

# NOVA SCOTIA *Hop Growers' Guide* 2013



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## FOREWARD

This guide is has been prepared as a resource to assist individuals and businesses wishing to develop a hopyard or hop farm in the Annapolis Digby region of Nova Scotia. It outlines what is involved in choosing a site to grow hops and the resources and investments required to establish a small-scale commercial hopyard. Hop growing requires a suitable growing environment, production knowledge, skills, and a market for the hops that will be produced. The guide also explores the operation of a hopyard and the potential market opportunity for hop sales with in the province.

It is important to note that the hop industry in Nova Scotia is still in the early stages of development, and hop varieties and growing systems have not yet been fully proven in commercial applications. Therefore, new hop yard developers should carry out their own research and assessment before they make a decision to invest into the commercial production of hops. This should involve visiting existing hop growers in the region to learn and gain from their hop production experiences. There are also many good hop production resources and consultants available to help individuals wanting to develop a new hopyard. This guide was not meant to replace those resources, but to offer a comprehensive overview of what is involved in the production and marketing of hops in Nova Scotia. There is no associated guarantee of hopyard success implied with this guide; however the information will be useful to individuals assessing the opportunity and decisions associated with establishing a new hopyard enterprise.

## ACKNOWLEDGEMENTS

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## 1.0 INTRODUCTION

The Annapolis Digby Economic Development Agency has identified a potential opportunity to supply regional microbreweries, brew pubs, and home brewers with locally produced hops. This opportunity is worthy of further exploration as both Annapolis and Digby Counties have underutilized agricultural capacity and unique microclimate areas that have the potential to support the development of new hopyard farms.

The supply of hops to the craft microbrewery industry sectors in Europe has historically been an economic contributor to the rural economy and is now gaining significance in the USA and many regions of Canada. The increased interest in and growth of, the microbrewing sector in Nova Scotia and Atlantic Canada is creating new opportunity and potential demand for locally produced hops. When available, microbrewers are utilizing locally grown hops to create unique branded seasonally crafted beers. This allows them to offer beers with new and unique value propositions and to niche out market share in the very competitive beer marketplace. Another potential market is with home brewers as they discover the value in using local hops to make home brewed beer and ale.

The future growth and market opportunity for the small-scale hop producer will be closely linked to the future development and growth of the micro-brewing sector and the willingness of that sector to buy and utilize locally produced hops. Close alliances will need to be developed between brewers and hop producers to ensure that hop varieties, quality and volumes required can be supplied. The success of the Nova Scotia hop sector is largely dependent on the ability to create a solid value chain extending from the hopyard through to the end consumer that appreciates locally crafted beers.

The development of a small-scale perennial hopyard is a long-term investment and will require an investment into land, equipment, trellis systems, hop growing skill development and hop rhizomes. This investment is not uncharacteristic of what is required to establish other perennial horticultural crops such as apple orchards, grape vineyards or blueberry fields. There are some labour very intensive aspects to hop production, particularly for the small-scale hop producer. The development of a new hopyard business should be well researched, planned and markets must be established for it to be profitable. This guide was created to inform and assist individuals on what is involved in the establishment and operation of a new hopyard.



Photo 1 - Hopyard - (Courtesy of Viliam Zvalo, Perennia)

## 2.0 ABOUT HOPS

Hops are an indigenous plant to North America, but it was the early French, English, Dutch and Germany settlers that introduced the cultivated European hop varieties to the continent. Commercial hop production originated in the Northeastern region of the USA, but as a result of disease pressures in the early 20<sup>th</sup> century the industry migrated to the drier climates of the Northwestern states. Hops along with water, grain (barley) and yeast are the four main ingredients used to make beer. The hop is what gives beer flavor, aroma and it also acts as a natural preservative to keep beer from spoiling. Adding different hop varieties at various stages in the beer making process, allows brewers to manipulate the bitterness, flavor and aroma of beer. *(For example, the unique character, flavour and taste of an India Pale Ale is the result of a higher volume of hops being used longer during the brewing process.)* Hops similar to grapes take on the terroir of the region in which they are grown. *(Terroir is the expression of the unique characteristic synergies that are created as a result of the combination of a plant, a regions geography, including soils and climate.)* As a result, the flavour, aroma, acid levels and essential oils of a hop will vary some from region to region. This is an advantage that can be used by brewers to create regionally branded and specialty flavoured beers. Hops are a global commodity and the dominant hop producing regions are Western Europe, Northwestern USA and China.



Photo 2 – Hop Cones

### The Hop Plant

*Humulus lupulus* is the botanical name for the common hop plant. It is a tenacious, aggressive and vigorous growing plant, a characteristic that has contributed to its nickname the “earth wolf”. Hops behave as an herbaceous perennial in the climate of southwestern Nova Scotia. While semi-woody tissues develop, the plant dies back close to or below the ground level each year and sends out new shoots and rhizomes each spring. At the height of the growing season and under ideal conditions, hops can grow up to twelve inches per day. Hop plants are long lived and can remain productive for 25 years or more in a prime-growing environment.

The female hop flower cone (cluster) is valued and utilized in beer making; adding flavour, aroma, preservative and desirable head characteristics to a beer. Hop plants are dioecious (separate male and female plants) and only the female hop plant is used in

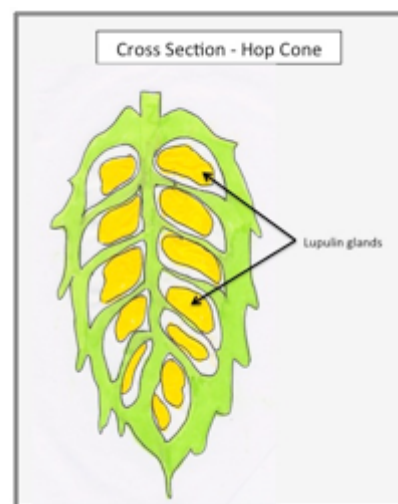


Figure 1 – Cross Section Hop Cone

commercial hop production. Fertilized female hop cones are not marketable. The main desired component in the female hop cone for beer making is a chemical substance called **lupulin**, a bitter resinous yellow powder consisting of essential different oils and acids (alpha and beta). Growers need to become familiar with the different hop varieties that brewers prefer, in particular the desired acid and oil profiles. The quality and variety of a hop cone determines the marketability of one hop variety over another. Hop resins (lupulin) contain both alpha and beta acids. There are two types of hops; (1) bittering hops and (2) aroma hops.

<i>Bittering Hops (Alpha Acids)</i>	<i>Alpha acids add bitter flavour and antibacterial properties to beer. Bitterness is measured in IBUs (International Bitterness Units). The level of alpha acids in a hop will contribute to the bittering effect. Hop bittering is used to counteract the sweetness of the malt.</i>
<i>Aroma Hops (Beta Acids)</i>	<i>In beer making beta acids add aroma. Unlike bitterness, there is no scale or standard to measure aroma. The essential oils contained in a hop also create aroma and are used in the finishing stages of beer making.</i>

The composition of the essential oils in hops can differ between varieties and between production years of the same varieties. Therefore, it is very important when establishing a new hop yard to ensure that the varieties of hops grown will preform well on the site as anticipated, and contain the desired resin components and acid levels that are expected and acceptable to the target market. Experimenting with a test nursery plot using a number of different hop varieties to confirm hop cone preference with local brew masters is a good first initiative to undertake before investment is made into a larger-scale hopyard. When producing hops, customer loyalty is established by the ability to produce and deliver a consistent quality hop product that the market wants to buy.

Hop Varieties

Today brewers have access to a wide range of hop varieties and cultivars each with unique and distinct characteristics. Research is ongoing to find new and better yielding hop varieties that have characteristics that will create a higher value proposition for the grower and result in better beers for the brewers. The hop industry is still young in Nova Scotia and hop varieties are not yet commercially proven in regards to long-term performance and annual yield volumes. Grower trials, government research trials and an identification of varieties successfully grown in other regions (New England, Quebec and Ontario) will be of help great help to a new hopyard manager deciding what varieties will best preform and be productive in Nova Scotia. The final confirmation of which varieties to grow will come from the customer, the microbreweries that will be the primary market for the hops produced. Growers should continually test new varieties with brewers to determine preferences and to anticipate the future demand for hops varieties.



Photo 3 – Hop Bine - Courtesy Meander River Farm

Hop Cultivar/Variety Descriptions

(Source: Hop Variety Characteristics Manual - Hopunion CBS LLC & USDA Hop Cultivar Description)

The following hop varieties are commonly grown in North America. The table below describes maturity timelines (Early, Mid, Late), susceptibility to diseases and pests, anticipated yields, growth habit and % alpha acid. It is important to note that this information is based on the northwest USA growing regime and the identified characteristics could vary considerably under Atlantic Canada growing conditions.

Hop Variety	Maturity	Disease & Pest Susceptibility	Yield* lbs/acre	Growth Habit	% Alpha
Amarillo	M	Fairly resistant to all diseases	NA	Good	8-11
Brewer's Gold	M to L	Low resistance to wilt & powdery mildew	2400	Normal	8-10
Cascade	M	Good resistance to downy mildew, tolerant of verticillium, prone to insects and aphids	1430 -1960	Good to Excellent	4.5 - 7
Centennial	M	Moderate resistance to downy mildew and verticillium	1500-1750	Good	9.5-11.5
Chinook	M to L	Moderate resistance to downy mildew, good insect tolerance	1780-2230	Good	12-14
Fuggle	E	Resistance to downy mildew, insect tolerance	1070-1600	Neat & Manageable	4-5.5
Galena	E to M	Some downy mildew resistance, slight susceptibility to powdery mildew, aphid susceptible	1700-2230	Neat and Columnar	12-14
Golding	E to M	Sensitive to downy mildew, highly sensitive to hop mosaic virus	900-1300	Average	4-5
Hallertau	E	Fairly sensitive to downy mildew, verticillium & insects	800-1250	Variable in Production	3.5-5.5
Magnum	L	Good resistance to wilt, downy mildew, susceptible to powdery mildew	1340 - 1700	Good	12-14
Mount Hood	E to M	Moderately resistant to downy mildew	1520-1960	Vigorous	5-8
Northern Brewer	E to M	Susceptible to downy mildew, resistance to aphids and mites	1000-1400	Adequate in temperate climates	8-10
Nugget	M	Moderate good resistance to downy mildew, susceptible to mites	1700-2230	Good	12-14
Saaz	E	Some tolerance to downy mildew, prone to virus	600-1000	Difficult to grow	3-4
Sterling	M	Moderate resistance to downy mildew	1800 - 2000	Moderate	6-9
Tettnang	E	Moderate resistance to downy mildew, sensitive to insects & mites	900-1340	Fairly Neat	4-5
Warrior™	M	Moderate tolerance to powdery mildew, spaerotheca	2400-2600	Vigorous	15-17
Willamette	E to M	Fairly resistant to downy mildew, susceptible to verticillium and powdery mildew.	1340 -1700	Good, vigorous	4-6

- Potential Average Yield Washington State, Dried Hops lbs/acre

### Hop Variety Trials in the Maritimes

Aaron Mills Ph.D. research scientist at the Agriculture and Agri-food Canada Harrington Research Centre in Prince Edward Island has for the past two years been undertaking hop variety trials using a low trellis system. The hop varieties used in the trial were Sterling, Nugget, Cascade and Newdale. The Sterling variety hop plants were removed from the trial as a result of a virus infection. In 2013 Dr. Mills is undertaking new research trials that will include 20 different hop varieties under a 2-acre high trellis system. One acre will utilize an organic production system and one acre a conventional production system.

