

# THE PURDUE LANDSCAPE REPORT

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## Oak Kermes Scale and Fungal Dieback: A One-Two punch for Northern Red Oak

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Northern red oak (*Quercus rubra*) is a Midwest native and is generally well adapted to growth across much of the region, but we get questions about dieback or 'flagging' on it fairly regularly.

The two most common causes of twig dieback on this host are Kermes scale (*Allokermes galliformis* and *A. kingii*) and fungal canker/dieback pathogens (*Botryosphaeria* spp. and related fungi). Either problem alone can cause dieback but we frequently see both the scale insect and the fungal pathogen(s) together on the same stem. In a recent small pilot survey of trees on the Purdue campus we found that all 10 twigs with Oak Kermes scale we collected also had fungal canker/dieback. This could be coincidence, but it seems to point to an association between the insects and the fungi involved. The scales may be creating wounds that allow easier infection by dieback pathogens or they may be stressing the tree enough that normally small twig infections move more quickly into small branches and cause noticeable dieback.

### Symptoms and Signs

New cases of dieback (flagging) appear in mid-summer, around July, as small twigs or individual leaves turn brown near branch ends (Figs. 1 and 2). Oak kermes scales appear as one or more bumps present on petioles or stems where dieback is developing (Figs. 3 and 4). The size and distinctive stripe across the middle help distinguish them as Oak kermes scale (Fig. 5). Honeydew and sooty mold are usually also present on leaves and branches of heavily infested trees. Fungal dieback, when present in the absence of the Kermes scales often starts out in a similar pattern, but usually causes twig death instead of death of individual leaves. Stems with fungal cankers may have small cracks, sunken areas and raised bumps where fungal fruiting bodies are

developing (Fig. 6).



Fig 1. Oak trees with kermes flagging. Photo by Cliff Sadof



Fig 2. Red Oak flagging. Photo by John Obermeyer





Fig 3. Kermes scale on Oak twig. Photo by John Obermeyer



Fig 4. Kermes scale on Oak twig. Photo by John Obermeyer



Fig 5. Kermes scale on Oak twig. Photo by John Obermeyer



Fig 6. Botryosphaeria canker on Red Oak. Photo by John Obermeyer

### Oak Kermes Biology



Fig 7. White male kermes scales in June. Photo by Cliff Sadof

Oak kermes has one generation per year. They winter as immature settled scales on twigs and branches. When the weather warms in the spring, about May in the Midwest, the scales become active and move to a new site on the stems to feed. White male scales (Fig. 7) can be seen feeding on the trunk in June. Winged adult males emerge in early summer and fly to mate with females in the tree canopy. Mated females become rather large and brown with a distinctive light color stripe across the middle. They are capable of producing over 3000 eggs from July to early September. Eggs hatch into flat immature crawlers during September and October. These crawlers settle in nooks and crannies of twigs to feed before becoming dormant in the winter.

### Botryosphaeria Biology

This group of pathogens (several species may be involved) are similar to each other, in that they overwinter in infected branches and twigs in the tree, then in the spring begin releasing both sexual (ascospore stage) and asexual (conidia stage) spores which can infect new twigs. Ascospores can become airborne and be moved by wind, but conidia are mostly dispersed by water movement during rainfall or periods of heavy dew. Small wounds from insect feeding, physical damage or pruning increase the chances of infection, but these fungi can also infect susceptible hosts directly in the absence of a wound through natural openings, such as lenticels, and direct penetration of succulent new growth. Botryosphaeria can attack a very wide range of



woody plants so there is always plenty of inoculum around, either in your landscape or in your neighbors' trees or nearby woods.

### Management

Insecticides are not very effective at controlling Oak kermes scale. Apply horticultural oil when scales become active in May. This will kill immature scales and conserve natural enemies that normally keep this scale under control. Some trials show that application of a pyrethroid insecticide (bifenthrin, permethrin) could cause greater rates of mortality. Pyriproxifen, an insecticide that has proven effective against armored and soft scales may also be useful at this time. Active ingredients which are effective against kermes include: Bifenthrin, Flupyradifurone, Horticultural oil (Paraffinic or superior oil), Permethrin, and Pyriproxifen.

The list of options for managing the fungal pathogens is shorter still: prune out dieback where practical, control the scale where possible and optimize growing conditions for the tree to help it better resist infections. Fungicides are of no help in this situation.

### Diagnosis and Confirmation

If you suspect Oak kermes scale or a fungal dieback, photos of the tree can be sent to the PPDL along with branch samples containing both living and dead tissue. The transition zone from live to dead tissue is the ideal material for diagnosticians to use to isolate and confirm the fungal dieback and an entomologist can determine the presence of scale insects.

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## I'm Just Not Lichen It

(Lindsey Purcell, [lapurcel@purdue.edu](mailto:lapurcel@purdue.edu))

Each year, several calls and emails express concern or interest regarding this "strange growth" on my tree. Does it mean my tree is dying? Should I spray something to kill it?

