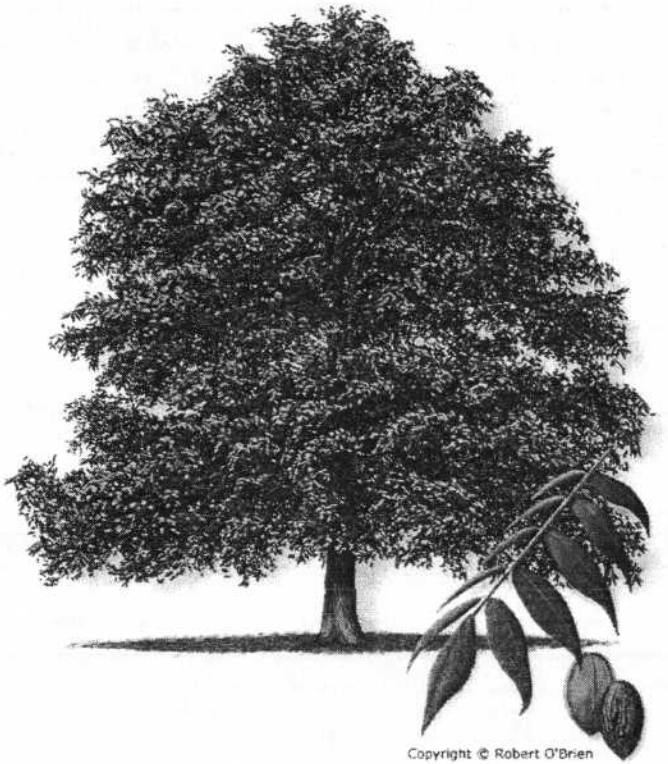
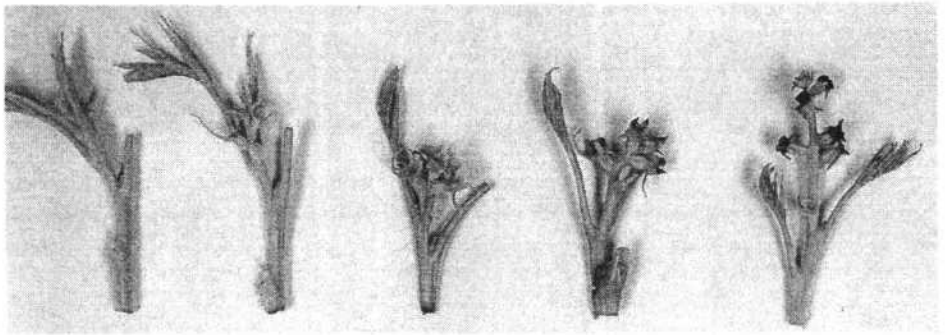
Pecan
(*Carya illinoinensis*)

- Hardwood, deciduous tree native to North America
- Member of the Walnut Family---Juglandaceae
- Closely related to hickory (Carya)



Pecan Flowering



- Cross pollinated crop (wind)
- Many catkins are produced from a single bud.
- Because pollen distribution is at random in the wind, a super abundance of pollen is needed to ensure adequate pollination.

- Similar to people
  - Takes two to make a seed
  - Seedlings are different from the parent and each other

