2018 Northern-Hardy Fruit Evaluation Project Update
Kathy Wiederholt – Fruit Project Manager

In 2018, the Northern Hardy Fruit Evaluation Project brought information to 1,335 people through tours, meetings, video conference programs, emails and personal phone calls. Since the project started in 2006, 12,077 constituents have interacted with the fruit project. Five new contacts requested information about starting orchards in the state. In addition to constituents in North Dakota, calls came from Minnesota, Illinois, Pennsylvania, Rhode Island, New Jersey and Canada. Twenty-seven NDSU Extension colleagues requested help or information.

Cooperators: Our 2018 cooperators were Karen's Kuchens in Larimore, ND, Tongue River Vineyard in Miles City, MT and Dakota Sun Gardens Winery, Carrington, ND.

Weather: Fall 2017 was dry with no rain falling after September 26th, although temperatures still averaged 60°F. Winter and spring 2018 were slightly below average for temperature, driven by three 7- to 12-day cold periods from late December through mid-February. Snowfall was low with only 20" by the end of January and a further 29.3" through April; our greatest one-time snowfall was only 5.5" in March. The first week of April had single-digit low temperatures but then warmed up enough for apple tree pruning to begin April 10th. Cool weather persisted for one more month. Summer temperatures were slightly warmer than average while the season's rainfall was 6.71" below average. Most of our summer rain fell between June 1st and July 3rd, which was good for early-ripening crops like haskaps and juneberries. From July 5th until October 31st, we received only 2.8" of rain, leading to late-summer irrigation of crops like apple, aronia, juneberry, currant and haskap. Many areas of North Dakota received plentiful rain this season but the storms usually skirted Carrington.

Field Day: Field day 2018 featured Dave VanderWerf, an aronia grower from Sioux Center, Iowa, as the featured speaker at the 2018 Field Day fruit tour. In the afternoon, he lectured on aronia sales and marketing. The morning orchard tour attracted 65 people while approximately 60 people attended the afternoon session, about half of whom were new participants. Mr. VanderWerf's appearance was supported by a North Central SARE grant.

Irrigation project: 2018 was the fourth year of irrigating Juneberries. For a second year, the irrigated row produced more fruit than the row that is not irrigated. Rows 1 and 2 are irrigated while rows 3 and 4 are not. We usually pick all four rows, however our help was limited this year and we focused on just half the crop. The original currant trial has been removed, however we irrigate half the new black currants.

Juneberry production in row 2 irrigated vs row 3 dryland

2018	45.8	
2017	4.3	
2016	-26.2	
2015	17.8	Irrigated
2014	-7.9	All
2013	56.1	dryland
	↑pounds	difference

Mason Bees in the Orchard: In 2017, we experimentally confined mason bees with a selection of Canadian haskaps to force the bees to pollinate the crop. These bees are important pollinators of *Rosacea* fruit crops in areas where clay soil is readily available. They are not native to our area of the Plains and don't really care for haskap flowers but will utilize them if they have nothing else. In last year's experiment, the plants with confined bees produced less fruit than the freely-pollinated plants.

2017 Tundra: natural pollination – 6922g. Mason bee pollination – 3581g (48.3% less).
2017 Borealis: natural pollination – 5516g. Mason bee pollination – 4128g (25.2% less).

Based on the 2017 results, we applied for and received a USDA Specialty Crop Block Grant. In the 2018 trial, the bees we purchased were very small and we could not place them outside until May 9th due to cool weather and very few flowers. (Recommended date is by May 1st.) After pollination, bird netting was deployed June 11th but the waxwings had already started eating the berries. Yields were really small in each of the 4-plant groups.
2018 Tundra: natural pollination – 721g. Mason bee pollination – 57g (92.1% less).
2018 Borealis: natural pollination – 537g. Mason bee pollination – 96g (82.1% less).

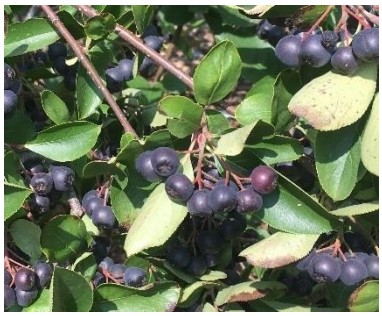
In 2017, the confined mason bees were much more successful at pollinating the haskaps considering that it was an extraordinary year for wild bumblebees– the best pollinators for haskap. The mason bee-produced fruit was not that far behind the production of the naturally-pollinated plants. 2018 was really a failure due to bird depredation and poor mason bee health.

