

	Other threats globally	Organism(s)	Means of spread	Control measures	Control approaches being used in other countries	Detection/diagnostics	Scale of damage commercial loss amenity, landscape (die back, reduced vigour, tree mortality)	Knowledge gaps	Research in progress	Opportunities to work with others? Who?	Impact of research on control	Likelihood of developing practical control options	Longer term options
				<i>Not present in the EU. Imperative to keep out. Maintain knowledge of trade routes, awareness on nurseries, foresters, general public</i>									
19	Spruce budworm	<i>Choristoneura fumiferana</i> (moth)	Long distance: possible spread via movement of infested plant material (plants or cut foliage). Locally: Adult flight or 'ballooning' of early instar larvae by wind blow.	Prohibition of the import of plants and cut foliage of <i>Abies, Larix, Picea, Pinus</i> and <i>Pseudotsuga</i> from infested countries, as recommended by EPPO for other North American insect pests of conifers	Aerial application of insecticides (mainly <i>Bacillus thuringiensis</i>) is the most commonly used method against <i>C. fumiferana</i> . However, natural enemies (e.g. <i>Apanteles fumiferanae</i> , <i>Omotoma fumiferanae</i>) can limit populations of the pest and inundative releases of <i>Trichogramma minutum</i> have been made. Sex pheromones are under investigation for trapping and mating disruption.	Defoliation and presence of larvae and associated silken threads.	<i>C. fumiferana</i> occurs mainly on <i>Picea</i> and <i>Abies</i> , but also on <i>Pseudotsuga</i> , <i>Pinus</i> and occasionally on <i>Tsuga</i> and <i>Larix</i> . It especially attacks <i>Abies balsamea</i> , <i>Picea glauca</i> and <i>P. rubens</i> in eastern North America and <i>A. lasiocarpa</i> , <i>Picea engelmannii</i> , <i>P. glauca</i> and <i>Pseudotsuga menziesii</i> in the West. Periodic very large outbreaks causing severe defoliation and occasional tree mortality throughout range in North America.	Potential for damage in Europe extrapolated from widespread planting of suitable host tree species. No direct knowledge of impacts and no known interceptions.	Extensive research in North America with good knowledge of pest population dynamics and factors triggering outbreaks.	Researchers in Canada particularly.	Improvements in detection methods and in relationships of forest structure to outbreak dynamics.	A number of existing options are used in North America and would be applicable to Europe.	Although the pest is unlikely to be transported to Europe, awareness and early detection would be desirable.
20	Sweet chestnut gall wasp	<i>Dryocosmus kuriphilus</i> (Hymenoptera: Cynipidae - gall wasp)	Long distance: Plants for planting and cut branches of <i>Castanea</i> (young chestnut plants or cut branches with buds moving in trade can contain eggs or first instar larvae within buds). Locally: Adult females disperse between trees. The species is parthenogenetic (female only).	Prohibition of movement of infested plants or cut branches of <i>Castanea</i> spp. Removal of infested branches (low infestation) or whole trees (high infestation).	Direct removal of infested chestnuts carried out in China. Not regarded as practical in EU and EPPO region.	Damage to development and to fruit, with signs of characteristic gall development.	The gall wasp attacks <i>Castanea crenata</i> , <i>C. dentata</i> , <i>C. mollissima</i> , <i>C. sativa</i> and their hybrids. Extensive damage to chestnut production (60-70% losses have been recorded).	Natural enemies under European conditions where the wasp has already established, e.g. Italy.	Research in Italy on possible control measures.	Chinese and North American research groups.	Investigations of either augmentation or release of natural enemies taking place in Europe and China.	Most likely longer term options will be based on natural enemies.	
