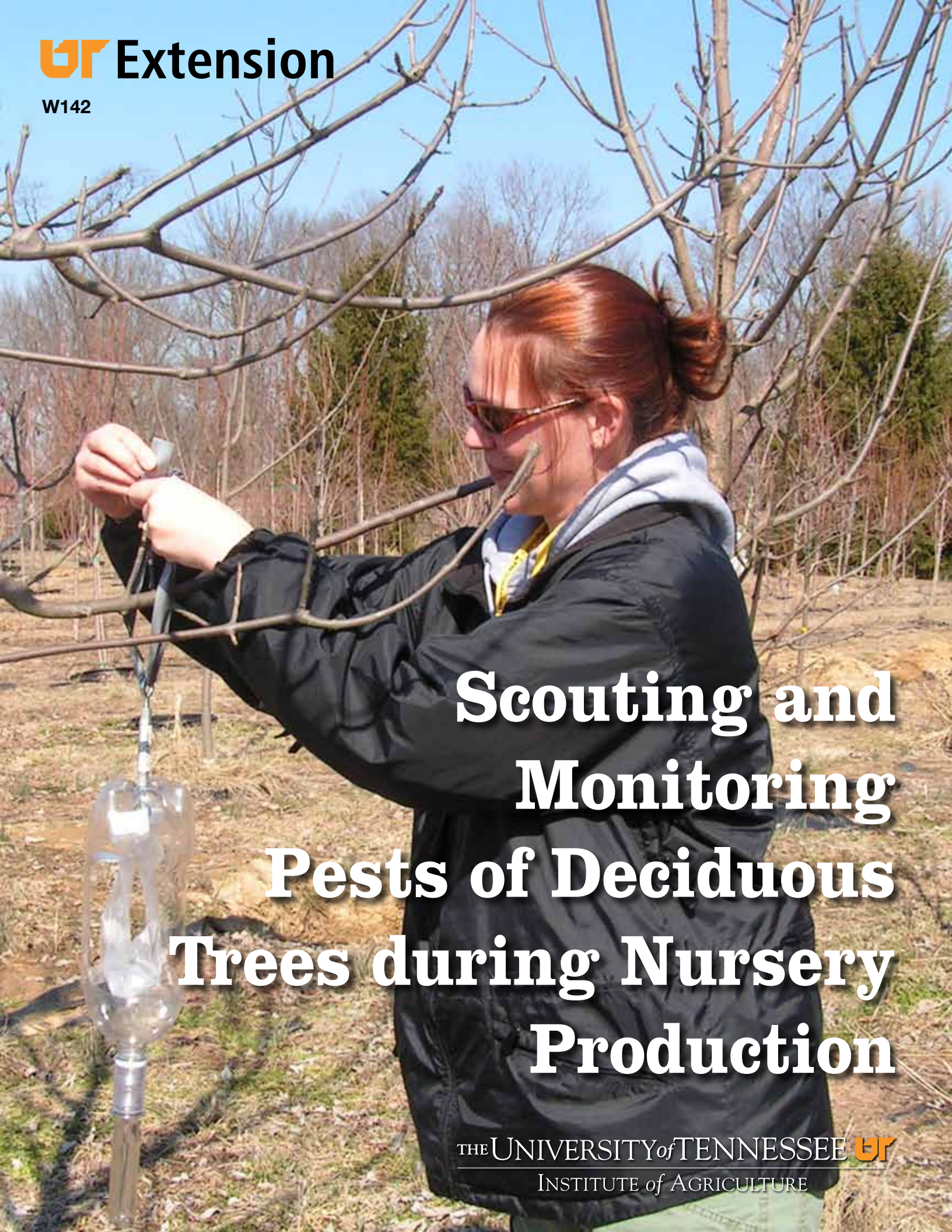
UT Extension

W142



Scouting and Monitoring Pests of Deciduous Trees during Nursery Production

THE UNIVERSITY of TENNESSEE UT
INSTITUTE of AGRICULTURE

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Integrated Pest Management (IPM) can be defined as a sustainable approach to managing pests that combines biological, cultural and chemical tools in a way that minimizes economic, health and environmental risks (Adkins and Sidebottom 2000). The goal of IPM in the nursery is not to eradicate every pest, but rather to manage serious pests to a level that reduces damage and also reduces the cost of pest control. Every insect, disease and weed pest is not a threat to plant health, plant sale or achieving a premium price. Weighing the cost of the damage and the cost of control measures for each pest, as well as the effectiveness of the control option and the time of application, is a component of IPM (EPA).

