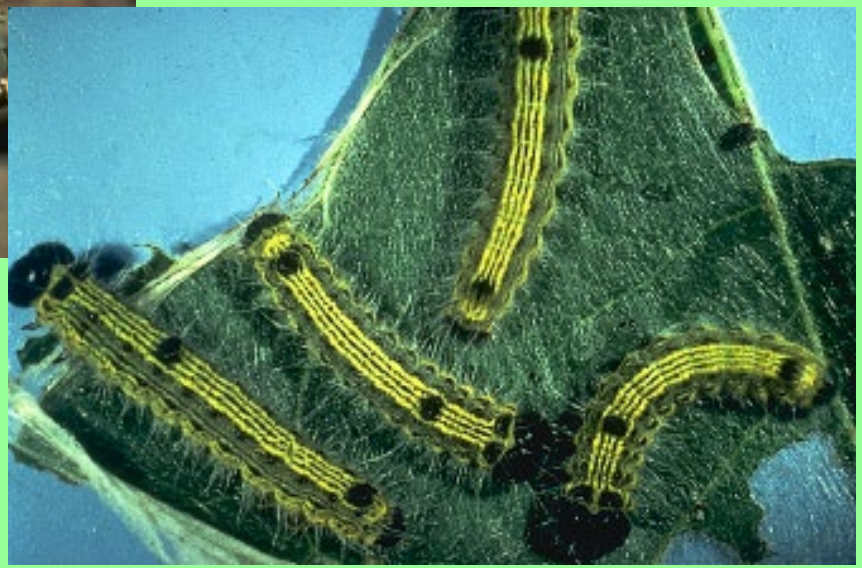
Introduction to Lepidoptera



Dr. Vera Krischik, Department of Entomology, University of Minnesota

Arborvitae Leaf Miner

Argyresthia thuiella
Family Argyresthiidae
Native pest

Hosts: Arborvitae and junipers.

Life History: Adults emerge in June and July, larvae feed in fall and the following spring.

Overwintering: Larvae in terminals.

Damage: Yellow and brown tips; damage most severe on south side of plants.

Arborvitae Leaf Miner

Monitoring: Shake foliage for moths in June and July. Look for larvae in late summer and following spring. Break open brown tips to look for larvae, tunnels, and frass.

Physical Control: Prune off infested tips.

Chemical Control: Systemic insecticides (fall and spring) and residual insecticides (June and July).

Biological Control: 26 parasitoids including *Pentacnemus bucculatricis* and *Apanteles bedelliae*.

Bagworm

Thyridopteryx ephemeraeformis
Family Psychidae
Native pest

Hosts:
Arborvitae, cedar, juniper, other conifers, boxelder, black locust, elm, maple, oak, persimmon, and poplar.

Bagworm

Life History: Larvae enclose themselves in bags, where mating and egg laying also occur. Females never emerge from bags. One generation a year.

Overwintering: Eggs inside bags.

Adult female with eggs

Adult female pupa

Bagworm

Damage: Defoliation.

Monitoring: Look for larvae and bags; use pheromone traps for adult males.

Adult male

Top: Female pupal case.
Bottom: Female with eggs extracted from pupal case

Bagworm

Physical Control: **Manually remove and destroy bags during light infestations.**

Chemical Control: **Insecticides when bags are small and *Bacillus thuringiensis* var. *kurstaki*.**

Biological Control: **Ichneumonid, eupelmid, and chalcid parasitoids, vespid wasps, and fungal pathogens.**

Snailcase bagworm,
Apterona (=crenuella) helix

Cankerworms, Spring and Fall

Paleacrita vernata **(spring)**
Alsophila pometaria **(fall)**
Family Geometridae
Native pests

Hosts: Apple, ash, beech, birch, elm boxelder, hickory, linden, maple, and oak.

