Chestnut Phenotypes and Plant Pathogens

B3 Summer Science Camp
at Olympic High School

Dr. Jennifer Weller

Collecting samples in nature

- What is the goal?
- How do you identify those specimens you want from everything else that looks similar but is something else?
- What part of the specimen is important to later studies?
- How do you preserve the part(s) you care about?
- How do you make sure your record-keeping is good? What things should go in the record?

Known differences in the two Chestnut species

- The overall height and shape of the two trees is quite different
- Density of simple vein hairs on the lower (abaxial) surfaces
  - The abaxial interveinal leaf surface of the American chestnut is glabrous (smooth, without hairs)
  - The abaxial interveinal leaf surface is pubescent in the Chinese chestnut (very hairy)
- Density of simple twig hairs in the leaf midribs and secondary veins
  - The petiole, midrib and secondary vein of the Chinese chestnut Sun leaves are covered in dense simple hairs as are the twigs, while they are not visible on the twigs and sparse on the other parts of the American chestnut
- Stipule size (little outgrowths on each side of a leaf where it joins the petiole)
  - Stipules are wide at the base (5-10mm) of the Chinese chestnut and taper to a point
  - The American chestnut stipule is narrow at the base (1mm) and slowly tapers to a point.
- Stem color
  - Growing American leaves have a reddish stem
  - Growing Chinese leaves have a green or tan stem.

American at Maturity: 75-100 ft high, 15 ft in diameter, have a single main trunk

Chinese at Maturity: 40-60ft with a 40-50ft crown, multiple main trunks, branches droop.

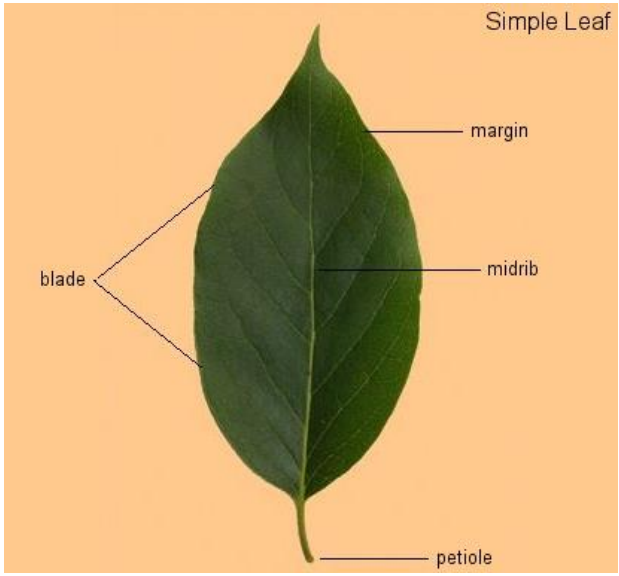
Pollination

- Chestnuts are monoecious (mono-ee-shus): both male and female flowers appear at the same time on the same shoots of a tree.
  - Flowers are on the tips (after leaves expand).
- Chestnuts are self sterile – they will not self pollinate. The wind is the major way they are pollinated (not insects).
- Seedlings need 5-7 years before they produce nuts.

These are called catkins – the female flowers are at the base and the male flowers extend along the length.

Leaf anatomy and vocabulary

- The upper surface of a leaf is called adaxial
- The lower surface of a leaf is called abaxial
- The main part of the leaf is the leaf blade or lamina
- The little hairs that you can see are called trichomes.



Nuts and Leaves

American leaves have sharp ‘teeth’ and are 5-10 inches long.. Usually there are 3 - 7 nuts in a bur. The nuts are hairy near the tip.

Chinese chestnut leaves are 4-8 inches long, oblong with serrated edges. There are 1-3 nuts per bur, they are 1-3 inches across, and smooth.

American Chestnut: Twigs and Leaves

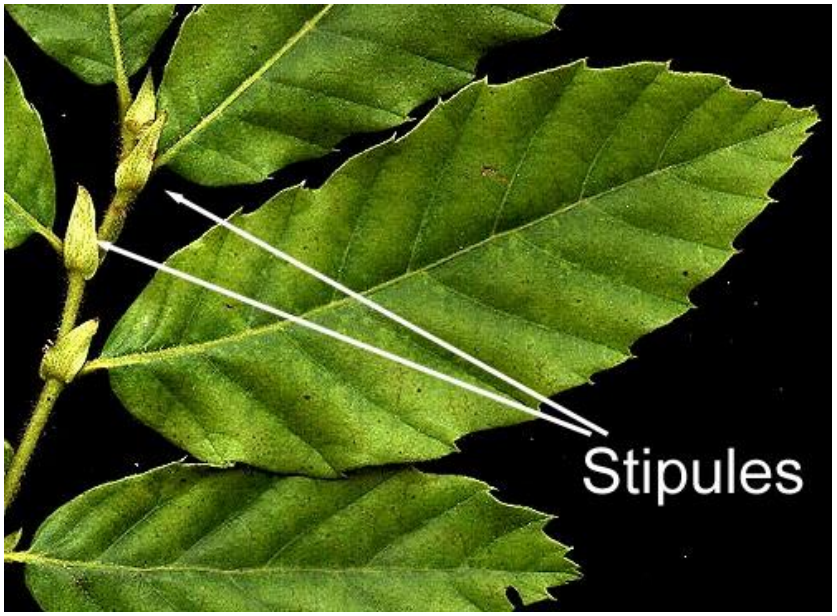
- The leaves are smooth and thin
  - There are few hairs on abaxial surface or twig
  - Petiole is red, twig is brown
  - There is a very sharp angle where the leaf joins the petiole.

