Some Pests and Diseases of Chestnut

A brief introduction to the perils of being a grower of chestnuts.

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Rules

- Contact your Regional Science Coordinator
  - Establish and maintain based on sound management practices.
- Make friends with your local extension specialist
- Take pictures
- Do some research and be diligent!

Site selection!!
Environmental problems

Fertilization
Watering

- Varmints
- Fungi
- Insects

Biggest Rule

Monitoring is Key for early detection

Mensuration and proper monitoring.

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What Can Go Oh, So Wrong

- Poor site selection
  - Poor fertility
  - Wrong pH
  - Poorly Drained
- Poor Management Practices
  - No weeding
  - Over / under watering
  - No protection from varmints
- Varmints
  - Deer
  - Groundhogs
  - Rabbits
  - Voles
  - Turkeys
  - Blue Jays
  - Raccoons
- Insects
  - chestnut weevil
  - ambrosia beetle – shothole borers
  - Cicadas
  - chestnut gall wasp
  - Aphids
  - Leaf hoppers
  - Japanese beetles / rose chaffers
- Fungi
  - *Cryphonectria parasitica* – Chestnut blight
  - *Phytophthora cinnamomi* – Ink disease
  - Others

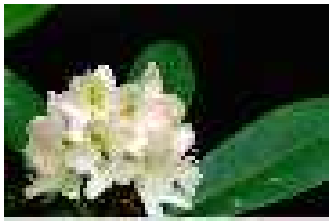
Site selection

Choice of proper site is the first and most important step in deciding the best ways to plant your American chestnuts

- Lots of sunlight to encourage growth and fruiting.
  - Clearcut areas vs. old fields
    - Clearcuts may = mychorrizal assocations
      - BUT clearcuts may have old stumps and roots that make mowing and other maintenance difficult.
    - Fields often easier to work and maintain, with the exception of often having hardier weeds.

Site Selection

- Low pH: 4.5-6.5; aim for 5.5
  - Get a soil test!
  - Work with Regional Coordinator / Extension Agent to analyze recommendations
- Look at other species growing on the property
  - White oak, chestnut oak
  - Rhododendron, mountain laurel, and blueberries.
- Well-drained and high permeability!!
  - This is <u>especially</u> important in the South where *Phytophthora* is especially rampant.