Fall cankerworms

Cankerworms, Spring and Fall

Life History: **Fall cankerworms adults emerge in October; eggs overwinter and larvae feed during following summer. Spring cankerworm adults emerge in March. One generation a year.**

Overwintering: **Eggs or pupae.**

Adult male

Adult female

Cankerworms, Spring and Fall

Damage: **Shot holes, consumption of all but mid vein, dieback.**

Monitoring: **After April, look for shot holes on top branches.**

Cankerworms, Spring and Fall

Physical Control: **Sticky bands around trunk.**

Cultural Control: **Looser tree wraps to prevent egg-laying.**

Chemical Control: **Residual insecticides, oil, or *Bacillus thuringiensis* var. *kurstaki* sprayed on trunk and branches.**

Clearwing Borers

Cottonwood Borer

Several species
Family Sesiidae
Native pests

Hosts: Alder, ash, birch, dogwood, fir, lilac, hawthorn, mountain-ash, maple, oak, pine, poplar, sycamore, viburnum, willow, and fruit trees such as apricot, cherry, peach, and plum.

Clearwing Borers

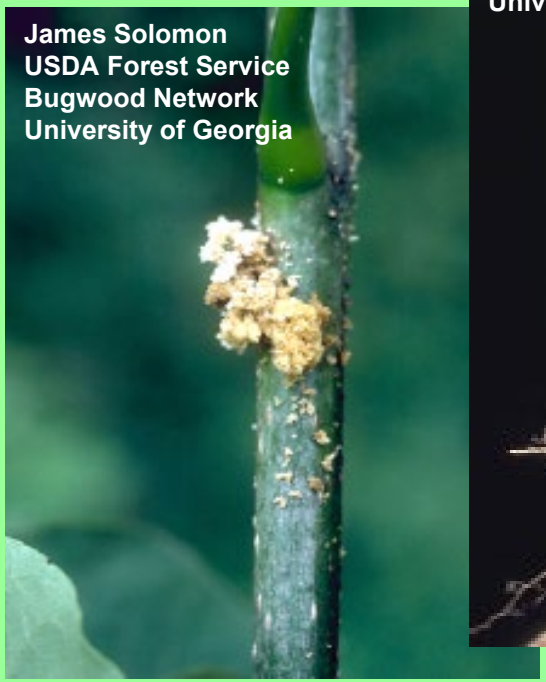
Life History: Most adults emerge in May and June (banded ash borer emerges in August). Larvae mine sapwood during the summer and pupate in the following spring. One generation a year.

Dogwood Borer

Clearwing Borers

Overwintering: Mature larvae in tunnels under bark.

Damage: Gnarled or rough bark, weakened branches.



Clearwing Borers

Monitoring: Look for frass, tunnels, and pupal skins around tree wounds, loose bark, and cracks. Use pheromone traps.

Cultural Control: Avoid damage to trees and minimize tree stress. Do not band trees.

Chemical Control: Chlorpyrifos or permethrin on bark in spring.

Biological Control:
Several parasitic wasps, nematodes.

Larva killed by nematodes

Eastern Pine Shoot Borer

Eucosma gloriola
Family Tortricidae
Native pest

Hosts: Austrian, jack, red, Scotch, Swiss mountain and white pines, and Douglas fir.

Life History: Adults, eggs, and larvae appear in May. Larvae bore in shoots until pupating in July. One generation a year.

Eastern Pine Shoot Borer

Overwintering: Pupae in soil.

Damage: Flagging, reddish shoots, frass, oval exit holes. Trees may become bushy.

Monitoring: Look for damage and exit holes. Break open shoots to look for borers.

Eastern Pine Shoot Borer

Physical Control: **Prune out infested shoots.**

Chemical Control: **Bifenthrin in May.**

Biological Control: **5 species of parasitic wasps including *Glypta* sp. (Ichneumonidae).**

Eastern Tent Caterpillar

Malacosoma americanum
Family Lasiocampidae
Native pest

Hosts: **Apple, crabapple, pear, plum, wild cherry, other fruit and shade trees.**

Top: Eastern tent caterpillar
Bottom: Forest tent caterpillar

Eastern Tent Caterpillar

Life History: Eggs hatch as buds begin unfold in spring. Gregarious larvae hide in a tent during day and feed at night. One generation a year.

Overwintering: Eggs.

Damage: Silken webs in tree forks, defoliation.

