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***[1]***DRAFT ANNEX TO ISPM 39: Use of systems approaches in managing the pest risk associated with the movement of wood (2015-004)

***[2]*Status box**

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| ***[3]***This is not an official part of the standard and it will be modified by the IPPC Secretariat after adoption. |
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| ***[15]*Steward history** | ***[16]***2021-11 SC Steve CÔTÉ (CA, Lead Steward)***[17]***2022-05 SC Harry ARIJS (BE, Assistant Steward)***[18]***2021-11 SC Sophie PETERSON (AU, Assistant Steward)***[19]***2019-05 SC Rajesh RAMARATHNAM (CA, Lead Steward) |
| ***[20]*Notes** | ***[21]***2022-07 Edited***[22]***2023-05 Edited |

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***[24]***This annex was adopted by the XXX Session of the Commission on Phytosanitary Measures in XXX 20XX.

***[25]***The annex is a prescriptive part of the standard.

***[26]***INTRODUCTION

***[27]***Scope

***[28]***This annex provides guidance to national plant protection organizations (NPPOs) on the use, within the context of a wood-commodities systems approach, of specific integrated measures that, when applied together, reduce the pest risk posed by quarantine pests associated with the international movement of wood. This annex applies to the wood of gymnosperms and angiosperms (i.e. dicotyledons and some monocotyledons, such as palms) other than bamboo and rattan.

***[29]***BACKGROUND

***[30]***A systems approach may provide, where appropriate, an equivalent (according to ISPM 24 (*Guidelines for the determination and recognition of equivalence of phytosanitary measures*)) alternative to a single phytosanitary measure, such as a treatment, or replace more restrictive phytosanitary measures, such as prohibition. A systems approach may also provide countries with additional opportunities to facilitate or expand trade while effectively managing pest risk.

***[31]***Any systems approach for wood should be developed in accordance with ISPM 14 (*The use of integrated measures in a systems approach for pest risk management*). Measures combined in the systems approach may include a wide range of actions that go beyond what are traditionally thought of as treatments, these including production practices and the ways in which wood commodities are transported to the importing country. Other measures may be carried out once wood commodities enter the importing country. In combination, these measures reduce the pest risk for the importing country and thus facilitate safe trade.

***[32]***The guidance provided in this annex pertains to quarantine pests associated with wood and with specific locations within the wood. It identifies specific procedures and practices that may be applied from pre-planting to post-import of wood in a systems approach to meet phytosanitary import requirements. It also details the documentation required to demonstrate the measures that have been taken. The annex provides guidance on the respective responsibilities of NPPOs and participating entities in developing the systems approach, implementing the measures and supervising the implementation.

***[33]***REQUIREMENTS

1. ***[34]***Developing a wood-commodities systems approach

***[35]***Development of a wood-commodities system approach requires knowledge of the biology of the pest or pests associated with the wood commodity or commodities, the production chain of the commodity or commodities and the associated pest risk. Specific pest risk management options to be included as measures in the systems approach should be effective and feasible. The selection of the measures should be negotiated between the NPPO of the importing country and the NPPO of the exporting country.

1. ***[36]***Practices employed along a wood-commodities production chain for consideration when developing a systems approach

***[37]***Practices relating to activities in an exporting country, from pre-planting to transport, that may reduce pest risk are described in Table 1.

***[38]***The NPPO of an importing country may decide to approve, when applicable and feasible, the use of some of the practices described in Table 1 as post-import measures. In addition, practices that are specific to the post-import part of the production chain may be employed (Table 2).

