Minutes NC-140 2000 Annual Meeting

November 6-7, 2000
ATI/OSU, Wooster, Ohio

Presiding: Dr. David Ferree, Ohio State University
Meeting convened: 8:09 am

Dr. Ferree conducted business and welcomed the group. We are meeting at ATI because the facilities at OARDC are being renovated. Discussed the timing of subcommittee meetings. Gerry Brown (KY) was in a bicycle accident this summer and has been in the hospital for the past four months. He is recovering, but has plateaued. A card will be circulated to be signed by the group and sent to him.

Introductions: We went around the room and each introduced themselves. Dr. Stephen Myers, Dept. Chair at OSU welcomed the group to Ohio and to OARDC. Dr. Myers formerly was a member of NC-140.

Win Cowgill moved to adopt the agenda as ammended, seconded by Peter Hirst. Agenda adopted.

Minutes for this meeting will be posted to the NC-140 web site within a month of the meeting. Approval of minutes from 1999 will be copied and circulated and approved later in the meeting.

Future Meeting sites:

Curt Rom moved to host meeting in South Carolina in 2004, Seconded by Ron Perry. Motion carried.

Date	Location	Host	
2001	California	Scott Johnson	Dates: Nov. 1-6, 2001
2002	Wisconsin	Teryl Roper	Dates: Nov. 8-12, 2002
2003	Nova Scotia	Charlie Embree	(Wes Autio, chair)
2004	So. Carolina/No. Carolina (NE-183)	Greg Reighard/Mike Parker	

A discussion ensued regarding hosting meetings within the North Central Region vs. holding them outside the region and the financial implications for each.

Report from Administrative Advisor, Dr. Ian Gray (Michigan State University).

Having Extension members on NC projects is positive in the aspect of getting information to the public. Minutes and annual reports are the means of communicating with the NC Directors. Minutes are important. Copies of guidelines for the minutes and annual report are available for the Chair and Secretary. A new format for the annual report has been determined and is in the guidelines. The report needs to focus on impact and results. The minutes are due in the directors office within one month of the meeting and the annual report within 2 months. The minutes should be distributed electronically. Hard copies sent to individual members. Dr. Gray will send minutes to the directors of the participating stations. The annual report process is the same.

The re-write is important. Need to spend time this year to finalize the project. The proposal needs to be to Dr. Gray by December 2001. Dr. Gray will then submit the project to the NC Multi-State Research Committee. NCA-4 will review the project as well as other colleagues not involved in the group.

Daryl Lund will be moving to Madison, WI and will be the NC Executive Director, beginning January 2001.

Planting reports:

Publications:

1988 Pear rootstock planting. An abstract and a brief article was published for an international meeting in Italy this past summer. Anita hoped to have the full manuscript ready shortly for submission. Gene Mielke was reporting for Anita.

1990 Plum Rootstock planting. Bob Anderson has not finished this work, but hopes to have this done next year. Anita A. and Peter Hirst are publishing a report for the IN & OR plantings.

Dr. Ferree reminded us that as plantings trail out problems occur. Michelle Warmund asked that if people are publishing in international meetings that NC-140 be mentioned and that members be asked for use of the data.

1990 Gala Rootstock planting. Dr. Marini has a manuscript to be checked for errors by January 1, 2001. Only eight states are involved in this planting. Dr. Marini would like this manuscript published in J. Amer. Pomological Soc. Dr. Marini questioned if there were multiple clones of P.1. The P.1 in the 1994 planting look different in Virginia than the 1990 planting. In North American trials P.1 has been larger than M.7, but in Poland it was much smaller. Dr. Ferree asked if other data was available for this planting that might also be published in JAPS. There are some data on root distribution from North Carolina State (Mike Parker).

1990 Orchard System Trial. Data were collected from eight locations. Most places TCSA was more related to tree density than to training system. The CL on M.26 or Mark were least productive (took time to fill space). Slender spindle was most productive over the trial, however, the fruit was poorly colored. Vertical axe was intermediate in productivity. M.9 was the best rootstock for axe. MI, NY and VA had higher yields. A manuscript is available here for comments and will be submitted to HortScience for publication by Jan. 1, 2001. There are some "ancillary" projects, but the data are not yet ready for publication.

A discussion ensued about whether to submit to HortScience vs. J. Amer. Pomological Soc. Page charges are an issue (who will pay?). Co-authors might divide the cost of publication.

1990 Apple cultivar/rootstock planting. Wes Autio has a manuscript for the main paper. A second paper will discuss winter damage/blackheart injury. Accessory cultivars is another paper. Another on spur quality and morphological differences. Paper should be ready for submission by March 1. Papers were distributed to co-authors. Will be submitted to JAPS.

Current Plantings:

1992/93 Liberty/CG rootstock planting. Dr. Robinson has a request for data. Proposed that the 92 planting be discontinued following the 2000 season. Substantial data are missing from previous years at various sites. Proposed that the 1993 planting be discontinued following the 2001 season. Dr. Robinson made a request for data from this planting. There is some variability in tree uniformity. Terence suggests that data be taken on all trees. He will then make comparisons to other trees and will discard "large" trees.

