

Contingency Plan for the Bronze Birch Borer (*Agrilus anxius*)

INTRODUCTION

1. Serious or significant pests require strategic-level plans, developed at a national level, describing the overall aim and high-level objectives to be achieved and the response strategy for either eradicating or containing an outbreak.
2. Following identification by the National Plant Health Risk Register, the Plant Health Risk Group (PHRG) has commissioned pest-specific contingency plans for those pests that pose the greatest risk and require stakeholder consultation. The Forestry Commission is also prioritising plans which require updating, including the plan for the Bronze Birch Borer.
3. The purpose of pest-specific contingency plans is to ensure a rapid and effective response to an outbreak of the pest or disease described.
4. Contingency planning starts with the anticipation and assessment of potential threats, includes preparation and response, and finishes with recovery.

Anticipation

5. Researching sources of information and intelligence about the pest, including horizon scanning.

Assessment

6. Identifying concerns and the preparation of plans.
7. Setting outbreak objectives.

Preparation

8. Ensuring staff and stakeholders are familiar with the pest.

Response

9. Implementing the requirements to either contain or eradicate, including work to determine success.

Recovery

10. Identifying when the response strategy has been effective, or when the response is not considered feasible, cost effective or beneficial.

11. The Defra Contingency Plan for Plant Health in England (in draft 2015) gives details of the teams and organisations involved in pest response in England, and of their responsibilities and governance. It also describes how these teams and organisations will work together in the event of an outbreak of a plant health pest.

The purpose of Pest-Specific Contingency Plans is to ensure a rapid and effective response to an outbreak of the pest or disease described.

Scope

This contingency plan was prepared by the Forestry Commission's cross-border Plant Health Service for use at country and national (GB) levels. It should be used in conjunction with the Specific-Incident Contingency Plan for Plant Health Pest and Disease Outbreaks developed by Forestry Commission England's Forest Services division, which provides details of the level of response required and by whom, depending on the scenario.

Forestry Commission Scotland and the Welsh Government will develop similar documents detailing their management of outbreaks. Where an outbreak becomes of national (GB) concern, the Chief Plant Health Officer will form an outbreak management team to co-ordinate the activities in the different countries.

This contingency plan falls into three main parts:

- official action following a presumptive diagnosis;
- official action following the confirmation of an outbreak; and
- pest background information.

It is designed to help government agencies anticipate, assess, prepare, prevent, respond and recover from pest outbreaks.

This plan will be updated following new information or changes in policy or contact details (last updated August 2015).

Objectives of this plan

- To raise awareness of the potential threat posed by *A. anxius*, thereby ensuring that stakeholders are aware of the symptoms caused by infestation by this pest.
- To provide guidance on the steps to be taken whenever symptoms of attack by *A. anxius* are observed.
- To ensure that infestations of *A. anxius* are managed promptly with the aim of eradicating pioneer populations of the borer.

- To ensure that all relevant Forestry Commission staff, other government agencies and local authorities are conversant with the contents of this Contingency Plan so that effective and immediate action is implemented as required.
- To ensure that good communications are put in place at regional and national levels so that all stakeholders (including the media) are kept fully informed of the scale of infestation.

Anticipation and Assessment

- 1.1. *Agrilus anxius* (Linnaeus) (Coleoptera: Buprestidae), commonly known as the Bronze Birch Borer, is a specialist wood borer of *Betula* (birch) species.
- 1.2. Its native range covers North America, where it occupies a wide range of ecological and climatic conditions.
- 1.3. It is mainly a secondary pest, attacking trees weakened by drought, old age, defoliation or soil compaction, although it has been known to attack healthy trees.
- 1.4. It is a quarantine pest for the EU (2014/78/EU), and is on the EPPO A1 list of quarantine pests with potential to cause extensive damage if introduced.
- 1.5. It is officially absent from the UK.