***[39]*Table 1.** Examples of practices that may be used from pre-planting to transport

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| ***[40]*Pre-planting** |
| ***[41]*Use of resistant genotypes** | ***[42]***Planting tolerant or resistant genotypes, selected for the environmental conditions of the planting location, can reduce infestation.  |
| ***[43]*Site selection** | ***[44]***Pre-planting assessments, including soil testing, may be conducted to assess site suitability. |
| ***[45]*Species selection** | ***[46]***Planting species and cultivars of trees that are appropriate for the particular geographical region, soil and climatic conditions can reduce plant stress and susceptibility to pests. Planting forests with mixed species rather than using monoculture or clonal trees can reduce the vulnerability of forests to pests. |
| ***[47]*Drainage** | ***[48]***Tillage to improve drainage before planting can reduce pest populations. |
| ***[49]*****Pest free areas or areas of low pest prevalence** | ***[50]***Pest risk can be reduced by establishing trees from pest free areas or areas of low pest prevalence as described in ISPM 4 (*Requirements for the establishment of pest free areas*) ISPM 22 (*Requirements for the establishment of areas of low pest prevalence*) and ISPM 8 (*Determination of pest status in an area*).  |
| ***[51]*Pre-harvest** |
| ***[52]*Silvicultural practices** | ***[53]***Planning and operational practices that can result in pest risk reduction may be applied to both planted and naturally regenerated forests. Post-planting assessments may be conducted to regularly review the progress of planted seedlings. Thinning, spacing and pruning may be carried out to remove unhealthy or infested trees or branches and improve growing conditions. Similarly, roguing (routine removal of plants that exhibit evidence of disease, infestation, off-type characteristics or undesirable traits) improves harvest quality. Well-planned and managed natural and planted forests provide an opportunity to maximize tree health and keep it under review while optimizing timber production.  |
| ***[54]*Field inspection** | ***[55]***Data from field inspections may be used to guide harvest-planning decisions and to help ensure that infested trees are not selected for export.  |
| ***[56]*Surveillance** | ***[57]***Surveillance may be used in the establishment and recognition of pest free areas and allows for early detection and intervention when pest outbreaks occur. Surveillance should be conducted in accordance with ISPM 6 (*Surveillance*). |
| ***[58]*Application of semiochemicals** | ***[59]***Semiochemicals may be used to reduce pest populations via techniques such as pest-mating disruption and to check for pest presence to ensure early detection. Anti-aggregation pheromones (chemical substances that interrupt pest aggregation on a resource) may be used to reduce pest populations or protect healthy tree stands that may be susceptible to pests. |
| ***[60]*Chemical controls** | ***[61]***Pesticide use can reduce pest-population density.  |
| ***[62]*Biological control** | ***[63]***Biological control agents can reduce pest-population density. |
| ***[64]*Pest free areas or areas of low pest prevalence** | ***[65]***To confirm the maintenance of a pest free area or area of low pest prevalence, the pest status in the area should be verified in accordance with ISPM 4 (for pest free areas) or ISPM 22 (for areas of low pest prevalence) |
| ***[66]*Harvest** |
| ***[67]*Timing of harvest** | ***[68]***To determine whether the likelihood of infestation by a particular pest can be reduced by altering the timing of the harvest, it is important to understand the biology of the pest. For those pests that exhibit distinct seasonality in temperate forests, such as bark beetles, ambrosia beetles and other wood-boring pests, it may be feasible to identify the ideal timing of harvest to reduce levels of attack by the pest and therefore infestation, but this may not be possible in tropical forests, as pest species may have multiple overlapping generations throughout the year or year-round activity with peak levels of activity in the dry or wet season. |
| ***[69]*Assessment of standing trees for pest presence** | ***[70]***Assessing standing trees before harvest when signs or symptoms of pests are most likely to be present can help in the selection of non-infested trees.  |
| ***[71]*Post-harvest** |
| ***[72]*Rapid removal and timely transport of harvested round wood** | ***[73]***Round wood can be susceptible to infestation after it has been harvested. The season of harvest, the length of time that the round wood remains in the forest after harvesting, and the length of time that it takes to transport the wood to the processing facility or holding yard, can all influence the likelihood of post-harvest infestation. Rapid removal and timely transport can therefore reduce the likelihood of such infestation  |
| ***[74]*Visual examination for pests during volume and quality determination** | ***[75]***To reduce the likelihood of infested wood entering the production chain, round wood may be visually examined for evidence of pests by trained personnel during the process of scaling and grading.  |
