2016 Northern-Hardy Fruit Evaluation Project Update
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In 2016, the Northern-Hardy Fruit Evaluation Project reached at least 2,400 people through speaking engagements, calls and emails, and tours. Over 200 calls and emails were replied to through the year, with 25 of those from Extension and other professional colleagues in the state. Contacts are primarily from North Dakota but other calls came in from Alabama, Maryland, Minnesota, Montana, North Carolina, South Dakota, Vermont, Wisconsin and a Chilean fruit researcher. The project has reached almost 9,700 people since it began in 2006.

Cooperators: Our cooperators in 2016 were Tongue River Vineyard in Miles City, MT, Dakota Sun Gardens Winery, Carrington, ND and Woodward Farms in Cathay, ND. As a measure of our success, some of our past cooperators indicated that they now needed more fruit than CREC had available and they had found other sources within and outside of the North Dakota. We did not distribute all of our fruit in 2016.

Weather: Fall 2015 tended toward dry with 1.68 inches of rain from Sept 1 until Nov 1. In winter, only 17 nights were below zero, with the majority of those coming in January 2016. Snow depth was light though better in the orchard than the surrounding area; a total of 35.9 inches of snow fell in 2015-16. Conditions were warmer than the average from March – May when plants begin to grow. A cold period developed May 13-15 with a low of 25^{o}F on the 14th. Despite the freeze, there were no widespread reports of field crop injury in the area, nor much blossom or noticeable fruit loss in the orchard.

From May 1–July 13 there was 3 inches of rain followed by 8 inches through August. Hail July 9th scarred almost all of the apples and grapes. It dropped or ruined approximately 70% of the almost-ripe cherry crop and about 50% of the currant crop. Then fall was dry again with only 2.4 inches of rain falling from Sept 1 through Nov 27. Temperatures were much above normal through Nov 15th. Both spring and fall high temperatures were about 3^{o}F warmer than the 30-year average while the low temperatures in these periods were 4^{o}F warmer.

We finally received 2 inches of precipitation (rain and snow mix) November 28-30, and then 'winter-like' temperatures ensued. On Dec 5-8, we had a 16- to 20-inch blizzard with a lot of drifting. A further 9-inch blizzard occurred the last week of the month. There are snow drifts over 8-feet tall in our area. The ground is hardly frozen and we hope moisture enters the soil slowly in the spring.

Field Day: The CREC Field Day and fruit project field tour was July 19th with 65 people attending. Our speaker was not able to attend due to airline/weather delays. We conducted a project tour and NDSU graduate student, Caitlyn Kreuger, spoke on her work with spotted winged drosophila (SWD), a fruit pest.

General: There was almost no fruit in 2015. No fertilizer was applied in 2016 due to a) lack of fruit production in 2015 and b) equipment changes; we were only supplied with full-size trucks this year and these will not fit between the fruit rows. In 2017, we will have to apply it from the ends of the rows with longer hose.

Irrigation project: 2016 was the second year we have applied water to Juneberries and black currants. The first two rows of each were watered the last week of June and again during the third week of September. Currant loss to hail and SWD were such that any measurements would not be correct in 2016, and there was no crop in 2015. Juneberry harvests were thus: 2015 - irrigated rows produced 30 lbs *more* than dry rows. 2016 - irrigated rows produced 77 lbs *less* than dry rows.

Bees in the orchard: In 2016, I placed 1,000 blue orchard mason bee cocoons in the orchard April 28th, just as the dandelions and Canadian and Russian haskaps were starting to bloom. All the bees seemed to hatch but there were not that many filling reed-tubes w eggs. I documented mason bees pollinating just a few honeyberry blossoms, and according to research in Canada and Poland, mason bees do NOT care to visit *Lonicera* if they have other choices. They prefer *Rosacea*, dandelions and willow; bumble bees are the best pollinator for haskap. The mason bees were extremely active May 15-21 while cherries were in full bloom, but there was almost no activity seen at the bee houses after that. May 21 was very hot and very windy. Aronia, apple, currants and haskaps were still blooming into the following week, but of these, only apple is a favored source. Aronia almost never attracts bees; only flies.

In mid-July, I removed the bee reeds from the orchard and placed the occupied reeds into a netting bag to allow the larvae to develop away from bee pests. These reeds hung in a protected outdoor area until October when I opened the reeds, removed the bee cocoons, washed and disinfected the cocoons and then stored them in the refrigerator until spring 2017. Only 500 new cocoons were retrieved.

