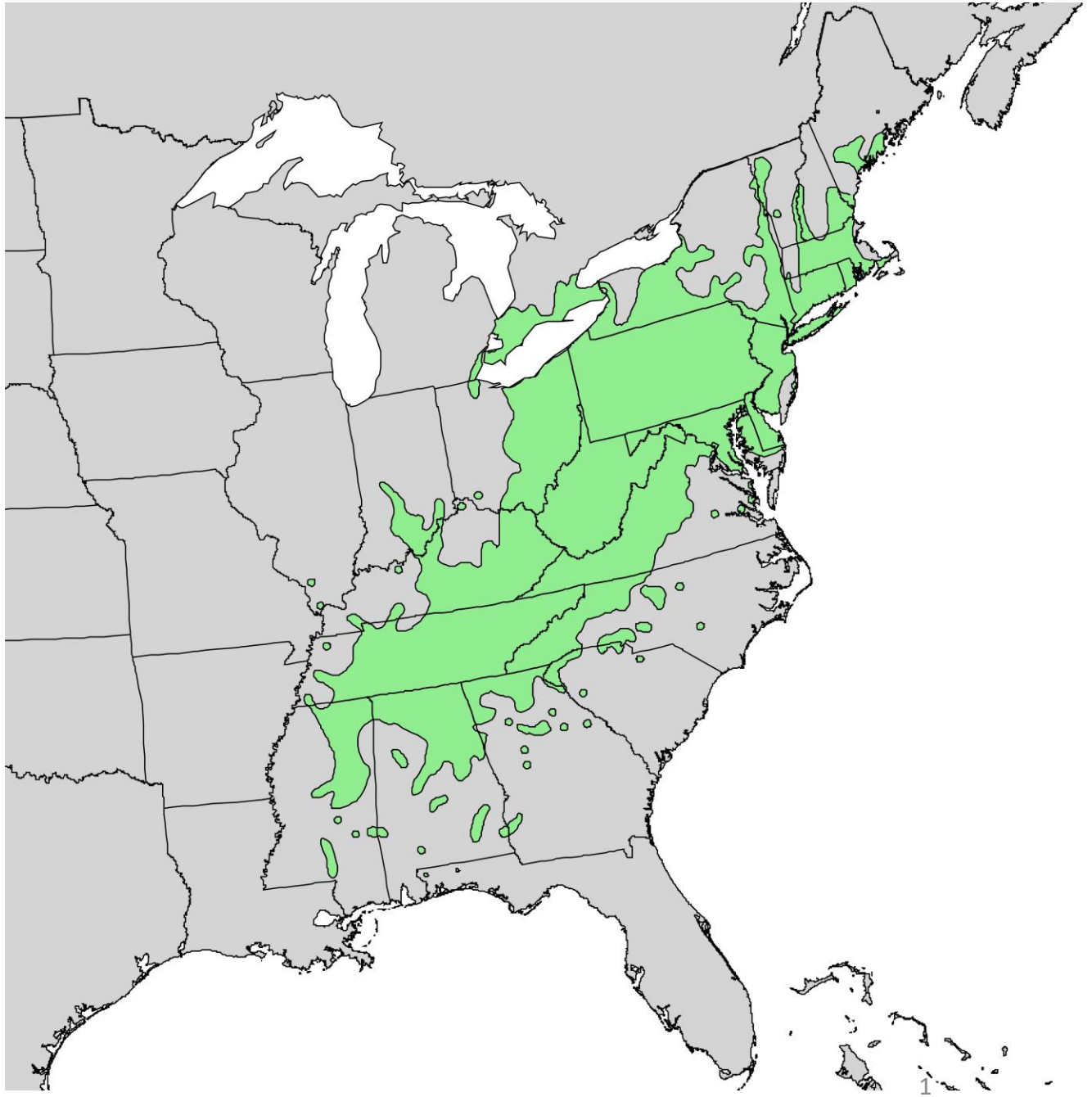
# Reviving the American Forest with the American chestnut: William Powell at TEDxDeExtinction

- **Historically:** ¼ of Appalachian trees were A. Chestnut

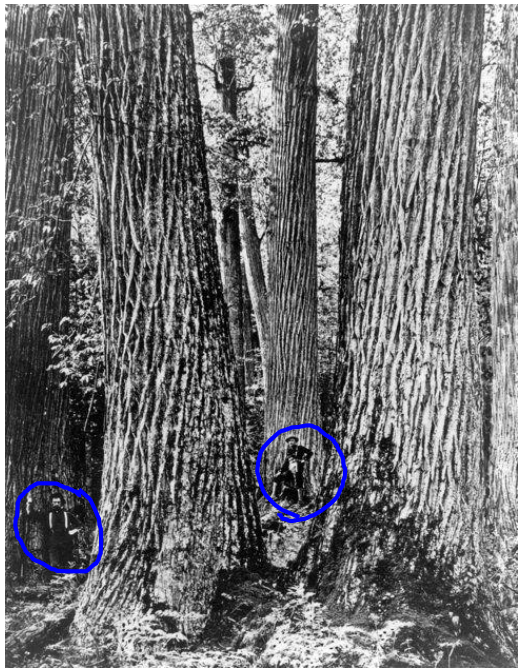
https://reviverestore.org/events/tedxdeextinction/reviving-the-american-forestn-with-the-american-chestut/



