



Exploring the World of Science

Workshop Wednesday Tree Identification with Guests from the US Forest Service Unaddressed Questions

I've started going through all of the trees and labeling leaf shape, margin, venation, etc. and I'm wondering how I should organize all the data to best prepare me for the competition. (i.e., should I be looking through a spreadsheet or should I try and prepare a step-by-step guide)

It really depends on what you think you need the most help in remembering; the two-inch binder is designed to help you. As you go through the process of compiling, think about the prompts that might help you to remember some of the trees; consider which trees are simply too tricky to remember. Refer back to the tips from USDA Forest Service experts on the webinar held Nov 9.

Are there any leaf shapes that might get confused with other leaf shapes?

There are lots of leaf shapes that can be confused with each other. Because of this it is important to not rely solely on leaf shape to identify a tree. Yes, some species have leaves that are totally unique, but most have leaves that could be described similarly to both closely and distantly related species.

This is why it's so important to use a combination of physical and ecological characteristics throughout the tree ID process. Even if we are looking only at leaves, there are features like color, texture, size, venation, and arrangement (and many more) that will help you distinguish species from one and other.

Will leaves without branches be given? And if so, is there a way to tell their arrangement without the branch?

With several hundred tournaments taking place across the country, it is impossible to predict exactly what will be presented at any given event. That would mean you should prepare to analyze leaves without their corresponding branch. If you are asked about arrangement without a branch being present you will have to work with the information that you are provided, or are able to determine, such as leaf type, tree species, known ecosystem to make a determination.

How can you distinguish between compound leaflets that have stems too as opposed to compound leaflets?

If you are looking at a structure and trying to determine if it is a branch with simple leaves or a compound leaf, the first thing I would do is look for buds. A leaf, by definition, whether simple or compound, always grows from 1 bud. So, if the structure you are looking at has buds anywhere on it, then the leaf-like parts are simple leaves; if it doesn't have buds then the entire structure you are looking at is likely a compound leaf.

Could you talk a bit about the Ginkgo tree?

The ginkgo is a really interesting tree. It is an ancient conifer, but its cones don't look like you would expect. They are more like fruits. (There are separate female and male trees, so not all ginkgoes will have these fruit-like cones.) It is deciduous, with broad, sort of fan-shaped leaves that fall off in the autumn. It is also a living fossil very similar to trees that lived 170 million years ago. It has been cultivated for hundreds of years and was thought to be extinct in the wild but was discovered in two small populations in China relatively recently.

How do the features of the Audubon guide compare to the ones discussed in this session?

The Audubon guides are nice, but we prefer guides that rely on drawings or paintings rather than photos. The photos in the guides are good, but drawings and paintings are more helpful in identifying important characteristics, and often are shown side by side to emphasize key differences. That said, the

Audubon guides have very good information about species that can be helpful and the photos are good ones.

Can you explain forest succession and what we should study about that topic?

Explaining fully the topic of forest succession is beyond what we can do here; but generally, forest succession addresses how the species present in a forest ecosystem will change over time. At the most basic level you should make sure you know the different types of succession, the species found at different phases of succession, what causes succession to occur, and the mechanisms by which it occurs. You can find this information in a good general biology textbook or for more advanced information you might consider a textbook like [Introduction to Forestry an Open Educational Resource \(https://www.oercommons.org/courses/introduction-to-forestry\)](https://www.oercommons.org/courses/introduction-to-forestry).

How do we differentiate between related species, especially pines such as the Austrian pine vs red pine?

It doesn't look like Austrian pine is on the list, but native pines can be somewhat similar.

- *First, look at the needles.*
 - *How many in a bundle? They will typically be in bundles of 2, 3, or 5 (sometimes having bundles of both 2s and 3s).*
 - *How long are the needles, and how thick?*
- *Next, look at the cones if they are available.*
 - *How big are they?*
 - *How sharp are the prickles on the ends of the scales?*
- *Finally, look at the bark.*
 - *What color is it?*
 - *How thick?*
 - *Is it flakey, or in blocks?*

What questions should we prepare for the most?