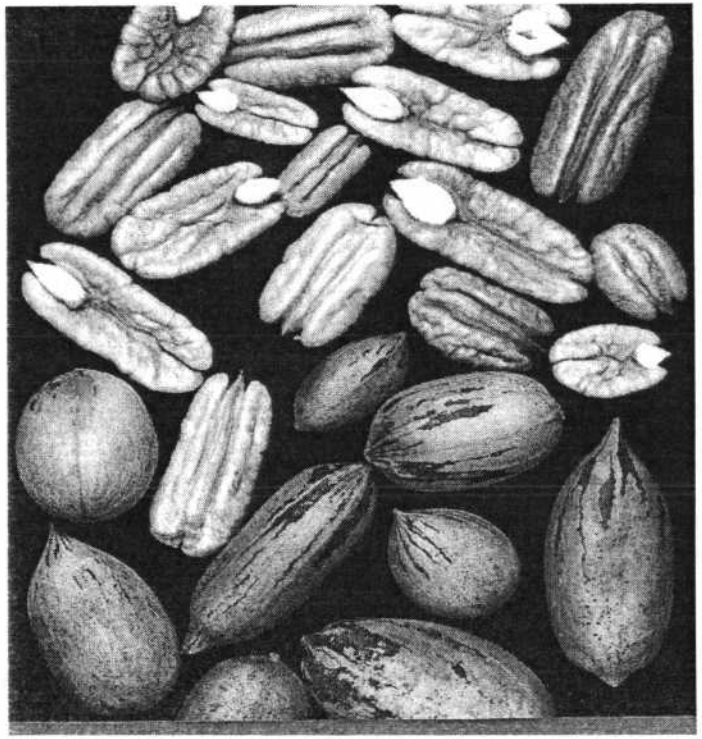
Adaptability of Pecan

- Genetic variation

- Requirements for growth and production:
  - >180 frost-free days for nut production
  - Prefers neutral to slightly acidic soils, high organic matter
  - In wild: Requires 50"-60" of rainfall/year
    - Survives in some semi-arid locations due to periodic flooding
  - Good soil moisture and well-drained soils

Native/Seedling Vs. Cultivar

- Pecans may be either grafted (Improved)cultivars or natives/seedlings.
- **Natives/Seedlings** -develop from a tree that grows from a nut
- **Cultivar = Variety**
  - Grafted or budded onto another rootstock to provide uniformity



Seedling trees have diverse nut size, nut shape, and kernel quality.

Development of Pecan Cultivars (Varieties)

- Many improved pecan cultivars are seedlings which had desirable traits and were propagated through grafting/budding

- Pecan breeders utilize classical breeding techniques to develop new cultivars

- Pecans are not currently produced via genetic modification

  - Currently not even using genetic markers

Basic pecan breeding

Table 1. Pecan selection technique in the breeding program.

Phase	Description	Years	# Clones per year	Spacing (m)
1	Seed Production	1	1,000-2,000	-
2	Scab Screening	1	1,000-2,000	0.3 × 0.3
3	Seedling Orchard	7-10	500 – 1,000	3 × 4.6
4	Grafted Yield Trial	10-15	1-5	12.2 × 12.2

Each seedling requires 14 m^2 (150 ft^2) for ~10 years for phase 3 selection.

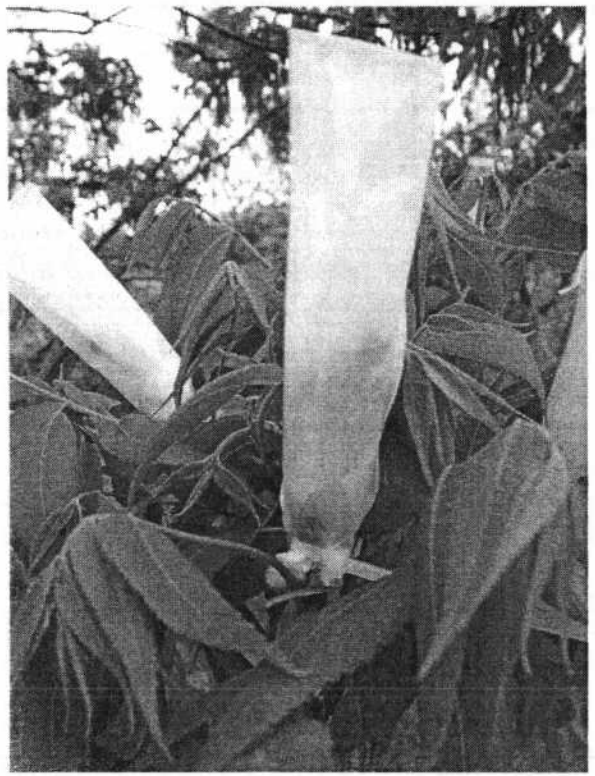
Bottleneck: Often don't have the money/field space to grow as large of a progeny as desired in the seedling orchard.

