2020 Northern Hardy Fruit Evaluation Project Update
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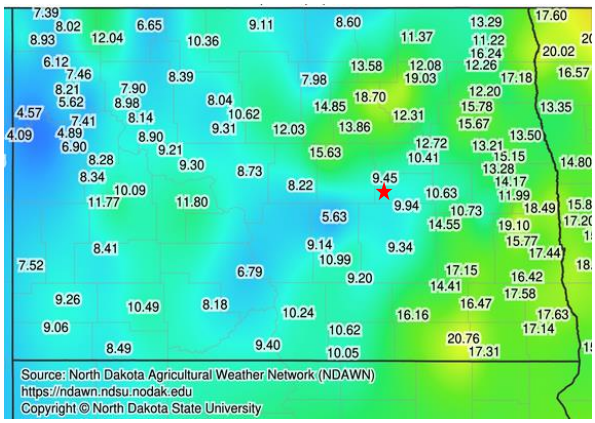
In 2020, the Northern-Hardy Fruit Evaluation Project provided distance learning for approximately 950 people through videos and video conference programs. We served over 100 people and educators in-state as well as from Iowa, Michigan, Minnesota, Montana and Tennessee through calls and email. We have reached over 14,000 people in our 15 years of fruit research at the Carrington Research Extension Center orchard.

Cooperators: Our 2020 cooperator was Dakota Sun Gardens Winery, Carrington, ND. We donate apples to the Carrington Daily Bread food pantry.

Weather: The fall of 2019 was extremely wet across the state and Carrington shared in that wealth, including a blizzard October 10-12 that delivered 27 inches of snow which melted in the following weeks. November 11th, the temperature plunged and for three days, lows were 0 to -4.5°F. Red currant and some apple production were affected.

Winter high temperatures were about normal, but low temperatures were 2.4 degrees warmer than the 20-year average. Typical snowfall began in November and was enough to blanket the orchard plants with a winter total of 42.3 inches after the October blizzard. Spring high temperatures were over 5°F cooler than average, leading to later blossoming and delayed development of most orchard fruit for a second year in a row. Rainfall was extremely short this year. Irrigation efforts began in June and continued through October. At 9.45", the April through October rainfall left us 7.6" below average and in "severe drought" conditions. There was a freeze across most of the state September 8 and 9. The only plants that appeared injured at CREC were the grapes.



Rainfall 4/1-10/31/2020

SWD: Spring temperatures were cooler but June was almost 5°F warmer than average. The first SWD were found in fallen haskap fruit on June 25th. Spraying commenced four days later with a new Jacto A200 airblast sprayer. Pesticides were applied on a 6- to 7-day schedule in the evening utilizing NuFilm at 0.125% of total volume and KeyPlex Ecotrol® PLUS at 2 pints/acre. Pesticides in the rotation included malathion, Mustang Maxx, Excirel and Entrust. All crops were sprayed preharvest and at least once post-harvest until no fresh fruit is left within or under the crop. The climate in North Dakota is so dry that fallen fruit is generally desiccated within several days.

This year, haskaps and Juneberries were mostly protected from SWD. However, the fruit flies still built up to levels that cherries and currants sustained damage. Evans cherries were a

complete loss and currants lost 30-50% of their fruit. Black currants do not seem to support the development of larvae but ovipositioning opens the fruit to pathogens that spoil the berries prior to harvest. The late black currants were fairly unaffected and Aronia was not affected.

Field Day: Due to the ongoing coronavirus pandemic, our Field Day was conducted through video presentations. The Fruit Project had three videos: an orchard overview and then one each featuring haskaps and aronia. Over 100 people viewed the videos.

