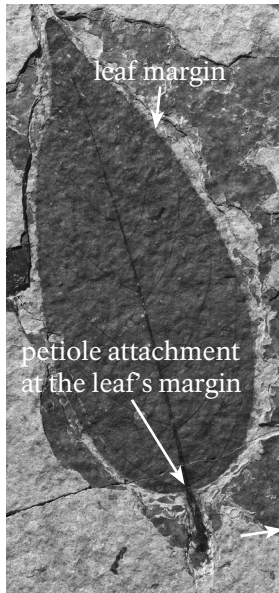
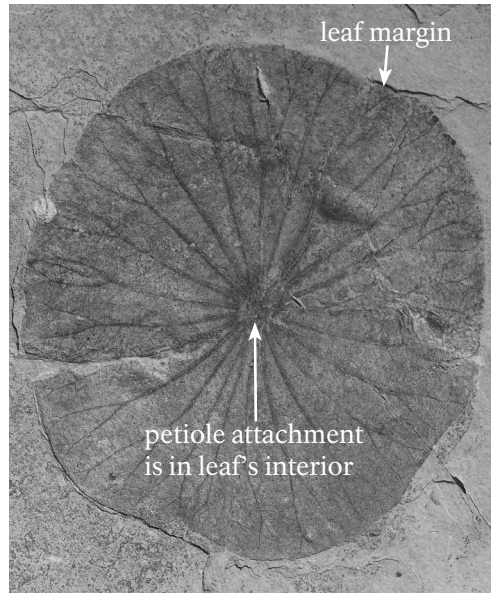


Seven Simple Steps to Binning Leaves

Step 1. *Where is the petiole attached?* The **petiole** is the stem of a leaf. If it connects to the leaf at its margin then the attachment is **marginal**. If it connects in the leaf's interior it is **peltate**. **If the leaf is peltate stop and assign it to Bin 12, otherwise continue to Step 2.**

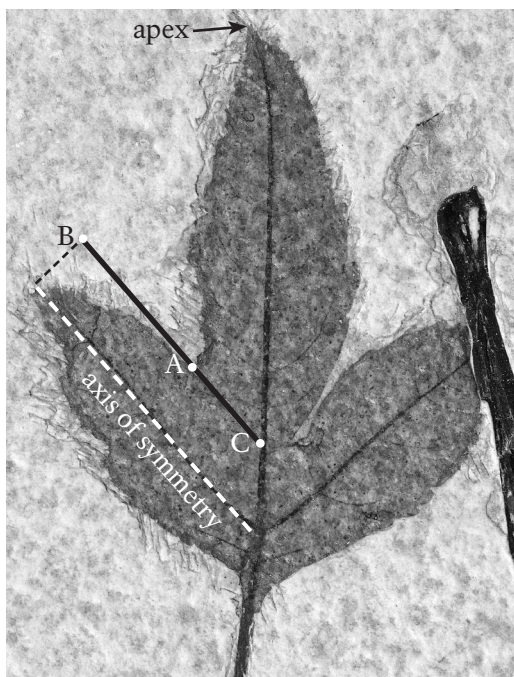


marginal

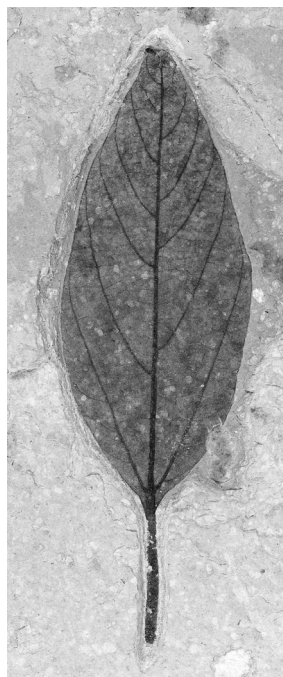


peltate (bin 12)