Preparation

- 2.1. Following suggestions from the NPPO of Norway, where *Betula* spp. comprise up to 30% of the woodland cover, a [PRA](#) for *A. anxius* has been conducted by EPPO and the pest was added to EPPO A1 list and added to Annex 1 of EU Plant Health Directive.
- 2.2. EPPO is (2015) preparing a quarantine pest data sheet for the organism.
- 2.3. The UK Government has contributed to the EPPO PRA on the species.
- 2.4. Importation of birch wood from North America has been controlled since October 2014.

Response

Legislation

3.1. A list of the relevant legislation which may influence a response is listed in appendix 3.

OFFICIAL ACTION FOLLOWING A PRESUMPTIVE DIAGNOSIS

Trigger

3.2. The key indicators which would trigger a response are findings of or reports of:

- the presence of an infested tree in a nursery;
- the presence of an infested tree in the wider environment; or
- the presence of the pest in a consignment of imported plants.

This can be reported in from nursery growers, woodland owners or members of the public.

Communication

3.3. In England, a duty officer (from FC England or the Animal & Plant Health Agency (APHA)) will act as a point of contact for incidents, and it is their job to assign a response officer to incidents when they occur. Similar arrangements are expected to be in place in Scotland and Wales. The response officer investigates and reports back to the Defra contingency core group, which is an 'ad hoc' group put together in response to a notification, and which is usually chaired by the Chief Plant Health Officer. Country teams in Scotland and Wales will fully manage the outbreak in accordance with their own generic contingency plans, but will provide updates to the Defra contingency core group for information purposes and for Defra to report to the European Commission (EC).

3.4. The response officer will gather information including the location, likely origin, host or commodity, level of damage, extent of outbreak, and risk of spread. The composition of the contingency core group will depend upon the pest or disease in question, and will comprise plant health officials and specialists from the risk group.

3.5. Based on the information fed back to it, the contingency core group in England will decide upon the alert status to be given (black, amber or red) to the outbreak, which will determine the level of response (see Appendix 1 for alert status table). In Scotland and Wales, the core contingency group can advise on alert status and the appropriate response. If required, the Contingency Core Group will request the relevant organisation/s to set up an incident management team to resolve the incident.

Holding consignments and movement / planting restrictions

3.6. Until further investigation, no material shall leave the site, and local operations will be halted until such time as the suspected case is confirmed as a false alarm.

Preliminary trace forward / trace backward

3.7. The most likely source of entry is the importation of wood or live trees from Canada or the USA. Depending upon the entry pathway, tracing forward and backward to identify suspect material will be conducted to identify other potentially contaminated stock or sites.

Surveying to determine whether there is an outbreak

3.8. An outbreak of *A. anxius* is most likely to be detected through general surveillance or a report from the public of birch trees showing canopy thinning, dieback or mortality, with suspect insect galleries and damage beneath the bark. Sightings might also be reported from nursery owners and/or garden centre managers. Confirmation that *A. anxius* is present will require examination of samples and follow-up inspections.

3.9. Follow-up inspections should gather information on:

- the likely origin of the pest and, if a consignment of plant and plant product is suspected to be the origin of the outbreak, details such as other destinations;
- the location and ownership of the affected site, including any abiotic factors that may influence the outbreak, e.g. public access, presence of watercourses, etc. Include maps if possible;
- the hosts infested at the site (species, variety, development stage, etc.);
- when and how the pest was detected and identified (including photographs of symptoms);
- the level of pest incidence and, where appropriate, life stages present;
- the extent and impact of damage (including part of host affected);
- any recent import or movement of host plants or host plant products into and out of the affected site;
- any movement of people, products, equipment and vehicles, where appropriate;
- the relevant treatments applied to host plants that might affect development of symptoms or detection and diagnosis of the pest;
- any history of the pest on the site, place of production or in the area; and
- likely biodiversity impacts of any control, including any duty of care obligations under NERC (2006) Act.

Confirmation of a new outbreak

- 3.10. Whenever possible, a positive identification of *A. anxius* will be made on site by a suitably experienced entomologist. In situations where no specialist is available, or the site is not readily assessable, samples should be taken for laboratory analysis. Samples should only be removed from the site in a biosecure way by trained individuals with relevant safety equipment.
- 3.11. Beetles suspected to be *A. anxius* from infested material should in any event be placed in a secure container, double bagged and sent immediately to Forest Research for diagnosis. The samples should be clearly labelled with the date of collection, location (address, postcode, GPS) and the contact details of the person collecting the samples. The address is: Entomology Branch, Forest Research, Alice Holt Lodge, Wrecclesham, Farnham, Surrey, GU10 4LH.