With hundreds of tournaments across the country there is no way we can predict what type of question you will see most in this event. That said, one important piece of information that you should keep in mind is that according to 3.a in the Rules for the event no more than 50% of the questions can require you to give the common or scientific name for a specimen. That means the other 50% of the questions will focus on topics identified in 3.e. and 3.f.

When given a full image of a tree, and you can't see individual leaves, how could you use tree shape?

*Most trees cannot be identified to the species level by tree shape alone. The term "tree shape" describes the shape a trees stem and canopy. [This image](#) shows some common types of tree shapes. The trouble with using tree shape as a diagnostic characteristic is that it can vary within and among species, so you want to know something else about the tree to identify the species. If you have a full image of a tree, you will likely be able to tell if it is a conifer or not and whether it is generally tall, or short. Using those characteristics plus tree shape you will be able to narrow the image down to a group of trees. After that you would need more information to determine the exact species. (except for *Cereus giganteus*, that should be easy).*

What are good online resources for tree specific information?

You can find good online resources recommended by the Forest Service on the Science Olympiad Forestry Event Pages for [Division B](#) and [Division C](#).

Few of the trees in the same family have similar leaves and flowers (mainly the catkins). The pictures on the internet don't help distinguish them. Any tips on how to learn those. (e.g., bur oak, white oak look similar if the acorn is not provided to identify)

Pictures on the internet can be extremely deceiving. One thing that images don't convey well is size. The leaves of Burr Oak and White Oak can look similar, but Burr Oak leaves can grow much larger and the lobes on Burr Oak leaves tend to be deeper than those on White Oak leaves as well. You can also use bark and acorn characteristics, combined with leaf shape, to separate many similar looking species, not just oaks. With tree ID, the devil is in the details, but with practice in the field the skills will come.

Any indigenous knowledge about trees?

While indigenous knowledge of trees is not spelled out in Sections 3.e. and 3.f. of the Rules for this Event with several hundred tournaments occurring across the country this season it is impossible to definitively say whether or not some questions on this topic might be included. The topics in Section 3.f. particularly with regard to economic, medicinal, and building uses may lend themselves to asking questions about indigenous people and trees.

Apart from tree identification will there be any questions on the botanical terms, forest types etc.?

50% of the questions can focus on topics like you described above. Please see Sections 3.e. and 3.f. for a more comprehensive list of topics that you should be prepared to answer questions about.

Any urban and community forestry questions?

With several hundred tournaments occurring across the country this season it is impossible to definitively say whether or not some questions on these topics might be included on a test. 50% of the questions can focus on topics like you described above. Please see Section 3.f. for a more comprehensive list of topics that you should be prepared to answer questions about

Would you recommend including range maps in the binder by species, or families?

If you have room in your binder, range maps could be helpful, but a good field guide should have these maps (though in some field guides they are small).

How would you recommend memorizing and understanding the effects that certain invasive species have on trees?

Only some tree species are affected by invasive insects and diseases, so it might be a good idea to understand which tree species are most at risk. A good resource that lists the most problematic invasive insects and diseases can be found here: <https://www.dontmovefirewood.org/invasive-species/>

If you take the time, as we recommended, to put together ecological and human-use information on tree species genera (and maybe a few important species), you could include information from this site.

What trees are the tallest? What trees are the longest living? What trees are currently most susceptible to disease?

*The tallest trees in the United States are coast redwoods in California and southwestern Oregon (*Sequoia sempervirens*). The longest living are Great Basin bristlecone pines (*Pinus longaeva*).*

Several tree species are at susceptible to diseases. The following site has information about important invasive insects and diseases: <https://www.dontmovefirewood.org/invasive-species/>

Here are some particularly susceptible tree species and the diseases affecting them:

- *White pines (especially *Pinus monticola*, *Pinus flexilis*, *Pinus albicaulis*): white pine blister rust*
- *Redbay: laurel wilt*
- *American chestnut and its relatives: chestnut blight*

- *American beech: beech bark disease and beech leaf disease*
- *Butternut: butternut canker*
- *Flowering dogwood: dogwood anthracnose*
- *American elm: Dutch elm disease*
- *Red oaks (several species): oak wilt*
- *Port-Orford-cedar: Port-Orford-cedar disease*
- *Coast live oak, tanoak, California-laurel: Sudden oak death*
- *Black walnut: Thousand cankers disease*

How do people determine the difference between really similar species in overlap areas, such as the overlap between Fremont's and Eastern Cottonwoods which are mostly indistinguishable? What about hybridization?

