Pest Update (January 6, 2021)

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Note: samples containing living tissue may only be accepted from South Dakota. Please do not send samples of plants or insects from other states. If you live outside of South Dakota and have a question, please send a digital picture of the pest or problem.

Available on the net at:
http://sdda.sd.gov/conservation-forestry/forest-health/tree-pest-alerts/

Any treatment recommendations, including those identifying specific pesticides, are for the convenience of the reader. Pesticides mentioned in this publication are generally those that are most commonly available to the public in South Dakota and the inclusion of a product shall not be taken as an endorsement or the exclusion a criticism regarding effectiveness. Please read and follow all label instructions as the label is the final authority for a product's use on a pest or plant. Products requiring a commercial pesticide license are occasionally mentioned if there are limited options available. These products will be identified as such, but it is the reader's responsibility to determine if they can legally apply any products identified in this publication.

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Plant development for the growing season

We are now deep into winter and there is no plant development. And that is a good thing. Tissue that is growing is susceptible to freeze injury. The last part of a tree to harden is the roots and they are less hardy (cold temperature tolerance) as the above-ground parts of the tree. Soil temperatures below 10^{o}F are fatal to most tree roots. Fortunately, roots are well insulated by the soil and the litter layer so extremely cold temperatures are rare.

We are well above that threshold at this time and with the snow cover I doubt if we will see cold temperature root mortality this year. However, during cold, open winters in the past we did see substantial seedling mortality in young belts. The only place we will see damage (and already are) are in potted trees left outside. The soil volume in a pot is not great enough to provide adequate insulation. Do not set a potted Christmas tree (or other potted tree) outside now without plenty of straw or mulch to cover and protect the root ball. Otherwise, it will be a 'Charlie Brown' tree come spring.

Timely Topics

Emerald ash borer life cycle

Emerald ash borer has been confirmed in three South Dakota communities, Canton, Sioux Falls and Worthing during the past two years. I expect we will confirm emerald ash in nearby communities during 2021. There are likely more communities in Lincoln and Minnehaha Counties where the insect is present but not yet detected. It is also beginning to appear in windbreaks near Canton and I suspect we will have more reports of producers noticing extensive, and expanding, dieback in the ash row in their belts.

We will probably find it soon, perhaps 2021 but if not then likely 2022 in some of the communities adjacent to these two counties. Since emerald ash borer infestations tend to follow transportation corridors, communities along I-29 and I-90 will soon become infested. By the end of this decade many areas of the state will be impacted by this insect.

So now is a good time to review the life cycle of this insect. The past two years samples have been collected monthly during the dormant season and almost weekly during the growing season to monitor development of the insect. Understanding when the various life stages – egg, larva, pupa, adult – occur is important for setting "no fly" recommendations – times we do not want to move wood around *in* a community since the adults are flying – and determining the optimum timing for treatment.

Emerald ash borer can have a generation take either one or two years to complete. Early in an outbreak, when the ash trees are healthy, many of these insects have a two-year life cycle meaning it take two years to complete one generation. Once the outbreak starts to expand and more trees become stressed by repeated attacks by the insect, a generation can be completed in one year. We commonly saw two-year life cycles in 2018 as larvae were found every month of the year. Now the one-year life cycle dominates.

We will start the life cycle with the bullet-shaped, metallic green adults emerging from the tree. This usually begins in early June, which coincides with the start of flowering on black

locust (*Robina pseudoacacia*) (450-500 degree days, base 50). The peak of emergence is about three weeks later when little-leaf linden (*Tilia cordata*) is in full bloom (1000-1100 degree days, base 50). Emergence significantly tappers off by mid-July when smooth hydrangeas (*Hydrangea arborescens*) are blooming. The adults live for about three to six weeks, so they have disappeared by the end of August.

The adults feed on ash leaves for about a week or two following emergence and then mate, laying eggs about a week later. This means we start seeing eggs laid in mid-June. The white, 1/25-inch diameter eggs are laid in bark crevices or beneath bark flaps, usually near branch collars in a sunny spot on the tree. The eggs turn brown within a few days and hatch about a week after they are laid. We start seeing larvae in late June.

The development time for the four molts, instars, of the wormlike larval stage is temperature dependent. The sweet spot is about 80^{o}F, extended periods of temperatures below 65^{o}F or above 95^{o}F slow development (and this is temperature beneath the bark which may be 5^{o}F different from the air temperature). The first instar larvae immediately burrow through the bark into the inner bark (phloem) where they start cutting serpentine tunnels (also called galleries) perpendicular to the grain of the wood. They are about 1/4- inches long and remain in this instar for about ten days. These are the most common larval stage during late June into mid-July.