OFFICIAL ACTION FOLLOWING THE CONFIRMATION OF AN OUTBREAK

Strategic Actions on confirmation

- 3.12. On positive confirmation the following should be initiated:
- notification of ministers and senior officials;
 - setting up regular (determined by scale of outbreak) Lead Government Department (LGD) meetings to keep partners aware of current status, actions and possible future requirements and to agree communications strategy;
 - notification of EU and others; and
 - discussions with stakeholders.
- 3.13. In most cases, the Forestry Commission (England and Scotland) is likely to appoint an incident controller and an incident management team. The Welsh Government would take the lead in Wales. Forestry Commission England Forest Services have developed a specific contingency plan for Plant Health Pest and Disease Outbreaks (in draft 2015), which will be implemented in response to a confirmed *A. anxius* outbreak. Forestry Commission Scotland and the Welsh Government will have similar documents detailing their management of outbreaks.
- 3.14. The aim will be to eradicate new outbreaks following the procedures set out below. If surveys reveal that there is little realistic prospect of eradicating the pest, the OMT will consider switching to a strategy of slowing the rate of spread.

Communication

- 3.15. The incident controller will set up a management structure to provide incident management. The circumstances of the outbreak will determine the size and nature of the management structure.

Surveillance

- 3.16. Surveillance methodology will be the same as that for an outbreak of emerald ash borer (*Agrilus planipennis*) (Ryall *et al.*, 2010, 2011). A delimiting survey should be set up as soon as possible after the first finding of *A. anxius*, to determine the geographic limits of the infested area, and to demarcate a regulated area.

There shall be two elements to the delimiting survey:

- an **intensive survey** of all birch trees within at least 1 km radius of the first tree(s) found to be infested; and
- **line transects** outwards to at least 10km, along which visual inspection and destructive sampling of birch trees are carried out at regular intervals (e.g. every 50-100m) to estimate the full extent of spread.

- 3.17. Surveys should focus first on open-grown birch trees, and those growing along the edges of woodlands, and should include the inspection of previously cut trunks and branches, cutting residues and naturally occurring debris showing signs of beetle activity. Birch trees showing canopy thinning and dieback should be felled, and the bark removed to look for galleries and immature life stages. Apparently healthy trees may also be infested with *A. anxius* and, therefore, these will also require checking for the presence of the pest. This should be approached in a standardised manner, e.g. by removing two branches of 5–8cm diameter from the mid-crown of each tree, and peeling the bark from the first 50cm above the base of the branches to look for larval galleries (Ryall *et al.*, 2010).

- 3.18. If more trees are found to be infested, the surveys should be extended, so that the intensive survey covers all birch trees out to at least 1km from the new infested trees, and the line transects extend a full 10km from the new infested trees. This process should be continued to provide a preliminary assessment of the infested area, and should be repeated in subsequent years, to monitor the spread of *A. anxius*, and to update the boundaries of the infestation and regulated area.

Demarcated zones

- 3.19. A statutory regulated area should be established as soon as possible after the discovery of an outbreak of *A. anxius*, to help minimise spread of the pest within the infested area, and to prevent human-assisted transport to areas outside the infested

area. An initial regulated area of at least 20km around the infested trees will need to be established, within which measures to prevent the movement of potentially infested birch material should be implemented. These measures should include a prohibition on the movement of untreated birch wood (including firewood, roundwood, sawn wood, wood chips, waste wood and arboricultural arisings) and plants for planting of birch from the infested area to the rest of the regulated area, and from the regulated area to regions outside the regulated area. Subsequently, the size of the regulated area might need to be increased, depending on the spread of *A. anxius*.

