2017 Northern-Hardy Fruit Evaluation Project Update
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In 2017, the Northern Hardy Fruit Evaluation Project brought information to over 1,000 people through tours, meetings, video conference programs and personal phone calls. Since the project started in 2006, 10,740 constituents have interacted with the fruit project. Five new North Dakota business contacts were made and two received fruit samples. Eight new contacts requested information about starting orchards in the state. In addition to constituents in North Dakota, calls came from Minnesota, Montana, Illinois, Nebraska, Oregon, Wisconsin, and South Dakota. We also corresponded with a researcher from Kazakhstan.

Cooperators: Our 2017 cooperators were Tongue River Vineyard in Miles City, MT, Dakota Sun Gardens Winery, Carrington, ND and Woodward Farms in Cathay, ND. The fruit project manager also worked with a distillery in Fargo in regard to using black currants.

Weather: Fall 2016 was extended and dry with 2.4 inches of rain in September and October. November averaged 52.2^{o}F, which was 14.4^{o}F above average. During this extended warm period, chilling requirements were met and some Russian honeyberries bloomed. Winter low temperatures (Dec-Feb) were 4.0^{o}F warmer than average. Snowfall was 56.2 inches from Nov 28, 2016 - April 1, 2017, with 77% occurring in December. Three blizzards filled the orchard with snow, ruining much of the grape trellis and both the east and west ends of the orchard fence. Thawing began in mid-March with near average temperatures thru May 30th.

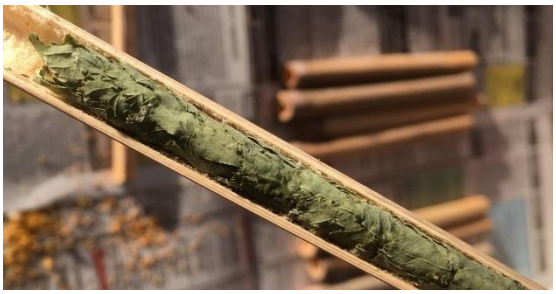
Drought conditions developed across North Dakota in spring 2017. Carrington was lucky, with 4.56 inches of rainfall in May and June, and a remaining 4.58 inches through August. Rain events were several weeks apart but were in amounts that allowed the moisture to soak into the soil. Wide swaths of hail passed near CREC, but missed the orchard this year. The orchard yielded good crops except for aronia.

Field Day: Our annual tour took place on July 18th with 65 people attending. Our featured speaker was TJ Prochaska, Area Extension Specialist in Crop Protection, North Central Research Extension Center. He discussed native pollinators and we looked for some around the orchard.

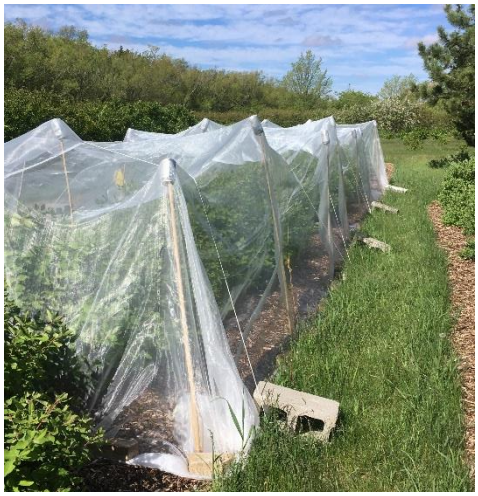
Irrigation project: 2017 was the third year for irrigation in the Juneberries and currants. The currants had no crop because bearing canes were removed to eliminate currant borer larvae. The two irrigated Juneberry rows produced 25% more fruit than the two non-irrigated rows. As a caveat, all the Juneberry rows were pruned to thin and reduce the height in 2016 and 2017. In 2016, the irrigated rows produced 77 pounds *less* and in 2015, 30 pounds *more* fruit.

