Meadowview Notes 2005-2006

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Meadowview experienced low rainfall in the summer of 2005, especially during June. As usual during dry summers, temperatures were fairly hot. This weather pattern is associated with fast rates of canker expansion. Thanks to the irrigation system at our Glenn C. Price Research Farm, the rates of canker expansion there were not so great that we lost promising trees, nor were they so great that it was overly difficult to distinguish intermediate from low levels of blight resistance. However, irrigation could not decrease the hot temperatures that favor the blight fungus so canker expansion rates were faster than in wetter, cooler years.

Like 2005, it was quite wet in the winter of 2006, delaying plowing until March, as in 2004. But, once again we were able to finish planting by early April, as we now have sufficient equipment to prepare orchards quickly once the weather breaks. We have sufficient equipment because of the generous support of TACF members, and we thank you for this for the third year in a row!

Inventory.
Our current holdings are presented in Table 1, and changes from 2005 to 2006 are indicated in Table 2. We now have more than 26,000 trees and planted nuts, an increase of approximately 4,000 over last year (Table 2). The addition of B_3-F_2 trees has been offset by the removal of straight backcross trees as we have made selections and rogued the rejects. Note also that we have planted our first B_3-F_3 nuts!

Starting with the Spring, 2007, issue of this journal, results from our state chapter breeding efforts will be presented by our Regional Science Coordinators, Dr. Paul Sisco in the south, Sara Fitzsimmons in the Mid-Atlantic, and Leila Pinchot in New England. Therefore, chapter results are no longer being presented in Meadowview Notes. Suffice it to say for now that we have vigorous breeding programs fully underway at numerous chapters.

Harvest.
Meadowview Notes for last year were printed late, in time to include the harvest results for 2005. See *Journal of The American Chestnut Foundation* 19(2):27. Next year's notes will include our harvest results for 2006.

Personnel.
Thanks once again to your generosity, TACF was able to hire three new science staff in the last year. Leila Pinchot was mentioned previously. At Meadowview, Dr. Bob Pairs was hired as a Research Geneticist and William White as a Research Technician. William came on board just as we were starting to collect pollen this June, during our busiest season, and one of his charges is to supervise pollen collection and distribution to state chapters. It was a real baptism under fire for William. He immediately made some improvements to our germination testing procedures; we hope this will help ensure that we ship highly viable pollen to our state chapters.

Dr. Paris came on board in November of 2005, as things were slowing down for the year. This gave him a bit of time to evaluate various approaches to increasing the number of sources of blight resistance being used in the breeding program, with a view to ensuring long-term stability of blight resistance. With that in mind, Bob initiated a number of crosses this June, as well as exploring rapid methods for evaluating blight resistance in chestnut and aggressiveness in the blight fungus.

William and Bob currently are hard at work initiating various studies to evaluate strains of the blight fungus for ability to break down the blight resistance we are backcrossing into American chestnut.

It has been a real pleasure for me to work with Bob and William and I anticipate that you will enjoy reading Journal articles they will be writing about their work for many years to come, including next year's edition of Meadowview Notes.

Blight resistance screening in B_3-F_2 seedlings.
The year 2005 was the second in which we screened 'Clapper' B_3-F_2 seedlings for blight resistance and the first for 'Graves' B_3-F_2 seedlings. The results of the 'Clapper' tests for the past two years are presented in Table 3 and those for the Graves' test in Table 4.

I combined the 2004 and 2005 results for blight resistance screening of 'Clapper' B_3-F_2 seedlings (Table 3) because the same genotypes were represented in both years. This increases the sizes of the populations up to levels where we would expect strongly to observe some trees with high levels of blight resistance. There were some individuals classified as highly resistance, but, overall, the populations had mean resistance ratings higher than 3.0, the level expected, roughly, for B_3-F_2 populations. This may be because the 'Clapper' B_3-F_2 seedlings were planted at a farm which is not irrigated.

In contrast, 'Graves' B_3-F_2 seedlings (Table 4) grown under irrigation at the Price Research Farm had mean resistance ratings closer to 3.0, not significantly different from the F_1 controls planted in that orchard. However, no B_3-F_2 seedlings were classified as highly resistant. This could have occurred for several reasons. First, the low number of planted seedlings gave only a small chance that one would be highly resistant. Second, the fact that the B_3-F_2 seedling's average resistance rating was slightly higher than the F_1 controls --a difference too small to be statistically significant in this study—may be hinting that the B_3 parents of the B_3-F_2 seedlings had inadequate blight resistance. Lesser apparent resistance of the B_3-F_2 seedlings than the F_1 controls alternatively may have occurred because the B_3-F_2 seedlings were smaller than this particular set of F_1 controls, which showed strong hybrid vigor. Nevertheless, I was impressed enough with five progeny from the B3119 x B3176 cross to transplant them to the 'Graves' B_3-F_2 seedling seed orchard being developed at our Wagner Research Farm. Some of those transplanted seedlings are still showing good resistance as of writing this in July, 2006.