### Hop Variety Trials in Quebec

(Source: Julien Venne, Agronomist, CREDETAO- Hop Production Presentation)

The Agricultural Research and Technology Development Centre for the Outaouais is undertaking a three-year hop variety trial with two farms in the Pontiac Region of Quebec. The trials are to a large degree in response to craft brewers wanting local sources of organic hops.<sup>1</sup> Below are some of the varieties being examined in the Quebec trial.

Brewer's Gold	Spät	Willamette	Golding
Cascade	Hallertauer	Mount Hood	Tettnanger
Northern Brewer	Mittlefrüher	Nugget	Hesbrucker

### Hop Varieties Used by Local Microbrewers

Each microbrewer uses particular or favourite hop varieties in their beer making recipes. It is what makes each brand of beer unique. This also highlights the importance of establishing good communication throughout the hop value chain so that desirable hop varieties are produced. This does not mean that brewers will not experiment with different and new hop varieties that are introduced to them. Brewers say that a new hop producer needs to talk to brewers before establishing their hopyard to make sure that the varieties they plan to grow have the characteristics that brewers want to use and buy.

The hop varieties used as identified in interviews with some local Nova Scotia brewers were: Amarillo, Brewers Gold, Cascade, Centennial, Galena, Golding, Hallertauer, Warrior and Willamette. A 2010 New England Hop Study surveyed 21 brewers with the top varieties being identified as Cascade, Centennial, Hallertau, Golding, Willamette, Saaz, Amarillo, Northern Brewer, Tettnang, and Perle.<sup>2</sup>

If a hopyard contains all of the same hop variety, it would result in the entire hopyard needing to be harvested at the same time. Considering the high post harvest perishability of a hop crop, this would create pressure on the farm's harvest resources and labour, and ultimately affects the

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<sup>1</sup> Richard Ledbetter, Quebec Farmers Advocate June 2010, <http://www.quebecfarmers.org/wp-content/uploads/2009/08/QFA-2010-06.pdf>

<sup>2</sup> Rosalie j. Wilson, 2009-2010 Feasibility and Market Research Study for Commercial Hop Production in New England, September 2010



quality of the hop product. Succession planting utilizing different varieties that mature at different times (early, mid, late) allow for an extended harvest season and creates better utilization of hopyard resources and labour. Successive planting could greatly benefit fresh (wet) hops sales timelines, as there are limitations in the volumes of fresh hops that a small microbrewer can handle any one time.

### Plant Replacement

Hop plants can live for 25 years or more, but over time they become less productive and the yields will naturally decline. Hop plants in a large-scale commercial hopyards are often replaced on a regular basis in response to market changes, varietal improvements or for disease management purposes. There are ongoing hop breeding initiatives focused on developing improved, higher yielding, more disease resistant hop plants with higher alpha acid levels.

### Plant Patents

Many of the new and improved hop varieties are protected under plant patent laws, which prohibit propagation without permission and a license agreement. Patented hop rhizome and plants will be more expensive to purchase but often have added production benefits such as increased hardiness, yield, dwarf growth habit, and resistance to pests and diseases.

### Rhizomes

Hopyards are populated with hop rhizome cuttings. Once a hopyard is established and mature (3 to 4 years), rhizomes can be propagated from the existing stock for replacement plants and expansion of the hopyard. A new hopyard should purchase rhizomes from a reputable supplier. Hop plant rhizomes are available from numerous sources in Canada, the USA and Europe. Care must be taken in selecting a rhizome supplier to ensure freshness, that the plants are disease and pest free, as well as true to variety. Introducing new disease or pest problems can be very serious and costly as they can quickly spread through the rest of the hopyard. Hop rhizome buyers should be cautious, as rhizome price is not always an indication of quality. It is good due diligence to obtain inspection certificates, assurances and guarantees from suppliers as to the health of rhizomes. Some varieties of hop rhizomes can be in high demand, so it is best to book rhizome orders with suppliers early. Certified organic rhizomes are available from a number of suppliers. (See: *Rhizome Suppliers*)

Phytosanitary certificates are required when importing plants from other countries to Canada. This is a certificate of ensuring that the plants have been inspected and are disease and pest free for export/import. Experienced hop exporters will be aware of the phytosanitary certificate requirements and will arrange to have export shipments inspected along with the proper documentation that will limit possible importation delays at the Canadian border. A phytosanitary certificate is an assurance, not a guarantee, and the Canada Food Inspection Agency (CFIA) may preform a follow up visit your farm after rhizomes have arrived for additional inspection.

Rhizome cost will depend on the supplier, the variety and volumes purchased and if the rhizomes are certified organic. Prices for hop rhizomes can range from under \$2 up to and over \$10 for potted rhizomes. Buying more expensive potted second year hop plants may be a way to shorten a new hopyard's development timeline.

Rhizome Suppliers

Rhizomes are available from various suppliers in Canada, the USA and from Europe. Commercial volume purchases, or growers combining orders, will achieve much better pricing from suppliers than what is listed on websites. The following table is a listing of commercial suppliers of hop rhizomes. *(There is no associated recommendation or implied guarantee of quality for any of the suppliers on this list.)*

Supplier	Phone #	Websites / Contact
<b>CANADA</b>		
Happy Hopyard (New Brunswick)		<a href="mailto:happyhopyard@gmail.com">happyhopyard@gmail.com</a>
Quebec Multiplants (Quebec)	(418) 687-1616	<a href="http://www.quebecmultiplants.com">http://www.quebecmultiplants.com</a>
Richters (Ontario)	(905) 640-6677	<a href="http://www.richters.com">http://www.richters.com</a>
Four Horses (Ontario) (Certified Organic)	(613) 503-0141	<a href="http://www.fourhorses.ca/index.php?route=product/product&amp;product_id=105">http://www.fourhorses.ca/index.php?route=product/product&amp;product_id=105</a>
Crannog Ales (British Columbia) (Certified Organic)	(250) 675-6847	<a href="http://www.crannogales.com">http://www.crannogales.com</a>
Hop Connect (British Columbia)	(604) 358-4677	<a href="http://www.hopsconnect.com">http://www.hopsconnect.com</a>
<b>USA</b>		
Freshops (Oregon)	(541) 929-2736	<a href="http://www.freshops.com">http://www.freshops.com</a>
Northwest Hops (Oregon)	(503) 710-1251	<a href="http://www.NorthwestHops.com/">http://www.NorthwestHops.com/</a>
RNV Enterprises (Washington)		<a href="http://www.rnventerprises.com/">http://www.rnventerprises.com/</a>
North East Hop Alliance (New York)	(315) 684-3001	<a href="http://nehopalliance.org/category/resources/">http://nehopalliance.org/category/resources/</a>
Foothills Hops (New York)	(315) 495-2451	<a href="http://www.foothillhops.com/">http://www.foothillhops.com/</a>
Atlantic Hops (New York)	(914) 834-5130	<a href="http://www.atlantic hops.com/">http://www.atlantic hops.com/</a>
Gorst Valley Hops (Wisconsin)	(608) 228-3117	<a href="http://www.gorstvalleyhops.com">http://www.gorstvalleyhops.com</a>
<b>EUROPE</b>		
Gartnerei Eickelmann (Germany)		<a href="http://www.eickelmann.de">http://www.eickelmann.de</a>

*Section Checklist*

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1.	Talk to local hop growers to determine which hop varieties that are performing well in the region.	
2.	Examine results of available regional hop research variety trials.	
3.	Verify the hop (variety) requirements & preferences of local microbrewers.	
4.	Choose rhizome suppliers carefully and look for health quality assurances.	
5.	Pilot trial rhizomes on proposed sites before undertaking large-scale plantings.	
6.	Choose varieties that have characteristics suitable for the regions climate.	
7.	Plant varieties that will extend the harvest timeline. (E.g.: Early, mid, and late)	

*Useful Hop Plant Resources*

Hop Varieties <a href="http://www.hopunion.com/17_HopVarietyHandbook.cfm">http://www.hopunion.com/17_HopVarietyHandbook.cfm</a>
USDA Hop Cultivar Descriptions <a href="http://www.ars.usda.gov/pandp/docs.htm?docid=14772">http://www.ars.usda.gov/pandp/docs.htm?docid=14772</a>
American Organic Hop Grower Association <a href="http://usorganichops.com/AOHGA/research.html">http://usorganichops.com/AOHGA/research.html</a>
Rhizome Information <a href="http://www.freshops.com/hop-growing/rhizome-information-rhizome-variety-list">http://www.freshops.com/hop-growing/rhizome-information-rhizome-variety-list</a>
CEDETAO Hop Growing Guide (French) <a href="http://credetao.tumblr.com/achat">http://credetao.tumblr.com/achat</a>
Vermont Hop Variety Trails <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011_Hops_Variety_Trial_Report_final.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011_Hops_Variety_Trial_Report_final.pdf</a>
Fact sheet: How to grow your own hop rhizomes. <a href="http://www.rnventerprises.com/files/How_to_Grow_Rhizomes_2012.pdf">http://www.rnventerprises.com/files/How_to_Grow_Rhizomes_2012.pdf</a>
2010 Organic Hop Variety Trial: Preliminary Results (Vermont) <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011_Hops_Variety_Trial_Report_final.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011_Hops_Variety_Trial_Report_final.pdf</a>
USDA Hop Cultivar Index (Details on hop varieties.) <a href="http://www.ars.usda.gov/pandp/docs.htm?docid=14772">http://www.ars.usda.gov/pandp/docs.htm?docid=14772</a>
Gorst Valley Charter Program <a href="http://www.gorstvalleyhops.com/charter_grower.php">http://www.gorstvalleyhops.com/charter_grower.php</a>
USA Hop Grower Variety Manual <a href="http://www.usahops.org/graphics/File/HGA_BCI_Reports/Variety_Manual_7-24-12.pdf">http://www.usahops.org/graphics/File/HGA_BCI_Reports/Variety_Manual_7-24-12.pdf</a>
Clean Plant Centre Northwest Hop Propagation Fact Sheet <a href="http://www.usahops.org/graphics/File/Hop_Clean_Plant_Network/Hop_Prop_Tips_R5.pdf">http://www.usahops.org/graphics/File/Hop_Clean_Plant_Network/Hop_Prop_Tips_R5.pdf</a>
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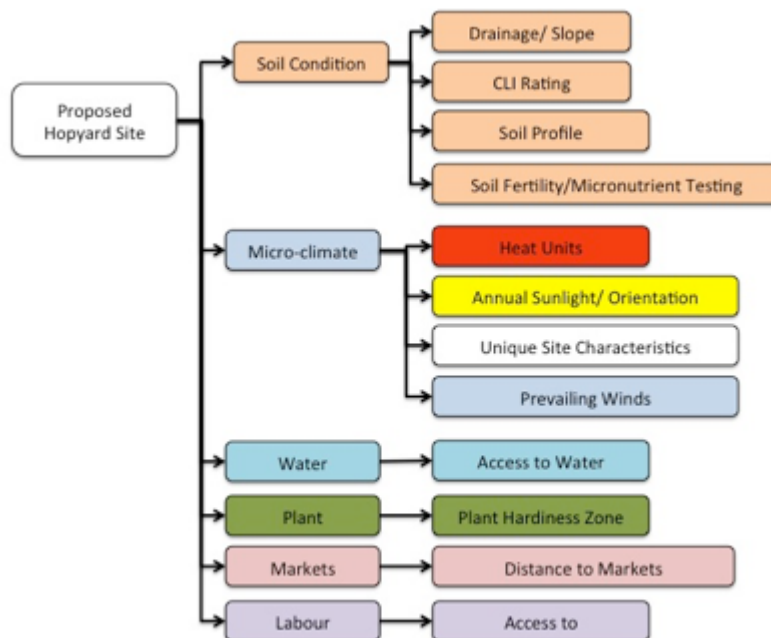
### 3.0 HOPYARD SITE CONSIDERATIONS

Hopyard or hop field is the term commonly used to describe a farm that commercially produces hops for the brewing of beer. While the hop is a perennial plant with an aggressive growth habit, it requires good growing conditions if maximum yields are to be expected. Hop plants grow best in fertile well-drained land, receiving high annual levels of sunlight, in a location with good air circulation and a relatively dry climate. These conditions minimize hop plant diseases and pests, and maximize hop cone quality and the total annual yield.