Apples: Blossoming occurred approximately May 15 ('Zestar') until the 25th when all cultivars were considered 'done'. 'Sweet 16' and 'Honeycrisp' bloom about 3-5 days after 'Zestar' starts but they are all complete about the same time. During the bloom period, only one day was cool and rainy; the others were good for bee flights. Blossom set was quite heavy. Students thinned the crops the second week of June but we were not able to re-thin until early August. This, and the drought, may affect the crop in 2019. The apple trees were watered in mid-August, giving later varieties 25 gallons and early varieties only 10 gallons to try to not split the fruit. On September 20, we received 0.70" rain and also re-watered every tree with about 15-20 gallons of water.

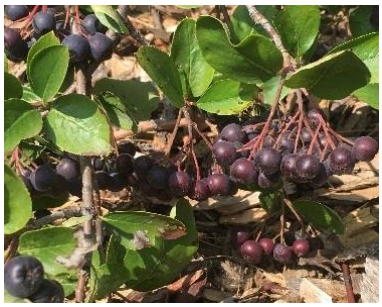
Harvest: 'Zestar' – 146lbs, 'Hazen' – 262lbs, 'Honeycrisp' – 430lbs, 'Sweet 16' – 119lbs
'Haralred' – undetermined

'Hazen', 'Honeycrisp', 'Sweet 16' and 'Haralred' all had some watercore – a condition where sugars accumulate and cause a clear, wet-looking area inside the apple. 'Haralred' was especially bad, with the three trees in the sunniest locations affected the worst. When affected by watercore, you could see a discoloration on the red skin. The partly-shaded tree next to the pines had better fruit.

Aronia: In 2017, the aronia crop failed. As feared, the 2018 crop was huge! We ran out of time to prune in spring and the plants seemed to set every flower bud they could. When the size of the crop started to emerge in July, we wondered whether the plants could ripen all the fruit they held; they couldn't.


'Nero', upper fruit 8-20

With the drought, our concern was whether there was enough moisture for the crop. On July 5th, the orchard received 2.5 inches of rain. On August 2nd, the soil in the upper 6 inches under the mulch was still moist enough to form shapes, but not ribbons. Irrigation that day delivered 29 gallons per plant or, 2.4 gallons per emitter. We irrigated again August 24th (125 gallons, 5 gal/plant) and after harvest on September 20th with 400 gallons (16 gal/plant) and 0.7" of rain.


'Nero', lower fruit 8-20

Even with extra water, the plants probably did not have enough resources to ripen the large crop. The four older varieties and, to an extent, 'McKenzie', displayed several classes of berries: large, dark-colored fruit; medium and small dark-colored fruit; and medium and small red-colored fruit. It is only during years with the mildest growing conditions (not too hot, not too dry) that we don't see the undeveloped, red, berries. The more stresses, the more 'bad' berries. At CREC, in general, we see more red, undeveloped berries on the sunny sides of the plants and on the branches that arch downward toward the ground.

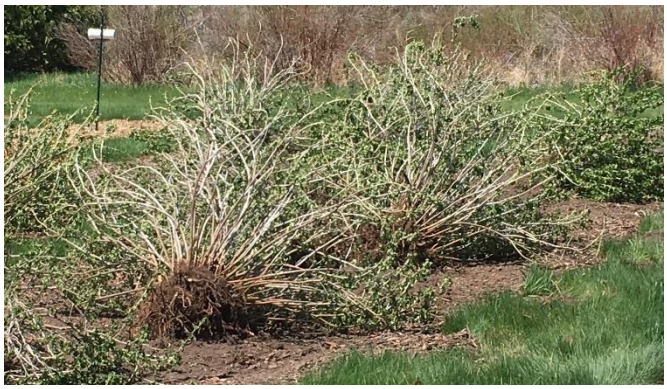
In preparing for Field Day, we requested frozen berries from grower Claudette Carlson, Portland, ND. In response to a comment on how large and perfect her berries were, she told us that she screened the fruit so that she only sold the largest, juiciest fruit. We took this to heart and paid attention to the berry quality during harvest this year. The largest berries are the best. The smaller the black fruit is, the more astringent it is, though it is still sweet. We built a screen for sorting the fruit by size.

