



Timing Control Actions for Landscape Insect Pests Using Flowering Plants as Indicators

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Landscape managers in Kentucky contend with a wide variety of plants and associated pest problems. In any given landscape, there may be hundreds of species and cultivars of native and exotic trees, shrubs, and garden plants. Throughout the growing season, these plants may be attacked by a similarly diverse assortment of insects, including wood borers, leafminers, scale insects, plant bugs, and leaf-feeding caterpillars.

Timing is everything when managing landscape pests. To be effective, insecticides or biological controls must be applied when pests are present and at their most vulnerable life stage. For example, scale insects are best controlled after the eggs have hatched but before the crawlers have formed a protective cover. Controlling wood borers requires treating host trees with insecticides to intercept the newly hatched larvae before they have penetrated the bark. Leaf-feeding caterpillars such as bagworms and tent caterpillars are easiest to control when the larvae are small. Timing is especially important when using short-lived materials such as summer oils, soaps, and *Bacillus thuringiensis* (BT).

Frequent in-field inspection is the most reliable means to detect insect problems and determine time control efforts. Unfortunately, regular monitoring is too time-consuming for many landscape managers. Field workers may not know when or where to look for vulnerable life stages or may not recognize them when encountered. Pests such as the holly leafminer, honeylocust plant bug, and potato leafhopper feed in advance of any recognizable damage. Pheromone traps are available for monitoring certain insects (e.g., clearwing borers) but require time and expertise to use effectively.

Forecasting Using Plant Phenology

Phenology is the science dealing with the effects of climate on seasonal biological events, including plant flowering and insect emergence. Insects are cold-blooded, and like plants, their development will be earlier or later depending on spring temperatures. Since both plant and insect development are temperature-dependent, seasonal appearance of particular insect pests should follow a predictable sequence correlated with the flowering of particular landscape plants. In a three-year research project, the seasonal development and emergence of 33 important insect pests was monitored and tracked resulting in the creation of the timetable below. This information will help landscape managers and lay persons anticipate the

appearance of important insect pests and effectively schedule control measures.

Using the Table

Beginning in early spring, the table predicts the sequence and date of emergence of particular insect pests (in bold type) of woody plants or turf. Seasonal emergence of each pest is correlated with the flowering of 34 familiar landscape plants. First bloom (when a plant produces its first flower), 50% bloom, and 95% bloom (essentially full) are included to delineate distinct stages of flowering in the landscape. The table also lists calendar dates of pest emergence during 1992-94, along with the three-year average. Flowering tended to be a more reliable indicator of insect emergence than calendar date due to year-to-year temperature fluctuations.

Locate the pest you wish to monitor in the first column of the table. Under each pest in the first column is a list of indicator plants. In the second column is a list of closely correlated flowering events. These flowering or phenological events are indicators of pest emergence.

Example #1: Eastern tent caterpillar. Egg hatch and first appearance of this pest would coincide with the blooming of Forsythia x intermedia (border forsythia) and initial blooming of *Magnolia stellata* (star magnolia).

Example #2: Oystershell scale. Egg hatch and crawler emergence should coincide with 95% bloom of *Malus sargentii* (sargent crabapple) and first bloom of *Viburnum plicatum* var *tomentosum* (doublefile viburnum). These flowering events also correlate closely with adult emergence of *Magnolia* weevil (also called yellow poplar weevil).

Example #3: Bagworm/Dogwood borer. Egg hatch of bagworms and first flight of dogwood borer adults occur at about 95% bloom of *Ilex opaca* (American holly) and first bloom of *Crataegus phaenopyrum* (Washington hawthorn).

Determining Treatment Date

For most insects listed in the table, the ideal time to begin insecticide treatment is at or shortly after pest emergence. For bagworms, delay treatment one to two weeks after eggs hatch to ensure all young larvae have emerged from the old

bags. For clearwing borers (dogwood, lilac, peachtree, lesser peachtree) and American plum borer, apply a bark spray 10 to 14 days after first flight. Apply a second bark spray one month later for better control of dogwood, peachtree, and lesser

peachtree borers. For flatheaded borers (bronze birch borer, flatheaded appletree, honeylocust, twolined chestnut borer), apply a bark spray at or shortly after emergence and repeat after three weeks.

