APPLICATION FOR RELEASE

APPLICATION FOR RELEASE OF (check one):

x☐ **CULTIVAR**
☐ **ASSOCIATE CULTIVAR**
☐ **GERMPLASM**
☐ **PARENTAL LINE**
☐ **GENETIC STOCK**

1. Crop: Pecan [*Carya illinoinensis* (Wangenh.) C. Koch]

2. Experimental no. or name: Selection no. 121. Tom

3. Pedigree and history: 'Tom' originated from a cross of 'Wichita'× 'Pawnee' (Fig. 1). 'Pawnee' was selected as a parent due to its moderately large nut size (49 nuts/lb.), high kernel percentage (58-59%), and early nut maturity which is about 21 days before 'Stuart', the most widely grown cultivar in Georgia. Except for the newly released 'Byrd', 'Cunard', and 'Treadwell', 'Pawnee' is the only exceptionally early maturing pecan cultivar of commercial significance. In the humid southeastern United States and under heavy fruiting stress, the kernel seed coat of 'Pawnee' develops conspicuous and unattractive dark spots (speckling) which convey a dirty and unacceptable appearance. 'Pawnee' is highly susceptible to scab disease [*Fusicladosporium effusum* (G. Winters) Partridge & Morgan-Jones], the single most serious pecan disease in the southeastern United States.

'Wichita' was selected as a parent due to its relative early nut maturity (7 to 10 days before 'Stuart'), acceptable nut size (57 nuts/lb.), and a very plump kernel with a cracking percentage of 60 to 61%, which is higher than 'Pawnee' (i.e. 58 to 59%). 'Wichita' is highly susceptible to the scab fungus and the fruit is very susceptible to splitting during the "water stage" (liquid endosperm stage) of fruit development. Both parents have a higher kernel percentage than most cultivars including widely planted 'Stuart' (47-48%) and 'Desirable' (51-52%), the latter being the leading cultivar planted in new orchards until recently.

4. Description of plant material: Trunk bark is grey (RHS 202B) and scaly (Fig. 2). Date of bud break is similar to 'Stuart' and later than 'Byrd', 'Huffman', 'Morrill', 'Cunard', and 'Treadwell' (Table 1). Leaf color is forest green (Fig. 3) (RHS 137A). Leaflets droop from the rachis, curve inward, and form a "tunnel" configuration. One margin of the leaflets flares upward creating a ruffed appearance (Fig. 3). The leaflets are convoluted which increase acropetally on the leaf and on leaves of the shoot. Leaf architecture is a distinguishing trait. Stigma color is oxblood (RHS 61A). Shuck sutures are winged which is accentuated acropetally (Fig. 4). As the nut near maturity, the shuck becomes stippled (Fig. 4). 'Tom' is protandrous and is pollinated by 'Elliott' and 'Schley' (Table 2). 'Tom', in turn, will pollinate 'Elliott', 'Schley' and 'Cheyenne'.

Pecan cultivars can be clearly identified using a combination of nut shape and shell characteristics. These identifying characteristics for 'Tom' are as follows. General nut shape is ovate-oblong, cross-section is round, base shape is round, apex shape is mildly acuminate, the apex is not grooved, shell suture is not elevated, shell surface is subtly ridged, and shell topography is smooth. In pecan, the nut length to width ratio and the ratio of nut width across sutures to between sutures (nut flatness) tends to be constant for a genotype. Respectively these ratios for 'Tom' are 1.64 and 0.96 (Table 3). Nut maturity is early and is in the same class as 'Treadwell', 'Byrd', and 'Cunard' (Table 3). Nut size (nuts/lb) is larger than 'Elliott' but less than the other early maturing 'Treadwell', 'Byrd', and 'Cunard' (Table 3). The shell is thick and percentage kernel is correspondingly less than 'Treadwell', 'Byrd', and 'Cunard' (Table 3). Kernel size is larger than 'Elliott' (Table 4) and suitable for the confection trade. Kernel color is good and similar to 'Elliott' (Figs. 5 and 6). Unlike the male parent, 'Wichita', kernel speckling (Table 5) and fruit split have not been observed. Precocity is moderate and decidedly less than 'Cunard', 'Byrd', and 'Treadwell' (Table 6), and 'Desirable' (Tables 6 and 7). Prolificacy is exceptionally high (Table 8) and, so far, alternate or irregular bearing has not occurred (Tables 9 and 10) in spite of a moderately

large cluster size (Table 11). 'Tom' has good resistance but not immunity to black pecan aphids [*Melanocallis caryaefoliae* (Davis)] (Table 12), and to pecan leaf scorch mite [*Eotetranychus hicorire* (McGregor)] (one location only) (Table13). So far, scab disease has not been observed on sprayed trees (Tables 14 - 17), but during the excessively wet 2013, slight scab (lesions barely detectable) occurred on about 2% of the fruit on unsprayed trees at Watkinsville but not on an unsprayed tree in Albany.

