent oviposition. If the plants are grown for several years, netting should be done every year. Surveillance and forecasting should be in place to detect first emergences and be sure to cover the entire flight period. For some beetles (e.g. *Rhynchophorus ferrugineus*) experience showed that nets should be reinforced as the insect can chew its way through the net. For *S. candida*, however, strength of the net may not be crucial as cheesecloth was used successfully for experimental cages by Hess, 1940. The Panel on phytosanitary measures considered that this option is less reliable and acceptable only in areas of low pest prevalence.
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?	no	No, because of the biology of the pest
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)?	no	Certification schemes are usually established to address viruses/pathogens that are transmitted by the mother plant. They do not address insect pests specifically but general inspections required in this framework may allow the pest to be detected. This approach is considered under the option of “pest-free place of production” (see answer to question 3.28).
3.25 Has the pest a very low capacity for natural spread?	no	
3.26 Has the pest a low to medium capacity for natural spread?	yes possible measures: pest-free place of production or pest free area.	Adults are of relatively sedentary nature (Hanks, 1999). They fly very short distances (ca 9 m) when host plants are nearby. However it was observed that they can fly over 200 m in a single flight (Hess, 1940). Nevertheless, spread might be at a longer distance when pest pressure increases. Hess (1940) report that "*S. candida* is able to migrate actively into new areas where the frequency of orchards and back-yard plantings make conditions suitable for short flight migrations, such as along river valleys in the northwestern portion of its range; however, there appears to be little chance of its extending its range across natural barriers of even a few miles except by artificial transportation".
3.28 Can pest freedom of the place of production or an area be reliably guaranteed?	yes	Pest free site / place of production can be reliably guaranteed: (a) the plants should be grown throughout their life in a place of production situated in a pest-free area established by the national plant protection organisation in the country of origin in accordance with ISPM 4 *Requirements for the establishment of Pest Free Areas*; or (b) the plants should be grown, during a period of at least two years prior to export, in a place of production established as free from *S. candida* in accordance with ISPM 10 *Requirements for the establishment of pest free places of production and pest free production sites*: (i) which is registered and supervised by the national plant protection organisation in the country of origin; and (ii) which has been subjected annually to two official inspections for any signs of *S. candida* carried out at appropriate times and no signs of the organism have been found; and (iii) where the plants have been grown in a site:

		— with complete physical protection against the introduction of *S. candida*; or — with the application of appropriate preventive treatments and surrounded by a buffer zone with a radius of at least 500 m where official surveys for the presence or signs of *S. candida* are carried out annually at appropriate times. In case signs of *S. candida* are found, eradication measures are immediately taken to restore the pest freedom of the buffer zone; and (iv) where immediately prior to export consignments of the plants have been officially subjected to a meticulous inspection for the presence of *S. candida*, in particular in stems of the plant, in accordance with ISPM 31 *Methodologies for sampling of consignments*. Where appropriate, this inspection should include destructive sampling.
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?	no	Pest symptoms are not easy to detect at an early stage. Given its host range, surveillance would be very demanding.
3.31 Does each of the individual measures identified reduce the risk to an acceptable level?	yes	The measures identified are as follow: -crop grown under specified conditions -Pest Free Place of Production -Pest Free Area Each measure reduces the risk to an acceptable level.
3.34 Estimate to what extent the measures (or combination of measures) being considered interfere with international trade.		The measures are likely to have an impact on trade but these are common measures requested for plants for planting worldwide. Although precise data on trade is difficult to obtain, it appears that affected trade is limited.
3.35 Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.		There will be no additional import inspection cost for the importing country as a PC is already required for this pathway. Nurseries in the exporting countries will face additional costs (treatment and/or netting of the crops, inspection of surrounding of nurseries and/or removal of wild host plants in the surrounding of the nursery). Nevertheless, these measures are considered cost-effective compared to the measures needed for an eradication of an outbreak or to the measures if the pest enter the PRA area and establish in fruit growing areas. Cost of eradication in Germany is estimated about 30 000 Euros for 2008 and 2009 but the pest occurred in a small area with a limited number of host plants (Baufeld, pers. comm. 2009).
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?	yes	The measures envisaged interfere with international trade, but not unduly. It is not envisaged to close the pathway.

3.2a Pathway :		Round wood of host plants with bark including firewood
3.2 Is the pathway that is being considered a commodity of plants and plant products?	yes	Round wood of *Prunus*, *Malus* and *Pyrus* is mostly used for furniture or specialty items (Alden, 1995). It is high quality wood. The Panel on Phytosanitary Measures considered that it was therefore less a risk than firewood, which is of lower quality. Typically, firewood may originate from the thinning of wood lots, salvaged from forestry slash piles, the culling of undesirable or damaged species, removal of dead or dying trees, or the management of firewood production areas.
3.12 Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest? (if yes, specify the measures in the box notes)	no	This type of wood is not regulated in at least 32 of the 50 EPPO countries, some of them (EU countries) being the major points of import for the region (see Appendix 2). Import of logs with bark from North America is prohibited in Israel (Israel, 2009).
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?	Yes, in combination. Possible measure: visual inspection.	Visual inspection may detect the pest in log but this measure is not considered sufficient alone, and should be used in combination. Although literature reports that later instars of larvae can be detected due to the presence of frass, this will be difficult in practice as logs are moved during transport and frass will consequently disappear. Galleries may be detected in logs and lumbers depending on the level of infestation, stages of larvae, and height of the cut. In sawn wood, larvae holes can be seen nevertheless probability of detection decreases with increasing wood thickness. This option was not considered feasible in routine by the Panel on Phytosanitary Measures.
3.14 Can the pest be reliably detected by testing (e.g. for pest plant, seeds in a consignment)?	no	Development of acoustic systems to detect the presence of boring insect in wood is underway but further development is necessary before practical tools are available. Further details are provided in Farr & Chesmore (2007). However *S. candida* is a small larva, which does not seem appropriate to such a technique (Gill, pers. comm., 2009).
3.15 Can the pest be reliably detected during post-entry quarantine?	no	Post-entry quarantine is not a relevant measure for wood.
3.16 Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?	yes Possible measure: specified treatment.	Chemical treatment Methyl Bromide fumigation of wood will not be effective because of the presence of bark and of the size of the logs: according to EPPO Standard PM 10/7(1) *Methyl bromide fumigation of wood to control insects* (EPPO, 2008), only wood without bark and whose dimensions does not exceed 200 mm cross section can be fumigated to destroy insect pests. Heat treatment According to EPPO Standard PM 10/6(1) *Heat treatment of wood to control insects and wood-borne nematodes* (EPPO, 2008), Cerambycidae are killed in round wood and sawn wood which have been heat-treated until the core temperature reaches at least 56 °C for at least 30 min