2018 production was an all-time high of 455.4 pounds. The previous high production was in 2016 when there was 275.4 pounds. The prior 4-year average, 10-berry weight was 9.6 grams whereas the 2018 10-berry weight was down to 6.6 grams; these were very small berries. After sorting, the largest berries weighed just 132 pounds; the remaining 323 pounds were discarded.

Canadian Sour Cherries: As we have for the last two years, we again pruned the cherries after fruit set to open the canopy to light and wind. Again, we saw a good set on 'Carmine Jewel' and almost no crop on 'Crimson Passion'. Sprays for SWD were ineffective for us and the crop was lost. The crop was extremely early, ripening around July 10th, when we were still harvesting

juneberries. We let it go and did not try to salvage any fruit. The plants will be cut down and sprayed with herbicide to fully remove them. They blossom beautifully and are visited by bees, flies and migrating warblers. But their fruit just increases the population of SWD and makes trouble for other crops like juneberries and currants. We still have young 'Romeo' and 'Juliet' cherry shrubs that we will evaluate for several years though they will also harbor SWD.

Red and White Currants: The variety 'Red Lake' was removed in 2018 to reduce the red currants down to the best varieties. To continue to reduce currant borers, the remaining plants were pruned heavily, so production was quite low. The variety 'Hron', acquired from McGinnis Berry Crops, BC, Canada, has been very unproductive. These were planted in 2012 and have had very little fruit. It is quite sour and ripens very late, leaving it susceptible to SWD. It will be removed in 2019, leaving 'Rovada', 'Rosetta', 'Jhonkeer Van Tets' and the 'unknown' variety we received in place of a white selection.



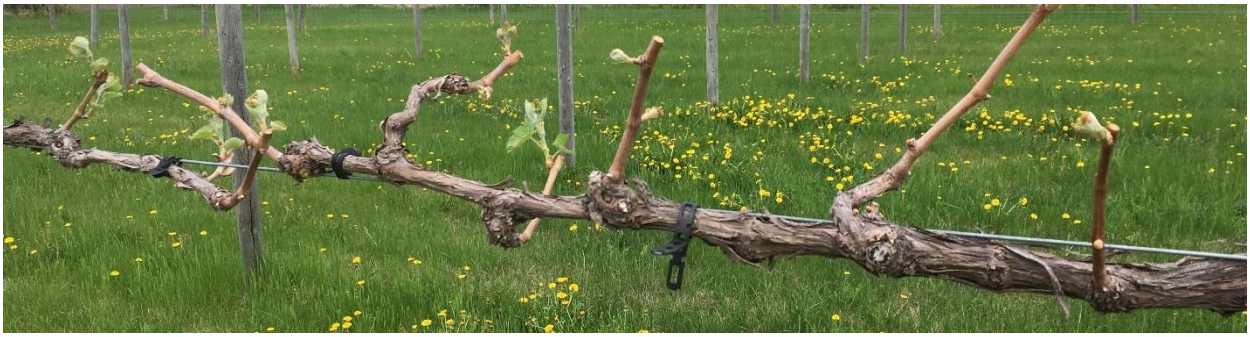
Black Currants: The original black currant trial was installed in 2007 and removed in spring 2018. We have a 'new' trial, installed in 2012, and we just do not have the ability to harvest and store both. In 2017, we made an effort to really get after currant borers and pruned out all the canes older than 1 year. The plants regrew nicely and looked better than they had in years. We kept 4 plants each, from one row, of 'Titania', 'Whistler' and 'Blackdown'. The remaining three rows will be replanted to Japanese haskaps. The original demonstration black currants had a small amount of fruit this year due to recovery and regrowth from the prior pruning for borers. It was harder to pick the fruit this year because of all the new, lush leaves.

Five of the six 2012 McGinnis trial varieties yielded 3.5-5.5 pounds per plant. The exception was 'Tofino,' which had some winter damage, with dead canes. 'Tofino' is not a good variety for production but may be suitable for u-pick plantings; it has a long ripening period and always seems to have black, red and green berries at any given time. It had the most drinkable juice this year but the plants will be removed. For two years, 'Cheakamus' has been a favorite. It ripens evenly on the plant with very little running (berry fall). It has a mild black currant flavor and is not too acidic even though the sugars are never among the highest. 'Tiben' also ripens pretty evenly with little running, but the harvested berries end up with more strig pieces than other varieties.

