

## MEADOWVIEW NOTES 2002-2003

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**I**n the year 2002, Meadowview again was blessed with abundant rainfall from May until mid-August, when hot weather and drought set in and persisted until October, 2002. In October, the pattern of the last few years finally broke, and it became very rainy, enough so that field operations were seriously retarded. With one break from mid-December through mid-January, 2003, the wet weather continued until March, when we finally were able to start plowing for the spring plantings. It was not exceptionally warm on anyone day in April and May, but consistently warm enough that most trees had leafed out fully by the first week in May, about two weeks ahead of time. Cool, wet weather set in again toward the end of April and persisted up through June.

Our current holdings are in Table 1, and changes from 2002 to 2003 are indicated in Table 2. We now have more than 20,000 trees covering more than 70 acres. The most notable changes from last year are the continued accretion of B3-F2 trees, and some reduction in the number of B2 trees. The latter reflects our pending conversion of the Wagner Research Farm into a seed orchard for Graves B3-F2s. We expect to begin the planting of those nuts next winter. The other notable change is the increase in B1-F2s and B2-F2s, earlier generations than the B3-F2s. The B1-F2s and B2-F2s are intended to provide a foundation for increasing the number of sources of resistance throughout the chapters, as was discussed in last year's Meadowview Notes.

Table 3 presents the current holdings of 'Graves' and 'Clapper' third backcrosses in the various state chapters. Taking the chapters and Meadowview together, TACF now has more than 35,000 trees in the ground. Note that the Pennsylvania Chapter produced their first B3-F2 nuts last year!

The 2002 harvest (Table 4) was a disappointment, in part. We had a late harvest at the farm, perhaps due to persistent heat and drought through September. I was assessing when to begin harvesting in the mountains by visiting a site close to Meadowview. However, that site, and the farms, did not reflect temperature and moisture further up the



valley (20-25 miles), where the bulk of our mountain pollinations were located. There, the nut crop was not late, but we were, and many nuts had dropped by the time we went to harvest. We probably lost about 1000 nuts, mostly first and second backcrosses. But, on the bright side, we completed one line of B3-F2 nuts!

### EFFICIENCY OF CONTROLLED POLLINATION

In 2002 we compared the nut yield from pollinations done with fresh catkins to those done using dried pollen, and there was no significant difference between the methods (Table 5). However, dried pollen did give a substantially better yield in one instance. I hope we get an opportunity to repeat this test in the future.

I would like to thank Lou Silveri, Ron Myers, Gene Whitmeyer, and Harry Norford for helping out with pollination this year. They came

down on their own and stayed at Emory and Henry College. We also had a group come down under an Elder Hostel program. Sam Fisher, Neil Rich & Chrystle Gates of the Southwest Virginia 4-H Center have

A Quick Guide to Chestnut Breeding Terminology		
PARENT	=	OFFSPRING
American x Chinese	=	F1' "F-one"
F, xF,	=	F2' F-two
F2 x F2	=	F3' F-three
F, x American	=	B" first backcross, or B-one
B, x American	=	B2' second backcross, or B-two
B2 x American	=	B3' third backcross
B3 x American	=	B4, fourth backcross
B, xB, B,-F2'	=	B-one F-two
B,-F2 x B,-F2	=	B,-F3' B-two F-three
B2 x B2 B2-F2'	=	B-two F-
B2-F2 x B2-F2	=	B2-F3' B-two F-three
B3 x B3	=	B3-F2' B-three F-two
B3-F2 x B3-F2	=	B3-F3' B-three F-three

been very helpful managing the Elder Hostel program, which would not occur without their initiative. Thank you -this wouldn't get done without your help. If you would be interested in helping pollinate next year, plan on any time in June after the 10th. (Call 276-944-4631 around June 1). If you would be interested in the Elder Hostel program, call 617 -426-8055 or write 75 Federal St., Boston MA 02110.