Tracing forwards / backwards

- 3.20. If the infected trees have been planted recently, i.e. within the previous two years, the source of the plants must be traced back to the supplying nursery, and the nursery visited and inspected for the presence of *A. anxius*. In addition, any supplies of birch planting material from the nursery over the previous two years must be traced to the final planting sites, which must be inspected for the presence of *A. anxius*.

Pest management procedures

- 3.21. The initial management approach should focus on eradicating *A. anxius* as quickly as possible. The only effective way to do this will be to establish a clear-cut zone around the outbreak, within which every birch tree is felled and destroyed. Given that adult *A. anxius* can disperse several kilometres, and pioneer populations are very difficult to detect before damage builds up and becomes visible, this clear-cut zone will need to extend outwards **to at least 10-20km**.
- 3.22. Subsequently, should *A. anxius* be found to have spread beyond the-clear cut zone and eradication is no longer feasible, the management strategy should change to one of annual monitoring and the phased removal of the worst affected birch trees. The objective of this approach is to slow the rate of spread, and allow any resistant or tolerant birches, if they exist, to be identified and propagated. Birch trees within and beyond the known infested area should be assessed each year during mid and late summer for canopy thinning and dieback, and all trees with more than 50% canopy thinning should be felled and the material chipped to less than 1.5cm in three dimensions, and/or burnt. Trees that are felled should be inspected to confirm whether *A. anxius* is present, and this information should be forwarded to Forest Research, where it will be used to help monitor spread.
- 3.23. Chemical insecticides can be effective in killing larvae, pupae and adults of *A. anxius*, but they are not recommended for control. Insecticides are costly, and are likely to have undesirable side effects, especially if applied on a large scale. For practical and environmental reasons, therefore, it is proposed that chemical control is used only in

exceptional cases, i.e. for the protection of historic and valuable amenity trees and trees of historical, heritage or cultural importance.

- 3.24. If the pest becomes established, annual surveys will be required to monitor spread, to redefine the infested area and the boundaries of the regulated area, and to identify birch trees with more than 50% canopy thinning. Surveys of canopy thinning and dieback would need to be carried out during mid or late summer, although surveys at other times of the year might be useful for identifying heavily infested trees. Trees marked up in the summer may be felled during autumn or winter.
- 3.25. Assessing trees for canopy thinning and dieback can be based on visual, ground-based surveys. Traps that capture adult *A. anxius* could also be used to detect the presence of beetles in areas outside the known infested area, which would provide advance warning that regular surveys and tree removal might soon be required. In contrast, the use of trap logs to detect *A. anxius* does not seem to be effective, because the beetle prefers to attack live, standing trees.

Disposal plan

- 3.26. Birch trees felled to reduce *A. anxius* infestation should be destroyed within the infestation area by chipping to less than 1.5cm in three dimensions, and/or burning. Firewood, roundwood, sawn wood, wood chips, waste wood and debris found to contain *A. anxius* life-stages, or showing signs of infestation, should be destroyed in the same way.

Public outreach

- 3.27. It is crucial to have public support for the management programme, and to help with general surveillance. Engaging the public will require the provision of timely and accurate information, and opportunities to participate in monitoring and control. Information can be made available through newspapers, radio, TV, the internet, social media and publicity materials such as leaflets and posters, and should be targeted locally, especially within the infested and regulated areas, and, if appropriate, at a national level.
- 3.28. It is important to provide information on: the location and size of the infested and regulated areas; statutory and voluntary responsibilities; rates of spread; management options; pathways and ways in which the pest might have arrived and could be transported; the prospects for birch; and what people can do to help, especially in terms of monitoring and arranging for severely affected birch trees to be felled. Managing this level of public engagement will require a central communications office with a clear communications strategy and plan designed to present and explain,

reactively and proactively, the policy and operational objectives and methods, and to foster public and stakeholder support for the action. This office must be capable of handling a large numbers of enquiries, and able to provide general and specific information.