Overall, I have cautious optimism that we will be able to recover highly blight-resistant progeny among the B_3-F_2 seedlings from the 'Clapper' and 'Graves' sources of resistance, but we certainly do not have firm evidence for this yet. This year we inoculated many more 'Clapper' and 'Graves' B_3-F_2 seedlings than in 2004 and 2005. However, as I discussed last year, we are moving to staged screening for blight resistance in B_3-F_2 seedling seed orchards, which means this year we only inoculated with a relatively nonaggressive, but virulent, strain of the blight fungus. This will separate out the weakest trees, those in resistance classes 4 and 5. It will be one or more years before we inoculate the stronger trees with an aggressive strain of the blight fungus to separate out the strongest trees. Stay tuned!

I would like to thank Lou Silveri, Dave Lazor, Chandis Klinger, Bart Chezar, and Marshal Case(!) for helping out with pollination and inoculation in 2005. They came down on their own. We also had a group come down under an Elder Hostel program. Sam Fisher, Director of the Southwest Virginia 4-H Center has been very helpful managing the Elder Hostel program and running the crew, which would not occur without her initiative. Thanks to all —this wouldn't get done without their help. If you are interested in helping to pollinate next year, plan on any time in June (call 276 944-4631). If you are interested in learning more about the Elder Hostel program, call 617 426-8055 or write 75 Federal St., Boston MA 02110.

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 2006, with the number of sources of blight resistance and the number of American chestnut lines in the breeding stock.

Type of Tree	**Number of**		
	Nuts or Trees	**Sources of Resistance**	**American Lines***
American	2162		235
Chinese	692	51	
Chinese x American: F_1	523	22	90
American x (Chinese x American): B_1	425	15	33
American x [American x (Chinese x American)]: B_2	1559	10	91
American x {American x [American x (Chinese x American)]}: B_3	3818	9	77
Am x (Am x {Am x [Am x (Ch x Am)]}):B_4	9	1	1
(Ch x Am) x (Ch x Am): F_2	710	6	6
[Ch x Am) x (Ch x Am)] x [Ch x Am) x (Ch x Am)]:F_3	6	1	1
[Am x (Ch x Am)] x [Am x (Ch x Am)]: B_1-F_2	769	4	8
{Am x [Am x (Ch x Am)]} x {Am x [Am x (Ch x Am)]}:B_2-F_2	341	5	5
(Am x {Am x [Am x (Ch x Am)]}) x (Am x {Am x [Am x (Ch x Am)]}):B_3-F_2	12376	2	29
B_3-F_3	121	1	2
Chinese x (Chinese x American): Chinese B_1	191	3	4
Chinese x [American x (Chinese x American)]	41	1	1
European x American: F_1	3	1	1
Japanese	3	2	
American x Japanese: F_1	11	2	2
(American x Japanese) x American: B_1	10	2	2
(American x Japanese) x American] x American: B_2	23	1	1
Castanea seguinii	48	1	
Chinese x Castanea pumila: F_1	9		
Large, Surviving American x American: F_1	328	13	29
(Large, Surviving American x American) x American: B_1	403	7	11
[(Large, Surviving American x American) x American] x American: B_2	94	2	3
Large, Surviving American x Large, Surviving American, and similar: I_1	689	13	12
Large, Surviving American: $F_2 = F_1xF_1$, etc, same LS parent	448	6	8
Large, Surviving American Other	175	9	10
Irradiated American x American: F_1	1	1	1
Other	25		
Total	**26013**		

* 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 parents would be counted as two lines rather than one line (this only occurs rarely).