Sometimes it's difficult to tell closely related species apart when they grow in the same area. Sometimes this is the result of hybridization between two species. We recommend you focus in on the key details identified by field guides as much as possible and do your best when you are practicing on your own. Hybrids are not included on the Science Olympiad list so you should not have to identify any during the event.

Is there a good way to tell American Elm and Slippery Elm apart?

The easiest way is to feel the leaves. The tops of slippery elm leaves (contrary to the name) feel almost like sandpaper, while American elm leaves are smoother. Slippery elm twigs and buds are thicker than those of American elm. The bark of American elm can be distinctive – on older trees, the thin ridges can develop into a kind of diamond-like pattern. American elm leaves tend to be a bit narrower too, but that can be hard to tell if you don't have them next to each other.

Any advice on identifying elms and trees that look like elms?

There are several native elm species in the US, but only two are on the Science Olympiad list, American elm and slippery elm. A description of some other elms is below.

*The other species in the same family with elms is hackberry, *Celtis occidentalis*. Like the elms, its leaf bases are uneven, but the leaves have long points, and it has distinctive warty-looking bark and it has berry-like fruits (unlike the papery fruits of the elms).*

The important things about elms are that they have uneven leaf bases, doubly-toothed leaf edges (small teeth on bigger teeth) and small, flat, papery-winged roundish fruits. Two that are hardest to tell apart are American elm and slippery elm (see above). Two species have smaller leaves and corky wing-like growths on their smaller branches: rock elm (mostly in the North, with medium-sized leaves) and winged elm (mostly in the South, with small leaves). Winged elm also has more prominent wings on its leaves, and its fruits are hairy, while rock elm fruits are not. Cedar elm, found in Texas, Louisiana, Mississippi, Arkansas and Oklahoma, sometimes has wings on its branches, but not always. Its leaves are smaller than winged elm's, and sandpapery.

What is the best way to identify a tree by its bark?

As with any tree identification, you can use a combination of different bark characteristics to help you determine which species it is. The color, thickness, texture, and pattern are all useful bark characteristics during tree ID.

However it is important to remember that the bark of some trees changes depending on the age of the tree. See [this image](#) of Black Cherry bark; the inset image is young bark, while the larger one is old bark.

If you are identifying trees in the winter, and aren't sure from the bark alone, try to use other information like your geographic location and local habitat to make an informed guess at the tree species.

If two field guides have conflicting information, is there a way to determine which would be better to use?

Generally speaking, field guides should align pretty well. They might differ in the characteristics they focus on, but in almost all cases, they should get you to the same conclusion.

The rules say "leaf specimens... may be accompanied by twigs, cones, seeds, or other parts of the tree." Does that mean there will not (or should not) be a question with a twig or a cone as a sample without a leaf along with it?

No, that is not a correct interpretation of that rule. The meaning of that rule is to inform students participating in the event that they will not only be provided leaves to make identifications from but also they may be provided additional specimens

Is there a way to tell what the species of the tree is in the winter when all the leaves have fallen off?

Yes, absolutely. There should always be characteristics other than leaves to help you identify a tree, though you might have to focus on small details. Depending on the species, things that can be helpful are bark, fruits (like acorns), the thickness of twigs, and the shape and arrangement of leaf buds.

Would taking its conservation status into consideration also make sense if you're figuring out which tree of two it is?

