

AMERICAN CHESTNUT: FLOWERS AND BREEDING



FLORAL BIOLOGY AND POLLINATION

**Richard
King
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FLOWERS



DEVELOPMENT AND TIMING

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Flower Biology



- Flower = reproductive structure
- Several pollination vectors:
 - Wind
 - Insects
 - Birds, bats or other animals
 - Water

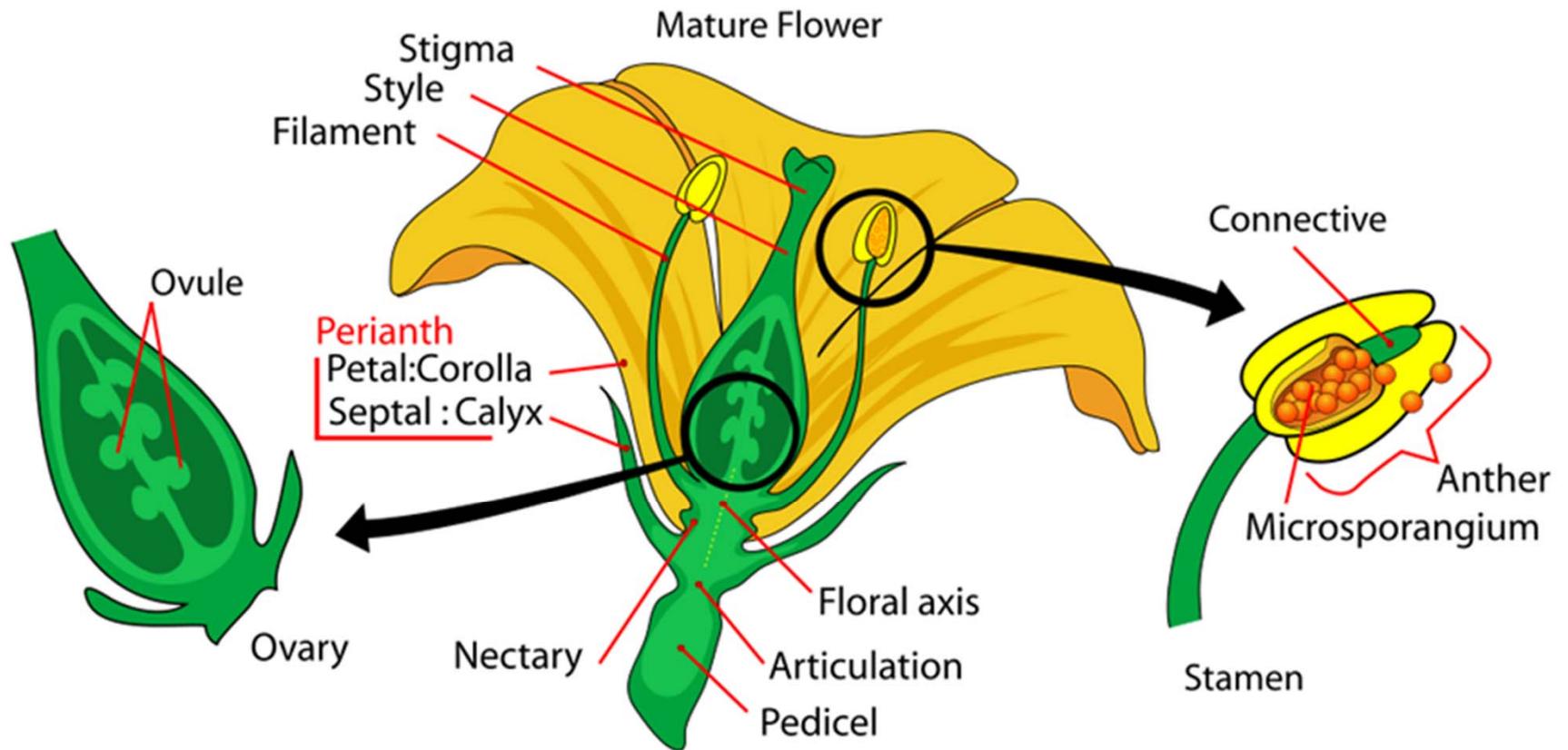


<http://pdphoto.org/PictureDetail.php?mat=pdef&pg=8202>



http://en.wikipedia.org/wiki/File:Flower_poster_2.jpg

Flower Biology

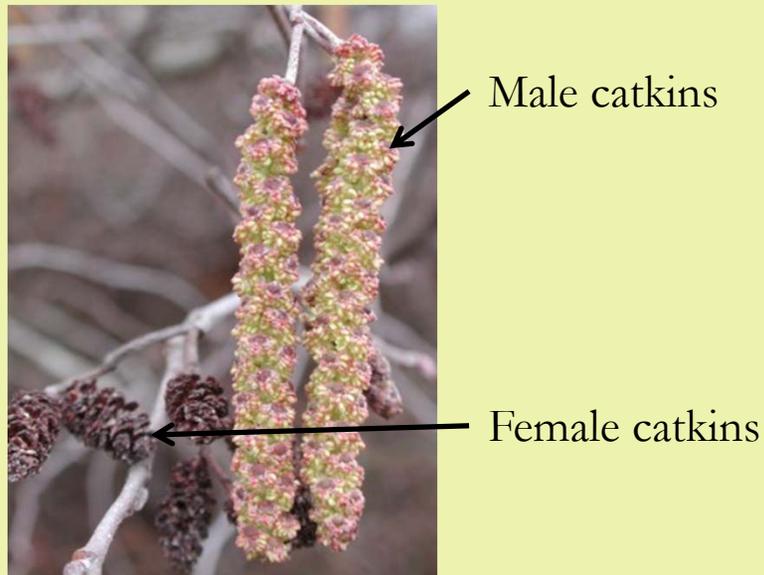


Flower Biology



Monoecious

- Male and female flowers on the same plant



<http://en.wikipedia.org/wiki/File:Tagalder8139.jpg>

Dioecious