| ***[76]*Anti-aggregation pheromones to repel insects** | ***[77]***Anti-aggregation pheromones, if available, may be used to repel pests from places of natural disturbance (e.g. windthrows) or logging and storage areas.  |
| ***[78]*Protection of round wood after harvest** | ***[79]***Protection of round wood after harvest (e.g. storing in water, sprinkling with water, insect nets) may be used to prevent post-harvest infestations by bark beetles and wood borers. |
| ***[80]*Removal of branches (or boughs)** | ***[81]***Branch removal can be an effective method to reduce pests of foliage and twigs, preventing the movement of those pests.  |
| ***[82]*Processing wood commodities** |
| ***[83]*Rapid processing of round wood**  | ***[84]***Rapid processing (to reduce timing between harvest and processing of round wood) reduces the likelihood of infestation. |
| ***[85]*Removal of bark** | ***[86]***Removal of bark substantially removes pests inhabiting the outer surface and those found directly beneath the bark. Debarked and bark-free wood are described in section 2.1 of this standard. Bark removal can prevent post-harvest infestation by some species of wood pest.  |
| ***[87]*Sawing and planing wood** | ***[88]***Sawing removes most of the bark as well as some of the outer wood, eliminating pests living in or just under the bark. Sawn wood with rounded edges poses a greater pest risk than square-edged sawn wood, as a larger percentage of the wood just below the surface of the bark is included. The process of sawing wood can destroy insect pests present in the wood and render it less suitable for pest survival. The presence or absence of bark and the thickness of a piece of sawn wood affect pest risk. Planing reduces the dimensions of sawn wood and may be used to remove residual bark.  |
| ***[89]*Quality control of sawn wood** | ***[90]***During grading of sawn wood and quality control, wood with insect galleries or fungal infection may be removed from the production chain or marked for treatment.  |
| ***[91]*Inventory and contamination management** | ***[92]***Post-harvest inventory management and keeping storage and processing areas free of soil and wood debris play an important role in reducing the likelihood of infestation. Segregation of wood into different pest risk categories at appropriate stages of the production chain may be an important component of a systems approach. |
| ***[93]*Pest free areas or areas of low pest prevalence** | ***[94]***To confirm the maintenance of a pest free area or area of low pest prevalence, the pest status in the area should be verified in accordance with ISPM 4 (for pest free areas) or ISPM 22 (for areas of low pest prevalence).  |
| ***[95]*Surveillance** | ***[96]***Surveillance using traps and lure combinations may be used to detect pests within and around a storage and processing facility. Surveillance should be conducted in accordance with ISPM 6. |
| ***[97]*Visual examination of wood commodities** | ***[98]***Visual examination may be used to identify specific signs or symptoms of pests and determine if measures applied have been effective. The size and disposition of the wood commodities and the cryptic nature of some pests can, however, make visual examination more challenging. |
| ***[99]*Chipping** | ***[100]***The pest risk associated with wood chips varies depending on tree species, presence of pests in the original material, bark content, chip size and intended use (i.e. fuel, landscape mulch, or pulp for fibre production). Commercial specifications for chip quality related to specific intended uses may be used to reduce pest risk. For example, chips for fibre production have minimal bark, consistent moisture content and uniform shape and size, resulting in low pest risk for some organisms compared with chips used as a bioenergy source that may have greater variation in size and may contain bark.***[101]***The physical process of wood chipping or grinding is lethal to many insect pests; the process can destroy living organisms or disrupt the host material so that the insect cannot complete its life cycle. Chipping into small pieces is an effective method of reducing populations of wood borers (e.g. cerambycids) in wood chips.  |
| ***[102]*Heat treatment** | ***[103]***Heat treatment involves heating wood to kill, or otherwise cause sublethal effects. Heat treatment does not necessarily involve moisture reduction. Types of heat treatments include, but are not limited to, steam and vacuum-steam heating, kiln-heating, solar heating, joule heating and dielectric (microwave or radio-frequency) heating. ***[104]***Technical standards for heat treatment schedules should be established by NPPOs.  |
| ***[105]*Air-drying** | ***[106]***Air-drying wood to the equilibrium moisture content can prevent some pests from completing their life cycle, because of the reduction in moisture content. |
| ***[107]*Kiln-drying** | ***[108]***Kiln-drying can prevent some pests from completing their life cycle in wood commodities, because of the heat exposure and reduction in moisture content. Kiln-drying is described in Appendix 2 of this standard. |
| ***[109]*Irradiation** | ***[110]***Irradiation may be used as a pest risk reduction measure during or after processing of wood commodities. Irradiation should be applied in accordance with ISPM 18 (*Requirements for the use of irradiation as a phytosanitary measure*). |