### NUMBER OF PROGENY PER LINE TO RETAIN AT B3

Last year I discussed the layout of B3-F2 seed orchards, and the relative

merits of producing B3-F2 seed by controlled or open pollination. Another important consideration in producing B3-F2 seed is the number of straight B3 mother trees to select per line. For open pollination, I originally thought that it would be best to retain only one individual per line, in order to avoid the inbreeding arising from full-sib crosses between two individuals from the same line. However, simulations (Figure 1) indicate that inbreeding in later generations actually is decreased by retaining more than one straight B3 per line, *if all* the B3-F2 trees are grown in *one* seed orchard, rather than dispersing the seed orchard over more than one location. It is true that there is more inbreeding at B3-F2 when more than one individual is retained per line. But this is outweighed by less inbreeding at B3-F3 when more than one is retained, because there are fewer crosses between sibs at B3-F2, those being replaced by crosses between first cousins.

The greatest reduction in inbreeding occurs when two individuals are retained per line, rather than one (Figure 1). The reduction shrinks rapidly beyond two. Inbreeding finally starts to increase, erratically in these simulations (data not shown), when more than 10 individuals are retained per line.

Another equally, or perhaps more important reason to retain more than one straight B3 per line is to ensure production of adequate numbers of B3-F2 progeny, partially by ensuring that at least one B3 mother survives long enough to produce adequate numbers of progeny. Single trees can be lost due to random events such as wind throw.

It is still important, however, not to select too many straight B 3 individuals per line, so that fairly stringent selection for American type can be performed. It also is important to try to have equal numbers of selections for each line, so that one line does not become over-represented in the progeny, again leading to inbreeding.



We would like to remind all TACF members that you are welcome to visit the farms at any time. We are in a white house on the northeast side of Virginia Route 80, one-third of a mile southeast of Exit 24 on Interstate 81, the Meadowview Exit. We generally are there during normal work hours, but it might be good to call ahead (276-944-4631).

**TABLE 1**

*Type and number of chestnut trees and planted nuts at TACF Meadowview Research Farms in May 2003, with the number of sources of blight resistance and the number of American chestnut lines in the breeding stock.*

Type of Tree	Increase or Decrease* in		
	Nuts or Trees	Sources of Resistance	American Lines
American	2120		187
Chinese	918	41	
Chinese x American: F1	696	25	95
American x (Chinese x American): B1	1064	11	36
American x [American x (Chinese x American)]: B2	4650	9	96
American x {American x [American x (Chinese x American)]}: B3	6425	6	71
Am x (Am x {Am x [Am x (Chin x Am)]}):B4	86	1	1
(Chinese x American) x (Chinese x American): F2	710	5	5
[Ch x Am) x (Ch x Am)] x [Ch x Am) x (Ch x Am)]:F3	6	1	1
[Amer x (Chin x Amer)] x [Amer x (Chin x Amer)]: B1-F2	688	4	3
{Am x [Am x (Ch x Am)]} x {Am x [Am x (Ch x Am)]}:B2-F2	381	4	5
[A x (A x {A x [A x (C x A)]})] x [A x (A x {A x [A x (C x A)]})]:B3-F2	3452	2	8
Chinese x (Chinese x American): Chinese B1	142		
Chinese x [American x (Chinese x American)]	41		
Japanese	3	2	
American x Japanese: F1	14	2	2
(American x Japanese) x American: B1	198	2	2
Castanea seguinii	48	1	
Chinese x Castanea pumila: F1	9		
Large, Surviving American x American: F1	251	13	27
(Large, Surviving American x American) x American: B1	768	7	12
Large, Surviving American x Large, Surviving American: 11	194	6	6
Large, Surviving American: F2 = F1 xF1, same LS parent	703	5	5
Large, Surviving American: Other	59	2	2
Irradiated American x American: F1	41	1	1
Other	26		
<b>Total</b>	<b>20,693</b>		

\* The number of lines varied depending on the source of resistance. We will have to make additional crosses in some lines to achieve the desired number of 75 progeny per generation within a line. In keeping with past practice, the number of lines for each source of resistance are added separately; thus, progeny from two sources of resistance that share an American parent would be counted as two lines crather than one line (this only occurs rarely).