All tree and nut characteristics, including prolificacy, early nut maturity, and resistance to the scab fungus have remained stable across all locations in Georgia (Watkinsville, Leary, and Albany).

Need for and potential users of plant material: 'Tom' is being submitted as an early maturing small nut for the confection/gift package trade.

Currently, 'Elliott' is the ideal nut for the confection/gift package trade. The nut is an excellent cracker (90% or more intact halves), the kernel is an attractive golden color, noted for excellent flavor, unusually uniform size and small kernels (250 – 300 halves/pound or Junior Mammoth Halves). The color and distinct flavor makes it a specialty in the gift package trade. The small kernel is ideal for pecan ice cream and the chocolate covered trade and, because its size is similar to almonds and cashews, the three are sold as a chocolate covered nut mix. The tree is not susceptible to the scab organism in most locations. Nut maturity is about 10 days ahead of conventional cultivars which is a major marketing advantage. Small, thin shelled, early maturing nuts are subject to major bird predation. This is not a problem with 'Elliott' due to its relatively thick shell and round cross section (Table 3). Birds prefer thin shells (easily pecked) and round is more difficult to grasp in the beak than flattened or oval.

'Elliott's major and dominating disadvantage is its low nut production, mainly

because of a strong alternate bearing habit (Table 9). Attempts to level out production by fruit thinning have largely been unsuccessful due to the difficulty of judging fruit load. Leaf color and shuck color are visually similar. Because of its low productivity 'Elliott' is no longer planted in commercial orchards except in low areas conducive to scab disease and as a pollinizer. Although nut maturity is relatively early, it is not early compared to the newly released 'Treadwell', 'Byrd', and 'Cunard' (Table 3). Earlier maturity would increase the market value of 'Elliott'.

Early nut maturity is especially important in Georgia because the market has the advantage of a harvest that is earlier than Texas and New Mexico, the only two major competitors for Georgia pecans. Because of its earliness, 'Byrd' nuts sell for about 30% or more above the norm for Georgia pecan cultivars. Assuming 1500 lbs. of nuts/acre and $2.30 for 'Desirable' and $3.50 for 'Byrd', gross return/acre for 'Desirable' and 'Byrd' is $3,450 and $5,250, respectively. As the harvest becomes later, the price per pound normally declines (near Thanksgiving) and often appreciably. Thus, early harvest is important to the Georgia grower due to its effect on profitability.

The intended geographic range of commercialization is the southeastern United States, but, 'Tom', because of its high and consistent production, early nut maturity, good kernel color, and a kernel size well suited to the gift package and confection trades, and, so far, very high resistance to scab disease will be of interest in all geographic regions suited for pecan.

5. Justification for release:

Main Attributes

- So far, scab disease has not been observed on sprayed 'Tom' trees (Tables 14-17) but during wet 2013 slight fruit scab (rating of 2) occurred on an unsprayed tree at

Watkinsville but not in Albany.

- Nut maturity is exceptionally early and is about 13 days before 'Elliott' and similar to 'Byrd', 'Treadwell', and 'Cunard' (Table 3). 'Tom' is the only exceptional early small nut suitable for the confection trade.

- Prolificacy is exceptionally high and equal to the highly prolific 'Cunard' (Table 8) but differs from 'Cunard' in that so far fruit thinning is not required.

- In contrast, to 'Elliott', alternate or irregular bearing has, so far, not been a problem (Tables 9 and 10) which is not due to a small cluster size (Table 11) or low kernel percentage (Table 3).

- Small kernel size (Table 4) and excellent color (Figs. 5 and 6) without speckling (Table 5 and Figs. 5 and 6) makes 'Tom', like 'Elliott' suitable for the confection trade.

Secondary Attributes

- Tom has good resistance, but not immunity, to black pecan aphid, *Melanocallis caryaefoliae* (Davis) (Table 12) and pecan leaf scorch mite, *Eotetranychus hicorire* (McGregor) (one location only) (Table 13).

- So far, fruit split during the liquid endosperm stage of fruit development has not been observed, in contrast to the male parent.

- The roundish cross-section and thick shell (Table 3) are not conducive to bird predation, which has not been observed to be a problem.

