Source for insecticide options: Purdue Extension: 1-https://extension.entm.purdue.edu/EAB/index.php?page=faq

Table 1. Insecticide options for professionals and homeowners for controlling EAB that have been tested in multiple university trials. Some products may not be labeled for use in all states. Inclusion of a product in this table does not imply that it is endorsed by the authors or has been consistently effective for EAB control. See text of "Insecticide Options for Protecting Ash Trees From Emerald Ash Borer, 2014 2nd Edition" for more information and details.

Insecticide Formulation	Active Ingredient	Application Method	Recommended Timing
Products Intended for Sale to Professional Applicators			
Merit® (75WP, 75WSP, 2F)	Imidacloprid	Soil injection or drench	Early to mid- spring or mid-fall
Safari ™ (20 SG)	Dinotefuran	Soil injection or drench	Mid- to late spring
Transect ™ (70WSP)	Dinotefuran	Soil injection or drench	Mid- to late spring
Xylam® Liquid Systemic Insecticide	Dinotefuran	Soil injection or drench	Mid- to late spring
Xytect™ (2F, 75WSP)	Imidacloprid	Soil injection or drench	Early to mid-spring or mid-fall
Azasol™	Azadiratin	Trunk injection	Mid- to late spring after trees have leafed out
Imicide®	Imidacloprid	Trunk injection	Mid- to late spring after trees have leafed out
TREE-äge™	Emamectin benzoate	Trunk injection	Mid- to late spring after trees have leafed out
ArborMectin™	Emamectin benzoate	Trunk injection	Mid- to late spring after trees have leafed out
TreeAzin®	Azadiractin	Trunk injection	Mid- to late spring after trees have leafed out
Safari™ (20 SG)	Dinotefuran	Systemic bark spray	Mid- to late spring after trees have leafed out
Transect (70 WSP)	Dinotefuran	Systemic bark spray	Mid- to late spring after trees have leafed out
Zylam® Liquid Systemic Insecticide	Dinotefuran	Systemic bark spray	Mid- to late spring after trees have leafed out
Astro®	Permethrin	Preventive trunk, branch, and foliage cover sprays	Two applications at 4-week intervals; first spray should occur at 450-550 degree days (50ºF, Jan.1); coincides with black locust blooming
Onyx™	Bifenthrin		
Tempo®	Cyfluthrin		
Sevin® SL	Carbaryl		
Products Intended for Sale to Homeowners[1]			
Bayer Advanced™ Tree & Shrub Insect	Imidacloprid	Soil drench	Early to-mid-spring
Optrol ™	Imidacloprid	Soil drench	Early to mid-spring
Ortho Tree and Shrub Insect Control Ready to Use Granules	Dinotefuran	Granules	Mid- to late spring

[1]Additional imidacloprid and dinotefuran products intended for sale to homeowners may be available in your area.

Time of Year and EAB Treatment

Product	Time of Year[1]	Other Considerations
Imidacloprid	Spring (early April to mid-May) Fall (October to November)	Spring treatments more effective than those in fall No more than 128” DBH of tree can be treated per acre at 1x rate
Dinotefuran	Spring (early May to mid-June)	No more than 104” DBH of tree can be treated per acre
Emamectin benzoate (TREE-äge®) [2]	Bud-break to end of June Late August (after heat wave) until leaves begin fall color	Spring applications kill adults before eggs are laid this year. Fall applications kill next year’s adult beetles
Azadirachtin (TreeAzin®)	Bud break to end of June	To be applied every other year until peak of EAB when should be applied annually

[1]Actual months vary with latitude. Trees must be actively transpiring for effective uptake of all products.
[2]As long as water is present and product is taken up by the tree, this product will provide 2 years of control.