**TABLE 2**

*Changes between 2002 and 2003 in the number of chestnut trees and planted nuts of different types at TACF Meadowview Research Farms, including changes in the number of sources of blight resistance and the number of American chestnut lines in the breeding stock.*

Type of Tree	Increase or Decrease* in Number of		
	Nuts or Trees	Sources of Resistance	American Lines
American	189		20
Chinese	20	-1	
Chinese x American: F1	45	1	11
American x (Chinese x American): B1	43	-1	-5
American x [American x (Chinese x American)]: B2	-423	0	-9
American x {American x [American x (Chinese x American)]}: B3	107	1	-1
Am x (Am x {Am x [Am x (Chin x Am)]}):B4	-14	0	0
(Chinese x American) x (Chinese x American): F2	-70	0	-14
[Ch x Am] x [Ch x Am] x [Ch x Am] x [Ch x Am]:F3	0	0	0
[Amer x (Chin x Amer)] x [Amer x (Chin x Amer)]: B1-F2	179	1	-3
{Am x [Am x (Ch x Am)]} x {Am x [Am x (Ch x Am)]}:B2-F2	-12	0	-4
[A x (A x {A x [A x (C x A)]})] x [A x (A x {A x [A x (C x A)]})]:B3-F2	2178	0	0
Chinese x (Chinese x American): Chinese B1	0		
Chinese x [American x (Chinese x American)]	0		
Japanese	0	0	
American x Japanese: F1	-2	0	-1
(American x Japanese) x American: B1	0	0	0
Castanea seguinii	0	0	
Chinese x Castanea pumila: F1	0		
Large, Surviving American x American: F1	-53	1	-9
(Large, Surviving American x American) x American: B1	183	0	2
Large, Surviving American x Large, Surviving American: 11	132	2	1
Large, Surviving American: F2 = F1 x F1, same LS parent	358	0	-5
Large, Surviving American: Other	-16	0	-5
Irradiated American x American: F1	0	0	0
Other	-33		
<b>Total</b>	<b>2811</b>		

\* The decreases in B1' B2' B2-F2 and Large, Surviving American F1 & '1 trees reflects roguing of trees with inadequate levels of blight resistance. The increases reflect further breeding and collecting.

**TABLE 3**

*Number of third and fourth chestnut backcrosses at TACF Chapters in 2003, with the number of sources of blight resistance and the number of American chestnut lines in the breeding stock.*

<b>Chapter</b>	<b>Nuts or Trees</b>	<b>Number of Sources of Resistance</b>	<b>American lines*</b>
Maine	1581	2	21
Massachusetts	2328	2	20
Pennsylvania	9338*	2	32
Indiana	2057	1	11
Kentucky	150	1	1
North Carolina	865	2	9
Tennessee	745	5	6
<b>Total</b>	<b>17,064</b>		

\* Includes B3-F2s!

**TABLE 4**

*The American Chestnut Foundation Meadowview Farms 2002 nut harvest from controlled pollinations and selected open pollinations.*