If you were to know the conservation status of a specimen it could be a characteristic of the specimen that you consider in your identification; however, other characteristics such as color, bark shape, leaf shape, and geography are likely to be more useful in your decision making even for very closely related trees.

How do you memorize how a tree looks?

It's less about memorization and more about using tools to identify key parts of a tree. Consider characteristics, geography, etc.

What are some good websites/sources that you would recommend?

Please look at the resources provided on the Event Pages; [Division B](#) and [Division C](#). There are a variety of resources there and you should explore to find the one that is best for you.

What do you mean by "able to remain a forest"?

The phrase "able to remain a forest" was mentioned during the webinar in connection with forest management. These days there are lots of strong factors such as climate change, pollution, and human development that pressure certain ecosystems to change. This means that there are some places that (without deliberate management by humans) will eventually transition into a different type of ecosystem. In other words, forest management ensures a forest is "able to remain a forest".

Could you explain succession in relation to trees and how to find trees' successional status?

When talking about succession in trees, we are usually talking about which types of trees you can expect to find in a given place, a certain number of years after a major disturbance (clearcut, big fire, tornado/hurricane, etc.). In other words, the trees you find at one place will be different 5 years after disturbance than they will be 20 years after disturbance.

In general, when a given species appears in a place's pattern of succession is determined by (1) how much light the tree prefers, (2) how its seeds are dispersed, & (3) how quickly it grows. These factors vary by species, and even closely related species can differ in these characteristics. Succession, like all ecological processes, is highly dynamic and depends on the characteristics of all species present before, during, and after a disturbance.

A tree's successional status isn't always stated explicitly in field guides. However, there are some common terms you'll see that can provide clues.

- *"shade-tolerant" is a term usually applied to late-successional species (the opposite, shade-intolerant, applies to early species)*
- *"fast-growing" or "weedy" is a term typically applied to early-successional species*
- *When talking about seeds, "wind-dispersed" trees are usually early-successional species*

A Google search can sometimes provide you a specific answer, but usually only for early-successional species.

Do you know of any significant, common symbiotes for trees other than Mycorrhizal fungi?

They are more parasites than symbiotes, but mistletoes are plant species that grow in the crowns of several tree species. Too many mistletoe plants on a tree can cause it problems (see [Mistletoe - Wikipedia](#)).

Which places have more gene flow between different individuals or more discrete things? What determines that?

Gene flow between populations of trees depends on a few things, including the mechanism for how pollen and seeds are dispersed (for example, insects versus wind for pollen, gravity versus birds for seeds) and how far apart the populations are. Generally speaking, there will be less gene flow to populations that are more isolated and that don't have good long-distance mechanisms for dispersing their pollen and seeds.

How do you memorize how a tree looks?

Generally speaking, there are too many trees to memorize how every species looks. It might be a better use of your time to practice using field guides to identify species around you. Forestry professionals do memorize species, usually during a semester-long college class, but that takes a lot of time and effort. At the same time, it might be a good idea to work on memorizing the 20-25 most common trees in your area, focusing on leaves and other key characteristics.

What do you do when you have no idea what the fire regime of a place is?

Fire regimes are an extremely complex topic. A place's fire regime describes the type, intensity, frequency, and seasonality of the fires that occur. [This video](#) provides a good overview of fire regimes.

Humans have altered the natural fire regimes of many ecosystems in the US, so many forests that historically had short fire regimes don't anymore and now different communities of plants have grown in and the forests no longer look the way they once did. Page 10, [of this booklet](#) has two great maps that can help you get a sense for the different historical fire regimes in the US.

We seem to have more frequent and larger forest fires now. Is part of forest management preventing forests? What can we do so forests can survive a fire?

The USDA Forest Service has created a website related to this topic. Please visit [Wildland Fire | US Forest Service \(usda.gov\)](#) to learn more about forest fires, their prevention, and forest management.

Is there a way to control burn trees?