		As *S. candida* feeds on live wood, kiln drying alone might be sufficient to kill the larvae but this option should be investigated further. Irradiation According to EPPO Standard PM 10/8(1) *Disinfestation of wood with ionizing radiation* (EPPO, 2008), Cerambycidae infesting wood are killed after an irradiation of 1kGy. Such treatments might be applied to quality logs but will be too expensive for a low-value product such as firewood.
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)	Yes, in combination. Possible measure: removal of parts of plants from the consignment	Evidence of the pest is present in bark and sapwood. Removing bark and sapwood will enable detection. Therefore, if bark and sapwood is removed and there is no sign of infestation, the wood can be considered as free from the pest. This measure should be considered carefully for logs because removal of bark and sapwood might affect the value of the consignment as it could result in uncontrolled desiccation, cracking and discoloration of the wood. For firewood, Sanchez & Barberena (2009) note that that part of the bark may be peeled off during the production procedure to help wood drying. Eliminating the lower part of the trunk (1m) will decrease probability of infestation but will also decrease the value of the commodity.
3.18 Can infestation of the consignment be reliably prevented by handling and packing methods?	Yes. Possible measure: store wood before export	Hess (1940) notes that many larvae, particularly early instars, die in dead trees before reaching maturity. If the wood is stored in the country of origin for 1 year before export, early instar larvae will die because of desiccation. Late instar larvae may complete their development in the year and emerge (if the wood is cut for over one year, the larvae will not be able to chew their way out of the wood as it will be too hard). As *S. candida* is a pest of healthy trees, it will not be able to reinfest cut logs.
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?	yes possible measure: import under special licence/permit and specified restrictions	Infested consignment can be imported during periods of the year when temperature is below 10°C (to avoid emergence and survival of the adult), and processed immediately. Additionally, waste should be controlled to be sure that they are not infested. Such measure should only be applied in the framework of specific agreement. It will not be appropriate for firewood as it will not be possible to control that the firewood for domestic use is used immediately.
3.20 Can infestation of the commodity be reliably prevented by treatment of the crop?	no	It is not feasible to treat trees in woodlands.
3.21 Can infestation of the commodity be reliably prevented by growing resistant cultivars? (This question is not relevant for pest plants)	no	No resistant cultivar to this pest is recorded in literature.
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	no	Such measures are not relevant for woodlands.

of running water, etc.)?		
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?	no	Such measures are not relevant for woodlands.
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)?	no	Certification schemes do not exist for wood.
3.25 Has the pest a very low capacity for natural spread?	no	
3.26 Has the pest a low to medium capacity for natural spread?	yes .	See answer for the pathway "plants for planting" possible measures: pest-free place of production or pest free area.
3.28 Can pest freedom of the crop, place of production or an area be reliably guaranteed?	yes	Pest-free place of production is difficult to guarantee in woodlands as it is not possible to apply insecticides or to place nets. Only Pest free area can be guaranteed.
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?	no	Symptoms are not easy to detect at an early stage. Given the pest host range, surveillance would be very demanding.
3.31 Does each of the individual measures identified reduce the risk to an acceptable level?	no	Visual inspection is not reliable on its own, nor removal of parts of plants from the consignment.
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?	yes	
3.32b List the combination of measures		Visual inspection and removal of bark and sapwood of the consignment can be combined to increase reliability of inspection. This is not appropriate for firewood.
3.34 Estimate to what extent the measures (or combination of measures) being considered interfere with international trade.		The trade is limited but no measures regulating this trade exist at the moment. Consequently, there is potential for interference. Concerning trade of firewood, it can be noted that import of firewood into Canada as well as domestic movement is submitted to phytosanitary measures since 2006 (CFIA, 2006) to prevent entry and spread of regulated insect pests. Therefore US exporters of firewood are already applying such requirements (heat treatment or PFA for certain pests) for export to Canada.
3.35 Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.		Exporting countries will face additional costs for treatment and inspection of consignments. Wood of host species is not currently submitted to a phytosanitary certificate. Therefore there will be additional costs for inspection in the importing countries.

		These measures are considered cost-effective compared to the cost of an eradication program if the pest enters the endangered area and to the measures to take if the pest establish.
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?	yes	The measures envisaged interfere with international trade, but not unduly. It is not envisaged to close the pathway.

3.41 Consider the relative importance of the pathways identified in the conclusion to the entry section of the pest risk assessment		The EWG considered that it was difficult to judge the relative importance of the different pathways. In general, the importance of both pathways “plants for planting” and “wood” are difficult to judge since no interceptions are known and the origin of the German outbreak is unknown and could not be traced back to any of these pathways. For both pathways the probability of entry was assessed as “low”.

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Appendix 1: Import of plants for planting of host species

Table 1.1 Import of Trees, shrubs and bushes, grafted or not, of kinds which bear edible fruit or nuts (excluding vine slips) from Canada and USA into the European Union on the period 2005-2008 (quantity in 100 kg)

PARTNER	CANADA				USA			
REPORTER/PERIOD	2005	2006	2007	2008	2005	2006	2007	2008
Austria	0				34		0	
Belgium							1	1
Bulgaria								
Cyprus								
Czech republic		1	0			10	6	6
Denmark						0		
Estonia								
Finland			0			7	9	
France					9			
Germany					0	23	5	6
Greece								
Hungary								
Ireland					32	63		
Italy		220			255	12	8	4
Latvia								
Lithuania								
Luxembourg								
Malta								
Netherlands					30	77	9	0
Poland			1			47	68	
Portugal					0			
Romania								
Slovakia								
Slovenia								
Spain					4315	440	365	2500
Sweden		2			3	2		
United Kingdom					2	10	2	1368

Source: Eurostat (Extracted on 27/10/2009)

Appendix 1: Import of plants for planting of host species

Table 1.2 Export of *Amelanchier* plants for planting from Canada into the European Union during the period 2000-2009 (number of plants)

COUNTRY/PERIOD	2002	2003	2004	2005	2006	2007	2008	2009
Czech Republic	0	1040	0	0	1000	0	0	0
Finland	80	14000	11406	0	0	0	0	0
France	500	1	0	0	337	0	0	0
Germany	0	30	40	0	110	0	35	400
Netherlands	0	0	0	5100	0	0	0	2384
Sweden	0	800	6	0	1950	0	0	20

Source: B.D.Gill and C. Lemmon, CFIA (Extracted on 11/12/2009)

Table 1.3. Import of plants for planting from the USA and Canada into Germany from 2003 to 2009