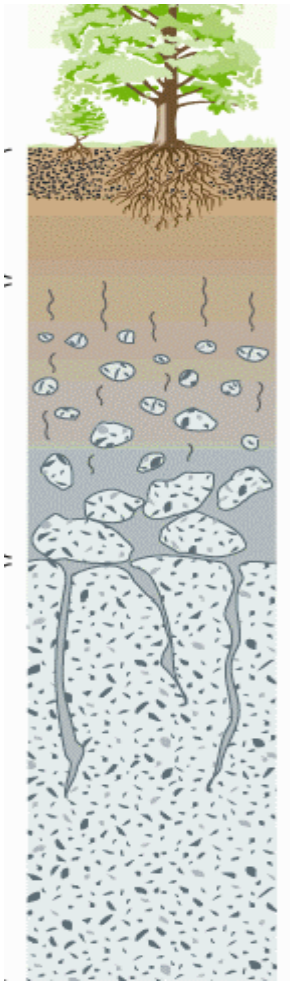


All images: www.plants.usda.gov

Well-Drained Soils

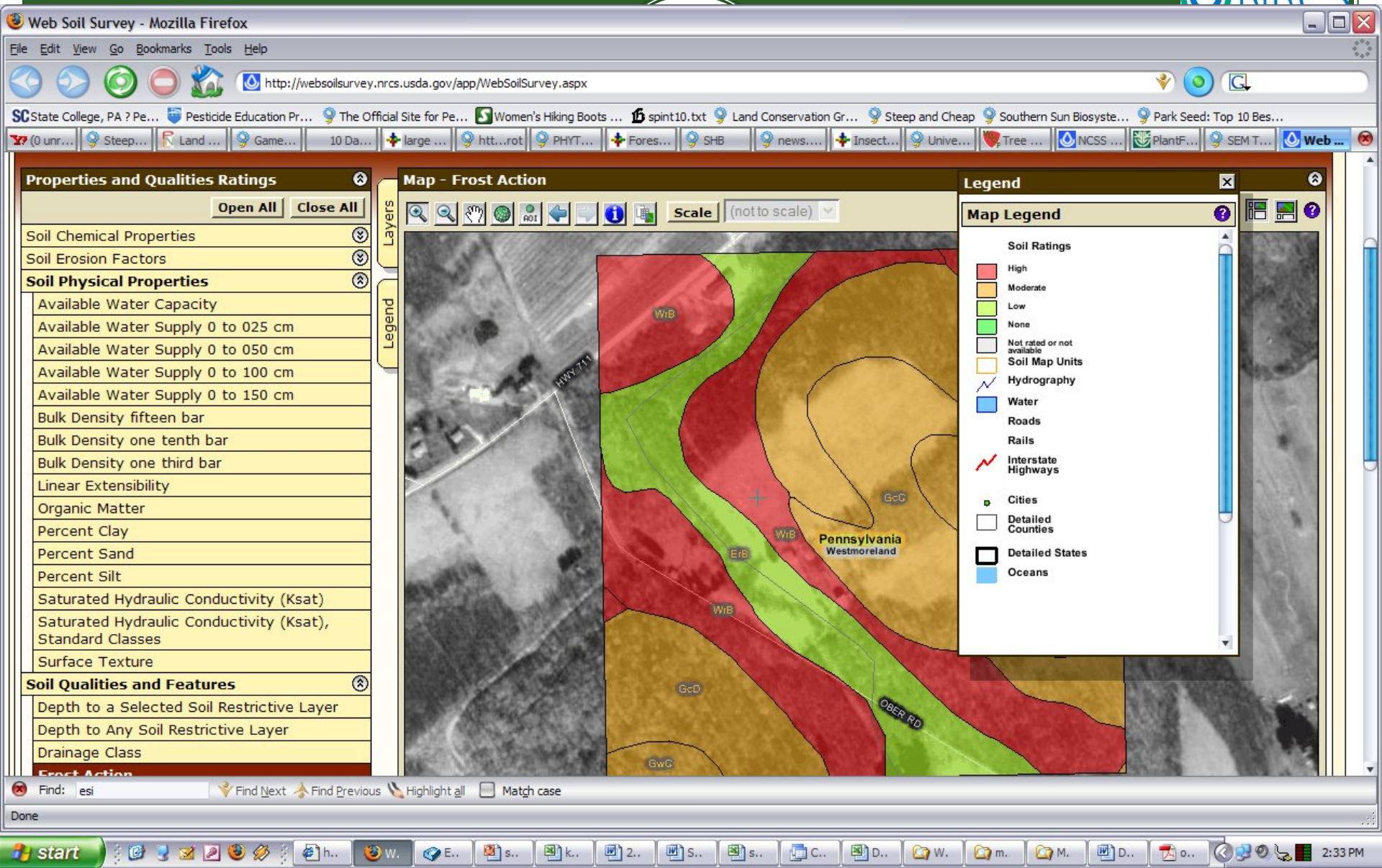
- Well-drained
  - Sandy, sandy loam ||| Little to No Clay
  - No standing water

- Explore land well
  - Look up on Soil Maps
    - Local library
    - http://www.nrcs.usda.gov
      - Use Web Soil Survey
- Get a soil sample