The main components of a nursery IPM program include prevention, mapping, scouting, record keeping, pest identification, action/economic thresholds, selecting the appropriate control and evaluating the control measure. Once control is deemed necessary, cultural, biological and mechanical techniques as well conventional pesticides are options. The least toxic pesticides are considered before resorting to more toxic alternatives.

Scouting for pests (diseases, insects and weeds) is a major component of IPM (Figure 1). By scouting, growers detect insects and mites while the population is small and when disease and weed incidence is low and localized. Also, scouting can reveal pests when they are less mature, and thus more likely to be easily controlled with non-chemical options, fewer applications and/or less toxic products. Similarly, monitoring with traps can help determine not only when a population becomes active, but also assess the size of the population, which helps gauge the "pressure" relative to anticipated injury caused by that pest. Monitoring and scouting in the dormant season can be used to assess the effectiveness of the previous season's control measures and to anticipate the pest pressure for the current season. Scouting and monitoring following use of control measures can also aid in evaluating product effectiveness.

Rather than relying on regularly scheduled pesticide applications, IPM relies on knowledge to determine when and if to spray. Scouting and monitoring traps, proper pest identification, understanding pest lifecycles and multiple pest interactions, as well as employing economic thresholds, are examples of the critical role that knowledge plays in IPM. Growers adopting IPM will need to invest some time learning about the different pests and related information, but the reward can be increased quality, a decrease in number of cull plants and less time required to spray, because more targeted and less frequent pesticide applications are possible.

Nursery growers indicate that they use IPM practices but some components to IPM are not widely adopted because demonstrated success is needed, IPM takes too much time to implement and nursery-specific IPM information is not readily available (Hoover et al. 2004 and LeBude et al. 2012). Application of IPM to nursery crops is limited, because validated, standardized protocols and corresponding action thresholds have not been published (Adkins et al. 2010, LeBude et al. 2012).

Figure 1. Scout for overwintering maple mites at the branch collar.

In spite of these perceptions and constraints, there are established economic and environmental benefits from scouting nursery crops (Briggs et al. 2002, Fulcher 2012, and Stewart et al. 2004). By following the protocols for major pests of deciduous ornamental trees outlined in this publication, field producers saved, on average, $9,179.17 ($30.39/acre) per nursery per season. The objective of this publication is to remove barriers to IPM adoption by familiarizing nursery growers with specific time-efficient scouting protocols that have been effectively used in nurseries.

The following protocols and procedures are designed for select insect, mite and plant disease pests of deciduous trees and were developed and tested over a five-year period. They have been used in 16 nurseries to detect pests early and efficiently. Trapping information is included for one additional pest (flatheaded appletree borer) that was scouted but not trapped in the five-year study. This pest is a destructive one in Tennessee and an effective trapping system has been developed; therefore, trapping information for this pest is deemed too useful to omit.

Host plants were selected due to a relatively high level of pest susceptibility, in order to increase the chance of detecting pests present in the nursery. Scouting schedules (Tables 1 and 2) were developed for Middle Tennessee. Growers may need to adjust the timing of scouting and monitoring for their specific location, microclimates or unusual weather.

Scouting Tips

- Check the nursery spray records before scouting to ensure you are not entering an area that is being sprayed or within a re-entry interval.
- Use scouting protocols to plan which pests to scout and on which host plants.
- Randomly select trees for scouting and scout trees from all areas/parts of the row. Avoid scouting trees that are planted consecutively within a row, on the end of the row, or the edge of a block.
- Record insects, mites and diseases using UT Extension publication W143, Recordkeeping Guide for Scouting and Monitoring Pests of Deciduous Trees during Nursery Production.
- When unusual symptoms are detected, mark the host trees and submit samples to your county Extension office or the UT Soil, Plant and Pest Center. http://soilplantandpest.utk.edu

Sun and Heat Safety

Wear sunscreen and a large-brimmed hat for protection from the sun. Take frequent breaks and drink plenty of water when the temperatures are excessively high. Be familiar with the signs of heat stroke and heat exhaustion.