Dr. Patrick Conner

The Start: Making the Cross

150 clusters of 'Gloria Grande' were bagged and pollinated with 'Barton' pollen.

- Out of those pollinations we collected 141 seed.
- We average about 1 nut per bag applied.



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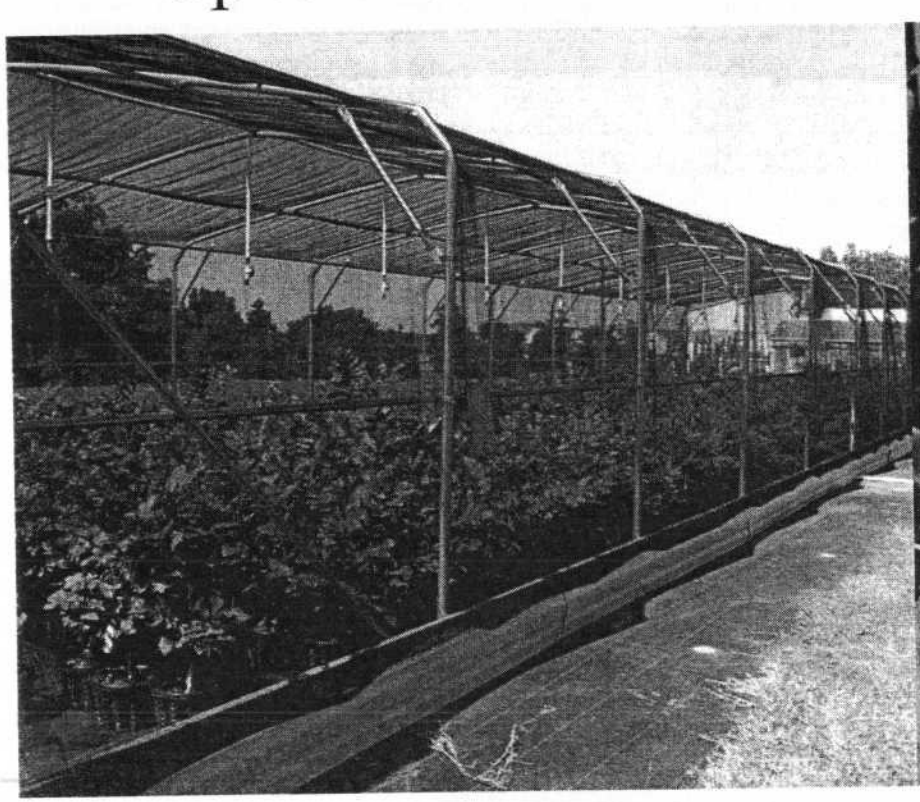
We now plant seedlings in pots to facilitate scab screening in the first year.

- Screen for foliar resistance to pecan scab.
- Up to 80% elimination of some progenies.



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Growing the Tree: Transplanting

- The year 2000 progenies spent 2 years in the nursery before being planted in the progeny field in the spring of 2003.
- Potted trees now spend 1 year in a pot and are planted in the progeny field the next year.

Growing the Tree: First Fruit

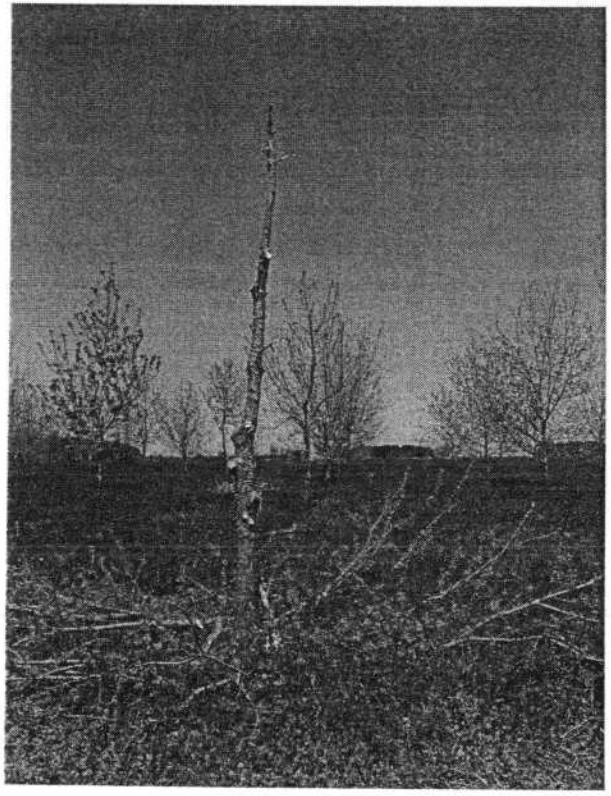
Ga. 00-7-75 produced its first crop of nuts in 2007, its 7th year of growth, 5 years after transplanting.

