



The Gall of Those Midges!

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The topic of this feature article evolved from some information Dan Gilrein, Extension Entomologist from Suffolk County Cornell Cooperative Extension shared with us regarding a currently unidentified spruce gall midge causing distal terminal dieback on Norway spruce, which got us thinking about other types of gall midges and the damage they cause. Midges are small fly-like insects in the Cecidomyiidae family of flies (order Diptera) that are likely to be noticed only by the most astute of observers. A gall is the result of a reaction by a plant to irritation, in this case the irritation is the egg laying or the feeding of larvae of the midges. In addition to the following information from Dan Gilrein about this unidentified spruce gall midge we'll discuss other gall midges we commonly see including the balsam gall midge, the Douglas-fir needle midge, the honeylocust pod gall midge, and the maple eye spot gall midge.

Unidentified Spruce Gall Midge

"Very early this spring I was brought onto an estate to assist with some plant health problems. Among them, a Norway spruce was showing signs of the 'new' gall midge seen before on Long Island and in Connecticut the last few years. This one causes some distortion and occasional loss of last year's foliage on some twigs. There are small, bud-like galls concealed beneath last year's bud scales on many affected twigs. Cutting these open, a small yellow larva is often found. In the recent case damage was much more apparent on the sheltered side of the tree; the sunny and windward side had almost none. The owner is concerned about the appearance of the tree but it more cosmetic than a health threat; unfortunately we aren't aware of any effective control.

The nearest ID we could come to this newer gall midge was possibly *Dasineura abietiperda*, which is reported from Europe, but a gall midge specialist we've been working with on this is not at all convinced this is the species, so for now exactly what it is, is an open question.

There are a number of gall-forming insects in spruce, several adelgids being the most common and distinctive, each with their particular spruce species preferences. There are also several gall midges (small flies) that use spruces and they also seem to have species preferences as well as for various locations on the plant; some of these attack seeds, others attack cones, one has been found in resin, another in terminal buds, and a well know spruce gall midge, *Mayetiola piceae*, forms small galls, often close together, in twigs. *M. piceae* forms small swellings on young twigs, often with some distortion at the point of attack. There may be one or many galls at this point, twigs can be slightly or very distorted with loss of needles and possibly dieback. Damaged twigs may survive and continue to grow but the distortion often remains.

The 'new' gall midge can also cause loss of needles and some distortion; the most common symptom is dieback of new growth and failure of buds to grow. Also you won't find the galls in the middle of the twigs that are so obvious with *M. piceae*. There are small bud-like galls at the base of the terminals hidden by last year's bud scales or very nearly so. They are hard to see, but even in the field you can find them once you know where to look. Cutting thru any swollen areas will quickly reveal whether there is or was a gall midge present on suspect twigs."



Left: Damage from unidentified spruce gall midge. Note loss of needles on recent growth and some twigs distorted. Right: The small bud-like galls at the base of the twig normally concealed by the old bud scales. Inset: Two of the galls on this same twig cut open. Photos © Lorraine Graney, Plant Disease & Insect Diagnostician, Bartlett Tree Research Laboratory



Left: Balsam gall midge damage. Right: Honeylocust pod gall midge damage. Photos © Dawn Dailey O'Brien



Left: Douglas-fir needle midge causes the affected areas to swell. © Daniel Gilrein. Inset: Douglas-fir needle midge adult. © USDA Forest Service Archive, USDA Forest Service, Bugwood.org. Top Right: Douglas-fir needle midge larva. © Ward Strong, BC Ministry of Forests, Bugwood.org



Bottom Right: Maple eye spot gall on red maple leaf. Inset: Underside of leaf showing white maggot in the center of the gall. © Dawn Dailey O'Brien

Balsam Gall Midge (*Paradiplosis tumifex*) (151)

Hosts: Primary hosts are balsam fir (*Abies balsamea*) and Fraser fir (*Abies fraseri*)

Description & Life Cycle: These midges overwinter as larvae in cocoons in the soil and emerge as adults in mid-May. During their short lives of only a few days, adults mate, and females lay eggs on the bases of newly developing needles. Generally only one egg is laid per needle, but if adult populations are high, more may be deposited. After the eggs hatch, young larvae apparently secrete a chemical that causes rapid cell division in the surrounding needle tissue. This proliferation of growth soon envelops the larva, forming a “gall” about 3 mm in diameter. The gall protects the larva while it feeds and grows. Mature larvae emerge in September or October and drop to the ground to spin cocoons.

Signs & Symptoms: Larval feeding causes small galls to develop on the needles of these hosts, followed by eventual loss of infested needles. Galled needles are shed from the tree shortly after the larvae depart, leaving heavily infested Christmas trees looking bare. In these cases, harvest may have to be delayed for at least two years.

Management: This pest may be a semi-cyclic phenomenon in Christmas tree plantations, with the population building to damaging levels over a course of a couple of years, then virtually disappearing for several years.

