

ALASKA PIONEER FRUIT GROWERS NEWSLETTER

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1998 ORCHARD REPORTS

FAIRBANKS—*Clair Lammers*

Our growing season started at the normal time of year. We had NO rain until July 11. I started irrigating May 27th. We had "the best year ever". I ripened 93 varieties of apples for a total of 1239 pounds, 8 varieties of plums for 67 pounds, 5 varieties of pear for 16 pounds, 4 varieties of apricots (did not weigh) and 6 varieties of cherries. Our killing frost arrived on September 29 with a low of 24°F. Total rain fall was 10.95 inches.

EAST ANCHORAGE—*Kevin Irvin*

This past growing season proved to be somewhat of a challenge with the spring weather turning cold as it did and essentially stopping growth for up to a month depending on the varieties. In my crowded container grown orchard the biggest set back was pollination. While all trees eventually blossomed they didn't at the normal time and some were set back where they didn't blossom with the other trees or it rained and the bees weren't active. 'Yellow Transparent' didn't set any fruit at all as it finally blossomed in the latter part of June after 'Norland', 'Westland', 'Summer Red', 'Heyer 12' and 'Parkland'. 'Norland' faired the best with an average fruit set; however, the size was smaller than normal. Smaller size also was seen in 'Parkland' and 'Heyer 12' which also when it ripened didn't taste good.

Everyone complained that the summer temps. were cooler than normal. I believe the summer temps were in the normal range but that it was the spring temps that hurt. After what looked like an early spring and with trees budding out the cold weather came back and virtually stopped all growth. Depending on the variety they either sat there trying to figure out what to do or just shook a little and

then continued on. However all of my trees were a month behind ripening. 'Northstar' pie cherry which usually ripens at the end of July ripened at the end of August, which I might add, enabled me to enter them in the fair! My unknown plum never did ripen, this was the first year I had fruit set after hand pollinating them and again blossom time was delayed compared to 1997. 'Norland' for me has always ripened at the end of August; this year it was the 3rd week of September. 'Gold Spice' pear did ripen in time for the tasting. My 'Valiant' grape set quite a few clusters however they didn't ripen on the vine before the first frost on 27 Aug. started it into dormancy. I still have hope for grapes.

As Lawrence Clark said, "this was not an apple year". I think there is a lot to be said for Norland. I don't know anyone that grows 'Norland' that didn't get apples and looking at the entries in the Fair, 'Norland' was dominating. I also think one must diversify in apple varieties. The more varieties you grow the better chance of at least some ripe apples. In other words, don't put all your apples in one basket.

PETERS CREEK—*Dwight Bradley*

This was the best year yet for our apple orchard in Peters Creek. The fall of 1997 was a late one, which allowed just about all trees to harden off nicely. There were no severe fall ice storms when the leaves were still on — one of the two worst things that can happen to apple trees here in the fall (the other being moose). The winter of 97-98 was mild (lowest = -25°F), and we had ample snow cover that came not long after the ground froze, and lasted all winter. We also were spared any prolonged warm spells in January or February, of the type that caused sunscald problems for us a few winters back. Spring breakup came a couple of weeks early. The only cold-related damage was to a couple Parkland/Antonovka trees, which died, but

which were already nearly dead from the two previous winters. Most trees came through the winter of 97-98 in perfect condition.

Early breakup was followed by a cold May, and the trees leafed out and bloomed later than ever before. It was not until June 5 that the first few apple blossoms opened enough for a bee to get in; this is about a week later than normal. Eventually, 57 out of 78 apple trees bloomed, and 53 of these bore fruit. About half were fruiting for the first time, in their third season including the year they were grafted. June and July were wetter than normal — more like August usually is. (It was NOT a tomato year!) It was so rainy that I never really needed to water anything, not even thirty or so new grafts in pots. Even though the summer was somewhat colder than normal, (only 3 days above 70°F), all the rain had a remarkable effect on growth. Even the weakest trees put on 12" of new growth, and the most vigorous put on 24-27". I guess I need to water a lot more in the future.

Tip bearing. As a consequence of the late fall in 1997 and the mild winter that followed, many varieties (e.g., Norland, Parkland, Rescue, Norda) bore apples on their tips in 1998. You could tell months in advance which trees were going to tip-bear, from the fat terminal buds.

