Northeast Superior Regional Chiefs' Forum

Report on

Next Steps for Birch Business Development in the Chapleau Crown Game Preserve

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Prepared by: Ecotrust Canada

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This report has been developed to guide the ongoing work and implementation of the conservation economy of the Northeast Superior Regional Chiefs' Forum (NSRCF), the NSRCF Elders Council, and the Regional Development Corporation. The research is intended to deepen understanding of the potential for creating new forestlands business opportunities, adjacent to forestry, in the Chapleau Crown Game Preserve (CCGP), and set out the steps required to achieve desired goals. It is Ecotrust Canada's intention that this work contribute to the ongoing dialogue and experimentation that will enable the region to build a more resilient economy into the future.

Ecotrust Canada would like to acknowledge and thank the individuals and organizations who provided guidance, support, and resources that contributed to this project. Particularly, the members and staff with the Northeast Superior Regional Chiefs' Forum; NSRCF Elders Council; Tembec Inc. in Timmins, ON; Ontario Ministry of Natural Resources and Forestry regional staff and Chapleau & Wawa districts; Craig and Jenny Tallman at North of 49 Birch Syrup in Cochrane Land Information Ontario; the 2015 Guardians; Leo Lepiano & the University of Toronto's Faculty of Forestry; and Northern Information Technology and Geomatics Cooperative (NITGC). We acknowledge the financial support of Natural Resources Canada in making this project possible.

Review of Feasibility Study Findings

In April 2015, Ecotrust Canada completed a Feasibility Study on Birch Syrup Production in the Chapleau Crown Game Preserve. This study indicated that commercial-scale birch syrup production could theoretically be economically viable in the Chapleau Crown Game Preserve (CCGP), assuming relatively strong sap yield and sweetness from trees in the area.

In this study, the potential benefits from such an enterprise were found to be significant, including the opportunity to:

a) re-engage some of the region's Aboriginal people's in activities on the land;
b) bring the forest industry and communities together around a collaborative approach to resource management; and
c) introduce and demonstrate one Non-Timber Forest Product business in the region, in hopes of adding other complementary industries over time.

Using key assumptions based on other regions, it was estimated that a commercial operation with 1000-2000 taps would see annual revenues of $18,000-40,000 per year and a net profit of $2,500-$22,000 per year. It would utilize about 11 hectares of land in the CCGP and would seasonally employ 5-15 people.

The financial forecast for a birch syrup business in any given forest depends on the sap yield and relative sweetness of the sap, as these figures highly impact productivity and the ease with which sap can be converted to syrup. While the 2015 Feasibility Study used a range of assumptions for these key figures based on birch syrup studies in Quebec and Vermont, these key figures are now being refined through this study by identifying the most suitable forest stands in the CCGP and collecting data by tapping trees on the ground.

Work Completed & In Progress

A number of activities were undertaken by Ecotrust Canada in collaboration with the Northeast Superior Regional Chiefs' Forum and other local partners to identify and understand the birch syrup opportunity:

- Identifying the need to create alternative economic opportunities on the Chapleau Crown Game Preserve, and creating a vision to guide work on the CCGP
- Mapping sites where non-timber forest products *could* exist in the CCGP, based on habitat suitability, forest type, and factors specific to the NTFP (e.g. distance from road, time of last harvest) – resulting in areas of potential opportunity
- Completing feasibility studies for *two* of the identified NTFPs: birch syrup and ecotourism
- Ground-truthing maps – deploying Guardians to validate mapped data and collect additional data about NTFP potential. The focus in 2015 was on birch syrup, and over 300 hectares were assessed
- Creating a data management system to hold and report on the Guardian data, including observations about birch trees
- Developing criteria to prioritize sites – not guessing where there *may* be birch trees, but knowing how many are in a plot, their size and health, and how accessible they are
- Identifying priority test sites within the Chapleau Crown Game Preserve – which sites are most likely to host a successful birch syrup enterprise?

- Conducting test tapping on four priority sites – once areas were identified, it is essential to understand how much sap the trees produce, and the level of sweetness.