Origin	Year	Plants	Number of shipments	Number of plants
CA	2006	Malus, Pyrus, Cydonia	1	2
US	2003	Malus, Pyrus, Cydonia	3	12507
US	2006	Malus, Pyrus, Cydonia	1	101
US	2008	Malus, Pyrus, Cydonia	1	300
US	2004	other fireblight host plants	1	600
US	2008	other fireblight host plants	2	12
US	2003	Prunus	1	200
US	2005	Prunus	2	13
US	2009	Prunus avium	1	85800

Source: German NPPO, 2009

Appendix 1: Import of plants for planting of host species

Tables 1.4. Import of ornamental plants for planting with roots from Canada and USA into the European Union on the period 2005-2008 (quantity in 100 kg) Source: Eurostat (Extracted on 27/10/2009)

Table 1.4a Outdoor rooted cuttings and young plants of trees, shrubs and bushes (excl. fruit, nut and forest trees)

PARTNER	CANADA				USA			
Reporter/Period	2005	2006	2007	2008	2005	2006	2007	2008
Austria				0	0			0
Belgium and Luxbg					5	7	68	38
Bulgaria								
Cyprus					1			
Czech Republic								
Denmark					0			
Estonia					2			
Finland	0	0	0	2			0	3
France			0		4	6	9	1
Germany					13	12	9	7
Greece					0		2	
Hungary								
Ireland	0							
Italy					3		658	540
Latvia					0	3		
Lithuania							0	0
Luxembourg								
Malta								
Netherlands		0			72	9	4	836
Poland					57	2	1	0
Portugal					1	2	1	
Romania								
Slovakia								
Slovenia								
Spain					41	118	1	1
Sweden	0			11	5	0		0
United Kingdom					4	5	23	108

Table 1.4b Outdoor trees, shrubs and bushes, with roots (excl. cuttings, slips and young plants, and fruit, nut and forest trees)

PARTNER	CANADA				USA			
Reporter/Period	2005	2006	2007	2008	2005	2006	2007	2008
Austria						0		
Belgium and Luxbg					86	4	52	598
Bulgaria								
Cyprus								
Czech Republic								
Germany					150	130	945	1042
Denmark								
Estonia								
Spain					2639		563	39
Finland								0
France		0		0		88	2	3
United Kingdom					719	17	247	74
Greece								
Hungary					0			
Ireland							13	
Italy								2
Lithuania								
Luxembourg								
Latvia								
Malta								
Netherlands					314	416	420	85
Poland							0	
Portugal								
Romania	0							
Sweden	2				57	0	50	0
Slovenia								
Slovakia								

Table 1.4c Perennial Outdoor Plants

PARTNER	CANADA				USA			
REPORTER/PERIOD	**2005**	**2006**	**2007**	**2008**	**2005**	**2006**	**2007**	**2008**
Austria								
Belgium					5	18	20	
Bulgaria								
Cyprus							73	
Czech Republic						0		
Germany	0				0		1	
Denmark						0		
Estonia								
Spain								
Finland								
France								
United Kingdom					1		0	
Greece								
Hungary						1	0	
Ireland								
Italy					1		363	
Lithuania								
Luxembourg								
Latvia					0			
Malta								
Netherlands		0			1	0	2	
Poland					0	0		
Portugal							0	
Romania								
Sweden					1	0		
Slovenia								
Slovakia								

Source: Eurostat (Extracted on 27/10/2009)

Table 1.5. Import of ornamental plants for planting with roots (host and non-hosts plants) into the European Union in the period 2005-2008 (quantity in 100 kg)

PRODUCT	Import in 100 kgs	2005	2006	2007	2008
Trees, shrubs and bushes, grafted or not, of kinds which bear edible fruit or nuts (excl. vine slips)	Total import in EU	82485	66748	23460	17983
	Import from USA and CA	4680	914	474	3885
Outdoor rooted cuttings and young plants of trees, shrubs and bushes (excl. fruit, nut and forest trees)	Total import in EU	15203	8602	10191	11316
	Import from USA and CA	208	164	776	1547
Outdoor trees, shrubs and bushes, with roots (excl. cuttings, slips and young plants, and fruit, nut and forest trees)	Total import in EU	139432	116493	138753	66876
	Import from USA and CA	3967	655	2292	1843
Perennial outdoor plants	Total import in EU	16398	6419	7397	-
	Import from USA and CA	9	19	459	-

Source: Eurostat (Extracted on 27/10/2009)

Table 1.6. Export of some plants for planting (hosts and non-host plants) from USA to the EPPO region (quantity in thousands plants)

Partner	Product	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
European Union-27	TREE,SHRUB,BUSH	81	52	57	95	129	163	101	122	76	373	188
European Union-27	TREES/SHRBS LIVE	115	119	87	5	12	6	27	15	43	104	111
Middle East	TREES/SHRBS LIVE	23	3	6	0	13	-	0	0	0	0	14
Middle East	TREE,SHRUB,BUSH	12	10	18	14	10	7	8	4	5	2	2
Other Europe	TREE,SHRUB,BUSH	0	0	0	0	0	0	0	1	1	1	16
Other Europe	TREES/SHRBS LIVE	0	0	0	0	0	0	0	0	0	0	0
Former Soviet Union-12	TREE,SHRUB,BUSH	0	0	0	0	0	0	0	2	1	34	5
North Africa	TREE,SHRUB,BUSH	0	19	9	0	0	1	1	0	0	45	0
Total		**247**	**202**	**186**	**115**	**200**	**178**	**147**	**150**	**131**	**582**	**376**