The answer is "No".

Trees can have a partnership with lichen (pronounced "liken") basically anywhere on the tree. This interesting organism can be found on trunks and branches alike. The key thing to remember, they are not and do not cause disease problems. They exist on the tree to only to obtain sunlight and can grow rapidly when exposed to full sun conditions. In addition to growing on tree parts, lichens can be found in just about any suitable environment including dead wood, rocks, soil, or just about any place they can obtain sun.

Lichen species are an extraordinary organism because it consists of two unrelated organisms, an alga and a fungus. These two components coexist as a single organism creating a symbiotic relationship. The alga, because it is a green plant, can photosynthesize and provide energy for the lichen. The fungus contributes to the relationship by obtaining water and minerals and by protecting the algal cells from desiccation. The fungus and the alga when working together make up what is known as the lichen thallus.

The color and form of this growth is often used to group and classify the lichens. The most common species of lichens on trees tend to be a gray-green color, but other species may be orange,

yellow, slate blue, or black.



Example of crustose lichen.



Example of foliose lichen

There are three major growth forms of lichens: foliose, fruticose, and crustose. Foliose lichens have leaf-like lobes. These are the gray-green structures that can often be seen growing on tree trunks or branches. They are slightly raised and can grow and coalesce with other lichen thalli, covering several inches or more of bark. If moistened, they become somewhat rubbery and can be removed. Fruticose lichens have hair-like or stringy thalli and are less common. Finally, as the name implies, crustose lichens have crust-like thalli. Crustose lichens can often be found tightly embedded on rocks or lower tree trunks. (Rocks with lichens are used to add interest to rock gardens.)



Lichen and a sap rot fungus on a tree.

Don't be alarmed if you see them on your trees or anywhere in the urban forest because they are an important part of the ecosystem and can tell a story. Lichens need clean, fresh air to survive. As an organism they can absorb everything beneficial nutrients to harmful toxins. They especially like to absorb water in the air, which is why so many are found in damper areas along lakes and streams or other water sources.

Look around the big cities of the world. What do you see? Not very many lichens, that's for sure. Very few lichens can survive near factories, next to highways, and other sources of pollution. Because lichens are extremely sensitive to air pollution, their absence can be used to indicate poor air quality or excessive air pollutants. In fact, some research indicates the various forms of lichen can help in identification of the type of possible pollution sources and their origin. So, don't get alarmed about it, just start taking a little "lichen" to it.

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## 10 Places to Refresh Your Management Knowledge Over the Winter

(Elizabeth Barnes, [barne175@purdue.edu](mailto:barne175@purdue.edu))



Box tree moth is one of many emerging pests that you can learn about in the winter courses offered online and in person.

There may be fewer insect problems to deal with now that bugs are settling in for the winter, but that doesn't mean you should stop thinking about them. Fall and winter are the perfect time to brush up on your knowledge of all things six-legged, whether friend or foe, and new management techniques. We've compiled a list of organizations that continue to provide educational programs through the fall and winter months.

### EAB University

This webinar series features invasive species experts from around the country. This semester includes talks on spotted lanternfly, box tree moth, and long-term invasive species management. Spotted lanternfly was recently reported in Indiana and box tree moth is an emerging species of concern. Learning about them now is a great way to be prepared in case they reach your area. Registrations for these webinars and recordings of past webinars are [available on the EABU site](#).

### Master Gardener and Master Naturalists

Those interested in horticulture or the natural world in general can deepen their knowledge through [Master Gardener](#) and [Master Naturalists](#) programs. They have an extensive collection of resources that is well worth checking out even if you don't decide to join one of the programs.

### Purdue Entomology and Forestry and Natural Resources

These two Purdue departments regularly host webinars, conferences, and in-person events covering a range of insect and plant topics. These events are great ways to connect with experts and get answers to issues you've encountered. Purdue FNR is also offering networking sessions this week for foresters and those interested in the field. Most programs are free and open to the public.

### **CISMA (Indiana Invasive Species Groups)**

Looking for something in person? Join your county CISMA! This network of invasive species groups hold year round events and many have regular newsletters. They also offer services like free [Land Assessments and Management Plans](#) for people concerned about invasive plants. Even if you don't join one, check out their [Landowner Toolkits](#) for some great tips on taking care of all sizes of property.

### **National Societies' Webinars**

Many national societies host webinars that are open to the public. Many offer a range of topics from research reports to

management guides to refresher courses. The [Entomological Society North American Invasive Species Management Association](#), and [Natural Areas Association](#) all regularly offer a range of webinars on invasive species, land management, and insects.

### **Local Conventions**

Many local groups have live and virtual conferences planned for the winter months including: [The Annual Woodland Owner Conference](#), [Indiana Green Expo](#), [Indiana Native Plants Society](#), and the [Bi-State Garden Conference](#).

*Cover image by Elizabeth Barnes, Purdue Entomology*

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