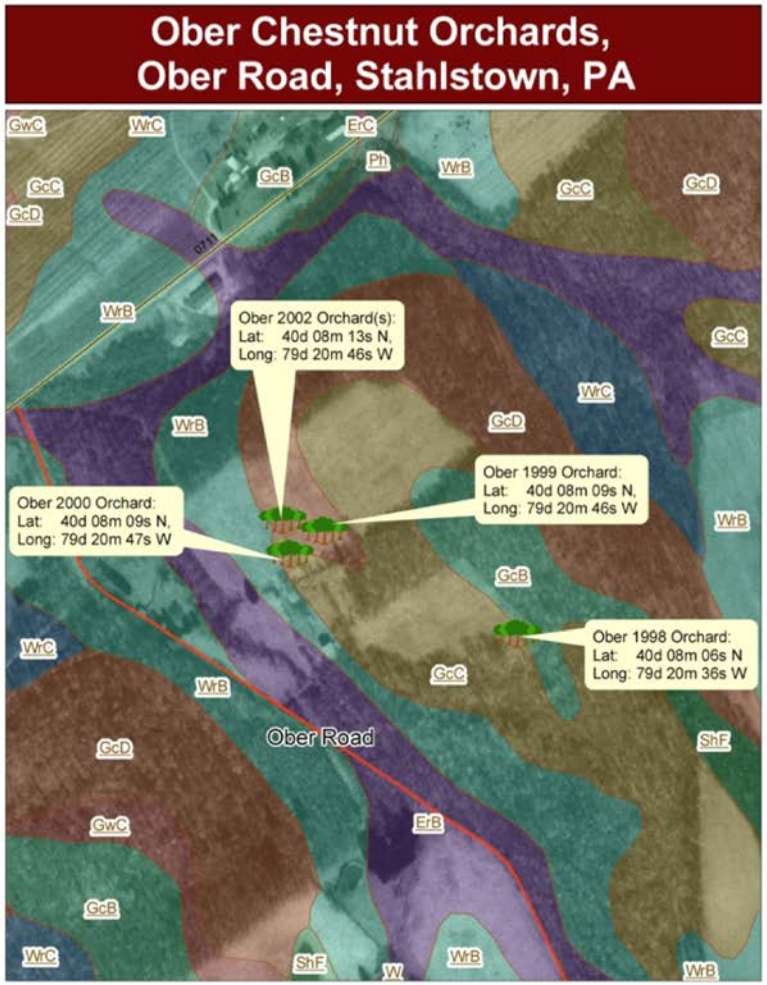


http://www.geology.fsu.edu/faculty/parker/1000/weather/1000weath.html

NRCS Web Soil Survey (WSS)



Do Some Research



- Chestnuts aren't going to grow everywhere.
- Don't just plant the tree and walk away.

Differences in Site and Nutrition

Healthy Chinese chestnut

Soil is too shallow ~6” to limestone bedrock

Soil is too shallow ~20” to limestone bedrock

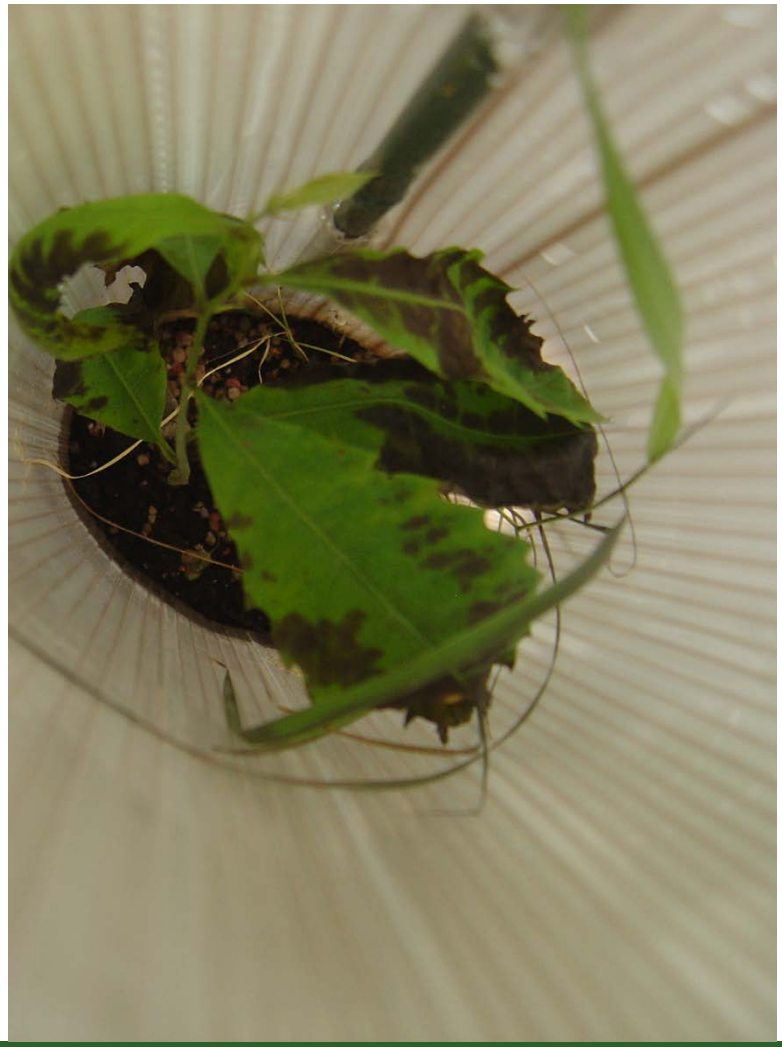
Over / underwatering

- Either way they look wilty
- Over-watering tends to be more black-brown while under-watering tends to look more light brown.