It was a normal August — cold and wet. The first mild, patchy frost, which blackened a few of the outer leaves on zucchini and bean plants, came on August 19. We got a killing frost on August 28, but then things eased up for three weeks and it wasn't until the last week of September when we started getting frosts every night. The two early frosts didn't affect the apples at all, and in fact may have helped with the hardening-off process.

With the late bloom and cool growing season, apple harvest was also later than normal. We began picking a few Rescues and Parklands around Sept. 20; these varieties reached their prime around Sept. 25. Norland ripened about a week behind Parkland, and in fact about half the crop was still not quite ripe on Oct. 4, when we had to pick everything, ready or not, before the temperature dropped into the low 20's.

When we originally laid out the orchard in 1992, we had decided on a spacing of 10 by 14 feet, the 14-foot lanes being wide enough for our Kubota tractor even after some years of growth. This year, we planted a new tree in between every older one, giving a new layout of 5 by 14 feet. Over the past few years, I've been more and more impressed by the importance of shelter for trees, even at the expense of a little sunlight. Bob Boyer's studio

courtyard in Anchorage, surrounded by a combination of buildings and tall cedar fence, is a great example of the value of calm air. His trees are spaced so closely that none of them enjoy full sun all day long— but still they thrive, I believe because of the warm microclimate. Similarly, Kevin Irvin's container orchard is crowded but thriving inside high walls. Jim Yassick's apple trees just down the road from us in Birchwood are interplanted with tall spruce and birch, and they have grown impressively despite the partial shade. Jay Dearborn's orchard in Palmer is crowded. Even though our orchard in Peters Creek is in a *relatively* calm spot (compared to other locations in Peters Creek a mile or so closer to the mountain front), there are fairly constant light breezes that keep the temperatures down. The idea with reducing the tree spacing to 5 feet is to provide some wind relief from the trees themselves. Next year, in addition, we'll be planting a permanent windbreak along the fence, either tall perennials such as hops, or possibly, tightly spaced spruce trees.

Notes on varieties in Peters Creek:

Parkland. Our most successful variety; all but a few of our 18 trees bore fruit, including most of a bunch of Parkland/Antonovka that were purchased from Lawyer's as one-year whips in 1996. The fruit this year was attractive, tart, crisp, and just sweet enough. Not a particularly complex flavor, but excellent. There was a slight tendency to split (maybe 5% of the fruit — I suspect due to all the rain). Most of the Parkland trees set too many apples, and I didn't get around to thinning them until mid-August. So, most of my Parklands were pretty small. Those on the occasional branch with only one or two apples were significantly bigger.

Norland. Over the past four years, almost every apple tree that died was replaced with a Norland or Parkland; we now have 26 Norlands and all but a few of the youngest have now fruited. The fruit does not seem to need thinning quite as badly as Parkland, but those trees with only a couple of apples did bear somewhat larger fruit than comparable trees with an average load of apples. Without a doubt, Norland is the most reliable apple we grow. It is not as good as Parkland, nor quite as early to ripen, but definitely hardier.

Rescue. Two out of two trees bore nice crops, although the fruit could have used some thinning.

Yellow Transparent. Two Yellow Transparent trees bore fruit. These were both bought from Lawyer's as Parkland (on Antonovka rootstock), and were just now found to be Yellow Transparent, when they fruited for the first time. The apples

were quite good, and ripe but not overripe on Sept. 26.

Trailman. All three trees of this variety bore fruit, one in its fourth leaf and two others in their third. Trailman was the first to leaf out in May and the first to bloom in June. The older tree set a heavy crop, but during late August and early September, almost every apple ended up cracking, presumably from too much rain. (Tom Marshall had the same experience in Anchorage). Those few fruits that did not crack were ripe around Sept. 26. Great flavor, somewhat reminiscent of a tart, tangy Golden Delicious. I observed watercore in around half the apples that I cut open. The apples are small and oblong.

Heyer 12. One tree, age three, bore for the first time. I don't know why I even planted this mediocre variety, except for the sake of something different and, I suppose, to hedge bets against the next killer winter. The apples were still not quite ripe when I picked them on Sept. 30. A few were cracked.