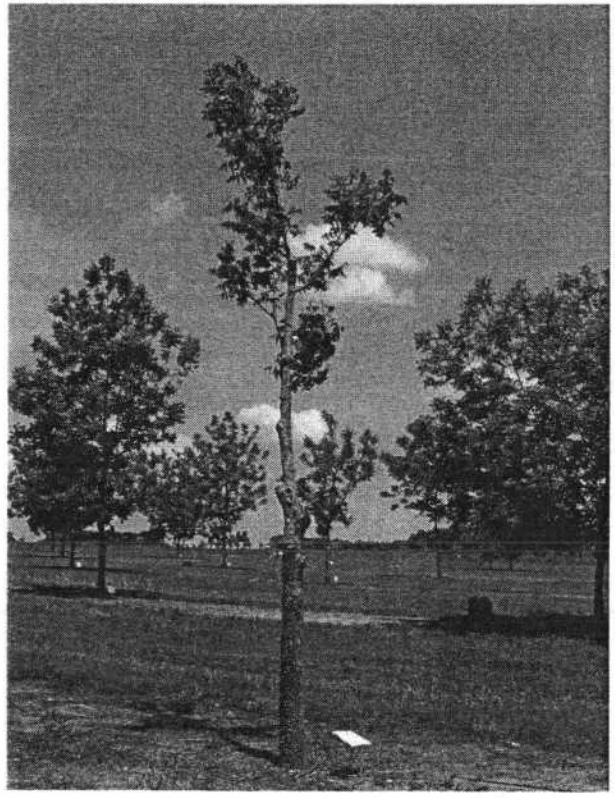
- First fruiting season is generally in years 7-9, six years is the earliest we have fruited something.
- Seedlings take longer than grafted trees to fruit because they go through a juvenile period.

Making a Selection

We watched Ga. 00-7-75 for only 2 years before topworking it into or trial orchard.

- When something is propagated for further trials it goes from being a "seedling" to a "selection".
- We have topworked a few selections, but mostly we have had to graft young trees, which take longer to fruit.



