ADVENTURE SCIENTISTS

EXPLORE. COLLECT. PROTECT.

ASH Field Protocols

GEAR LIST

A Stuff sack

B Bag with silica desiccant

C Alcohol kit for cleaning

D Measuring tape

E Saw-toss tool

F Envelopes for samples

YOU PROVIDE: Smartphone or tablet (required); binoculars, pocket knife (both optional)

TO DO BEFORE HEADING OUT

PERMITS

Download or print permits or permission letters for the public land you are visiting. Make sure you've read it thoroughly and are following the permit requirements.

Verify the tree species and number of trees to be sampled on the permit, as well as if anyone needs to be notified ahead of your visit.

PREDICT: WHITE OR GREEN ASH?

It is difficult tell white and green ash apart in the field, but the project scientists are anticipating that. You can help them out by finding out what grows in the area you'll visit.

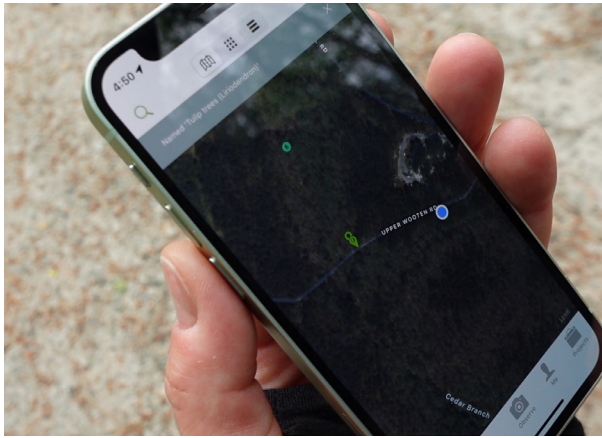
Check iNaturalist, or contact park managers if you are visiting a park, to predict whether you will find white ash or green ash, or a mix. Even foresters have trouble distinguishing between these two species! Use the resources in this guide to make your best judgment call. Be assured, our scientific partners will sort out the ash species using genetics in the lab.

FIND YOUR TREE

LOOK FOR ASH HABITAT

We advise using the app iNaturalist to guide you to trees. Scout before you head out in the field, use the map to guide you while in the field. We also recommend using Seek, an app by iNaturalist, to verify your species ID.

Green ash is widely distributed, prefers bottom lands with moist soil. White ash is the most common ash, but never the dominant species in an area. It prefers moderately well-drained soils from sea level up to 4,000 ft.



TRACKING DOWN ASH TREES

Looking for compound leaves will be your best "search image" to find ash trees. See the next page.

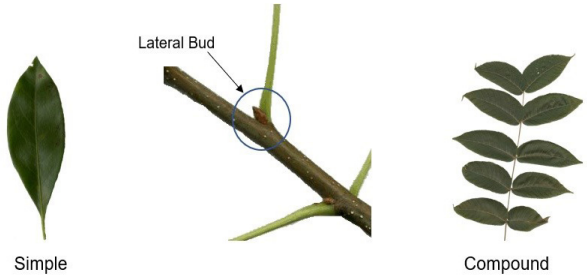
Ash trees also grow in stands with other ash trees, so look for groups of similar trees. Your goal will be to sample 20-40 individuals during your outing.