Tree Size Guide to EAB Treatments

Trunk Circumference (Diameter)	Recommended Action	DIY or Professional Application?
Up to 60” (Up to 20” DBH)	Annual application of 1x rate of Imidacloprid in spring	DIY – *Many products*
45-60” (15-20” DBH)	OR Annual application of 2x Imidacloprid in fall	Professionals (Xytect or Merit for 2x) DIY (Optrol 2x)
Up to 66” (22” DBH)	Dinotefuran (Safari or Transtect) Trunk Spray or Soil Injection (by professionals) adjust rate with size as indicated by label	Professionals
No size restriction	Emamectin benzoate (TREE-äge) every 2 years OR Azadirachtin (TreeAzin) every 2 years early, and then yearly during peak pressure 2 years	Professionals only

Tree Condition Guide to EAB Treatments

Canopy Thinning	Products that Can Work	Other Considerations
Less than 10%	Imidacloprid (Merit, Xytect and others) Dinotefuran (Safari and Transtect) Emamectin benzoate (TREE-äge) or Azadirachtin (TreeAzin)	Right tree in the right place?
Up to 25%	Imidacloprid (Merit, Xytect and others) Dinotefuran (Safari and Transtect) Emamectin benzoate (TREE-äge)	No product can bring the dead part of a tree back to life.
25-50%	Emamectin benzoate (TREE-äge)	No product can bring the dead part of a tree back to life. Is the living part of the tree worth saving?
Greater than 50%	Nothing	Remove the tree.


PA DCNR - Forestry Archive, Bugwood.org

Tree Replacement Guidelines and Options

When it comes time to choose a replacement tree for your landscape there are many options. Help ensure long-term health and value by following a few simple steps.

- ❑**Conduct a thorough Site Evaluation**
- ❑**Identify the right Tree Characteristics**
- ❑**Purchase a Quality Tree**
- ❑**Plant the tree correctly**

Site Evaluation. Put the "Right Tree in the Right Place." Don't waste your money on a tree that won't survive or one that doesn't fit into your landscape.
These are the things to consider before you choose which tree you will purchase.

- ❑Hardiness Zone - Will your tree survive the winter?
- ❑Soil
  - ❑pH - Some trees cannot tolerate high pH, others cannot tolerate very low pH
  - ❑Drainage, texture and compaction - Standing water, droughty areas; trees have different tolerances
  - ❑Size of planting area and depth of soil (tree lawn, backyard, etc.) - Fit your tree to your landscape
- ❑Physical obstructions
  - ❑Overhead wires (Consider short trees or columnar varieties)
  - ❑Proximity to buildings, curbs, and driveways (Fit your tree to your landscape and keep in mind the ultimate size of the tree)

Tree characteristics. There is more than just beauty to think about when selecting what your tree should look like.

- ❑Height of the tree- Do you need a short or a tall tree?
- ❑Shape of the canopy- Round, wide spreading, or columnar?
- ❑Evergreen or deciduous?
- ❑Growth rate- One that will grow very fast, or one that takes it time?
- ❑Fruit- Some trees have "messy" fruit (honeylocust, horsechestnut).

Once you have your limitations identified you can narrow down your tree choices and really choose "The Right Tree in the Right Place." A thorough list of tree characteristics and a comprehensive site evaluation worksheet can be found in "Recommended Urban Trees: Site Assessment and Tree Selection for Stress Tolerance" from the Urban Horticulture Institute at Cornell University.
http://www.hort.cornell.edu/uhi/outreach/recurbtree/.
And, check Cornell's Woody Plant Database to see images of your options and to search for trees by different characteristics http://woodyplants.mannlib.cornell.edu/ .

See Table 1 for a list of some trees to consider. Disclaimer- not all trees will work for all sites! Conduct a site evaluation.

Purchase a quality tree. Make a list of 3-4 tree choices and shop at a nursery you trust; also remember they may be able to order a variety for you. When choosing the one to take home, select a tree that is free of serious insect and disease problems and physical damage and has proper branch arrangements. Also, choose a tree that has been properly grown and has a good sized root ball that free of weeds.

