IPM Guide for Select Insect Pests On PA Christmas Tree Farms

Bagworm

Description:

- Caterpillar pest that forms a protective casing out of foliage
- Brown casings hang down from branches and may be mistaken for cones. May be 1.5-2 inches when larvae are mature.
- Hosts:
  - All conifer species
- Damage:
  - Young larvae will cause brown, chewed areas of foliage.
  - Older larvae will eat all the needles from a twig.

Life Cycle:

- The adult male leaves his casing to mate with the females in late August - September.
- The females will lay eggs and die in the casings. Eggs overwinter in mother's casings.
- Eggs then hatch early – mid June.

Monitoring:

- In early June, look for silk strands coming from ends of casings. Young larvae exit on these strands.
- Look for brown, chewed tips of the season's new needles and the young larvae hanging down from these needles.

Management:

- Physical – Remove bags from trees by hand before late spring to prevent new bagworms from emerging.
- Bio-Rational – Apply a *Bacilus thuringensis* (Bt) spray in early summer to infest newly emerged bagworms.
  - *Javelin, DiPel* (Bt) *[Less harmful to beneficial insects]
- Traditional – Apply a registered insecticide at the time of bagworm emergence. Wait until majority have emerged to spray; one application should be enough. Some insecticide options:
  - *Pyreth-it* (Pyrethrin)
  - *Conserve* & *Entrust* (Spinosad)
  - *Orthene* (Acephate)

Balsam Twig Aphid

Description:

- Pale green aphids feed on the season's new needles.
- Hosts:
  - True Firs (Fraser & Canaan may show most damage.)
- Damage:
  - New season's needles are twisted and stunted
- For cut trees, light damage may be tolerable until year before sale.

Life Cycle:

- Overwinters on the underside of the twig, at the base of a needle, as a silvery, football shaped egg.
- Stem Mothers hatch from eggs in early spring, usually early-mid April.
- Stem mother give birth to live nymphs which will move into opening buds to feed on the new needles.

Monitoring:

- Check for populations by beating end of branches over paper or black cloth.

Management:

- Treat if majority of trees have more than 2 aphids.

- Two Possible Treatment Times:
    - After egg hatch, but no later than bud swell. Only one spray should be necessary.
    - In the fall, when eggs are present. (North Carolina)
- Some insecticide options:
    - *SuffOil-X* (Petroleum Oil – emulsified)
    - *Movento* (Spirotetramat) *[Less harmful to beneficial insects]
    - *OnyxPro* (Bifenthrin)

Cooley Spruce Gall Adelgid

Description:

- Small, sucking pests
- Feeds on needles and twigs
- Form protective waxy, wool-like coverings outside of gall
- Hosts:
    - Douglas-fir
    - Colorado Blue Spruce
- Damage:
    - Kinked Needles (Douglas-fir)
    - Thumb-sized galls (Blue spruce)

Life Cycle:

- Overwinter as uncovered, immature nymphs on needles or bark crevices near the buds.
- Begin to form protective, wooly, wax covering in the early spring as it matures.
- Lays eggs.
- Nymphs hatch and either settle on the surface of newly expanding needles (Douglas-fir) or begin to form a protective gall inside the developing buds (Colorado spruce).
- On Douglas, the nymphs continue to cycle through several generations on the needles.
- On Colorado spruce, the nymphs will mature inside the gall and will exit the gall as it dries and opens in late summer. These will move to new twigs and will molt into winged adults and can either move to Douglas-fir or remain on spruce. The winged adults will produce the overwintering nymphs usually by early-mid October.

Monitoring:

- Scout in summer for trees that have galls or kinked needles with white waxy tufts.

Management:

- Clip off galls on Blue Spruce in early summer before they dry up and open.
- Treat with dormant oil in late fall or early spring when trees are dormant.
- Apply registered insecticide in early October or before bud break in spring to target overwintering nymphs.
- Some Insecticide options:
    - *Movento* (Spirotetramat) *[Less harmful to beneficial insects]
    - *Lorsban* (Chlorpyrifos)
    - Acephate (Orthene)
- Remember not to use oil products on glaucous trees!