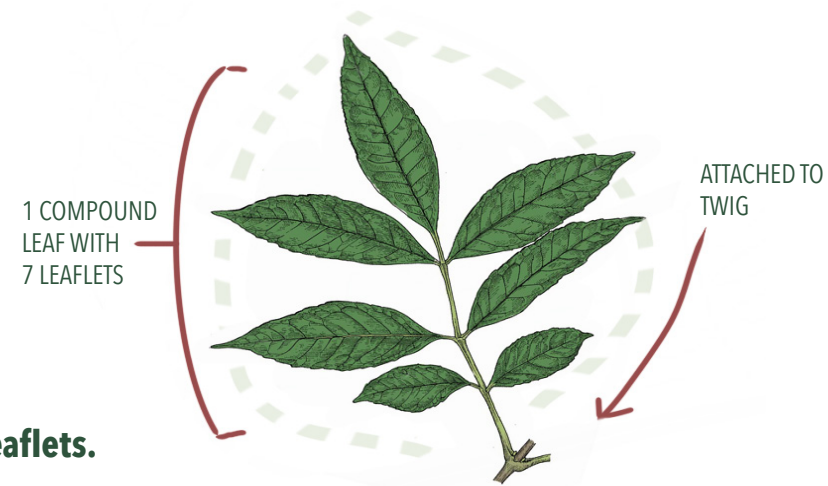
FIND YOUR TREE: COMPOUND LEAVES

LEAF SHAPE & STRUCTURE

Broadly, leaves can either be simple or compound. Simple leaves have a leaf blade all in one piece, though it may be lobed or divided.

Compound leaves have multiple leaflets, attached to a single middle stalk with their own distinct stalks. See illustrations. You will find a "lateral bud" at the base of a leaf, not at the based of a leaflet. You can imag a compound leaf filling the space of a large simple leaf (see dotted outline).





Ash have compound leaves with 5-7 leaflets.

ASH CHARACTERISTICS

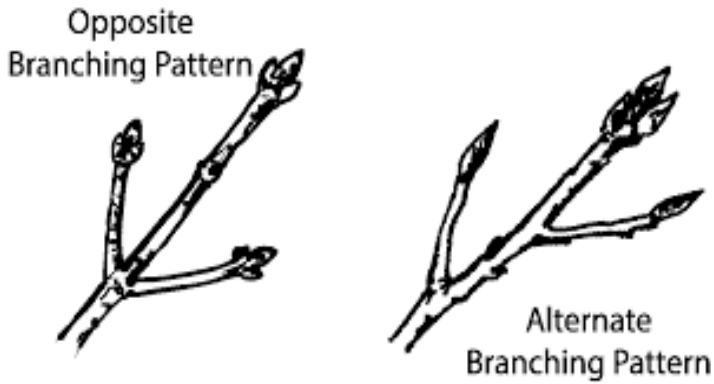
LEAVES Look for trees with compound leaves. Each compound leaf has 5 to 9 leaflets on an ash tree.

GROWTH PATTERN

Leaves, leaflets, branches all grow in an opposite arrangement (see step 1 of key on next page)

BARK

Bark ridges on mature ash trees form diamonds



IDENTIFY THE TREE

STEP 1:
Look at the branching pattern on the tree. How do twigs, leaflets, and leaves grow in relation to one another?

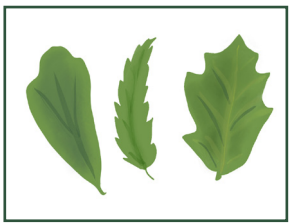
Branches opposite

Branches alternate

not an ash

STEP 2:
Look at the leaves

Compound leaves



Simple leaves

not an ash

IDENTIFY THE TREE

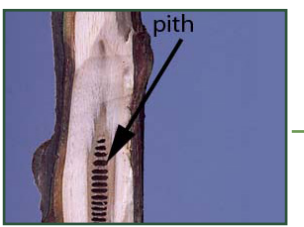
STEP 3:
Count the leaflets on a few compound leaves. How many are there?

5 to 7 leaflets

9 to 15 leaflets

not an ash

STEP 4:
It's an ash! You can sample. For an extra check, you can cut open a twig, lengthwise, and look at the pith (the tissue at the center).



chambered pith

not an ash

DISTINGUISH BETWEEN ASHES

Don't stress, but make your best call!

Ash Bark Characteristics: White vs Green vs Black

White Ash

The bark pattern resembles a diamond pattern; is broken into broad, parallel ridges by deep furrows; is dark brown or deep gray.