Eastern Tent Caterpillar

Monitoring: Look for tents in late spring and black egg masses in winter.

Eastern Tent Caterpillar

Physical Control: **Prune out and destroy egg masses and webs.**

Cultural Control: **Eliminate wild cherries.**

Chemical Control: **Spray foliage when tents first appear.** ***Bacillus thuringiensis*** **var.** ***kurstaki*****.**

Biological Control: **Several hymenopteran parasitoids, tachinid flies, vespid wasps, ants, birds, nuclear polyhedrosis virus.**

Elm Casebearer

Coleophora ulmifoliella
Family Coleophoridae
Native pest

Hosts: **American, red, and slippery elms.**

Life History: **Adults lay eggs in July. Larvae mine, then make cases before overwintering. They continue feeding the following spring. One generation a year.**

Overwintering: **Larvae in cases on twigs.**

Elm Casebearer

Damage: Mining causes brown, oval patches on leaves.

Monitoring: Look for brown patches between leaf veins in August. Look in late summer for brown cases under leaves.

Chemical Control: Acephate in severe infestations.

European Pine Shoot Moth

Rhyacionia buoliana
Family Tortricidae
Introduced pest

Hosts: Austrian, Eastern white, red, Scotch, and Swiss mountain pines.

Life History: Larvae make tents in spring, then bore into sheaths, needle bases, and buds until August. Feeding continues the following spring. One generation a year.

European Pine Shoot Moth

Overwintering: Larvae in tunnels in buds.

Damage: Dead shoots and branches, crooked trunks and branches called “post horns.”

Monitoring: Look for “post horns” that indicate prior infestation.

European Pine Shoot Moth

Physical Control: Prune out infested shoots before June. Remove crooked leaders, branches, and branches below snow line.

Chemical Control: Spray in April, June, and July.

Biological Control: Over 100 beneficials.

Fall Webworm

Hyphantria cunea
Family Arctiidae
Native pest

Hosts: Over 100 trees and shrubs including birch, cherry, elm, and willow.

Life History: Adults emerge in June and July and lay eggs on leaf undersides. Larvae feed in nests until leaving to pupate. One generation a year in the north, up to four in the south.

Fall Webworm

Overwintering: Pupae in cocoons in sheltered places.

Damage: Nests on terminals, deformed branches.

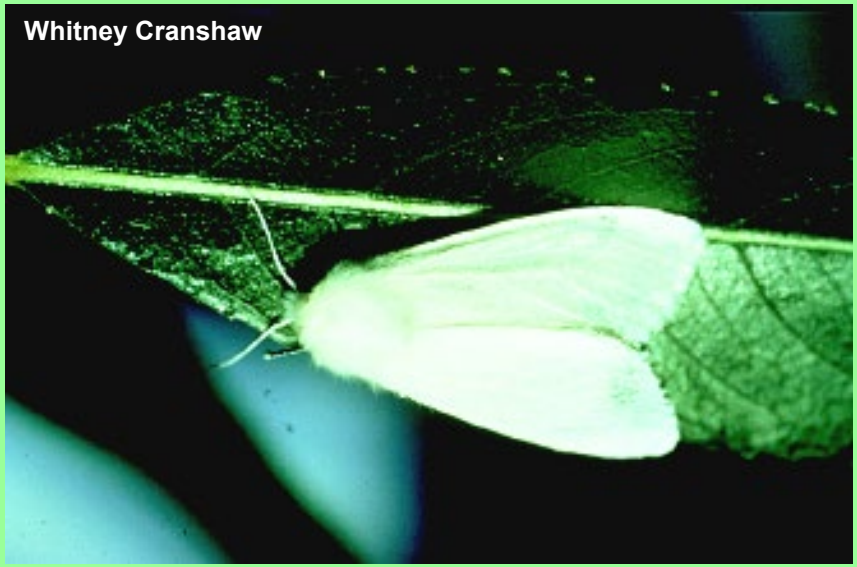
Monitoring: Look for larvae and nests on terminals.

Fall Webworm

Physical Control: Prune out webbing.

Chemical Control: Horticultural oil or soap or *Bacillus thuringiensis* var. *kurstaki* for young larvae.