#### *Site Selection Criteria*

Under ideal growing conditions a hop plant can produce for 25 years or more. The development of a hop yard requires an investment into land, equipment, irrigation systems, hop plants and a trellis support system. It typically will take 3 to 5 years for hop plants to reach full cone production levels and to maximize hop crop returns. Therefore, the selection of the right hopyard site is critical to the long-term success and profitability of the hopyard business.

Due to the perennial nature and long life of the hop plant, attempting to make post hopyard establishment remediation's to the soil and site infrastructure can be a difficult and costly to undertake. A poor site will greatly impact the annual crop yields and hop cone quality. A new hopyard site needs to be assessed in regards to: soil quality, characteristic, fertility, drainage, microclimate, proneness to frost, orientation to the sun, prevailing winds, access to water for irrigation, plant hardiness, distance to markets and access to labour.



### Agricultural Characteristics of the Digby Annapolis Region

Both Digby and Annapolis counties have good quality farmland available for new agricultural development. The region has unique microclimates, many of which are influenced by proximity to water and with orientation to the sun. The region has many soils with characteristics that will support the production of various perennial agricultural crops. Each site will be unique and require a thorough assessment as to whether hops can be grown successfully on a commercial scale. Site characteristics have an impact on plant performance, plant yield, and will affect the feasibility and profitability of a new hopyard. New hop yard developers may find it beneficial to retain the services of a professional agronomist that can offer a professional opinion and assist in the assessment of a proposed new hopyard site.

*Note: Perennia offers both preliminary and detailed site assessments for individuals developing hopyards. ([http://perennia.ca/site\\_assessments.php](http://perennia.ca/site_assessments.php))*

### Soils

A site's soil quality and characteristics are a critical foundation for successfully growing commercial perennial crops such as hops. It is very worthwhile to assess a proposed site's soils to determine what amendments should be added prior to planting hop rhizomes. This will involve examining the soil characteristics, structure, profile, drainage, and undertaking soil testing to determine existing nutrient/micronutrient levels and assessing organic matter content. A wide range of soils with a variety of characteristics and agricultural capability exist in Annapolis and Digby Counties. Much basic information can be determined about a site's soils from the Nova Scotia County Soil Survey publications. *(Note: The county soil map links are identified in this section's useful resources.)*

Once a perspective hop-growing site has been selected:

- 1) Identify the site's location and orientation on a soil survey map. Soil survey maps are available for both Annapolis and Digby counties. The soil map will tell the general characteristics of the soils and details of the land, which may be important in helping to screen potential hopyard locations. The maps will identify the soil type, CLI classification, bedrock, slope and various other characteristics of the land.
- 2) Next undertake an on site evaluation, which may include digging test holes to determine soil profile, hardpan, surface water, drainage and stoniness. Test holes will help to determine if poles can set deep enough as required on the site. Good site drainage is critical, as perennial crops do not tolerate pooling of water around roots.
- 3) The next step is to take soil samples and send the samples to a lab for testing.
- 4) Retain an agronomist advisor/consultant that is qualified to interpret soil test data and interpret the site's capabilities and potential for growing hops.

### Soil Testing

Soil tests and analyses are available from a number of private labs and from the Nova Scotia Department of Agriculture. Sampling information, testing methodology and soil sample boxes can be picked up from a regional NS Department of Agricultural office.

### Fertility Assessment

Hops require a reasonably fertile soil with medium to high levels of nitrogen for good vine production and yield. Often soil fertility can be identified by the growth of biomass plants existing on a site. Old agricultural fields may be very low in nutrients and require significant inputs before establishing a hop yard. Cold wet soils would generally not be able to supply adequate nutrient charges to grow a good hop crop each year. Well-drained soils with medium to high organic matter levels (5-7%) would be best to retain and supply nutrients annually. Systems need to be put in place to ensure these levels are initially supplied and replenished on an annual basis.

### Nutrient Testing

Any potential hopyard site should have soil samples analyzed at a certified laboratory for basic nutrient levels. This is a very minor investment and the snapshot of your soil health should be repeated every two to three years to measure fertility trends. The costs of this analysis are easily recovered in the first fertility adjustment. Adjustments in soil pH, phosphorous and potassium are most beneficial to perennial plants such as hops when incorporated prior to planting.

In Nova Scotia soil pH may be a very limiting factor to the establishment of new hop plants. A soil pH of 6-6.5 is required to release many nutrients to plants. A naturally low pH exists in soils throughout Nova Scotia and must be identified by a buffered soil pH analysis. Dolomitic limestone (Mg based limestone) often preferred as magnesium (Mg) is often low in east coast soils and a 10:1 ratio with calcium (Ca) is often encouraged with the use of this product. Soil testing will identify all of the major and minor nutrient requirements and the levels in the soil. This record will be a benchmark for change and the fertility program. Without proper soil pH balance applied fertilizers may not be available to the plant.

To evaluate the growth of perennial plants, a tissue analysis is often undertaken annually to identify what nutrients are accessible to the plant. Leaf petiole analysis is selected at critical stages of growth and can be often correlated to crop yield. These results are only useful when they are compared to standards and collecting several years of data from the hopyard will provide the best records for your management decisions. The combination of soil tests (slow changing) and leaf analyses (rapid changing) will be used in your selection of fertility applications required for each season.

### Biological Analyses

In modern agriculture, the biological activity of the soil is often associated with nutrient availability and soil health. Tests are available to measure both the micro flora and fauna of your soil, which has impacts on soil fertility, pest and disease complexes, and long-term storage of nutrients in the soils. These analyses are fairly expensive but will again give a good picture of the soil health and long-term productivity. They are often used in organic systems where nutrient schemes are more often managed over a series of years.

### Nutrients

The supply of nutrients to hopyards can be obtained in a wide variety of forms in modern agriculture. Synthetic sources (prilled fertilizers) are the easiest to obtain and often provide a rapid adjustment in the nutrient level, but also may have side effects such as pH suppression. Natural or organic source nutrients are often slower acting yet can provide effects over several years. A combination of the different nutrient sources may provide good results for perennial crops such as hops.

### Nitrogen

Hops are heavy feeders and require significant amounts of N to produce high yielding vines. Nitrogen is a water mobile nutrient stored mostly (90%) in the organic matter in soil. To manage nitrogen properly attention should be paid to maintaining soil organic matter in the soil at levels of 5-7%. This is often considered high for agricultural soils, but is the best approach to maintaining soil N at sufficient levels through the season. Regular additions of nitrogen will be required on an annual basis.

### Phosphorous

Phosphorous (P) is a very immobile nutrient in the soil and levels as indicated by a test should be adjusted prior to planting. P soil levels can be medium to medium low and still provide for the growth of productive hop vines. Low P analysis fertilizers may be useful to reduce the stimulation of annual weed growth without affecting crop yield.

### Potassium

Potassium (K) is a nutrient often required in medium levels in many perennial crops. It plays many roles in water management and drought tolerance in plants. K often needs to be replenished annually due to losses in plant foliage and the seeds. Some forms of potassium are unacceptable for use in organic production systems and new growers should examine what sources are available locally.

### Micronutrients

Micronutrients are often very important in the production of perennial plant crops. Soil testing analysis is essential in understanding what levels of these critical nutrients are present in the soil. Micronutrients may be supplied in many forms and common sources would include chelated nutrients for foliar sprays, as secondary components in prilled fertilizers, and in composts and manures. Leaf tissue analysis will provide a picture of the levels actually taken up by the plants. In the Nova Scotia **boron** (B) is often low in many soils and can affect the establishment and growth of hops. Boron can also be toxic at low levels so care should be taken in the application techniques and rates.

Small changes of less than 1 kg per hectare in the soil level can have both positive and negative effects.



Photo 4 - Early Season Hopyard - Courtesy Meander River Farm

### Composts and Composted Manures

Nutrients arising from composted organic sources usually only supply 1-15% of the total nutrient load in the first year. These products are part of a long-term nutrient management plan and care should be taken to get an analysis before proceeding with their use. They may contain forms of nutrients containing high salts or other compounds harmful to plant growth if they have not been properly stabilized. The benefits associated with composted organic products are very positive typically increasing long-term organic soil matter levels, stimulating active micro flora and fauna in the soil, holding soil nutrients, retaining soil moisture and reducing the bulk density or compact ability of soils.

### Developing a Fertility Plan

It is important for new producers to access information and resources to develop a plan to manage fertility in the hopyard soil. Many factors influence the actual soil nutrients available from season to season and from various nutrient sources. Benchmarking, record keeping and consulting with experts should be practiced in regards to the long-term availability of nutrients in farm soils.

### Geographic Location

Nova Scotia is located along the same latitudinal lines as the major hop growing regions in Europe. The maritime climate has mild but humid wet fall weather and high levels of rainfall. The region is also prone to hurricanes and high fall winds, which can cause significant hop cone and plant damage at or prior to harvest.



### Microclimates

Microclimates exist throughout Annapolis and Digby Counties. In general a microclimate is the climate of a small environment, typically a town, forest, valley or even an individual property or farm. Microclimates occur naturally due to large bodies of water, topography of the land, particular soil types or can be created, as is the case in towns where the mass of the urban area and concentrations of pollution can create a heat island, unique areas warmer than the surrounding area. Microclimates are areas significantly different from the average of a larger area. They are not necessarily favorable. For example, an area could be overly susceptible to frost, a microclimate not favorable to perennial crop production. Favourable microclimates have allowed agricultural crops to grow in some areas where they otherwise would or should not. Microclimate assessments typically analyze site information including:

- Annual heat units achieved
- Sunlight levels and orientation
- Unique site characteristics (Natural windbreaks, slopes, ravines)
- Prevailing wind direction
- Influences from bodies of water

A project to assess weather conditions and their influence on agricultural production potential in South West Nova Scotia was undertaken in 2011. The *South West Nova Scotia Temperature and Solar Radiation Study 2011* is a very comprehensive report and can help in identifying microclimates and site weather patterns that could be useful when assessing potential new sites for hop production in the Annapolis Digby region.