Control Measures

Use the results of scouting to determine if control measures are warranted. This requires considering time until sale, market/quality expectations, expected effectiveness of control and presence of naturally occurring predators and parasitoids. Once control is deemed necessary, use cultural, biological and mechanical techniques or less toxic pesticides before resorting to more toxic alternatives, when possible.

Unfortunately, research-based economic or action thresholds, the population level for insects and mites and the incidence and/or severity level for diseases at which control actions must be executed, do not exist for most nursery crop pests. This is a major limitation to using IPM in nursery crops. If the decision is made to use a conventional pesticide, consult UT Extension Insect and Plant Disease Control Manual, PB 1690, http://eppserver.ag.utk.edu/redbook/redbook.htm for recommendations.

Recordkeeping

For scouting recordkeeping forms, see UT Extension publication W143, Recordkeeping Guide for Scouting and Monitoring Pests of Deciduous Trees during Nursery Production. Keeping pest records from year to year can be a valuable way to assess new control measures, determine if a pest population is increasing or decreasing over time and refining pest emergence to a particular location and the microclimates within that location.

Scouting Protocol

Links below each pest are included to provide images to aid in pest identification, detailed lifecycle information and management recommendations. An asterisk signifies the most susceptible species when determined through published research. Susceptible species or selections are ideal candidates for scouting efficiently. Consult the "Literature Cited and Additional Resources" section for references used to select the most susceptible plants to scout. It is not necessary to scout each pest each week of the year or to trap for pests year-

round. Scouting schedules (Tables 1 and 2) can be used to plan scouting and trap monitoring efforts.

Aphids

Active infestation/symptomatic plants – *Malus* and *Betula*. Scout for adults clustered on crabapple branch tips or on the underside of leaves on *Betula*. Scout leaves on 1 shoot per tree, 15 trees of each cultivar.
http://oregonstate.edu/dept/nurspest/aphids.htm

Apple Scab

Active infestation/symptomatic plants – *Malus* ('Hopa'*, 'Indian Magic'*, 'Liset'*, 'Radiant'*, 'Royalty'*, and 'Ruby Luster'*). Initially, look for velvety, greenish-black fungal growth with feathery edges along the veins. With time, the infection develops from the linear infection along the veins to a round spot. Scout leaves on 5 branches from each of 15 plants. See University of Kentucky Extension publication Apple Scab PPA-24 (link below) for details on monitoring weather for infection periods. Rainy periods or overhead irrigation through the summer could lengthen the scouting schedule due to potential for secondary infection.
http://utuknurseryipm.utk.edu
http://www.ca.uky.edu/agc/pubs/ppa/ppa24/ppa24.pdf

Bacterial Leaf Scorch (BLS)

Active infestation/symptomatic plants – *Acer*, *Platanus*, *Liquidambar* and *Quercus*. Scout for scorch symptoms (brown, dry leaf margins with yellow wavy band between scorched and green tissue). If the scout cannot distinguish BLS from drought stress, collect leaf samples and submit them to a lab for confirmation. Note presence/absence on leaves from 5 branches on each of 15 plants of each genus.
http://www.usna.usda.gov/Research/BacterialLeafScorch.html
http://utuknurseryipm.utk.edu

Black Knot

Overwintering life stage – *Prunus* ('Thundercloud'*, Mt. St. Helens*). Look for black, swollen areas on pencil-sized or larger branches and trunk. Scout 5 branches on each of 15 plants. Record presence/absence.
http://shelbycountytn.gov/DocumentView.aspx?DID=1109
http://www.ca.uky.edu/HLA/Dunwell/KHC/NurseryUpdate2_2002.html

Active infestation/symptomatic plants – Monitor weather and plant development for infection periods to determine if/when pesticide applications are needed. Conducive conditions include after budbreak, once rainy periods with temperatures above 55 degrees F occur and until 2-3 weeks after bloom when shoots are no longer expanding.