Biological Control: Over 50 parasitoids, and 36 predators.



Forest Tent Caterpillar

Malacosoma disstria
Family Lasiocampidae
Native pest

Hosts: Alder, aspen, ash, basswood, birch, cherry, elm, hawthorn, maple, oak, peach, poplar, willow and flowering fruit trees.

Life History: Larvae appear in May and feed gregariously. Pupae and adults occur in summer, and eggs are laid on twigs in late summer. One generation a year.

Forest Tent Caterpillar

Overwintering: Black egg masses on twigs.

Damage: Shot holes, defoliation.

Monitoring: Look for shot holes in May.

Left: Young larvae and hatched eggs
Below: Adult male

Forest Tent Caterpillar

Physical Control: **Physically remove egg masses and groups of larvae.**

Chemical Control: **Residual insecticides or *Bacillus thuringiensis* var. *kurstaki*.**

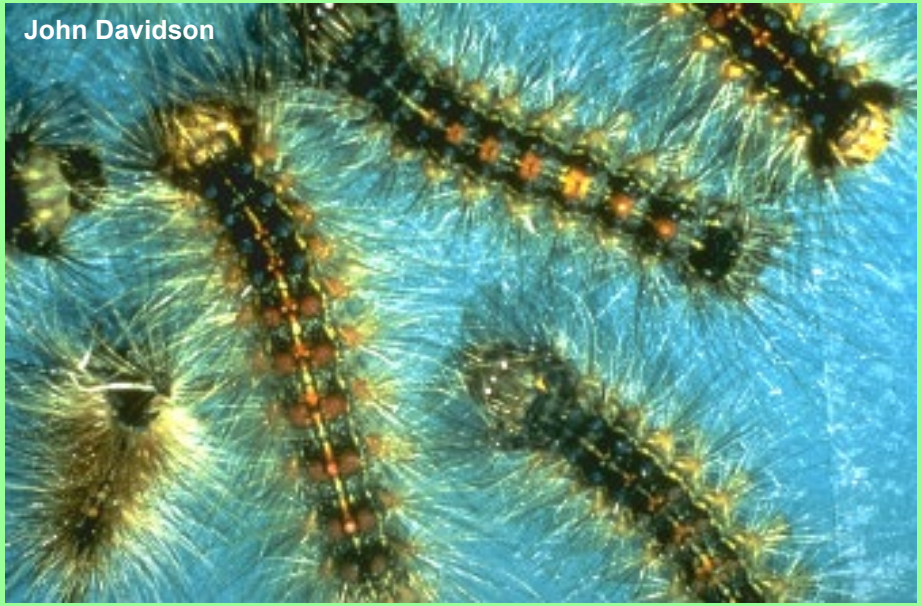
Biological Control: **Nuclear polyhedrosis virus, several hymenopteran and dipteran parasitoids (such as the fly *Sarcophaga aldrichi*).**

Cocoon

Gypsy Moth

Lymantria dispar
Family Lymantriidae
Introduced pest

Hosts: Oak, apple, crabapple, aspen, poplar, basswood, birch, blue spruce, and over 300 other species.



Gypsy Moth

Life History: Eggs laid in masses in July and August, larvae emerge the following spring and pupate in June and July. One generation a year.

Overwintering: Egg masses.

Male (left) and female

Female with eggs

Gypsy Moth

Damage: Shot holes, defoliation.

Monitoring: Pheromone traps, look for damage and egg masses.

USDA Forest Service Archives, USDA Forest Service
Bugwood Network, University of Georgia

Gypsy Moth

Chemical Control: **Diflubenzuron or *Bacillus thuringiensis* var. *kurstaki* in May.**

Biological Control: **Several hymenopteran and dipteran parasitoids, carabids, rodents, nuclear polyhedrosis virus, *Entomophaga maimaiga* fungus.**

