A variety of treatments are available for controlling emerald ash borer (EAB), including trunk injections and implants, soil treatments, and bark and foliage sprays. This publication describes the treatments most commonly used.

All of the trunk injection treatments described here have been shown to be effective against EAB, but actual treatment success can vary depending on initial tree condition. Trees already showing decline from EAB often do not respond well to treatment.

All trunk injections and implants cause damage to trees. Larger hole sizes and larger amounts of product injected cause greater internal damage. Some treatments also pose a greater risk to the applicator and others.

When to begin treatments

Treatments are generally recommended only when EAB is known to be within 15 miles of your location. Check product labels for additional guidelines.

Trunk injection effectiveness and damage

• Many factors related to a product’s application method influence the effectiveness of a trunk-injection treatment. Products placed more shallowly in the tree are used more completely, and less product is needed to be effective. Products give more uniform control in the tree when the tree has not been damaged by recent borer tunneling.

• Sap in the xylem of ash trees moves almost entirely in the outer three annual rings. As xylem rings become older, they become less able to transport sap. Injection products placed within the outer three rings move more completely to where the products are needed compared to those placed into deeper, older rings.

• Deep injection holes and large amounts of product are more likely to cause significant internal damage and contribute to a decline in the health of the tree compared to shallow holes and small amounts of product. The kinds of damage caused by large holes and large amounts of product include the loss of the ability to move water, carbohydrates and other materials through the tree; the loss of stored carbohydrate reserves (the tree’s energy reserves); and the loss of the ability to store carbohydrates for future use.

• When repeating treatments, previous injection holes should be examined. Any holes that have not closed are signs the tree is not healthy, and a repeated treatment could seriously weaken or kill it.
### Trunk-injection treatments for emerald ash borer control*

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Imicide</th>
<th>Pointer</th>
<th>TREE-äge</th>
<th>TreeAzin</th>
<th>Xytect Infusible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered in Nebraska</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Not as of December 2014</td>
<td>Not as of December 2014</td>
</tr>
</tbody>
</table>

#### Risk to applicator and others from injections

<table>
<thead>
<tr>
<th>Product</th>
<th>Active ingredient</th>
<th>Pesticide signal words</th>
<th>Restricted use pesticide</th>
<th>Number of years a treatment is likely effective</th>
<th>Equipment for application</th>
<th>Method of application</th>
<th>Timing of application according to label</th>
<th>Label rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imicide</td>
<td>Imidacloprid</td>
<td>Caution</td>
<td>No</td>
<td>1 year</td>
<td>Maugé Tree Injector</td>
<td>Product is pressure injected into holes drilled through the bark and into the xylem (wood).</td>
<td>No information about timing was found on the label</td>
<td>1 capsule (3 or 4 ml) per 2 inches of trunk diameter</td>
</tr>
<tr>
<td>Pointer</td>
<td>Imidacloprid</td>
<td>Warning</td>
<td>No</td>
<td>1 to 2 years</td>
<td>ArborSystems Wedge Direct-Inject Injection Unit</td>
<td>Product is pressure injected with a needle-like device through the bark to the outer surface of the xylem (wood).</td>
<td>Early spring through fall</td>
<td>1 to 2 ml per 4- to 6-inch spacing around trunk circumference</td>
</tr>
<tr>
<td>TREE-äge</td>
<td>Emamectin benzoate</td>
<td>Warning</td>
<td>Yes</td>
<td>2 to 3 years</td>
<td>Arborjet</td>
<td>Product is pressure injected into holes drilled through the bark and into the xylem (wood).</td>
<td>At least 30 days before historical egg hatch or adult flight</td>
<td>Varies from 2.2 to 16.5 ml per inch of trunk diameter</td>
</tr>
<tr>
<td>TreeAzin</td>
<td>Azadirachtin</td>
<td>Warning</td>
<td>No</td>
<td>1 year</td>
<td>BioForest Technologies Ecolect System</td>
<td>Product is pressure injected into holes drilled through the bark and into the xylem (wood).</td>
<td>May to the end of August</td>
<td>12.5 ml per inch of trunk diameter</td>
</tr>
<tr>
<td>Xytect Infusible</td>
<td>Imidacloprid</td>
<td>Warning</td>
<td>No</td>
<td>1 year</td>
<td>Rainbow Treecare Scientific Advancements IQ Tree Infuser</td>
<td>Product is pressure injected into holes drilled through the bark and into the xylem (wood).</td>
<td>When trees are in full leaf</td>
<td>Varies from 4 to 16 ml per inch of trunk diameter</td>
</tr>
</tbody>
</table>

#### Recommended hole diameter and depth

- **Hole diameter:** 11/64”
- **Hole depth:** 1/2”
- **Not a drilled hole, but a horizontal cut at the surface of the xylem:** Width: 3/32” Depth: 1/32”

#### Amount of product needed for a 25-inch diameter tree

- **42 ml**
- **24 ml**
- **260 ml**
- **312 ml**
- **225 ml**

#### Recommended injection hole diameter and depth into the xylem—in addition to drilling through the bark, phloem and cambium.