- **Stable mast - nut crop:**

  food source for many

  animals



# Reviving the American forest

- **Niche:** filled by oak **species**
- Loss has led to an **extirpation,** decline, and elimination of many **species:** including the extinct Carolina parakeet and passenger pigeon

# Restoration of the Chestnut

## Economic Values

a. **Agriculture** – nut crop used for a variety foods

b. **Wood product**: rot resistant and straight grained (making easy cuts in wood working)

c. **No need for chemicals** – such as used in pressure treated wood and telephone poles

d. **American Heritage:** “chestnut street”, music/songs, poetry

# Elimination and Extirpation of the American Chestnut

- **Chestnut blight:** an introduced and invasive pathogen/parasite
- **Eastern U.S.:** 3-5 billion trees killed in 50 years
- **Functionally extinct**

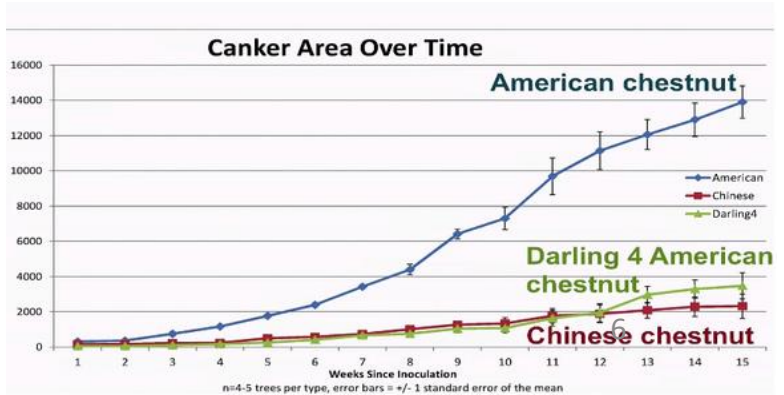
# Restoration of the American Chestnut - Breeding

- **1st Crossing:** with the Chinese Chestnut (AC x CC)
- **2nd crossing:** Hybrid (AC/CC plant from 1st crossing)) x A. Chestnut ↳ "mix"
- **Genome:** all the genes in a species' DNA

**Issues to address:**

a. **CC is an orchard (domesticated) species:** want to "breed out" the unwanted traits

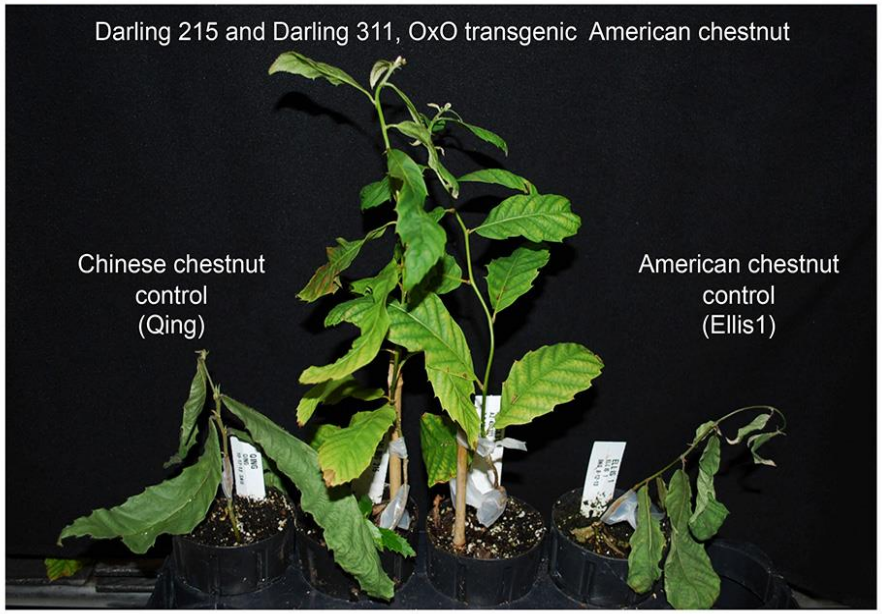
b. **AC is a wild species**



# Restoration of the American Chestnut –

**Transgenics** => "move genes"
↳ move

- ✓ Using a bacteria to "move" genes around in plants
- ✓ **Castanea – genus** → chestnut varieties
- ✓ **enzyme (protein** that acts as **catalysts) -** speeds up a reaction or process (building, breaking down, repairs)



All plants were produced from tissue culture. Non-transgenic & transgenic Americans are clonal (Ellis 1 cell line). Pictured 8 days post inoculation with *C.parasitica* strain EP155. American stem diameters were ~1.5mm, Chinese ~2.0mm. Darling 215 OxO expression level is the threshold for high resistance in leaf assays and Darling 311 has higher expression levels than 215.

# Restoration of the American Chestnut – Transgenics

- **oxalate oxidase (oxalic acid) detoxifies** the oxalate oxalic acid) produced by the blight fungus.
- The **gene** is inserted into **transgenic chestnuts:** purpose is to build up blight resistance

# Restoration of the American Chestnut –

# Planting the Trees (www.acf.org)

- ✓ Highly regulated by federal agencies
- ✓ **Focus Areas:**

A. mining reclamation sites

B. Private land

C. Historic sites