Assess damage/control efficacy – Look for cracked bark and swollen stems on current year's growth, indicating a new infection. Scout 5 branches on each of 15 plants. Record presence/absence.
http://www.ca.uky.edu/HLA/Dunwell/KHC/NurseryUpdate2_2002.html

Calico Scale

Overwintering life stage – *Acer* (Northwood*, 'Legacy'*, Green Mountain* *A. campestre**), *Celtis** and *Zelkova**. Scout for immature second-instar females, which are oval, almost flat in profile, and gray to black. Also, scout for signs of an infestation during the previous season. Look on trunk, especially at nodes and behind stakes for dead adult females on the bark or light-colored round circles where females were attached to the bark. Record presence/absence on 15 plants of each cultivar. http://utuknurseryipm.utk.edu

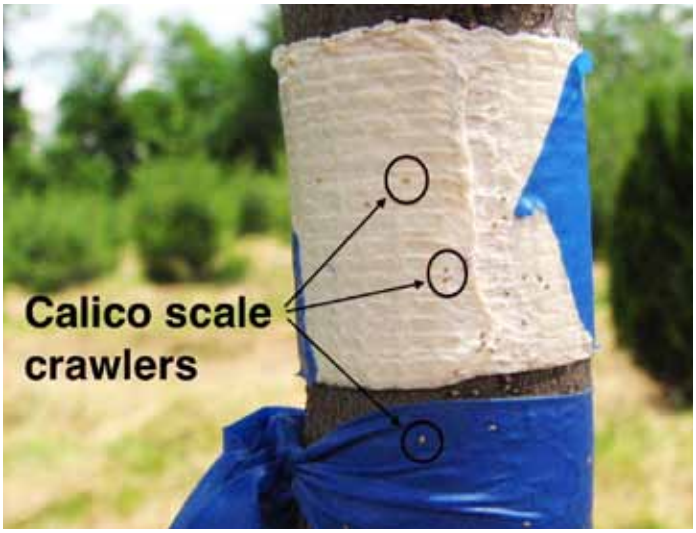

Figure 2. Double-sided tape placed around the trunk above females can detect calico scale crawler emergence.

Active infestation/symptomatic plants – same species as listed for scouting the overwintering life stage. Scout for adult females that overwintered as immature scale on the trunk. Look on trunk, especially at nodes and behind stakes for black and white calico-patterned adult females, swelling to pencil eraser-size, to control before eggs hatch. Record presence/absence on 15 replications of each cultivar.

Assess damage/control efficacy – same species as listed for scouting the overwintering life stage. Following egg hatch, monitor leaves for presence of small yellowish crawlers along veins. Record presence/absence on 15 replications of each cultivar.

Cedar Quince Rust

Active infestation/symptomatic plants – 'Hopa' , *M. halliana* 'Parkmanii' and 'Ralph Shay'. See University of Kentucky Extension Publication PPA-23 for details on monitoring weather for rust diseases. Monitor junipers in the field margins and vicinity for orange telial masses (fungal fruiting bodies) oozing from branch cankers, as this is the source of infection. Telial masses of cedar quince rust and cedar apple rust are distinct. Cedar apple rust produces a gall ½-2 inches in diameter on juniper; cedar quince rust produces orange telial masses on twigs and small branches.
http://www.ca.uky.edu/agc/pubs/ppa/ppa23/ppa23.pdf
http://utuknurseryipm.utk.edu

Eastern Tent Caterpillar

Overwintering life stage – *Malus* (*M. hupehensis**, 'Sugar Tyme'*, 'Radiant'*, 'Dubloons'*, 'Sinai Fire'*, 'Sentinel'*, 'Snowdrift'*, 'Harvest Gold'*, 'Ormiston Roy'*, 'Donald Wyman'*, 'Silver Moon'*, *M. baccata* 'Jackii'*, 'Red Splendor'*, 'Narragansett'*). Scout 15 crabapples for overwintering egg masses. Look for black egg masses, 1 inch long, encircling pencil-sized twigs. Count number of egg masses per tree.
http://www.entomology.umn.edu/cues/Web/109EasternTentCaterpillar.pdf
https://utextension.tennessee.edu/publications/Documents/SP341-N.pdf

Active infestation/symptomatic plants – *Malus* (Madonna*, 'Baskatong'*, 'Dolgo'*, Harvest Gold*, *M. baccata* 'Jackii'* and 'Snowdrift'*) and *Prunus* (*P.* x *cistena**). Look for presence of white webbing at base of branches and presence of masses of small caterpillars with a white stripe down the back and blue spots down the sides. Count number of webs per tree; scout 15 trees per cultivar.