Sizes are maximum sizes as recommended on the label or in user instructions.

#### Damage to trees caused by the injections

- **Low**
  - Holes total: 0.1 cu. in.
  - Product: 2.6 cu. in.
  - Total: 2.7 cu. in.
- **Low**
  - Holes total: 0.003 cu. in.
  - Product: 1.5 cu. in.
  - Total: 1.5 cu. in.
- **High**
  - Holes total: 0.7 cu. in.
  - Product: 19.0 cu. in.
  - Total: 19.7 cu. in.
- **High**
  - Holes total: 0.9 cu. in.
  - Product: 13.7 cu. in.
  - Total: 14.6 cu. in.

#### Risk to applicator and others from injections

- **Relative degree of risk and main source of risk to the applicator**
  - Moderate: Leakage of pesticide around injection sites and removing pressurized capsules before completely empty
  - Moderate: Leakage of pesticide around injection sites
  - QUIK-jet & Tree L.V.:
    - High — Pouring the pesticide from an open container
    - Viper:
      - Moderate — Pouring from the container (but not needed at every tree)
  - High: Pouring the pesticide from an open container and removing pressurized canisters before completely empty
- **Relative degree of risk and main source of risk to others by injection equipment being disturbed if left unattended during slow uptake**
  - High: Capsules with pressurized pesticide could be pulled from the tree
  - Low: (No equipment remains outside the tree)
  - QUIK-jet & Viper:
    - Low — (No equipment remains outside the tree)
    - Tree L.V.:
      - High — Tubes with pressurized pesticide could be pulled from tree
  - High: Canisters with pressurized pesticide could be pulled from tree
- **Low:** (No equipment remains outside the tree)

* Other similar products may be available. No endorsement or discrimination is implied.

† Damage is generally greater as hole size and amount of product increase. The data presented reflect maximum hole size and average amount of product.
## Other treatments available for emerald ash borer control*

<table>
<thead>
<tr>
<th>Method</th>
<th>Active ingredient</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Professional products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil drenches and granules</td>
<td>Imidacloprid</td>
<td>Criterion, Lesco Bandit, Merit, Xytect</td>
</tr>
<tr>
<td>Soil drenches and systemic bark sprays</td>
<td>Dinotefuran</td>
<td>Safari, Transtect, Zylam</td>
</tr>
<tr>
<td>Residual bark and foliage sprays</td>
<td>Bifenthrin, Cyfluthrin, Permethrin</td>
<td>Onyx, Tempo, Astro † (in order of the active ingredient)</td>
</tr>
<tr>
<td><strong>Homeowner products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil drenches and granules</td>
<td>Dinotefuran</td>
<td>Green Light Tree &amp; Shrub Insect Control with Safari, Ortho Tree &amp; Shrub Insect Control Granules</td>
</tr>
<tr>
<td></td>
<td>Imidacloprid</td>
<td>Bayer Advanced 12 Month Tree &amp; Shrub Insect Control, Compare N Save Systemic Tree &amp; Shrub Insect Drench, Merit</td>
</tr>
<tr>
<td>Residual bark and foliage sprays</td>
<td>Permethrin</td>
<td>Hi-Yield 38 Plus Turf, Termite and Ornamental Insect Control †</td>
</tr>
<tr>
<td></td>
<td>Spinosad</td>
<td>Ferti-lome Borer, Bagworm, Tent Caterpillar &amp; Leafminer Spray</td>
</tr>
<tr>
<td>Trunk implants</td>
<td>Acephate</td>
<td>Acecap</td>
</tr>
</tbody>
</table>

* Other similar products may be available. No endorsement or discrimination is implied.
† This product may be used on ash, but the label does not specifically mention emerald ash borer. No guarantee of effectiveness is implied.

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**Photo credit:** Three cover photos by David Cappaert, Michigan State University, Bugwood.org