*(Note: For more information on microclimates and to access this report contact a regional office of the Nova Scotia Department of Agriculture.)*

### Water

Consideration should be given to ensure that sufficient fresh water resources are available for irrigation purposes. Global climate change is affecting agricultural production even in traditionally wet regions such as Nova Scotia. Hop yields will be greatly affected by water shortages and from drought conditions. Commercial hop plants require approximately 30 inches of water per year, more than double the normal average annual rainfall in the Annapolis Digby area. Under irrigation of hop plants will reduce the quality and value of the hop cones. When growing hops, an overhead irrigation system should not be used, as it will promote disease. Drip irrigation systems work best, as they require lower water flow (gallons per minute) volumes, smaller pump systems and can also be used effectively to apply water-soluble fertilizers. Water quality and flow rates should be established for any on site well. If water is to be accessed for irrigation from rivers, lakes or streams, provincial permits may be required as well as an environmental impact assessment. Consult your municipal county office or the Nova Scotia Department of the Environment for regulations in your area. Water quality testing is also available from the Nova Scotia Department of Agriculture Analytical Services Branch.

Plant Hardiness

The majority of the Digby Annapolis region has a plant hardiness zone rating of (5-7) depending on the particular location within the counties. This rating is based on minimum temperatures and other environmental factors. Some hop varieties may be less hardy than other hop varieties, so it is important to assess the climate and match suitable plants to the site and the plant hardiness zone rating. Plants that are not hardy may be less vigorous, yield less hop cones, be more susceptible to disease and pests, and crowns may die back farther each year and plants may be slower sending out new shoots in the spring. Plant hardiness problems have been experienced with the introduction of some new varieties of other commercially produced horticultural crops introduced from warmer drier regions. Therefore, is not advisable to undertake large planting of new and unproven hop varieties until the performance and hardiness in the region has been assessed and verified.

Markets

Proximity to markets is also a site consideration, especially when selling fresh (wet) hops. The product is highly perishable and quality will diminish rapidly if there is any delay in getting fresh hops to brewers in a timely manner. Long transport distances increase the carbon footprint of production, increase the cost of getting products to market and can reduce the quality of the product.

Labour

Hop production is labour intensive, particularly in the early spring and at harvest time. It is important to have access to sufficient labour resources of both the quantity and the skill necessary to undertake the proper production practices required in the hop yard.

Section Checklist

<i>Considerations When Establishing a Hopyard Site</i>		✓
1.	Assess the soils: drainage, slope, texture and fertility, and stoniness. (Soil tests.)	
2.	Assess the microclimate, orientation of the site to sun, and prevailing winds.	
3.	Take soil samples and send for testing.	
4.	Consult an agrologist to assist with site assessment.	
5.	Ensure access to sufficient water supply for irrigation.	
6.	Pilot trial rhizomes on proposed site before undertaking large plantings.	
7.	Check trial hop varieties with potential buyers (brewers).	
8.	Reasonable distances to markets.	
9.	Access to suitable labour recourses.	

*Useful Resources*

Perennia – Extension and Advisory (902) 678-7722 <a href="http://perennia.ca/site_assessments.php">http://perennia.ca/site_assessments.php</a>
Nova Scotia Department of Agriculture Regional Office Locations <a href="http://www.gov.ns.ca/agri/contactus/reps/arcs.shtml">http://www.gov.ns.ca/agri/contactus/reps/arcs.shtml</a>
Nova Scotia Department of Agriculture Analytical Services <a href="http://www.gov.ns.ca/agri/qe/labserv/index.shtml#analytical">http://www.gov.ns.ca/agri/qe/labserv/index.shtml#analytical</a>
Soil Survey Reports for Nova Scotia <a href="http://sis.agr.gc.ca/cansis/publications/surveys/ns/index.html">http://sis.agr.gc.ca/cansis/publications/surveys/ns/index.html</a>
Soils of the Annapolis Valley <a href="http://sis.agr.gc.ca/cansis/publications/surveys/ns/ns22/index.html">http://sis.agr.gc.ca/cansis/publications/surveys/ns/ns22/index.html</a>
Annapolis County Soil Survey <a href="http://sis.agr.gc.ca/cansis/publications/surveys/ns/ns16b/index.html">http://sis.agr.gc.ca/cansis/publications/surveys/ns/ns16b/index.html</a>
Digby County Soil Survey <a href="http://sis.agr.gc.ca/cansis/publications/surveys/ns/ns11/index.html">http://sis.agr.gc.ca/cansis/publications/surveys/ns/ns11/index.html</a>
Fertility Guide for Hops in the Northeast, UV <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/HopFertilityManagementNE.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/HopFertilityManagementNE.pdf</a>
2010 Organic Hop Variety Trial: Preliminary Results (Vermont) <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011_Hops_Variety_Trial_Report_final.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011_Hops_Variety_Trial_Report_final.pdf</a>
South West Nova Scotia Temperature and Solar Radiation Study 2011 Prepared by: David Colville (Research Scientist) or Wayne Reiger (Research Associate) Applied Geomatic Research Group, NSCC. Lawrencetown Campus <a href="http://agrg.cogs.nsc.ca/">http://agrg.cogs.nsc.ca/</a>

## 4.0 ESTABLISHING A HOP YARD

If proposed hopyard location meets all the requirements and passes the site assessment, the hopyard development can begin. This will include site preparation, trellis installation and planting rhizomes.

### *Site Preparation*

This involves preparing the site and amending the soil as required in preparation for planting the rhizomes. Site preparation can include, but not be limited to:

- Plowing and disking of the land.
- Subsoil plowing if determined necessary to break up hardpan.
- Addition of organic matter, compost, green manure crops, etc.
- The installation of drainage tile systems to reduce surface water pooling.
- Liming the soil to raise the pH level.
- Amending of the soil nutrients and micronutrients.
- Forming of the hop beds.

Site preparation requires access to equipment; including tractors, plows and discs, rototillers, fertilizer spreaders, etc. This equipment may be available to rent or depending on the area, custom services many also be possible. To prevent possible soil compaction, avoid using heavy equipment when soil is wet.

Hop yard trellis posts and rhizomes can be installed in year one with trellis wires added in year two as the rhizomes become more established and begin to grow.

### Trellis Systems

Hops require a trellis system to support the hop vine shoots (often called bines) as they grow. Shoots can grow 25 feet or more in one season and can develop a considerable weight. There are basically two types of trellising systems used in commercial hop production; (1) the standard high trellis system where the wires are supported 18-20 ft. above the ground and (2) the dwarf trellis system where wires are maintained at a height of 10-12 ft. The dwarf trellis systems are newer, and less proven than the standard trellis systems.

Both standard and dwarf hop trellis designs are under consideration in Atlantic Canada, but the industry is still young and the commercial success of different trellis systems has not had time to be fully proven in the region. Choosing a trellis system will require research as well as consultation with experienced hop growers and agronomists to determine which system is best for a particular site. A trellis system basically consists of wooden poles, wire/cable, clamps, fittings and ground anchors. The size of poles and the amount of each trellis item required will vary with the trellis design.

### The Standard Trellis System:

In a standard trellis system poles need to be 20 to 22 feet long and a minimum of 6" in diameter. Hardware should be attached to poles before they are installed to make installation easier. It is best to use cedar or tamarack poles to extend the life of the pole and reduce rot. The poles should be placed 4 feet into the ground extending below the frost line. Poles will need to be replaced overtime as they will eventually decay and breakdown. Poles are installed approximately every 5 or 6 plants depending on spacing. The University of Vermont

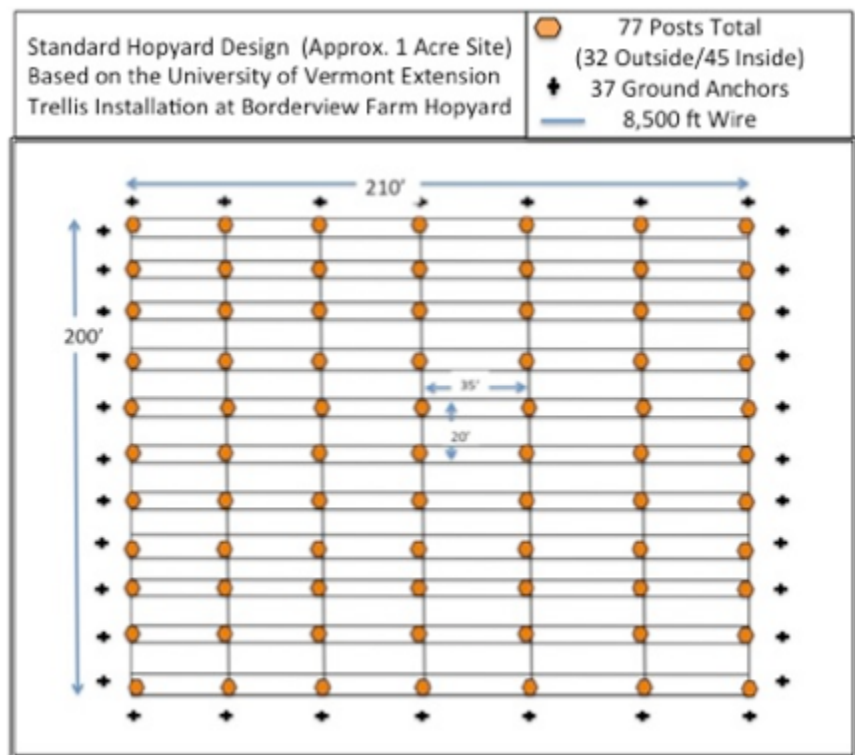


Figure 2

design spaces poles 20' by 35' apart. Inside poles are placed upright and end poles are angled outward at 60°-65° to add strength and support to the trellis system. Wires that secure the trellis in all directions connect the poles. Major wires need strength; 3/8" or 5/16" aircraft cable is flexible, easy to work with and found to be very strong. Trellis wires are fastened to the ground using various turnbuckles and anchoring devices. The method used to anchor wires to the ground will depend to a large degree on the site conditions, the structure of the soil and an individual's innovation. It is important that the ground anchors are solidly secured, as they must hold the weight of the entire trellis, the mature hop bines and maintain the units integrity under windy conditions. Two excellent sources of more detailed trellis construction information are Rebecca Kneen's (Left Fields, BC) Small Scale & Organic Hops Production Guide and the University of Vermont's Borderview Farm Building a Hopyard PowerPoint presentation. (See resource section for links.)



Photo 5 - Standard Trellis Hopyard - Courtesy of Viliam Zvalo (Perennia)

### Support Twines

Coir fiber twines are strung in a V shape from the top wire and anchored to each hop plant at the ground. The vines are either strung parallel to the hop beds or perpendicular creating an arch in the alleyway. The second method requires tying twines at about the 5ft level to facilitate cultivation and maintenance. Two to three vine shoots are trained up each twine and the remainder are pruned away. Often one extra vine shoot is left for a short period as a replacement vine.