Apples: Apple blossoms were within a day or two of opening when a low temperature of 25°F occurred May 14th; Zestar was blooming. The trees still set a good crop and we thinned the fruit several weeks after bloom. On July 9th, hail damaged almost every developing apple. On August 9th, we re-thinned all the trees to remove the spoiled and most damaged fruit. Production estimates are: six 'Honeycrisp'- 253 lbs; four 'Sweet 16'- 100 lbs; four 'Hazen'- 150-200 lbs; four 'Zestar'- 20 lbs; four 'Haralred'- apx 10 lbs. Fruit was distributed to employees and the local food pantry.

Véraison Aug 12

Aronia: Aronia bloomed for a 5-day period in the fourth week of May and were mostly complete by the 26th. Production was excellent this year with 275 lbs collected. This is 40 pounds more than the previous high in 2013. This year, we had almost no insect damage to the leaves by either pear slug sawflies or lace bugs. No insecticides were applied. No SWD was detected but a few cherry fruit worms were found in the fruit at harvest. Véraison was recorded August 12th as fruit had turned red-black and began to swell. Harvest did not occur until September 2-9 when sugar levels and taste agreed.

Canadian Sour Cherry: The dwarf hardy cherry shrubs had an excellent crop in 2016, but harvest was limited by hail and SWD. 'Carmine Jewel' bloomed May 9-17 while 'Crimson Passion' began a few days earlier and both persisted through the 17th. 'Evans' aka 'Bali' is about one week later and bloomed May 13-20. Mason bee activity was extremely high May 14-20. Cherries were ripe extremely early this year, and unevenly ripe, with harvest occurring July 12 and 13. We feel this is due to the freeze May 14th.

Fruit was sprayed with insecticide to prevent SWD damage. It seemed as if the protective sprays worked, as little damage was detected in the dwarf cherry fruit. Unfortunately, it seems as if timing was the biggest protectant. When 'Evans' cherry was ripe one week later, they were completely infested with SWD despite further sprays. This was also a period of heat, humidity and, finally, rain.

Hail on July 9th dropped or ruined what seemed like 70% of the near-ripe cherry crop. Students were employed to rake up the fruit and drive them away from the orchard. The remaining fruit had a lot of damage from bruising to cuts. In the end, we harvested only 93 lbs of 'Carmine Jewel' and 32 lbs of 'Crimson Passion' that were usable (12 plants of each). 'Evans' cherries were harvested by several volunteers who tried to find a bit of usable fruit among the damage and insects. The CREC-saved amount was 17 lbs which was perhaps 20% of the 'Evans' crop on two trees.

'Crimson Passion' has always been less vigorous than 'Carmine Jewel'. It suffers from 'barren branches' (see right), a condition in which reproductive buds from the previous year do not form new vegetative buds. Thus, no new fruit or leaves can form. 'C.Passion' starts to bloom a day or two earlier than 'C. Jewel' but never has near as much fruit. In addition, almost all the 'C.Passion' plants have 'gummosis', a condition in which resin is pushed out of damaged areas to try to seal off insect-, bacterial- or fungal-damaged areas. This seems to have started on 2-3 plants, 1-2 years after hail in 2012. Now, most of the 'C. Passion' have gummy oozes and will probably be removed. This may have been spread through pruning but root grafting or insects cannot be ruled out as the source of the problem.

Red and White Currants: Due to hail, SWD and being unprepared for the very early, yet uneven ripening of the red and white currants, we lost quite a bit of this crop. 'Red Lake,' 'Redstart,' 'Blanka' and 'Swedish White' were almost a complete loss due to SWD infestation. The hail bruised and opened up fruit which then attracted SWD. We were able to harvest three red varieties that averaged about 10 pounds of fruit per plant. 'Blanka' has declined substantially in the last year, with one plant near death. Its fruit is quite tart and not that pleasant, so it will be removed.

Black Currants: What I have perceived as winter damage the past few years is most likely currant borer damage; the shoots that were bored are slow and weak. Undoubtedly, there was winter damage the past several years, which appears similar, and that led me to not remove some of the infested canes which increased the level of pest. In May 2016, I cut out as many 'slow' canes as I could and burned them. It will take a few years of vigilance to reduce the borers.