- Male and female flowers on separate plants



<http://en.wikipedia.org/wiki/File:Hollyflowers.jpg>

Chestnut Flowers



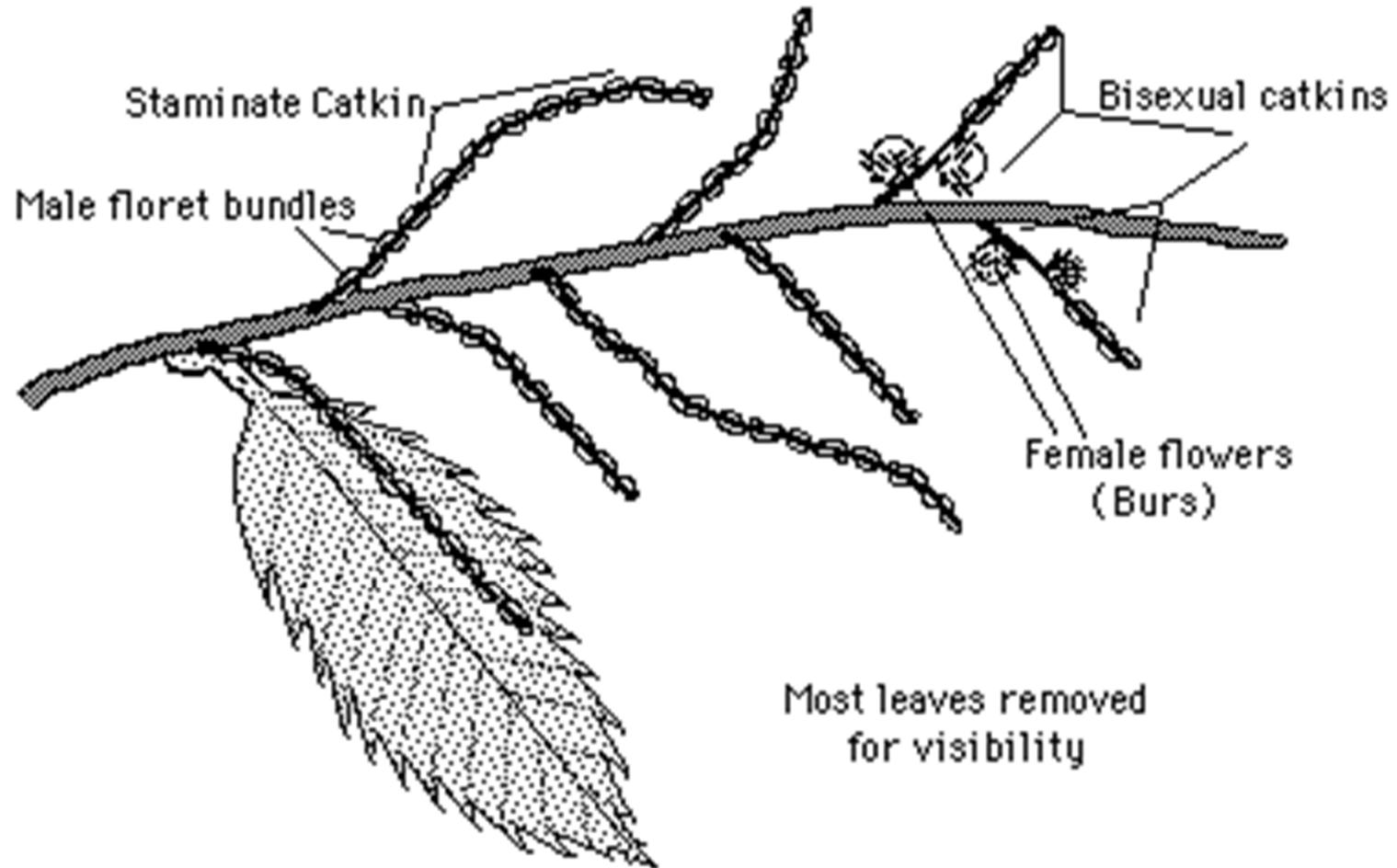
Male

Female



On the same plant: Monoecious

Chestnut Flowers



Chestnut Flowers

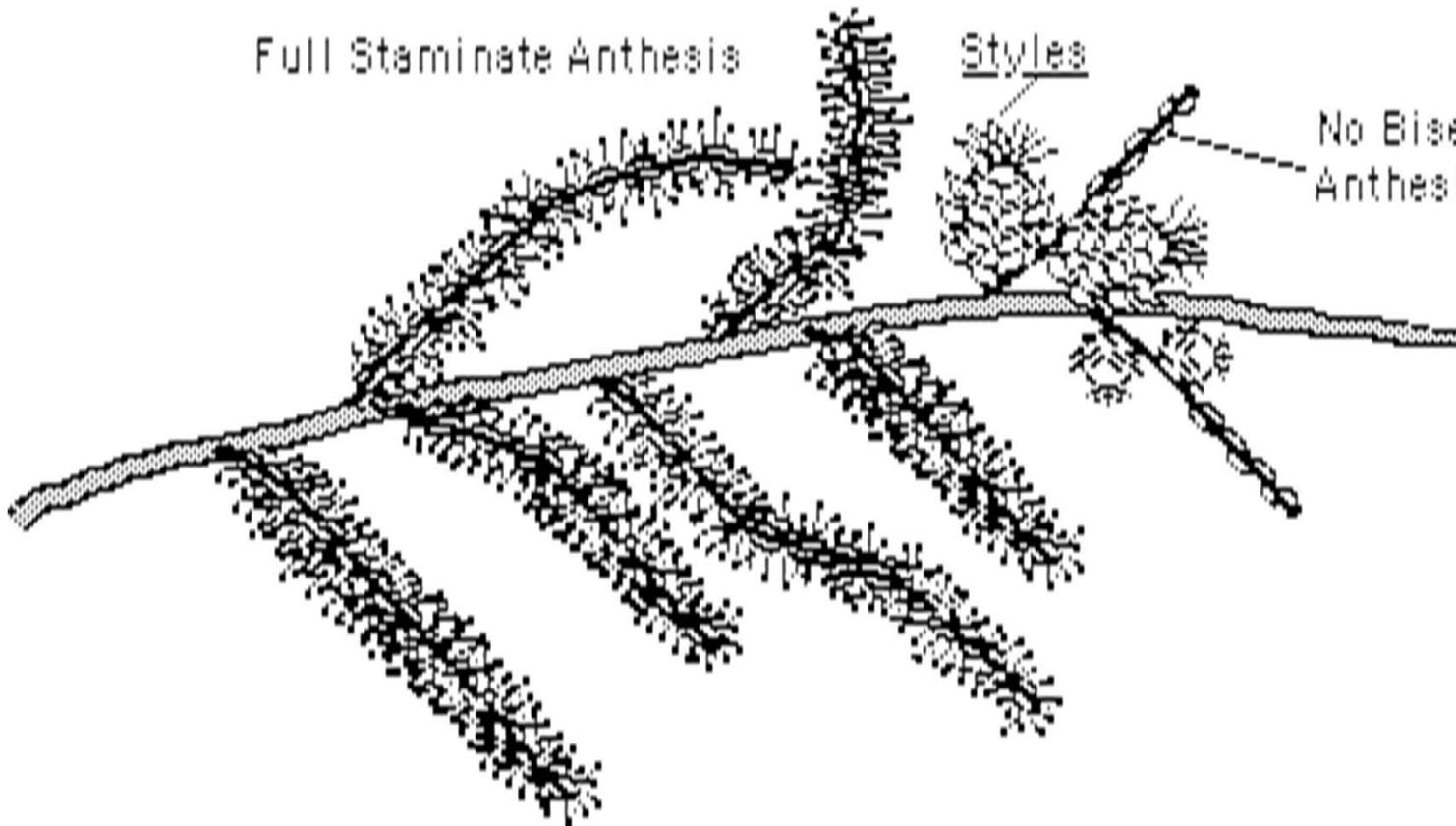
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Full Staminate Anthesis