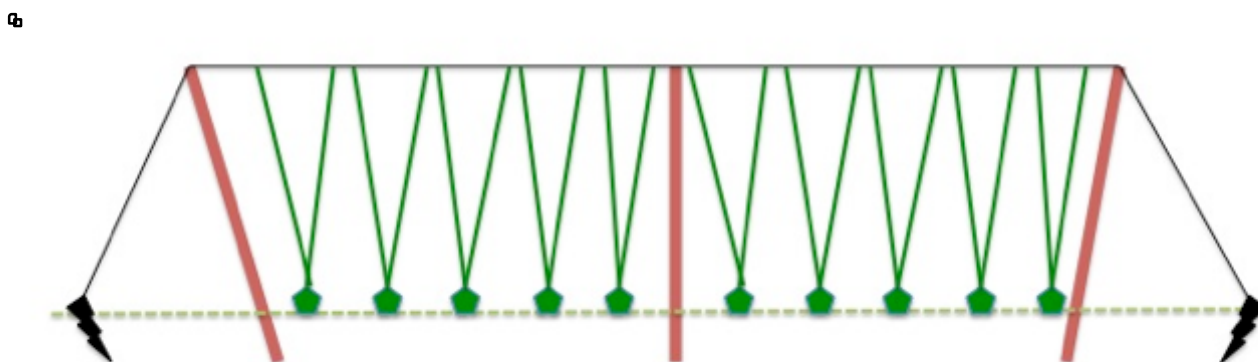


Figure 3 – Diagram of Hop Support Training Twines

### The Dwarf Trellis System

The dwarf trellis systems are newer systems and less proven in the conditions of the east coast, but may have benefits and applications for the small-scale hopyard. Poles are much shorter only 10-12 feet above the ground, which results in overall lower hopyard establishment costs. The downside of the dwarf system is lower total hop yields and a risk of increased disease problems as a result of reduced air circulation. Benefits of a dwarf trellis system are that it costs less to set up, makes manual harvest and vine management easier and may reduce potential damage from high winds. The main challenge is that many of the traditional hop varieties grow too aggressive for a dwarf trellis system and that most hopyard equipment is designed for the standard trellis system. Also, many of the dwarf hop varieties are patented and rhizomes may be more expensive to purchase and supplies limited. Hop production using a dwarf trellis system is an area of much research activity and it should be monitored for application under Nova Scotia growing conditions.



Photo 6 - Dwarf Trellis Hopyard - Courtesy of Viliam Zvalo (Perennia)

*Gorst Valley Hops of Wisconsin is a company that is focused on solving the problems faced by the small-scale hop grower. They have developed proven business models, hopyard designs, processing equipment and best management practices for small-scale hop production. (<http://www.gorstvalleyhops.com/>)*

### Rhizome Planting

To establish a standard one-acre hopyard typically requires between 800 and 1100 rhizomes depending on the row spacing. There is a variety of spacing distances used between rows and between hop plants. Spacing is often adjusted to accommodate for the size of the farm's cultivation equipment. Sometimes between the rows is spaced wider with plants spaced closer together within the rows. Large hopyards will often space wider between plants to allow for cultivation in both directions. Standard spacing is approximately 7.5 feet by 7.5 feet, which allows for the use of a 6ft tiller or cultivator between plants. Spacing has an influence on air circulation in the hopyard and crop yield. Dwarf trellis systems may increase the number of plants per acre to make up for reduced yields.



Photo 7 - Planting Rhizomes - Courtesy of Meander River Farm

New rhizomes lose vigour over time and should be planted as soon as possible. Rhizomes need to be planted in good loam soil 1-2 inches below the surface with buds facing up. It is worthwhile spending the time to prepare the soil prior to planting rhizomes, as it will help the plants get a good start.

### Hopyard Establishment Costs

The cost of constructing a hopyard can vary dramatically depending on the chosen design, and the availability of poles, trellis construction materials and supplies. The number of poles, amount of wire required and the number of rhizomes planted can also vary with different hopyard designs. There is an abundance of trellis design, construction information and rhizome planting information available from a quick Internet search. Some excellent sites are listed in the resource section. It will also be useful to visit other hop growers and examine any research trails and studies that have been undertaken in the region and Eastern North America.



Photo 8 - Placing Trellis Poles - Courtesy of Meander River Farm

The main costs of the establishing a hopyard involve:

- The purchase of the land
- Land preparation before planting
- Soil amendments required
- The purchase and installation of the trellis system (poles, wires, and accessories)
- Cost of the hop rhizomes
- Equipment rentals for installing poles and wires
- Labour to prepare land, plant rhizomes and install the trellis system

The cost of establishing a hop yard will ultimately depend on the resources that are available to the developer including; access to land, equipment, trellis materials and labour. Some hopyard developers may have woodlands with access to poles, or the ability to source low cost wire and fittings and low cost labour. This totally depends on the resourcefulness of the developer.

The following is an estimate of the cost of developing a one-acre hopyard. The trellis costs are based on the University of Vermont's Borderview Farm .75-acre hopyard construction project costs. The project has accurate cost accounting of for all materials, equipment and labour. (See link in Useful Resources.)

The estimate does not include land costs, labour, other infrastructure such as buildings, standard farm equipment (tractor), maintenance equipment, harvesting equipment, irrigation filters and pumps, and processing equipment, or storage facilities. The assumption is that there is access to

water and that some basic farm equipment is available. Labour rates were not included, as these will vary with each farm.

***Budget: Hopyard Development Cost (1 Acre) (208' x208')***

*(Note this is an estimated cost based on the available information.)*

Site Preparation	\$	Total \$
Land preparation (tractor, disking, sub-soiling, rototilling)	\$500	
Tile drainage (Site specific need.)	\$4,000	
Soil amendments (Lime, fertilizers, etc.)	\$1,500	
Subtotal	\$6,000	\$6,000
<b>Trellis Installation</b>		
Field posts (77 posts - 32 outside/45 inside)	\$1,925	
Wire (8,500 ft.)	\$2,312	
Ground anchors (38)	\$700	
Miscellaneous (Clamps and fittings)	\$980	
Bobcat and auger rental install poles	\$700	
Tractor 60 hours (lift)	Not Included	
Labour estimated at (80 hours)	Not Included	
Subtotal	\$6,617	\$6,617
<b>Irrigation System</b>		
Irrigation system (lines only)	\$2,290	
Labour install estimated at (40 hours)	Not Included	
Subtotal	\$2,290	\$2,290
<b>Rhizome Installation</b>		
Plants (Hop Rhizomes) 1000 /acre @\$2 each	\$2,000	
Labour estimated at (40 hours)	Not Included	
Subtotal	\$2,000	\$2,000
<b>Total Estimated Establishment Cost</b>		<b>\$16,907</b>

***Section Checklist***

<i>(Considerations When Establishing a Hopyard)</i>		✓
1.	Researched different hopyard designs. (Standard and dwarf systems)	
2.	Talked with local hop growers to determine trellis systems that work in Nova Scotia.	
3.	Explore Gorst Valley Hops small-scale hopyard designs.	
4.	Identify local sources of trellis materials and poles.	
5.	Prepared site including soil amendments and drainage.	
6.	Added lime and fertilizers as required adjusting the soil nutrient values.	
7.	Order rhizomes early to ensure desired varieties are available.	
8.	Plant varieties that allow sequential harvest.	
9.	Identify suitable methods of ground anchoring trellis wires.	
10.	Identify systems and safe methods to string high trellis wires.	



*Useful Resources*

University of Vermont Northwest Crops & Soils Program Website (Hop information links & useful videos.) <a href="http://www.uvm.edu/extension/cropsoil/hops">http://www.uvm.edu/extension/cropsoil/hops</a>
Hopyard Feasibility Study New England <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/hops-feasibility-study.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/hops-feasibility-study.pdf</a>
Washington State University Hop Cost of Production Templates <a href="http://impact.wsu.edu/IMPACTProjects.html">http://impact.wsu.edu/IMPACTProjects.html</a>
Hop Yard Budgeting: construction and Economics Edward Page and Ron Godin, University of Colorado <a href="http://www.msue.msu.edu/objects/content_revision/download.cfm/revision_id.532409/workspace_id.-30/Hops-Hopyard Construction: Budgeting and Economics.pdf">http://www.msue.msu.edu/objects/content_revision/download.cfm/revision_id.532409/workspace_id.-30/Hops-Hopyard Construction: Budgeting and Economics.pdf</a>
Borderview Research Farm – Building a Hopyard <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/Rainville-Building-a-Hopyard.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/Rainville-Building-a-Hopyard.pdf</a>
Julien Venne, M.Sc. Agronomist CREDETAO 2012 Presentation Hop Production <a href="http://credetao.tumblr.com/achat">http://credetao.tumblr.com/achat</a>
UVM Extension NW Crops and Soils Hop Info Sites <a href="http://www.uvm.edu/extension/cropsoil/hops">http://www.uvm.edu/extension/cropsoil/hops</a>
Borderview Research Farm – Hopyard Construction Costs <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/Hopyard-labor-materials-costs.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/Hopyard-labor-materials-costs.pdf</a>
UVM Extension -Borderview Research Farm –Hopyard Irrigation System Costs <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/Hopyard-irrigation-materials-costs.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/Hopyard-irrigation-materials-costs.pdf</a>
Scotian Gold Cooperative Ltd., Coldbrook, NS – Grower Supplies and Hopyard Materials <a href="http://www.scotiangold.com/agri-services">http://www.scotiangold.com/agri-services</a>
Setting Up A Hop Yard <a href="http://www.usahops.org/index.cfm?fuseaction=hop_info&amp;pageID=7">http://www.usahops.org/index.cfm?fuseaction=hop_info&amp;pageID=7</a>
USDA Hops Website <a href="http://www.ars.usda.gov/Main/docs.htm?docid=11069">http://www.ars.usda.gov/Main/docs.htm?docid=11069</a>
American Hop Museum Establishing a Hop Yard <a href="http://www.americanhopmuseum.org/hopgrowingseason.htm">http://www.americanhopmuseum.org/hopgrowingseason.htm</a>

## 5.0 HOP YARD PLANNING

When developing a hop yard or any production-based business, there is a strong tendency to focus on the product, “growing the hops”. While producing a quality product is important, business success does not come only from growing hops; there also needs to be a validation of the hop markets to ensure that someone (microbrewers) will want to buy the hops that are produced. Undertaking pilot hop variety trials will be useful and help to mitigate the risk of growing the wrong varieties, as well as help to facilitate validation of the market opportunity with brewers. If there is no market for the hops produced, then there is no real business opportunity. The development of a business plan will help new hopyard developers to validate the market opportunity and outline how they intend to capture a share in the hop marketplace.

### The Business Plan

A business plan is a means to an end, and it will be a guide on the path to developing a new hopyard. There is no guarantee of success having a business plan, but in today's competitive business environment it will likely be much more difficult to succeed, without one. A business plan helps to focus attention on the priorities and the strategies necessary to achieve the desired goals. A plan is a tool to help monitor, benchmark and measure a hopyard's development, progress and growth over time. A good business plan will help determine if the business is moving forward, backwards, or simply standing still. Planning helps to better identify, analyze and evaluate business opportunities and options, as well as to make better and more informed management decisions.

#### *It is not only about the business plan document!*

There is a difference between the planning process, the plan document and the implementation of a business plan. The greatest benefits realized from business planning are what is learned going through the business planning process, not the resulting plan document.

- The **business planning process** helps to discover where it is business wants to go and defines how it plans to get there.
- The **plan document** is a means to clarify and share the vision, objectives, goals and strategies with others.
- When actions are taken to **implement the strategies**, then the plan becomes a reality.

Everyone has his or her own unique reasons for wanting to become a hop farmer. However, from a business management perspective hopyard owners are going into hop farming for three basic reasons:

- (1) To run a successful and profitable hop yard business.
- (2) To create long-term security for retirement.
- (3) To eventually sell, or pass the hop yard business on to someone else.

A business plan typically consists of:

- Business Information: Details about the business, resources available, the management team and who is available to mentor and help develop the project.
- Project Details: A description of what the hopyard project entails, what it will cost and how long it will take to develop.
- The Marketing Plan: It defines the hop market opportunity, the competitive environment, the distribution channels, who will buy the hops, the unique selling attributes (value proposition), at what price, and how the business intends to capture a share of the competitive hop market.
- The Production Plan: What resources are required to grow hops (land, equipment and buildings), the unit costs and the production strategy.