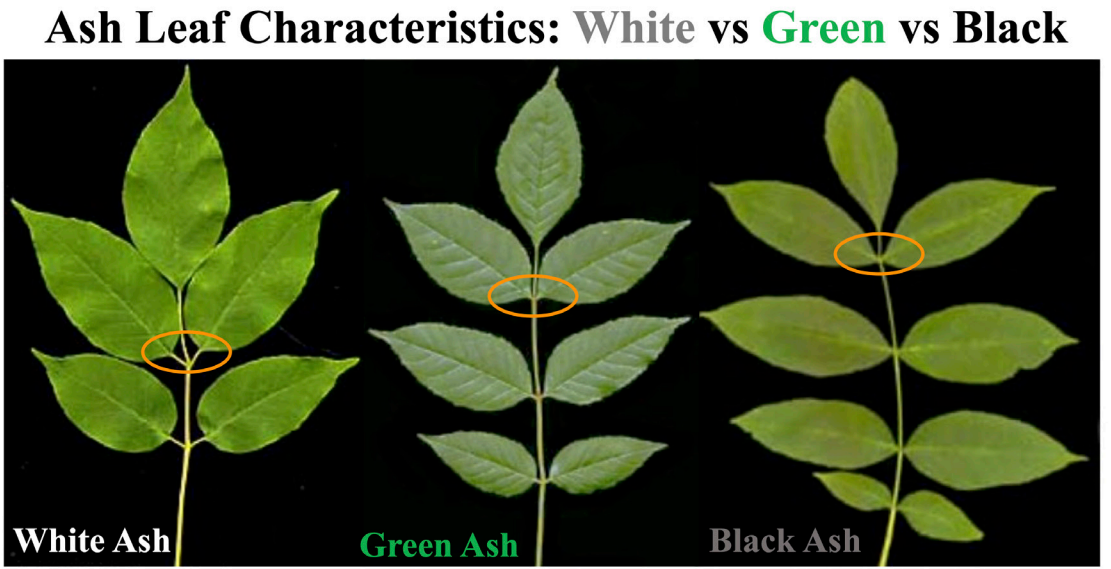
Green Ash

The bark on the trunk of old trees is dark gray or brown, and firm and furrowed like that of the white ash; also resembles a diamond pattern.

Black Ash

The bark is gray to dark gray, corky and spongy, with generally parallel ridges. It rubs off freely with the hand.

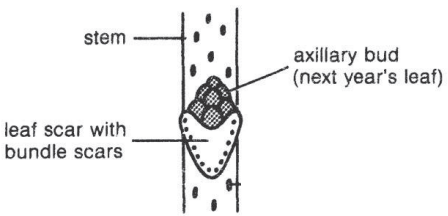
DISTINGUISH BETWEEN ASHES



See the difference in the length of the stalk that attaches a leaflet to the main stalk. White ash is longer, green is shorter, black has no stalk before the main stalk.

DISTINGUISH BETWEEN ASHES

The leaf scar is a mark left after a leaf falls off a growing twig. Marks of vascular bundles (tissue that transports nutrients) are visible in leaf scars.

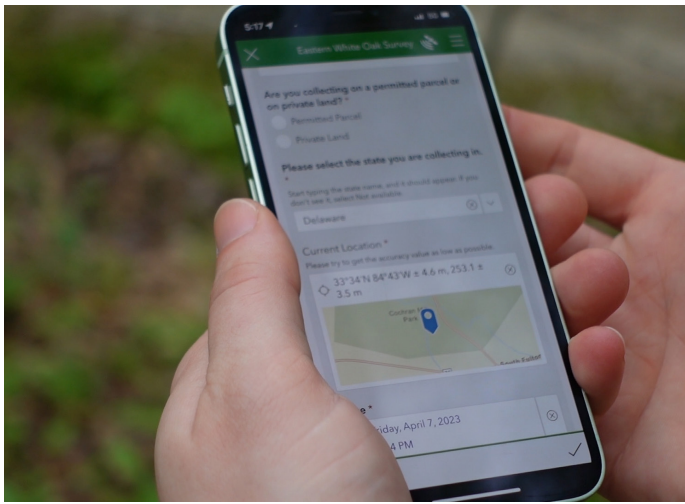


Ash Leaf Scar Characteristics: White vs Green vs Black

White Ash	Green Ash	Black Ash
Leaf scar is rounded at the bottom, notched at the top.	Leaf scars are semicircular to flat across the top.	Nearly circular leaf scar.