1994 Gala dwarf rootstock planting. The five-year report was published last year. Dr. Marini has data from 22 of 25 sites. Data collection is a problem. A copy of the protocol is available on Dr. Marini's home page. Data submitted is better than in the past. Biennial bearing is a problem at some sites. Survival is good at most locations. Copies of 1999 data were distributed. A separate analysis of M.9 clones was suggested. Fleuren 56 is different at most sites (11 of 25 sites have this rootstock). NAKBT 337 is very small. Pajam 1& 2 are larger. If a tree is lost by tractor injury or wind damage indicate that to Dr. Marini and the tree can be deleted as this is not a "biological" reason. Dr. Robinson suggested that an analysis of M.9 & clones be done at the sites that have the full set of M.9 clones. Dr. Marini does not want to do a separate analysis of the M.9 clones for statistical reasons. Three statistical options exist. 1) do a within site comparison, 2) comparison across all sites, 3) do an analysis of a subset of the data that has all M.9 clones. A discussion ensued on appropriate statistical analysis of the data.

Dr. Warmund moved to allow the coordinator to select the statistical analysis appropriate to the planting. Second by Dr. Hoover. Motion carried.

1994 Gala semi-dwarf planting. Tree survival has been good. G.30 has been variable. Have survived well in some sites and other sites have lost all. Alternate bearing is a problem at some sites. Keeping the dwarf and semi-dwarf planting different is a good idea. P.1 are large trees. Rich would like to have the data by Feb 1. A question was asked about authorship when data are submitted through year 5 and are included in the 5-year summary. Should they be included as authors in the final paper? The consensus is that if data are in the 10-year summary they should be authors. We should include data if orchards are taken out early, but not include it in the statistical analysis. We should include information about reasons why orchards were removed.

1994 Peach rootstock planting. Greg Reighard provided reprints of articles from previous plantings. Greg wrote a 5 year performance report for international meeting in New Zealand. It will be published in *Acta*

*Horticultura*e. A more complete paper will be put in JAPS. A discussion ensued about removing this planting early and the value of the data that might be collected. Differences between survival and growth in the northern and southern regions were expected. However, the Midwest has not had a test winter to fully determine cold hardiness. Perhaps the data collected should be adjusted to reduce the amount of work. Dr. Ferree moved that the planting should be terminated after the 2000 data collection and write the summary paper after this year. Dr. Rom seconded. Motion failed.

Greg has the protocol for data collection. Cooperators should get the protocol to those who actually do the work (technicians). A summary article will be prepared for the first 5 years of this planting (beyond Acta Hort.).

1998 Apple planting (Geneva planting). Terence Robinson put out a data request for past years and for 2000. G.16 are larger than M.9 with Gala. Under Jonagold the G.16 rootstocks are larger than M.9 or G.41. Ron Perry asked about the virus status of G.16. G.16 is extremely sensitive to latent viruses. It is not clear which virus causes death. Some viruses are lethal and the trees die in the nursery. A second situation arises where the trees live in the nursery, but the trees are short in stature. If shipped as small caliper trees they will die in the orchard in the first year. With virus free wood the trees survive fine. Can test for virus status of bud wood by grafting onto G.16 the year prior to grafting wholesale quantities. The rootstock is precocious and productive and fireblight resistance.

Year 4 should be a good crop year. Can thin lightly with Sevin in year 4 followed by hand thinning. Gala thinned to 6" apart and Jonagold thinned to 4" apart. However, this is local discretion. If growth is non-vigorous don't allow them to fruit.

1998 cherry rootstock planting. Ron Perry is coordinating eastern cherries (6 sour, 4 sweet). He needs plot plans and data. Would like to have data so a preliminary paper can be distributed by late winter 2000. Frank Kappel is coordinating the western cherries. There is quite a bit of tree loss in the west (Bing as scion). Largest trees were Gisela 6 and Giessen 318 & 17. NY is having serious problems with Pseudomonas in sweet cherries. May lead to high tree loss. SC has a lot of bacterial canker. Have fall treated with Bordeaux. NY has 13 scions over Gisela 6 and the scion size response is different even with the same rootstock. There are fruit size differences in tart cherries related to fruit size. Mahaleb, the largest stock, had the smallest fruit. W53 gave good fruit size, brix and yield. Rootstock may also affect date of maturity. A discussion ensued about anchorage and the need to support trees. ISHS cherry symposium in WA & OR in June 2001. Eastern planting data could be summarized for the meetings (3-year summary). West could do that too. Abstracts due Jan 1, 2001.

Broke for lunch at 12:00.