Apples: The temperatures were moderate but the bloom period for the apples seemed short this year. 'Zestar!' blossoms began opening May 22nd and all the varieties were finished by June 1. 'Zestar!' was probably affected by the sudden cold weather last November and therefore produced only a handful of fruit on the four trees. It is typically a reliable bearer at CREC and is pleasant in that it self-regulates the number of apples set, i.e. it doesn't overbear or need the fruit thinned. 'Sweet 16' also set hardly any fruit. The three remaining 'Hazen' trees had a typically large crop that was ready September 13th, about one week later than normal. The fruit was extra-crisp this year though some of the apples still split. The six 'Honeycrisp' trees produced over 400 pounds of medium-sized fruit that was not ready to harvest until October 12. The fruit was more numerous and smaller due to poor fruit thinning in June. 'Haralred' had a small harvest this year, with the two younger trees producing most of the crop.

Harvest: 'Zestar!'(4) – 24lbs, 'Hazen'(3)– 200lbs, 'Honeycrisp'(6) – 419lbs, 'Sweet 16'(4) – 15lbs 'Haralred'(4) – 84lbs

Aronia: The Aronia crop looked promising after bloom but was incrementally decreased by the drought through the rest of the summer; the green berries kept falling off. This was the only crop in which the current year's fruit was affected. The season began with very good soil moisture. Additional moisture of note: June 25: 27 gallons per plant, June 30: 0.73" rain, July 8: 0.61" rain, July 17: 2.2" rain, July 23: 27 gallons per plant, July 24: 1.2" rain, and Aug 17: 37 gallons per plant. (Note: 1 inch of rain over the area of 1 aronia plant equals 21 gallons of water.) Harvest was started September 10 and by this time, there was very little crop left and small-sized berries. Typical weight per berry is 0.98 grams, while this year, weights averaged only 0.72 grams per berry. No SWD fruit flies were seen in Aronia this year.

Canadian Sour Cherries: 'Juliet' cherry proved to be an earlier crop than any other cherry we have grown. It was ready, or very close to ready, when we picked it on July 14th while 'Romeo' was not ready until July 21. 'Evans/Bali' tree cherries were ready one week after 'Romeo' and were ruined again. SWD fruit flies were seen on 'Juliet' but the fruit was not ruined, so we picked it and it was good. Optimal harvest conditions are when the fruit is very dark red but we could not wait that long. 'Romeo' had a small crop of cherries and while we were waiting for the three plants to ripen, the birds ate most of them. 'Romeo' fruit is firm like 'Crimson Passion' while 'Juliet' fruit is more tender like 'Evans' or 'Montmorency' but still red throughout. 'Juliet' plants have dozens and dozens of suckers. 'Romeo' has hardly any.

Black Currants: It does not seem as if you can completely eliminate currant stem borer, you can only manage it. The past two years, we made a strong effort to eliminate currant borer. The shrubs were dormant pruned and then in early May, we remove all weak-looking branches again and burned the whole pile to kill the larvae. It doesn't seem to make a difference in the number of poor branches we see the following year. These branches all produce berries – on fact, I think they look like "all berry, no leaf," as the leaves are smaller and fewer in number.

We had to remove branches in July that intruded into the row-middles so that our tractor and sprayer could pass. This lowered production. Despite the use of this new air-blast sprayer, SWD still affected the currant berries so that 30-50 percent of the crop fell or was shriveled and fell or was shaken off prior to final harvest. It seems like the insects lay their eggs in the berries but the larvae are generally unable to develop. When soft berries are soaked in water, very few larvae come out. Very few larvae are found when berries are broken open, either. As we continue to spray and the season gets hotter and drier, the last berries to ripen are almost not affected. In the McGinnis variety trial, the variety 'Tofino' was removed in 2019. It suffered winter injury in 2018-19 and ripen so unevenly; while ripe fruit was falling, green fruit was still present. This season, rows 1 and 2 of the full trial were removed. The market for black currants has never developed and they stayed in our freezers. The pandemic also tipped the decision so that we could work with fewer students. The McGinnis varieties are much higher in acids than the varieties in our first trial. They are, however, much more productive and upright. Our favorite varieties are 'Cheakamus' and 'Tahsis' because they ripen the most evenly. 'Tiben' has nice flavor but retains too many stems for something like jam production.