There were challenges aligning planned test tapping with when birch sap was running due to unusual Spring weather. We anticipated test tapping would take place in March 2016, but this was pushed to late April 2016 because of climate conditions. As a result, the data in this report is based on a limited dataset.

Data Results & Additional Research

In the 2015 Feasibility Study, dozens of accessible birch stands were identified within the Chapleau Crown Game Preserve. These stands were ground-truthed in the summer of 2015 so that we are basing recommendations observed and up-to-date data. A number of criteria were considered in selecting the sites for test tapping, including:

- Tree Density (highest concentration of sampled densities > 100 trees/ha)
- Road & Trail Access
- Proximity & travel time to Chapleau
- Abundance of potential sap-yielding White Birch (>80% of trees in stand); 90-100 stems per hectare of white birch trees >20 cm dbh
- Eco-tourism and educational potential
- Whether it is sizable enough to facilitate commercial birch production (1000-2000 taps)

A cluster of sites was identified which met these criteria and is located just fifteen minutes from Chapleau. Of these sites, test tapping was conducted in four areas- three of which are located adjacent to each other. The sampled sites are noted in Figure 1 below as 40, 143, 145, and 147.

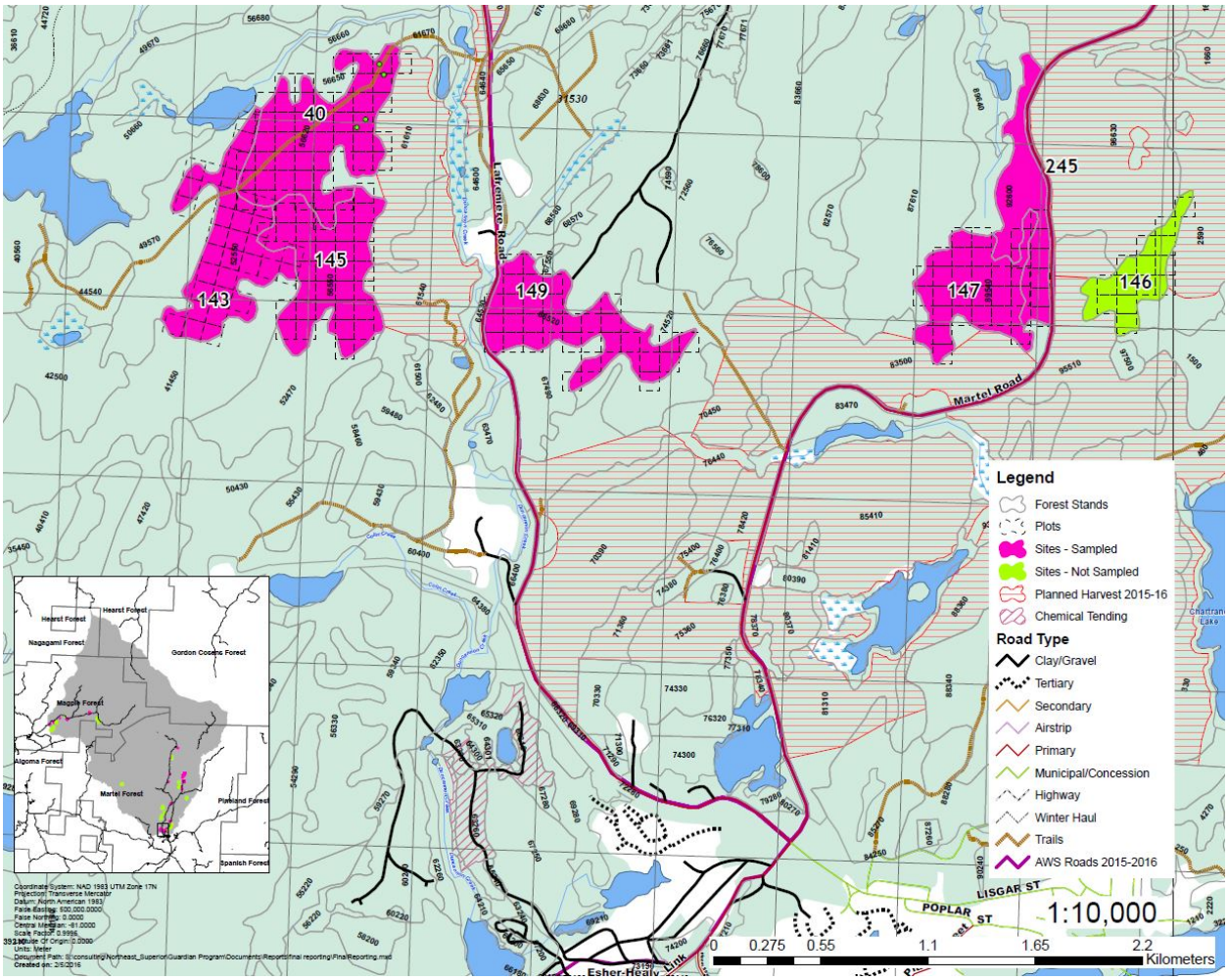

Figure 1- Birch Sap 2016 Tapping Test Sites in CCGP

Summary of site characteristics:

Site ID	Industry STAND ID	Forest	HA	Sampled plots in 2015	Total Tappable Plots	Site Stem Density	Distance from Chapleau	Species Composition	X	Y
40	56620	Martel	39.7	30	17	90	11	BW90 SW10	-83.466	47.883
143	52550	Martel	32.2	29	17	101	11	BW60 PO20 BF10 SW10	-83.472	47.877
145	56550	Martel	33.6	6	4	94	11	BW60 PO20 PJ10 SW10	-83.465	47.876
147	89540	Martel	26.2	12	11	118	11	BW50 PO20 BF10 CE10 PJ10	-83.421	47.877