Reconvened at 1:03

Rewrite committee report:

Proposed objectives for the revised NC-140 project are as follows:

1. To evaluate the field performance of pome and stone fruit rootstocks in various environments and under different management systems.
2. To assess and improve propagation techniques of pome and stone fruit rootstocks.
3. To develop improved pome and stone fruit rootstocks through breeding and genetic engineering, and to acquire new rootstocks from worldwide sources.
4. To determine biotic and abiotic stress tolerances of pome and stone fruit trees in relation to new and existing rootstocks.
5. To evaluate and optimize experimental designs for multi-site rootstock trials.

1999 dwarf apple planting. There is a dwarf and semi-dwarf planting on either McIntosh or Fuji. Wes Autio passed out the data collection, weather, and tree management protocol for 2000. Data should be submitted by January 15, 2001 on paper and on disk. There will be core data with extra analysis for rootstocks not in all plantings. A question was asked about leaning trees. The protocol for the semi-dwarf planting allows for trees to lean up to 30º. If the trees lean more than 30º they should be staked and then the

trees should be supported for 2 years and then remove the stake. The intent is for the semi-dwarf trees to be free standing. Cooperators should provide comments to Dr. Autio indicating that trees are leaning and have been staked.

Future plantings:

2002 Apple Planting: Terence Robinson reported very poor take in the nursery. Terence distributed a table of liners planted and the number budded. There are not enough budded trees to have a uniform trial. It is possible to delay until 2003 and have a slightly different, but larger trial. Some rootstocks are already in the 1999 planting, but Terence thought they were worthy of additional testing. Ron Perry reported an interaction of Bud.9 on fireblight susceptibility on the scion. Some nurseries are importing B.9 from Europe and this clone may be different than the clone used by TRECO. TRECO's clone is more upright, while the European clone is weeping. Growers will be asking about B.9 if the fireblight reports are true. A suggestion was made to set out perhaps 10 smaller plantings with 6 trees per site. We discussed whether 6 trees would be sufficient at a site to separate rootstock differences.

2002-2003 Pear rootstock trials (Gene Mielke). The number of sites has increased. Will have 9 sites. 3 each in CA & WA (Omak, Wenatchee, Yakima); Hood River, NY, WV (Bosc). There has been high variability in the nursery. Pyrodwarf was touted, but was based on a single tree. Additional trials are in place in Europe. Some 20,000 trees will be sold in the US next year. There will be nine stocks in the 2002 planting. 2003 will have 12-14 additional rootstocks. The actual number will depend on the nursery performance.

2002 Peach planting. (Greg Reighard) The peach planting also had trouble in the nursery. Greg made the decision to wait another year. More liners were sent and planted and the misses were re-budded. Should be able to reuse the trees that made it this year by digging, root pruning and replanting. Many of the trees were small. There will be some size differences in the final planting. However, some of the largest trees could be discarded. Should end up with about 18 stocks by 2002. A discussion ensued regarding how to handle trees of two different ages. There are enough trees for about 6 plantings. Spacing is also an issue. Want wide spacing to avoid tree to tree competition. Peach planting committee will meet at 6:30 am Tuesday morning at the Best Western Hotel.

2004 Cherry Planting. The planting was originally planned for 2004, but have not been able to obtain the desired rootstocks and get them through virus sensitivity testing in time for planting for a 2003 trial. There are a number of new materials from Europe and California that we want to trial. Some Picu 1 & 3/sweet cherry trees are available for small plantings. See Greg Lang for details.

Financial exposure. NC-140 members have financial exposure. Individual planting leaders contact with nurseries to make trees with the assumption that cooperators will buy trees at a 6 given price. Sometimes the planting leaders have had difficulty finding funds to pay for the trees.

Non-disclosure/non-propagation agreements. Apparently this issue has been worked out for existing planting materials. We cannot agree to non-disclosure as that would not allow for publication of our results.

Website Committee: Win Cowgill and Jon Clements. An ad hoc committee met and discussed the project website. The committee has registered a URL: www.NC140.org. The committee is looking for more content for the site. The annual report should be posted on the front page along with funding sources. The minutes will be available on the site. The protocols will be available on the site. We need to have a method to contact state leaders via e-mail—on the front page? Individual state reports will still be password protected. Need to create a self-subscribing filemaker database for members to update contact information i.e. telephone, address and e-mail. **Content issues:** Abstract versions of state reports should be included (needed as part of the minutes). A discussion ensued about whether all state reports should be available on the web site. The consensus is that state reports MAY be made available on the website, but not all, at the cooperators discretion. Extension publications and popular press might be linked.

Minutes should capture the discussion and are not a collection of individual state reports. The secretary will send around a request via e-mail for an abstract of the state reports.

Closed at 3:05 pm for tours.

Reconvened at 8:10 am

Minutes were approved at corrected to include Mike Parker from North Carolina who was present at the meeting in 1999.

Continued discussion of the NC-140 web site.

An electronic copy of the state reports to be uploaded to the website (password protected) prior to the annual meeting. Paper copies will be provided at the annual meeting by each state cooperator. Further, the project protocols will be posted to the web.