Fertilizer Burn

- Be careful with fertilizers, especially heavy N-fertilizers or straight ammonia.

- Fertilizer burn will create black edges of leaves and may lead to death of seedling.



Frost Heave

- Certain soils are prone
  - Shrink-swell capacity
  - Typically higher-clay content soils
    - Should be avoiding anyway
- If can't avoid:
  - Lack of insulation exacerbates problem
  - Leave some ground cover
    - Establish insulation
      - Hay
      - Some other cover

Field: Frost Damage

- Late-spring frosts can be damaging
  - Newly emerged leaves shrivel and turn black, may even fall off
  - Expanding buds may be injured
    - Flower buds can be damaged, reducing flowering later in the season
- Frost damage looks terrible
  - Many growers jump to alternative conclusions
  - Keep an eye on the nighttime lows and watch for frost warnings
- Trees should re-leaf, though growth may be set-back for the season

Spencer Brookes – Shieling Forest Orchard

Field: Winter Injury

- Low winter temps can cause stem injury or death
  - Most common at northern range limits and high elevations
  - May be more of a juvenile issue, research is on-going
- Suggested measures:
  - In cold environments plant chestnut in more protected areas
    - Canopy cover can help moderate temperatures
  - Choose chestnut sources native to cold-adapted sites
    - May be better suited for survival

Field: Frost Cracks and Sun Scald

- Frost cracks
  - Most common on thin-barked trees
  - Caused by rapid expansion and contraction of water in wood cells
    - Usually when night temperatures fall rapidly
- Sun scald
  - Warm sunlight or reflected light "wakes up" dormant cells, which can then be killed by plummeting nighttime temperatures
  - Observed as sunken or dead bark, usually on SW exposure
- Prevention
  - Wrapping trunk
  - Painting bark
  - Shading

James Solomon, USDA Forest Service, Bugwood.org: http://www.ipmimages.org/browse/detail.cfm?imgnum=3046022

Varmints

- Voles
- Groundhogs
- Rabbits

- Deer
- Bear

Voles

- Girdle base of tree
- Like to overwinter in warm places

Groundhogs / Rabbits

http://www.hoghaven.com/emerge2.htm

- Chew off bark

- Rabbits
  - Damage similar to groundhogs/voles

Protect Your Investment!

- Keep vegetation around planting low
  - Less vegetation = better visibility for predators
- Protect using
  - short shelter
  - Flashing
  - something!

Deer

- Fencing
- Repellent
- *__NO__* tall
  tree
  shelters

- Deer are grea an others
- 10-20 trees: u and 4’ in heig on building cage
  - Narrower dia
- Highly recom ers greater than

Museum of Tube Horrors

Other options

- Protection from deer should stand about 5-6 feet in height.
- Some mesh type tubes are available.
  - The Massachusetts Chapter recommends use of hardware cloth cages.
    - Stems and lateral branches may still get nipped
    - Grow through holes and rub against metal
  - Be certain to check these protectors to be sure they are standing or have not been crushed by wind, rain, hooligans.

More About Deer

- Deer repellents
  - Must be applied to all new growth and after any rain event.
    - Approximately every 2 weeks
  - Homemade egg sprays
    - Mix a cocktail of 3 eggs to 1 gallon water in a blender
    - Strain through a cheese cloth (optional)
    - Apply with a backpack or handheld sprayer.
  - Commercial repellents
    - Bitrex, Plantskydd
- Fencing options
  - Baited electric fencing
  - Woven wire (galvanized steel) fencing
    - For especially large plantings
  - Plastic fencing

Bears

- Biggest problem with tall tree shelters
- Will destroy trees getting to burs

- Not much one can do
- Woven wire fencing
  - Strands of electric fencing along top

Humans

- Four wheelers
- Target practice
- Stealing seedlings (!!)