Fireblight

Overwintering life stage – *Pyrus* ('Bradford'*, Whitehouse'*, 'Aristocrat'*, 'Red Spire'*), *Malus* (*M. baccata* 'Jackii'*, 'Baskatong'*, Brandywine*, Camelot*, 'Candy Mint'*, 'Dolgo'*, 'Donald Wyman'*, 'Doubloons'*, 'Glen Mills'*, Golden Raindrops*, Harvest Gold*, 'Jewelberry'*, 'Liset'*, Madonna*, 'Mary Potter'*, 'Molten Lava'*, 'Narragansett*, 'Ormiston Roy'*, 'Pink Satin'*, 'Prairie Maid'*, 'Prairiefire'*, 'Professor Sprenger'*, 'Purple Prince'*, 'Red Splendor'*, *sargentii**, 'Sentinel'*, 'Silver Drift'*, 'Silver Moon'*, 'Sinai Fire'*, 'Snow Drift'*, 'Strawberry Parfait'*, 'White Angel'*) and *Amelanchier*. Look for dead shoots and suckers in a shepherd's crook shape and basal cankers from previous season's infection.
https://utextension.tennessee.edu/publications/Documents/SP277-R.pdf
http://utuknurseryipm.utk.edu
http://www.ca.uky.edu/agc/pubs/ppa/ppa34/ppa34.pdf

Active infestation/symptomatic plants – same taxa as for overwintering life stage. Select 3 taxa/cultivars to monitor. Look for flagged shoots and suckers in a shepherd's crook shape and dying branch tips with a defined dead/live stem interface. Count number of flagged branches on 15 trees of each cultivar/taxa selected.

Flatheaded Appletree Borer

Overwintering life stage – *Acer* (Burgundy Belle*, Green Mountain*, October Glory*, Northwood*, Red Sunset*, 'Somerset'*, 'Sun Valley'*). Look for swollen, spiraling callus growth and cracked bark near the cutback/base of trunk for plants entering their second year in production. Focus scouting efforts on the southeast or southwest side of the trunk. Remove any bark and plate-like frass under the bark to expose the D-shaped opening once the adults emerge later in the season. Flag 15 infested trees to scout in April/May.
https://utextension.tennessee.edu/publications/documents/SP503-I.pdf
http://utuknurseryipm.utk.edu

Active infestation/symptomatic plants – same taxa as for overwintering life stage. Check trees marked during February for development of an exit hole near the cutback/base of trunk. Look for a D-shaped opening in the wood. Monitor as many as 15 infestations previously identified and flagged during February for development of the emergence hole.

Granulate Ambrosia Beetle (GAB)

Active infestation/symptomatic plants – Set out 2-liter bottle traps; bait with ultra high-release ethanol lures. Previous trapping results suggest that placing at least one trap near any water source, such as ponds,

streams or rivers, may detect GAB in greater numbers.

Check frequently (daily if temperatures are in the 70s) for very small, reddish-brown beetles.
http://soilplantandpest.utk.edu/pdffiles/OPandDUpdates/mar-17-2008.pdf
http://utuknurseryipm.utk.edu

Assess damage/control efficacy – all species (especially *Acer**, *Cercis**, *Koelreuteria** and *Styrax**). Scout for toothpick-shaped extrusions coming out of the trunk and large branches. Be certain to check other fields containing additional plants of the infested species. Record the percent presence/absence for 15 plants per genus.

Honeylocust Plant Bug

Active infestation/symptomatic plants – *Gleditsia triacanthos inermis* 'Sunburst*'. Scout 15 plants for presence of pale green insects 5-6 mm long on leaflets. Spray when more than 1 insect per leaf (not leaflet).
http://www.uky.edu/Ag/Entomology/entfacts/trees/ef419.htm
http://woodypests.cas.psu.edu/FactSheets/InsectFactSheets/html/Honeylocust.html

Honeylocust Spider Mite

Overwintering life stage – *Gleditsia triacanthos inermis* 'Skyline', 'Shademaster', 'Sunburst', 'True Shade'. Look for overwintering adults. They are orange-red and clustered at the tips of the dormant buds. Scout one apical bud per tree, 15 trees of each cultivar.
http://www.entomology.umn.edu/cues/Web/151HoneylocustSpiderMite.pdf

Active infestation/symptomatic plants – *Gleditsia triacanthos inermis* 'Skyline', 'Shademaster', 'Sunburst', 'True Shade'. Do a bang board test with all leaflets from 1 node in a single beat. Scout 3 nodes per tree on 5 replications per taxa.