ENTER GENERAL INFORMATION

Open the Survey123 app. Tip: Use airplane mode while collecting data to save battery. Close the app when you aren't actively entering data.



Select "Tulip Poplar and Ash Survey" and tap "Collect"

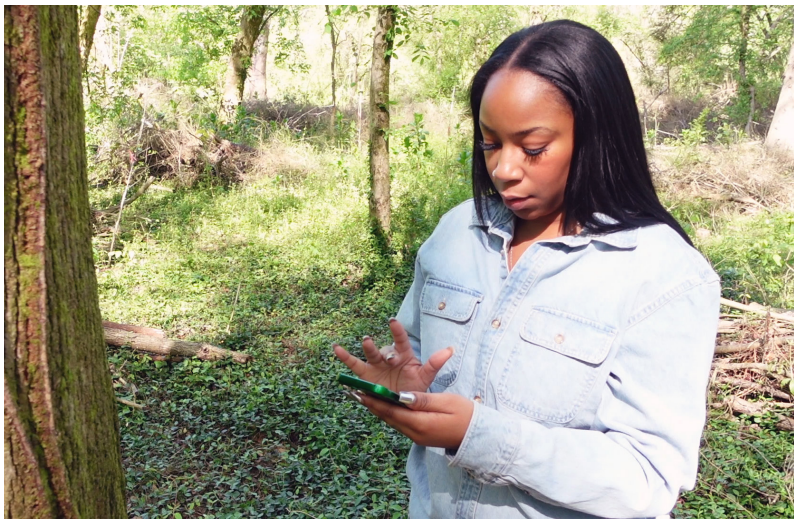
Follow prompts in the survey, including:

Mark your location: Look at the map and verify that the location is accurate. Click the target icon in the upper left to correct the location if needed. Tap and hold to increase accuracy to +/- a few meters or as low as possible. Tap again to stop.

Check that the date is accurate.

ABSENCE DATA AND TOOL CHECK

Did you look carefully and not find any ash trees in the area? Select "Yes" when asked "Is this record for absence data" and record notes about the area where you didn't find any ash. This informs our partners and other volunteers.



TOOLS SANITIZED?

Select "Yes" to indicate that your tools are clean before proceeding.

If this is your first tree, the tools arrived clean.

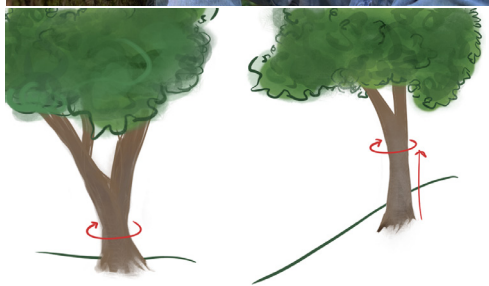
If you sampled before and forgot to clean, do it now! See page 21.

MEASURE TREE CIRCUMFERENCE

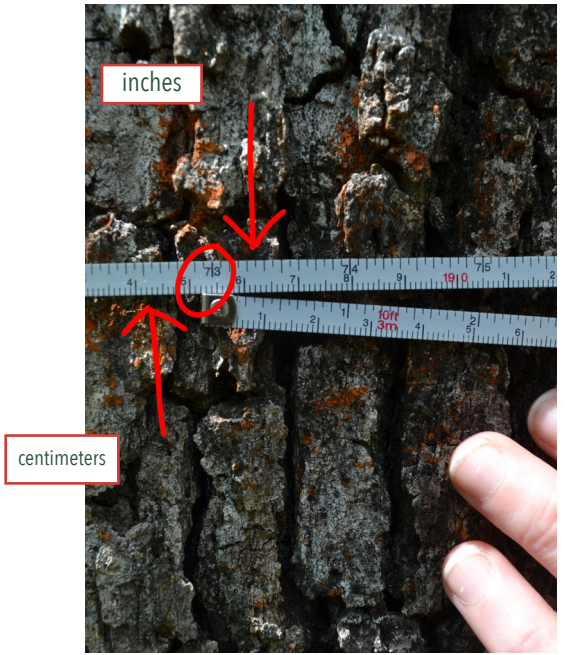
Measure the circumference at a height of ~137 centimeters (54 inches or 4.5 feet) up the trunk. Use the tape to find this height from the base of the trunk, as pictured.