In summary, the justification for release of 'Tom' is its high prolificacy, consistent production, early nut maturity, a kernel size suited to the confection trade, excellent kernel color and absence of speckling, and good resistance but not immunity to black pecan aphid and pecan leaf scorch mite (one location), and so far, no observed scab disease on sprayed trees and very high resistance on unsprayed trees. 'Tom' will fill a market vacuum for an early, small kernel with excellent color.

Comments from pecan growers following field observations of Selection 121 suggest grower demand for trees will be exceptionally high.

Patten Seed Company, Lakeland, GA; Shiloh Pecan Farms, Ray City, GA; Nut Tree Pecan Nursery, Albany, GA; Southeast Georgia Pecan Nursery, Reidsville, GA, and Linwood Nursery, La Grange, CA have expressed an interest in nursery propagation of 'Tom'.

7. Participating scientists: None.

8. Location(s) at which plant material was developed: The cross was made in 1995 at the University of Georgia Horticulture Farm, Watkinsville, GA. The seed was planted in 1996 and fruited in 2005. In 2006, 'Tom' was selected for trial. Fruiting trees of 'Kiowa' were top worked to 'Tom' in 2006 and 2011 at NILO Plantation, Albany, GA to evaluate alternate bearing and nut quality associated with heavy fruiting stress inherent to mature trees. Experimental plantings (from nursery trees) were established at NILO in 2011 and 2012 and at Graham Pecan Farm 2-year-old trees were top worked in 2009.

9. Recommended form of intellectual property protection and royalty:

Cultivar and associate cultivar applications only provide the following information:

10. Method of propagation: Vegetative. Grafting and budding.

11. Amount of breeder seed stocks available (if applicable):

12. Amount of foundation seed stocks available if applicable:

13. Amount of cutting or bud material available for vegetatively propagated material for nursery distribution (if applicable): In Albany and Leary GA., graft wood is available from top worked trees. Beginning in 2013, wood is available from two certified plantings. Additionally, graft wood is being increased on the Horticulture Farm at Athens.

14. Describe any unusual difficulty anticipated in the production of any class of seed stocks: Hopefully none but it depends on demand. The demand for the previously released Byrd' 'Cunard', 'Morrill', and 'Huffman' has been exceptionally high and graft wood has been inadequate in spite of the substantial volume that has been available.

15. Suggest up to three names for the cultivar, if appropriate: 'Tom.'

16. Name approved by plant cultivar and germplasm release committee:

Table 1. Bud break date for 'Tom', 'Stuart', 'Huffman' 'Morrill, 'Byrd', 'Treadwell', and 'Cunard' pecans, Watkinsville, GA, 6 year average.

Cultivar	Bud break date
Tom	4/2a
Stuart	3/31ab
Huffman	3/30b
Morrill	3/30b
Byrd	3/27c
Treadwell	3/27c
Cunard	3/26c

Means followed by the same letter are not statistically different, $P \leq 0.05$, n = 6.

Table 2. Periods of pollen shedding and stigma receptivity for 'Tom' and selected other pecan cultivars in April, Watkinsville, GA.

	April																				
	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Protandrous cultivars																						
Cheyenne	.....																					
	____																					
Desirable														.....								
	____													.....								
Tom																						
	____																					
Protogynous																						
Elliott					.....																	
														____								
Schley							.....															
														____								
Stuart											.....											
																		____				

.....= Period of stigma receptivity.

___= Period of pollen shedding.

Table 3. Nut characteristics of 'Treadwell', 'Byrd', 'Tom', 'Cunard', 'Morrill', 'Elliott', and 'Huffman' pecans, Albany, GA, 2009- 2012.

Cultivar	Wt./ nut (g)	Nuts/lbs	Nut length (mm)	Length/ width [z]	Nut [y] flatness	Shell thickness (mm)	Kernel (%)	Nut maturity date [x]
Treadwell	9.5cd	48cd	41.5d	1.92b	0.97d	0.70bd	62.2b	24a
Byrd	8.9d	51c	42.4d	1.88b	1.04b	0.51e	62.3b	24a
Tom	7.8e	58b	36.3e	1.64c	0.96d	0.84a	54.7cd	25a
Cunard	11.1b	41e	52.2a	2.18a	1.03b	0.66cd	62.5b	26a
Morrill	10.1c	46d	49.2b	2.07a	1.11a.	0.63d	65.9a	35b
Elliott	7.1f	64a	32.5f	1.39d	1.04b	0.70bc	52.0e	38b
Huffman	12.2a	37e	44.7c	1.65c	1.03b	0.72b	55.5cd	33b

Means followed by the same letter within a column are not statistically different, $P \leq 0.05$, n= 4.

[z] Length to width ratio = nut length divided by width. Width was measured midway the length of the nut and across the suture.
[y] Nut flatness = ratio of nut width across suture to width between suture. Measurement was made midway the length of the nut.
[x] Date when shuck dehiscence had occurred on 50% of the fruit, days from September 1.