Japanese Beetle

Active infestation/symptomatic plants – Rosaceous plants (crabapples, cherries and plums), *Tilia* and *Zelkova* in production and smartweed (*Polygonum*) in unmaintained areas. Scout for adults on leaves in sun on 15 plants.
http://www.ca.uky.edu/HLA/Dunwell/KHC/NurseryUpdate14_2003.html

Japanese Maple Scale

Overwintering life stage – *Amelanchier**, *Carpinus**, *Gleditsia triacanthos inermis**, *Ilex**, *Magnolia** and *Zelkova**. For shrubs and multi-stem trees, focus at the base of the plant from the soil line to approximately 8 inches above the soil line. On standard-form trees, scout the trunk and scaffold branches, in particular at the branch collar. Pull apart branches of dense shrubs to clearly see the interior. Scout 15 plants of each genus.
http://utuknurseryipm.utk.edu

Active infestation/symptomatic plants – same taxa as for scouting overwintering populations. Wrap double-sided tape or black electrical tape coated with a thin layer of petroleum jelly on the surface around branches with infestations to detect lavender crawlers. Use a 20x hand lens to monitor the edge of the tape or harvest infested stems and examine with microscope.

Maple Spider Mite

Overwintering life stage – *Acer* (Autumn Blaze*, Red Sunset*, October Glory, 'Somerset'*, Northwood*). Scout wrinkled bark on underside of branch collar with hand lens for reddish-orange eggs. Estimate the percent surface area under the branch that is covered with orange eggs. Categorize as low (>15 percent), medium (15-50 percent) or high (>50 percent). Scout 3 branches on each of 5 trees.
http://www.ca.uky.edu/HLA/Dunwell/KHC/NurseryUpdate20_2004.html

Active infestation/symptomatic plants – same taxa as for scouting overwintering populations. Scout under branch collar in wrinkled bark with hand lens for hatched eggs (clear as opposed to un-hatched eggs, which are orange). Scout leaves for new generation. Earlier in the season, start with leaves closest to the trunk and scout leaves further along the branch as the season progresses. Count number of mites on 5 leaves per plant, 5 replications per taxa.

Maple Shoot Borer (also called maple tip moth)

Maple Phenology/Development – *Acer* (Autumn Blaze®, Autumn Fantasy*, 'Brandywine'*, Burgundy Belle*, 'Legacy'*, October Glory*, Red Sunset, Sienna Glen*, 'Somerset'*, 'Sun Valley'*). Rate development of the second set of leaves from the branch tip to properly schedule applications: 1 – dormant; 2 – green tip; 3 – very small leaves unfolding from the bud; 4 – leaves ≥ 1 inch and expanding; 5 – 2 inches or more of shoot

expansion, leaves 50 percent or greater of mature size. Rate the lateral side branches and the central leaders separately, as control may be desired for the central leader only. Scout 15 plants of each taxa.

Assess damage/control efficacy – *Acer* (Autumn Blaze, Autumn Fantasy*, 'Brandywine'*, Burgundy Belle*, 'Legacy'*, October Glory*, Red Sunset, Sienna Glen*, 'Somerset'*, 'Sun Valley'*). Scout for flagged shoot tips. Count number of flagged shoot tips per 15 branches per taxa.
http://www.ca.uky.edu/HLA/Dunwell/KHC/NurseryUpdate12_2003.html

Potato Leafhopper

Active infestation/symptomatic plants – *Acer* ('Autumn Flame'*, Burgundy Belle*, Red Sunset*, Sienna Glen*, 'Sun Valley'*). Count the number of adults per leaf on 10 leaves per tree on 15 trees of each taxa. Scout leaves on the branch tips.
http://utuknurseryipm.utk.edu/