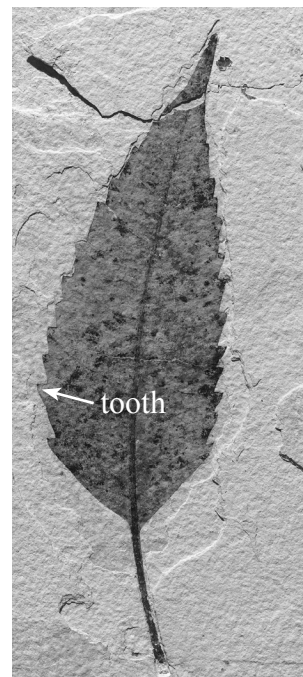
Step 2. *Is the leaf unlobed or lobed?* Lobed leaves have a marginal projection (or finger) with a sinus (A) that cuts at least 25% of the distance from the lobe's tip (B) to the midvein (C), measured parallel to the projection's axis of symmetry along the side toward the apex. To calculate the percentage, divide the length of line segment BA by the length of line segment BC and multiply by 100. If the leaf has one or more projections measuring at least 25% it is **lobed**, otherwise it is **unlobed**. A projection that is less than 25% is considered a tooth. **Continue to Step 3.**



lobed (tri-lobed)

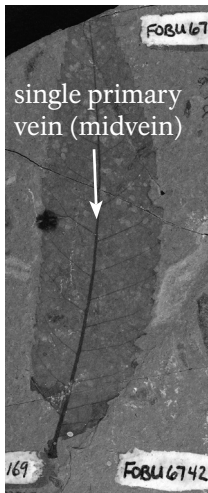


unlobed

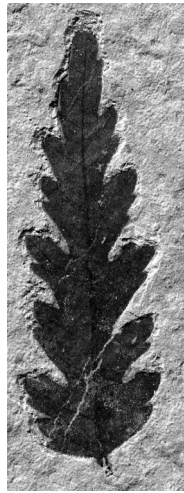


unlobed (toothed)

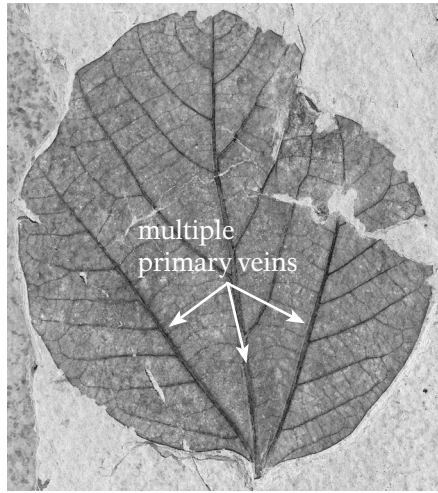
Step 3. How many primary veins are there? A **primary vein** begins at the base of the leaf near where the petiole attaches and includes the thickest vein (generally the midvein) plus any others 75% or more of that vein's thickness. If a leaf has a single primary vein it is **pinnate**. If it has more than one primary vein it is **palmate**. **If the leaf is pinnate and lobed stop and assign it to Bin 13, or if it is palmate and lobed stop and assign it to Bin 14, otherwise continue to Step 4.**



pinnate (toothed)



pinnate (lobed)
(Bin 13)

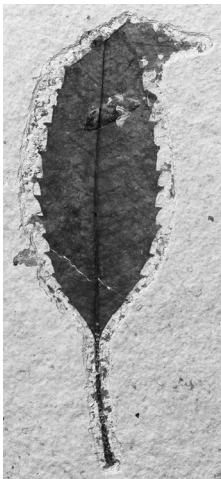


palmate (untoothed)



palmate (lobed)
(Bin 14)

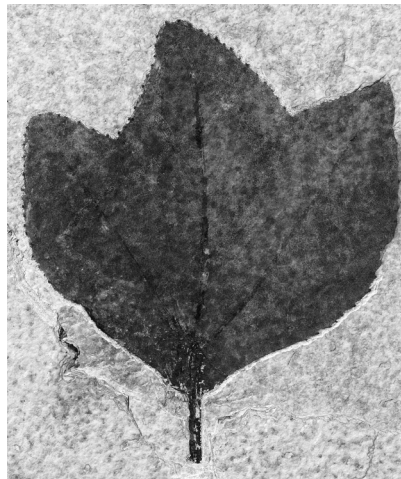
Step 4. Is the margin of the leaf toothed or untoothed? A **tooth** is a vein-bearing projection with a sinus that cuts into the margin less than 25% of the distance to the midvein, measured parallel to the projection's axis of symmetry along the side facing the apex. A leaf with one or more teeth is considered **toothed**. A leaf with no teeth is **untoothed**. Both lobes and teeth can be present on the same leaf. **Classify all leaves including those you have already binned as toothed or untoothed** (This information will be used later to calculate mean annual temperature). **Proceed to Step 5.**