USDA Forest Service does do prescribed burns, but has a large team of dedicated, highly trained experts to do this, and only under very specific conditions. Here is the website with more information:
[Prescribed Fire | US Forest Service \(usda.gov\)](#)

Could a tree with invasive roots not be an invasive tree? **FS**

Yes! The word invasion means different things in the terms “invasive roots” and “invasive tree(plant/species)”. “Invasive roots” is a term that describes when tree roots growing in human environments (cities, parks, suburbs, landscaping, etc.) are able to grow into and damage our infrastructure.

This is a big issue in urban settings where roots from street trees grow into pipes or electrical conduits in search of water or nutrients. It also a problem is less developed areas, where roots break through impervious surfaces like asphalt in concrete, which can make them unsafe to use and costly to replace.

Urban Forestry is an exciting field of study. To learn more about the [USFS](#) and [Wikipedia](#) pages are good places to start.

An “invasive tree” describes a tree growing some place outside its native range in a way that negatively impacts the typical functions of said place.

Knowing a lot about the tree and a multitude of its elements is something that should be consistent throughout all trees right (aside from economy and background)?

To identify a tree, you don't need to know everything about all of its characteristics. We recommend focusing on the diagnostic characteristics that matter – such as the alligator-like bark and oval-shaped simple leaves with parallel veins for American dogwood. The other characteristics could be useful in some cases, but it's probably not a good use of your time to focus too much on every little thing.

In terms of the natural history and ecology of trees, it would probably be good to have some of this information for each genus and maybe at the species level for a few important species (like white oak, loblolly pine, ponderosa pine, tulip-poplar, etc.)

Do you know if we'll be tested much on forest conservation and welfare?

With hundreds of tournaments across the country there is no way we can predict how much any one topic will be emphasized at any given tournament. That said, one important piece of information that you should keep in mind is that according to 3.a. in the Rules for the event no more than 50% of the questions can require you to give the common or scientific name for a specimen. That means the other 50% of the questions will focus on topics identified in 3.e. and 3.f. Of the many topics spelled out in those two sub-sections forest conservation and welfare are included. That would mean you should be prepared to answer questions on that topic.

USDA Forest Service Resources:

i-tree: <https://www.fs.usda.gov/ccrc/tool/i-tree>

Forest Type map: <https://www.fia.fs.usda.gov/library/maps/index.php>

Most common tree species and distribution by state: [Tree species distribution in the United States Part 1 \(figshare.com\)](#)

Oak tree field guide: *A Field Guide to Native Oak Species of Eastern North America* Authors Stein, Binion and Acciavatti

General:

Tree Finder, author, Watts- ISBN0-912550-01-5

Winter Tree Finder-ISBN-978-0-91255-003-9

Bark, A field guide to trees of the Northeast- ISBN978-1-58465-852-8

State ID:

Mississippi Trees- in book form and app. Published by Mississippi Cooperative Extension
[Minnesota Forests 2018: Interactive Report \(arctgis.com\)](#)

Trees to know in Oregon and Washington published by Oregon Cooperative Extension:
<https://osupress.oregonstate.edu/book/trees-to-know-in-oregon-and-washington>

Forest Trees of Maine:

https://www.maine.gov/dacf/mfs/publications/handbooks_guides/forest_trees/index.html

Maine Kids guide: https://www.maine.gov/dacf/mfs/projects/fall_foliage/kids/treeguide.html

Tree keys from Cornell (NY): [Summer and Winter Keys \(cornell.edu\)](#) (also attached)

Common Trees of PA, can be found at this link:

[elibrary.dcnr.pa.gov/GetDocument?docId=1742149&DocName=sf-](http://elibrary.dcnr.pa.gov/GetDocument?docId=1742149&DocName=sf-commonTrees2014_online.pdf)

[commonTrees2014_online.pdf](http://elibrary.dcnr.pa.gov/GetDocument?docId=1742149&DocName=sf-commonTrees2014_online.pdf) (Users can download and print it or the Science Olympiad can request printed copies for participants by contacting Jeff Woleslagle at jwoleslagl@pa.gov)

Online Botanic Glossary:

<http://www.virtualherbarium.org/glossary/glossary.php>