Grapes: The trellis that holds 'Brianna' fell when the south end post broke in a windstorm this year. It was probably weakened by the blizzard in October 2019. We did not put it back up and will probably just remove it. In general, grapes did quite well with good crops of fruit. There was no winter injury. The growing season was a little late this year and we had freezing temperatures (29 and 27°F) September 8th and 9th that injured the leaves on all the plants, some worse than others. Our earliest varieties, 'Valiant' and 'Somerset Seedless', stayed tart and the latter did not develop its full flavor or color before the final freeze in October. It's probable that most grapes in the state did not ripen to their potential.

Haskaps and Honeyberries: Due to coronavirus precautions, birds were allowed to take all the early Russian and Canadian haskaps. We did not net the older Japanese haskaps either. The birds give up on these later haskaps but they still make a mess out of them as they flit in and out of the shrubs, knocking fruit to the ground. This is a ready source of SWD fruit flies as the insects utilize the fallen fruit. Crushing the berries into the woodchips hopefully helps as the air is so dry here that the pulp desiccates in one to two days.

In 2020, we concentrated our efforts on managing the new plants. Twenty-one new plants had fruit and all were evaluated for berry cling, quantity, size, shape and taste as well as plant shape and sturdiness. No judgements will be made until they have produced fruit for a second year. In 2021, seven new plants will begin fruiting followed by 17 plants in 2022.

We have found that the best way to start a haskap plant, or really any shrub, correctly, is to let the plant grow for one full season and then cut the plant back to several inches tall. This directs the root energy into what remains and forces new buds to break. We typically get nice, sturdy, vertical shoots this way. Haskaps structure has 'opposite'-type branching which tends to be more brittle than wood that has 'alternate'-type branching. In June of the year that a plant is cut back, it is helpful to tie the new shoot mass with a piece of encircling twine to support the shoots until the brittle green wood turns brown. This prevents most wind damage.

Our overall goal is to find several selections of Japanese haskap that will hold the fruit in windy conditions as well as have good production and flavor. And early harvest will keep the fruit ahead of SWD fruit flies in North Dakota.

Of note regarding new Japanese haskaps is that the fruit project manager went to Oregon this spring to continue to collect berry and plant information in Dr. Thompson's breeding orchard. Travel was restricted and flying seemed too risky. Instead she and her husband drove and

stayed in their camper. This gave us one more year of data on young plants as they began to bear more fruit. We selected about 25 plants for further study at CREC. Some were propagated from green cuttings in 2020 while others will be propagated from dormant cuttings in 2021.

Juneberries: Juneberry pruning continued for a fourth year. The plants have gotten very tall, especially so during 2019 when it rained so much.

The berry crop was ready for harvesting to begin on July 6th and it continued until we finished

'Smoky' berries on July 23. The crop was huge this year despite all the big branches removed by pruning; there was easily 6-700 pounds of fruit from 100 plants. The weather seemed especially windy this season with many large thunder storms passing near CREC just before the Juneberries were ripe. Drought, or perhaps rubbing from the wind, damaged the wax coating on the berries and they began to shrivel quite quickly. SWD fruit flies were detected in the orchard June 26th but they did not become a problem in the Juneberry crop until later when we were harvesting the last berries for discard.

The Juneberry crop is the only one we have that requires regular application of insecticides and fungicide for native pests (not including SWD). In 2020, we tried JMS Stylet oil as an organic control measure against fungi. You cannot use a spreader-sticker with it and it went on kind of 'hard', i.e. it was a pain to get coverage with my hand sprayer and you really had to pump up the pressure. This product is recommended in the Cornell Pest Management Guidelines and it says to use at least 200 PSI pressure to ensure proper coverage. We probably won't use it again unless we can use the tractor-mounted sprayer. We use azadirachtin and spinosad or pyrethrin against flower thrips and usually spray fungicides (Switch and Tilt) two to three times. The last two years we have also had to control lace bugs which feed on the leaves (first seen in Aronia). For SWD, we use malathion, Entrust, Mustang Maxx, and Exirel which kills the lace bugs as well.