'Nechako' was an extra variety that did not fit into the trial space. It was planted in 2- and 3-foot spacing but it's not really indicative of how other plants might do. It's a smaller plant and the berries grow thickly around the stems making it difficult to harvest with whacking sticks. For the past two years, the flavor has been terrible – like cardboard. But this year, the flavor was much better and only slightly cardboard-y. It may have been riper – the acidity was lower and °Brix higher, though pH was similar.

Variety	Number of plants	Harvest Date	Wt per plant (lbs)	Wt/plant 2 yr ave	°Brix	pH	Titratable Acidity (%)	Note
Blackcomb	15	8/7	4.06	4.27	17.8	2.66	5.01	Well ripened, still tart
Cheakamus	15	7/31	5.32	5.32	15.9	2.71	4.19	Mild taste. **Evenly ripe!**
Stikine	15	7/18-24	3.48	5.59	15.2	2.69	3.78	Berries run early
Tahsis	15	7/26	5.57	5.37	15.0	2.76	3.34	Mild. Lower fruit ran. Uneven size
Tiben	15	8/6	5.48	5.67	17.2	2.69	4.49	Nice taste, too many stems
Tofino	14	8/8	1.02	2.15	18.0	2.87	2.99	Terrible. Tricolor, ran, bland
Nechako -2 ft space	7	8/9	1.81	2.44	19.2	2.91	3.17	*Better taste '18 - just sl cardboardy,*
Nechako -3 ft space	7	8/9	2.66	3.23	19.0	2.91	3.19	*tight stem cling: more handpicking*

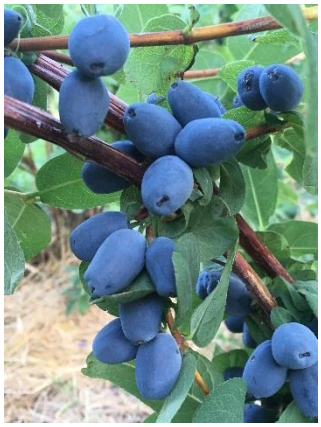
Grapes: Our vineyard has been reduced to 100 plants, which is manageable. There was no winter damage last year and pruning was enjoyable in the spring. Despite the cool spring and average summer, the drought moved the berries along in ripening. 'Somerset Seedless' grapes were 'almost ready' on August 22nd and picked on the 29th. Other purple grapes ripened before the flocks of flickers and robins arrived and were used by staff and community members for juice and jelly.



Haskaps and Honeyberries: The 2017-18 winter was average with about a foot of snow throughout the orchard. There was no winter damage to any of these plants. With fewer summer students anticipated, the Russian honeyberries were not netted. The fruit project manager was in Oregon visiting Dr. Thompson's orchard the first week of June and the other haskaps did not get netted until June 11. The birds started eating the Canadian berries before this, especially the planting-depth trial (which has been converted to the mason bee trial). However, after we netted, the birds moved on and did not depredate any later Japanese berries that were not covered.

The search for new Japanese selections with fruit that withstands North Dakota breezes continues. Cuttings selected in 2016 and propagated in 2017 had good take. But the cuttings selected in 2017 and propagated in 2018 did not fare as well due to the small diameter of the material – it was too weak to form roots and grow. Of the 13 selections we propagated, only six made it to the field. The 2018-19 cutting request included seven selections from '17-18 (not all are available now) and 11 selections from the 2018 orchard visit. Propagation will begin in 2019 when the temperatures in our unheated shed get in the mid-30s and low 40s.

We added some other Canadian cultivars to our trials: 'Boreal Beauty', 'Boreal Beast', 'Boreal Blizzard' and 'Aurora'. The 'Boreal' series have some Japanese heritage and should be more upright with large fruit. An older 'Aurora' plant here had some really large, long berries this year that were very, very tasty.


'Kawai' berries in Ore.

The trip to Oregon in spring 2018 included a visit to a haskap grower. Growth in the Willamette valley climate is much greater than in North Dakota. The 5-year old plants were shoulder height with great berry production. This encouraged me to irrigate our berries more and to prune them more severely in 2019 to encourage new growth (blooming is on the previous year's wood).