Larva killed by nuclear polyhedrosis virus

Mimosa Webworm

Homadaula anisocentra
Family Galacticidae
Introduced pest

Hosts: **Honeylocust and mimosa.**

Life History: **Two generations per year.**

Overwintering: **Pupae in leaf litter.**

Damage: **Webbing on leaves and defoliation.**

Monitoring: **Look for webbing in June to August.**

Mimosa Webworm

Cultural Control: **Thornless varieties of honeylocust suffer most damage.**

Chemical Control: ***Bacillus thuringiensis*** **var. *kurstaki* or azadirachtin in June.**

Biological Control: **The ichneumonid *Parania geniculata* and the eulophid *Elasmus albizziae*.**

Mourning Cloak Butterfly

Nymphalis antiopa
Family Nymphalidae
Native pest

Hosts: **Elm, cottonwood, willow, hackberry, birch, linden, and other poplars.**

Life History: **Adults emerge in early spring and larvae feed in summer. Two generations per year.**

Overwintering: **Adults.**

Mourning Cloak Butterfly

Damage: Defoliation.

Monitoring: Look for egg clusters in spring, larvae through July, and pupae and butterflies in July.

Mourning Cloak Butterfly

Chemical Control: **Do not kill these larvae. They become attractive butterflies and will not cause significant harm to trees.**

Biological Control: **Parasitoids.**

Poplar Tentmaker

Clostera inclusa
Family Notodontidae
Native pest

Hosts: **Poplar and willow species.**

Life History: **Adults lay eggs under leaves in April. Gregarious larvae feed in tents until October. One or two generations per year.**

Overwintering: **Pupae in cocoons on ground.**

Poplar Tentmaker

Damage: Skeletonization and defoliation.

Monitoring: Look for nests and damage.

Eggs and first instar larvae

Poplar Tentmaker

Damage: Skeletonization and defoliation.

Monitoring: Look for nests and damage.

Close up of eggs

Redhumped Caterpillar

Schizura concinna
Family Notodontidae
Native pest

Hosts: Apple, aspen, birch, cherry, elm, cottonwood, hickory, persimmon, poplar, dogwood, redbud, sweetgum, walnut, willow, and rosaceous plants.

Life History: Gregarious larvae active in August and September. One to five generations a year.

Overwintering: Prepupae in cocoons in leaf litter.

Redhumped Caterpillar

Damage: Skeletonization and defoliation.

Monitoring: Beginning in August, look for larvae and damage.

Physical Control: Prune out groups of larvae.

Chemical Control: Horticultural oil or *Bacillus thuringiensis* var. *kurstaki* for young larvae, contact insecticides for older larvae.

Biological Control: Parasitic wasps *Hyposoter fugitivus* and *Apanteles* spp., spiders, lacewings, bigeyed bugs, and damsel bugs.

Spruce Budworm

Choristoneura fumiferana
Family Tortricidae
Native pest


Steve Katovich, USDA Forest Service

Hosts: Balsam fir, white, red, and black spruces, larch, pine, and western hemlock.

Life History: Larvae emerge in spring, adults are active from June to August. Eggs laid in masses under needles. Larvae feed on branch tips. One generation a year.

Spruce Budworm

Overwintering: Larvae in silken hibernacula on branches or under bark scales.

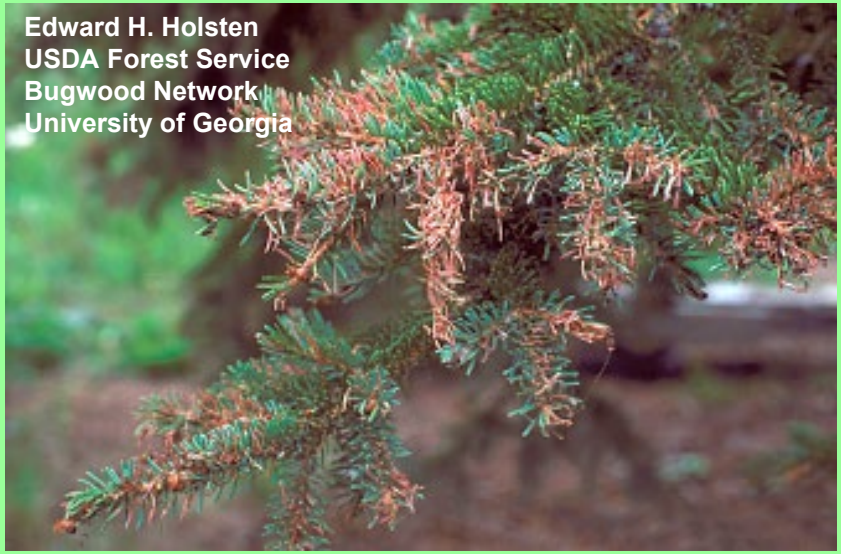
Damage: Frass and silk webs on buds and needles, browning of crowns, defoliation.