Source: Department of Commerce, U.S. Census Bureau, Foreign Trade Statistics

Appendix 2 – Import of wood of host species in the EPPO region

Table 2.1. Export of cherry wood from USA to EPPO region

Group of countries	Commodity	Unit	2004	2005	2006	2007	2008
EUROPEAN UNION - 27	HW LOGS, CHERRY	M3	61 152	55 662	47 433	29 267	12 627
	LMBR, CHERRY	M3	0	0	0	18 105	9 915
	LMBR,R, CHERRY	M3	31 530	24 411	18 060	0	0
	LMBR,D, CHERRY	M3	15 573	19 079	17 642	0	0
	HVN CHRY<6MM NBK	M2	17 210 282	10 085 158	8 743 073	0	0
	HVN CHERRY<6MM	M2	0	0	0	6 931 399	4 220 445
OTHER EUROPE	HW LOGS, CHERRY	M3	730	0	110	223	0
	LMBR, CHERRY	M3	0	0	0	321	145
Albania, Bosnia and Herzegovina, Gibraltar, Croatia, Iceland, Kosovo, Montenegro, Macedonia, Norway, Svalbard, Serbia, Serbia and Kosovo, Liechtenstein, Switzerland, Azores	LMBR,R, CHERRY	M3	290	85	267	0	0
	LMBR,D, CHERRY	M3	0	255	40	0	0
	HVN CHRY<6MM NBK	M2	66 385	32 159	23 939	0	0
	HVN CHERRY<6MM	M2	0	0	0	14 322	0
FORMER SOVIET UNION Azerbaijan, Armenia, Belarus, Georgia, Kyrgyzstan, Kazakhstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Union of Soviet Socialist Republics, Uzbekistan	LMBR, CHERRY	M3	0	0	0	40	75
	HW LOGS, CHERRY	M3	0	48	0	0	0
	LMBR,R, CHERRY	M3	55	39	48	0	0
	HVN CHRY<6MM NBK	M2	64 567	124 035	58 551	0	0
	HVN CHERRY<6MM	M2	0	0	0	17 295	27 988
MIDDLE EAST Bahrain, Iran, Israel, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates, Turkey, Arabian Peninsula States, NEC, Yemen	LMBR, CHERRY	M3	0	0	0	2 151	1 555
	HW LOGS, CHERRY	M3	643	1 301	1 592	1 622	484
	LMBR,R, CHERRY	M3	2 645	2 095	2 164	0	0
	LMBR,D, CHERRY	M3	381	327	433	0	0
	HVN CHRY<6MM NBK	M2	350 632	577 137	406 851	0	0
	HVN CHERRY<6MM	M2	0	0	0	74 887	106 557
NORTH AFRICA Algeria, Egypt, Libya, Morocco, Tunisia	LMBR, CHERRY	M3	0	0	0	102	101
	LMBR,R, CHERRY	M3	33	6	55	0	0
	HVN CHRY<6MM NBK	M2	0	18 499	23 400	0	0
	HVN CHERRY<6MM	M2	0	0	0	15 663	265 097

Data Source: Department of Commerce, U.S. Census Bureau, Foreign Trade Statistics

Name of commodity /Code	FAS Unit	Description
HW LOGS, CHERRY / 4403990055	M3	Cherry wood, (prunus spp), in the rough, whether or not stripped of bark or sapwood, or roughly squared, not treated (CBM)
LMBR, CHERRY / 4407940000	M3	Cherry wood, lumber
LMBR,R, CHERRY / 4407990040	M3	Cherry wood, sawn or chipped lengthwise, sliced or peeled,whether or not planed, sanded or finger-jointed, thickness over 6 mm, rough (CBM)
LMBR,D, CHERRY / 4407990041	M3	Cherry wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, thickness ov 6 mm, NESOI (CBM)
HVN CHERRY<6MM / 4408900115	M2	Cherry veneer sheets and sheets for plywood and other wood sawn lengthwise, sliced or peeled, thickness not over 6 mm, spliced or end jointed
HVN CHRY<6MM NBK / 4408900130	M2	Cherry veneer sheets and sheets for plywood and other wood sawn lengthwise, sliced or peeled, thickness not over 6 mm, not reinforced

Table 2.2. Export of logs of cherry wood (in m 3) from USA (HW LOGS, CHERRY – 4403990055) per country in 1999-2008

	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
EUROPEAN UNION - 27	**63606**	**85118**	**69841**	**64290**	**58009**	**61152**	**55662**	**47433**	**29267**	**12627**
Germany	20674	36722	22778	23604	22996	22495	21543	17952	12453	4869
Portugal	13303	9544	10030	6524	7825	8436	5921	7409	4947	2723
Italy	16711	14064	20521	16564	13031	19904	20660	15894	5518	2113
France	6757	7598	4904	5593	3318	3331	1795	1316	838	792
Belgium-Luxembourg	2128	3452	1457	1510	1232	479	541	731	430	698
Spain	1904	3824	3024	2915	5057	3012	2582	2826	1722	559
United Kingdom	372	614	672	1182	450	188	499	456	671	293
Sweden	0	978	19	70	0	341	70	0	11	126
Netherlands	515	1171	939	325	382	312	144	131	150	116
Finland	23	0	0	0	0	0	0	0	51	73
Ireland	41	0	42	589	271	284	175	0	98	72
Latvia	0	0	0	0	0	0	0	0	525	38
Denmark	706	6840	2571	4055	1235	1157	282	54	66	36
Czech Republic	0	0	0	552	2176	909	1296	621	1217	34
Austria	378	114	2458	424	0	225	33	36	0	32
Greece	78	23	80	65	36	67	121	0	33	32
Slovenia	0	156	346	318	0	12	0	0	494	21
Cyprus	0	18	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	32	0
Malta	16	0	0	0	0	0	0	7	11	0

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
OTHER EUROPE	**562**	**674**	**772**	**268**	**257**	**730**	**0**	**110**	**223**	**0**
Gibraltar	108	11	0	0	0	0	0	0	0	0
Croatia	0	28	0	0	0	0	0	10	0	0
Iceland	0	6	0	0	0	0	0	0	0	0
Norway	58	149	120	0	16	20	0	0	18	0
Switzerland	396	480	652	268	241	710	0	0	205	0
Serbia Montenegro	0	0	0	0	0	0	0	100	0	0
FORMER SOVIET UNION	**0**	**49**	**118**	**0**	**0**	**0**	**48**	**0**	**0**	**0**
Georgia	0	0	70	0	0	0	0	0	0	0
Moldova	0	49	0	0	0	0	0	0	0	0
Russia	0	0	0	0	0	0	48	0	0	0
Ukraine	0	0	48	0	0	0	0	0	0	0
MIDDLE EAST	**186**	**26**	**140**	**323**	**226**	**643**	**1301**	**1592**	**1622**	**484**
Jordan	0	0	0	0	0	0	0	0	63	169
United Arab Emirates	30	0	0	152	42	0	0	126	384	123
Israel	33	0	0	0	0	0	7	21	45	97
Turkey	108	26	65	0	64	641	1251	1430	772	79
Kuwait	15	0	0	13	0	2	0	15	0	16
Lebanon	0	0	0	0	0	0	0	0	69	0
Qatar	0	0	0	0	0	0	0	0	136	0
Saudi Arabia	0	0	75	158	120	0	43	0	153	0

Data Source: Department of Commerce, U.S. Census Bureau, Foreign Trade Statistics

Table 2.3. Export of logs of other types of temperate wood (in m 3) from USA per country in 2004-2008

These figures are for the commodity corresponding to the following code and description: "4403990090 – Non coniferous wood NESOI in the rough whether or not stripped of bark or sapwood or roughly squared not treated". It includes all types of temperate hard wood excluding red oak, white oak, beech, birch, ash, western red alder, cherry, maple, yellow poplar, walnut, paulownia (all these woods have a specific code).