Phenological sequence of woody plant flowering and insect events in Lexington, Kentucky, 1992-94

Insects

Indicator plants	Phenological Event	1992 Average	1993 Average	1994 Average	3-yr Average
<i>Acer saccharinum</i> (silver maple)	1st bloom	23 Feb	12 Feb	20 Feb	18 Feb
<i>Cornus mas</i> (cornelian cherry dogwood)	1st bloom	22 Feb	10 Feb	04 Mar	21 Feb
<i>Acer saccharinum</i> (silver maple)	50% bloom	01 Mar	17 Feb	24 Feb	24 Feb
<i>Cornus mas</i> (cornelian cherry dogwood)	50% bloom	26 Feb	28 Feb	13 Mar	03 Mar
<i>Acer saccharinum</i> (silver maple)	95% bloom	03 Mar	22 Mar	07 Mar	10 Mar
<i>Forsythia x intermedia</i> (border forsythia)	1st bloom	27 Feb	27 Mar	11 Mar	12 Mar
<i>Cornus mas</i> (cornelian cherry dogwood)	95% bloom	29 Feb	23 Mar	17 Mar	13 Mar
Eastern tent caterpillar	Egg hatch	03 Mar	29 Mar	18 Mar	16 Mar
<i>Forsythia x intermedia</i> (border forsythia)	50% bloom	05 Mar	29 Mar	18 Mar	17 Mar
<i>Magnolia stellata</i> (star magnolia)	1st bloom	05 Mar	29 Mar	24 Mar	19 Mar
<i>Rhododendron 'PJM'</i> (P.J.M. rhododendron)	1st bloom	07 Mar	02 Apr	26 Mar	22 Mar
<i>Magnolia x soulangiana</i> (saucer magnolia)	1st bloom	04 Mar	04 Apr	29 Mar	22 Mar
<i>Forsythia x intermedia</i> (border forsythia)	95% bloom	09 Mar	01 Apr	28 Mar	23 Mar
<i>Pyrus calleryana 'Bradford'</i> (Bradford pear)	1st bloom	09 Mar	04 Apr	27 Mar	23 Mar
<i>Magnolia stellata</i> (star magnolia)	50% bloom	09 Mar	07 Apr	30 Mar	25 Mar
<i>Magnolia x soulangiana</i> (saucer magnolia)	50% bloom	09 Mar	11 Apr	06 Apr	29 Mar
Inkberry leafminer	Emergence	NA ^a	08 Apr	25 Mar	01 Apr
<i>Pyrus calleryana 'Bradford'</i> (Bradford pear)	50% bloom	21 Mar	08 Apr	05 Apr	01 Apr
<i>Pyrus calleryana 'Bradford'</i> (Bradford pear)	95% bloom	24 Mar	10 Apr	07 Apr	03 Apr
<i>Rhododendron 'PJM'</i> (P.J.M. rhododendron)	50% bloom	FREEZE	07 Apr	31 Mar	03 Apr
<i>Amelanchier arborea</i> (serviceberry)	1st bloom	30 Mar	11 Apr	05 Apr	05 Apr
<i>Rhododendron 'PJM'</i> (P.J.M. rhododendron)	95% bloom	02 Apr	10 Apr	05 Apr	06 Apr