Chinese Chestnut Twigs and Leaves

- Chinese: the leaves are thicker, hairy on the lower surface
  - The twigs are brown and have hairs.
  - The base where the leaf meets the petiole is wider.
  - The petiole is green or tan

Petiole colors

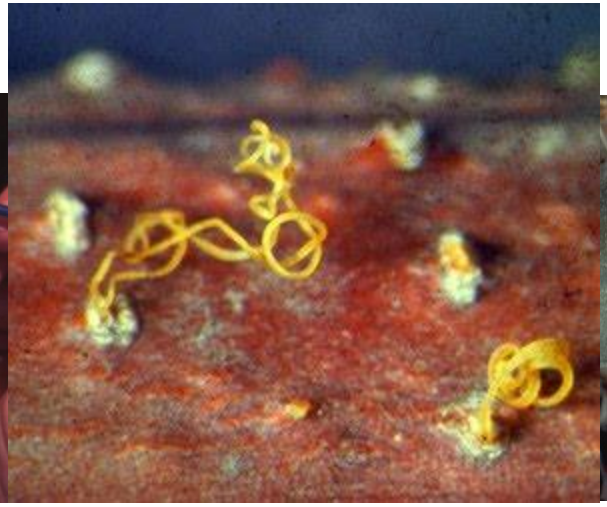
Stipules



Bark /Blight (Cryphonectria parasitica)







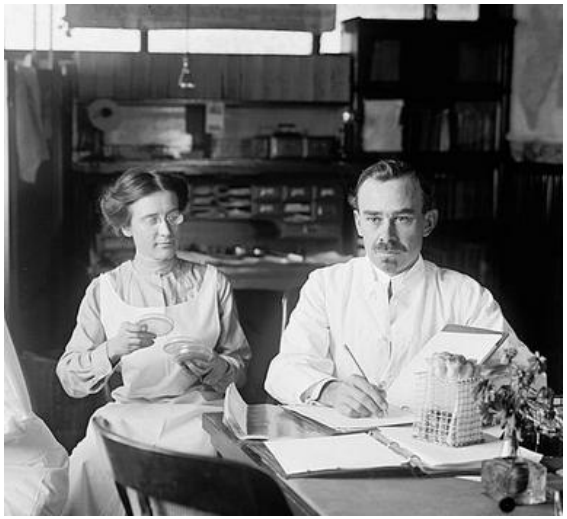

Now that you know some of what you will be measuring, here are some good field tools

- Measuring tape, rulers to millimeter lengths
- Magnifying glass
- Camera that can take close-ups.
- Notebook or voice recorder
- GPS locator/app (location, including altitude)
- Sample collection and indelible ink for labeling (baggies, collection tubes, wooden scrapers, water-proof pens)
- Sample preservation materials (ice, dry ice, drying agents, enzyme inhibition materials)

A lab notebook

- Goal: capture the workflow, both intended and actual.
- Name and Date on the notebook
- Waterproof ink for all notations.
- Leave some pages at the beginning for a table of contents
- Number pages as you go.
- Experiments are recorded in parallel on one page or opposite pages:
  - The plan with detailed notes (what reagents to prepare ahead, for example, or to warm up instruments)
  - What happened while following the plan – actual measurements, source of reagents, observations, loss of attention leading to doubt about a step, etc.
  - Explanations of outcomes *as the process occurs*
- Make time at the end of the day to summarize results and observations, recommendations for the next lab, then initial the page.
- Do not skip pages
- Common solution recipes and calculation pages can go in an appendix

The Field notebook



- Working as a team, set up one notebook ahead of time to share (one can collect while the other records)
- Work as a class to set up labeling codes unique for each team (the tubes are pretty small).
  - Name, date, location code, details in notebook
- When you collect samples, write in your notebook exactly what the label is for every sample. The samples go on dry ice (carried by Dr. Weller) and will be stored in a -80 Freezer overnight.
- Notebook might say:
  - Collected leaf sample in a Baggie labeled T1-me_L, 6/15/15, L1a which was at the first collection point, coordinates are: 35.213316, -81.293555.
  - Bark scrapings were collected into a tube that has the label: T1_me_B, 6/15/15, L1a.
  - There is a duplicate of each sample, the labels are T1-me_L, 6/15/15, L1b and T1_me_B, 6/15/15, L1b.
  - Comment 1: Maria took a picture of the tree – the printed image will be placed here: (indicate a spot)
  - Comment 2: We were only able to find shoots coming from the stump, the tree seems to have died.
  - Comment 3: The bark has speckles of bright orange on it (see picture) – this is what we scraped into the tube.

Team 1, Maria Echeverria could be → T1_me
Team2, Tripp Stender could be → T2_ts
Location could be L1, L2 etc, and if there are replicates you could use a, b.
Leaf tissue could be L, bark scrapings B and soils samples S:

T1_me_L
6/15/15
L1a

Questions?