Morden 359. This tree has never quite recovered from the winter with no snow, but continues to struggle on, and to produce a dozen or so unripe apples each year. I have never tasted a ripe one.

Heyer 20. This tree is thriving. The tree has a nice shape and a good spreading habit. It produced a nice crop of not quite ripe, medium-sized apples that are usable for everything but fresh eating. Maybe some quirky year, they'll ripen on the tree. I recommend this variety for other growers with better microclimates.

Yellow Jay. The original seedling tree in Dearborn's orchard produces a huge crop of great-tasting apples, which this year began to ripen around Sept. 20. Our only producing Yellow Jay tree, in a poor location, never has produced a truly ripe apple. We picked about 50 premature apples when forced to, on Oct. 4, but they were only useful for cider, sauce, and pies.

MAKING CUTTINGS? USE WILLOW WATER—TED SWENSON (9325 SW 3rd Ave., Portland, OR 97219)

(This article is from Pome News)

Many times when I take cuttings the directions indicate that I should use a rooting hormone to increase the rate of rooting. Many rooting hormones on the market are synthetic preparations of indolebutyric acid (IBA). You can use the real thing by mixing a batch of willow water.

Take a handful of willow twigs (any willow [*Salix*] will do) and cut them into pieces an inch or two long. Soak the pieces in a few inches of water for a day or two. Remove the twigs. Use the water to soak cuttings in overnight or to water flats of newly started cuttings.

Since this is kitchen science, the amount of hormone will vary depending on the season, kind of willow, and amount of twigs. But it will work: give it a try.

FIRST-PLACE FAIR WINNERS— Kevin Irvin

Congratulations to Robert Rehus, Jerry Schreiber, Jay Dearborn and Phyllis Kircher, all of Palmer. All won first place in the tree fruit division in the crabapple or apples 2" and over classes at the State Fair in Palmer this past August. Each won a one-year membership in the Fruit Growers for 1999.

A NOTE ON 'BACCATA'—Kevin Irvin

I have one tree I began growing for a pollinator. This past season was the first year it blossomed and it was of no use as a pollinator. The cold spring weather had no effect on it and it was the first to blossom. It set very small crabs no bigger than the end of my little finger and I wonder what it's pollinator was. The hard frost I had on 27 Aug. sent it into dormancy and by the 3rd week of September there were no leaves left on it. With all the controversy about 'Baccata' this may be something to take into account should you consider it as a rootstock.

BYELUI NALIV: A PROMISING ANTIQUE RUSSIAN VARIETY— Dwight Bradley

In September, we had a visit from a geologist who spent his first 40 or so years in Russia, then moved to Colorado a few years ago, when the standard of living in Russia started to spiral downhill. Like many professionals from Moscow, he owned an acre of land about an hour away from the city, with a small cabin, garden, and orchard. His orchard contained 25 apple trees situated in a climate broadly similar to that of Edmonton and Fairbanks; the latitude of Moscow is about 55°N. We spent some time discussing Russian apple varieties. Of greatest interest for Alaskan growers is Byelui Naliv, which means "Juicy White". This is an antique variety, from before the Revolution, that is still very popular. In the 1884 paper by Charles Gibb, titled *On the Russian apples imported by the U.S. Dept. of Agriculture in 1870*, Gibb quoted a

Dr. Regel, who evidently was from Russia, as follows: "Byelui Naliv is one of the most valuable of the Russian apples, because it grows even in the northern part of the Province of St. Petersburg, even at the Valaam Monastery (62°N), near the northern end of Lake Lagoda, and in some parts of Finland." Does anyone know of a source for Byelui Naliv (Juicy White) in the USA?