<i>Berberis x mentorensis</i> (mentor barberry)	1st bloom	30 Mar	12 Apr	08 Apr	06 Apr
<i>Acer platanoides</i> (Norway maple)	1st bloom	05 Apr	10 Apr	04 Apr	06 Apr
<i>Magnolia stellata</i> (star magnolia)	95% bloom	FREEZE	11 Apr	04 Apr	07 Apr
<i>Cornus florida</i> (flowering dogwood)	1st bloom	01 Apr	14 Apr	09 Apr	08 Apr
Boxwood psyllid	Emergence	16 Apr	07 Apr	04 Apr	09 Apr
<i>Berberis x mentorensis</i> (mentor barberry)	50% bloom	30 Mar	18 Apr	11 Apr	09 Apr
<i>Amelanchier arborea</i> (serviceberry)	50% bloom	08 Apr	12 Apr	09 Apr	09 Apr
<i>Viburnum x juddii</i> (Judd viburnum)	1st bloom	08 Apr	13 Apr	10 Apr	10 Apr
<i>Magnolia x soulangiana</i> (saucer magnolia)	95% bloom	FREEZE	14 Apr	08 Apr	11 Apr
<i>Acer platanoides</i> (Norway maple)	50% bloom	14 Apr	12 Apr	08 Apr	11 Apr
<i>Amelanchier arborea</i> (serviceberry)	95% bloom	12 Apr	14 Apr	08 Apr	11 Apr
<i>Malus floribunda</i> (flowering crabapple)	1st bloom	08 Apr	15 Apr	12 Apr	11 Apr
<i>Berberis x mentorensis</i> (mentor barberry)	95% bloom	02 Apr	22 Apr	15 Apr	13 Apr
<i>Viburnum x juddii</i> (Judd viburnum)	50% bloom	12 Apr	17 Apr	11 Apr	13 Apr
<i>Cercis canadensis</i> (eastern redbud)	1st bloom	15 Apr	17 Apr	11 Apr	14 Apr
<i>Malus floribunda</i> (flowering crabapple)	50% bloom	13 Apr	20 Apr	14 Apr	15 Apr
<i>Syringa vulgaris</i> (common lilac)	1st bloom	15 Apr	18 Apr	14 Apr	15 Apr
<i>Acer platanoides</i> (Norway maple)	95% bloom	20 Apr	15 Apr	12 Apr	15 Apr
<i>Aesculus x carnea</i> (red horsechestnut)	1st bloom	NA	30 Apr	03 Apr	16 Apr
<i>Malus sargentii</i> (Sargent crabapple)	1st bloom	13 Apr	22 Apr	14 Apr	16 Apr
<i>Cornus florida</i> (flowering dogwood)	50% bloom	17 Apr	19 Apr	15 Apr	17 Apr
<i>Cercis canadensis</i> (eastern redbud)	50% bloom	17 Apr	21 Apr	13 Apr	17 Apr
<i>Viburnum x juddii</i> (Judd viburnum)	95% bloom	19 Apr	19 Apr	13 Apr	17 Apr
<i>Prunus serrulata 'Kwansan'</i> (Kwansan cherry)	1st bloom	14 Apr	19 Apr	25 Apr	19 Apr

