Fruit Tree Shelter Project 2016/2017
Final Report
Proponent: Kim Melton
With support of Growing Forward 2 and the Yukon Agriculture Research Committee

Overview

The research goal of this project was to establish the transferability of a specific fruit tree shelter design from the Klondike Valley to the southern Yukon, specifically to learn about adjustments that might need to be made to account for variation in climate and ecology. Secondary goals were to expand the fruit production capacity of individual growers and provide accessible models of this growing method within the Whitehorse region. Three shelters were constructed by the proponent on three volunteer host sites and planted with two or more apple trees. Hosts were instructed on care during site visits throughout the season of 2016 and into the summer of 2017. Trees were assessed for overall health and growth following the winter of 2016. Although no temperature data was obtained, the lack of winter damage to any of the trees is a solid indication of the functionality of the shelters. As anticipated, spring management was important: lack of monitoring and ventilation led to early emergence from dormancy in one case and winter covering with a white tarp prevented this in another.

Timeline

2016/06	Project approval by the Research Committee
2016/07	Shelter construction, soil testing, tree planting
2016/08-10	Site visits and consultation with hosts, installation of TidBit dataloggers
2016/12	Interim report submitted to GF2
2017/06	Site visits, tree assessment, datalogger retrieval
2017/07-09	Phone and email consultation with hosts

Site Descriptions

Sites were selected from volunteers who had experience in growing perennials and were willing to contribute resources to the project.

Figure 1: Approximate site locations. 1 – McClintock, 2 – Annie Lake Road, 3 – Burma Road

Site 1 – McClintock Valley, Host Cain Vangel (The Farm Gate)

The McClintock Valley site is situated about 40km southeast of Whitehorse, a kilometre off of the Alaska Highway, and the shelter is on the southeastern edge of a cleared rolling field set in spruce forest about a kilometre upslope from the McClintock River. The shelter is 24' long and oriented longways north-south, with the southern end approximately 20m from the edge of the spruce trees. Immediately to the east are a couple cultivated rows of annual crops and a row of young haskap bushes before getting back into spruce forest. The shelter is built upon ground that had previously seen pigs and at the point of construction showed very lush growth of predominantly lamb's quarters. The soil test results showed high organic matter and phosphorous and a need for nitrogen and potassium. TidBit no. #9902732.

Figure 2 – McClintock Valley site, shelter under construction, and completed

Site 2 – Annie Lake Road, Host Agnes Seitz (Needle Mountain Food Forest)

The site is located at the northern base of Needle Mountain at km 9 Annie Lake Road, roughly 40km from Whitehorse. A small parcel of land has been cleared out of the spruce forest over the last five years, and existing infrastructure includes a small greenhouse, raised garden beds, hugelkultur beds and a perennial food forest in development. The soil test showed necessary nutrients in good quantity with a high amount of organic matter. Due to the limited space of worked land we decided to construct a one-cell (12') shelter suitable for two trees with the understanding that the hosts may extend it in future years following more land development. The shelter was situated lengthwise on a terraced bench in a slope with raised garden beds above and below. The topography was deemed more relevant than north-south aspect. Proximity to the mountain gives this location extensive winter shading, so no additional winter preparations were made after closing up the shelter in the fall. TidBit no. #10285124.

Site 3 – Burma Rd, Host Bernard Briggs (Poplar Flats)

The site is located about 30km north of Whitehorse on the North Klondike Highway on Burma Rd, a few kilometres west of the Yukon River. The surrounding area is highly developed agricultural land (hay and grazing predominantly) with scattered aspen stands amongst open fields. The soil testing for the shelter location came back as very poor with high sulfates, explained by the host by the history of landscaping and earth movement at the site. TidBit no. #9902734.

Trees & Planting

At all three sites, an Autumn Delight (aka 4-10-43) and PF12 on Siberian Crab rootstocks were planted. Both of these trees came out of the fruit breeding program at the University of Saskatchewan, are commercially available and have produced successfully in shelters in the Klondike. The Farm Gate also purchased two additional trees from Klondike Valley Nursery, a Misty Rose on a dwarfing Ottawa 3 rootstock and a Norda. Poplar Flats had other existing apple trees that were covered by the shelter extension. At all sites, existing vegetation was cut back to ground level, with the immediate planting area being dug over. Comfrey plants were planted next to each tree as mineral accumulators and to act as a 'living fertiliser' to be cut and applied regularly as mulch. Amendments differed between the sites based on local availability, host preference and soil test results. Example rodent protection collars were provided at all sites.