| ***[111]*Fumigation** | ***[112]***Fumigants may be used as a pest risk reduction measure to treat wood commodities. Some phytosanitary treatments using fumigants are described in ISPM 28 (*Phytosanitary treatments for regulated pests*). Fumigation used as a phytosanitary measure should be applied in accordance with ISPM 43 (*Requirements for the use of fumigation as a phytosanitary measure*). |
| ***[113]*Anti-fungal sap-stain chemical dips** | ***[114]***Wood commodities may be treated with anti-fungal sap-stain chemical spray or dips may be used to prevent the growth of stain fungi on logs or sawn wood (see Appendix 2 of this standard).  |
| ***[115]*Modified atmosphere treatment** | ***[116]***Wood commodities may be exposed to a modified atmosphere as a pest risk reduction measure. See Appendix 2 of this standard and ISPM 44 (*Requirements for the use of modified atmosphere treatments as phytosanitary measures*) for the use of modified atmosphere as a phytosanitary measure.  |
| ***[117]*Pre-dispatch** |
| ***[118]*Limiting the storage time** | ***[119]***Dispatching wood commodities within a specified time frame that limits the storage time reduces opportunities for post-harvest infestation.  |
| ***[120]*Timing of dispatch** | ***[121]***Dispatching wood commodities only when pests are inactive and applying a pest risk reduction measure upon arrival in the importing country can be effective in reducing pest risk. The timing of dispatch should be based on biological data and technical justification. |
| ***[122]*Storage-area segregation** | ***[123]***Regulated commodities may be segregated or stored in a manner designed to prevent infestation. This may be achieved by covering, containerizing, or storing in buildings where pheromone traps are deployed.  |
| ***[124]*****Storage-area cleanliness**  | ***[125]***Keeping storage areas free from contamination can help to prevent infestation of commodities stored there and may therefore be included as a component of a systems approach.  |
| ***[126]*Pre-dispatch protection** | ***[127]***A storage enclosure can be very effective at protecting wood commodities from infestation before dispatch. As contact with the ground can risk commodities becoming infested with soil pests, storing commodities on cement pads or raised platforms can be beneficial. Surveillance, or regular checks for pests combined with measures to prevent or deter pests (e.g. host removal, reduction or altering of facility lighting, or pesticide application), may be used to protect wood commodities during storage. |
| ***[128]*Water application** | ***[129]***Round wood may be sprinkled with water in some storage areas (where appropriate) to reduce insect infestation and water pressure-washing may be used to remove pests, soil and debris.  |
| ***[130]*Verification of pest status** | ***[131]***Outer perimeter pull–push systems with aggregation and anti-aggregation pheromones and traps may be used to verify pest status and manage some insect pests. With NPPO oversight, this may be considered surveillance and should be conducted in accordance with ISPM 6. |
| ***[132]*Topical pesticides** | ***[133]***To prevent pests from infesting processed wood commodities, topical pesticide treatments may be applied.  |
| ***[134]*Packaging** | ***[135]***Packaging (including wrapping) may be used to prevent infestation, contamination and damage by the weather before and during transport.  |
| ***[136]*Pre-dispatch sampling and inspection**  | ***[137]***To ensure that the phytosanitary import requirements of the importing country are met, sampling and inspection may be conducted at various points within a systems approach.  |
| ***[138]*Sampling and laboratory testing** | ***[139]***When the identity of microscopic organisms such as fungi and nematodes on the outer surfaces of wood, or within the wood, cannot be confirmed through inspection, wood tissues may be collected according to methods approved by NPPOs and tested in the laboratory to determine the pest diagnosis. |
| ***[140]*Certification** | ***[141]***Certificates should be issued in accordance with the importing country’s phytosanitary import requirements. |
| ***[142]*Transport** |
| ***[143]*Protection during transport** | ***[144]***Wood commodities may be protected during transport (e.g. by covering them or sealing them in closed containers) to reduce the likelihood or severity of infestation by pests during transport. |
| ***[145]*Phytosanitary treatment during transport** | ***[146]***Wood commodities may be treated in either containers or ship holds while in transit. The type of treatment that is appropriate depends on the type of container required or available, the expertise needed, shipping laws (including occupational and health requirements), the wood commodities being transported and the importing country’s phytosanitary import requirements. |
| ***[147]*Planned transport routes** | ***[148]***The choice of transport route may be influenced by the known distribution and phenology of pests associated with the wood commodities being transported and the weather and climatic conditions during transit.  |
| ***[149]*Cleaning shipping containers** | ***[150]***The inside and outside of containers may be cleaned after unloading or before reloading to reduce the likelihood of pests from previous cargoes infesting wood commodities. |