Data gathered from the four sites suggests a relatively strong case for Birch Sap & Syrup production. Sap sweetness is one of the key factors determining economic viability for any birch stand as sweeter sap takes less time to evaporate into the final product.

The 2015 Feasibility Study was based on two studies in Quebec & Vermont where sap sweetness was 0.7 and 0.74 °Bx respectively. So far in the Chapleau Crown Game Preserve test sites sweetness ranges from 0.6-1.1 °Bx. Notably, this data is from the earliest week of the season and sweetness typically increases throughout the season as flow increases.

To supplement this limited data, Craig and Jenny Tallman at North of 49 Birch Syrup in Cochrane, Ontario have generously provided figures from their own operations. They report that their sap sweetness typically ranges from 0.8-1.4 °Bx.

Another major factor in birch syrup business viability is the annual sap yield per tree. While this limited study was not able to assess the total yield for the season at the test sites, the estimated yield in nearby Cochrane 5,500 Litres from 120-200 taps over a two week harvest, or an average of 34.4L/tap assuming 160 taps. This compares to 30L/tap from our previous assumptions in Quebec and 63L/tap in Vermont.

Finally, this sap must be converted to syrup through a process of evaporation. The local experience of North of 49 Birch Syrup indicates that it takes 120 L of sap to produce 1 Litre of Syrup. This is right in-between the earlier assumptions for sap:syrup ratio of 124.5 in Quebec and 116.6 in Vermont.

Test tap Tree ID	Highest Daily Sweetness Record (°Bx.)	Highest Daily Flow Amount (Litres)
BW145P11T1	1	1.8
BW145P11T2	0.9	1.5
BW145P11T3	1.1	1
BW145P11T4	0.8	1.25
BW145P11T5	1	2
BW245P3T1	1.1	3
BW245P3T2	0.9	2
BW245P3T3	1.1	3.5
BW245P3T4	1	3
BW245P3T5	1	3.5
BW40P50T1	1	2
BW40P50T2	1	0.25
BW40P50T5	0.9	1.25
BWXXP3T4	1	1.25
BWXXP3T5	0.9	1.5