Juneberries: The juneberry plants were pruned again to remove older wood and reduce the height. Within the plants you can see some 3- or 4-year-old sprouts that are straight, 8-ft-tall branches with blooming only at the very tops. That's an unproductive use of space. So these past few years, we have been cutting new, vertical shoots back by half the new wood to encourage lateral branching.

The crew of summer students available to the fruit project this year was quite inexperienced. In anticipation of this, we did not net the two outer rows of the trial. This cut down on work and allowed us to continue to evaluate the effects of irrigation on half the plot. It was a good plan as it took us from July 5-12 to harvest the two rows. We were really pushed on quality by the hot weather and 2.5 inches of rain on July 3rd which knocked semi-ripe fruit to the ground. At the beginning of harvest, the early fruit was only 60% ripe, but by the 10th, the fruit was starting to shrivel and SWD had moved in. 'Smoky' was a loss for us as it did not finish ripening and shriveled at the same time. We picked it to weigh it and then discarded it.

In not netting half the juneberry crop, we expected the birds to harvest the fruit for us. This was not the case as the dry weather seemed to have encouraged the birds to move elsewhere before the fruit was ripe. The 'free' berries, however, did not stop birds from getting inside the

netted crop! To prevent SWD overload summer students and their parents (and grandparents) as well as fruit project friends were invited to harvest the fruit.

Plums: As in years past, good weather during pollination did not produce a large crop. The plums that developed were infested by curculios and most of the crop dropped. For the first time, we did not pick up the dropped plums. Our past efforts to lesson curculio damage never seemed to make a difference! There must be a lot of plums in area shelterbelts that support these weevils.

Elderberries: The two remaining plants of 'Johns' and 'York' were removed by mowing and herbicide. A bit of fruit had ripened in our last few 'long' falls. Then the birds spread the seeds to make weeds in the juneberries! The single unnamed plant from David Podall is still growing and ripening much earlier but we cut the fruit off of it to prevent seed spread.

Hazelnuts: We have two plantings of hazelnuts, six plants each. The first is from University of Saskatchewan-Saskatoon, 2007 and the second is from Riverbend Hazelnuts, 2014, Horace, ND.

The plants from Riverbend Hazelnuts don't have nuts yet. Dan Johnson has been breeding them since about 1998 and has some superior selections. Ours should fruit next year.

For several years, two Canadian plants have had winter-damaged branches: slow to leaf with small leaves or dead branches. After this past winter, the largest plant had some dead branches and two others had slight injury. None of the six plants produce nuts very consistently. We notice that many of the catkins are killed in the early spring weather. Plants #2, #3 and #6 seem pretty hardy though – #2 is a very small plant and the other two are more typically sized. The cold weather in early 2019 will be an additional test.

In Oregon, hazelnuts are bred to slip their interior skin after blanching. All of our nuts keep their skins. Plants #4 and #6 had smooth, light tan skins while the others had coarser skin pieces attached to the inner skins.

Canadian Hazelnuts - *Corylus avellana or Corylus americana*								Planted 2007			
		Growth cm	Vigor	Crown Width cm	Cold Damage	Shell thickness (mm)	# of good nuts	# Empty nuts	Wt of 10 whole nuts (gram, ave)	Ratio g nuts/ g shell	Plant Notes 10/2/2018
N	**One**	336	5	315	2	1.5-2.0	56	8	22.1	0.67	Biggest plant. Some winter killed branches- 1st time
	Two	210	1	156	0.5-1	1.6-1.8	56	3	15.3	0.59	Small. Getting overshadowed. A little winter damage?
	Three	300	5	261	0.5-1	1.7-2.0	491 est	42	20.4	0.54	Full plant. A little winter damage?
	Four	294	4	230	2	1.0-1.1	41	12	12.0	0.88	Can see dead branches from last 3 winters
	Five	220	3	206	2	- -	- -	- -	- -	- -	Can see dead branches from last 3 winters
S	**Six**	270	5	250	0	1.0-1.5	917 est	41	12.7	0.75	Full plant. No winter damage
	These are FI hybrids of (wild hardy American Hazelnuts X cultivated European Hazelnuts) x tame Oregon pollen.										
	We expect 1/4 to be very hardy, ½ to be reasonably hardy with occasional partial dieback and 1/4 to die as soon as they grow above the snowline.										
	We also expect 1/4 to have large nuts, ½ to be average size and 1/4 to be puny.										