Photo courtesy: Whitney Cranshaw, Colorado State University, Bugwood.org

Figure 7. Exit holes of the walnut twig beetle. Their high number in a single location indicates that the holes are not entry holes or due to other causes. Because juvenile bark beetles don't usually travel far when feeding under the bark, the general rule of thumb is that a few adults go in to lay eggs and many new beetles come out.

Thousand Cankers Disease: What You Need to Know

by Jody Thompson

Introduction

Seven states and rising. That's where Thousand Cankers Disease (TCD) has been found and quarantines issued in the Eastern U.S. since 2010 (Fig. 1).

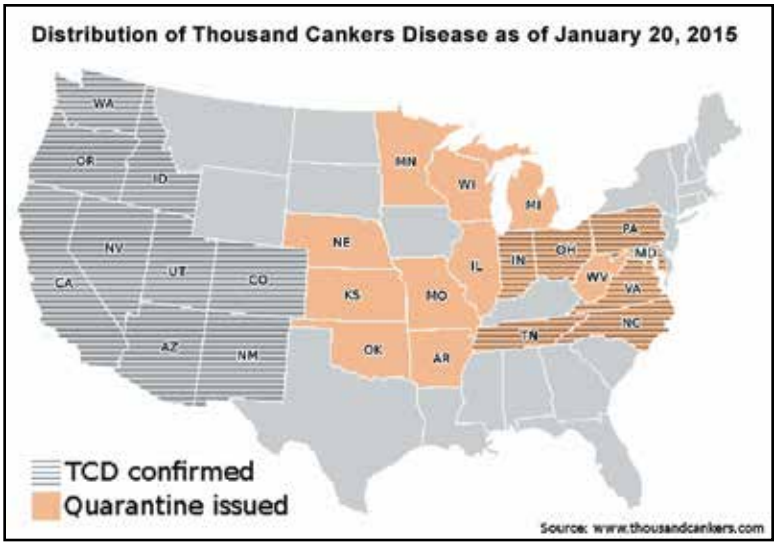

Figure 1. Thousand Cankers Disease locations and states with quarantines. Source: http://www.thousandcankers.com/media/images/TCD_Confirmed_State_Map_1_2015.png

TCD refers to a fungus that is spread by the walnut twig beetle; once the fungus is inside the tree it creates many small cankers that disrupt nutrient flow in the tree and leads to tree mortality. It was first discovered in Colorado in 2001. Kentucky has yet to find TCD, but we have realized that this may be one of those "it's just a matter of time" situations. The initial find in the Eastern U.S. was in Tennessee; over the past four years, the vectoring insect, infecting fungus or both has been found in Virginia, Pennsylvania, Ohio and Indiana. In 2013, it was found very close to Kentucky in Butler County, Ohio, and now experts are trying to figure out the details of the spot in Indiana. Some of these spots, such as Tennessee and Virginia, are well-established. Other spots, though, seem to be relatively new, such as Ohio and Pennsylvania.

What Happens When TCD Gets Here?

The blunt answer is that it's going to start killing trees. This doesn't necessarily mean that it's time to start cutting walnut. We certainly can't compare this problem to Emerald Ash Borer (EAB). EAB kills quickly, including healthy trees, which is different than most of our tree pests. TCD is a slower progressing problem, and by the time a tree is dying from it, the infestation is usually several years old. Also, remember that it hasn't been found in Kentucky yet. Even if it is found here, though, we don't expect it to immediately take over the entire state. Like many pests, many areas may remain unaffected for a long time. However, it is important to understand that the trees at risk are walnuts growing in plantations, orchards, remote woodlands and home landscapes. Essentially, walnuts in all locations are at risk.

How Does Thousand Cankers Disease Work?

Where Did TCD Come From?

TCD is native to parts of the southwestern U.S. In its native habitat, TCD has a job: it helps get dying trees out of the way and decomposed. This is similar to the function of thousands of other species of insects and fungi that are found living harmlessly everywhere trees grow, including many native to Kentucky.