The second instar are almost 1/2-inch long. They continue to crave serpentine galleries through the inner bark. However, they are still so small that they can fit in the inner bark and cambial tissue, so you do not see any carving into the wood. They feed for about ten days before molting in the third instar. The 2nd instar is commonly found during July. However, a few are still around in August and I found one or two even in early September.

The third instars are about 3/4- to 1-inch long. These larvae are so thick they cannot fit in the narrow band of the inner bark and will begin to etch the sapwood as they continue to wind their galleries in the tree. The third instar is the real tree-killers. The tunnels become so extensive and thick that they disrupt the movement of sugars from the leaves to the roots. The sapwood etching can also disrupt water movement. The third instars are typically found in late July through early September. The beetle's life cycle is becoming more synchronized by this

time in development and most of the larvae found in a tree are in their third instar by mid-August. There will be a few 2nd instars as well as 4th instars.

The fourth instars are about 1 1/4-inch long. These are even larger than the third instars and do extensive injury with their tunneling. The increasingly larger tunnels can be more than a foot long by this time. These are commonly found by late August and after about a month, usually by October, they are beginning to dip into the sapwood to form an overwintering cell about 1/4–inch into the wood. The fourth instar larvae have all move to their cells by late October where they curl into a J-shaped form for their long winter nap. This stage is also known as the prepupae.

The following May the overwintering prepupae form pupae which gradually take on the appearance of the adult beetle. This stage starts just a little before many crabapples begin blooming (about 220-260 degree days, base 50). Pupae are a little longer than 1/2 -inch and gradually take on the appearance of the adult. After three weeks pupa being to become adults. These new adults may remain beneath the bark for a week or two before emerging. Emergence starts when we have day temperatures staying above 50°F with emergence continuing through June but tapering off by early July.

The importance of life cycle development on timing treatments

I prefer that trees are treated by trunk injection during May, just after the leaves begin to form, through June. Since adults must feed on ash leaves before mating and laying eggs, trees that are treated in May will have insecticide in the foliage to kill the adults before they lay eggs on the tree. Any female that happens to land on the tree without munching a few leaves from the tree (she stopped for a snack on a nearby ash first) will find her larvae have a very short life. It does not take much insecticide to kill first and second instar larvae and these will die before they do much tunneling and damage to the tree.

The spring injection will continue to work through the next growing season, killing adults and young larvae. It will need to be repeated the following spring to maintain a high degree of protection. Hence injecting every other spring is the best timing for protecting an ash tree.

Treatments in mid-summer, July and August, can be effective (if there is adequate soil moisture to carry the insecticide throughout the canopy). But they will kill few adults that

first season and the larvae have already carved an extensive network of tunnels that are damaging the tree.

The insecticide will continue to work throughout the next growing season, killing adults and young larvae. However, that protection may not extend a full two years into the following season so treatments should move to the spring. Hence, if an ash tree is treated in the summer or fall, the following treatment should be moved to the spring about a year and half later.

E-samples

What is this tree? Not one you want to mess with!

I received this picture of a tree growing along a ditch near Gayville, SD. This is the stem of a young common honeylocust (*Gleditsia triacanthos*). The honeylocust trees we plant in towns were developed from the thornless variety (*G. triacanthos* var *inermis*). Before we started releasing thornless honeylocust cultivars in the mid-1940s, honeylocust was banned from many communities – with these thorns you can see why!

So why the thorns? The current thought is that the large, branched thorns keep critters from reaching up to the sweet honeylocust pods. The critters are gone now. I have not seen any mastodons lately in South Dakota, at least not in the past 9,000 years (about the time I started teaching here according to some students).

Honeylocust pods are annoying to rake up but they are also very sweet. Apparently, they were tasty to mastodons and the sweetness was instrumental in getting these big mammals to chew on the pods and poop out the seeds, scattering them across the landscape. But the seeds are not ripe until the pods fall from the tree, so the tree did not want the pods picked too early. If you look closely at a honeylocust, you notice the thorns stop about 15 feet from the ground, about the reach of a mastodon. A good way to discourage them from grabbing the fruit too early!

Squirrels chewing bark off elm trees

This is a phenomenon that occurs throughout much of the country and almost every year. It not hard to see reports from alarmed elm tree owners from North Dakota to Florida concerned with squirrels chewing the bark from their elm trees. While elms seem to be a preferred food, you can also find squirrel damage on basswoods, hackberries, and maples. This past week I have had several call and text messages from South Dakotans wondering why squirrels are stripping bark from their trees!

No one knows the reason why squirrels strip the bark off these trees. The most likely reason is they are looking for a sweet treat. Down south in Texas, the squirrels are after the cedar elms (*Ulmus crassifolia*), in Missouri the American (*U. americana*) and slippery (*U. rubra*) elms and up here the American and Siberian (*U. pumila*) elms. It does not appear they have a favorite elm; it is just whatever is available.