Table 4. Kernel characteristics of 'Elliott' and 'Tom' pecans, NILO Plantation, Albany, GA, 2012.

Cultivar	Kernel length (cm)	Kernel width (cm)	Kernels/lb (no.)
Elliott	2.51b	1.88b	268a
Tom	2.83a	2.05a	216b

Means followed by the same letter within a column are not statistically different, $P \leq 0.05$, n= 15.

Table 5. Susceptibility of 'Tom', 'Byrd' 'Morrill', "Huffman', 'Pawnee', 'Cunard', 'Treadwell', and 'Desirable' pecans to kernel speckling, Watkinsville, GA, 2000-2006, 2008, n=8.

Cultivar	No. of years with Kernel speckling
Tom	0
Byrd	0
Morrill	0
Huffman	0
Pawnee	4
Cunard	0
Treadwell	0
Desirable	0

Table 6. Precocity of 'Cunard', 'Byrd', 'Treadwell', 'Desirable', 'Morrill', 'Elliott', 'Tom', 'Huffman', and 'Stuart' pecans.

Cultivar	Years to initial fruiting [z]
Cunard	2
Byrd	3
Treadwell	3
Desirable	4
Morrill	4
Elliott	5
Tom	5
Huffman	5
Stuart	6

[z] Years from transplanting from the nursery.

Table 7. Nut production of young 'Tom' and 'Desirable' pecan trees, Leary, GA. [z]

Cultivar	Yield (lb/tree)
Tom	0.3b
Desirable	2.9a

Means followed by the same letter are not statistically different, $P \leq 0.05$, n= 14.

[z] Production 4 years after top working 2 year-old trees.

Table 8. Production, nuts per pound, percentage kernel of trees top worked to 'Tom', 'Cunard', 'Treadwell', 'Huffman', and 'Morrill', NILO Plantation, Albany, GA, 2009-13.

Cultivar	Lbs/tree	Nuts/lb.	Kernel (%)
Tom	57a	59d	54.7c
Cunard [z]	42ab	40b	62.5b
Treadwell [z]	29b	48c	62.2b
Huffman	30b	37a	55.5c
Morrill	33b	45c	65.9a

Means followed by the same letter within a column are not statistically different, $P \leq 0.05$, n = 5.

[y] Cunard and Treadwell were fruit thinned as needed. About 50% of the fruit was removed. Other cultivars were not fruit thinned.

Table 9. Production consistency, nuts per pound, and percentage kernel of 'Tom' and 'Elliott' pecan trees, NILO Plantation, Albany, GA, 2009-13. [z]

Year	Lbs/tree		Nuts/lb.		Kernel (%)	
	Elliott	Tom	Elliott	Tom	Elliott	Tom
2009	13	29	67	59	52.7	57.0
2010	43	34	62	62	50.6	53.0
2011	20	68	63	54	54.0	54.2
2012	30	90	65	59	50.9	53.9
2013	52	125	68	59	54.4	54.9

[z] All data are on an individual tree basis, n = 1. 'Elliott' borne alternately or irregular, 'Tom' did not.

Table 10. Alternate bearing tendency of 'Byrd', 'Treadwell', 'Elliott', 'Huffman', 'Tom', 'Morrill', and 'Cunard' pecans, NILO Plantation, Albany, GA.

Cultivar	Years to fruiting (no.)	Years until bearing alternate (no.) [y]
Byrd	2	3
Treadwell	2	3
Elliott	2	4 [y]
Huffman	2	>6
Tom	2	>6
Morrill	2	>9
Cunard	2	10 [z]

[y] Years after top working mature trees to the respective cultivar, n=3. Top working simulates a mature tree and allows for earlier evaluation of alternate bearing, kernel development under heavy fruit load, and suitability for mechanical harvest and ease of fruit thinning.

[z] Annual production maintained by fruit thinning.

[y] Years from initial fruiting. Data for 'Elliott' were from non top worked trees planted in 2002.

Table 11. Fruit cluster size of 'Byrd', 'Desirable', 'Huffman', 'Tom', 'Morrill', 'Pawnee', Cunard, 'Treadwell', and 'Elliott' pecans, Watkinsville, GA. Data are averages of three years, 2005, 2006, and 2008.

Cultivar	Fruits/cluster(no.)[z]
Byrd	3.1abc
Desirable	1.8f
Huffman	1.6f
Tom	2.8bcd
Morrill	2.9bcd
Pawnee	3.2ab
Cunard	3.2ab
Treadwell	2.7cd
Elliott	2.8bcd

Means followed by the same letter are not statistically different, $P \leq 0.05$, n=30.