If the tree has multiple trucks, measure below the split, at the narrowest portion, even if lower than 1.3 meters. See A.

If the tree is on a slope, measure from the uphill side at a height of 1.3 meters (4.5 feet). See B.



MEASURE TREE CIRCUMFERENCE



Wrap the measuring tape snugly around the tree.

Adjust so that the tape is level for an accurate measurement.

In Survey123, enter numbers only.

The tape has both inches and centimeters. Check to be sure you report **centimeters**. Tip: centimeters will give you a higher number than inches, ie: 73 in = 185.5 cm.

TRUNK TOO BIG FOR THE TAPE?

Wrap the cord of the saw-toss around the tree instead. Note where the cord meets and measure the cord in sections with the tape.

EVIDENCE OF REPRODUCTION

With die-off due to emerald ash borer infestation actively occurring, our partners want to know if the tree you sample is actively reproducing and worth returning to for potential seed collection.

Answer the question in Survey123 by comparing what you see to the photos below.

SEEDS, "SAMARAS," IN THE TREE

SEEDS, "SAMARAS," ON THE GROUND

SAPLINGS/SEEDLINGS GROWING NEARBY

COLLECT LEAVES & BUDS

Your goal is to collect 2 leaves and 3 buds from each tree.

First, figure out what strategy (A or B) you will use, based on how accessible branches are on your tree.

A) BRANCHES WITHIN REACH?

Go to page 19.

B) BRANCHES OUT OF REACH, BUT WITHIN 30 FEET?

Use the saw-toss tool. See instructions p17-18.

USING THE SAW-TOSS TOOL (B)

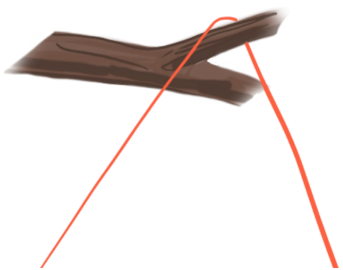
SELECT A WEIGHT

Tie one end of the cord to something small and heavy that you can toss: a rock, hefty stick, or a water bottle work well.

SELECT YOUR TARGET

Look for small branch that you can toss the weight over.

Select a twig you hope to get. Aim for a crux, where one twig joins the larger branch. The saw toss can only saw through twigs not much thicker than a pencil. And remember, you only need two leaves!



TOSS

We've had success with underhand tosses but try overhand if that doesn't work for you. Make sure the paracord is coiled loosely at your feet, so the cord can follow your toss easily into the air.

You will likely need to make multiple tries!

Once your line is over the branch, carefully pull the weighted side down until the metal part of the tool reaches the branch.

SAW

Keep tension on both sides of the saw, and move the metal chain back and forth over the twig. Once the metal bites into the wood, keep the chain moving in a sawing motion. **Continuous movement helps to avoid getting the saw stuck.**

Watch for the falling branch!

PREPARE SAMPLES

Separate two leaflets from a compound leaf.

Use your fingers, a pocketknife, or clippers if you have, to snip off approximately one inch of twig containing a bud. See circled section in photo. Do this 3x to get 3 buds. You want the growing end of the branch, where the freshest DNA resides.

Place all samples from one tree in one envelope.

ENTER DATA ON SAMPLES

Open Survey123. Scan the bar code on one of the sample envelopes. Verify that the number in the app matches the number on the envelope.

Fill out the survey: Indicate which samples you collected. Take photos of samples with the bar codes visible.