1998 ORCHARD TOURS—

Kevin Irvin

This past summer was the first year (since I've been in the Fruit Growers anyway) that we had a tour every month. In May we toured the Mystery Trees in Anchorage as well as making stops at Bob Boyer's and Tom Marshall's to see their trees. Anyone who hasn't seen Tom's 'Oriole' tree should, with his careful attention and nurturing not to mention the numerous varieties on one tree, it truly is impressive. Bob's 'Sam' sweet cherries are a sight to see and if you can talk him into letting you try one or two in the fall, well, they're better than store-bought. In June we went to Jim Yassick's in Birchwood. Talk about a greenhouse with grapevines! I was also interested in his 'Dwarf Russian Almond' bushes. This may be the variety for growing nuts in Alaska. They are small but hey, a nut grown and ripened in Alaska, what more do you want! They do have a very strong almond flavor, how do I know? well I snuck a couple, and these were from 1997 still on the bush! In July we went to Kevin Irvin's container grown orchard in East Anchorage. Being the one writing this article I won't brag about how I grow tree fruit except to say that it can be done. I truly was overwhelmed by the turn out and hope all that came left with some new knowledge. In August we went to Jay Dearborn's out in Palmer. 'Vista Bella' is one variety I didn't think would ripen here, but Jay says it will. Another interesting variety was one that has small apples that hang on the tree through the winter then in the spring he eats as apple raisins! Another note of interest is most of these trees are on 'Baccata' and are doing fine. Also in August we were going to do a repeat of the May tour to see the fruit or lack thereof on the 'Mystery' trees. We got sidetracked to Pat Carney's in south Anchorage. Pat has been able to achieve exceptional growth on his grafted trees by using grass compost and what he calls "poop dirt" from his family's farm. With his combination he has 2 year old trees producing apples! I am impressed.

I think this new summer agenda of touring different orchards was very rewarding. We all have different 'tricks of growing' and varieties that we grow. Most of us know the basics and some of us are more experienced, but none of us know everything.

Given the environment we live in with all the different microclimates and techniques we have, I don't think anyone who visited any of these orchards left without learning something. I want to thank everyone who invited us to their place and look forward to touring more of your orchards next growing season. Until then happy catalog reading!

OREOLE APPLE TREE UPDATE

Tom Marshall provided some new information on his Oreole tree, which is topworked with 19 other varieties. The tree bore 350 Oreole (of which 66 were blown off in a bad August windstorm), 74 Geneva Early, 37 Novosibirski Sweet, 26 Trailman, 19 Parkland, 15 Yellow Transparent, 21 Centennial, 7 Whitney, 1 Norcue, 7 Ginder Gold, 2 Mantet, and 1 Summerred. Oriole and Geneva Early from this tree were the second- and third-ranked apples in this year's tasting (see below). Centennial and Trailman suffered from splitting fruit in August. The tree also has grafts, yet to bear, of Wolf River, Calville Blanc d'Hiver, Westland, Pitmaston Pineapple, Chinese Golden Early, Norland, Red Duchess, and the Helen Butcher apple.

ANNUAL ALASKAN-GROWN APPLE TASTING —*Dwight Bradley*

1998 Results

The annual Alaskan-grown apple tasting was held at Bradley's in Peters Creek on Sept. 26, 1998. About 25 people were there, and 17 rated the apples. We tasted 31 varieties of apples, a dozen repeats of these same varieties, two varieties of pear, and one each apricot and plum. The highest-rated apples this year were Viking (grown by Bob Boyer), Geneva Early (Tom Marshall), Oriole (Tom Marshall), and Ginger Gold (Bob Boyer). Bob and Marianne Boyer tested each variety for sugar content; we were surprised as usual at some of the results.

Variety	Grower	Avg. score	Sugar (brix)
APPLES			
Viking	Boyer	7.1	12.5
Geneva Early	Marshall	7.1	11
Oriole	Marshall	7.0	13
Ginger Gold	Boyer	6.9	11
15th St. Mystery	Boyer	6.8	11
Roda Mantet	Franke	6.7	11.5
Parkland	Bradley	6.7	12
Sunrise	Boyer	6.4	13
Norland	Bradley	6.4	12
Red Mantet	Franke	6.3	13.5
Mantet	Yassick	6.3	12
Geneva Early	Franke	6.2	11
Norland	Franke	6.0	14
Parkland	Boyer	6.0	15.5
Carroll	Boyer	6.0	14
Geneva Early	Dearborn	5.9	13
Parkland	Franke	5.9	11.5
Norland	Yassick	5.8	13
Vista Bella	Dearborn	5.8	14
Yellow Transparent	Franke	5.7	12
Summerred	Dearborn	5.6	11
Westland	Boyer	5.5	13
Yellow Jay	Dearborn	5.4	13
Lodi	Vochoska	5.4	13
Summerred	Irvin	5.3	12.5
Westland	Franke	5.2	10.5
Rescue	Bradley	5.2	13.5
Canada Red	Dearborn	5.2	12.5
Westland	Vochoska	5.1	10.5
Golden Transparent	Butcher	4.9	13.5
Goodland (misidentified?)	Mary Lou	4.8	13
September Ruby	Boyer	4.8	16
Westland	Boyer	4.8	11
Ultra Spire	Irvin	4.7	11.5
Chinese Golden Early	Dearborn	4.6	15
Unknown crab	Butcher	4.4	16
Harris Mystery	Harris	3.9	12
Heyer 12	Yassick	3.8	10
Rosthern 15	Marshall	3.8	11
Red Transparent	Franke	3.7	10.5
Haralred	Yassick	3.3	12.5
Wealthy	Franke	3.1	10
Hazen		2.8	11
OTHER FRUIT			
Opal Plum	Marshall	7.3	12
Gold Spice Pear	Irvin	6.6	11.5
Manchurian Apricot	Anderson	5.9	16
Ure Pear	Irvin	5.7	11