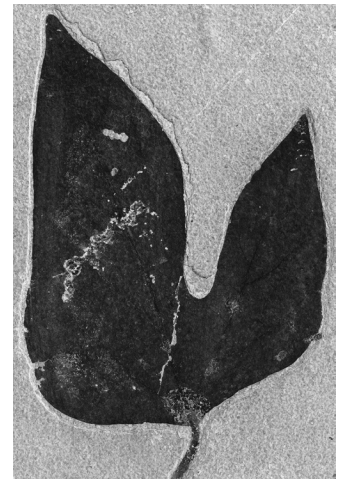
toothed



untoothed

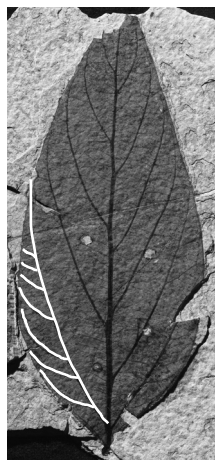


lobed and toothed

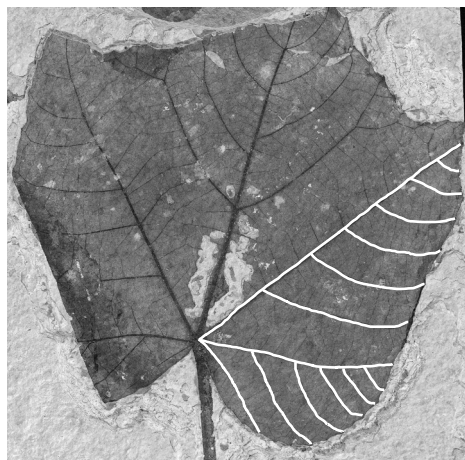


lobed and untoothed

Step 5. Does the leaf display agrophics or no agrophics? Agrophics are a series of parallel second order veins originating from a lateral primary or secondary vein and traveling toward the leaf's margin. They are not paired with a vein on the opposite side of the lateral vein. This results in a comb-like arrangement of veins. **Continue to Step 6.**



agrophics (simple)



agrophics (compound)



no agrophics

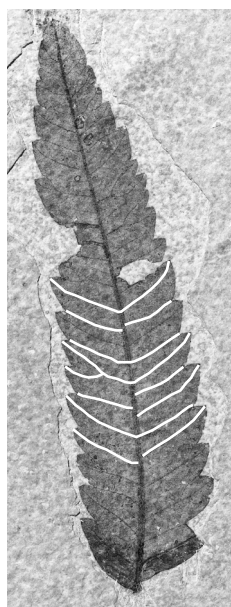
Step 6. What path do the major secondary veins take? Remember that a pinnate leaf has only one primary vein and a palmate leaf has multiple primaries. Secondary veins are attached to a primary vein, but are not as thick. Concentrate on the path of the major secondary veins as they near the margin in the center portion of the leaf to determine if they are craspedodromous, semicraspedodromous, eucamptodromous or brochidodromous. **If the leaf is craspedodromous, pinnate, toothed and has no agrophics, or if is brochidodromous, pinnate, untoothed and has no agrophics proceed to Step 7. Otherwise, assign the leaf to the appropriate bin.**

Craspedodromous—major secondary veins reach the leaf margin, usually ending in a tooth.