[z] Cluster counts made after the second drop was completed.

Table 12. Leaf susceptibility of 'Byrd', 'Huffman', 'Morrill', 'Cunard', 'Tom', 'Treadwell', and 'Sumner' pecans to black pecan aphids at two Georgia locations.

	Leaf rating [z]			
		Leary		Watkinsville
Cultivar	2009	2011	2012	2011
Byrd	1.5d	1.9a	1.1c	1.8ab
Huffman	1.4e	1.4b	1.1c	1.0b
Morrill	2.3b	1.9a	2.3a	2.0a
Cunard	1.1e	1.9a	1.3c	2.0a
Tom	1.1e	1.2bc	2.3a	1.0b
Treadwell	1.9c	2.1a	1.2c	1.8ab
Sumner	2.8a	1.8a	-	-

Means followed by the same letter within a column are not statistically different, $P \leq 0.05\%$, n=19.

[z] 1 = no injury
2 = <1% of leaves with injury
3 = 1-10% of leaves with injury
4 = 11-50% of leaves with injury
5 = >50% of leaves with injury and partial defoliation.

Table 13. Leaf susceptibility of 'Tom', 'Byrd', 'Morrill', 'Huffman', 'Cunard', and 'Treadwell' pecans to pecan leaf scorch mite, Graham Pecan Farm, Leary, GA, 2009.

Cultivar	Leaf rating [z]
Tom	1.1b
Byrd	1.1b
Morrill	1.2b
Huffman	1.6c
Cunard	2.2d
Treadwell	2.7a

Means followed by the same letter are not statistically different, $P \leq 0.05\%$, n=19.

[z] 1= no damage
2= trace
3= multiple lesions
4= minor defoliation
5= severe defoliation.

Table 14. Leaf scab susceptibility of 'Byrd', 'Morrill', 'Cunard', 'Treadwell', "Tom', 'Elliott', and 'Desirable' pecans at two Georgia locations.

	Leaf scab [x]				
		Leary [y]		Watkinsville [z]	
Cultivar	2009	2010	2011	2010	2011
Byrd	1.0b	1.0b	1.0a	1.4b	1.0a
Morrill	1.3b	1.0b	1.0a	2.0b	1.0a
Cunard	1.3b	1.0b	1.0a	1.8b	1.0a
Treadwell	1.2b	1.0b	1.0a	1.6b	1.0a
Tom	1.0b	1.0b	1.0a	-	1.0a
Elliott	1.0b	-	-	-	1.0a
Desirable	4.7a	2.9a	1.4a	3.8a	1.0a

Means followed by the same letter within a column are not statistically different, $P \leq 0.05$.

[x] 1 = no scab lesions
2 = occasional lesion on leaf, less than 1% of leaves with lesions
3 = lesions scant on 2 to 10% of leaves
4 = lesions widespread but no leaf distortion
5 = lesions widespread and severe leaf distortion.

[y] n = 19, trees sprayed with fungicides.
[z] n= 5, trees sprayed with fungicides.

Table 15. Fruit scab susceptibility of 'Tom', 'Morrill', 'Cunard', 'Treadwell', 'Byrd', 'Huffman', and 'Desirable' pecans at two Georgia locations.

	Fruit scab [z]	
Cultivar	Leary [y] 2012	Watkinsville- five year average [x]
Tom	1.0a	1.0c
Morrill	1.0a	1.8b
Cunard	1.0a	2.3b
Treadwell	1.0a	2.2b
Byrd	1.0a	1.7bc
Huffman	1.0a	1.0c
Desirable	4.3b	3.3a

Means followed by the same letter within a column are not statistically different, $P \leq 0.05$.

[z] 1= no lesions
2=occasional lesions, <10% of fruit with scab
3=lesions common on fruit but not damaging, 1-50% of fruit with scab
4=wide spread lesions on fruit but not damaging, 51-75% of fruit with scab
5= widespread lesions on fruit, fruit size suppressed.

[y] n=19· trees sprayed with fungicides
[y] years 2005, 08, 09, 10, 11, 12, n=5, trees sprayed with fungicides.

Table 16. Fruit scab susceptibility of 'Tom' and 'Desirable', Leary, Georgia, August 28, 2013.

Cultivar [y]	Fruit scab rating [z]
Tom	1.0a
Desirable	4.0b

Means followed by the same letter are not statistically different, $P \leq 0.05$.

[z] 1= no lesions
2=occasional lesions, <10% of fruit with scab
3=lesions common on fruit but not damaging, 1-50% of fruit with scab
4=wide spread lesions on fruit but not damaging, 51-75% of fruit with scab
5= widespread lesions on fruit, fruit size suppressed.