- **The Human Resource Plan:** What human resources are required to operate the hop yard, what skills are required, how those skills will be developed and what people will be paid.
- **The Financial Plan:** It outlines and details the project costs, when the funds are required, how it will be funded and for how long the funds will be required. It also includes pro-forma financial statements including: balance sheet, income statement and cash flows.
- **Supporting Resources:** These are resources that confirm or expand upon the information included in your business plan such as: resumes, quotations, equipment details and detailed financial histories.

If there is a need for financing the new hop yard, potential lenders or investors will ask to see a business plan. A business plan can be done in-house or a consultant can be hired to prepare one. There are many useful and helpful resources available to assist in the development of a business plan for a new hopyard. **To determine what business planning assistance is available contact a Regional Enterprise Network Office or one of the regional Nova Scotia Department of Agriculture offices.**

#### *Business Management*

Even with a small hop farm there is a demand for the grower to be an expert: in the hop field, as an office manager and as an expert marketer. A skilled business manager works to keep production costs down, manages the staff performance, anticipates market change and maintains good record of the business operations and finances. Good record keeping supports better decision-making and allows a hopyard manager to benchmark changes in the business from year to year and to make the necessary adjustments and improvements. What cannot be measured cannot be managed.

#### *Certifications*

If planning on becoming a certified organic hop grower the hopyard will need to become certified. The Atlantic Canada Organic Regional Network (ACORN) can help to identify the process and requirements necessary to become a certified organic hop grower.

ACORN Atlantic Canada Organic Regional Network

<http://www.acornorganic.org/>

Toll free: 1-866-322-2676

#### *Financing a New Hop Yard*

The development of a commercial scale hop yard requires a financial investment into land, plants, trellis systems, equipment, and building infrastructure. The hop yard can be financed through the investment of one's own resources (equity) or through debt financing (loans & mortgages).

The following are the traditional lenders to agriculture and agricultural based businesses in Nova Scotia:

- The Nova Scotia Farm Loan Board (NSFLB)
- Farm Credit Canada (FCC)
- Commercial Banks & Credit Unions
- Community Business Development Corporation (CBDC)

For further information on financing a hop yard, individuals should contact one of the institutions above to determine interest rates, down payment requirements, lending programs and available products.

Development Assistance

There are also various agriculture programs available to assist in the development and expansion of farm enterprises. These programs change from year to year. For information on what development programs are available, contact a regional office of the Nova Scotia Department of Agriculture. Most agriculture development programs require that the business be a farm registered with Access Nova Scotia.

Section Checklist

		✓
1.	Talk to a Regional Enterprise Network Office or a Nova Scotia Department of Agriculture Regional Office to discuss creating a business plan.	
2.	If planning to grow certified organic hops, contact ACORN or COG to determine certification requirements and process.	
3.	Talk to financial institutions to determine their lending criteria in regards to hopyard development.	
4.	Explore development and assistance programs available through the Department or Agriculture and other government agencies.	

Useful Resources

Nova Scotia Department of Agriculture Regional Office Locations <a href="http://www.gov.ns.ca/agri/contactus/reps/arcs.shtml">http://www.gov.ns.ca/agri/contactus/reps/arcs.shtml</a>	
Access Nova Scotia <a href="http://www.gov.ns.ca/snsmr/access/default.asp">http://www.gov.ns.ca/snsmr/access/default.asp</a>	
Nova Scotia Farm Loan Board Long term fixed interest loans, new entrant interest forgiveness program. <a href="http://www.gov.ns.ca/agri/farmlb/">http://www.gov.ns.ca/agri/farmlb/</a>	
Farm Credit Canada A variety of loans, programs and resources for agricultural business. <a href="http://www.fcc-fac.ca/en/aboutus/officeresults_e.asp?provField=NS&amp;cityField=Kentville&amp;Submit=Submit">http://www.fcc-fac.ca/en/aboutus/officeresults_e.asp?provField=NS&amp;cityField=Kentville&amp;Submit=Submit</a>	
Community Business Development Corporation (CBDC) Assist in the creation of small businesses and in the expansion and modernization of existing businesses	

by providing financial and technical services to entrepreneurs.

[http://www.cbdc.ca/ns/annapolis\\_ventures\\_index](http://www.cbdc.ca/ns/annapolis_ventures_index)

Industry Canada – Starting a Business

[http://www.ic.gc.ca/eic/site/icgc.nsf/eng/h\\_07064.html](http://www.ic.gc.ca/eic/site/icgc.nsf/eng/h_07064.html)

## 6.0 HOP YARD MANAGEMENT

Once a hopyard has been established, the annual operations need to be managed effectively to achieve the required production levels and desired hop cone quality. A hop yard manager only gets to grow 25 to 30 hop crops during their career so each crop counts. Record keeping from year to year in regards to field production is a good business management strategy that helps improve decision-making and best management practices. A skilled hopyard manager works to keep production costs down, while improving; fertility, cropping practices, irrigation management, and disease/pest control to maximizing the production of each hop plant. To maximize total crop yields the health and yield of each individual plant is very important.

### *Annual Hopyard Production Activities*

The following is an outline of the many different activities that need to be performed in the hopyard each year.

Spring Activities	<ul style="list-style-type: none"> <li>• Soil sampling to determine fertility requirements</li> <li>• Application of fertilizers and amendments</li> <li>• Pruning of hop crowns</li> <li>• Cleaning up materials from previous year</li> <li>• Set training wires or coir fiber lines</li> <li>• Train shoots (wrap clockwise) two per wire + one spare (left middle)</li> </ul>
Summer Activities	<ul style="list-style-type: none"> <li>• Weed control &amp; mowing</li> <li>• Application of fertilizers and amendments</li> <li>• Scouting for pests and disease</li> <li>• Tissue/leaf analysis testing</li> <li>• Disease control measures</li> <li>• Irrigation management</li> </ul>
Fall Activities	<ul style="list-style-type: none"> <li>• Weed control &amp; mowing</li> <li>• September harvest</li> <li>• Remove cones from vines</li> <li>• Clean up hop year debris for winter</li> <li>• Winterize irrigation lines</li> <li>• Fall pest and disease management</li> </ul>
Winter Activities	<ul style="list-style-type: none"> <li>• Cold storage</li> <li>• Hop processing</li> <li>• Hop marketing and sales</li> </ul>

Labour Requirements

Hopyard labour requirement need is greatest in spring (trim the crowns, set the training wires and train the vines) and again in fall for the harvest (to cut down the vines, transport them to a cleaning area, picking the cones from the vines, process and dry cones, packaging hops and fall clean up).

In a small-scale hopyard one fulltime worker with part-time help should be able manage most of the general production activities except during spring and harvest. It is best to consult with local hop yard growers to determine the annual labour requirements for a small-scale hopyard.

Hop Production Knowledge

A hopyard field manager needs to learn and understand hop plant growth, rhizome and shoot management, soil testing, hop vine training, hop nutrient requirements, pest and disease management, integrated pest management, organic methods, irrigation systems, weed control and hopyard cultivation techniques.

Hopyard Operating Expenses

There is an annual cost of resources for operation of a hopyard. The table below outlines an estimate of some of the potential annual costs of maintaining a hopyard. (It does not include labour costs.) These costs will vary from site to site depending on production practices, production system, soil conditions, and weather.

Estimated Annual Operating Resource Costs

Annual Hopyard Operating Expenses (Estimated for One Acre)	\$
Soil Testing & Tissue Analysis	\$150
Fertilizers and Micro-nutrients	\$500
Coir Fiber Lines for Training Vines	\$150
Pest Management Control Materials	\$300
Weed Management Control Materials	\$200
Irrigation Expense	\$200
Trellis Repair and maintenance	\$250
Total	\$1,750

(Note: These costs are estimates based on information available at the time of this report, actual cost may vary with each hopyard.)

Time to Reach Hop Plant Maturity

It typically takes four years for a hop plant to reach full maturity. The results in the chart are anticipated results based on the achievement of good cultural practices, a supportive growing environment and a skilled producer. These estimates based on the 2009-2010 New England

Commercial Hop Production Study.<sup>3</sup> (Note: Yield/production data is currently not available for Nova Scotia growing conditions to confirm these projections.)

Year One	Year Two	Year Three	Year Four
Harvest 0%	Harvest 40%	Harvest 80%	Harvest 100%

*Section Checklist*

		✓
1.	Annual soil and leaf testing and analysis.	
2.	Continue to upgrade hop production skills, attend conferences and visit other growers.	
3.	Trim hop crowns early spring.	
4.	Train hop shoots on trellis ropes.	
5.	Manage fertility, weeds and irrigation.	
6.	Budget for hopyard operational expenses.	
7.	Focus on each plant achieving full productivity.	

*Useful Resources*

USA Hops – Outlines Seasonal Hop Production Activities <a href="http://www.usahops.org/index.cfm?fuseaction=hop_info&amp;pageID=1">http://www.usahops.org/index.cfm?fuseaction=hop_info&amp;pageID=1</a>
Information for Small Scale Hop Growers <a href="http://www.gorstvalleyhops.com/production.php">http://www.gorstvalleyhops.com/production.php</a>
ATTRA Hops: Organic Production Report <a href="http://hops.msu.edu/uploads/files/organic_hops.pdf">http://hops.msu.edu/uploads/files/organic_hops.pdf</a>
Oregon Hop Commission- Hop Culture Information <a href="http://www.oregonhops.org/index.html">http://www.oregonhops.org/index.html</a>
Heidi Oran – How to Grow Hops (COG) <a href="http://www.cog.ca/uploads/TCOG_Articles/How_to_Grow_Hops.PDF">http://www.cog.ca/uploads/TCOG_Articles/How_to_Grow_Hops.PDF</a>
Rebecca Kneen, Left Fields, Small Scale & Organic Hops Production Guide <a href="http://www.crannogales.com/HopsManual.pdf">http://www.crannogales.com/HopsManual.pdf</a>

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<sup>3</sup> 2010, Rosalie Wilson, 2009-2010 Feasibility and Market Research Study for Commercial Hop Production in New England

## 7.0 HOP PEST & DISEASE MANAGEMENT

There are many diseases and pests that can affect and impact the growth and health of a hop plant in a commercial plantation. In the early 20<sup>th</sup> century the hop industry in the USA migrated from the wet northeastern states to the drier northwestern states as a result of a devastating downy mildew infestation. Disease and pest infestations are also more likely to occur as a result of poor cultural practices, poor site locations and plants weakened due to poor fertility and nutrition. Growers can study and learn pest & disease management skills on their own, seek counsel from Department of Agricultural extension agents, or hire private consultants and crop scouts. Proactive and preventive methods combined with good cultural practices are effective actions to help reduce incidents of disease and pest infestation.

### Site Impact

Factors, which influence microclimate, can have prominent effects on disease and pest concerns. Breezy sites sloping into afternoon sun will help to reduce the development of most pest and disease issues in hops plantings. Conversely areas of poor air circulation, high humidity or fog and early day shade may increase the reliance on intervention sprays in both organic and conventional systems.

### Pest Management

Typical hopyard pests such as aphids, spider mites and leaf eating caterpillars will develop in the Nova Scotia climate. The Eastern Comma Caterpillar in the photos below has been a damaging pest in Nova Scotia hopyards. The pictures illustrate the larva and egg stage. Examination of possible pest control strategies should be investigated to ensure compatibility with a desired system of production (conventional vs. organic). Both significant reductions in yields and quality of the hops crops can be experienced in the presence of these pests. New growers would be expected to understand these pests, their life cycles and their avoidance or control possibilities. Deer grazing can also be a problem in some hopyards and fencing to keep out deer may be necessary in some locations.