Review measures in the case of prolonged official action

3.29. If eradication proves ineffective, efforts should shift to slowing the rate of spread and trying to retain any tolerant birches. The focus should move from managing the outbreak with the aim of eradication to a programme of monitoring on an annual basis, combined with selective felling. A review of the management programme should be undertaken regularly (at least annually) to determine the success and cost-effectiveness of the measures in the longer term. This review will involve consultation with stakeholders and should include:

- evaluation of the effectiveness of current measures;
- evaluation of the economic impact and cost-effectiveness of continuing existing measures;
- consideration of further measures to strengthen containment and eradication actions;
- consideration of statutory obligations and impact on import and export procedures;
- consideration of alternative approaches or the cessation of statutory action; and
- consideration of biodiversity impacts following control.

In circumstances where official action is no longer considered appropriate, stakeholders should be consulted and a timetable and mechanism agreed for the removal of official measures and for the dissemination of pest management information as appropriate.

Criteria for declaring / change of policy

3.30. Policy changes can be considered in light of:

- changes in the geographic distribution of *A. anxius*;
- new or updated research information on the pest species' range and lifecycle;
- availability, appropriateness and efficacy of deploying biological control agents;
- identification of new pathways for introduction; and/or
- resistance, or the establishment of resistant populations, of *Betula* spp.

Evaluation and review of the contingency plan.

3.31. . The plan should be reviewed annually to take account of:

- any new legislative measures or amendments to measures implemented to reduce the risk of introduction;
- changes in the geographic distribution of *A. anxius*;
- new or updated research information on the range and life cycle of *A. anxius*;
- identification of new pathways for introduction; and
- resistance, or the establishment of resistant populations, of *Betula* spp.

Recovery

4.1. If *A. anxius* were to be introduced into the UK, or elsewhere in Europe, the likelihood is that it would, without control, spread and eventually kill all *Betula* spp. Recovery to the pre-infestation condition would be unlikely. The only possible mitigation of this situation would be for other tree species to replace birch, although this would take a very long time, and the resulting woodland would be ecologically different.

Appendix 1: PEST BACKGROUND INFORMATION

Identity of organism and quarantine status

Species name:	<i>Agrilus anxius</i> (Gory, 1841) (Coleoptera: Buprestidae)
Synonyms:	None
Common name:	Bronze birch borer
UK risk rating:	Unmitigated 100/125; mitigated 50/125
EU status:	<i>Agrilus anxius</i> is on the EPPO A1 list number 362.
UK status:	Absent

Hosts

All birch trees (*Betula* spp.)

Life cycle

The life cycle of *A. anxius* can last 1 or 2 years. The insect overwinters as larvae in the wood, just under the bark. Pupation takes place in shallow cells in the xylem in late April and early May (Hoover 2002), , and adults emerge from May to mid-July, depending on climatic conditions. (Muilenberg & Herms, 2012).

Life stages: *A. anxius* has four larval stages, or instars. Eggs are laid in cracks and crevices on the bark of stems or branches. Larvae bore into the bark after hatching, and feed by making galleries in the phloem and scarring the outer xylem. (Note: in the USA, larvae have not been reported to colonise trees with main stems below 2cm diameter, but have been observed to bore from larger stems and branches into branches as small as 1cm diameter (Herms, pers. obs.; Nielsen, pers. obs.). Most 4th-instar larvae bore into the outer sapwood to construct individual pupal chambers (generally to a depth of 1cm, and rarely deeper than 2.5-cm, based on data obtained for *A. planipennis*). Each 4th-instar larva also bores a short gallery into the outer bark which the future adult will use to exit the tree. The larva fills this gallery in the outer bark with frass. The 4th-instar larva overwinters inside the pupal chamber, and is often referred to as a prepupa at this time.

Due to their habit of living mostly within the wood, late larval stages, i.e. 4th-instar larvae, and pre-pupae and pupae are likely to survive in wood even if the bark is removed. Development starts again after the pre-pupae have experienced a suitable cold period, and pupae form in

the pupal chamber. Pupation ends and adults emerge once enough days of adequate temperatures have accumulated. Adult emergence generally occurs over 10 weeks during late spring and early summer. Adults have a life span of approximately 23 days, and require continuous feeding on foliage, including seven to 10 days of maturation feeding before becoming reproductively mature. They have a short survival period of four to seven days in the absence of food).