Cryptomeria Scale

Description:

- Armored scale
- Two generations during the growing season

- Found at the base of a tree, close to trunk
- Hosts:
    - True Firs preferred, potentially Douglas-fir and spruces
- Damage:
    - Yellow speckling on needles
    - Loss of needles in heavy cases

Life Cycle:

- Overwinters as immature scales
- LATE SPRING – Scales mature into adult females and males
- LATE MAY / EARLY JUNE – Females lay eggs which stay under scale covering.
- EARLY TO MID JUNE – Scale nymphs or crawlers hatch out of eggs and move out from under the mother's scale cover
- JUNE / JULY – Crawlers settle and begin to form scale covering and feed.
- EARLY AUGUST – 2ND generation of eggs develop.

Monitoring:

- Monitor undersides of lower branches near the trunk for yellow speckled needles.
- Use a hand lens to see if crawlers are present on underside of the needles.

Management:

- Some level of control can come from natural predators.
- Purchase and release of parasitoid wasps*, Aphytis melinus*, from biological control companies can help to keep small populations of Cryptomeria scale in check.
- When crawlers emerge, make 2-3 applications 7-10 days apart with a registered insecticide or super-fine horticultural oil.
- Some insecticide options:
    - *Movento* (Spirotetramat) *[Less harmful to beneficial insects]
    - *Lorsban* (Chlorpyrifos)
    - *Dimethoate* (Dimethoate)
    - *Warrior* (Lambda cyhalothrin)

Douglas-fir Needle Midge

Description:

- Light orange, fly-like midge
- Long, delicate legs
- Tiny – adults are 3 mm in size
- Carries out life cycle by forming galls in needles
- Damage:
    - Swollen, yellowed galls in needles of new growth, causing needles to kink

Life Cycle:

- Adults emerge at end of April – early May.
- Eggs are laid about 5 days after adult emergence and hatch about 3 days later.
- Newly hatched larvae burrow inside the needles to begin feeding.
- Gall becomes evident about 3 weeks after larvae enter needles. About the 4th week in May.
- Infested area swells on bottom side of needle.
- Larvae begin exiting needles in mid-November.
- Midge pupate and overwinter in the soil.

Monitoring: Emergence Traps

- Scout Douglas-fir in fall to detect infestation. Monitor adult emergence with emergence traps if infestation is high.

* Trap Construction:
    - Cardboard Box (keep flaps for anchoring)
    - Mayonnaise or Peanut Butter Jar.
    - Duct Tape
    - Place at base of previously infested trees.
* Put traps out April 1st. Place traps on the side of the tree where the most damage was found.

Management:

* Because of long, thin ovipositor, females can lay eggs in buds before full bud break.
* Usually too late to wait until 10% bud break
* Some insecticide options:
    - Acephate (Orthene) - Allows for application up to 2 weeks before bud break
    - Azadirachtin (Azatin)
    - Chlorpyrifos (Lorsban, Whirlwind)

Elongate Hemlock Scale

Description:

* Armored Scale
* Found on lower and inn branches of the tree
* Damage moves upward as population increases.
* Scale coverings on the underside of the needles
* Damage:
    - Yellowed needles on lower branches, beginning at trunk
    - Tree may appear flocked
    - Premature needle drop
    - Eventual branch and limb dieback and death of tree with severe infestations

Life Cycle:

* NOVEMBER - MARCH – Scale overwinters in several stages
* MARCH – MAY - As scales develop, male and female armor differs.
* Male scales mature into adult winged insects
* Oval females produce protective "elongate" covering.
* THROUGHOUT SEASON – Eggs are laid within female casing.
* LATE MAY – Crawlers begin to appear and continue throughout growing season

Monitoring:

* Monitor undersides of lower branches near the trunk for yellow speckled needles.
* Use a hand lens to see if crawlers are present on underside of the needles.

Management:

* Crawlers can be active in April as soon as temperature warms, but are most present in Late May / Early June
* When crawler numbers increase in Early June, begin spray program of 3 applications every 4 weeks, or 4 applications every 3 weeks with a registered insecticide. (This may not be necessary every season.)
* Some insecticide options:
    - *Movento* (Spirotetramat) *[Less harmful to beneficial insects]
    - *Lorsban* (Chlorpyrifos)
    - *Dimethoate* (Dimethoate)
* Alternative Method:
    - A single basal trunk application of Safari prior to bud break
    - Tested in Connecticut by Dr. Richard Cowles.