Table 1 - Test tap tree sweetness and flow through April 28th

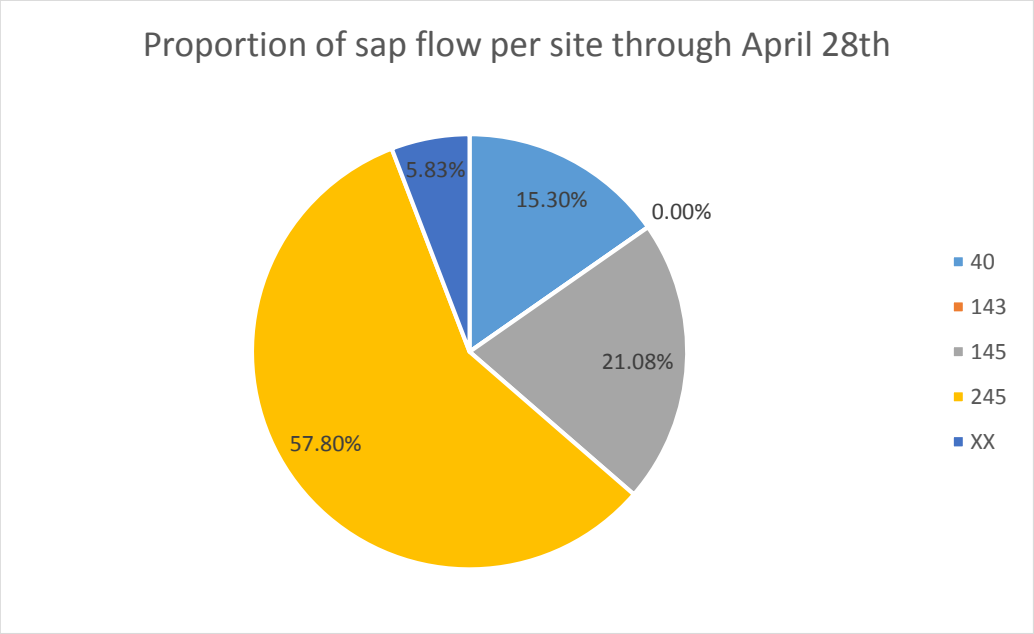

Figure 2 - Proportion of sap flow through April 28th

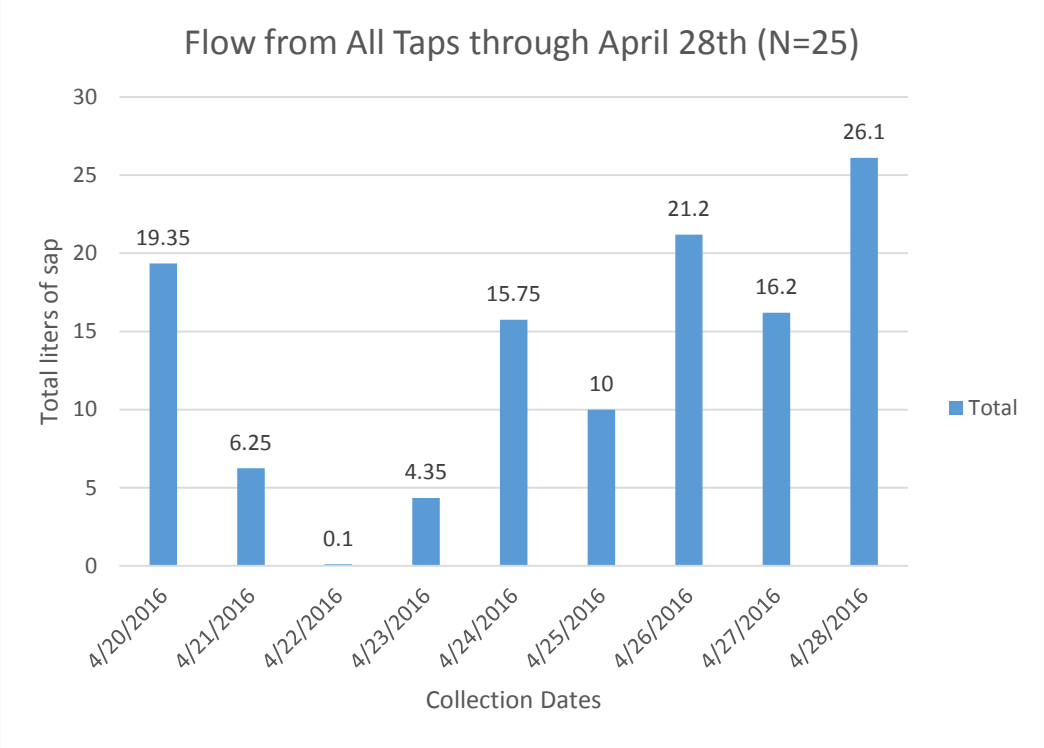

Figure 3 - Sap Flow from all sites

Recommended Site

Of the sites sampled, the cluster of sites 40, 145, and 143 present the strongest immediate opportunity for birch sap production. In addition to proximity, scale, and density, this site offers strong potential for tourism and educational visits and is located in a picturesque area near two lakes.

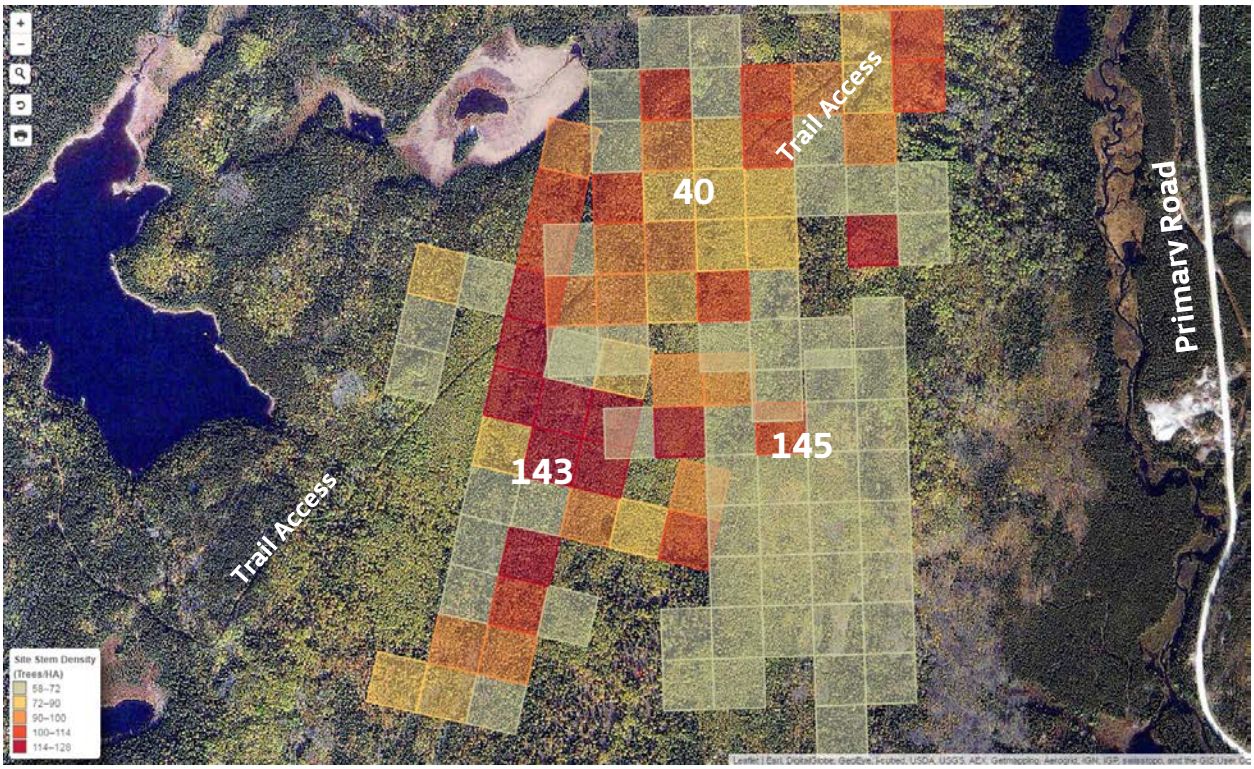

Figure 4 - Map of three priority sites, 143, 140, 40 for Birch Tapping

As an alternative cluster in years where recommended tap rotation may necessitate movement of operations to another stand, sites 147 and 245 present viable options to sustain a profitable operation during those years, though additional investment may be required to provide adequate access to these sites. Between these two sites in the alternative cluster, there is a total of 11 hectares of optimal sized birch trees, with the potential for 4 more after re-sampling occurs. See below for a more detailed discussion on tap rotation.