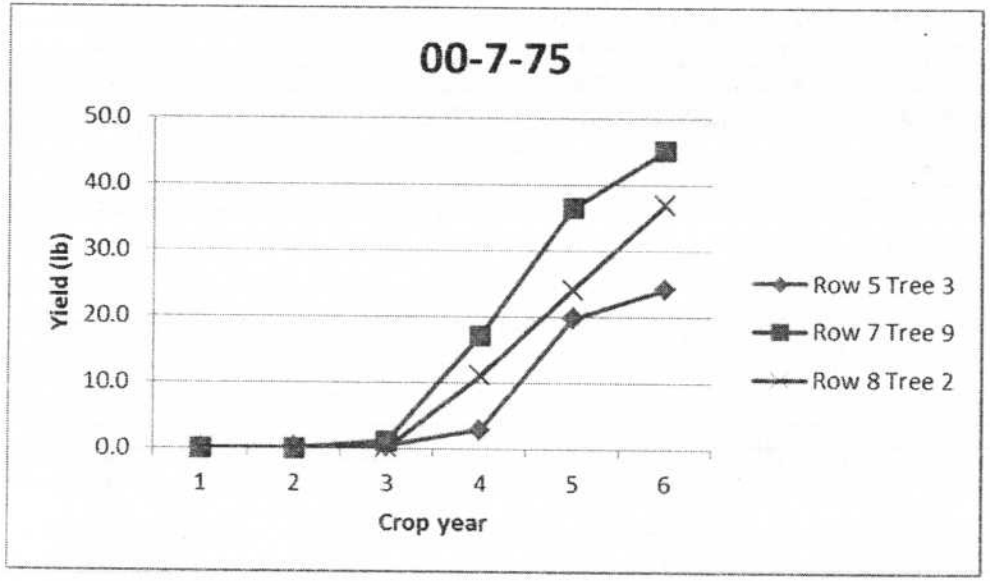


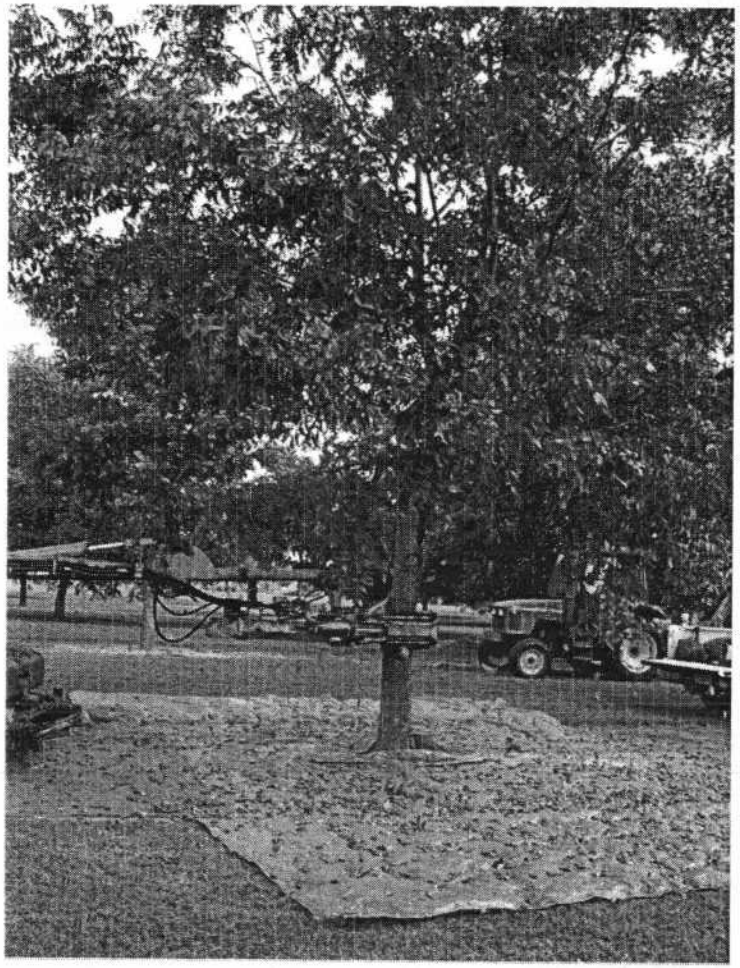
Trialing the Selection: Station Yield Trials

Topworked trees began fruiting in 2011, the third year from topworking.

Yields are approaching that of unworked trees.

How much yield data is enough to release?





UGA Recommended Pecan Cultivars

Low Input	Medium Input	High Input	Conditional	Trial
Amling	Caddo	Desirable	Cape Fear	Byrd
McMillan*	Forkert*	Pawnee	Creek	Zinner*
Excel*	Oconee		Kiowa*	Lakota*
Elliott*	Sumner*			Mandan
Kanza*				Morrill
				Ellis*
				Huffman
				Treadwell
				Cunard

*Type II—Stigma receptive before pollen mature

Budbreak

April

Pollination

May

Catkin differentiation for next year, ≈ 3 weeks after budbreak

June

July

Water stage

Aug

Female flower induction

Sept

Shuck split

Oct

Defoliation

Nov

Dec

Jan

Bud swell

Pistillate flower differentiation

Feb Mar

Amling & Amling, 1983