Several parasites help keep the pest population in check most years. Scout for this pest in late summer when galled needles are still on the foliage. If the number of galled needles is small, or infested trees are still three or more years from harvest, little or no chemical control may be needed. Chemical control may be warranted if more than 10 percent of needles on affected trees show galls, or the plantation has had a history of problems with this pest.

Douglas-fir Needle Midge (*Contarnia pseudotsugae*)

Hosts: Douglas-fir (*Pseudotsuga menziesii*)

Description & Life Cycle: Adult emergence occurs about the time of bud break and there is one generation a year. Females lay eggs in expanding buds. Once they larvae emerge and move into the needle. This is the point where the gall is formed. In late summer the larvae drop to the soil from the underside of the needle and overwinter in the soil under infested trees.

Signs & Symptoms: The larvae of this midge cause swelling or galling and distortion of needles of Douglas-fir. Later in summer the portions beyond turn brown and may break off. This injury than can sometimes be confused with that caused by Cooley spruce gall adelgid (CSGA) or Rhabdocline or Swiss needlecasts. Only the midge will cause an actual gall (swelling) though where the larva is feeding inside. Like damage from CSGA, needles damaged from this midge are often bent and distorted at the point the insect is feeding. The discolored area on the needles starts off yellow but then turns purple and eventually brown as the season progresses. The swelled area can appear reddish or purplish. If you suspect CSGA look for cottony remnants or cast skins at the point of distortion.

Management: Timing of control is aimed at the adult midge before the female can lay eggs. Set up emergence traps on the ground under Douglas-fir trees with midge damage in early April prior to budbreak to catch adults and help determine appropriate timing. Directions for making your own Douglas-fir needle midge trap may be found at <http://pubs.extension.oregonstate.edu/em9093/overview-trapping-and->

[monitoring-options](#). Check traps every other day until midges appear. Time applications within a week after first adults are detected in traps. See the Cornell Guidelines for registered insecticides for this pest.

Honeylocust Pod Gall Midge (*Dasineura gleditschiae*) (225)

Hosts: Honeylocust (*Gleditsia triacanthos*) only

Description & Life Cycle: The adult midges first appear when new growth on the honeylocust begins in spring. The midges are ⅛ inch long and black with a red abdomen. The females lay their eggs, which are kidney-shaped and lemon-colored, on newly opening buds. In one to two days, the maggots hatch and start to feed. These ¼ inch whitish to slightly yellow maggots, usually one to several per gall, cause the leaflets to swell into pod galls. The pod galls turn brown and drop to the ground. The larvae mature and pupate in the pods. The adults emerge from these pods. The cycle repeats itself. There may be up to five to seven generations per year.

Signs & Symptoms: The larvae cause the leaflets to deform into a globular or pod-like shape. These structures can be seen as the leaves begin to expand. Infested leaflets may brown and drop prematurely. Otherwise vigorous trees will refoliate. However, with repeat attacks, the branches die and the trees lose some ornamental quality.

Management: To determine when the adults are active place sticky traps on some of the terminals in early May (150–99 GDD₅₀). This will monitor the adult midges as they emerge from their overwintering sites about the time honeylocusts break bud. If the adult midges are present in high numbers, a pesticide application may be required. Honeylocust trees should be treated in mid-May (192–229 GDD₅₀). In autumn, rake up and destroy pod galls that fall to the ground. All honeylocust appear to be somewhat susceptible but cultivars such as ‘Sunburst’ are especially so.

Maple Eye Spot Gall Midge (*Acericecis ocellaris*) (223) A.K.A. Ocellate Gall Midge and Maple Leafspot Gall Midge

Hosts: Primarily on red maples (*Acer rubrum*) but occasionally also on *A. saccharinum*, *A. spicatum*, and *A. pennsylvanicum*.

Signs & Symptoms: Circular Spots (¼ inch diameter) on the upper and lower leaf surfaces of maple leaves. The spots have bright red and yellow margins and begin to appear in May and are most intense in color in June. There is a slight swelling in the center of the circle. The galls look somewhat like eyes, thus the name. The spot area later turns brown. These galls are often mistaken for a purple-eye leaf spot (*Phyllosticta minima*) a fungal disease.

Description & Life Cycle: The tiny adult midges emerge from the soil in the spring and lay their eggs in the soft tissue on the undersides of tender young leaves. The larva (maggot) feeds and secretes hormone-like chemicals which cause the leaf tissue surrounding it to swell slightly and the leaf develops bright red and yellow rings around the gall. Each spot contains a single, translucent midge larva. The larva completes its development in one to two weeks, it then drops from the underside of the leaf to the ground to burrow into the soil and pupates. It overwinters as a pupa in the soil. There is one generation a year. By the time leaf spots are evident, most maggots have fallen off the leaf.

Management: Even though the galls can be striking in appearance, this insect does not harm tree health, therefore management is not necessary. In most years, the midges aren’t abundant enough to produce sufficient numbers of galls to get attention.