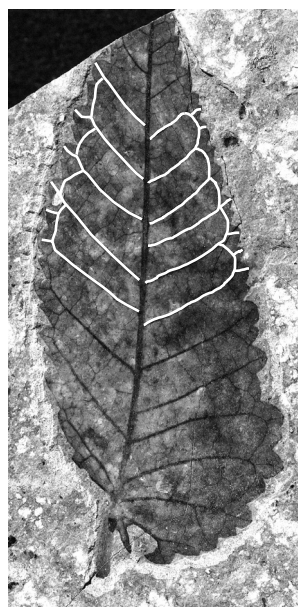
Semicraspedodromous—the secondary veins branch near the leaf margin, one branch ends at the margin, usually in a tooth, and the other loops to join an adjacent secondary.

Eucamptodromous—the secondary veins do not branch or reach the margin, instead they gradually lose gauge (thickness).

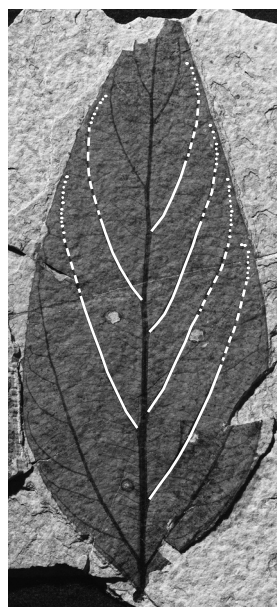
Brochidodromous—the secondary veins join near, but do not reach the margin forming loops and arches.



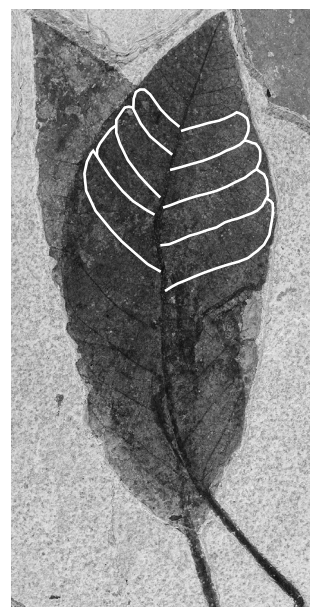
craspedodromous



semicraspedodromous

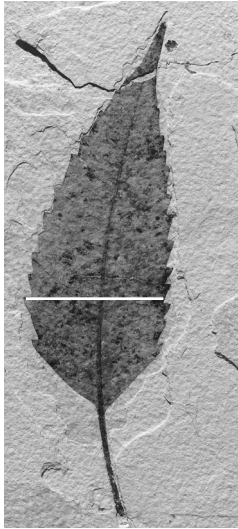


eucamptodromous

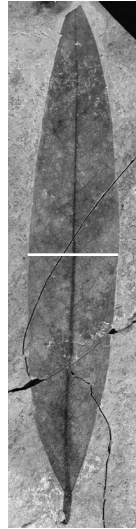


brochidodromous

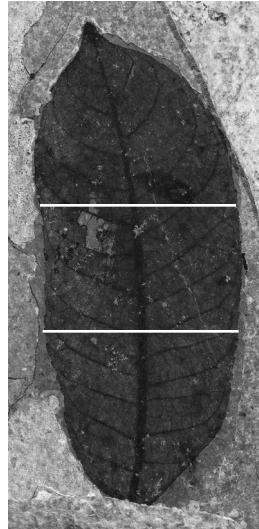
Step 7. What shape is the leaf?—Leaf shape is based on where the widest part of the leaf is located. It is **ovate** if it is widest in the bottom 2/5ths of the leaf (nearer the petiole). It is **elliptic** if it is widest in the middle 1/5th of the leaf. It is **oblong** if the leaf margins are nearly parallel through the middle 1/3rd of the leaf. It is **obovate** if the leaf is widest in the upper 2/5ths of the leaf (nearer the apex). **Determine the shape. Assign the leaf to the appropriate bin.**



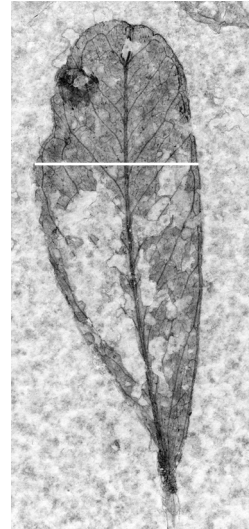
ovate



elliptic



oblong



obovate