Monitoring: Look for damage.

Spruce Budworm

Chemical Control: **Insecticides in May to July. *Bacillus thuringiensis* var. *kurstaki*.**

Biological Control: **Parasitoids (more than 90 species), and birds.**



Damage

Pupa in tree

Uglynest Caterpillar

Archips cerasivorana
Family Tortricidae
Native pest

Hosts: Chokeberry, black cherry, and other hardwoods.

Life History: Eggs hatch in May, larvae live together in dense nests of webbing, leaves and twigs. Adults emerge until September. One generation a year.

Uglynest Caterpillar

Overwintering: Eggs in masses on trunks or stems.

Damage: Usually only affects appearance of plants.

Monitoring: Look for nests.

Uglynest Caterpillar

Physical Control: Prune out and destroy webbed nests.

Chemical Control: *Bacillus thuringiensis* var. *kurstaki* for young larvae, residual insecticides for older larvae.

Walnut Caterpillar

Datana integerrima
Family Notodontidae
Native pest

Hosts: Apple, birch, hickory, honeylocust, oak, pecan, walnut, and willow.

Life History: Eggs laid in June, larvae feed gregariously. One or two generations a year.

Overwintering: Pupae in soil.

Walnut Caterpillar

Damage: Skeletonization and defoliation.

Monitoring: Look for groups of larvae feeding in June and mature larvae on the ground in late summer.

Physical Control: Prune out groups of larvae.

Chemical Control: Horticultural oil for young larvae, residual insecticides for older larvae.

Biological Control: The fly *Archytas metallicas* and egg parasitoids.

Whitemarked Tussock Moth

Orgyia leucostigma
Family Lymantriidae
Native pest

Hosts: Maple, horsechestnut, birch, apple, sycamore, poplar, linden, elm, rose, fir, larch, and 60 other deciduous species.

Life History: Eggs hatch in April to June. Two generations a year.

Overwintering: Eggs.

Whitemarked Tussock Moth

Damage: Skeletonization, consumption of all but mid vein.

Monitoring: Look for shot holes in April.

Chemical Control: Residual insecticides or *Bacillus thuringiensis* var. *kurstaki*.

Biological Control: Parasites such as *Hyposoter* spp. (Ichneumonidae), predators, microbial diseases.

Yellownecked Caterpillar

Datana ministra
Family Notodontidae
Native pest

Hosts: Azalea, basswood, chestnut, crabapple, beech, birch, elm, honeylocust, locust, maple, mountain ash, oak, peach, sumac, walnut, and many other fruit and shade trees.

Life History: Adults emerge in June or July and larvae feed until October. One generation a year.

Yellownecked Caterpillar

Overwintering: Pupae in soil.

Damage: Skeletonization, defoliation, dieback.

Monitoring: Look for damage and groups of larvae.

Yellownecked Caterpillar

Physical Control: Manually removed larvae.

Chemical Control: Horticultural oil for young larvae, residual insecticides for older larvae.

Biological Control: Predaceous bugs, parasitic flies, robins, and blue jays.

Zimmerman Pine Moth

Dioryctria zimmermani
Family Pyralidae
Native pest

Hosts: All pines except white pines.

Life History: Larvae feed until late July, when the adults fly. Eggs hatch in August; larvae hibernate and continue feeding the following spring. One generation a year.

Overwintering: Larvae under bark.