Web site budget: For the past two years the residuals from the annual meeting have been directed to support the web site. Options were listed for obtaining funds to support the web site.

1. Direct the webmasters to invoice each state/province $100 per year.
2. Include a $50 surcharge to cover web and publication charges.

Motion by Ron Perry to have the webmasters send and invoice to each cooperating unit for $100 for web services. Second Wes Autio. Motion carried.

The secretary was directed to send a letter to those who worked to make this meeting a success with a copy to the Dept. Chairman.

Bruce Barritt asked that members who have results from these plantings to consider publishing the results in Compact Fruit Tree, the publication of the International Dwarf Fruit Tree Association.

Report by Russian Scientists:

Visitors (Genadiy Eremin and Viktor Eremin) to the meeting from Russia gave a presentation about fruit research in the Crimean region of Russia. They showed a short video describing the activities at their research station to develop widely adapted and easily propagated rootstocks for stone fruits. Our visitors then showed slides of trees on various rootstocks.

Cooperator reports and abstracts:

New Jersey. Some question about P.1 being scion rooted. Had yield reduced by spring frost and poor weather following bloom. In their apricot trial they lost all fruit from a spring frost. This planting will be removed. They continue to lose some peach trees (1994 planting) to various problems.

Illinois. IL had a light crop on the 1994 dwarf planting. They have lost 5 of CG.30. P.1 is still growing strong.

Arkansas. Not a good year in AR. All of the trials had a light crop—biennial bearing is a problem. Fruit size increased with crop load.

British Columbia. Seeing rootsuckering in the Weiroot stocks and in G473-10. G.16 is larger than expected. Data are still being analyzed and the report will be posted to the WWW. 1998 G16 vs. M9 trial: This trial consists of G16, M9 and M9EMLA rootstocks with ¡Royal Gala¢ as the scion. Some of the M9 trees died from the pre-importation fumigation. Blossom clusters were counted this spring (2000) and the trees were allowed to carry a small crop. Floral density (clusters per cm2 of trunk cross-sectional area) ranged from 17.6 to 24.5 and did not differ significantly among the rootstocks. So far the trees on G16 are larger than those on M9 or M9EMLA.

California. Cherry report from Steve Southwick is available. The 1999 apple planting had significant fireblight. About 40% of the central leaders were removed to cut out fireblight. CG.707 defoliated mid-season. The other stocks look good. CA is evaluating stone fruit rootstocks and are continuing evaluating materials produced by Fred Bliss.

Georgia. Has the 1994 peach rootstock planting. Good tree survival. There were differences in yield from the various rootstocks. Fruit were small due to a very dry year with no irrigation.

Iowa. Participation in 1993 Cornell-Geneva semi-dwarf, 1994 Gala dwarf, and 1994 Gala semi-dwarf cooperative rootstock plantings, and two state initiated rootstock plantings continue. In terminated 1990 NC-140 cultivar x rootstock planting, trees on Mark followed by B.9 sustained the greatest black heart injury. In the Cornell-Geneva planting, trees on CG.222, CG.156, CG202 and CG.521 continue to exhibit the highest yield efficiencies. Trees on CG.30 and CG.210 have suckering problems. Among M.9 clones in the dwarf Gala planting, trees on M.9 Pajam 2 are larger than trees on M.9 Pajam 1 and M.9 NAKBT337. In the semi-dwarf Gala planting, trees on P.1 are the largest and least productive, while trees on CG.30 have been the most productive. In a state initiated interstem trial, Mark as an interstem induces little dwarfing.

Indiana. 1999 Fuji planting trees arrived in poor condition due to shipping problems. Are considering withdrawing from the trial. Mortality was high. Flueren 56 is the smallest M.9 clone. G.30 trees and M.26 trees were lost to wind and weak graft unions.

Kentucky. Have a lot of leaning the in the semi-dwarf portion of the 1994 planting.

Massachusetts. ***1994 NC-140 Apple Rootstock Trial.*** In 2000 at the Massachusetts site, the most yield-efficient trees were on M.9 EMLA or M.9 Fleuren 56 rootstocks. However, efficiency was statistically similar for all six strains of M.9 in this study. Largest M.9-rooted trees were on Pajam 2, nearly 75% larger than comparable trees on Fleuren 56. Trees on V.1 produced the greatest yield (cumulatively – 191 kg/tree) but also were the largest trees in the trial, about 15% larger than comparable trees on M.26 EMLA.

1994 NC-140 Peach Rootstock Trial. In 2000 at the Massachusetts site, Redhaven peach trees on 13 different rootstocks were similarly yield efficient. However, trees on Ishtara were only 42% of the size of trees on Lovell rootstock.

1995 Nova Scotia/Maine/Massachusetts Apple Cultivar/Rootstock Trial. A trial with Nova Scotia, Maine, and Massachusetts was established in 1995, utilizing Cortland, McIntosh, Macoun, and Pioneer Mac as scion cultivars and 12 rootstocks. In 2000 and cumulatively in Massachusetts, P.16 rootstock resulted in the most yield efficient trees. Greatest yields were obtained from trees on Mark in 2000 and cumulatively, but they also were the largest in the trial.