We did not net the Juneberries for a second year since there was little bird pressure and the plants have grown so tall. We did not notice Cooper's hawks nesting near the orchard this year but late in the summer, several hawks were in the shelterbelt. We also used the Bird-x scare device, which helps.

Pears: Our ten remaining pear trees continue to do well though there is a healing frost crack in the west 'Stacey' tree. After bloom, I sprayed diluted white latex paint on the south and west sides of all the pear and apple trunks and large limbs to reduce heating in late winter.

All the varieties had some pears this year. At the extremes, both 'Schroeder Hardy ND' trees had hundreds of fruits while one 'Patten' tree had one fruit. Except for 'SHND', none of the east trees had fruits which is an odd occurrence. I removed about 10 gallons of small pears from the two 'SHND' trees the first week of August and probably another 5-7 gallons from the ground September 1. The stem connections of these pears are quite brittle and so we removed the fruits that most challenged the pull of gravity. On September 2nd, a strong, blustery storm passed near CREC and almost all the pears fell to the ground. None of the fruit was ready for picking except 'Stacey', and those fruits overripened while the fruit project manager was on vacation at the end of August. 'Patten' lost its single fruit. 'Nova' had tasty fruit with very few tannins (tasted while light green, after it fell from the tree).

Pear ripening appears to be an art. Or a science. Even tree-fruit breeders aren't sure. Mr. Art Schroeder assured me that 'Schroeder Hardy ND' has been ripened and used for canning by a friend. We have not been able to ripen it here and it spoils from the inside out. Most sources say to pick pears when the fruit lenticels turn from green to brown, and the overall fruit color turns from dark green to light green. After refrigeration at about 37°F for various lengths of time, we then tried to ripen the fruit at room temperature (68-70°F) and cool temperature (50°F) with no success. After talking to Dr. David Bedford, University of Minnesota, we will buy a handheld penetrometer to better gauge the optimum picking time.

PEARS	**Trunk Caliper (mm)**				**2020**	**2020**	
	2015 *apx*	**2018**	**2019**	**2020**	**Crop west/east**	**Ready to pick**	**Notes**
Ayers	13-19	48	x	x	x	x	Not hardy enough. *Removed*
Ely	13-19	40	50	59	yes/no	~9/21	Nice moderate growth. Very small, late fruit.
Nova	13-19	63	72	96	yes/no	~9/5	Tall, lanky growth.
Patten	13-19	50	60	72	yes/no	~9/10	Big, lanky growth
Schroeder Hardy ND	13-19	46	62	68	yes/yes	~9/6	Big. The first to fruit. Overcrops. How to ripen??
Stacey	13-19	72	80	102	yes/no	~8/24	Very pyramidal and tall

A windstorm knocked the pears off the trees Sept 2, 2020, except some remained on SHND and all remained on Ely where the fruits were very small and were 3 weeks from ripe. Date of ready-to-pick fruit is an estimate.

Hazelnuts: Unfortunately, we still did not beat the squirrels to the hazelnuts. This year, we noticed squirrels taking them Friday, July 24, which is 2-3 weeks earlier than last year. By Monday, the nuts were gone. Until 2019, the squirrel feast never began until after September 1st. Now that it begins earlier, it is during the hot, uncomfortable days of currant harvest when our attention is diverted.

The same Riverbend hazelnut plant as last year had a bumper crop: 2J-141, the third plant from the left. This plant also has a very pleasant red color in fall.

With close inspection, three older Canadian hazelnut plants were found to have Eastern Filbert Blight. These were cut to the ground. In the Riverbend hazelnuts, one branch in plant 2T-111 had stromata and it was pruned out.

Riverbend Hazelnuts, above, September 22, 2020.

Left: July 5, 2020

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Carrington REC, 2020