But what they all have in common is sweet (to a squirrel) inner bark. The sweetness is usually highest in the spring, just before bud break but the sugars also seem to concentrate in long dry warm Autumns. Combine that with the drought reducing the fruit and nut crop on many trees this year, common winter food resources for squirrels, and you have the perfect conditions for stripping elms.

There is not much that can be done to stop them. Some recommend setting another food source out to appease the squirrels, but this can just bring in more squirrels and some still prefer your trees. Another tactic is to place a smooth tin sheet around the trunk of an isolated elm so the squirrels cannot climb the tree. The recommendation is the sheet must be at least 2 feet wide and the base of the tin sheet be about three feet from the ground. The sheet must be removed before the tree starts to grow in the spring, otherwise it can choke and girdle the trunk.

Samples received/Site visits

Hamlin County **Thinning ponderosa pines and Colorado spruce**

Pine pitch moths (*Retinia*) nodules (pitch masses) were found on many of the stunted or dead pine shoot tips. The dead tips result in prolific branching to these shoots, so the canopies have a tufted appearance. They also seem to prefer specific trees – reason unknown – so a few trees can become heavily infested while surrounding trees are free of these nodules.

I was able to find a pupa inside a nodule. The literature says the insect pupates in the spring and they should be larvae now, but I can find both at this time of year. The insect also can have a two-year life cycle so some overlap in life stages is not too surprising. Unfortunately, there is not an insecticide treatment for this insect. The literature suggests breaking open the nodules and crushing the larvae inside. This would be a very time-consuming task and might be appropriate in an isolated young tree, but not in a stand.

The spruce planted along the road presented with thinning foliage in the lower canopies. The trees were spaced very close so much of the interior thinning can be attributed to mutual shading. While spruce will tolerate denser shade than many pines, they still require higher light intensities than many deciduous trees. Spruce that planted too close - where the lower branches of adjacent trees are intertwined – usually start losing the needles on the shaded, lower branches.

But the still air and higher humidity in these shade branches also are favorable environments for many diseases, insects, and mites. These trees had a very dense population of spruce bud scale (*Physokermes piceae*). It was hard not to find a branch node that did not have at least several adult female scales attached to it. The adults are reddish-brown, global, and really do look like a spruce bud (hence the name and the reason they are frequently overlooked).

These insects suck the sap from the branches which can contribute to decline. Treat trees when lindens begin to bloom (mid-June) with an insecticide label for this use and containing dinotefuran as the active chemical. Summer horticultural oils can also be used; an advantage to these is they have a lower impact on the numerous insects that feed on scale crawlers and provide most of the control. Imidacloprid can be used as a soil drench in early fall for control the following season

Pennington County **Black Hills spruce losing needles**

We do not see many foliage samples of white spruce (*Picea glauca*), what we commonly refer to as Black Hills in South Dakota. But no tree species is complete free of problems. A foliage disease we see on white spruce, but not usually on Colorado spruce (*P. pungens*) is lirula needle blight (*Lirula macrospora*). The disease seems to appear sporadically, in small groupings, rather than widespread across the landscape. It also is more common in cool climates so occurs more often in the Black Hills than in Sioux Falls. I frequently saw this disease in northern Minnesota, near Duluth, but not in the southern part of the state.

The symptoms, yellow banding, occurs more than a year after the initial infection. The yellow bands turn light purple which eventually extends to the entire needle. The black, elongated fruiting bodies of the fungus will appear on the underside of the two-year-old needles. About three years after infection, the needle turns gray and fall. A common pattern is the newest foliage, the needles on the tips appear normal (though may be infected), with the older needles progressively showing more systems; 2nd year needles yellow

banding becoming purple, 3rd year needles will be reddish brown, and 4th year needles turning gray and falling.

The disease usually does not require treatments. It does not always result in tree decline, sometimes it is limited to the lower branches. Since the infected needles can remain attached for several years, the trees often have a gray cast to these needles along the lower branches. There are varying degrees of resistance to this disease and some trees will repeatedly present symptoms and other never.

The best approach is to remove trees that repeatedly present severe symptoms. This effort is particularly valuable in dense stands where the shading and still air allow the foliage to stay wet longer (a requirement for fungal spore germination). Opening the grouping of spruce by removing some of the trees may reduce the severity of infection on the remaining trees.

Fungicide treatments may be necessary for trees that repeatedly present symptoms. Chlorothalonil is labelled for spruce foliage diseases and the recommendation is treating when the new needles have half formed with a second treatment 10 days later. However, one treatment in late July has also shown effectiveness at reducing the severity of the disease. If fungicides are used, remember these sprays protect foliage from becoming infected. They will not significantly reduce symptoms of foliage already infected. This is one reason treatments for fungal foliage diseases of conifers are usually done for at least two years in a row.

Reviewed by Master Gardeners Dawnee Lebeau, Carrie Moore, and Bess Pallares

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