1995 New Brunswick/Pennsylvania/Massachusetts Apple Rootstock Trial. A trial was established in 1995 in Pennsylvania, Massachusetts, and New Brunswick with Ginger Gold apple as the scion cultivar and 10 rootstocks. Results were similar in 2000 to those obtained with the Nova Scotia/Maine/Massachusetts trial.

1996 Massachusetts Apple Rootstock Trial. A trial was established in 1996 in Massachusetts, including McIntosh on six rootstocks, five of which were from the V series. In 2000, V.1, V.2, V.3, V.7, and M.26 EMLA resulted in similar tree size, but trees on V.4 were nearly 3 times as large. Yield efficiency was greatest from trees on V.3.

1998 NC-140 Apple Rootstock Trial. In 2000 at the Massachusetts site, Gala trees on G.16 rootstock were more than twice as large as those on M.9 NAKBT337, and were about one third as yield efficient.

Impacts. Massachusetts growers have planted nearly 80% of all new apple trees on rootstocks defined by these trials and those conducted previously as superior. One result has been a gradual increase in the quality of fruit produced. Further, all recommended rootstocks are fully dwarfing, resulting trees size less than one half of those planted in the 1970's and 1980's. These trees, therefore, are more efficient to harvest and train and require less than half of the pesticides required by the larger trees planted in 1970's and 1980's.

Maine. Renae Moran is the new official representative from Maine. Have the 1994 dwarf and semi-dwarf planting. Have taken required data. Considerable variability between stocks in the dwarf planting. The semi-dwarf planting is much less variable. G.30 had suckers and all trees are alive.

Michigan. Michigan is working to delineate the B.9 clones. This is more important because of the apparent benefit of B.9 for fireblight. MI is recommending making a berm be plowed up in the tree row not long after planting. Trees are planted with 4-6 inches of shank. The berm is put up to about 3 inches above the graft union and will settle to just below the graft union. This is to prevent dogwood borer injury. Sweet cherries are growing well with much vigor. MI is losing trees in the tart cherry planting. Gisela 5 and Edabriz are both productive. Put in a five acre organic planting this spring directed by a committee.

Amy Iezzonni has looked at about 300 selections from her tart cherry breeding trials. About 60 are left as candidates after virus screening work.

Minnesota. In 1993, 7 rootstocks with Liberty as the scion cultivar were planted at the Horticultural Research Center (HRC) in Excelsior, MN. During the winter of 1999-2000, the minimum temperature recorded was –33C in mid-January, and the maximum winter temperature was 24C in early March. Temperature fluctuations above freezing occurred throughout the dormant season, however, there is no evidence that these fluctuations led to damage in the planting. This planting is allowing us to complete 2 objectives simultaneously: winter-hardiness testing of the scion cultivar, and precocity and size control of the rootstocks. Death in the planting occurred for four years after the unusually cold winter of 1995-96, making Liberty marginally winter hardy; however, there were no additional tree deaths in the past year. There are no statistical differences among rootstocks for yield, yield efficiency, or average fruit weight.

In the spring of 1999, 12 dwarf and 8 semi-dwarf rootstocks with McIntosh as the scion cultivar were planted at the HRC. Fireblight was rampant throughout the planting in 1999. After the winter of 1999-2000, a total of 11 trees had died - five dwarf and six semi-dwarf - with M9 and Supporter4 experiencing the most mortality. This planting will allow us to test the different rootstocks for winter hardiness, precocity, and size control of the scion.

Missouri. SW MO peach planting is on a grower site. Grower thinned too well for 2000, so had large fruit.

Missouri-Columbia. In the 1994 peach trial, trees on Montclar, Tzim Pee Tao, H7338013, and Rubira had 100% survival in July 2000. Lovell and GF 305 trees had only 38% survival. Cumulative yields of S.2729 and Redleaf were nearly twice that of Tennessee Natural, Lovell, Ishtara, and BY-520-8. Three major episodes of high winds resulted in the removal of this planting in August.

The low temperature tolerance of peach floral buds collected in Missouri, Ohio, and South Carolina was evaluated in January, March, and November from 1997 to 1999. The low temperature tolerance of peach trees is generally site and rootstock specific as stressed trees often have poor "cold hardiness". When data from common rootstocks were pooled from all three states and analyzed, Bailey was the only rootstock that had consistently cold tolerant floral buds in all three sites on the three dates of collection when there were significant differences among treatments. However, S.2729, Chui Lum Tao, Tzim Lum Tao, H7338013, H7338019, and Ta Tao 5 trees were not included in this analysis.

When bud data from only Missouri were analyzed, there were significant differences among rootstocks on Jan. 1997 and 1999. Floral buds from Ta Tao 5 were consistently cold tolerant. In contrast, floral buds from BY520-8 and S.2729 had poor cold tolerance.