It is estimated that this 22 hectare site could provide for 2,000-2,200 taps- likely meeting the scale required for viable commercial syrup production. However, some tap rotation or rest periods may be necessary to ensure sustainable harvest, and this could reduce the number of taps available in any given year to about 1,000 within the priority site.

The Need for Tap Rotation

Research is underway to explore the causal pathway of Birch tree disease and infection observed in birch trees by producers in the United States. The suspected cause of infection incidence in trees is due to the tap and spile rotation configuration not giving the tree enough of a rest period in between seasons. Researchers in Vermont have made recommendations for sustainable tapping in Maple trees

based on the depth of the tapping hole into the radial growth rings of the tree column (Van Den Berg, 2010).

Unfortunately tapping standards for birch trees are not as comprehensive as maple trees, and no work has been completed to investigate tree infection and disease. The same researchers suggest that similar tapping standards should be created to mitigate the risk that birch trees have to disease and infection through the same growth ring exposure theory. According to Heloise Dixon-Warren (2007) trees should not be tapped in consecutive years for more than two years at a time. A recommended rest time for each tree is not given, but we suspect this would apply to younger, smaller DBH classes since there is less surface area to rotate taps and their central columns are larger relative to the DBH of the trunk.

To mitigate potential disease and infection, Dixon-Warren (2007) recommends applying a spiral pattern rotation configuration that works up the tree, tapping the successive year's tap at 5-10 cm to the side and 15 cm above or below the previous year's tap. This method will allow the tapper to utilize the entire area of the tree while also allowing the previous years' tapholes to sufficiently heal. Other producers have their own rotation periods that allow for sufficient healing. In Sasketchewan, a producer rotates their operation every six years, and relocates to an entirely new stand (Wiesner, 2007). Another producer, based out of Alaska, taps a tree for a maximum of four consecutive years and then lets it rest for eight years (Dixon-Warren, 2007). We suspect the desired rotation regime depends on a combination of tree size, health, and sap yield and quality over time, but this is based off anecdotal evidence. Ensuring that a profitable operation will be sustainable will depend on the rotation regime that is applied to the trees and stands.

For the purpose of setting-up a birch syrup operation in the Chapleau Crown Game Preserve, we suggest two options that would facilitate the necessary tap rotation:
1) The priority cluster could be tapped at no more than half its total potential- about 1,000 taps. This would likely allow the operation to alternate between two stands within the site at least every two years.
2) The priority cluster could be tapped at its full potential- about 2,000 taps. Tree health could be monitored and if it was determined that rotation was needed, the alternate site could be tapped to provide relief.

It can also be considered that while the priority and alternate sites identified are those with tree density of at least 100/ha, it is likely that immediately adjacent stands also offer relatively high densities of birch trees which could be tapped. If appropriate sites could be identified immediately surrounding the priority cluster, it may not be necessary to rotate to the alternate site. This would save the cost of setting up additional access and tapping infrastructure at the alternate site.

Challenges & Upgrades for Recommended Site

Access is the primary challenge facing this site and there are a number of road and crossing upgrades that will be required for the site to become operational.

Access to the site from Lafreniere road is not possible without crossing Duncannon Creek. There are a range of options to explore to facilitate creek crossing for the business:

- It is likely possible to cross with an ATV directly through the creek between June 15 & September 1. If product could be stored on-site until that time, this would avoid any bridge expense
- It may be possible to source a temporary bridge from Tembec, but this would need to be negotiated and the company is unlikely to provide this indefinitely
- There is an existing road over the creek through Rey-Jean Oulette's property, and he has indicated that he is open to having his road used for this purpose. However, this would require the construction of an additional road into the production site.
- The stand East of the priority site is slated for harvesting next year, so it may actually require the forestry company to provide crossing and road access into the site. When this goes ahead, the company may be willing to extend their road all the way to the sap harvesting site.

