Quarantine Points

- The intent of a quarantine is to slow the artificial (human-assisted) movement of harmful pests.
- Federal quarantines focus on interstate movement.
- State quarantines focus on within-state movement.
- Quarantine is based upon no less than county-level.
Regulated Articles/Industries

- Ash nursery stock
  - nurseries
- Ash Logs
  - Mills, loggers
- Green lumber (ash)
  - Mills
- Pallets (utilizing ash)
  - Mills
- Hardwood firewood
  - Producers, retailers
- Wood waste
  - Arborists, landfills, transfer stations, homeowners, public works
Regulatory Stuff

- Logs and Firewood
- Pallets and packaging material
- Lumber
- Mulch, chips, nuggets
ISPM-15

The International Standard for Phytosanitary Measures, publication number 15 - Regulation of wood packaging material (WPM) in international trade.

Sets treatment standards – Heat and Methyl Bromide Fumigation for solid wood packing materials


Currently accepted by 134 countries

Heat Treatment Standards

- **ISPM 15:**
  - Heat treatment of wood packing material in international trade
  - Require holding a core temperature of 133°F (56°C) for a minimum of 30 minutes

- **USDA APHIS EAB Quarantine Standards:**
  - Hardwood logs and firewood T314-a
  - Require holding a core temperature of 160 °F (71°C) for 75 min. (APHIS 2006)
**History of heat treatment**

- Heat treating pallet lumber (overseas transportation)
- Mature industry
- Certification by third party (ALSC – accredited)
- Prevent spread of foreign invasives

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**Common terminology**

Heat treatment is using heat to kill any living organism as a quarantine – not always in a kiln.

Wood drying is the art and science of economically reducing the moisture content of wood to the quality that is best suited to its eventual use.
Options: Lumber

Kiln Dried: KD Agreement
* 2× year reporting (volume, # loads etc)
* Periodic kiln conditions and wood moisture check by PPQ
* bark is OK (for domestic movement)

Dry Kiln Schedule for EAB*

<table>
<thead>
<tr>
<th>Dry Bulb (°F)</th>
<th>Wet bulb Depression (°F)</th>
<th>Equilibrium moisture content (%)</th>
<th>Lumber thickness</th>
<th>Hours at set conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
<td>7</td>
<td>13.8</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>130</td>
<td>16</td>
<td>9.4</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>14</td>
</tr>
</tbody>
</table>

*Adapted from the powder post beetle (*Lyctus*) schedule the Dry Kiln Operators Manual (Snyder and George 1924)

1” green ash lumber:
Green to 6% moisture content requires 11-15 days
20% to 6% moisture content requires 4-7 days
Options: Lumber cont.

Green Lumber
Bark Free + ½” sap wood– Inspected by PPQ
APHIS 540 Certificate

Movement during non-flight period (April 1– Oct 1)
Limited permit
to mill, kiln etc.

Why the extra ½”?

![Image of wood section with pupal chamber and text: Pupal chamber (2607 exit) 3.3 - 7.5 mm below xylem surface. 2006 serpentine gallery (partially healed). 7.5 mm. 3.3 mm. Pupal chamber.]

P. J. Trainor
Treatment Options for Ash logs and All Hardwood Firewood in EAB Quarantine

Heat treatment to core temp of 160°F
- Conventional kiln
- Hot water
- Steam

Debarking (½” removal of sap wood)

Movement during non-flight period (April – Oct)
- sawmill
- veneer

Pallets and blocking

- “outs” mixed species are regulated
- Green pallets can move bark free (+1/2”) with inspection and stamp
- HT pallets can move with bark under ISPM-15
- Fumigated pallets also move under ISPM-15
Movement of firewood has been a major contributor to the spread of EAB in North America.
Our primary concern is to ensure that the heat treatments are conducted properly and the schedule is achieved.

But also . . . encourage the use of heat treatment as a mitigating treatment for EAB and other insects in firewood.

USDA - EAB Heat Treatment Certification Process

- Meet with the kiln operator and discuss the certification process so they know what to expect from the certification process.

- Assess whether HT for EAB is a viable option for the facility.
APHIS Certification Process

Submit a written treatment “Plan” to CPHST to include:

- The layout of the facility
- Describes the flow of untreated and heat treated firewood through the facility
- Outlines the physical specifications of the kiln/heat chamber
- Firewood load specifications, containers, and duration of treatments etc.
- Temperature monitoring equipment
Heating time to reach core temperature of 160°F (Initial 68°F)