Life cycle: The pest has a 1- or 2-year life cycle. In vigorous (i.e. non-stressed) hosts and in colder climates, the pest has a 2-year life cycle. Dates of emergence and the end of larval feeding, etc. depend on the climate and other conditions. This varies widely across the North American range of this beetle, in association with the distribution of *Betula*. It is unclear whether this would be the case if *A. anxius* established in the UK.

Identification

The eggs of *A. anxius* are white to creamy, becoming more yellow as they mature (Barter, 1957). Eggs are oval and approximately 1.5mm long by 0.75mm wide (Hutchings, 1923; Barter, 1957). Females lay eggs (singly or in clusters) in bark crevices, and can lay up to 75 eggs during a lifetime.



Figure 1 – *A. anxius* eggs, in oviposition just before hatching into larvae. Source G. Barter, Canadian Forestry Department

Larvae are white to creamy, with flat top and bottom surfaces. The head is small, and protracted into the wide prothorax. There are eight abdominal segments, followed by two caudal segments (Barter, 1957). The final caudal segment terminates in two sclerotized, tooth-like styles (urogomphi), which are characteristic of *Agrilus* (Slingerland, 1906). Mature larvae are 8–20mm long, and have four instars (Loerch & Cameron, 1983a). They start boring into the wood immediately after hatching.



Figure 2 - *A. anxius* larval stage. Source: W. Cranshaw, Colorado State University.

Adults are small, narrow, metallic copper-coloured beetles 7-12mm long (Muilenberg & Herms, 2012).



Figure 3: Adult *A. anxius*.
Source: W. Cranshaw, Colorado
State University.

Distribution of the organism

Agrilus anxius is native to North America (USA and Canada). It occurs throughout the range of birches in North America, and has been recorded in the areas indicated on figure 1 below.