	2004	2005	2006	2007	2008
EUROPEAN UNION - 27	**27096**	**24725**	**34281**	**73373**	**118956**
Italy	9853	13212	17229	43767	30074
United Kingdom	1213	1022	795	2375	29854
Germany	6304	6518	3923	11982	21254
Spain	133	452	3874	5082	8029
Greece	0	27	31	1073	6975
Belgium-Luxembourg	60	1110	2147	1882	3827
Portugal	19	458	1332	3651	3796
Cyprus	0	0	0	0	2593
Ireland	52	70	914	446	2488
Netherlands	5383	473	645	1119	1974
France	3314	549	2594	1141	1792
Finland	0	0	0	0	1746
Denmark	707	761	616	78	1067
Sweden	0	43	152	226	918
Malta	28	0	29	71	740
Lithuania	0	0	0	0	676
Romania	0	0	0	0	536
Slovenia	0	0	0	0	399
Estonia	0	0	0	55	95
Czech Republic	0	0	0	0	68
Bulgaria	0	0	0	0	28
Poland	30	30	0	0	27
Latvia	0	0	0	425	0
OTHER EUROPE	**1747**	**82**	**460**	**1014**	**3016**
Norway	0	62	70	29	1438
Montenegro	0	0	0	0	1268
Switzerland	1747	20	317	884	207
Croatia	0	0	73	74	103
Iceland	0	0	0	27	0
FORMER SOVIET UNION	**0**	**0**	**0**	**0**	**262**
Russia	0	0	0	0	262
MIDDLE EAST	**132**	**64**	**18**	**4010**	**16306**
Turkey	132	0	18	2656	6191
Saudi Arabia	0	0	0	182	4167
United Arab Emirates	0	0	0	613	3056
Israel	0	64	0	362	1362
Lebanon	0	0	0	0	848
Jordan	0	0	0	30	488
Qatar	0	0	0	136	99
Oman	0	0	0	0	58
Bahrain	0	0	0	31	37
NORTH AFRICA	**0**	**0**	**65**	**191**	**1081**
Morocco	0	0	0	71	627
Egypt	0	0	0	120	393
Algeria	0	0	0	0	61
Libya	0	0	65	0	0

Data Source: Department of Commerce, U.S. Census Bureau, Foreign Trade Statistics

Table 2.4. Monthly export of logs of cherry wood (in m 3) from USA (HW LOGS, CHERRY – 4403990055) per country in 2008 and in 2000

2008	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
European Union - 27	**2158**	**1392**	**1895**	**2434**	**1013**	**848**	**347**	**267**	**658**	**698**	**528**	**389**	**12627**
Germany	801	343	493	1459	627	200	264	78	172	226	83	123	**4869**
Portugal	646	392	672	371	190	121	0	80	99	84	48	20	**2723**
Spain	221	214	72	20	0	32	0	0	0	0	0	0	**559**
Italy	195	223	354	95	93	135	29	57	312	248	225	147	**2113**
Sweden	104	12	0	0	10	0	0	0	0	0	0	0	**126**
France	47	92	170	233	49	133	0	38	0	0	15	15	**792**
Netherlands	42	0	0	20	0	36	18	0	0	0	0	0	**116**
Latvia	38	0	0	0	0	0	0	0	0	0	0	0	**38**
United Kingdom	32	0	35	58	32	67	0	0	35	0	0	34	**293**
Slovenia	21	0	0	0	0	0	0	0	0	0	0	0	**21**
Belgium-Luxembourg	11	54	88	150	7	124	0	0	40	140	84	0	**698**
Austria	0	0	0	0	0	0	0	0	0	0	0	32	**32**
Denmark	0	0	0	0	0	0	36	0	0	0	0	0	**36**
Ireland	0	28	11	28	5	0	0	0	0	0	0	0	**72**
Czech Republic	0	34	0	0	0	0	0	0	0	0	0	0	**34**
Finland	0	0	0	0	0	0	0	0	0	0	73	0	**73**
Greece	0	0	0	0	0	0	0	14	0	0	0	18	**32**
Middle East	**36**	**61**	**86**	**11**	**19**	**0**	**119**	**21**	**92**	**0**	**0**	**39**	**484**
Israel	27	7	0	11	0	0	34	0	0	0	0	18	**97**
Jordan	9	0	86	0	0	0	69	0	5	0	0	0	**169**
Kuwait	0	0	0	0	0	0	16	0	0	0	0	0	**16**
United Arab Emirates	0	54	0	0	0	0	0	21	27	0	0	21	**123**
Turkey	0	0	0	0	19	0	0	0	60	0	0	0	**79**

2000	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
European Union - 27	**5233**	**7214**	**7951**	**12537**	**11003**	**7298**	**5348**	**2215**	**5576**	**8151**	**7055**	**5537**	**85118**
Germany	2622	3984	4279	6697	5542	2218	769	927	917	3987	2605	2175	**36722**
Italy	1085	1304	1518	2198	1726	1729	292	266	676	1283	983	1004	**14064**
France	498	607	429	458	857	373	47	181	2468	300	657	723	**7598**
Portugal	467	675	942	818	1723	219	65	142	559	1504	1546	884	**9544**
Spain	190	345	391	543	717	164	60	189	207	282	516	220	**3824**
Belgium-Luxembourg	180	163	236	567	275	619	476	474	0	192	270	0	**3452**
United Kingdom	69	48	0	225	163	0	0	0	0	25	63	21	**614**
Netherlands	66	0	156	192	0	107	415	21	20	77	68	49	**1171**
Denmark	34	45	0	821	0	1515	2734	15	729	501	244	202	**6840**
Austria	22	20	0	0	0	22	28	0	0	0	0	22	**114**
Cyprus	0	0	0	18	0	0	0	0	0	0	0	0	**18**
Greece	0	23	0	0	0	0	0	0	0	0	0	0	**23**
Slovenia	0	0	0	0	0	0	0	0	0	0	103	53	**156**
Sweden	0	0	0	0	0	332	462	0	0	0	0	184	**978**
Other Europe	**119**	**160**	**0**	**6**	**137**	**0**	**0**	**50**	**51**	**62**	**47**	**42**	**674**
Norway	119	30	0	0	0	0	0	0	0	0	0	0	**149**
Gibraltar	0	11	0	0	0	0	0	0	0	0	0	0	**11**
Croatia	0	0	0	0	0	0	0	0	0	0	28	0	**28**
Iceland	0	0	0	6	0	0	0	0	0	0	0	0	**6**
Switzerland	0	119	0	0	137	0	0	50	51	62	19	42	**480**
Former Soviet Union	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**49**	**49**
Moldova	0	0	0	0	0	0	0	0	0	0	0	49	**49**
Middle East	**0**	**26**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**26**
Turkey	0	26	0	0	0	0	0	0	0	0	0	0	**26**