Table 2. Changes between 2005 and 2006 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	80		29
Chinese	-122	-4	
Chinese x American: F_1	-335	0	-5
American x (Chinese x American): B_1	39	2	5
American x [American x (Chinese x American)]: B_2	47	0	10
American x {American x [American x (Chinese x American)]}: B_3	-1100	1	2
Am x (Am x {Am x [Am x (Ch x Am)]}):B_4	-77	0	0
(Ch x Am) x (Ch x Am): F_2	0	0	0
[Ch x Am) x (Ch x Am)] x [Ch x Am) x (Ch x Am)]:F_3	0	0	0
[Am x (Ch x Am)] x [Am x (Ch x Am)]: B_1-F_2	81	1	5
{Am x [Am x (Ch x Am)]} x {Am x [Am x (Ch x Am)]}:B_2-F_2	-24	0	0
(Am x {Am x [Am x (Ch x Am)]}) x (Am x {Am x [Am x (Ch x Am)]}):B_3-F_2	5081	0	6
B_3-F_3	121	1	2
Chinese x (Chinese x American): Chinese B_1	0	0	0
Chinese x [American x (Chinese x American)]	0	0	0
European x American: F_1	3	1	1
Japanese	0	0	
American x Japanese: F_1	0	0	0
(American x Japanese) x American: B_1	0	0	0
(American x Japanese) x American] x American: B_2	23	1	1
Castanea seguinii	0	0	0
Chinese x Castanea pumila: F_1	0		
Large, Surviving American x American: F_1	56	2	0
(Large, Surviving American x American) x American: B_1	-179	1	2
[(Large, Surviving American x American) x American] x American: B_2	-32	1	1
Large, Surviving American x Large, Surviving American: I_1	215	-1	-2
Large, Surviving American: $F_2 = F_1 x F_1$, same LS parent	-19	1	3
Large, Surviving American: Other	116	7	3
Irradiated American x American: F_1	0	0	0
Other	1		
Total	**3975**		

* The decreases in Chinese, F_1, B_3, and Large, Surviving American trees reflects roguing of trees with inadequate levels of blight resistance. The increases reflect further breeding and collecting.

Table 3. Combined Data for 2004 and 2005 on number of 'Clapper' B_3-F_2 seedlings ranked in various blight resistance classes.

Code of Mother Tree	Code of Resistant Grandparent	Number of Progeny Tested	Blight Resistance Class*				
			1	2	3	4	5
CH271	CL285	120	2	6	29	50	33
CH199	CL112	35	0	6	14	10	5
CH34	CL198	84	0	7	11	27	39
CH726	CL130	91	0	3	17	40	31
CH283	CL98	247	5	28	82	69	63
CH526	CL287	145	1	7	30	42	65

* 1 is the most resistant class and 5 the least. A rating of 1 indicates that cankers caused by both strongly and weakly virulent strains of the blight fungus were small (2-3 cm long) after one season of canker expansion. A rating of 2 indicates that cankers incited by the strong strain were intermediate in size (3-6 cm long) while the weakly virulent strain yielded small cankers. A rating of 3 indicates that the strong strain yielded large cankers (>6 cm long) and the weak strain small cankers. A rating of 4 indicates that the strong strain yielded large cankers and the weak strain intermediate cankers, and a rating of 5 indicates that both strains yielded large cankers. Typically, Chinese chestnut trees achieve a rating of 1 or 2 and American chestnut trees a rating of 4 or 5.

Table 4. Number of 'Graves' B_3-F_2 seedlings and check trees ranked in various blight resistance classes in 2005.

Type of Tree	Pedigree	Number of Progeny Tested	Blight Resistance Class*				
			1	2	3	4	5
B_3-F_2	B343 x B3176	13	0	0	2	5	6
B_3-F_2	B3176 x B343	11	0	2	4	4	1
B_3-F_2	B3119 x B3176	35	0	9	12	10	4
American	seedlings	1	0	0	0	1	0
Chinese	seedlings	3	3	0	0	0	0
F_1	'Nanking' Chinese x American	4	0	1	3	0	0

* See footnote to Table 3.

A Quick Guide to Chestnut Breeding Terminology

Parents		Offspring
American x Chinese	=	F_1, "F-one"
F_1 x F_1	=	F_2, F-two
F_2 x F_2	=	F_3, F-three
F_1 x American	=	B_1, first backcross, or B-one
B_1 x American	=	B_2, second backcross, or B-two
B_2 x American	=	B_3, third backcross, or B-three
B_3 x American	=	B_4, fourth backcross, or B-four
B_1 x B_1	=	B_1-F_2, B-one F-two
B_1-F_2 x B_1-F_2	=	B_1-F_3, B-one F-three
B_2 x B_2	=	B_2-F_2, B-two F-two
B_2-F_2 x B_2-F_2	=	B_2-F_3, B-two F-three
B_3 x B_3	=	B_3-F_2, B-three F-two
B_3-F_2 x B_3-F_2	=	B_3-F_3, B-three F-three