However, people have moved TCD from its native

habitat and spread it to areas where there are no checks and balances to control it. We don't know exactly how it got to this part of the country, but with walnut logs, nursery stock and firewood moving between endless varieties of origins, the possibilities are enormous.

How Does TCD Kill Walnut Trees?

TCD is an insect and disease complex of the walnut twig beetle, *Pityophthorus juglandis* (Fig. 2), and the associated fungus, *Geosmithia morbida*. When this tiny beetle with fungal spores stored on its body chews its way into a tree, it initiates a localized fungal infection. The infection results in a small, shallow area of dead tissue under the bark that we commonly call a canker (Fig. 3).

Photo courtesy: Javier Mercado, Colorado state University, Bugwood.org

Figure 2. The walnut twig beetle, Pityophthorus juglandis, is a native of the southwestern US, where it is not a pest in Arizona walnut.

Photo courtesy: Elizabeth Bush, Virginia Polytechnic Institute and State University, Bugwood.org

Figure 3. Small canker found under the bark of a walnut branch. On very small branches, the cankers can be very shallow making them easy to accidentally scrape off.

Like other complexes, many, many beetles simultaneously attack a single tree. Eventually, there are enough attacks that the cankers grow together (Fig. 4). After a point of significant infection and compromised tree health, other fungi can easily establish and contribute to the tree's decline, and the walnut tree dies.

Photo courtesy: Ned Tisserat, Colorado State University, Bugwood.org

Figure 4. Many cankers will form and eventually grow together. This will contribute to the destruction of the phloem tissue and the death of the tree.

Identifying TCD

How Do You Know If You Have TCD?

Any level of walnut tree decline during its normal growing season should be examined. From late May to the beginning of September, look for dead twigs and branches, wilting leaves and small dead areas just under the bark of branches (Fig. 5). Look for yellowing leaves prior to September, because at the end of the summer, walnut will start to naturally lose its leaves sooner than most other trees (Fig. 6). The first stage in this natural leaf loss is yellowing leaves, which can be similar to decline caused by TCD.

Photo courtesy: Karen Snover-Clift, Cornell University, Bugwood.org

Figure 5. Walnut dying from TCD. Branch death and wilting leaves are common symptoms.

Photo courtesy: William M. Ciesla, Forest Health Management International, Bugwood.org

Figure 6. Late season yellowing of walnut leaves just prior to leave drop. This is a natural event that can be mistaken for health issues.

Dead twigs and wilting leaves alone do not mean that your trees have TCD, but noticing any level of the previously mentioned signs is the first step toward finding out if you do. Also, dead branches can be misleading. Damage, other insect pests and excessive heat can cause individual branches to die, especially branch tips. Drought and compacted soils can also lead to walnut decline and death like they will for any other tree. Diagnosis can be tough, and an infected walnut can look like a lot of trees dying from a lot of different things.

If you suspect that a tree has TCD, look at the smaller branches first. They will have the thinnest bark and will be easier to examine. Also, smaller branches are usually attacked first because of their thinner bark. As things progress and many more bark beetles begin living in a tree, they will eventually attack lower areas of a tree with thicker bark.

The first things to look for are exit holes (Fig. 7 on page 16) where beetles chew their way out of the wood. If you think that you have found some, scrape the outer bark away very carefully (Fig 3). One lesson learned early on was

that when working with very small branches you can very easily scrape the canker off, and you would never know that it was there. This is less of a problem on larger branches. If after scraping thin bark off a branch, you find a gallery within a darkened/dead area, you should be suspicious and contact someone to verify what it is.