Indicator plants	Phenological Event	1992 Average	1993 Average	1994 Average	3-yr Average
<i>Prunus serrulata</i> 'Kwansan' (Kwansan cherry)	50% bloom	17 Apr	21 Apr	NA	19 Apr
San Jose scale	Egg hatch	20 Apr	NA	NA	20 Apr
Honeylocust plant bug	Emergence	13 Apr	29 Apr	19 Apr	20 Apr
<i>Syringa vulgaris</i> (common lilac)	50% bloom	18 Apr	24 Apr	18 Apr	20 Apr
<i>Malus sargentii</i> (Sargent crabapple)	50% bloom	16 Apr	26 Apr	19 Apr	20 Apr
<i>Prunus serrulata</i> 'Kwansan' (Kwansan cherry)	95% bloom	18 Apr	23 Apr	NA	20 Apr
Birch leafminer	Emergence	20 Apr	23 Apr	20 Apr	21 Apr
<i>Malus floribunda</i> (flowering crabapple)	95% bloom	20 Apr	25 Apr	18 Apr	21 Apr
<i>Cercis canadensis</i> (eastern redbud)	95% bloom	23 Apr	24 Apr	18 Apr	21 Apr
<i>Cornus florida</i> (flowering dogwood)	95% bloom	20 Apr	24 Apr	21 Apr	22 Apr
Hawthorn lace bug	Emergence	19 Apr	27 Apr	22 Apr	22 Apr
<i>Malus sargentii</i> (Sargent crabapple)	95% bloom	20 Apr	28 Apr	21 Apr	23 Apr
Oystershell scale	Egg hatch	20 Apr	30 Apr	21 Apr	23 Apr
Magnolia weevil	Emergence	18 Apr	01 May	22 Apr	23 Apr
<i>Viburnum plicatum</i> var. <i>tomentosum</i> (doublefile viburnum)	1st bloom	22 Apr	27 Apr	22 Apr	23 Apr
Blackcutworm	1st flight	NA	26 Apr	22 Apr	24 Apr
<i>Syringa vulgaris</i> (common lilac)	95% bloom	20 Apr	29 Apr	22 Apr	24 Apr
Lilac borer	1st flight	18 Apr	30 Apr	25 Apr	24 Apr
<i>Lonicera tatarica</i> (tatarian honeysuckle)	1st bloom	20 Apr	03 May	24 Apr	25 Apr
<i>Viburnum plicatum</i> var. <i>tomentosum</i> (doublefile viburnum)	50% bloom	23 Apr	30 Apr	25 Apr	26 Apr
American plum borer	1st flight	20 Apr	03 May	27 Apr	26 Apr
Holly leafminer	Emergence	24 Apr	01 May	26 Apr	27 Apr
<i>Crataegus viridis</i> 'Winterking' (Washington hawthorn)	1st bloom	23 Apr	04 May	25 Apr	27 Apr
<i>Cornus kousa</i> (flowering dogwood)	1st bloom	18 Apr	10 May	25 Apr	28 Apr
<i>Chionanthus virginicus</i> (white fringe tree)	1st bloom	22 Apr	06 May	27 Apr	28 Apr
<i>Aesculus carnea</i> (red horsechestnut)	50% bloom	NA	03 May	26 Apr	29 Apr
Lesser peachtree borer	1st flight	24 Apr	07 May	28 Apr	29 Apr
Pine needle scale	Egg hatch	25 Apr	07 May	29 Apr	30 Apr
<i>Viburnum plicatum</i> var. <i>tomentosum</i> (doublefile viburnum)	95% bloom	29 Apr	03 May	02 May	01 May
<i>Chionanthus virginicus</i> (white fringe tree)	50% bloom	27 Apr	09 May	29 Apr	01 May
<i>Crataegus viridis</i> 'Winterking' (winterking hawthorn)	50% bloom	27 Apr	08 May	30 Apr	02 May
Redbud leafhopper (<i>E. aclys</i>)	Emergence	04 May	04 May	28 Apr	02 May
Redbud leafhopper (<i>E. bistrata</i>)	Emergence	04 May	04 May	28 Apr	02 May
<i>Pyracantha coccinea</i> (scarlet firethorn)	1st bloom	04 May	07 May	01 May	02 May
<i>Lonicera tatarica</i> (tatarian honeysuckle)	50% bloom	02 May	07 May	27 Apr	02 May
Boxwood leafminer	Emergence	02 May	04 May	04 May	03 May
Euonymus scale	Egg hatch	04 May	07 May	01 May	04 May
<i>Aesculus carnea</i> (red horsechestnut)	95% bloom	04 May	06 May	02 May	04 May
<i>Cornus kousa</i> (kousa dogwood)	50% bloom	26 Apr	15 May	02 May	04 May
<i>Chionanthus virginicus</i> (white fringe tree)	95% bloom	30 Apr	11 May	04 May	05 May
<i>Crataegus viridis</i> 'Winterking' (winterking hawthorn)	95% bloom	04 May	12 May	04 May	06 May
Potato leafhopper	1st activity	03 May	14 May	06 May	07 May
<i>Pyracantha coccinea</i> (scarlet firethorn)	50% bloom	09 May	10 May	06 May	08 May
<i>Cladrastris kentuckea</i> (yellowwood)	1st bloom	11 May	10 May	05 May	08 May
<i>Ilex opaca</i> (American holly)	1st bloom	11 May	10 May	05 May	08 May
<i>Lonicera tatarica</i> (tatarian honeysuckle)	95% bloom	21 May	10 May	02 May	11 May
<i>Ilex opaca</i> (American holly)	50% bloom	13 May	14 May	08 May	11 May
<i>Cladrastris kentuckea</i> (yellowwood)	50% bloom	15 May	12 May	10 May	12 May
<i>Cornus kousa</i> (kousa dogwood)	95% bloom	05 May	24 May	10 May	13 May
<i>Pyracantha coccinea</i> (scarlet firethorn)	95% bloom	13 May	13 May	16 May	14 May