Data Source: Department of Commerce, U.S. Census Bureau, Foreign Trade Statistics

Table 2.5. Export of logs and lumber of all types of wood (in m 3) from USA per group of countries in 2004-2008

		2004	2005	2006	2007	2008
EUROPEAN UNION - 27	**Hardwood lumber**	**685316**	**684929**	**723560**	**646774**	**452577**
	Hardwood logs	265642	229073	274121	452922	418558
	Softwood lumber	132913	158238	183391	194393	94476
	Softwood logs	69439	27754	24096	80434	70998
OTHER EUROPE	**Softwood logs**	**20**	**958**	**20947**	**1077**	**28890**
	Hardwood lumber	10174	12779	12342	10532	8355
	Hardwood logs	6517	836	2419	6456	6986
	Softwood lumber	913	4029	1014	1732	1015
FORMER SOVIET UNION	**Hardwood lumber**	**212**	**306**	**1060**	**361**	**1796**
	Hardwood logs	0	48	87	205	1134
	Softwood logs	0	0	0	257	475
	Softwood lumber	55	49	153	0	293
MIDDLE EAST	**Hardwood lumber**	**52870**	**47335**	**34256**	**41970**	**42393**
	Hardwood logs	8229	8004	9046	22884	41129
	Softwood lumber	4595	7719	8222	15238	14548
	Softwood logs	13821	11288	150	7526	7843
NORTH AFRICA	**Softwood logs**	**634**	**2654**	**523**	**14392**	**24370**
	Softwood lumber	2038	4797	7815	19913	17347
	Hardwood logs	1695	2118	2454	4186	10418
	Hardwood lumber	3460	4586	5256	4979	6305
TOTAL (M3)		**1258543**	**1207500**	**1310912**	**1526231**	**1249906**

Data Source: Department of Commerce, U.S. Census Bureau, Foreign Trade Statistics

Table 2.6. Import of firewood from USA and Canada into the EU in 2007-2008 (source Eurostat 2009) in 100 kg**.**

PARTNER	**CANADA**						**USA**					
Reporter/Period	**2002**	**2003**	**2005**	**2006**	**2007**	**2008**	**2002**	**2003**	**2005**	**2006**	**2007**	**2008**
Austria												
Belgium and Luxemburg		2826	492									1
Bulgaria		35		183								
Cyprus											123	
Czech Republic												28
Denmark							45		3		1	68
Estonia												
Finland												
France				120	192		122				213	
Germany							61	13	20		94	
Greece												
Hungary												
Ireland	35	350	27		369	1	248	63	21	6	1500	850
Italia		260		4779	5734						4238	408
Latvia												
Lithuania												
Malta												
Netherlands												
Poland												
Portugal										822	812	440
Roumania												
Slovakia												
Slovenia												
Spain												130
Sweden	10		95				14	18	295	37	35	7
UK	515						936	4469	6296	6808	9045	8737
Total	**560**	**3471**	**614**	**5082**	**6295**	**1**	**1426**	**4563**	**6635**	**7673**	**16061**	**10669**

Appendix 3 - Surfaces of host crops in EPPO countries

Table 3.1. Surface of apple (ha) per country (source FAO stat – www.*faostat.fao.org)*

Country	Apple: area harvested (ha)		
	2005	2006	2007
Albania	3000	5500	7000
Algeria	24278	28658	31904
Austria	6060	6060	6061
Azerbaijan	20533	19196	22498
Belarus	64816	64857	63600
Belgium	7933	8600	8500
Bosnia and Herzegovina	15000	15000	16000
Bulgaria	5393	5708	5443
Croatia	8000	8500	9500
Cyprus	1274	1278	1062
Czech Republic	12400	12400	12500
Denmark	1617	1536	1486
Estonia	6539	5118	4331
Finland	646	635	649
France	57741	55174	53775
Georgia	28000	10000	28000
Germany	32339	32504	31721
Greece	13346	13288	13000
Hungary	42024	39136	40501
Ireland	1800	600	650
Israel	4480	3900	3200
Italy	57136	61655	61188
Jordan	3856	3856	2291
Kazakhstan	40000	26200	24400
Kyrgyzstan	24500	24500	25400
Latvia	8515	9446	7369
Lebanon	9400	9880	10100
Lithuania	20786	14856	13312
Luxembourg	1020	1020	1020
Malta	16	14	15
Moldova	64477	63627	62693
Montenegro		700	700
Morocco	25600	25000	25936
Netherlands	9737	9562	9400
Norway	1688	1645	1632
Poland	169650	161989	175595
Portugal	21292	20938	20700
Romania	81672	59298	57596
Russian Federation	392000	363800	355000
Serbia		35000	37000
Serbia and Montenegro	27000		
Slovakia	3198	3345	3244
Slovenia	3099	3099	2874
Spain	38974	37844	35270
Switzerland	4315	4280	4235
The former Yugoslav Republic of Macedonia	9000	9000	9000
Tunisia	25780	25410	25000
Turkey	121000	121480	121700
Ukraine	137900	124100	116000
United Kingdom	8450	15560	14960
Uzbekistan	61000	66163	70000

Table 3.2. Surface of pear (ha) per country (source FAO stat – www.*faostat.fao.org)*

Country	Pear production: area harvested (ha)		
	2005	2006	2007
Albania	400	450	450
Algeria	17218	20102	22128
Austria	413	414	414
Azerbaijan	4395	4004	4075
Belarus	4984	5203	5253
Belgium	6904	7900	8100
Bosnia and Herzegovina	5500	7400	6500
Bulgaria	327	327	569
Croatia	1900	2000	1900
Cyprus	136	139	166
Czech Republic	615	620	700
Denmark	463	440	400
France	9145	8542	8118
Georgia	5000	3000	2700
Germany	2189	2226	2097
Greece	4357	4353	4000
Hungary	3227	2162	2394
Israel	2100	1800	1900
Italy	39089	42475	41849
Jordan	269	268	329
Kazakhstan	4200	2700	1700
Kyrgyzstan	1700	1700	1800
Latvia	835	737	606
Lebanon	3400	3250	3050
Lithuania	753	946	1233
Luxembourg	128	128	128
Malta	5	4	5
Moldova	1298	1205	1247
Montenegro		450	500
Morocco	3900	3660	3883
Netherlands	6692	6914	7300
Norway	138	129	126
Poland	12566	12503	13036
Portugal	12997	12871	12900
Romania	6067	4421	4619
Russian Federation	16000	15400	14600
Serbia		13000	13500
Serbia and Montenegro	12900		
Slovakia	148	154	134
Slovenia	284	284	221
Spain	33535	33630	28166
Switzerland	946	898	870
The former Yugoslav Republic of Macedonia	1900	2000	1800
Tunisia	13120	12700	11000
Turkey	34700	33200	33300
Ukraine	15000	14400	14100
United Kingdom	1670	1600	1536
Uzbekistan	7000	10000	10500