Photo 9 - Eastern Comma Caterpillar (Left larva, right eggs on underside of leaf.) WNC Vegetable and Small Fruit News



### Disease Management

Diseases such as powdery and downy mildews should be investigated thoroughly as they typically occur in all production areas throughout North America and normally affect many crops in Nova Scotia. Intervention measures are common in the region to protect crops from the pathogens causing these diseases. Verticillium is a fungus transmitted by spores that cause plants to wilt and it typically affects the lower parts of the hop plant; low leaves, the crown and the roots. The fungus spores can remain dormant in the soils for a long time and it is difficult to get rid of them once established. In hop production; special attention should be given to plan cultural practices that will assist in pathogen management. Trellis systems, both dormant and summer pruning, and hop yards sanitation measures can have significant impact on reducing disease pressures. Cultivation of soils can spread diseases within a hopyard. New growers should ensure sufficient resources are available in new plantings to deal with disease issues. It should also be emphasized again, the importance of purchasing disease and pest free hop rhizomes so not to introduce new problems into the existing hopyard.

### Cultural Practices

The control of surrounding vegetation that may be reservoirs for insects, a disease inoculum or weed seed is recommended for the new planting. Removal, cultivation or burial of plant residues should be a basic pillar of hop production. Significant hand labor is required for many operations so consideration should be given to training and development of staff in these areas of sanitation and correct horticultural practice. Pruning and training will have significant effects on both pests and disease progress as well and offer rewards in quality and yield in this crop.

### Weed Control

Weeds can be significant competitors to the growth and development of young plants in the new hop yard. The elimination of problem weeds before planting will encourage rapid growth of healthy hop vines and early higher yields. Cultivation and hand labour will be required to assist in growth and elimination of pest reservoirs. Flaming as a weed control can be effective if done on a timely basis but is high in cost and requires many safety precautions. Other cultural techniques such as mulching may be beneficial but a plan should be developed that it works in conjunction with the important crown trimming and management.

### Varietal Resistance

There is much hop plant breeding activity in regards to disease and pest resistance being undertaken around the world. New hop plant varieties are being developed with improved resistance to some diseases and pests. Varieties with resistance to mildew in particular will be beneficial to hop growers in Southwestern Nova Scotia and should be utilized if there is a market for these hops.

Integrated Pest Management (IPM)

Modern IPM recognizes the need to determine levels of pest tolerance levels in crops. Control measures utilize all types of control strategies including cultural, biological and chemical. Bio-Pest Control agents such as beneficial fungi, beneficial bacteria and beneficial insects all are available and should be examined for their suitability in the specific hop yard control procedures.

Many of these bio-pesticide and beneficial organisms have been found effective against two-spotted spider mite, various aphids, leaf feeding caterpillars, beetles and various weeds. IPM systems may vary from conventional systems in the amount of pest damage that is tolerated. It is important to determine the significance of both yield and quality parameters for each specific market situation

Pesticide Applicator's Certification

The purchase and application of agricultural pesticides by a farm must be undertaken or supervised by a person with a Pesticide Applicators' Certification. In Nova Scotia the pesticide applicator certification is a 4-day course and it must be periodically updated and renewed.

Pesticide Herbicide Application

- Always read the pesticide label and follow specific directions.
- Use properly calibrated spray equipment to apply uniform coverage.
- Understand pesticide application times.
- Wear personal safety and protection as defined by the pesticide label.
- Be aware of pending weather conditions.

Potential hop growers should consult with extension agents, private consultants or crop scouts in the region. Disease and insect diagnostic resources at Perennia Inc. should be contacted to identify suspected pest problems.

Section Checklist

		✓
1.	Someone in the organization has a pesticide applicators license.	
2.	A strategy is in place to identify and manage diseases and pests in the hopyard.	
3.	Hopyard operational practices are established to minimize disease and pests.	
4.	Grow hop varieties that have resistance to hop diseases and in particular mildews.	
5.	Buy rhizomes from reputable sources.	
6.	Know who to contact in the case of a pest or disease outbreak?	

*Useful Resources*

University of Vermont Scouting Reports 2011/2012 <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011_Hops_Scouting_Report.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011_Hops_Scouting_Report.pdf</a> <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/VT_Hops_Scouting_Report_June_2012.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/VT_Hops_Scouting_Report_June_2012.pdf</a>
Nova Scotia Department of the Environment (Pesticide application) <a href="http://www.gov.ns.ca/nse/pests/applicatorcert.asp">http://www.gov.ns.ca/nse/pests/applicatorcert.asp</a>
Health Canada PMRA: Listings of Registered Pesticides and Bio-pesticides. <a href="http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php">http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php</a>
Pest Management Consultation in Nova Scotia <a href="http://perennia.ca/our_people.php">http://perennia.ca/our_people.php</a>
University of Vermont Various Disease and Pest Management Information Links <a href="http://www.uvm.edu/extension/cropsoil/hops">http://www.uvm.edu/extension/cropsoil/hops</a>
Cooperative Extension Washington State University (Field Guide for IPM in Hops) <a href="http://ipm.wsu.edu/field/pdf/HopHandbook2010.pdf">http://ipm.wsu.edu/field/pdf/HopHandbook2010.pdf</a>
Western North Carolina Vegetable and Small Fruit News – Eastern Comma Caterpillar Information <a href="http://wncveggies.blogspot.ca/2010/05/hops-pest-eastern-comma-butterfly.html">http://wncveggies.blogspot.ca/2010/05/hops-pest-eastern-comma-butterfly.html</a>
Book: Compendium of Hop Diseases and Pests <a href="http://www.apsnet.org/apsstore/shopapspress/Pages/43764.aspx">http://www.apsnet.org/apsstore/shopapspress/Pages/43764.aspx</a>
Northwest Michigan Horticultural Research Center – Insects in Hops <a href="http://www.msue.msu.edu/objects/content_revision/download.cfm/revision_id.539174/workspace_id.-30/Hops-Insects_in_Hops.pdf/">http://www.msue.msu.edu/objects/content_revision/download.cfm/revision_id.539174/workspace_id.-30/Hops-Insects_in_Hops.pdf/</a>

## 8.0 HOP HARVEST & POST HARVEST HANDLING

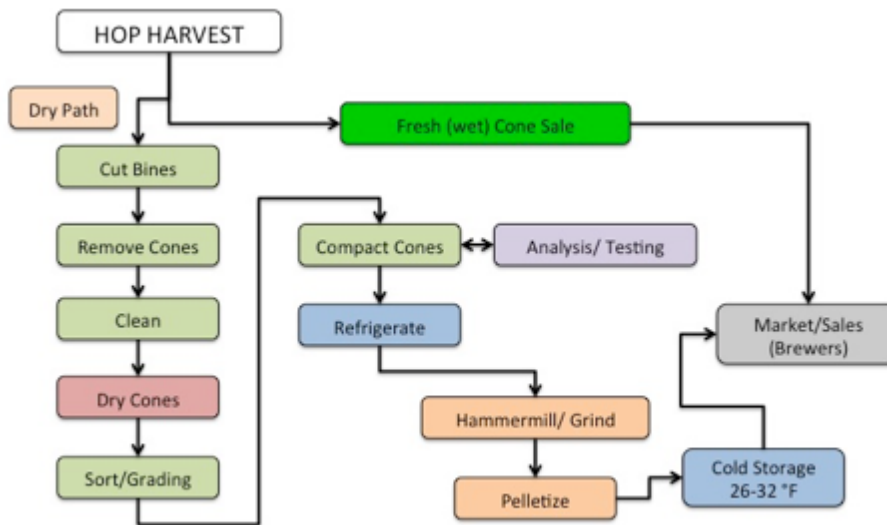
### *Harvest Timing*

The harvesting of hops in Nova Scotia typically takes place in the month of September when the hop cones have reached the proper maturity and moisture levels. Hops cannot be harvested during times of rainy weather and the typical Nova Scotia fall weather can create hop-harvesting challenges for growers. High winds or hurricanes prior to harvest are also a serious issue and can cause significant damage to hop cone quality and potentially ruin the crop’s value. Timing of the harvest is critical; if the hops are harvested too early the alpha/beta acids and essential oils will not have had time to develop to their peak levels and harvesting too late also causes a loss in quality of the acids and oils; both situations will result in lower returns from the marketplace.

Knowing exactly when to harvest hops is a skill that growers develop over time and as they gain more hop production experience. Hops are ready for harvest when the cones are approximately 80% moisture. A ripe, mature cone has a springy texture and is sticky to the touch. It will have a strong hop odour and the yellow lupulin is visible. Hop cones that have not quite reached maturity feel moist and stay compressed when squeezed and don’t have visible yellow

lupulin. Experienced growers may also use hop smell to determine if the crop is ready for harvest. If the hop cone passes the squeeze test, the grower will make a vertical cut into the hop cone with a knife to inspect the inside. If the lupulin inside is golden yellow and sticky the hop cones are ready to be harvested.

*The Hop Harvest Process*



Hops are harvested and sold mainly in two different ways:

- 1) Fresh (wet) hops – are sold directly from the field to breweries. This must be coordinated closely with the brewers as the fresh hop is very perishable.
- 2) Dry hops – to make dry hops, fresh hops are dried, packaged and held in cold storage until sold or further processed. The majority of hops are sold in a dried format.

*Field Harvest*

When it is determined that the hops are ready to be harvested, the small-scale hop producer may pick directly from the bine in the field using a ladder or a lift. Alternatively, in larger hopyards the training wire or coir twine line is cut at the bottom (ground level) and then at the top from the trellis and the bines are loaded onto trucks or wagons and then moved quickly from the field to a processing area for picking and cleaning.



Photo 10 - Picking Hops Off Bines - Courtesy Meander River Farm

### Hop Picking, Cleaning

Hop picking is very labour intensive when done manually. It is estimated that it takes one hour for one person to manually pick 1 lb of dried hops. Hops lose weight through the drying process at a ratio of approximately 5:1. Small-scale growers will find it very difficult to justify the economics of investing into automated hop picking equipment. Access to mechanical harvesting and secondary processing equipment are two of the major hurdles facing the small-scale hop grower. Semi-mechanical harvesting can increase efficiency to 1lb picked in 3 minutes verse one hour. As mentioned previously, Gorst Valley Hops has focused on the development of small scale harvesting and processing equipment for the hop industry and in 2012 introduced a small-scale hop vine harvester/cleaner that was selling for approximately \$13,000 per unit.

### Drying



Photo 11 – Dried Leaf Hops



Photo 12 - Home Brewer Package Leaf Hops 2 oz.

Before hop cones can be dried they must be sorted from the leaves and chaff. Care must be taken during the hop cone drying process as excessive heat can destroy hop quality and market value. Hops are dried quickly using an even heat source 50 to 60 degrees Celsius in a hop oast (dryer). The drying process requires good airflow through the hop cones to ensure even drying. When hop cone moisture reaches 8-10%, which can usually be achieved within 8-12

hours of drying, they are then cooled to a temperature of 20 degrees Celsius and compressed or vacuum-sealed into packaging and then placed in cold storage. Suitable drying oasts are often fashioned from recycled tobacco kilns, ginseng and grain dryers or are the result of the farmer's ingenuity. A search of the Internet will yield numerous designs and plans for building a small-scale homemade hop oast. Prior to vacuum packaging hops are pressed into blocks to reduce the volume as well as to remove as much air as possible to reduce potential oxidation of the hops. Small-scale hop producers often modify home trash compactors for hop pressing. The vacuum packaged hops are stored in a freezer until further processed or they can be sold.