Mason Bees in the Orchard: In 2016, 1,000 mason bees were placed in the orchard. We only saw intense activity for 7 days. Our return that fall was only 500 bee cocoons. These were placed into the orchard May 2nd but hatching was not observed right away. On Saturday, May 6th, the fruit project manager cut each cocoon open and allowed the bees to sip sugar water. Almost all the bees were alive, but many died soon after release. The reason for this was the

long, warm fall in 2016. It was reasoned, at the time, that nature should 'take its course.' But that meant that the bees were already using their energy reserves during this unusually long and warm weather period. We should have refrigerated them earlier in October. Fall 2017 was more reliably cool and cocoons were still extracted in November. Only 34 cocoons were retrieved. Some leaf cutter bees also used the reeds (picture, left) but instead of hibernating until spring, they hatched inside the protective bag in late summer and died.



In 2017, the fruit project manager experimented with confining mason bees to a selection of haskaps to force pollination. It worked in the sense that the bees were observed working the flowers and entering the reeds to lay eggs. Fruit was set but less than outside the net where a much larger-than-usual number of bumble bees were active.



In 2018, a grant supporting this research will allow us to buy and release fresh mason bees into the enclosure at higher numbers. This work is to see whether the poor production we see in Canadian haskaps may be due to pollination or other issues.

Apples: Apple production was limited this year. Temperatures were 12^{o}F above average at the beginning of bloom and 15 ^{o}F degrees below average in the second half. The honeybees arrived in this second period. This would have been more of the 'off year' according to past production though 'Zestar' and 'Hazen' seem to bear almost every year.

All 'Honeycrisp' had some fruit- Harvest from 6 trees was approximately 90 pounds. The other trees, at 4 each variety had: 'Hazen'- 70lb, 'Haralred'- 50lb, 'Zestar'- 50lb, 'Sweet Sixteen'- 30lb. The early apples were about one week later than typical while the later apples were about normal: during the last week of September and the first week of October.

Aronia: The prime aronia bloom period was from May 24 to June 1, following a 10-day cool spell. We expected a smaller crop after last year's record harvest. Rainfall was low, as described on page 1, but had not seemed to affect the aronia crop in the past. On August 13-15, as the berries were just starting to color, we had 2 inches of rain and in the next few days, the plants began to shed immature berries.

This fruit drop continued for another week or two until very few berries were left. The remaining berries never attained full size or properly ripe flavor; they were very astringent and sweeter than normal because they were left to ripen longer. The fruit was inedible and was

harvested for measurement purposes only. The 'Seedling' aronia had so few berries that they were not harvested at all.

A plant physiologist that I consulted thought that the plants were too stressed by the drought and produced 'stress hormones' that caused the fruit to abort in order to save the plants themselves. I am still surprised at this result due to our past history of very dry periods and the very good production offered by the black currant plants just 3-4 weeks earlier.

There were no pear slug sawflies in 2018 but there were lace bugs on the leaf undersides. These were controlled with one application of spinosad.

Canadian Sour Cherry: Both 'Carmine Jewel' and 'Crimson Passion' had good crops this year. Carmine Jewel produced an average of 25.5 pounds of fruit per plant, despite heavy pruning to thin the plants to an open state. 'Crimson Passion' produced 45.5 pounds of cherries, or about 4 pounds per plant. This is actually a good crop when compared to the past several years of little fruiting.

The past two years, the cherries were pruned in early July. In 2016, pruning time ran out while the plants were dormant and suddenly there was fungal spots on the inner leaves and green cherries during the humid weeks in early July. Since we knew they would need to be sprayed for SWD anyway, they were thinned at this time. In 2017, the same pruning schedule was followed and seemed to work well. With the July thinning, there is not as much regrowth that then has to be removed the next spring. In reading about plum pruning, it is recommended to prune after blossom to reduce watersprout re-growth. This seems to work well for the cherries, too.

Almost all the 'Crimson Passion' plants have 'gummosis' where a resin is produced to wall off an area damaged by fungi, bacteria or insects. The plants will be removed after the 2018 season.