Styles

No Bisexual
Anthesis yet



Flower Development



Flower Development

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POLLINATION



HOW TO BE THE BEE



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Pollination



- 3-step process, based on the timing of flower development
- Step 1:
 - Bagging
- Step 2:
 - Pollination
- Step 3:
 - Harvest



Bagging



- “Bagging” prevents pollen contamination and helps ensure a good controlled cross
- Remove male flowers, place bags over female flowers, secure in place with a zip tie or paper clip
 - Numbering bags first is helpful
 - Every 10th bag is a control
- Timing is important!
 - Bag too early = flowers abort
 - Bag too late = pollen contamination risk
 - Looking for female flowers with emerged, but unreceptive, styles

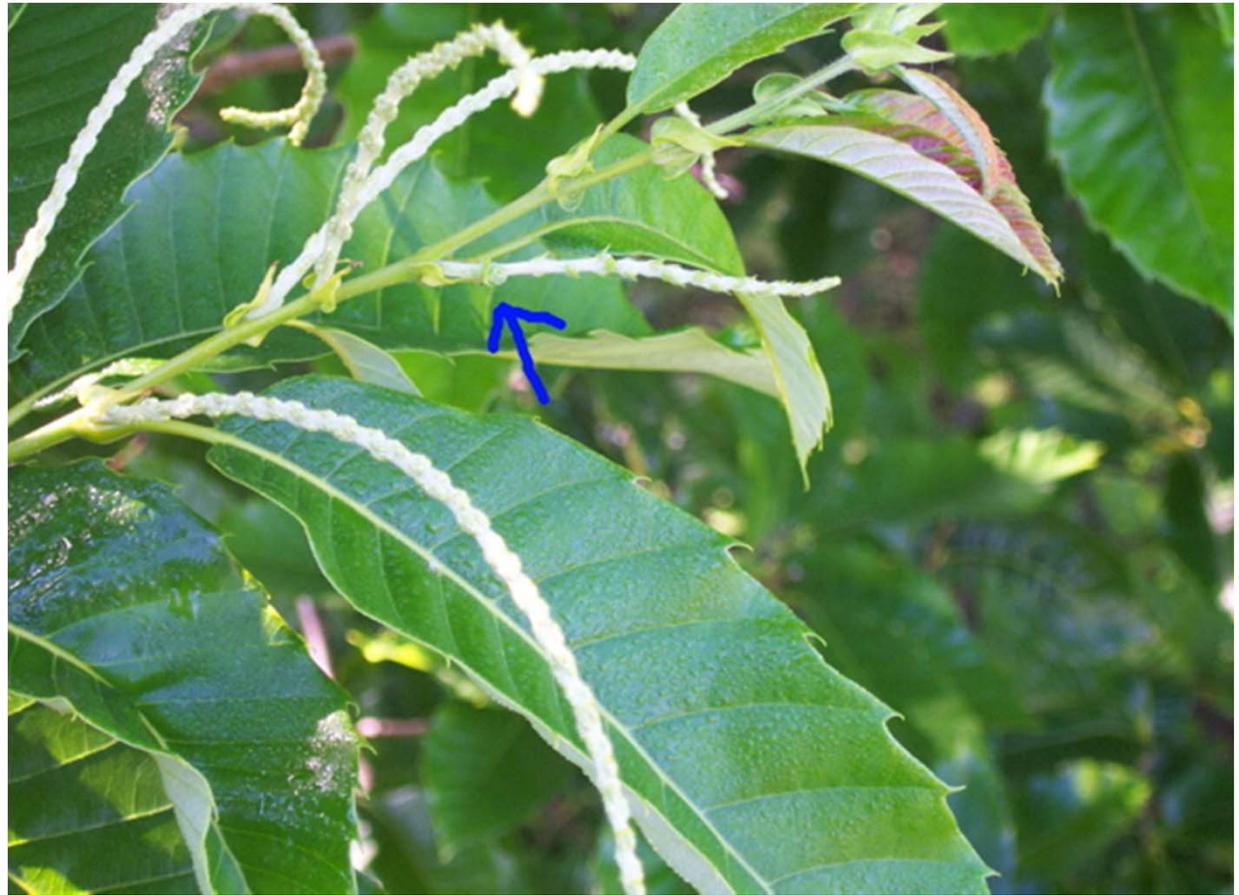




Too Early To Bag:

Immature female
flower

Catkins closed-up
tight



Chestnut Flower Development



Too Early To Bag:

Immature female
flower

Catkins closed-up
tight



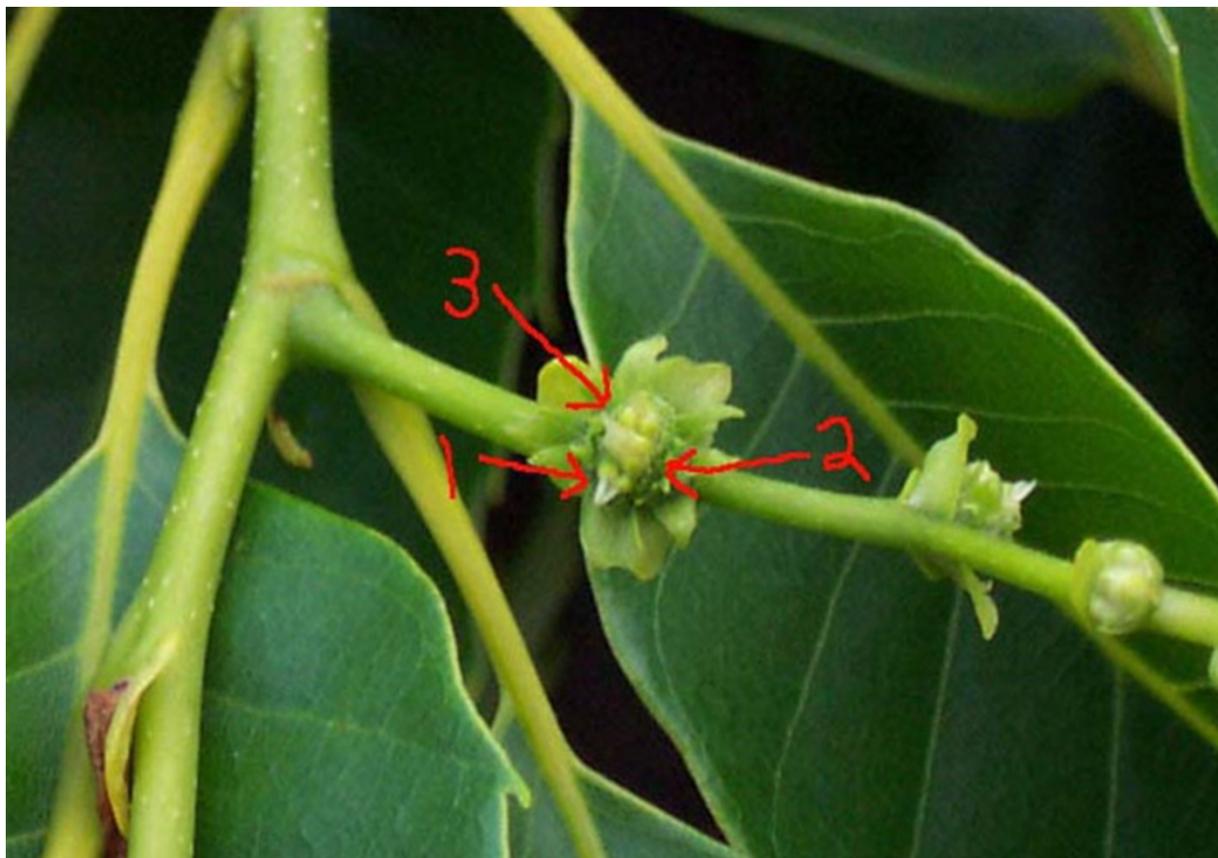
Chestnut Flower Development

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Ready To Bag:
Styles almost out



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Ready To Bag:

Styles almost out

Few anthers
emerged



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Ready To Bag:

Styles just emerged

Few anthers
emerged



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Ready To Bag:

Styles just emerged

Few anthers
emerged



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Almost Too Old
To Bag:

Styles emerged

Several anthers
emerged



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Almost Too Old
To Bag:

Styles emerged

Several anthers
emerged



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Too Old To Bag:

Styles emerged but
not yet receptive

Most anthers
emerged



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Pollination



- Pollinate when female flowers have become receptive
 - Styles fan out and turn a straw color
 - Anthers are emerged on male flowers, catkins are bushy
 - Usually 10-14 days after bagging
- Pollen can be fresh (catkin) or dried
 - Dried tends to be more successful
- Use “dunk” method or glass to apply pollen to the receptive styles of the female flowers
- Leave every 10th bag un-pollinated as a control
 - Helps confirm nuts harvested are from the pollen you applied



Pollination





Ready to Pollinate:

Styles emerged and receptive

Anthers emerged, catkins bushy



Bushy Catkins on Branch with Females Ready to Pollinate

Chestnut Flower Development



Ready vs. Not Ready:

Styles emerged and receptive (straw yellow)

VS.

Styles emerged but not yet receptive (still white)



Chestnut Flower Development



Ready vs. Not Ready:

Non-bushy catkin

VS.

Bushy catkin



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Ready vs. Not
Ready:

Non-bushy catkin

VS.

Bushy catkin



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Too Late to Pollinate:

Over-mature burs

Male catkins brown

Bisexual catkins flowering or browning