Insects

Heed all restrictions on labels before using pesticides. Consult your Agricultural Extension Specialist for proper identification of and proper treatment for pests and diseases.

- Chestnut weevils
- Japanese Beetles
- Asiatic Gall Wasps
- Cicadas
- Leaf hoppers
- Aphids
- Tent Caterpillars
- Ambrosia beetles (shothole borers)
- Orange-striped oakworms
- Yellowneck caterpillars

My Nuts Are Wormy

- Chestnut weevil
  - Overwinter in soil
    - Females feed on nuts
    - Oviposit eggs into developing bur / nut
      - Some fly in summer; some in late fall

William M. Ciesla, Forest Health Management International, www.forestryimages.org

Jerry A. Payne, USDA Agricultural Research Service, www.forestryimages.org

Chestnut Weevil Control

- Post-harvest
  - Hot water bath
  - 120°F for 20 minutes

- Keep the area underneath your trees debris free.
  - Remove nuts, husks, leaves in timely basis
  - Free-range poultry may help reduce larval populations

Japanese beetles / Rose Chaffers

Doug Stone, Mississippi State University, www.forestryimages.org

- Use Sevin
- Hand picking for light infestations and if caught early
- Beetle traps?? Use caution

Gall Wasp
Dryocosmos kuriphilus

- Chestnut gall wasp
  - Most growers don't need to worry about this one, yet.

Jerry Payne, USFS, www.insectimages.org

Gall Wasp History / Control

- Introduced to Georgia
- Moved north to Ohio (2003)
- Found in Maryland / Pennsylvania 2006

- There is a biological control.
- Don't destroy galls
  - Put up with it for a couple of years to allow predatory control to take effect.

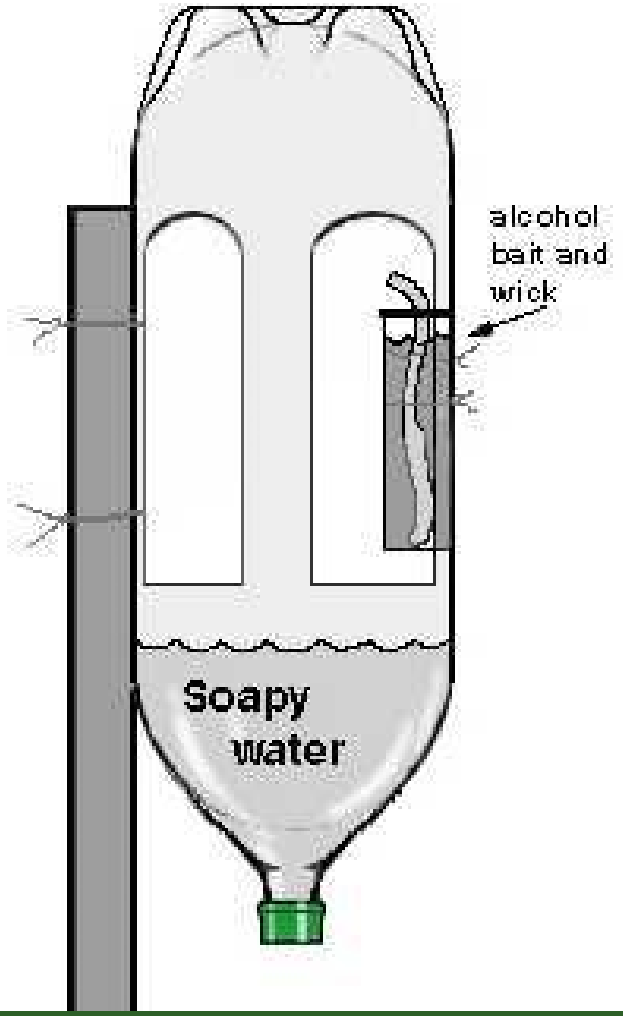
Shothole Borers / Ambrosia beetles (family *Scolytidae*)

- Diligent monitoring
  - Check once / week – March through growing season
  - look for the telltale pinholes
  - Tiny sawdust column
    - Present often (not always)
- If you find a pinhole
  - Treat weekly
  - Spray permethrin
  - Spray through that growing season and again in March of the next year.
- Rogue heavily infested stems
  - Burn them.
  - They'll probably resprout