The original trial established in 2007 will be decreased in 2017. 'Hilltop Baldwin' is truly affected by some winter stressors. Also, not all the plants are the same! Some have a different growth habit and ripening is a few days different. Production has been poor. 'Swedish Black' has an early, mild and sweet fruit but the growth habit is unacceptable. Almost all the plants we have grow 'wiggly' and with downward direction. No matter the pruning each spring, the canes grow quite low and make picking difficult. I observed this variety at the Plant Repository in Corvallis, Ore., where it grew upright. Two or three of our plants grow with a better habit than others. This variety would still be nice for a family that would like some fresh currants.

The hail dropped approximately half of the currant fruit July 9th. It was impossible to pick up the fruit as we struggled to continue harvesting Juneberries to keep ahead of SWD, and it laid on the ground. Despite several passes of pyrethroids, SWD were thick within all the currant plants and were not controlled. Many

The new black currant trial established in 2014 had its first crop this year. Fruit ripened very unevenly and it is possible we missed harvesting some plants that had only a few berries – they may have fallen off while we were waiting. These plants should be more upright than 'Titania.' They are, however, quite a bit more tart and they are later to ripen than all the varieties in the older trial.

Gooseberries: All the gooseberries had fruit this year. We did not pick it for weight.

Grapes: Half the grapes have been removed now; just two replications have been left. There have been numerous years of winter injury, whether the vascular tissue was hurt or whether snow pulled the trunks and canes off the trellis – almost every year I have had to retrain some or almost all of the vines. It is a huge amount of work with little reward. Grapes in North Dakota need to hang a long time to drop their acidity. During this time, bees, wasps and birds find the fruit. Netting is required but by this time of the year, our technicians are harvesting grain crops and our students are gone. Each year I take samples as long as I can, and there is always one day when the grapes seem to have disappeared overnight.

In 2016, I was busy thinning and pruning Juneberries and I did not have time to prune the grapes until they started to grow. I was very late and I left too many buds. I dropped clusters in June but the poor plants were stunted due the heavy crop. In mid-summer, I dropped almost all of the fruit to save the plants. Fall was long but the trellises are now covered with drifts this winter (2016-17). I imagine the plants will be dragged off the wires as the snow melts in spring 2017.

Haskaps and Honeyberries: The weather during Haskap/honeyberry pollination this year was cool at both the beginning and end of the Russian and Canadian periods. It was cool during the beginning of the Japanese bloom period but should have been fine when the majority of blossoms were open. The entire blossom period was extended by these cool temperatures.

The oldest Canadian and Japanese haskaps were reduced in number to give the plants more room and to allow for easier picking. With the exception of 'Indigo Gem,' the Canadian cultivars had their usual poor production. The older Japanese plants (2007) had few flowers this spring. However, the new Japanese selections had an excellent first crop.

The new Japanese selections were planted in late fall 2012 and allowed to grow as they would in 2013. In early spring 2014, they were cut back to several buds to force them to become 'shrubbier.' Knowing that strong wind is damaging to new, brittle haskap growth, in June, I tied each mass of new growth with a length of twine to hold it loosely upright. In spring 2015, I used standard pruning methods to thin the plants and remove unfit branches. In addition, *to the east row only*, I also cut the dormant branches back half way to encourage further branching. In spring 2016, I noted that the two methods of pruning resulted in:

West row: These plants had more strong new basal shoots. Overall, the new growth was not as dense. Pruning felt normal.

East row: The plants had a lot of smaller-diameter growth overall, especially in the upper halves of the plants. There were fewer strong new shoots from the basal area. On the cut-back shoots, sometimes the nearest buds died and then lower buds grew and branched out. Many times, only 1 of the 2 buds grew.

Pictures of New Haskap plants in 2016 before pruning

Spring 2016: *West row.* Traditional pruning in 2015

-Generally had a good number of strong basal shoots.

Spring 2016: *East row.* Traditional pruning + Cut back ½ way in 2015

-You can see many young, thinner branches that I had to spend time selecting and removing in 2016.
-There were not as many new, strong basal shoots

Overall, heights and widths were similar by fall 2016. However, the east row produced 4 pounds of fruit more than the west row.

Our two concerns/problems for growing haskap in North Dakota are wind and pollination. If the berries are not attached tightly, they will fall off in the wind – if they are attached too tightly, they will be too hard to harvest. There are a couple of selections noted in 2016 that seem to cling better and have good flavor.