In the 1992 Liberty apple trial, none of the dwarf (CG 11, 13, 29, 202) or semi-dwarf (CG 707, 222, 210, 30) are as productive as the M..9 or M.7A rootstocks. Survival of semi-dwarf trees has been poor as compared to M.7A.

In the 1993 Liberty apple trial, rootstocks included are M.9L, M.9 EMLA, M.26, CG.29, CG. 65, CG.11, and CG 007. M.9L and G.65 trees have the greatest cumulative yield and yield efficiency of the rootstocks included in this trial.

Several trees in the 1999 Fuji apple trial were lost due to repeated exposure to high winds. Three of the six original Supporter 4 trees were lost due to twisting action and breakage of the roots from the storms. One tree of all other rootstocks except CG.6814 were also lost due to the storms.

In a 1993 Fuji apple trial, Mark, B.9, V.1, V.3, M. 27 EMLA, M.9, M.9 EMLA, and other M.9 clones such as Pajam 1, RN.29, NAKB 337, 338, and 340, Janssen 337, and Burgmer 751, 756, and 984 are included. For years 1995-2000, trees on Mark had the greatest cumulative yield, while M.27 EMLA had the lowest cumulative yield. Cumulative yield among trees on M.9 clones differed by 375 kg. Of the M.9 clones, M.9 EMLA, M.9 Burgmer 751, M.9 NAKB 340 and Pajam 1 trees had the greatest cumulative yield, while M.9 NAKB trees had the lowest cumulative yields of any of the M.9 clones.

New Brunswick. 1994 Gala planting—Nic29 and the Pajams are doing well. 337 and EMLA.9 are too small. Lost about 30% of the G.30 trees to breakage.

North Carolina. North Carolina has five of the NC-140 cooperative plantings. The trials that are currently under investigation in North Carolina are the 1994 gala dwarf and semi-dwarf apple trials, the 1998 gala apple planting, and both the 1999 fuji dwarf and semi-dwarf apple plantings. The 1990 apple systems trial was removed in March, 2000. Prior to tree removal, the burr knots were counted on the scions in the Gala planting on two representative trees in each plot. The total number of burr knots closely followed tree vigor as measured by trunk cross-sectional area (TCSA) with the most vigorous trees having the greatest number of burr knots and the smaller trees tended to have fewer burr knots. In addition, two representative trees from each training system, rootstock, and variety were cut off at the graft union and weighed. Tree

weight also closely followed TCSA with P.1 having the greatest tree weight and M.27 the lowest. Root distribution of 4 rootstocks in the gala planting was also undertaken. A cooperative study with the Agricultural Engineering Department at NCSU was also undertaken to develop a method to test the strength of the graft union of different rootstocks with gala as the scion.

In the 1998 apple planting evaluating the performance of CG.16 to M.9 EMLA and M.9, the TCSA of CG.16 is approximately double that of the two selections of M.9 which were similar in TCSA. Fuji trees in both the dwarf and semi-dwarf 1999 apple trial grew well in 2000 and were defruited. After the first year of growth, the trees on CG.30 and Supp. 4 in the semi-dwarf planting had the greatest TCSA and trees on CG.210 the smallest. In the dwarf planting the trees on CG.935 had the greatest TCSA and trees on M.9 T337 the smallest. Cultural practices and data collection will continue in 2001 according to the NC-140 Committee recommendations.

Nova Scotia. Liberty planting is yielding heavily. The 1999 planting is surviving and growing well.

New York. *Apple*s. Data are in the report for the various trials. They are doing genetic testing to identify and differentiate rootstocks. Bill Johnson has left USDA/Cornell. The rootstock breeding program will continue. Two to three additional stocks will be released over the next few years. The stocks are 3041 and 5935 and both are M.9 in size. Fireblight testing continues on young trees. CG.5202 has done well in New Zealand and will be released there in 2002. It is a good stock in North America, but it has not stood out. It is M.26 size. Suggested that the reports should show the new numbers and that a table should be put on the NC-140 web site describing the changes.

Used four strains of fireblight to test for fireblight susceptibility. See table 10 of report for details. Have been testing rootstocks for susceptibility to viruses. Some are susceptible to stem pitting virus.

*Stone Fruit*s. Have done research to induce branching in young sweet cherries. Bud removal worked best and Promalin sprayed in paint was least effective. However, scoring and bud removal created openings for bacterial canker infection. Either a hack saw or a grape girdling knife have both worked well in BC. Tan to light brown paint was more effective in OR than white paint, presumably because of higher temperatures with the darker paint. Bob Anderson discussed the current situation of Plum Pox. A huge educational effort is needed to help nurseries develop clean nursery stock. Plum Pox has been found in Canada in the Niagara peninsula. Very little orchard testing has been done in the U.S. with some additional effort for “parent stocks”. 90% of peach cultivars don’t show visual symptoms. State and federal funds are needed to do the testing. Canada will be quarantined from sending *Prunus* budwood to the U.S. Canada has not yet decided whether to eradicate or maintain. With global markets and transfer of plant material scientists will have to work to ensure invasive species are not transferred.