Laura Lazarus, North Carolina Division of Forest Resources, www.forestryimages.org

Control

- Monitor!
  - Alcohol Trap
    - Alcohol wick in a 2-liter bottle filled with soapy water
- Spray
  - Permethrin-based



Aphids and Leafhoppers

- Sucking Insects
- Leaf curl
- Chlorosis

Susan Ellis, , www.insectimages.org

Leaf Hoppers and Aphids

- Typically, damage is cosmetic
- Hits toward end of growing season
  - August / September

Leaf Hoppers and Aphids

- Insecticidal soaps
- Biological control
  - Ladybirds
    - Available commercially

http://www.aphids.us

Periodical Cicadas

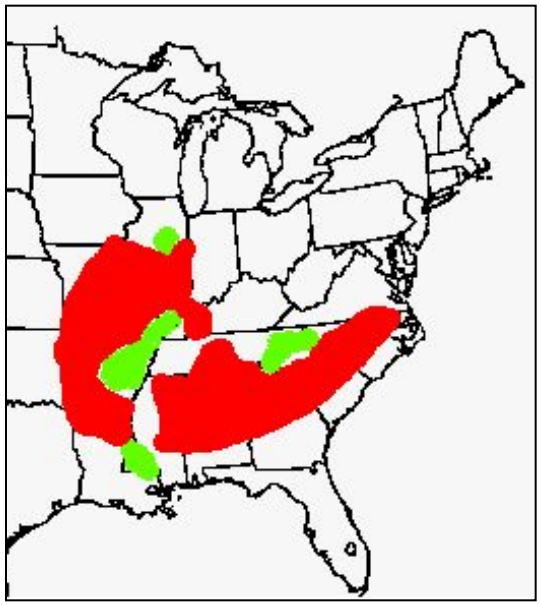
- Take orchards three years to recover
  - Large nut losses
  - Don't establish in heavy cicada years
  - Cover small trees (< 3 years)
    - Blueberry netting can help
  - Grin and bear it w/ larger trees

Cicada damage

Periodical Cicadas – Brood Maps

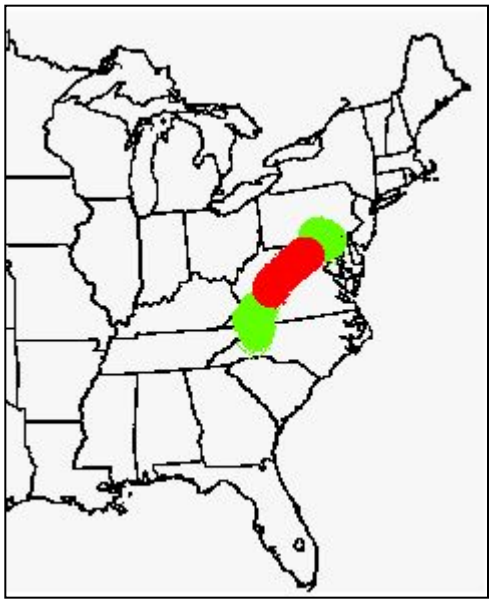
2011

Brood XIX



2012

Brood I



2013

Brood II

http://insects.ummz.lsa.umich.edu/fauna/michigan_cicadas/periodical/index.html

Cicadas in Pennsylvania

- Upcoming 2016, 2019
- Past 2004, One of the biggest = 2008, Brood X

Caterpillars

- Yellowneck Caterpillars
- Orange-striped oakworms
- Army worm?
- Tent Caterpillars
- Many others

- Keep an eye on
  - Typically do not do long-term harm to trees.
  - Dead limbs?
    - ID
    - Control

Allergies!

- Tussuck Moths
  - Out during harvest
- Gypsy moths
  - Out during planting

More than one pest

- OMG!!

Fungi

Heed all restrictions on labels before using pesticides. Consult your Agricultural Extension Specialist for proper identification of and proper treatment for pests and diseases.