Five-Year Results

The next table ranks the Alaskan-grown varieties that have been tasted over the past five years, since I've been keeping records. The order is highly subjective, based on years in the top ten, and number of years ranked in the top three. Ginger Gold, Oriole, Parkland, and Norland are the clear front-runners. Mantet and Viking have both placed first, but other years they have barely been edible — they don't ripen all the time.

Variety	Years in top ten	Years #1	Years #2	Years #3
Ginger Gold	4	2		
Oriole	4	1	1	2
Parkland	5		1	1
Norland	4		1	1
Mantet	2	1		
Viking	1	1		
15 th St. Mystery	3			
Roda Mantet	2		1	
Lodi	2			
Harris Mystery	2			
Sunrise	2			
September Ruby	1		1	
Geneva Early	1		1	
State Fair	1			1
Vista Bella	1			
Karl Franke Mystery	1			
Golden Transparent	1			
Canada Red	1			
Arvid Miller Mystery	1			
Whitney	1			
8 th & M Mystery	1			
Rescue	1			
Novo-sibirski Sweet	1			
Joyce	1			
Red Mantet	1			

ESPALIERS, CORDONS, AND OTHER SPECIALIZED PRUNING AND TRAINING TECHNIQUES

At the November 1998 meeting in Anchorage, Debbie Hinchey gave a well-attended, very informative talk on espaliers. The talk was illustrated with slides from a formal garden in Vancouver, B.C. The last three pages of this Newsletter are handouts that she prepared.

CORDONS (from The Complete Guide to Pruning and Training Plants, by David Joyce and Christopher Brickell, 1992, Simon & Schuster)

The cordon is a restricted form consisting in essence of a main stem furnished with short growing fruiting spurs. Apples are normally grown on dwarfing or semi-dwarfing rootstocks (vigorous rootstocks are only suitable on poor soils). Pears are usually grafted on to Quince A or Quince C rootstocks.

The cordon can be grown vertically or at an angle, and as a single stem or as two or more parallel arms. The single oblique cordon is the most common form and has several advantages: a number of trees can be grown in a small space; trees can be easily reached over their whole length; and training towards the horizontal checks vigor but encourages the production of fruit buds.

Cordons require permanent support. In the open garden use a system of posts and wires, spacing wires 2.4 and 6 feet above ground level. Use the same spacing for wires on walls or fences, running them 4-6 inches out from the surface to allow the free circulation of air. The cordons are tied to bamboo canes, which should be attached to the wires before planting. Allow 2½ -3 ft. between cordons.

Formative pruning and training

It is preferable to start with a branched maiden, on which the pruned back laterals will develop fruiting spurs. The tree will probably start bearing in its third year.

At planting, between late autumn and early spring (the latter in the north), set the cordon at an angle of 45 degrees, ensuring that the union is above ground and the scion is uppermost. In the northern hemisphere, slope cordons in north-south rows to the north, and in the southern hemisphere to the south. In east-west rows, slope the cordons to the east.

Tie the cordon to the cane at two points, and cut back laterals to four buds. In the growing season tie in extension growth of the leader and begin the summer pruning as outlined for the bearing cordon.

If there are flowers in the spring after planting, remove them, taking care to avoid damaging the shoot behind the blossom.