[y] n= 4, trees sprayed with fungicides.

Table 17. Fruit scab susceptibility of 'Tom' and 'Desirable', Albany, Georgia – five year average [y].

Cultivar	Fruit scab rating [z]
Tom	1.0a
Desirable	3.0b

Means followed by the same letter are not statistically different, $P \leq 0.05$.

[y] years 2009- 2013, n = 5, trees sprayed with fungicides.

[z] 1= no lesions
2=occasional lesions, <10% of fruit with scab
3=lesions common on fruit but not damaging, 1-50% of fruit with scab
4=wide spread lesions on fruit but not damaging, 51-75% of fruit with scab
5= widespread lesions on fruit, fruit size suppressed.

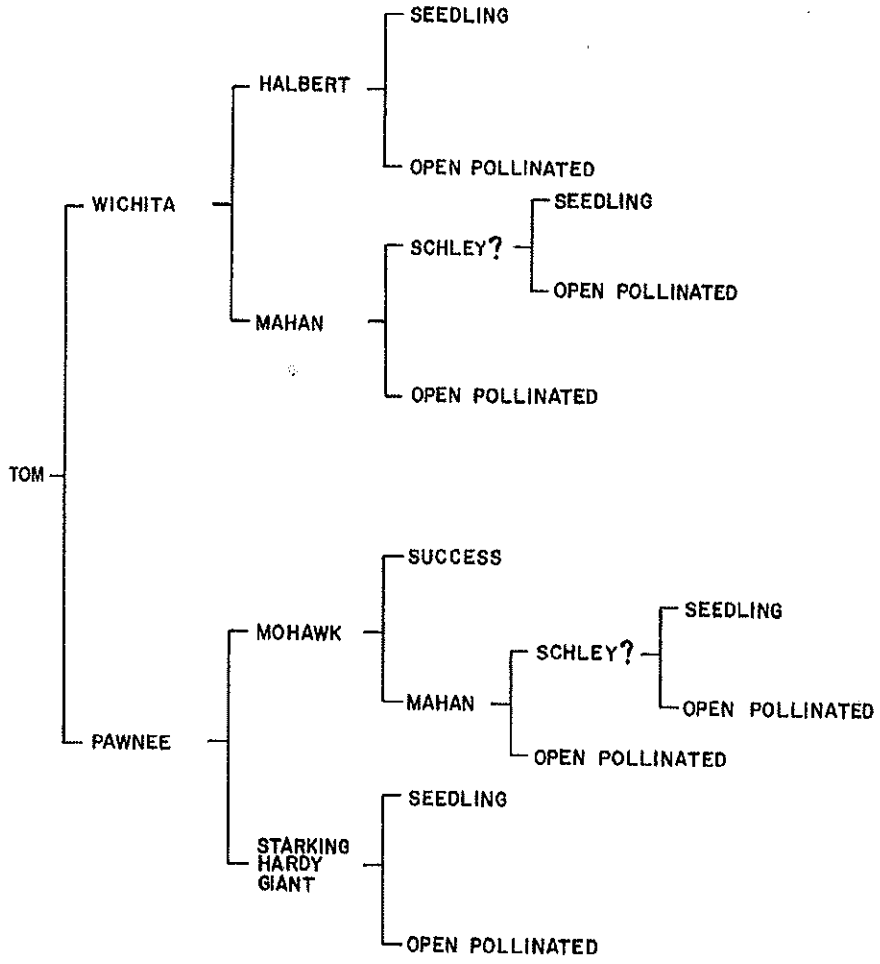

Fig.1. Pedigree of 'Tom' pecan.

Fig. 2. Scaly bark of 'Tom' pecan. Initially the bark is tight and the scaly characteristic develops with tree maturity.

Fig. 3. Leaf architecture of 'Tom' pecan. Leaflets droop from the rachis, curve inward, forming a "tunnel" configuration. One margin of the leaflets flares upward creating a ruffed appearance. The terminal leaflet also droops and was removed before photographing.