Table 3.3. Surface of quince (ha) per country (source FAO stat – www.*faostat.fao.org)*

Country	Quince production: area harvested (ha)		
	2005	2006	2007
Albania	200	200	200
Algeria	1344	1673	1741
Azerbaijan	2774	2641	2996
Belarus	539	401	120
Belgium	150	700	700
Bosnia and Herzegovina	210	210	210
Bulgaria	85	79	124
Croatia	70	70	150
Cyprus	13	12	12
France	199	190	190
Georgia	1000	180	300
Greece	146	155	300
Hungary	136	101	110
Israel	16	16	16
Italy	73	75	75
Jordan	0	0	0
Kazakhstan	500	200	200
Kyrgyzstan	300	300	300
Latvia	253	43	48
Lebanon	0	0	0
Lithuania	159	116	120
Moldova	318	327	344
Morocco	3400	3220	3743
Portugal	300	300	300
Romania	1000	1000	1000
Russian Federation	1100	1000	1000
Serbia		1500	2000
Serbia and Montenegro	1800		
Slovenia	0	0	0
Spain	1373	1380	1368
Switzerland	8	7	7
The former Yugoslav Republic of Macedonia	100	100	100
Tunisia	330	330	330
Turkey	10430	10400	10000
Ukraine	900	900	900
Uzbekistan	5500	5859	6000

Table 3.4. Surface of organic production of apple in the EU countries (in ha) in 2005-2008

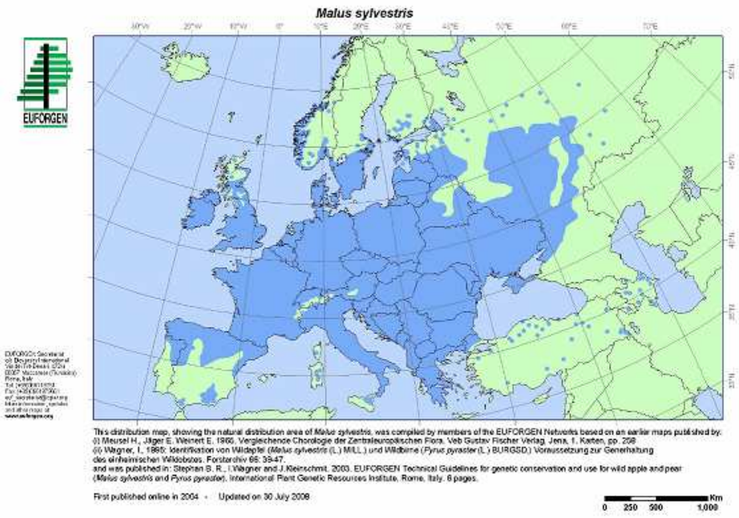
	Surface (converted and under convertion) in ha			
Country	**2005**	**2006**	**2007**	**2008**
Belgium	:	:	98	:
Bulgaria	:	:	:	:
Czech Republic	:	475	694	1260
Denmark	:	:	:	249
Germany	:	:	:	:
Estonia	:	:	:	253
Ireland	:	:	:	:
Greece	:	193	:	186
Spain	:	:	:	:
France	:	:	:	246
Italy	1837	2863	3009	3316
Cyprus	:	:	:	:
Latvia	284	435	443	281
Lithuania	936	1122	1144	1141
Luxembourg	:	:	:	:
Hungary	:	:	:	405
Malta	:	:	:	:
Netherlands	:	251	248	261
Austria	:	:	:	:
Poland	:	:	:	4752
Portugal	:	:	:	:
Romania	:	108	:	419
Slovenia	:	:	:	:
Slovakia	:	:	:	:
Finland	:	:	:	55
Sweden	:	:	:	:
United Kingdom	:	:	:	1213
Norway	:	:	:	:
Total	**3057**	**4779**	**4844**	**12089**

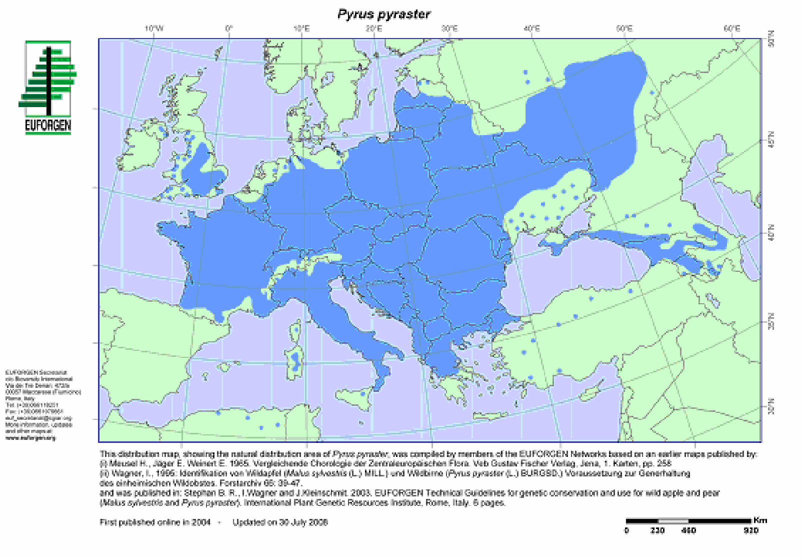
Table 3.5. Surface of organic production of pear in the EU countries (in ha) in 2005-2008