Summer pruning: the Modified Lorette System

This system is the most widely used method of pruning bearing cordons and is started in the second year. In mid-summer -apples generally about a week later than pears - cut back mature laterals growing directly from the main stem at three leaves, not counting the basal cluster. Shorten mature laterals arising from spur systems more drastically, cutting at the first leaf beyond the basal cluster. Delay cutting immature laterals, which are lighter in leaf and bark than mature shoots, until early autumn.

Sometimes secondary growths develop after the mid-summer pruning. Remove these, cutting back to a bud or leaf on mature wood, just before leaf fall. If secondary growth is a recurrent problem, delay the summer pruning by two or three weeks or follow the advice for winter pruning.

When the leader has passed the top wire, cut it back in late spring to within 6 inches of the wire. Annual cutting back in midsummer of all but about one inch of the year's growth will keep the cordon at the same height throughout its life.

A longer stem can be accommodated by lowering the cordon. However, this operation is most often used to check an over-vigorous cordon, limiting the amount of extension growth made and encouraging the production of fruit buds. The cordon should be lowered in stages, by about five degrees at each stage, to not less than 35 degrees.

PRUNING AND TRAINING

1. At planting, between late autumn and early spring (early spring in the north), set the branched maiden at 45°, ensuring the union is above ground and the scion uppermost. Tie the cordon to the cane at 2 points. Cut back laterals to 4 buds.
2. Remove flowers in the second year, but leave the basal rosette of leaves intact.
3. Begin summer pruning by the Modified Lorette System in mid- to late summer of the second year. Shorten to 3 good leaves above the basal cluster all mature laterals growing directly from the stem that are more than 9 inches long. Cut back to one leaf beyond the basal cluster any sublaterals growing from existing spur systems.
4. In autumn, just before leaf fall, remove secondary growths that have developed since the summer pruning. Cut back to a leaf or bud, on mature wood. (From a October 1998 conversation with horticulturist at the Univ. of British Columbia, I came to the conclusion that this last pruning could be left for the moose in the fall and not harm the tree. That is, of course, if they only eat the proper amount and are tidy about it - Debbie Hinchey)
5. When the leader has reached the required height and passed the top wire, cut back in late spring, leaving about 6 inches above the wire.
6. In mid-summer of subsequent years cut back all but one inch of the leader's growth. Continue to summer prune, cutting back to 3 leaves mature laterals growing from the main stem that are more than 9 inches long, and shortening to one leaf beyond the basal cluster any sublaterals growing from existing side shoots and spurs.

Winter pruning the bearing cordon

This is normally confined to simplifying crowded spur systems on mature trees. In mild areas with a high rainfall, secondary growth after summer pruning may be so prolific that the best course is to prune in winter. In such cases cut to three buds on laterals and one bud on sub-laterals.

Sometimes a young cordon produces insufficient laterals or laterals that are poorly spaced along the stem. Cutting back the previous summer's growth of the main stem by up to a third will encourage the development of new side shoots.

Winter is the best time to renovate neglected cordons, the aim being to restrict laterals to short fruiting spurs. After the initial renovation return to a program of normal summer pruning.

Lowering a cordon To check an over vigorous cordon or to accommodate a longer cordon, lower it but to not less than 35°. Lower 5° at a time, tying the cordon in to a new cane already fixed in position.

ESPALIERS (from The Complete Guide to Pruning and Training Plants, by David Joyce and Christopher Brickell, 1992, Simon & Schuster)

The espalier is a restricted form consisting of a central stem supporting several tiers of paired horizontal branches all trained in the same plane. Espaliers generally have four or five tiers, but more are possible and single tier espaliers are sometimes used as an edging to beds. Except on poor soils, apples are normally grown on dwarfing or semi-dwarfing rootstocks. Pears are grown on either Quince A or Quince C. Partially trained espaliers are sometimes available from nurseries. These start bearing sooner than those planted as maidens.

Espalier trees need support throughout their lives, whether they are grown against walls or trained on a system of posts and wires in the open. The height of the wires above ground level should correspond to the tiers of the espalier, which are usually 1 1/4-1 1/2 feet apart.