Options for Further Consideration

The 2015 feasibility study provided a broad overview of the birch sap and syrup markets as well as financial projections for a commercial-scale syrup production with 1000-2000 taps.

There are three models for moving forward in building out a birch enterprise:

- A small-scale Artisanal Birch Syrup operation using a tap & bucket collection system. This option may best complement cultural, educational, and eco-tourism opportunities.
- A larger-scale commercial Birch Syrup operation using a plastic tube vacuum collection system
- A 'Birch Water' business collecting the sap and marketing it as a natural health product, similar to coconut water or mineral water

Challenges and Benefits of each model:

1) Small-Scale Artisanal Syrup Production

   A small-scale Artisanal operation brings the lowest level of start-up costs and provides significant local employment benefits. The traditional bucket-harvest method is inherently more labor-intensive than the plastic tube collection system of larger-scale production, and this is a challenge to the business model.

   As the 2015 feasibility study was focused on commercial-scale production, further research was required to clarify whether this business could be profitable at this scale of production.

   We have gathered information out of conversations with North of 49 Birch Syrup in Cochrane. Their 200-tap artisanal syrup production provides a good sense of the work required to produce syrup in the traditional bucket collection system and with smaller-scale evaporation equipment. We understand that this leads to a fairly laborious process involving one week of preparation time for one person, two weeks of 12-hour harvest days for two people, as well as a time-consuming finishing and bottling process. Start-Up costs for this style of operation are estimated at $17,600 (not including road and site upgrades), significantly less than a larger-scale

commercial production.

It is estimated that this production model could bring revenues in the range of $15,000-$20,000 annually assuming 600 taps in production. Applying assumptions from the North of 49 operation we estimate that an artisanal business at a scale of 600 taps would require over 1,000 hours of labour input. This is actually 20% greater than the total labour estimated for a 2,000 tap operation using commercial-scale tubing collection. It is estimated that each litre of production takes four times as much labour time to produce under Artisanal collection and production methods as opposed to tube collection.

It is possible for an Artisanal birch syrup production to break-even or turn a slight profit, but only by getting the highest possible price for its syrup ($120/L) and paying relatively low wages to its workers. At a contract rate of $12/hr for all labour toward the operation, artisanal production could generate modest annual profit of $2,400/year and cover interest and principal payments on the financing of start-up expenses.

There is also a very real risk that this enterprise would require ongoing cash injections to maintain operations, given that retail syrup pricing varies and labour costs are likely to exceed $12/hr. However, if the goals of the enterprise were to provide employment and have people working on the land, these goals could be valued and measured along with profit.

2) Larger-Scale Commercial Syrup Production

A larger-scale commercial syrup production adds complexity and cost to the model, and also brings potential for significantly increased revenues and higher profitability due to lower labour costs. It is estimated that a business of this scale would seasonally employ 4-8 people in the harvest of sap and through the evaporation process into syrup, and pay wages in the range of $15-20/hr.

Data from the CCGP gathered in the 2016 harvest season falls well within the range of 2015 feasibility study assumptions. Applying validated local assumptions, we find the most realistic estimate of revenue for a birch syrup operation of this scale to be $21,500 for 1,000 taps and-$43,000 for 2,000 taps annually. Likewise, we estimate annual profits of $5,200 for 1,000 taps and $15,400 for 2,000. Start-up costs for this style of production are estimated at $45,400, not including site and road upgrades.

Note that there may be operational challenges with installing and maintaining the tubing required for this scale of operation given the potential interference of wildlife in a Game Preserve. This would need to be explored further, and defensive measures may need to be taken to prevent trampling of the collection tubing by local wildlife.

3) Birch Sap Bottling & Marketing as Birch Water

In recent years, Coconut Water has become a very popular drink in North American & European markets and is now a $1 Billion dollar industry. Birch Sap or 'Birch Water' presents many of the same health benefits and additional nutrients, such as electrolytes, anti-oxidants, and phyto-chemicals. It has been popular in Russia and Scandinavia for many years as a health drink and could be marketed across North America as a locally-produced equivalent to coconut water. In addition, it is identified as offering naturally detoxifying and revitalizing properties.