Indicator plants	Phenological Event	1992 Average	1993 Average	1994 Average	3-yr Average
Juniper scale	Egg hatch	18 May	14 May	13 May	15 May
<i>Ilex opaca</i> (American holly)	95% bloom	17 May	17 May	18 May	17 May
<i>Cladrastris kentuckea</i> (yellowwood)	95% bloom	18 May	18 May	17 May	17 May
Bagworm	Egg hatch	18 May	18 May	20 May	18 May
Dogwood borer	1st flight	19 May	19 May	23 May	20 May
<i>Crataegus phaenopyrum</i> (Washington hawthorn)	1st bloom	18 May	26 May	20 May	21 May
Bronze birch borer	Emergence	18 May	23 May	25 May	22 May
<i>Tilia cordata</i> (littleleaf linden)	1st bloom	02 May	07 Jun	28 May	23 May
<i>Syringa reticulata</i> (tree lilac)	1st bloom	30 May	23 May	19 May	23 May
<i>Catalpa speciosa</i> (northern catalpa)	1st bloom	21 May	26 May	25 May	24 May
Calico scale	Egg hatch	26 May	24 May	24 May	24 May
<i>Crataegus phaenopyrum</i> (Washington hawthorn)	50% bloom	21 May	28 May	24 May	24 May
<i>Hydrangea quercifolia</i> (oakleaf hydrangea)	1st bloom	02 Jun	25 May	23 May	27 May
<i>Catalpa speciosa</i> (northern catalpa)	50% bloom	26 May	28 May	29 May	27 May
Flatheaded appletree borer	Emergence	20 May	NA	06 Jun	28 May
<i>Crataegus phaenopyrum</i> (Washington hawthorn)	95% bloom	26 May	01 Jun	27 May	28 May
<i>Syringa reticulata</i> (tree lilac)	50% bloom	05 Jun	29 May	24 May	29 May
Peachtree borer	1st flight	05 Jun	26 May	26 May	29 May
Twolined chestnut borer	Emergence	26 May	01 Jun	31 May	29 May
<i>Magnolia grandiflora</i> (southern magnolia)	1st bloom	23 May	12 Jun	26 May	30 May
<i>Catalpa speciosa</i> (northern catalpa)	95% bloom	31 May	30 May	31 May	31 May
<i>Syringa reticulata</i> (tree lilac)	95% bloom	07 Jun	04 Jun	28 May	02 Jun
<i>Hydrangea quercifolia</i> (oakleaf hydrangea)	50% bloom	06 Jun	02 Jun	31 May	02 Jun
Japanese beetle	1st flight	08 Jun	03 Jun	03 Jun	04 Jun
<i>Tilia cordata</i> (littleleaf linden)	50% bloom	NA	09 Jun	04 Jun	07 Jun
Honeylocust borer	Emergence	26 May	15 Jun	13 Jun	07 Jun
<i>Hydrangea quercifolia</i> (oakleaf hydrangea)	95% bloom	11 Jun	08 Jun	05 Jun	07 Jun
<i>Magnolia grandiflora</i> (southern magnolia)	50% bloom	10 Jun	20 Jun	26 May	08 Jun
Walnut scale	Egg hatch	08 Jun	11 Jun	08 Jun	09 Jun
<i>Tilia cordata</i> (littleleaf linden)	95% bloom	NA	13 Jun	06 Jun	09 Jun
Cottony maple leaf scale	Egg hatch	NA	14 Jun	08 Jun	11 Jun
<i>Koelreuteria paniculata</i> (golden-rain tree)	1st bloom	18 Jun	17 Jun	13 Jun	16 Jun
<i>Abelia x grandiflora</i> (glossy abelia)	1st bloom	14 Jun	15 Jun	09 Jul	23 Jun
<i>Koelreuteria paniculata</i> (golden-rain tree)	50% bloom	01 Jul	21 Jun	21 Jun	24 Jun
<i>Koelreuteria paniculata</i> (golden-rain tree)	95% bloom	01 Jul	23 Jun	26 Jun	26 Jun
Obscure scale	Egg hatch	08 Jul	06 Jul	05 Jul	06 Jul

^a NA = not available for that year

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