Formative pruning and training

In early spring cut back a newly planted, unbranched maiden about 1 1/4 feet above the ground, making the cut to the topmost of three good buds. Growth from the top bud will extend the central stem, while growth from the two lower buds, one facing to the left, the other to the right, will develop as the two arms of the bottom tier.

In summer train the topmost shoot vertically to a cane. Horizontal training in the first summer would check the growth of the arms too severely. Train them on canes at 45 degrees to the horizontal. If growth is unbalanced, check a vigorous arm by lowering slightly and encourage a weaker arm by raising it. In late autumn carefully lower the two arms to the horizontal and tie them to the wires. If growth has been weak, shorten leaders by about a third to upward-facing buds, but otherwise leave them unpruned.

To create the next tier, prune back the central leader about 1 1/2 feet above the bottom branches. Yet again there must be three buds below the cut, one to extend the central stem and two, facing in opposite directions, to form the arms. Shorten surplus laterals to three buds. Throughout the subsequent summer train the leaders as for the first tier, with the arms at 45 degrees, until they are lowered to the second wire in late autumn.

Follow this pattern of building up tiers until the required number has been formed.

FORMING AN ESPALIER

1. After planting in early spring, cut back a newly planted, unbranched maiden at the topmost of 3 good buds about 1 1/4 feet above the ground.
2. During summer train the shoots to canes, the topmost vertically and the arms at 45°.
3. In late autumn carefully lower and tie down the 2 arms. If growth has been weak, shorten leaders by about a third. Cut back the central leader to the topmost of 3 good buds about 1 1/2 feet above the bottom branches. Shorten other laterals to 3 buds.
4. In the second summer train the central leader vertically and the 2 arms at 45°, as for the first tier. Shorten laterals growing from the horizontal arms to 3 leaves above the basal cluster.
5. In late autumn of the second year carefully lower and tie down the 2 topmost arms, pruning back by a third if growth is weak. Cut the central leader back at the topmost of 3 good buds about 1 1/2 feet above the second tier.

The arms of an espalier are like horizontal cordons, the fruit being borne on spur systems. As with cordons, summer pruning starts in the second year and the Modified Lorette System should be used. In essence this means cutting back mature laterals longer than 9 inches arising from the tiers to three leaves above the basal cluster, and any laterals on side shoots or spurs to one leaf. To stop the central stem and the horizontal arms extending too much, prune them back in late spring, cutting almost all of the preceding summer's growth. On mature trees, thin crowded spur systems in winter.

Old gardening manuals, and sometimes old gardens, reveal the range of forms in which apples and pears have been grown in the past. These are, generally, variations of the restricted forms, often elaborated for their ornamental value. The simplest of these variations are fans and cordons grown to form arches and tunnels.

Although the fan is mainly used for stone fruits such as peaches and cherries, apples and pears can also be grown in this way. Even when using dwarfing or semi-dwarfing rootstocks, apple fans need a minimum wall or fence height of about 7 feet, and pears on Quince A or Quince C require about 8 feet.

Summer pruning by the Modified Lorette System, treating each rib as though it were a separate cordon, controls the growth of the fan and promotes the development of fruiting spurs.

A fruiting arch is one of the easiest ways of accommodating a pair of trees in a very small garden. If there is room for no other fruit trees, the selection of cultivars must take account of their pollination requirements. The two trees are simply grown as vertical cordons that are arched over to meet each other at the top.

A series of arches can be used to form a tunnel. A much slower method of covering the framework of an arbor or tunnel is to train espalier trees on either side.

---Apples and pears can be trained as fans, either against walls (above) or in the open garden (above left) on a framework of wires. However, they require generous spacing and for this reason are not suitable for small gardens.

---An alternative to the fruit tunnel composed of a series of cordons is one made from 2 rows of espaliered apples or pears trained over a permanent framework of cordon apples or pears to a permanent framework that arches over a path.