21	Emerald ash borer	<i>Agrilus plannipennis</i> (beetle)	Internationally: via live ash trees imported for planting; potentially also in woodchips and wood for bioenergy (increasing), or wood products, especially with bark. High risk of hitch-hiking on vehicles from Moscow area to EU. Locally: natural dispersal (adults are strong fliers); human assisted movement in wood products e.g. firewood.	Not present in UK. No successful control measures once established; EU import controls to prevent entry.	EU import controls on live ash trees and wood; new (2011) regulations on wood fuel, including minimum size of wood chips, heat treatment, compliance with ISPM 15 protocols.	Early detection difficult. Larval feeding on inner bark leading to girdling and leaf yellowing and branch dieback. Tree mortality usually within a few years. Characteristic D-shaped exit holes, but only once adults have left.	European ash species are potentially highly susceptible and high mortality expected if EAB becomes established, with major economic and environmental impacts.	Uncertainty over the susceptibility of European ash spp. (<i>Fraxinus excelsior</i> , <i>F. ornus</i> etc). Lack of information on the situation in Russia, especially on rates of spread and tree mortality, and on the quantities of ash material moved along international pathways.	None in UK and EU. In USA, numerous studies on dispersal, ecology, surveillance, control methods, impact.	Researchers in US, Canada and China. Improvements in early detection would increase chances of eradication.	MODERATE: Improved detection will facilitate direct intervention to eliminate local populations.	MODERATE	Few - resistance highly unlikely in European ash species.
22	Emerald birch borer	<i>Agrilus anxius</i> (beetle)	Internationally: via woodchips and wood for bioenergy (increasing), live plant material, or wood products, especially with bark. Locally: natural dispersal (adults are strong fliers); human assisted movement in wood products e.g. firewood.	Not present in UK. No successful control measures once established; EU import controls to be put in place for birch products from North America.	EPPO Pest Risk Analysis recently completed; import controls to be established for birch products from North America, including minimum size of wood chips, heat treatment of wood products & importation of small plants only.	Early detection difficult. Larval feeding on inner bark leading to girdling and branch dieback. Possible swellings where tree has healed, tree mortality usually within a few years. Characteristic D-shaped exit holes, but only once adults have left.	European & Asian birch spp. are highly susceptible, and have been widely killed in North America. High mortality of European birch expected if <i>A. anxius</i> becomes established, with major economic and environmental impacts.	Uncertainty regarding the quantities of material and birch species moved along international pathways. Susceptibility of some European birch species unknown.	None in UK. In USA, ecology and impact of the insect on birch. Resistance of different birch species. Effect of wood chip size on survival rate.	US researchers at Ohio State University (<i>A. anxius</i> ecology & impact, resistance of different birch species).	MODERATE: Wood chip size and heat treatment of wood products important for control of importation.	MODERATE	Few - resistance highly unlikely in European birch species.
23	Oak wilt	<i>Ceratocystis fagacearum</i> (fungus)	Long distance: spread via movement of infested logs and lumber. Locally: Insect spread (nitidulid beetles and bark beetles), root transmission via natural root grafts.	Not known to be present in the UK; treatments aimed at preventing entry; import controls and inspection; treatment of oak logs/lumber from North America	In the USA: Early detection and prompt removal of dead or dying trees; severing root grafts between diseased and healthy trees. Minimising bark damage to trees when insect vectors most likely to transmit the pathogen.	Nested and real-time PCR assay recently developed capable of detecting pathogen in artificially infected wood and soil. Fungal morphology and disease symptoms also very characteristic and well described.	Potentially major: native European oaks have been shown to be susceptible to this pathogen and Europe also has a native oak bark beetle <i>Scolytus intricatus</i> which may be more effective at spreading the pathogen than N. American vectors.	Review of PRA; testing of diagnostic protocols	None	Opportunities to work with scientists in USA			
24	Plane wilt	<i>Ceratocystis platani</i> (fungus)	Long distance: spread via movement of infested plants, logs and lumber. Locally: infested soil; transmission via natural root grafts.	Not known to be present in the UK, but movement of <i>Platanus</i> plants/lumber from affected EU MS not currently regulated	In Europe/USA: Early detection and prompt removal of dead or dying trees; severing root grafts between diseased and healthy trees.; disinfection of pruning tools; control on movement of earth on infected sites.	Fungal morphology and disease symptoms well described. Routine PCR based and real-time diagnostic methods not developed.	Very damaging to <i>Platanus</i> (up to 80% of trees affected in some parts of France), but impact likely to be limited in UK because <i>Platanus</i> is mainly used as a street tree.	Pathway analysis; review of PRA; development of molecular diagnostic protocols	None	Opportunities to work with scientists in Europe and USA			