There is currently one company producing Birch Water in British Columbia under the brand 52 Degrees North. They offer three varieties- pure, mint, and raspberry and each 354 ml package sells for $3.99 at Whole Foods in Vancouver. Assuming 30% retail markup this suggests a wholesale price of $7.88 per litre of sap, compared to just $0.50-$1.00 per litre of sap when converted to syrup.

Since it does not require evaporation, the volume of product available from each tap is exponentially higher- estimated at 34.4L per tree. For the 22 hectare site identified, it is estimated that a Birch Water business would produce 68,000L of Birch Water annually and bring revenue in the range of $500,000 annually.

It is not yet clear what the local employment benefits for this business would be, but any business operating at this scale of revenues would need to hire numerous full-time permanent staff. In addition, such a business could offer additional opportunity to flavor with other local Non-Timber Forest Products- such as wild berries, increasing benefit to the local economy.

As this is still a small and emerging market, an attractive brand, effective marketing, and clear story would be essential to the success of this model. It would be a very unique product with a fantastic story to tell- local, organic, aboriginal owned and operated, all supporting the preservation of a nature preserve.

A Birch Water business would also likely qualify for significant additional support from the Federal Agri-innovation program supporting Commercialization & Adoption of innovative food products. This was a major source of funding for the Birch Water business in British Columbia.

Moving forward on this model would require additional study into the production, storage, distribution, packaging, and marketing requirements for a business dealing in much larger volumes of sap instead of the refined and evaporated syrup product. There is funding available from the Federal government for this planning work if this is a direction the community is interested in exploring further.

Summary of Birch Business Model Options

	Small-Scale Artisanal Syrup Production	*Larger-Scale Syrup Production*	*Sap Production & Birch Water Marketing*
Tourism, Cultural, & Educational Potential	High- artisanal production is attractive and provides for free flow through space	Low/Medium- tubing required makes site tours more challenging and reduces aesthetic appeal	Low- focus would likely be on marketing larger volumes of birch water product
Estimated Startup Costs	Equipment expenses of about $17,600	Equipment expenses of about $45,000	TBD- Less investment in evaporation equipment, greater investment in product storage, transportation and marketing
Scale of Revenue Opportunity	Up to $20,000 annually for an operation with 600 taps	Up to $45,000 annually for an operation with 2,000 taps	Up to $500,000 annually in retail sales from 2,000 taps
Local Employment Impacts	Low- Up to four people seasonally at $12/hr. The labour-intensive production process provides additional opportunities, but these must be lower-wage jobs given low profitability of model	Medium- Up to 8 people seasonally at $15-20/hr. The larger scale of production partly makes up for more streamlined production methods, and wages are higher for employees	TBD- a business with this scale of revenue is likely to have significant local employment benefits, though a higher portion of spending will also take place outside of the communitys
Sales, Marketing, & Distribution Effort Required	Low- small production volumes put limited pressure on sales	Medium- Higher production requires more sales & distribution effort to clear inventory	High- High volume of product requires special consideration for storage, transportation, distribution, & sales

Recommended Next Steps

1) Gather additional info on tourism, birch water, & alternative options as needed
2) Identify community values & goals in business development and match to selected option (Facilitated community conversations to clarify preference)
3) Develop the governance structure & cash flow projections for the recommended option- Ecotrust Canada can support application to funding sources & development of business plan
    - Note that up to $250,000 in equity funding is available from the Federal Government through Waubetek Business Development Corporation.

Sources:

Van Den Berg, Abby. 2010. *Defining modern, sustainable tapping guidelines for maple syrup production.* http://www.nsrcforest.org.

Wiesner, Terry and Dennis. 2007. Personal communication cited from *Birch Syrup Production Manual. Dixon-Warren, Heloise. (2007).*

Dixon-Warren, Heloise. 2007. *Birch Syrup Production Manual: A guide to Tapping, Processing, and Production of Birch Syrup in Canada.* Quesnel Community and Economic Development Corporation, Quesnel, British Columbia.