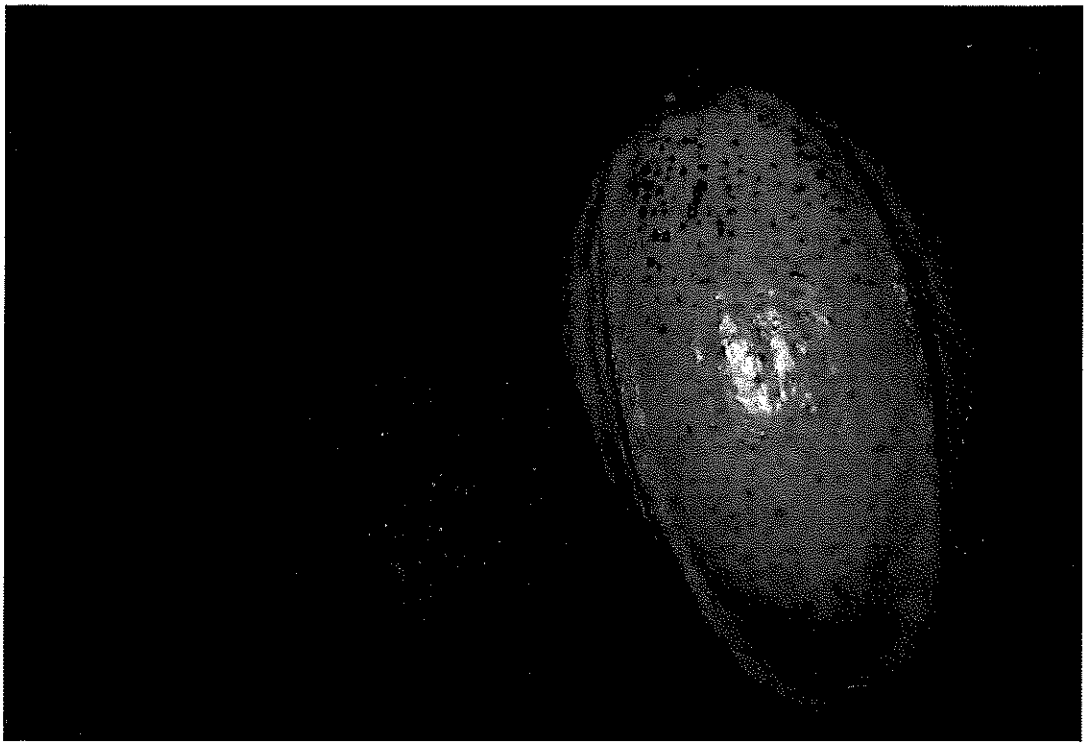

Fig. 4. Fruit of 'Tom' pecan near shuck dehiscence. Stippling on the shuck is a distinguishing characteristic.

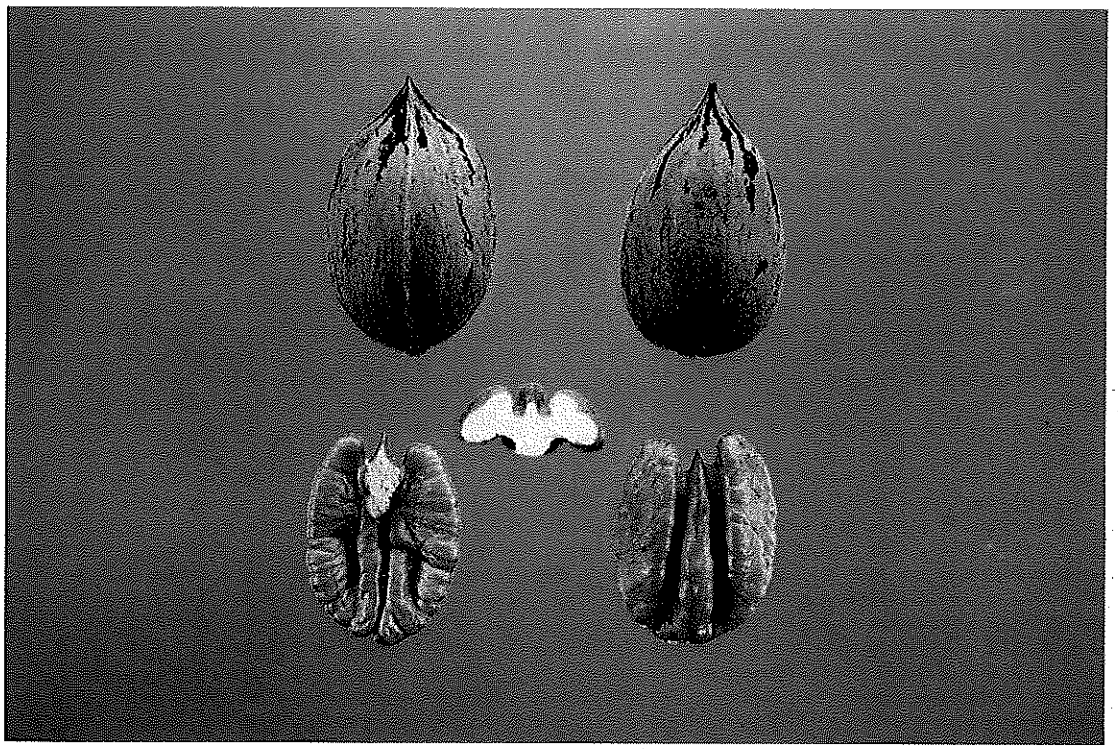

Fig. 5. Nut shape and kernel characteristics of 'Tom' pecan. From left to right: the top views depict the suture side and the non-suture side of the nut; and the bottom views, from left to right depict the ventral side of the kernel, the kernel in cross-section (dorsal side up), and the dorsal side of the kernel.