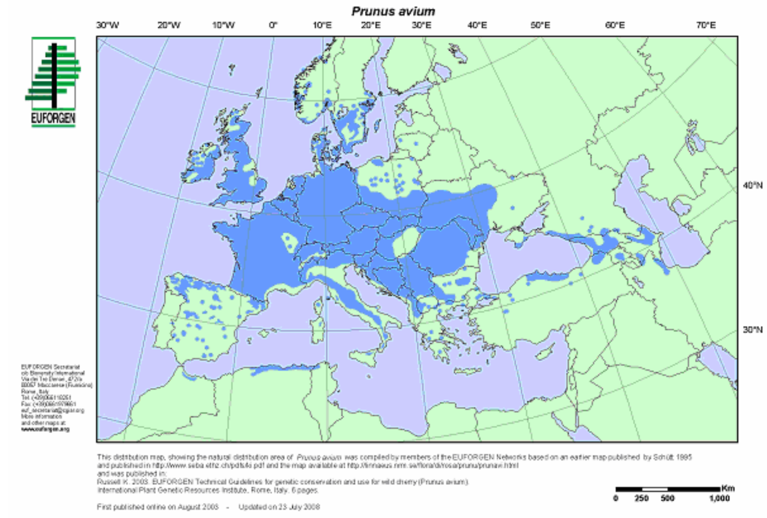
	Surface (converted and under convertion) in ha			
Country/Year	**2005**	**2006**	**2007**	**2008**
Belgium	:	:	29	:
Bulgaria	:	:	:	:
Czech Republic	:	70	114	317
Denmark	:	:	:	10
Germany	:	:	:	:
Estonia	:	:	:	0
Ireland	:	:	:	:
Greece	:	153	:	90
Spain	:	:	:	:
France	:	:	:	199
Italy	880	1412	1371	1462
Cyprus	:	:	:	:
Latvia	19	33	33	25
Lithuania	25	33	24	23
Luxembourg	:	:	:	:
Hungary	:	:	:	27
Malta	:	:	:	:
Netherlands	:	102	93	104
Austria	:	:	:	:
Poland	:	:	:	118
Portugal	:	:	:	:
Romania	:	0	:	5
Slovenia	:	:	:	:
Slovakia	:	:	:	:
Finland	:	:	:	0
Sweden	:	:	:	:
United Kingdom	:	:	:	106
Norway	:	:	:	:
Total	**924**	**1580**	**1521**	**1870**

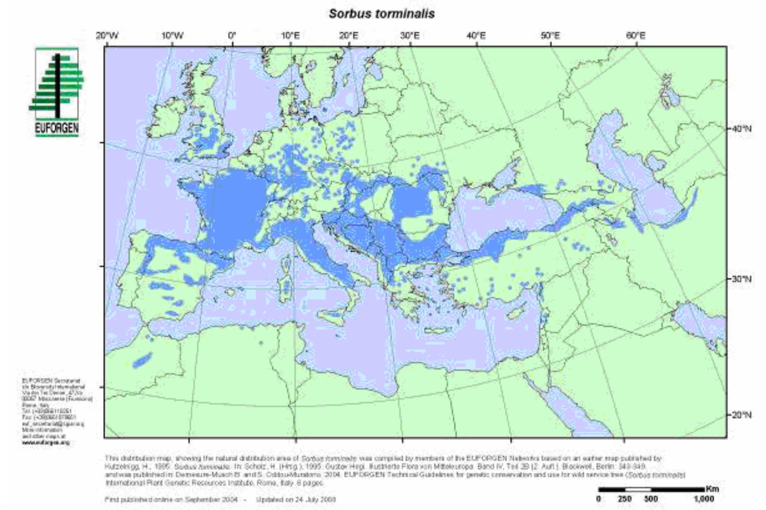
(Source: Eurostat, 2009, www.*ec.europa.eu/eurostat*)

Appendix 4 – Geographical distribution of some wild host plants of *Saperda candida* in the EPPO region.





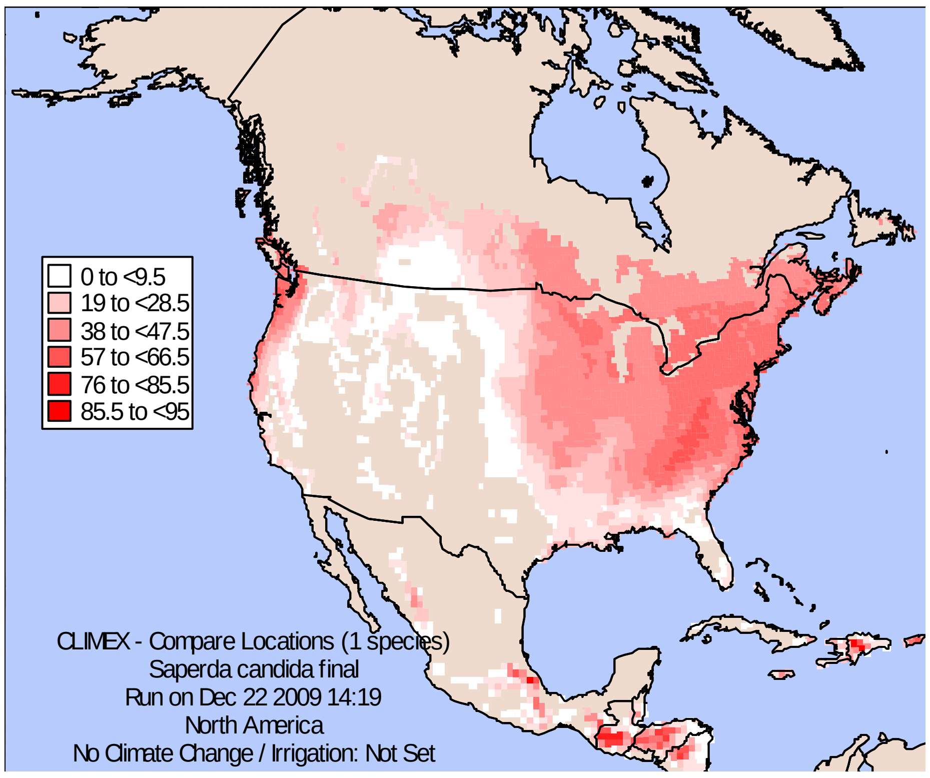




Appendix 5. CLIMEX Model

Table 5.1 Parameters used in CLIMEX to estimate the potential distribution of *S. candida* in the EPPO region

Moisture Index			
SM0	SM1	SM2	SM3
0.2	0.5	1.2	3
Temperature Index			
DV0	DV1	DV2	DV3
5	10	25	30
Light Index (not used)			
Diapause Index (not used)			
Cold Stress (not used)			
Heat Stress			
TTHS	THHS	DTHS	DHHS
30	0.002	0	0
Dry Stress			
SMDS	HDS		
0.2	-0.02		
Wet Stress			
SMWS	HWS		
3	0.001		
Day-degree accumulation above DV0			
DV0	DV3	MTS	
5	30	7	
Day-degree accumulation above DVCS			
DVCS	*DV4	MTS	
5	100	7	
Day-degree accumulation above DVHS			
DVHS	*DV4	MTS	
28	100	7	
Degree-days per Generation			
PDD			
1200			



Geographical distribution of *S. candida* in North America estimated by CLIMEX using the parameters in Table 5.1.