- Chestnut blight
- Phytophthora cinnamomi
- Stem cankering
- Anthracnose
- Powdery mildew

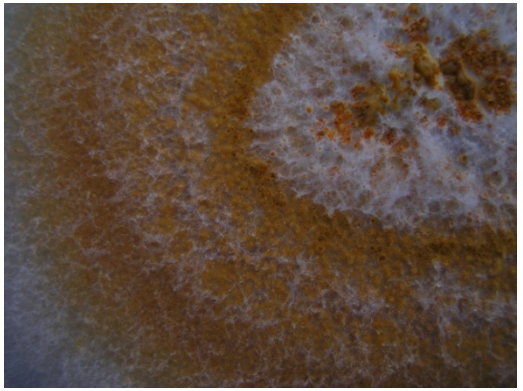
Anthracnose fungi

- Fungal disease
  - Large family,
  - Many anthracnose species affect many different host species
- Tip die-back
- Typically brought on by wet, cool springs
- Not much you can do about it
  - Recognize it || April - May
  - Don't freak out!
    - The tree will recover.

Photo courtesy Paul Sisco, TACF

Chestnut Blight

- Causal agent
  - Chestnut blight fungus
    - *Cryphonectria parasitica*
      - formerly *Endothia parasitica*



Stroma of *Cryphonectria parasitica*

Photo courtesy Tom Volk, UW-Lacrosse

Chestnut Blight Cankers

- Healing cankers

- Sunken cankers

Mudpacking

Pruning

- Best policy is generally not to prune.
  - Typically no reason to prune
  - Opportunity for blight infection.
- Some say prune in the summer
  - Have seen some good success with pruning in winter.
  - Some say prune in fall when the blight is less active

- If you do prune, be sure to mudpack the wound or seal w/ pruning sealer.

Pruning / Mudpacking / the Blight

- Mudpacking does not keep other cankers from forming
- Other biocontrol methods are available
  - Not generally practical
  - See Chestnut Growers site for more info. . .

Phytophthora infection

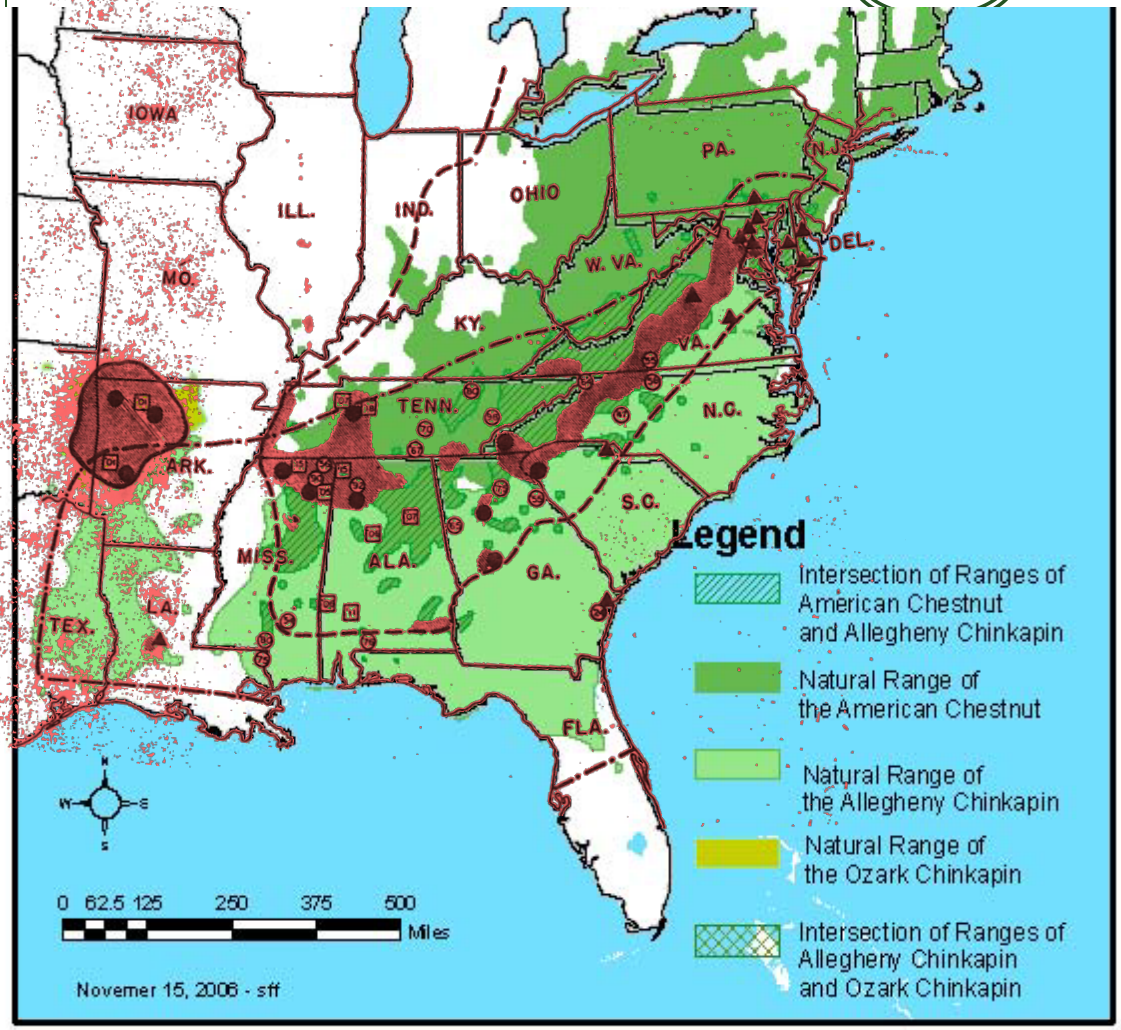
- *Phytophthora cinnamomi*
  - ink disease/root rot
  - Relative of Sudden Oak Death (SOD)
    - *Phytophthora ramoram*
  - Especially a problem in the South
    - And Europe and Australia