Ohio. Have a row of Morioka rootstocks that have not yet been released. (JM designation). Doing some work with response of rootstocks to soil compaction. The growth is related to carbohydrate partitioning.

Ontario. Top five for cumulative yield in Ontario are V.1, Pajam 2. O3, Mark, and M.26. All the semidwarf stocks are similar. Ontario is testing the V rootstocks. Generally they have found that V.3 is the smallest, but there is an interaction with scions. They have licensed nurseries for distributing V.1 and V.3 series. Hopefully these will be released over the next few years. V.4 will not be released as it is too vigorous.

Oregon. New proposed rules in OR would require all parent material to be produced organically. This is already the case in UK and some of Europe. Liberty trial—5 of the CG.13 trees had shothole borer. They found a variable response to bacterial canker on the cherry stocks. OR continues to evaluate Horner collection of pear cultivars. They are looking for precocity and reduced tree size. Some appear promising. Thirteen are currently in a trial.

Oregon had an exceptionally mild winter east of the Cascades. Temperatures in Hood River did not fall to the normal –5 to 0F in late December of early January. The lowest temperature observes was +26F during bloom. Some fruit marking was observed in the coldest areas, which did not have frost protection. The winter was wetter than average. The summer and fall was approximately 3F warmer, without the up and down fluctuations and the summer rainfall normally observed. Trees and fruit grew well. Data continues to be collected on the NC-140 apple, cherry and pear trials. This information is used by growers for making planting decisions. This is particularly true of the cherry industry, which is expanding rapidly. Other pear Hood River pear rootstock trails have led to a refinement in the selection of rootstocks planned

for the 2002 and 2003 trials. Several members of the Horner pear rootstock series show promise as a better dwarfing stock, but are not as yet in the "Malling 9" size range. Developments in propagation techniques and post-harvest tree handling have led to gains in tree survival and first season growth at the grower level.

Washington. Have evaluated southwest injury and subsequent death. The M.9 clones appear to be less tolerant of southwest injury on the scion cultivar. Greg Lang passed out yield data from the WA cherry planting. Had good yield, size, and precocity with the Giessen stocks. The Weiroot stocks were not as precocious.

South Carolina. In 1994, a peach rootstock trial consisting of 'Redhaven' on 18 rootstocks was planted at the Musser Fruit Research Farm near Clemson, SC. Tree survival remains high and essentially unchanged since year one. No rootstock has demonstrated consistent superior performance after 7 years. Guardian, a potential replacement for Lovell in South Carolina, has performed about the same as Lovell in this test. Across 20 locations in 18 states and provinces, no rootstock was more vigorous than Lovell or Nemaguard. Bloom was delayed more than 2 days and fruit maturity delayed 3 days with Ta Tao 5. The highest cumulative fruit yields were in NJ, OH, and SC. Across all sites, no rootstock yielded better than Lovell. Superior rootstock performance compared to Lovell has been difficult to assess since few differences have been detected due to experimental design limitations and the use of good, non-problematic sites for the test. Some performance trends are developing and recommendations for suitable or even superior rootstocks for specific sites and regions may be forthcoming in the future after more years of data are collected and analyzed.

In 1994, a Gala apple rootstock trial on 15 dwarfing rootstocks and on 6 semi-dwarfing rootstocks was planted. Fireblight severity was low in 2000. However, tree survival has been poor with all M.9 clones, with the exception of M.9 Pajam 2. Combining survival and cumulative yield, rootstocks V.1, V.2 and G.30 look promising as size controlling replacement rootstocks for M.9 and M.26 in South Carolina.

In 1998, a sweet cherry rootstock trial consisting of 'Hedelfingen' on 13 rootstocks was planted. About 25% of the trees have been lost to bacterial canker, despite multiple spring and fall copper sulfate/lime applications. Only 3 rootstocks have resulted in 100% survival in this planting after 2 years. A large range in vigor occurs amongst the rootstocks, with the largest trees more than twice the TCSA as the smallest trees.

In 1999, a 'Nagafu 6' Fuji apple rootstock trial on 6 dwarfing rootstocks and on 3 semi-dwarfing rootstocks was planted. All trees were precocious, producing a high number of flower clusters on both 1-yr and 2-yr wood. Incidence of fireblight has been minimal, with only 3 trees affected in 2 years. The high vigor of 16N trees may indicate that this is an off-type.

South Dakota. The Liberty/CG (CG13, CG30, CG202, CG210, CG222, M7A, EM7) semi-dwarf rootstock planting was established in 1993 at the N.E. Hansen Research Center, in Brookings, SD. Two NC-140 objectives are addressed with this planting: winter hardiness of the scion cultivar and rootstocks and size control and precocity of the rootstocks. The winter temperatures of 1999 to 2000 were very mild with temperatures above freezing throughout the dormant period. A minimum temperature of -28^{o}C occurred in December. There was minimal snow cover. No tree death has occurred in response to winter temperatures since 1995-1996. There are no differences among rootstocks for tree height or spread. Trunk cross sectional area of CG13 and CG210 are similar to M7A& EM7, however CG202, CG30 and CG 222 are significantly smaller. It was not possible to determine yield or yield efficiency as a localized hail storm from the northeast in May (2 weeks after blossom) stripped the leaves and most of the fruit from the trees.