<b>Nut Type</b>	<b>Female Parent</b>	<b>Pollen Parent</b>	<b>Pollinated</b>			<b>Unpollinated Checks</b>			<b>Number of American Chestnut Lines*</b>
			<b>nuts</b>	<b>bags</b>	<b>burs</b>	<b>nuts</b>	<b>bags</b>	<b>burs</b>	
B <sub>1</sub>	American	72-211 F <sub>1</sub>	3	74	61	0	7	5	2
B <sub>1</sub> -F <sub>2</sub>	Meiling B <sub>1</sub>	Meiling B <sub>1</sub>	643	543	168	5	52	156	8
B <sub>2</sub>	American	Nanking B <sub>1</sub>	2	27	42	0	5	5	2
B <sub>2</sub>	Nanking B <sub>1</sub>	American	76	96	159	3	11	17	3
B <sub>2</sub> -F <sub>2</sub>	Clapper B <sub>2</sub>	op	4016	open pollinated					6
B <sub>2</sub> -F <sub>2</sub>	R1T7 B <sub>2</sub>	R1 T7 B <sub>2</sub>	13	8	18	0	1	2	1
B <sub>2</sub> -F <sub>2</sub>	B2-F2 Clapper	op	320	open pollinated					4

*(Continued on next page)*

TABLE 4 (continued)

Female Parent	Pollen Parent	Pollinated			Unpollinated Checks			Number of American Chestnut Lines*
		nuts	bags	burs	nuts	bags	burs	
American	Douglas B2	50	71	129	0	6	13	
American	Graves B2	3	41	92	2	3	6	
Graves B2	American	230	527	1316	1	43	107	8
R1T4 B2	American	10	3	9				
American	R1T7 B2	187	223	375	3	31	59	7
Clapper B3	op	2793		open pollinated			5	
Kuling Chinese	American	10	43	85	0	5	8	
Mahogany Chinese	American	61	65	112	0	6	13	4
Nanking Chinese	American	261	132	325	1	16	48	3
Amherst F1	American	24	63	253	1	5	20	
American	OrtF1	310	294	780	9	26	69	5
American	Hill4565	2	55	43	1	4	5	2
Ort F1	Ort F1	816	368	1342	3	44	116	6
opDaresBeach	Ort F1	139	47	104	0	6	14	2
opWeekly	Ort F1	3	13	18	0	2	3	
<b>TOTAL CONTROLLED POLLINATIONS</b>		<b>2843</b>	<b>2693</b>	<b>6947</b>	<b>29</b>	<b>273</b>	<b>666</b>	

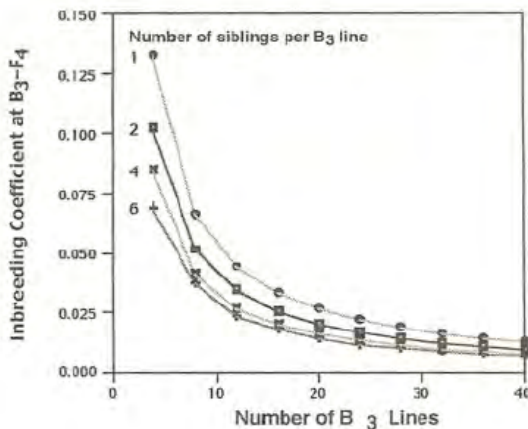
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**TABLE 5**

*Nut yield from pollinations using fresh catkins and dried pollen on the same tree.*

Cross	Pollen Type	bags	burs	nuts
TM287xTM441	fresh catkins	49	185	47
TM287xTM441	dried pollen	60	107	49
TM328xTM550	fresh catkins	34	173	4
TM328xTM550	dried pollen	33	81	30
TM441 xTM482	fresh catkins	59	42	52
TM441 xTM482	dried pollen	64	49	228
TM482xTM441	fresh catkins	33	30	46
TM482xTM441	dried pollen	18	228	13
TM693xTM550	fresh catkins	20	1	14
TM693xTM550	dried pollen	27	14	125

\* There was no significant effect of pollen type on the absolute number of nuts produced or the number of nuts produced per bur.



**Figure 1.** Effect of the number of siblings per B<sub>3</sub> line on the inbreeding coefficient at B<sub>3</sub>-F<sub>4</sub> versus the number of B<sub>3</sub> lines in the founder population, for partial diallel mating at B<sub>3</sub> with 4 lines per diallel, ten B<sub>3</sub>F<sub>2</sub> offspring per line, and for random mating thereafter.