*Average heating time, for comparison purpose only

X. Wang et al 2009

Effect of initial wood temperature on heat treating time

*Average heating time, for comparison purpose only

X. Wang et al 2009
Effect of dry heat vs wet heat

*Average heating time, for comparison purpose only

X. Wang et al 2009

Effect of using dry heat on green Vs seasoned (air-dried) firewood

*Average heating time, for comparison purpose only

X. Wang et al 2009
Heat treatment of single large pile of firewood
Conveyor firewood heat treater

Heat Treatment of Packaged and Palletized firewood
Temperature Monitoring

Morrifield Garden Center
Heat trace report from 10/2009-10/15 @ 0750

<table>
<thead>
<tr>
<th>Chamber temp</th>
<th>Spur 3F</th>
<th>Load</th>
<th>Repeat temp</th>
<th>Spur 3F</th>
<th>Load</th>
<th>Repeat temp</th>
<th>Spur 3F</th>
<th>Load</th>
<th>Repeat temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chamber 1</td>
<td>99.9</td>
<td>98.1</td>
<td>Chamber 2</td>
<td>98.5</td>
<td>97.4</td>
<td>Chamber 3</td>
<td>97.8</td>
<td>96.6</td>
<td>Chamber 4</td>
</tr>
<tr>
<td>Chamber 5</td>
<td>99.2</td>
<td>98.1</td>
<td>Chamber 6</td>
<td>98.7</td>
<td>97.6</td>
<td>Chamber 7</td>
<td>98.1</td>
<td>97.0</td>
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<tr>
<td>Chamber 9</td>
<td>99.5</td>
<td>98.4</td>
<td>Chamber 10</td>
<td>98.9</td>
<td>97.8</td>
<td>Chamber 11</td>
<td>98.3</td>
<td>97.2</td>
<td>Chamber 12</td>
</tr>
</tbody>
</table>

Comments: WTR-152/16
Temperature data loggers placed a minimum of 4 inches deep into the ends of the largest pieces of wood. Additional loggers attached to monitor ambient air temperature.

Thermal Mapping Procedure

Loggers placed in the center of the heating unit (bins, crates, carts, pallets, bundles, etc.).
Wrapped bundles need to come apart so loggers can be placed in the center of the stack.

Thermal Mapping Procedure

Loggers placed throughout the entire chamber - typically lower level of kiln.
Thermal Mapping Procedure

Kiln diagram and sensor placement.

Black numbers indicate location of USDA loggers
Red numbers indicate location of facility temperature probes

Ambient Kiln Temperatures

<table>
<thead>
<tr>
<th>Temperature (ºC)</th>
<th>0</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (hrs)</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

Doors opened?
Firewood Core Temperatures

Maximum ambient air temperatures (°C)

<table>
<thead>
<tr>
<th>Rear of Kiln</th>
<th>64</th>
<th>75</th>
<th>74</th>
<th>77</th>
<th>81</th>
<th>86</th>
<th>84</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65</td>
<td>69</td>
<td>79</td>
<td>82</td>
<td>90</td>
<td>93</td>
<td></td>
</tr>
</tbody>
</table>

Front Doors

Low maximum ambient temps indicates cold spot
Maximum core firewood temperatures (°C)

<table>
<thead>
<tr>
<th>Rear of Kiln</th>
<th>64</th>
<th>70</th>
<th>73</th>
<th>79</th>
<th>75</th>
<th>86</th>
<th>84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Doors</td>
<td>64</td>
<td>66</td>
<td>78</td>
<td>74</td>
<td>78</td>
<td>84</td>
<td>86</td>
</tr>
</tbody>
</table>

Max temperature in six USDA loggers did not reach the required temp (71°C)

** Note that facility temperatures do not agree with USDA loggers

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**Cold Spots**

- If cold spots exist, but all sensors meet the HT standard we will require the facility to monitor in those colder parts of the chamber
Thermal Mapping for Gypsy Moth HT

Common Problems - Failed Certifications

Fans not working / poor air flow
Packaging material restricts air flow
Facility sensors not calibrated
Facility sensors not properly located in the center of stacks
Compliance Agreement

- Agreement to abide by requirements
- Issuance of a stamp to be used on packaging
- Signed by owner, state regulatory official and federal regulatory official
- Rescinded if no longer in business or violate regulations
- Penalties up to $250,000 if violation was intentional; $1000 fine for moving firewood from a quarantined area to a non-quarantined area

Certificate

USDA – APHIS – PPQ
4700 RIVER ROAD
RIVERDALE, MD 20737

CERTIFIED UNDER 7CFR 301.45
Gypsy Moth (Lymantria dispar)
FEDERAL COOPERATIVE
DOMESTIC PLANT QUARANTINE

C.A. # WI-1031  HT
Future of EAB Heat Treatments / Certification

New standards or a universal standard for firewood?

New insects in new areas = increasing restrictions and regulations on firewood movement

Certifications and re-certifications performed by local PPQ staff with technical support from CPHST
Contact Info:

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USDA-APHIS-CPHST  
scott.myers@aphis.usda.gov  
(508) 563-9303 x259