Eriophyid Mites

Description:

- Rust Mites (or Sheath Mites when on Pines)
- Active in cool parts of season
- Only visible with a hand lens
- Hosts:
    - Spruces, hemlocks, true firs, pines
- Damage:
    - Discoloration of needles
    - Heavy populations can affect tree vigor

Life Cycle:

- Overwinters as eggs on base of the needles.
- Eggs hatch at 0-15 GDD.
- Numerous generations will take place throughout the growing season.

Monitoring:

- Look for silver or rusted discoloration of the foliage.
- Use a hand lens with a minimum of 16X magnification.

Management:

- Make an application of a miticide or insecticidal soap after eggs begin to hatch in early to mid-March. A 2nd application may be necessary.
- Some chemical options: (If using a miticide, make sure the label includes rust mites, as not all miticides are effective on this pest!)
    - *Envidor* (Spirodiclofen) *[Less harmful to beneficial insects]
    - *Avid* (Abamectin)
    - *Akari* (Fenpyroximate)

Spruce Spider Mites

Description:

- Tiny, Red and brown mite
- Body covered with hairs
- Round, red eggs are found on the twigs and at the bases of the needles
- Preferred Hosts:
    - True Firs (Especially Fraser and Canaan Firs)
    - Spruces (Blue & Norway)
- Damage:
    - Yellow stippling of the needles found near the needle bases.
    - Fine webbing can be found among the needles in cases of heavy infestation

Life Cycle:

- Overwintering Eggs will hatch at a range of 7 – 121 Growing Degree Days, usually in early to mid-April.
- Life cycle can take as little as 7 days to go through.
- There will be multiple generations throughout the growing season.
- Mites may dieback in very hot portions of the season and make a comeback when temperatures cool again in late summer/fall.

Monitoring:

- Look for twigs showing a yellowing at the base of the needles.

- Also, monitor by tapping branches over white paper. Consider treatment if majority of branches have 10+ mites each

Management:

- Apply registered miticide or insecticidal soap in spring or summer when mites are active.
- Some insecticide options:
  - *Envidor* (Spirodiclofen) *[Less harmful to beneficial insects]
  - *Avid* (Abamectin)
  - *Savey 50 DF* (Hexythiazox)

White Pine Weevil

Description:

- Wood boring beetle
- Brown mottled coloring with reddish-tan and white spots on the wing covers (elytra)
- Possible Hosts:
  - Pines (White, Jack, Scotch)
  - Spruces (Colorado, Norway, Serbian)
  - Douglas Fir
  - Firs (Fraser, possibly others) – Less common!
- Damage:
  - Top growth, or leader, of the tree is killed.
  - Growth is significantly reduced.
  - Multiple leaders can grow out, greatly misshaping the tree.

Life Cycle:

- Adult Weevils emerge from leaf litter under the tree in early spring – Late March-Early April
- Climb or fly to leaders to feed/mate/lay eggs
- About 10 days after emergence, females bore holes and lay eggs in leader.
- Larva hatch and feed on tissue under bark, causing the shepherd's crook symptom throughout summer.
- In late summer (end of July – August), adults emerge from leaders through holes and move to base of the tree to overwinter

Monitoring: Emergence Traps

- In summer, look for damaged leaders to determine where to place emergence traps next spring.
- Use baited Teddar's traps in early spring to detect adult emergence.
  - A 4' pyramidal-shaped base with a plastic funnel trap at the top.
  - Two bait vials attached at the top. (1 Ethanol & 1 Turpentine)
  - Traps are set up near a previously infested tree.
- White pine weevil adult emergence occurs at 7-58 GDD.
- Also, in late March- early April, look for droplets of sap on leaders (evidence of weevil feeding) on sunny days.