Site	Cultivar	Rootstock	Age (years)	Caliper (mm)	Fruit 2016	Fruit Buds	Bloom 2017	Winter Damage
1	Autumn Delight	Siberian Crab	1	5	N	N	N	N
1	PF12	Siberian Crab	1	6	N	Y	Y	N
1	Misty Rose	Ottawa 3	3	9	Y	Y	N	N
1	Norda	Siberian Crab	4	9	Y	Y	Y	N
2	Autumn Delight	Siberian Crab	2	9	Y	Y	Y	N
2	PF12	Siberian Crab	3	7	Y	Y	Y	N
3	Autumn Delight	Siberian Crab	2	11	N	Y	Y	N
3	PF12	Siberian Crab	1	14	N	Y	Y	N

Site Specific Methods and Results

Site 1 – McClintock

The shelter was completed and trees planted July 20th, 2016. The base growth of lambs quarter's was pulled and/or cut down at the soil surface prior to planting. Trees were planted into local compost turned with the existing soil as well as a small application of sulfate of potash (0-0-50) and bone meal. During the August site visit signs of water and heat stress were evident. In September it was found that the Misty Rose had seen extensive rodent damage where a collar had been knocked over and the vegetation allowed to grow back thick at the base of the tree. During the final 2016 season visit in October the shelter was covered with a white tarp in anticipation of spring warming. It was deemed unnecessary to cover the north and south ends, the north for aspect and the south for proximity to the forest and anticipated spring shading. Battens were placed between the rafters and the roof plastic to protect against excessive snowload. The site remained unvisited between the end of October and the spring when the host resumed agricultural activities on the property.

The host removed the tarp and opened the shelter for the first time in mid-may of 2017. The trees may have suffered some drought during the early spring, but early emergence from dormancy was prevented to a large degree by the tarp. During the site visit in June a *S*iberian crab rootstock was planted next to the Misty Rose and inarced into the trunk above the damage in the hopes that this might provide sufficient nutrition. More water stress was noted. The Norda was flowering well at the time of the visit and the PF12 was readying to bloom on three sites. No winter damage was seen on any of the trees.


Figure 3 – McClintock Valley site: Trees in shelter; winter covering; rodent damage on Misty Rose

Site 2 – Annie Lake Road

The shelter was built on July 17th 2016 with the generous assistance of the Mount Lorne Smallholder Network, a group of small farmers/gardeners/homesteaders who meet regularly for work projects to further their learning and community building. In exchange for a day's work six people received instruction in fruit tree care and the construction of this particular shelter design and the reasoning behind the project. Trees were planted with organic slow-release fertiliser (1 cup each Gaia Green, 4-4-4). The hosts sowed dutch clover as an understory, planted comfrey adjacent to each tree and used the lower edge of the shelter for lettuce production throughout the rest of the season. The lettuce and comfrey were looking very healthy during the August site visit, as were the trees. The host installed rodent protection in late August and cut down the clover once before the end of the season, reporting a visible improvement in leaf colour similar to the response to a quick-release fertiliser application. The comfrey was also cut and used as a mulch periodically. The June 2017 visit found the PF12 beginning to flower and the Autumn Delight in full bloom so that the last of it's flowers should overlap with the PF12. Both trees were looking very healthy with good color and leaf size and no winter damage. Outside, for comparison, young Trailman and Norland apple trees were leafing out well.


Figure 4 – Annie Lake shelter under construction and complete

Site 3 – Burma Rd

The shelter design was modified slightly to accommodate existing apple trees obtained in previous years from Klondike Valley Nursery for a total of 36'. An intern from the Agriculture branch helped in the construction of the shelter panels and the host contributed time and materials to completing the extra building required in August. The host also provided the use of his shop in for other aspects of the project. The trees were planted in large holes backfilled with soil from a more fertile location on the property and mixed with local compost. All trees were fitted with rodent protection. The host had already been growing strawberries in between the trees and continued to expand on this as well as planting comfrey and dutch clover in the corners of the shelter in the hopes that the clover will expand in years to come and outcompete other weeds. It was decided to rely on spring management of ventilation as opposed to shading the shelter due to proximity of the shelter to the host's home. However, early venting did not occur and the trees all flushed and bloomed very early. While no damage occurred thanks to the sheltered location, the blooms came out before pollinating insects were flying. This had the unfortunate consequence of little fruit production on the earliest to bloom despite strong flowering and good overlap between trees – hand pollination was demonstrated and suggested for the future. All trees bloomed well and are developing good form. Fruit, flower and pruning management were discussed and demonstrated with the hosts.

Figure 5 – Interior of Burma Rd shelter showing placement of Hobo datalogger.

Conclusion

No winter damage was seen on any trees at any of the sites. The data from the loggers was irretrievable for unknown reason so exact temperatures within the shelters cannot be known. Anecdotally, three winters' experience with the shelters at Klondike Valley Nursery show that the inside temperatures do not fall below -25ºC even when the outside temperature exceeds -40ºC. J Lenart has also observed that obvious winter damage occurs to the trees when they are exposed to -40ºC or below, or when rapid cooling follows a warm weather event. The winter of 2016-17 saw temperatures approaching -40ºC at the Whitehorse weather station (Environment Canada). This allows us to infer that the shelters both provided adequate protection from normal winter minimums and moderated any extreme fluctuations sufficiently. Host management was the largest deciding factor in tree performance. Areas that require frequent monitoring are irrigation, rodent protection (including weeding) and management of ventilation. Based on the results of this work, I would recommend this shelter design for use within the Whitehorse area, with the caveat that they require commitment on the part of the grower to gain the advantages they offer. Financial reporting has been provided in a separate document.