Vermont. Also had a warm winter. The CG series performs well in VT. Lost one Supporter 4 tree in the 1999 planting. The tree had begun to die at the graft union. The roots were still alive, but the scion had died.

Pennsylvania. Have a number of plantings in addition to the multi-state trials. 1999 was a dry year with much hand watering. 2000 was moist and the trees have grown well.

Utah. LaMar Anderson has retired and USU is in the process of developing a position announcement for a tenure-track position to be located in Logan. Fireblight was a severe problem this year. The 1994 semi-

dwarf planting was particularly hard hit. Cherry yield and fruit size were largest on 195. Using exotherm analysis Montmorency/Colt is less hardy in early winter than other stocks in the 1987 cherry planting.

Virginia. Have the two 1994 planting. The plantings have become biennial bearing. There was very little crop this year. Saw a number of fireblight strikes on root suckers (not the scion) in the semi-dwarf planting. They cut out the blight and have not lost a single tree. G.30 is starting to root sucker.

Wisconsin. The dwarf and semi-dwarf plantings were established in 1994 at the Peninsular Research Station, Sturgeon Bay, WI. Most trees appear to be growing well. The most vigorous trees were EMLA 26, M.9 EMLA, Pajam 2 and V-605-1. The highest yield for 2000 and the highest cumulative yield were on EMLA 9, followed by M.9 Nic 29, EMLA.26, and Pajam 2. The least vigorous rootstocks were P.22, B491, and EMLA.27. The semi-dwarf block was very uniform. There are no obvious differences in any of the parameters measured for this research.

Meeting adjourned at 12:10.

Respectfully submitted,

Teryl R. Roper
2000 Secretary NC-140

J.I. Gray
Administrative Advisor, NC-140

List of persons in attendance at the 2000 NC-140 meeting in Wooster, OH and their institutional affiliation.

Name	Institution
Andersen, Robert L.	NYSAES, Cornell Univ., Geneva, NY
Anderson, LaMar	Utah State Univ.
Autio, Wesley	Univ. of Massachusetts
Barden, John	Virginia Tech
Barritt, Bruce	Washington State Univ.
Belding, Bob	Rutgers University
Clements, Jon	Univ. of Massachusetts
Cline, John	University of Guelph
Compton, Jeremy	Rutgers University
Cowgill, Win	Rutgers University
Domoto, Paul	Iowa State Univ.
Embree, Charlie	Agriculture & Agri-Food Canada-Kentville
Eremin Viktor	Kpymsk Breeding Station, Russia
Eremin, Gennadiu	Kpymsk Breeding Station, Russia
Fennell, Anne	South Dakota State Univ.
Ferree, Dave	Ohio State
Frier, Jay	NYSAES, Cornell Univ., Geneva, NY
Garcia, M. Elena	UVM
Gray, Jan	Michigan State University
Greene, George	Penn State Univ.
Hampson, Cheryl	Agriculture & Agri-Food Canada-Summerland
Hayden, Dick	Purdue Univ.
Hirst, Peter	Purdue Univ.
Holleran, Todd	Cornell Univ.- Geneva
Hoover, Emily	Univ. of Minnesota
Johnson, Scott	Univ. of California
Kappel, Frank	Agriculture & Agri-Food Canada-Summerland
Kaps, Martin	SE Missouri State Univ.
Kushad, Mosbah	University of Illinois
Lang, Greg	Michigan State University
Lehman, Jerry	Support to Russian Material
Lokaj, Gail	Rutgers University
Marini,Richard	Virginia Tech
Mielke, Gene	Oregon State Univ. - MCAREC
Miller, Diane	Ohio State
Moran, Renae	U. of Maine
Mujica, Carolina	Sweet Cherry Private Advisor
Parker, Mike	North Carolina State Univ.
Perry, Ron	Michigan State University
Poch, Alberto	LaCumbre Nursery
Prive, Jean-Pierre (JP)	Agriculture & Agri-Food Canada
Reighard, Greg	Clemson University
Robinson, Terence	Cornell Univ., NYSAES
Rom, Curt R.	Univ. of Arkansas
Roper, Teryl	Univ. of Wisconsin-Madison
Schupp, Jim	Cornell-Hudson Valley Lab
Smith, Donald	Penn State Univ., U Park
Taylor, Kathryn	Univ. of Georgia
Tietjen, Bill	Rutgers University
Warmund, Michele	Univ. of Missouri
Wolfe, Dwight	Univ. of Kentucky
Zoppolo, Roberto	Michigan State University