- Strong program in TACF's southern region to breed resistance into advanced backcross material

http://www.unitus.it/dipartimenti/dpp/progetti/cost/phytopht.htm

Introduction and Distribution

Becky Bernard, http://www.cals.ncsu.edu/course/pp318/profiles/pc/pc.html



Crandall, Gravatt, and Ryan. Phytopathology 35: 162-180, 1945

- Introduced to US about 200 years ago
- Wiped out chestnut from many low-lying areas in the South
- Most likely eradicated chestnut from piedmont of South prior to introduction of chestnut blight fungus.

Identification of *Phytophthora cinnamomi* infection

Photo courtesy Paul Sisco, TACF

- Need to cut dying or *freshly* dead tree
- Examine tissue near base of tree for distinctive black streaking just under bark
- Send sample in for testing

Sending Samples for *Phytophthora* Testing

- The way to test is to dig up a dying (not dead) seedling with roots and some soil.
- Put the roots and soil in a plastic bag to keep them moist and send to
  - Dr. Steve Jeffers at Clemson University

- The top of the seedling can be cut off.
- Be sure to put information about location of the seedling and contact number.
- Don't more than two seedlings at a time.

Preventative measures

- The best way to avoid Phytophthora infection is just that – avoid it!
- Phytophthora is generally ubiquitous, but its survival is inhibited by dry areas and low temperatures.
- **<u>Rule #1: DON'T</u> plant in <u>SWALES</u>**
  - The ultimate defense is to plant in sandy, well-drained soils, avoid low-lying and flat land (unless the soil is sandy), and also, avoid old fields in the Piedmont.
  - In cases where the soils are ordinarily well-drained but are heavy in texture, unusually wet conditions can slow the drainage to create a *Phytophthora* problem.
- If diagnosed early, fungicide drench is possible
  - Ridomil or Subdue
  - Expensive! Labor-intensive!
- **<u>Rule #2: DO NOT PLANT in areas IDENTIFIED to HAVE PHYTOPHTHORA</u>**
  - Seed grass there to contain spread of fungus
  - Do not plant in death holes or downhill from death area

Photo courtesy Paul Sisco, TACF

Other Resources

There are other resources available that may help one in establishing an orchard and for further growing:

- TACF employees / Regional Coordinators
- Local extension agents

- The TACF handbook to Growing American Chestnuts
- Other TACF growers

- http://sfr.psu.edu/public/chestnut

- The Northern Nut Growers Association
  - Many knowledgeable growers, particularly for growing chestnuts for nut production
  - http://www.nutgrowing.org

Any Questions?

Others

- Powdery Mildew
- Spider mites