Powdery Mildew

Active infestation/symptomatic plants – *Cornus* (*Cornus florida*, *Cornus florida* 'Cherokee Brave' and 'Cherokee Princess') and *Quercus*. Scout 15 plants, one shoot per plant, on the north side of the plant. Look for presence/absence of a white powdery coating on the leaf surface and/or red twisted leaves. Scouting dogwoods can taper down in early August, at which point scouting oaks should intensify. Sprays should be initiated as soon as scouting reveals early signs of disease (white, fungal colonies on leaves).
https://utextension.tennessee.edu/publications/Documents/SP546.pdf
https://utextension.tennessee.edu/publications/Documents/PB1670.pdf

Southern Blight

Active infestation/symptomatic plants – *Malus*. Scout for rapidly wilting and dying crabapple trees (young liners only) and the presence of mustard seed-sized sclerotia and webbing of white mycelium on the trunk and shallow roots just under the soil.
http://utuknurseryipm.utk.edu

Tuliptree Scale

Overwintering life stage – *Liriodendron*. Second instar immatures are tiny, black, flattened and found on small branches. Scout for presence/absence on 15 replications per cultivar. Also, scout for signs of an infestation during the previous season. Look on the trunk, especially at nodes and behind stakes for dead adult females on the bark or light-colored round circles where females were attached to the bark.

Active infestation/symptomatic plants – *Magnolia* and *Liriodendron*. Look for round, large (1/3 inch diameter) females, grey to pink mottled with black. Scout for presence/absence on 15 replications per cultivar.
http://utuknurseryipm.utk.edu

Verticillium Wilt

Active infestation/symptomatic plants – *Acer*, *Cercis*, *Cotinus*, *Koelreuteria* and *Magnolia*. Scout trees for sudden wilting and dieback, especially during hot, dry periods. Wilting may affect only one side of the tree. Cut into stem to inspect for vascular staining. Monitor 15 plants per genus.
http://utuknurseryipm.utk.edu

Yellow Poplar Weevil

Active infestation/symptomatic plants – *Liriodendron* and *Magnolia*. Scout three outer leaves for rice-shaped holes on five plants of each genus.
http://bugs.osu.edu/~bugdoc/Shetlar/factsheet/ornamental/FSyellowpopweevil.htm

Using Traps

Set traps according to the scouting schedule (Tables 1 and 2). Traps should be hung at 4-6 feet above ground

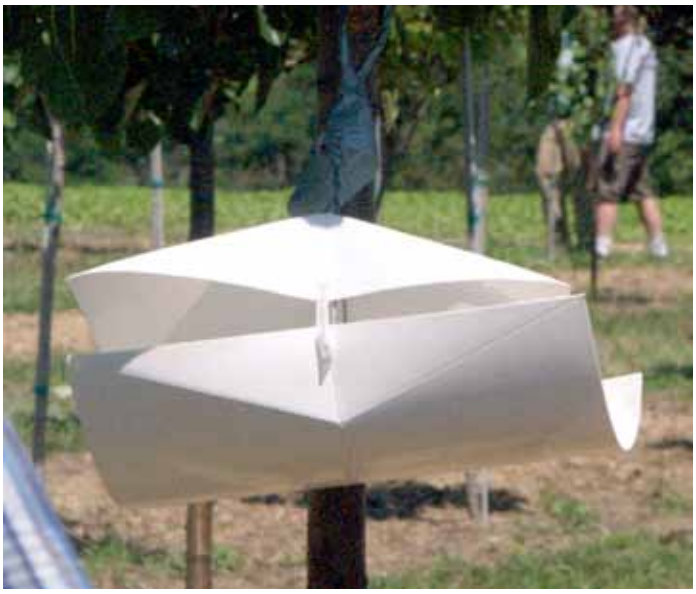

Figure 3. Wing traps with pheromone lures are useful for trapping clearwing moths.

Figure 4. Inside of wing trap with the borers caught in it and the lure.

level in the nursery, but can be placed at the office or other convenient location nearby. Traps can also be hung from limbs of trees in the nursery if duct tape or another protective coating is used to prevent bark damage (Figures 3 and 4). For flatheaded appletree borer, use red sticky traps that mimic a tree-trunk shape (no lure). Use commercially available ultra-high-release lures for granulate ambrosia beetle to better attract the adult beetles. For clearwing borers (e.g., peachtree and lesser peachtree borers) use the commercially available lures (not interchangeable, as they are different isomers). Use one trap per insect species.