Burs much larger than styles



Chestnut Flower Development

Harvest



- Female flowers develop into burs, which contain nuts, over the course of the growing season
- Harvest usually occurs around the 1st of October
- Timing is important – wildlife pressure
 - Sterile burs will be open and browning
 - Fertile burs begin to show a seam
- Can harvest before the fertile burs open
 - Ripen in the burs, somewhere “safe”



Harvest



- Keep good counts!
- Record the number of bags removed at harvest
 - Pollination bags and control bags
- Record the number of burs collected from each type of bag
- Record the number of fertile nuts collected from each type of bag
 - Control bags should not have fertile nuts



Nut Storage



- Viable nuts are plump and fat, infertile nuts are flat
- If in doubt, try a float test
 - Put nuts in a vessel of water - those that sink are viable, those that float are not
 - May use a 5% bleach solution for this to surface sterilize the nuts prior to storage
 - ✦ Do NOT leave chestnuts in a bleach solution for too long or they may become damaged!



Nut Storage



- Chestnuts are fairly perishable – proper storage is key
- Package chestnuts for planting in damp peat moss
 - Damp = wet enough to form a ball when squeezed, but not so wet water can be squeezed out
 - Peat is anti-fungal and helps prevent rot and other fungal problems
- Fill a Ziploc with damp peat and refrigerate
 - Approximately 34°F is a good storage temp
 - Try not to store chestnuts near ripening fruits like apples – ethylene may encourage the chestnuts to sprout early
- Monitor temp, moisture and condition every few weeks

Nut Storage



- Chestnuts need to stratify before planting
 - This is a cold period needed before the nuts will sprout
 - Chestnuts should stratify for 2-3 months before planting
- Once stratified, chestnuts will sprout, even in cold storage
 - Radicle, or young root, will emerge
 - Once emerged, try not to shift nuts too much in storage
 - ✦ Roots can sense gravity and grow “down”
- Once sprouted, nuts may be planted
 - Outside, after the risk of a hard frost
 - Inside, in pots