---The arcure method of training is not widely practiced today, but is an interesting variant of the cordon, with the tree trained in a sequence of arcs.

compiled and edited by Debbie Hinchey

APPLE WINTER SURVIVAL IN MINNESOTA—David K. Wildung (Horticulturalist, North-Central Experiment Station, Minnesota)

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The winter of 1995-96 will be remembered as the coldest winter on record in Minnesota. The all-time state low minimum temperature of -60°F was recorded at Tower, MN on February 2, 1996. While the official low temperature at Grand Rapids was -41°F , we observed -53°F in our strawberry plot area and other reports in the -50 to -55°F range were common in the Grand Rapids area. Temperatures of -40°F or less were recorded on nine dates in our blueberry and strawberry plots during the 1995-96 winter. At the same time northern Minnesota received above average snowfall in January and February that protected herbaceous perennials, strawberries and blueberry plants from the record cold temperatures. Blueberry plots, in fact produced record yields in 1996 despite the record cold because of the deep snow.

In contrast, exposed plant tissue suffered much winter damage. No where was winter damage due to the record cold more evident than to fruit trees. In our orchard many trees were totally winter killed and almost all trees suffered some winter injury. I had many calls from people who lost trees or had trees badly damaged. Fruit production in our orchard that had reached an all time high during the 1994 and 1995 growing seasons was the lowest it had been in many years. Periodically 'test winters' provide a severe cold test for tree fruits and the winter of 1995-96 resulted in the worst winter kill I have witnessed in over 25 years. It truly was a 'test winter'!

While no one likes to see such severe tree death and damage, one of the values of the North Central Experiment Station is as a cold winter hardiness testing location and the winter of 1995-96 provided us an opportunity to evaluate apple cultivar hardiness. The table lists the relative survival of the cultivars in our orchard following the 1995-96 winter. Winter damage was worse on the so called "hardy" cultivars than would have been predicted. Anything in the best survival list should be considered very hardy and dependable for nearly any winters we may have in northern Minnesota. The intermediate list contains many cultivars we normally think of as being "hardy" and probably would survive most winters in northern Minnesota. Even some of the cultivars in the worst survival list have produced well in our orchard. Many of these trees were over 10 years old. There were a few things in the survival that should be noted that reinforced ideas we have already known. First, crabapples are much hardier than large fruited apples. Among the best survivors were: Rescue, Dolgo, Chestnut, Whitney and Centennial Crabs. All except Dolgo are good eating crabs. Second, some of the old varieties of Russian origin are very hardy. Cultivars like Charlamoff, Antonovka and Hiberna have long been considered very hardy

and were used by old time orchardists as hardy framework trees years ago. If they only tasted good! Third, dwarf trees survived as well as standard trees. Trees died because of top damage. Most trees with dead tops had a root system that survived. Many root systems sent up shoots showing that the dwarf root system survived where the top died. Fourth, several McIntosh types are not hardy enough for most northern Minnesota locations. These include Britimac, Spartan, Killand, McLemore and Quinte. Lobo appears to be the hardiest McIntosh type.

There were a couple of surprises in the survival patterns. The most surprising survivor was Honeycrisp. This new U of M release came through the winter well. While it would be great news if this fine quality apple exhibited superior hardiness, the trees are young and we need additional evaluation on them to say it truly is hardy. Perhaps the biggest disappointment was Mantet. Normally considered very hardy it suffered severe winter damage in two places in our orchard.

The ranking of the remaining cultivars in the list pretty accurately describes their relative hardiness based on survival from previous evaluations at our location. The survival ratings in the list should be considered the worst case scenario for winter hardiness damage. Then too, the winter of 1995-96 was the coldest on record and hopefully will not be repeated for many years.

If any of you have observations from your own fruit tree survival, write me a brief note. I'll report any significant findings in a future *North Central Quarterly* article.

APPLE WINTER SURVIVAL (1995-96)

Best Survival:	Rescue Crab, Dolgo Crab, MN 447, Charlamoff, Chestnut Crab, Whitney Crab, Folwell, ?Honeycrisp?, Garland, Centennial Crab, Carrol, Wellington.
Intermediate:	Oriole, Antonovka, Goodland, Hiberna, Early Blaze, State Fair, Duchess, Garrison, Caravel, Keepsake, Lakeland, Beacon, Haralson, Lobo, Victory, Wedge, Yellow Transplant
Worst:	Sweet Sixteen, Red Melba, Viking, Prairie Spy, Redwell, Connell Red, Fireside, ?Mantet?, Honeygold, Paulired, Early Red Bird, Britimac, Minjon, Red Baron, Collett, Lodi, Thorberg, Summerglow, Spartan, Killand, McLemore, Quinte