***[151]****Notes:* NPPO, national plant protection organization.

***[152]***ISPMs are available at [www.ippc.int/core-activities/standards-setting/ispms](https://www.ippc.int/core-activities/standards-setting/ispms).

***[153]*Table 2.** Post-import practices

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| ***[154]*Storage in an importing country** | ***[155]***If agreed by the importing country, a systems approach may include provisions for wood-commodity storage that are designed to prevent pest escape, infestation, and contamination of storage areas. |
| ***[156]*Inspection on arrival** | ***[157]***Inspection on arrival may be used to verify that wood commodities meet the phytosanitary import requirements of the importing country. Inspections should be conducted in accordance with ISPM 23 (*Guidelines for inspection*). |
| ***[158]*Limiting intended use** | ***[159]***If agreed by the importing country, the intended uses of the wood commodities being imported may be stipulated in a systems approach. The systems approach may be set up for a particular intended use, such as wood chipping, and this intended use may determine the measures to be applied along the production chain and result in a different pest risk compared to other intended uses.  |
| ***[160]*Limiting points of entry and distribution** | ***[161]***If agreed by the importing country, specific points of entry or restrictions on the distribution of wood commodities after import (e.g. permitting initial movement only to a treatment facility) may be stipulated in a systems approach. |

***[162]****Note:* ISPMs are available at [www.ippc.int/core-activities/standards-setting/ispms](https://www.ippc.int/core-activities/standards-setting/ispms).

1. ***[163]***Designing a wood-commodities systems approach

***[164]***When designing a systems approach, the NPPO of the exporting country should select relevant measures, for example from those described in Table 1 and Table 2, and propose these to the NPPO of the importing country along with an explanation of how these measures would reduce the pest risk associated with wood commodities to meet the phytosanitary import requirements of the importing country. The NPPO of the importing country may request scientific evidence from the NPPO of the exporting country regarding the effectiveness and feasibility of the proposed measures.

***[165]***Consideration of best practices and standards used by industry to produce wood commodities may promote the development of the systems approach in a way that is feasible for, and acceptable to, both the exporting and the importing country. As industry has experience and an in-depth understanding of the wood production chain, it may be beneficial for the participating NPPOs to engage industry in the early stages of the development of the systems approach.

1. ***[166]***Responsibilities for implementation of a wood-commodities systems approach

***[167]***For the purposes of this annex, participating entities include entities authorized by NPPOs to perform phytosanitary actions.

* 1. ***[168]***Responsibilities of NPPOs

***[169]***The responsibilities of the NPPOs participating in a systems approach are described in ISPM 14. In addition, responsibilities specific to wood-commodities systems approaches should include, but are not limited to, the following:

* ***[170]***communicating the phytosanitary import requirements of the importing country and the requirements, specifically, of the wood-commodities systems approach, to all participating entities;
* ***[171]***agreeing to compliance procedures;
* ***[172]***determining the necessary corrective actions and conducting follow-up audits when nonconformities have been detected;
* ***[173]***reviewing the requirements or the design of the systems approach to address nonconformities, in order to prevent recurrence of the failures identified;
* ***[174]***ensuring that entities participating in the systems approach are authorized in accordance with ISPM 45 (Requirements for national plant protection organizations if authorizing entities to perform phytosanitary actions); and
* ***[175]***ensuring that the systems approach is audited in accordance with ISPM 47 (*Audit in the phytosanitary context*).
	+ 1. ***[176]***Responsibilities of entities participating in the systems approach

***[177]***The authorized entities participating in the systems approach, whether in the importing or exporting country, should conform with the requirements of ISPM 45.

1. ***[178]***Documentation

***[179]***Documents that can contribute to successful implementation and effective communication of a wood-commodities systems approach may include, but are not limited to, a description of the NPPOs’ requirements for the systems approach, the procedures for implementing the systems approach, and the records of its implementation.

* 1. ***[180]***Description of systems approach requirements developed by NPPOs

***[181]***A description of the requirements for the systems approach, developed by NPPOs, should cover aspects such as:

* ***[182]***the scope and purpose of the systems approach;
* ***[183]***the measures to be applied;
* ***[184]***the responsibilities of the NPPOs and participating entities; and
* ***[185]***how to ensure traceability.
	+ 1. ***[186]***Implementation procedures documented by participating entities and NPPOs

***[187]***Documented procedures, for example production manuals or standard operating procedures, describe actions, elements, processes and operational systems that make up the measures that are applied by participating entities and NPPOs. The documented procedures may include, but are not limited to, any of the following elements:

* ***[188]***a description of the organizational structure and responsibilities of the personnel involved in implementing the systems approach;
* ***[189]***training procedures used to ensure the competency of personnel responsible for implementing the systems approach;
* ***[190]***a description of the measures and how they will be achieved as part of the systems approach, which may include:
* ***[191]***the place or places of harvest or production,
* ***[192]***the taxa (trees, pests, or both) that the systems approach is designed to address,
* ***[193]***a description of the procedures or processes to be undertaken (e.g. processing, phytosanitary treatment, storage and movement, handling, segregating and traceability of the wood commodities) to ensure that the phytosanitary import requirements of the importing country are met;
* ***[194]***procedures associated with maintaining records of the measures applied in the systems approach; and
* ***[195]***procedures used by the participating entities to record, address and correct nonconformities that may occur.
1. ***[196]***Records that demonstrate implementation

***[197]***National plant protection organizations and participating entities should record the measures that have been applied in implementing the systems approach and should retain these records to demonstrate the implementation of the systems approach. The retention time of these records should be agreed between the NPPO of the importing country and the NPPO of the exporting country.

1. ***[198]***Traceability

***[199]***Participating entities in a systems approach should ensure that adequate records are retained to allow traceability in relation to all critical control points along the wood-commodities production chain. These records should be retained in the exporting country for those measures that are applied pre-export or during transit, or in the importing country in cases where measures are undertaken in the importing country.

1. ***[200]***Evaluating the effectiveness of a wood-commodities systems approach and its component measures

***[201]***Guidance on evaluation methods can be found in ISPM 14.

1. ***[202]***

***[204]***This appendix is for reference purposes only and is not a prescriptive part of the standard**.**

***[205]***APPENDIX TO ANNEX [X]: Major wood pests grouped according to where they live and reproduce

***[206]***Pests associated with trees can be grouped according to the plant tissues they use to live and reproduce. They include, but are not limited to, pests that live and reproduce in the following situations: on, in or just under the surface bark; wood tissue under the bark; and in foliage and twigs.

***[207]***Organisms on or in the bark or just under the bark in the cambium

***[208]***Certain species of insects, fungi and nematodes live in or just under the bark in the cambium:

* ***[209]*Bark beetles** (Coleoptera: Curculionidae: Scolytinae) – The members of this highly diverse subfamily spend most of their life cycle under the bark of their host trees, foraging on the inner bark and phloem. Some bark beetles feed on fungus-infected phloem to fulfil their nitrogen requirements.
* ***[210]*Fungi** – Many fungal pests, including stem rusts and canker fungi, grow and sporulate in close association with bark and phloem tissues.
* ***[211]*Fungi and fungus-like organisms** (e.g. *Phytophthora* species) – These pests may be present on the outer surfaces of some wood commodities.

***[212]***Organisms associated mostly with wood tissue located under the bark

***[213]***Certain species of insects, fungi and nematodes live mostly in wood tissue under the bark:

* ***[214]*Ambrosia beetles** (Coleoptera: Curculionidae: Scolytinae (Corthylini, Xyleborini, Xyloterini) and Platypodinae) – These beetles may be found in the inner bark, phloem and xylem.
* ***[215]*Wood borers** (Coleoptera: Cerambycidae, Curculionidae, Buprestidae; Diptera: Pantophthalmidae; Hymenoptera: Siricidae; Lepidoptera: Cossidae and Sesiidae; and Isoptera) – These insects feed on or excavate phloem and xylem.
* ***[216]*Fungi** – Many species of fungi inhabit the woody portion (xylem) of tree stems. The success, location and extent of fungal colonization is largely governed by the nutritional requirements of the fungi, the physical characteristics of the wood (chemical composition, cell structure, etc.) the wood moisture, the temperature and the presence of competing organisms. Decay fungi may be present throughout the xylem or, depending on the species, may be restricted to the sapwood or heartwood. Most canker and rust infections of stem wood are restricted to the outer several centimetres of wood.
* ***[217]*Nematodes** – Pathogenic nematodes live primarily in the sapwood, specifically in the xylem.

***[218]***Organisms associated with foliage and twigs

***[219]***Although foliage and twigs are not a major wood commodity, many forest organisms live and reproduce exclusively in these plant tissues:

* ***[220]***Organisms that live in and on foliage may include, but are not limited to, aphids, adelgids, moths, wasps, nematodes, scale insects, flies, spiders and ants.
* ***[221]***Twig borers may be found in small branches that are large enough to allow these pests to complete their life cycle.
* ***[222]***Like all other forest commodities, spores of fungi and fungus-like organisms may be present on outer surfaces.

***[223]***Potential implementation issues

***[224]***This section is not part of the standard. The Standards Committee in May 2016 requested the Secretariat to gather information on any potential implementation issues related to this draft. Please provide details and proposals on how to address these potential implementation issues.