Red and White Currants: The white currants were removed this spring after 'Swedish White' failed to grow very vigorously this spring. 'Blanka' is such a sour cultivar that it was also removed so as not to be the only example of white currant in the orchard. The white currant grown at CREC has been used successfully for several years by a winemaker as both a component of red currant wine and as a standalone white currant wine.

Red currants were much less affected by SWD this year. We were able to harvest the crops in a timely fashion and insecticide applications seemed to deter the insects as well. Our three most productive varieties produced: 'Jhonkeer Van Tets' (JVT): 11.5 lbs/plant; 'Rosetta': 17.5 lbs/ plant and 'Rovada': 20.9 lbs/plant. This is the most they have produced. 'Rovada' is less favored at CREC as it has a more vegetal flavor than the other two. 'JVT' is early and pleasant. CREC also has an unknown red currant that was received in place of a white currant in 2007. 'Mystery' produced 10.8 lbs/plant. It is earlier than 'JVT' and tasty.

'Red Start' red currant was also removed this year. It has been poor for several years. The plants are less productive, they don't ripen to a dark red and they have really declined in vigor. They may have had currant borer, but mainly the light color and poor taste doomed them.

Our selection of 'Red Lake' is also problematic. These plants were purchased from St. Lawrence Nursery and they do not seem like the actual named plants. The plants are half the size of others and the berries are small and cling very closely to the stems. They are impossible to pick by hand and have only been saved since we learned to harvest the berries with sticks ('whacking' the plants). This would never have been selected by University of Minnesota. The fruit project manager has a 'Red Lake' plant at home from another nursery and it grows and produces much like the orchard's better varieties. The orchard's plants have been saved to produce additional fruit for winemakers that use CREC fruit but may be removed in 2018.

Black Currants: In the 2007 black currant trial, all canes older than 1 year were removed in May and burned, so there was no production in 2017. For approximately 4-5 years, the fruit project manager has noticed unusual, poor growth in the black currants. It took a few years to determine that the condition is a result of cane injury from currant borers. It was masked by severe cold injury which preceded this infestation and was thought to be lingering. In 2012, a very warm March was followed by three days of freezing weather April 9-11 when lows fell to 24, 16 and 19^{o}F, respectively. In the variety trial that year, 'Black Down,' 'Swedish Black' and 'Hilltop Baldwin' were heavily damaged.

In the years since, there have been dead branches and branches that appear to have lots of fruit and very small foliage. This has been especially apparent in 'Hilltop Baldwin,' the variety most affected by the freeze. Currant borers had been suspected but sometimes during pruning, when a branch appeared to be slow and sickly, borer damage could not be found. This was frustrating. In 2017, the fruit project manager made the decision to remove all caners older than 1 year to remove as much of the infestation as possible. The removed canes were burned within 1 week.

Photo: Graham Calow
Granitethorpe Allotments, Sapcote
06 July 2016
From the website: www.naturespot.org.uk

The currant cane borer is the larval stage of the 'clear-winged moth,' which lays its eggs in the leaf axils of established canes in late June to early July (assumed in North Dakota). The larvae bore into the center of the shoot and feed there, overwintering in the pith. The following spring, affected shoots often leaf out late, are sickly, and may die. The moths emerge as adults in early summer.

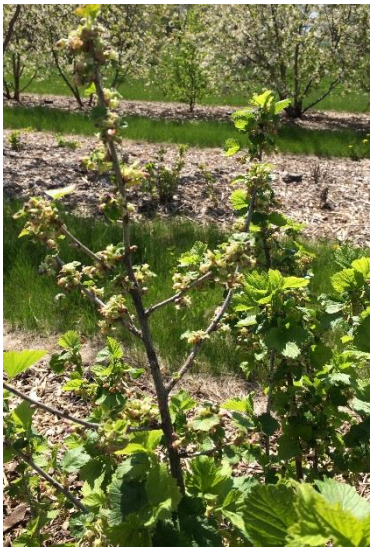
It is difficult to determine the proper time to spray and also difficult to get the insecticide in where it is needed. At about the time applications need to be applied, new lush growth is filling the center of the plants, making spray penetration difficult.