Unless looking in a canker using magnification, don't bother looking for the beetles, because they are tiny (Fig. 8). Saying

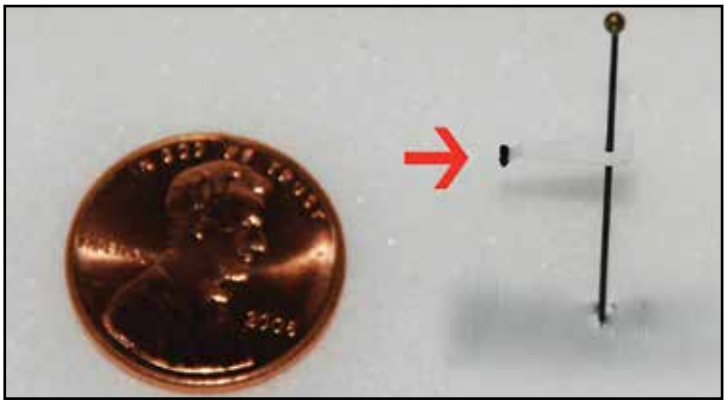

Photo courtesy: Eric R. Day, Virginia Polytechnic Institute and State University, Bugwood.org

Figure 8. Walnut twig beetles are small by any standard. However there are many types of small beetles, so identification must be made by a professional.

this is a tiny beetle, by the way, is an understatement. Even in the world of tiny insects, the walnut twig beetle is tiny. If you find tiny beetles, they will be very difficult to identify unless you have been trained to identify the large number of beetle species in the world.

Essentially beetle identification should be verified by a professional. Also, it can look similar to other tiny beetles that may be found in walnut, so, there is a danger in assuming that you have TCD just because you find a small beetle on a tree. This happens more often than you might think. The fungus will also require professional identification.

Managing TCD

Can We Protect Trees from TCD?

This is one of the most common questions asked about any sort of problem, and one that for TCD unfortunately has no good answer. There are no chemical controls known to stop TCD. It is logical to assume that we can spray something to stop it or save individual trees, because there are other pests and diseases for which that will work. Perhaps we will eventually have a solution, but that hasn't happened yet.

The best first course of action is to contact a tree professional to help you make decisions about your specific situation. Examples of professionals include foresters, consulting foresters and Cooperative Extension professionals, all of whom can work across numerous situations. Also consider certified arborists, tree care specialists who work across home and municipal landscapes.

Ultimately, the most important thing you can do is simply take care of your trees by managing them for overall health. The following are answers to a few common questions about TCD:

- Can't we kill the insects and stop them from spreading when we find them at a new spot?
  - The short answer has consistently been No. Because it is established in several areas and across numerous states, we can't know where all of the insects are. So, the disease will continue to spread, and we will continue to find it after it has become established in new areas. It's impossible to find all of these insects when there are millions of walnut trees in Kentucky alone.
- Pesticides work for my other problems, why don't they work on TCD?
  - Even the best insecticides don't kill all of the pest insects that can occur inside a tree. Some will kill most of them, but there will usually be a few that get missed. A single insect can often lay hundreds of eggs and occur by the hundreds of thousands in an individual tree. We never see most of what's out there.
- When is it too late to do something if my trees have TCD?
  - It depends on your goals for those trees.
    - Veneer – Has the potential to reduce higher quality logs to a lower grade.
    - Lumber – Has the potential to reduce lumber grade.
    - Nut Production – Anything that affects tree health affects nut quality and volume.
    - Ornamental – Anything that affects tree health affects ornamental tree quality and safety.
    - Naturally Occurring – As long as the tree lives, it will provide many of its original benefits.
- What is the government doing to stop TCD?
  - There is no federal quarantine for TCD due to the decision through APHIS that it would do little to affect the spread of TCD.
  - Many states, however, have developed their own quarantines. Kentucky is still formulating a decision about a walnut quarantine.
  - Trapping programs are in place in states throughout the eastern U.S., including Kentucky.

How To Get Help:

Contacts:

Kentucky Division of Forestry
502-564-4496
http://forestry.ky.gov/Pages/default.aspx

University of Kentucky Office of the State Entomologist
859-257-5838; ky-ose@lsv.uky.edu
http://www.uky.edu/Ag/NurseryInspection/

Local Cooperative Extension offices
http://www2.ca.uky.edu/county/

Consulting Foresters
http://kacf.org/index.php/find-a-forester/

University of Kentucky Forestry Extension
859-257-7597; forestry.extension@uky.edu
http://www2.ca.uky.edu/forestryextension/index.php

Certified Arborists
http://www.isa-arbor.com/findanarborist/findanarborist.aspx