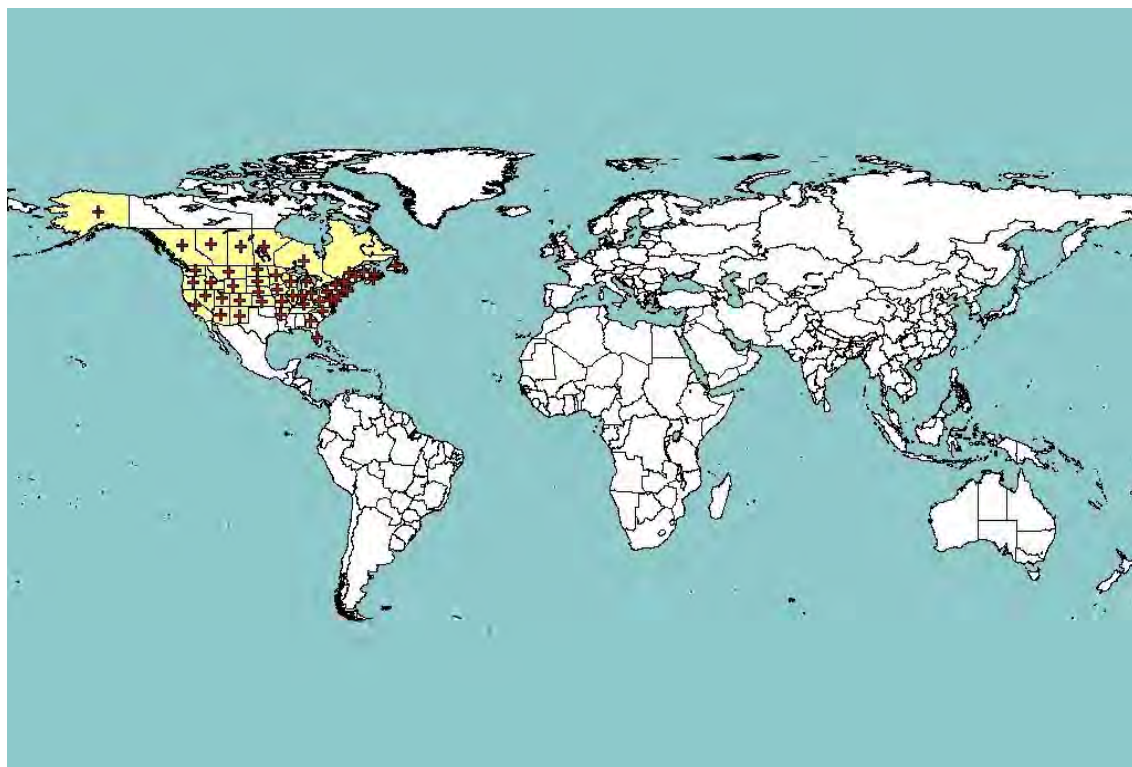


Figure 4: Distribution map of *A. anxius* as of June 2015: crosses indicate presence at sub-national records. (EPPO PQR database).

Damage impact and controls

Damage is caused by the larvae's feeding on the inner bark and cambium of the tree. Repeated attacks and the construction of numerous winding galleries by the larvae cause

disruption to nutrient transport, which eventually kills the roots of the host plant. Larval galleries can also girdle branches and trunks. Initial symptoms of an infestation appear in the upper crown of the tree, with leaf yellowing and branch dieback.



Figure 5 – Leaf yellowing and branch dieback associated with *A. anxius*. Source: S. Katovich, USDA Forest Service.

Other evidence of an infestation is the presence of 3-5mm-wide, 'D'-shaped exit holes formed by the emerging adult beetles.



Figure 6 – D-shaped exit holes of *A. anxius*. Source: W. Cranshaw, Colorado State University.

Rust-coloured sap oozing, and staining, can also be observed on the outer bark, along with swellings and bumps where the tree has healed inside.



Figure 7 – Bark staining associated with *A. anxius*. Source: R. Rosetta, Oregon State University.

In many cases, tree mortality is observed within a few years after the appearance of the first symptoms. Birches that are weakened or stressed by drought, old age, insect defoliation, soil compaction, stem or root injury are more susceptible to damage by *A. anxius*. Adult beetles feed on leaves (*Alnus*, *Betula*, *Populus*,), but damage to the foliage is insignificant.

Main pathways

Plants for planting and wood of *Betula* spp. with or without bark.

Import controls

Birch wood coming from the USA or Canada, where *A. anxius* is present, must be de-barked and have at least 2.5cm of sapwood removed or be treated with ionizing irradiation to achieve a minimum absorbed dose of 1 KGy throughout the wood. Wood chips, wood waste, scrap wood or similar material obtained in whole or in part from birch must be accompanied by an official statement confirming that it has originated from a country free of *A. anxius*, i.e. these materials, if they contain birch, cannot be imported from the USA or Canada. Isolated bark of birch must be free of wood.

Birch (*Betula spp.*) plants for planting must originate from a country known to be free of *A. anxius*, i.e. *Betula* species for planting cannot be imported from the USA and Canada.

Appendix 2. Alert Status categories

ALERT	STATUS	COMMAND LEVEL
White	Plant pest or disease with potential for limited geographical spread	Instigation of incident management plan involving

		operational command at appropriate level, and implementation of Standard Operating Procedures or scientific advice where applicable
Black	Significant plant pest or disease with potential for limited geographical spread	Instigation of incident management plan usually involving joint tactical and operational command at appropriate level. Implementation of plant pest/disease-specific response plans where applicable
Amber	Serious plant pest or disease with potential for relatively slow, but extensive, spread leading to host death and/or major economic, food security or environmental impacts	Instigation of incident management plan usually involving joint strategic and tactical command, and plant pest/disease-specific response plans where applicable
Red	Serious or catastrophic plant pest or disease with potential for rapid and extensive geographical spread leading to host death and/or major economic, food security or environmental impacts	Instigation of incident management plan involving strategic, tactical and operational command, and implementation of plant pest/disease-specific response plans where applicable

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EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION
ORGANISATION EUROPEENNE ET MEDITERRANEENNE
POUR LA PROTECTION DES PLANTES
11-16988 (11-16901)

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