Traps for different insect species should not be placed close to one another; place them at least 30 feet apart. To prevent cross-contamination when placing lures for more than one species, do not handle lures. The compounds in pheromone lures can penetrate many substances. Use disposable gloves, disposable forceps or shake lure out of the packaging onto the trap. Trap results can vary with location and microclimate; therefore, it is best to place more than one trap for a given pest in the nursery. Use at least one trap per 20 acres per insect species. Visual traps, e.g., flatheaded appletree borer, may require greater density. Store extra lures sealed in the refrigerator or freezer. Replace lures during the season according to manufacturer's recommendations.

Dormant Season Scouting Preparation

- Make field maps.
- Inventory, then purchase or make traps.
- Order new lures.
- Review previous seasons' scouting records.
- Read/attend educational programs on newly introduced pests, monitoring techniques, control measures, resistant plants, etc.

Scouting Supplies

- Alcohol to clean pruners.
- Clipboard.
- Compass.
- Cooler.
- Flagging tape and field flags.
- Hand counter.
- Hand lens.
- Ice packs.
- Insect collection vials.
- Insect traps.
- Lures for traps.
- Replacement liners for traps.
- Pruners.
- Pencils.
- Permanent marker.
- Recordkeeping forms (UT Extension publication W143, Recordkeeping Guide for Scouting and Monitoring Pests of Deciduous Trees during Nursery Production).
- Resealing bags.
- Scouting protocol.

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Table 1. Nursery scouting and trap monitoring schedule for arthropods in Middle Tennessee[1].

	Week of the Year																											
Scouting	**Feb**				**Mar**				**April**				**May**				**June**				**July**				**August**			
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Aphids										X	X	X	X	X	X	X	X											
Calico Scale	O								X	X	X	X	X	X														
Eastern Tent Caterpillar	O						X	X	X	X																		
Flatheaded Appletree Borer	O									X	X	X	X	X	X	X	X											
Honeylocust Plant Bug										X	X	X	X															
Honeylocust Spider Mite	O								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Japanese Beetle																X	X	X	X	X	X							
Japanese Maple Scale	O														X	X	X	X										
Maple Shoot Borer							P	P	P	P	P	P	A	A	A	A												
Maple Spider Mite	O									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Potato Leafhopper												X	X	X	X	X	X	X										
Tuliptree Scale	O																								X	X	X	X
Yellow Poplar Weevil												X	X	X	X	X	X											
Trap Monitoring																												
Granulate Ambrosia Beetle		X	X	X	X	X	X	X	X	X	X	X																
Flatheaded Appletree Borer										X	X	X	X	X	X	X	X											
Lesser Peachtree Borer										X	X	X	X	X	X	X	X											
Peachtree Borer														X	X	X	X	X	X	X	X	X						

[1] Overwintering or production in a Quonset hut can alter when infestation occurs.
O=Scout for *Overwintering life stage* or sign of previous infestation
X=Scout for *Active life stage*
A=Scout to *Assess damage/efficacy* of controls, not prevent infection/spread
P=*Monitor Phenology* to schedule applications

Table 2. Scouting schedule for select diseases in Middle Tennessee[1].

	Week of the Year																											
Diseases	**Feb**				**Mar**				**April**				**May**				**June**				**July**				**August**			
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Apple Scab								E	E	E	E	E	E	E	E	E												
Bacterial Leaf Scorch																									A	A	A	A
Black Knot	O							E	E	E	E	E													A	A	A	A
Cedar Quince Rust								E	E	E	E	E	E						A	A	A	A	A	A				
Fireblight	O								E	E	E	E	E	E	E	A	A	A	A	A	A	A	A	A	A	A	A	A
Powdery mildew														X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Southern Blight																			A	A	A	A	A	A	A	A	A	
Verticillium Wilt																			A	A	A	A	A	A	A	A	A	

[1] Overwintering or production in a Quonset hut and/or irragation can alter when infection occurs.

O=Scout for *Overwintering life stage* or sign of previous infestation

X=Scout for *Active life stages*

A=Scout to *Assess damage/efficacy* of controls, not prevent infection/spread

P=Monitor *Phenology* to schedule applications

E=Monitor *Environmental conditions* for infection (for fireblight, use Maryblight software)

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