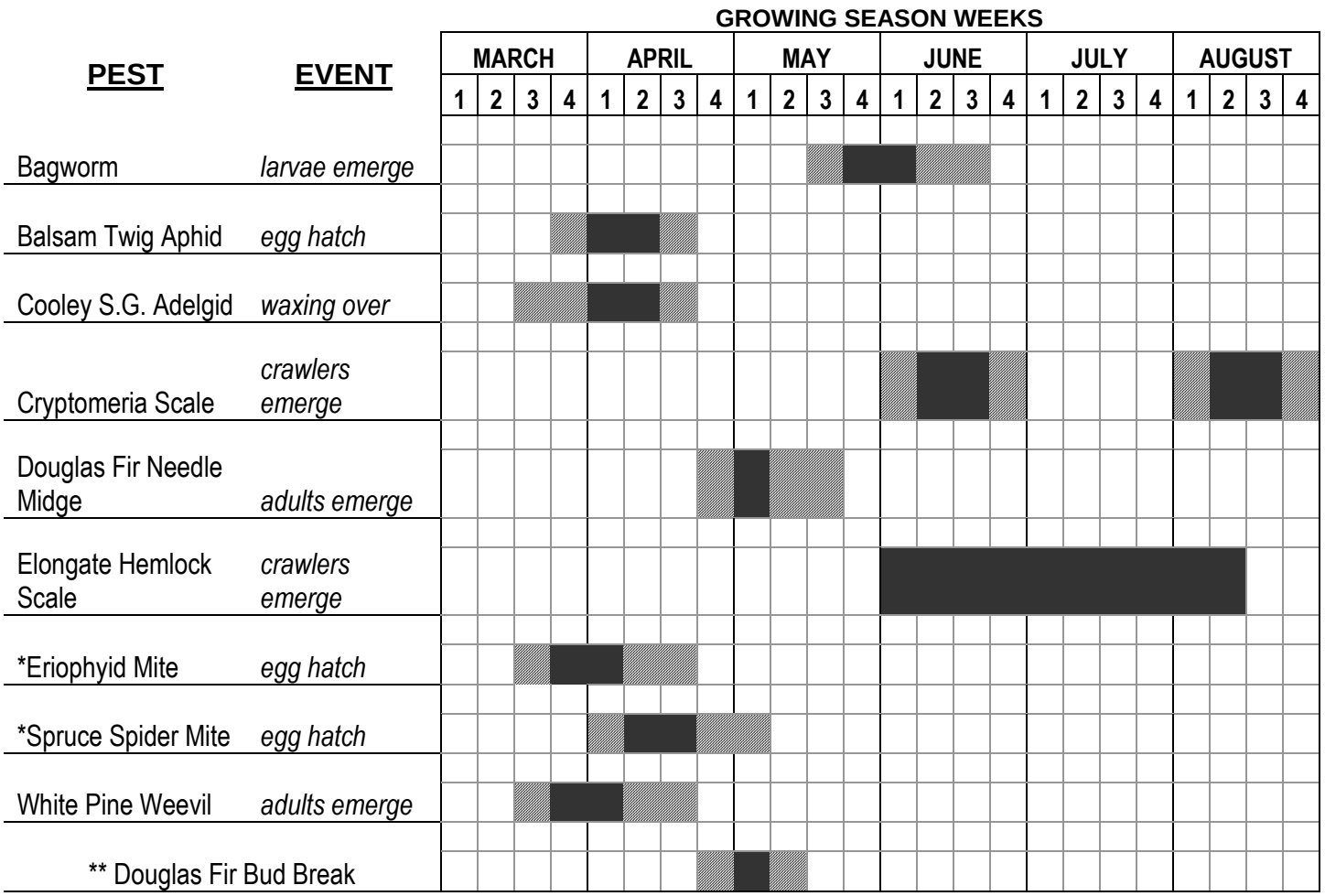
Management:

- 1-2 insecticide applications made at adult weevil emergence in Spring will provide excellent control.
- Some chemical options:
  - *Avaunt* (Indoxacarb) *[Less harmful to beneficial insects]
  - *Lorsban* (Chlorpyrifos)
  - *TriStar* (Acetamiprid)
- Good spray coverage of the upper 1/3 of the trees is critical!

Insect & Mite Calendar

This calendar gives a range of weeks of occurrence for each pest and pest event. The purpose of this calendar is to show growers how dates of particular pest events relate to others throughout the growing season. Because only weeks are given and not specific dates, these are just approximate ranges. The information in this calendar was collected from 10 years of scouting data in south central and southeastern Pennsylvania, so these ranges will differ from the actual calendar dates in other areas of the country.

= Early/Late Emergence = Peak emergence



* Population resurgence in September may require growers to treat, if numbers are high.

** Signals emergence of needle midge adults and the beginning of treatment for Rhabdocline and Swiss Needle casts.

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