Zimmerman Pine Moth

Damage: **Feeding under bark leads to brown terminal growth with a “shepherd’s crook” or fish-hook appearance, frass and pitch masses.**

Monitoring: **Look for damage, pitch masses, and dead branches.**

Zimmerman Pine Moth

Physical Control: Prune out damaged shoots in June before adults emerge, remove pitch masses in August.

Chemical Control: Insecticides in May and August.

Armyworm

Pseudaletia unipunctata
Family Noctuidae
Native pest

Hosts: **Turf grasses.**

Life History:
Populations arrive annually from the south.
Adults do not feed.

Overwintering: **Pupae in soil.**

Armyworm

Damage: Blades removed and holes in sod.

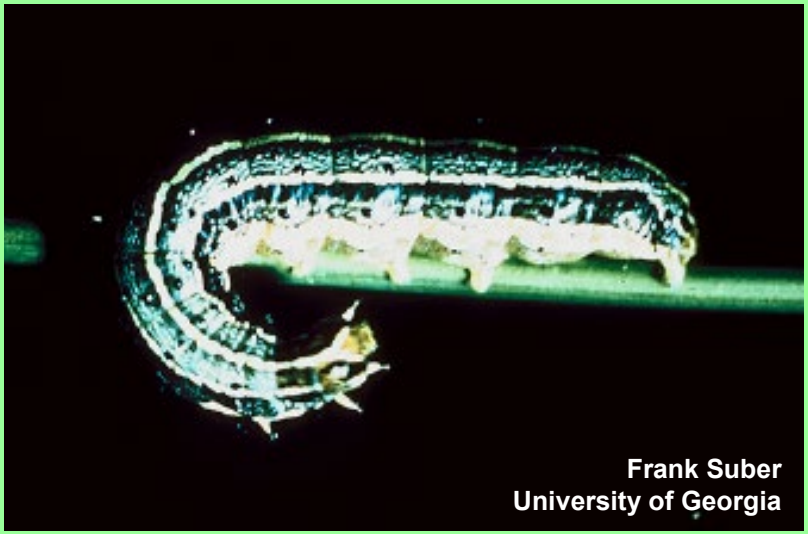
Cultural Control: Fertilize grass in spring and fall, water during droughts.

Chemical Control: Do not use broad spectrum insecticides routinely.

Biological Control: Carabid and staphylinid beetles, ants.

Fall Armyworm

Spodosptera frugiperda
Family Noctuidae
Native pest



Hosts: **Turf grasses.**

Life History:
Populations arrive annually from the south.
Adults do not feed.

Overwintering: **Pupae in soil.**

Fall Armyworm

Damage: Blades removed and holes in sod.

Cultural Control: Fertilize grass in spring and fall, water during droughts.

Chemical Control: Do not use broad spectrum insecticides routinely.

Biological Control: Carabid and staphylinid beetles, ants.

Cutworms

Black cutworm, *Agrotis ipsilon*
Bronze cutworm, *Nephelodes minians*,
Variegated cutworm, *Peridroma saucia*
Family Noctuidae
Native pest

Black cutworm

Hosts: Turf grasses.

Life History: Black cutworm adults arrive in summer on south winds. Larvae feed at night and hide in soil or under debris during day. Adults do not feed. One to three generations a year.

Cutworms

Overwintering: Pupae in soil.

Damage: Blades removed, holes in soil.

Monitoring: Look for larvae during the day in the soil or under debris.

Bronzed cutworm

Cutworms

Cultural Control: **Fertilize grass in spring and fall, water during droughts.**

Chemical Control: **Spray in evening.**

Biological Control: **Carabid and staphylinid beetles, ants.**

Sod Webworm

***Crambus* and *Parapediasia* species**
Family Noctuidae
Native pest

Hosts: Turf grasses.

Life History: Larvae feed at night and hide in silk tunnels or burrows during day. Adults do not feed. Two or more generations a year.

Overwintering: Pupae in soil.

Sod Webworm

Damage: Look for webs and use flotation method to count caterpillars.

Monitoring: Scout for webworms from June to September.

Cultural Control: Fertilize grass in spring and fall, water during droughts.

Chemical Control: Water lawn a day or so before insecticide application and delay further watering for three days after treatment.

Biological Control: Carabid beetles.