PACKAGE SAMPLES

Put samples in the envelopes. If you need to tear leaves to fit, that is OK.

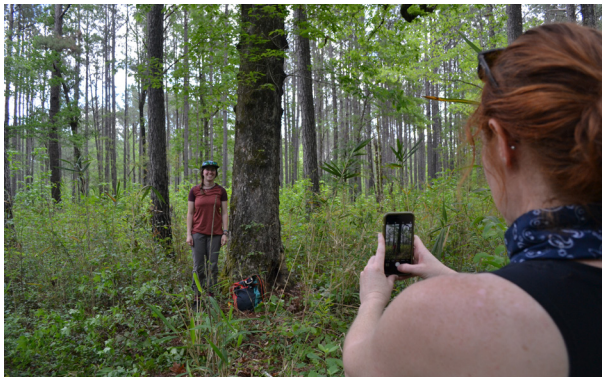
Do not seal the envelopes. Put the envelopes in the bag with desiccant.

ENTER NOTES

Take a photograph of the tree from about 6 meters (20 ft) away. Have your partner stand next to the tree or place a pack on the ground for scale.

Record whether there was anything notable or unusual about your sample collection (focus on anything that may affect data quality).

Record any unique characteristics about the tree and where to find it. Examples: Split trunk, height of large limb, a lightening scar, rotted area, distance and direction from a road or other marker.



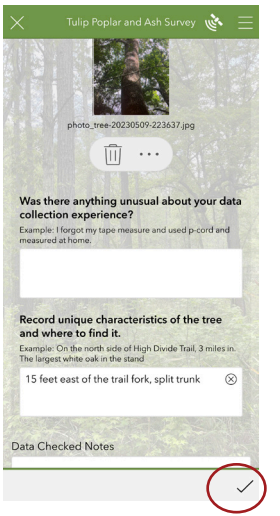
CLEAN EQUIPMENT

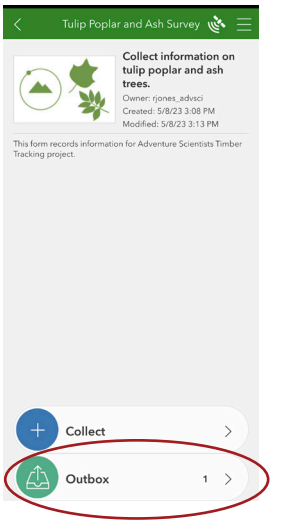
To prevent the spread of forest pathogens (trees get sick too!) you must clean your equipment after every tree.

Use the alcohol dropper to drip along the braided metal of the saw (similar to lubing a bike chain). Use alcohol swabs to wipe.

SEND IT!

Tap the check mark on the bottom right-hand corner of the Survey in your app. You have the option to either "Send Later" or "Send Now." If you aren't in cell service or don't want to use data, select "Send Later." Remember to send the record once you have WiFi or cell service. The records will be located in "Outbox."





DO IT AGAIN & REPEAT

COLLECT:
2 leaflets
3 buds
1 tree circumference measurement

From 20 - 40 individual trees.

You are sampling an entire "population" for the genetic analysis our scientific partners are doing.

Remain in the same forested area (don't cross major geographic features like a mountain) and you'll be sampling one population.

Sample along a line or transect (rather than a spiral or other shape) to get the broadest genetic diversity in the population. You can follow a path or a waterway. Individual trees should be 15-20 feet apart.
Sample at least 20 trees. More is better, up to 40 for a single population. If your stand appears to be a mix of white and green ash, sample more trees.

IN CASE OF EMERGENCY

FIRST, CALL 911

Once you are in a safe situation, after the emergency, alert Adventure Scientists staff about the incident by contacting: (406) 579-9702. ONLY contact this number if you are reporting an incident.

SHIP ALL SAMPLES, GEAR, & BOOKLET to
Adventure Scientists
214 E Mendenhall St, Suite 203
Bozeman MT, 59715

Have project-related questions?
timber@adventurescientists.org