These are the Japanese haskap plants where I mentioned "clinging well" in my notes:

21-20	**clinging well**	**TART/sour. Bland but 'green' flavor**	**Starting to soften w mushy texture. Small fruit w/ thick white bloom.**
22-26	**clinging well**	**Pleasant but tart**	**Rounder shape. Snappy skin. Firmer fruit. Can be sweet.**
44-19	Good Cling but starting to fall	Tart but sweetening	Firm, round shape, white bloom. Sl. uneven size.
88-92	Clinging well	sourish	A few reddish, but some soft - too soft
131-08	clinging well	Tart	Big, Round berries. Softening in box. *All have tails* . Branches are weak
142-30	clinging well Starting to fall	Sweet when ripe	Not bad, some sweet others tart. Softer.

These were the plants that produced the most fruit:

20-04	**1726g**	**575/plt**	**Terrible. Fell for 2 weeks**	**Too easy**	**Unremarkable. Bland but tart**	**Berries fell for 2 weeks. Small, sour, mushy inside. Even size. Some berries reddish yet.**
22-26	**1540g**	**513/plt**	**clinging well**	**Easy but clings**	**Pleasant but tart**	**Rounder shape. Snappy skin. Firmer fruit. Can be sweet.**
41-75	1699g	566/plt	Moderate Drop		Tart	Mushy interior. Not very good. Softening in box.
57-49	2097g	699/plt	Starting to fall early	Snug	Tart if still tight	Round shape. Softening where berries touch each other. And after picking.
108-23	**2179g**	**726/pl**	**Moderate drop**	**Tickled. Clung until touched**	**OK Not too sour**	**Nicest haskap I have ever picked! Clean+firm+OK flavor. Fruit on ground was pretty firm. More evenly ripe than most.**

I noted that plant 57-49 started to fall early, but as we picked it, the fruit was 'snug' This means that the fruit was not as ripe as it could have been, because it loosens and falls as it ripens. So, not a good candidate for North Dakota.

Several of these new Japanese selections show promise for our harsh conditions: 22-26 being one that clung well and produced a good amount of fruit. Though it might prove to be an early fruit dropper, I really liked 108-23, too. I look forward to several more years of production data.

Japanese haskap bloom later and have a much greater chance of having active native bumble bees visit their flowers. It is odd though, that the Canadian selections such as Borealis, Tundra and Indigo Treat don't have better crops – the Russian Berry Blue and Blue Belle begin bloom just a day or two earlier and outperform the Canadians almost every year. They actually outperform the original Japanese haskap plants, too.

Note: None of the Japanese haskaps we are working with are available in the commercial market. We do not propagate any of these.

Juneberries: Juneberry plants were previously pruned in 2014. They became quite tall in 2015 and required pruning again in spring 2016. Large branches were cut back for renewal and other tall shoots were headed back. Weak shoots affected by wooly elm aphids were also removed. Despite the sizable amount of wood removed, production was the largest to date, with 762 pounds of fruit harvested.

Hail struck the orchard July 9th, mid-way through Juneberry harvest. Some fruit was lost, but much was untouched due to the protective effect of the netting. The spotted wing drosophila (SWD) fruit fly became a slight problem in the second half of harvest but I did not spray the fruit due to the net. We hand-sorted the fruit to remove most of the damaged berries.

Plums: 'Pembina' and 'Toka' burst open on May 6th, followed the next day by 'Pipestone' and 'Waneta.' Most pollen was dried by May 9th, though 'Pipestone' still had approximately 30% good flowers. One of the 'Prairie Red' plum trees began to bloom May 9th and finished by May 17th. On May 14th, the morning temperature was 25°F, which probably affected fruit development in all the varieties. There was almost no 'Toka' or 'Pembina' fruit and little 'Pipestone' or 'Waneta' fruit. Much of the fruit that did develop was ruined by plum curculios.

Elderberries: Late summer had warm temperatures so long that both single plants of 'Johns' and 'York' elderberry had ripe, or mostly ripe, fruit. Two employees harvested the fruit and made juice with it. I did not feel the fruit was ripe enough at the time they took it and I found the resulting juice unpalatable. The single plant obtained from David Podoll was fully ripe 1-2 weeks before the two commercial cultivars.