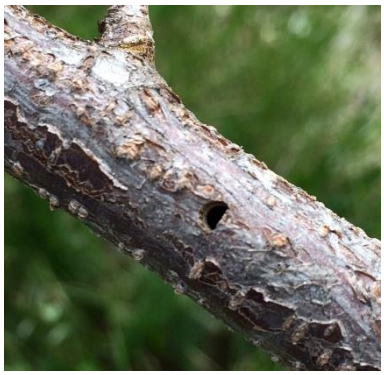
The best and most common recommendation to control currant borer in your orchard is to remove and destroy dying or sickly branches during the growing season. Follow recommended pruning practices and do not let shoots become too old. Keep plants growing vigorously.

Currant and Gooseberry Factsheet: http://www.omafra.gov.on.ca/english/crops/facts/98-095.htm#Control

Growing Currants and Gooseberries in Your Garden: Oregon State University EC 1361 / Reprinted April 1993

Photos of Currant Borer Damage from CREC Orchard:





Left: A branch with sickly growth near more lush leaves.

Center: Black pith and currant borer larva.

Right: The exit hole of an adult clear-winged moth

The severe pruning of the old black currant trial removed much of the source of currant borer in the orchard. However, the red currants and new trial also have borers. The red currants tend to grow as one plant and not with multiple shoots renewing from below ground. It is not as easy to prune them and maintain production. Diligent pruning will be carried out in 2018.

The McGinnis Black Currant trial had its first proper harvest in 2017. Harvest in 2016 was limited by the early July hailstorm that knocked off most of the fruit and invited SWD fruit flies. These varieties are later than the many the original trial. They also tend to be more tart.

Two varieties are proving to be interesting for North Dakota: **'Cheakamus'** held its fruit well and had 'good', 'pretty even' flavor from top to bottom. **'Tiben'** held its fruit well, too, and had some of the most 'perfectly ripe' fruit in firm yet tender berries. However, too many strigs (berry stems) found their way into the harvested berries.

The other varieties tend to run or ripen unevenly ('Tofino'). The earliest varieties, 'Stikine' and 'Tahsis,' need to be re-evaluated next year as they got a little overripe in 2017. These two also seem inclined to run.

The spacing demonstration is the variety 'Nechako.' Seven plants are 2 feet apart and seven are 3 feet apart. The 3-ft spacing yielded 5.1 lbs more fruit than the 2 ft spacing. We would not recommend this plant for production though; it has a 'cardboardy' flavor and the berries cling very closely to the canes making it difficult to pick, even with sticks.

Gooseberries: All the remaining eight gooseberry plants were removed from the orchard. Their fruit was not desirable to REC employees and even though these were the best of the original 13 cultivars, they still lost all of their leaves to disease by August. They were removed to make room for new haskaps.

Grapes: The 5-6 ft snowdrifts that covered the grape trellises in late 2017 did indeed create a lot of damage. Trellis wires were snapped and plants were crushed as the tightly-packed snow melted. In addition, both the east and west ends of the 8-ft orchard fence were ruined and had to be replaced by our intrepid technicians.

The grapes have been reduced from 288 plants to individual plants of the 17 cultivars with an additional 9 plants that duplicate a few of the selections. The grapes have been reduced over the last several years to reduce the amount of maintenance they require from May until late July. There was really nothing new to be learned about grapes at CREC. We found that they grow well (or too well for inexperienced growers), can always be retrained from new shoots if the original plant is damaged, gain high Brix levels but also retain too much acidity. They require a lot of labor during the harvest periods of our other fruit plants.

Haskaps and Honeyberries: The ground never froze in central North Dakota during the winter of 2017-18. A 16-inch blizzard blanketed the area following a record warm fall. Two more blizzards added to the insulation and resulted in the best wild bumble bee production in many years. *Pollination activity was much above normal* in the haskaps with bumble bees noted in them on May 9th. The honeybees arrived May 18th which is toward the end of Canadian haskap flowering and before half the Japanese haskaps were completed.