Steps to thoughtful planting. Once you have chosen your high-quality, perfectly suited tree at the nursery, follow these basic tree planting steps.

1. Secure your tree during its ride home. Tie up the canopy, tarp the foliage, or place the trees inside a vehicle. Secure the tree to vehicle so it does not roll during transport.
2. Measure your root ball and dig your hole accordingly. The hole should be only as deep as the roots and 3 times the diameter of the ball/container.
    - Remember: The top of the root system should be just below the surface of the soil and the root system may be buried inside the container/ball. Use a probe to find the depth of the roots inside the root ball and subtract that from the height of the ball.
3. Place the tree in the properly dug hole and then remove as much of the wire basket, burlap, and twine as you can. It may take a long time to degrade, and can hinder root growth. Push any of the wire basket or burlap that you cannot cut off into the bottom of the hole, where it will do less harm
4. Or, carefully remove the tree from its container. Check for circling roots and correct problematic ones.
5. Center the tree and backfill. Water and tamp the soil as you backfill to ensure air pockets are eliminated.
6. Do not place excess soil on top of the root system. The top of root system should be just at or below the soil surface and the trunk flare just above the soil surface.
7. Water the tree thoroughly once hole is backfilled.
8. Place 2-4" of woodchips or mulch around the tree, cover as wide of an area as you can. Be sure to leave a gap between the mulch and the tree's trunk. Woodchips and mulch piled up against the truck can cause disease problems.
9. Deeply water your new tree every few days the first year. Ensure water is penetrating deep into the soil by watering slowly for a long time.
10. Staking trees is usually not necessary. But if you must, use non-damaging material and remove it after one year.

For more information about proper tree planting see:

- ❑ "Recommended Urban Trees" http://www.hort.cornell.edu/uhi/outreach/recurbtree/. The steps are thoroughly described in the back of the book.
- ❑ http://treesaregood.org - Tree care web site from the International Society of Arboriculture

Table 1: Tree Suggestions: Remember- not all of these trees will be successful for you! Conduct a site evaluation and read up on the tree you want. Each tree's common name is followed by the scientific name and the USDA Hardiness Zone.

Small Trees- under 30'	Medium Trees- under 60'	Tall Trees- over 60'	
Serviceberry *Amelanchier spp.* – 3b	Red Horsechestnut *Aesculus x carnea* – 5a	Catalpa *Catalpa speciosa* - 4a	London Planetree *Platanus x acerifolia* – 5b
Hornbeam (Ironwood) *Carpinus caroliniana* – 3b	River Birch *Betula nigra* – 4a	Hackberry *Celtis occidentalis* – 3a	Bur Oak *Quercus macrocarpa* – 3a
Eastern Redbud *Cercis canadensis* – 3b	Katsura Tree *Ceradiphyllum japonica* – 5a	Ginkgo *Ginkgo biloba* – 4b	Northern Red Oak *Quercus rubra* – 3b
Hawthorn (Washington, Winter King) *Crataegus spp.* – 4a	Turkish Filbert *Corylus colurna* – 5a	Honeylocust- thornless *Gleditsia triacanthos inermis* – 4b	Baldcypress *Taxodium distichum* – 5a
Hophornbeam *Ostrya virginiana* – 3b;	Hardy Rubber Tree *Eucommia ulmoides* – 5b	Kentucky Coffeetree *Gymnocladus dioicus* – 4a	Basswood *Tilia americana* – 3a
Columnar Sargent Cherry *Prunus sargentii 'Columnaris'*– 4a	English Oak *Quercus robur* – 5b	Tulip Poplar *Liriodendron tulipifera* – 5b	Hybrid Elm cultivars (Accolade, Danada Charm) *Ulmus x species* – 3b -5a
Japanese Tree Lilac *Syringa reticulata* – 3a	Littleleaf Linden *Tilia cordata* – 3b	Black Tupelo *Nyssa sylvatica* – 5a	Zelkova *Zelkova serrata* – 5b

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