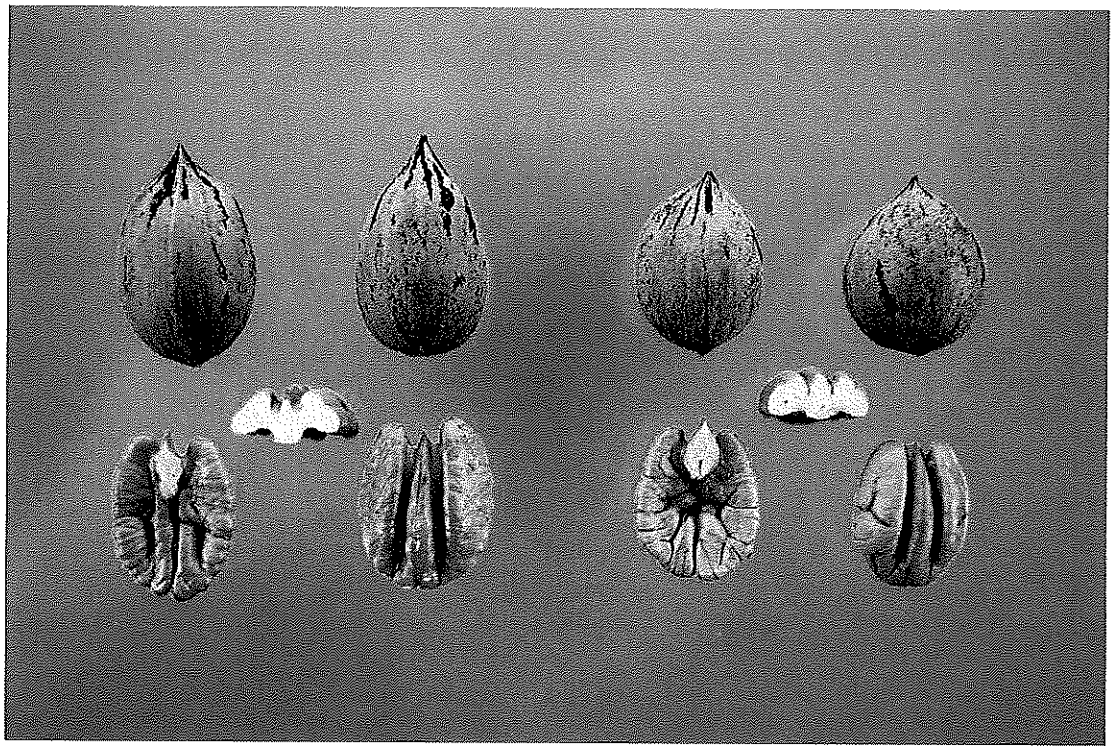

Fig. 6. Nut shape and kernel characteristics of 'Tom' vs. 'Elliott' pecans. Nut: left to right; 'Tom' suture side, non suture side; 'Elliott' suture side, non suture side. Kernel: left to right; 'Tom' ventral side, dorsal side; 'Elliott' ventral side, dorsal side. Cross section, dorsal side up.

APPLICATION FOR RELEASE

(Please keep this as a separate page)

Application for the release of (insert experimental name or number and crop)

Pecan selection no. 121

Recommended:

A. Originating Scientist — Date: 7-8-13

B. Department Head — Date: 7/8/13

C. For Griffin and Tifton, Assistant Dean — Date

D. Chair, GAES PCGRC — Date: 2/19/14

E. Robert N. Shulstad — Digitally signed by Robert N. Shulstad, DN: cn=Robert N. Shulstad, o=Agricultural Experiment Stations, ou=UGA CAES, email=shulstad@uga.edu, c=US, Date: 2014.02.26 16:34:40 -05'00'
Associate Dean for Research — Date

Approved:

F. J. Scott Angle — Digitally signed by J. Scott Angle, DN: cn=J. Scott Angle, o=UGA CAES, ou=Dean and Director, email=caesdean@uga.edu, c=US, Date: 2014.03.04 09:19:00 -05'00'
Dean and Director