In 2017, I did not net the oldest Japanese haskaps because I knew harvest help would be at a premium this year. I also didn't net one of the early Russian varieties (*tasty but difficult to pick*) and the Kurils (Blue Moon and Blue Velvet) (*very late, hard to pick, usually too busy to bother*). It was interesting to see that the birds took every early Russian berry but only part of the crop of later Japanese berries. I suspect this may be due to two things: the very attractive Juneberries became ripe during the later Japanese harvest season and perhaps the birds switched over to insects to feed their young.

In fall 2017, the Kuril-type honeyberries were pulled out. We have not harvested them in recent years as they are uninteresting and a bit hard to pick. Production has been low as well.

We also ascertained that 'Borealis' from the 2007 planting are not the plants of that name. These plants were obtained from a nursery in Saskatchewan before plants were approved for shipping to the US (the nursery received permission to ship them to us from University of Saskatchewan). In 2011, we planted a trial of 'Borealis' and 'Tundra' from plants obtained from another Canadian source common to US plant sales. The two plantings of 'Borealis' don't match each other in fruit. The original planting has fruit that is more sweet and bland; it ripens before the new plants we also know as 'Borealis.' The older plants may actually be 'Indigo Yum.'

'Indigo Gem' is known to be at least partly self-fertile. Self-fertilized haskap fruit is smaller than pollinated fruit. This year, 'Indigo Gem's' fruit was of two sizes: large, tasty ripe berries and many small, under-ripe berries that fell as we picked. I assume that the larger fruit was pollinated and the smaller fruit wasn't. The large fruit was probably overripe as it turned to mush with any bruising or picking pressure. We had to discard most of the crop though a more careful picker may have been able to save it.

The 12 new Japanese haskaps under investigation since 2012 were selected by Dr. Thompson for her purposes in her breeding program. We are evaluating them for adaptation to North Dakota conditions. They must be cold tolerant (they are), productive (varies), the fruit needs to cling until harvest (many fall) yet pick readily, and the fruit needs to be firm enough to survive hand and mechanical picking (hand picking is often more damaging). A pleasant, not too tart flavor is not too much to ask for either.

In this second year of fruit observation:

- 5 are being rejected for being a combination of too soft, too tart or fell too easily.
- 1 has questionable softness but appealing flavor.
- 4 have both appealing and unsatisfactory parts to their character.
- 2 are considered very good: the cling is better than most, the flavor and sweetness is nice, they have medium to good production. One has especially good skin integrity through freezing (many honeyberry/haskap leak juice through the skin).

In late September, ten further Japanese haskaps were planted for evaluation. These were selected by the fruit project manager specifically for fruit cling as well as flavor. We expect fruit in 2020 and more in 2021.

Juneberries: In 2016 and 2017 the Juneberry plants were aggressively pruned. Two to three older, larger branches were cut out of each plant both years and all tall branches were headed back to encourage new growth. Production was large both of these years: 762 pounds of fruit in 2016 and 697 pounds this year. The first berries were picked July 5th and the harvest was completed July 14th with no SWD detected.

Plums: The plums bloomed from May 8-15th. Several trees of 'Waneta' and 'Pipestone' had decent crops and 'Toka' had almost no fruit, as usual. 'Pembina' had a light crop which is usual for it, too. A person in Sheyenne, ND, related to me that each year his trees also lose almost all their fruit to curculios and leave almost none to harvest. There must be a lot of plums in area shelterbelts harboring all these weevils.

Elderberries: The Johns and York cultivar's flowers were harvested in mid-July at the height of bloom. This yielded two pounds of dried blossoms. Umbels with fruit began to ripen in September, but were several weeks behind the Podall selection. Some fruit was harvested by the birds and the rest was cut off to slow the spread of unwanted plants by seed. They will be removed in 2018 to make room for more haskaps and reduce our workload.