Once dried hops are sold in two main formats:

- 1) Dried whole hop cones – are dried, compressed, vacuum packaged and stored in a freezer until shipped to market.

- 2) Pelletized hops – are hops that have been dried, blended for standardization, hammer milled, pelletized, packaged and stored in a freezer until sold.

Some microbrewers use dried whole hop cones in their brewing. However they have to be set up to handle leaf/cone hops, as they can be difficult to clean out of the brewing vats. Most microbrewers use pelleted hops for the convenience. Pellets offer brewers consistency in alpha/beta acid levels and the pellet format is available in volume supply year round. Early communication with target market brewers will determine the format that they will require or prefer.

Further Processing- Pelletizing

Even a small pellet mill can be a large investment for the small-scale hop producer. In addition to the further processing equipment, a building is required to house the equipment from the weather and create a dry area in which to work. The investment into a hop processing facility could be more feasible if undertaken by a group, cluster or co-operative of small-scale hop producers.



Photo 13 - Pelleted Hops

Further Hop Processing Equipment Costs

The table below illustrates estimated prices for purchasing small-scale hop processing equipment. The price will vary with the manufacturer and the size of equipment purchased. Further cost savings may be possible by purchasing used hop processing equipment.

Post Harvest Equipment Estimates

Harvest - Post Harvest Equipment	Estimated Cost \$
Automated hop vine (bine) cleaner sorter	\$12,000 - 15,000
Small scale leaf chaff screener	\$5,000
Bale compressor	\$3,500
Vacuum packer	\$2,500
Hammermill (Small scale)	\$1,700
Small scale pelletizer	\$2,400
Mini oast – for one acre of hops	\$5,000
Commercial cold storage room and compressor (8' x8')	\$8,000 - \$10,000
Home Style Deep freezer (24 cubic feet)	\$1,000
Commercial Vacuum Packer with Nitrogen Flush	\$25,000
Combined Hammermill/Pelletizer Unit	\$36,000

As brewers have more success using locally produced wet hops to develop their branded beer products, this will likely lead to the need for further hop processing, pelletizing and storage facilities to supply those hops year round to those microbrewer. Small scale hop processing has

the potential to add value to hops and produce a local quality hop product that could over time be branded and marketed at premium price.

*Hop Packaging*

Special packaging is necessary to prevent oxidation and deterioration of the resins and oils. The industry uses fairly standardized packaging for hops. Hops are packaged into 2 oz, 5 oz, 8oz, 1 lb, 2 lb, 11 lb, and 44 lb vacuum pack or foil pouch bags, which are purged of oxygen and may be injected with nitrogen to preserve the freshness. Home brewers prefer the small package sizes and microbrewers typically utilize the 11 lb and 44 lb packages.



Photo 14 - Hop Packaging (11lb.)



Photo 15 - Standard Vacuum Pack Foil Pouch

*Section Checklist*

		✓
1.	Can identify when hops are ready for harvest.	
2.	Have identified the market and volume demand for fresh (wet) local hops and made contact with brewers.	
3.	Determine the size of oast (dryer) that is necessary to handle the annual hop production.	
4.	Identify the necessary further processing and storage equipment required to package hops.	
5.	Determine best packaging options and sources of packaging materials.	
6.	Develop strategies to access required harvest labour.	
7.	Discuss with other local hop producers to determine if it is feasible to share hop picking, drying and processing infrastructure.	

*Useful Resources*

Indie Hops Pricing and Availability <a href="http://www.indiehops.com/pdf//IH_contract_pricing.pdf">http://www.indiehops.com/pdf//IH_contract_pricing.pdf</a>
Indie Hops Oregon <a href="http://www.indiehops.com/oregon_farming.asp">http://www.indiehops.com/oregon_farming.asp</a>
Hop Pelleting System - small scale hammermill grinder LM72A Hops Pellet System \$35,900 Process up to 350 lbs/hour (Lawson Mills BC 1-888-313-9424) <a href="http://www.makepellets.ca">http://www.makepellets.ca</a>
Hop Harvesters <a href="http://www.DMFG.COM/our-harvester">http://www.DMFG.COM/our-harvester</a>
Make Own Pellets <a href="http://www.makepellets.ca/">http://www.makepellets.ca/</a>
Hop Harvest Calculator <a href="http://www.uvm.edu/extension/agriculture/engineering/?Page=hopscale.html">http://www.uvm.edu/extension/agriculture/engineering/?Page=hopscale.html</a>
Hop Growing & Harvesting <a href="http://www.northwesthops.com/Harvest_and_Drying_Hops_s/14.htm">http://www.northwesthops.com/Harvest_and_Drying_Hops_s/14.htm</a>
Report: Research, Development and Demonstration of Solar Hops and Herb Drying <a href="http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011-Annual-Report-to-CSU-Specialty-Crop-Program-Solar-Hops-Dryer.pdf">http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2011-Annual-Report-to-CSU-Specialty-Crop-Program-Solar-Hops-Dryer.pdf</a>

## 9.0 MARKETING HOPS



Photo 16 - Fresh Hops Going in the Brew Kettle - Courtesy of Meander River Farm

A success hopyard operator becomes skilled at producing quality hops, maximizing yields and in developing consistent markets. When establishing a new hopyard, it is important to thoroughly examine and validate the available hop market opportunity to ensure that the market demand is congruent with the hops that are being produced by the farm. In all likelihood, a hopyard will focus on the particular needs of a few target markets. Since each brewer, brewpub, microbrewery and home brewer has a particular hop interest, it is impossible to supply all markets equally. A new hop producer is faced with



two main choices; (1) guess which hop varieties to grow and then hope the market will buy them, or (2) identify the particular needs of the target market and then work to best fulfill those needs. This can be achieved when an open line of communication is developed between the hop producer and the hop buyer, vertically integrating the market chain. Many brewers report having trouble in recent years sourcing the hop varieties that they want to use. Home brewers are excited at the possibility that more local hops will be available to them. It makes good business sense to work closely with the target customer to identify their particular hop needs and requirements.

### Hop Products in the Market

Since hops are an extremely perishable crop they must be used in brewing or processed immediately after harvest. Hops are typically sold to microbrewers and home brewers either fresh (wet), as dried whole hop leaf cones, as hop pellets or as further value added hop products.

Fresh (Wet) Hops – are sold directly from the field to the breweries. They are valued for the “fresh hop characteristics” they can add to a beer. Fresh hop shelf life is measured in hours and they have to be utilized by brewer as soon as possible after being harvested. The breweries must also be set up to accept and handle fresh hops, as it is different than working with pellets. This requires good coordination and communication between the hopyard and the brewer. Depending on capacity, many microbrewers can only handle small volumes of fresh hops at any one time. In 2012 Nova Scotia microbrewers had access to only a limited supply of local fresh hops. The highest hop dollar return per lb of hops comes from fresh hop sales. Fresh hops reportedly are selling to microbrewers for between \$10 and \$15/lb.

Dry Hops – are hops, which have been dried and stored until they can be sold either as dried whole hop cones or are further processed into hop pellets. Drying, pelletizing, packaging and cold storage allow hops to be sold to brewers year round. The majority of hops used by brewers are in a dried/pelleted format. Brewers like the pelleted hops for the consistency of quality and supply they can offer. The dollar return per lb of dried hops is much less than for a lb of wet hops when taking into account the 5:1 ratio weight loss as a result of the drying process. Dried hop cones retail to home brewers in N.S. for approximately \$2.99/oz. and to microbrewers for \$5-\$25/lb depending on the variety.

Pelleted Hops – There are two types of hop pellets, the T-90 pellets which are prepared from whole cone hops. The T-45 hop pellets are similar to the T-90 pellets; however, they are milled at a lower temperature to remove the stickiness of the lupulin and some of the vegetative matter. Pellets are commonly sold to brewers in 11 Lb and 44 Lb foil pouch packaging. Pellets for the home brew market are sold in various sizes down to 2 oz. packages. Typically, pellets will retail to home brewers for approximately \$3/oz. and to microbrewers for \$5-\$25/lb depending on the variety.

Value Added Hop Products – value added hop products are hops that have been even further processed and refined to create specialty product concentrates to assist the brew master in the

production of beer. The market for these products is specialized and requires high quality products.

Other Value Added Hop Products - Some hop growers have created specialty hop products including candies, bine wreaths, ornamental decorations, specialty foods, pillows and sleep aids.

### Hop Market Trends

The major hop growing regions of the world are located in Western Europe, the Pacific northwest of the USA, and China. The large macrobrewing conglomerates are the main purchasers of hops, and as a result hops are very much a commodity-traded product, with prices reflecting the volumes and varieties purchased.

In 2012 the hop production for Idaho, Oregon, and Washington totaled 61.2 million pounds, down 5 percent from the 2011 crop of 64.8 million pounds. Zeus, Columbus, Tomahawk, Cascade, and Super Galena were the leading varieties in Washington, accounting for 43 percent of the State's crop. In Oregon, Nugget and Willamette were the major varieties, accounting for 58 percent of the State's production.<sup>4</sup>

There is an increasing interest from craft brewers to have access to more locally produced organic hops for brewing. The challenge for organic beer brewers has been that local hops have not been available in any significant quantities. Historically, growing organic hops was difficult due to the lack of pest and disease control options available to the organic hop grower. As a result organic growers experienced reduced yields and organic hops were priced up to 50% more than conventional grown hops making them less economically feasible to produce and hard to market. As of January 2013 the USDA has begun phasing out an exemption that allowed organic beer to be produced in the US without using organic hops. In anticipation of this change, organic hop production has been ramping up in the USA and both producers and researchers are working hard to improve hop varieties and production practices to close the market gap that has made organically produced hops less competitive in the marketplace. The annual supply of organic hops is growing rapidly in the US with the 2012 crop total reaching 218,000 lbs of organic hops, more than twice the 70,700 lb yield of 2011.<sup>5</sup>

### Beer Sales

Overall beer sales have been relatively flat in Canada and volume consumption has been in decline in recent years. Canadians bought 80.3 litres of beer per person in 2011 down from 85.6 litres per person in 2001.<sup>6</sup> This could be contributed to an aging demographic and an expected alcohol consumption shift from beer to wines and spirits as individual's age. Another fact to consider is that the Canadian alcohol consumer may be becoming more sophisticated and looking for uniqueness, specialty and crafted regional alcohol products. Gary McMullen, president of Muskoka Brewery and chair of Ontario Craft Brewers commented; *"If people are only looking to have one*

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<sup>4</sup> <http://www.usahops.org/userfiles/file/Statistics/National%20Hop%20Report-NASS%2012-12.pdf>

<sup>5</sup> 2012 (Nov) Organic Hop Market Report, American Organic Hop Growers Association

<sup>6</sup> <http://blogs.vancouversun.com/2012/03/27/canadians-drinking-more-wine-and-specialty-beer-says-statscan/>

*beer, they want something special to enjoy.”<sup>7</sup> When people are drinking less and appreciating what they drink more, they are willing to spend more on what they do consume and this is good for craft beer brewers and for local hop producers/suppliers.*

The Nova Scotia Liquor Commission 2011-2012 Annual Report indicates that the number of different beer products available on the liquor store shelf in Nova Scotia continues to increase each year, 515 products in 2008, and 765 products in 2011. Beer sales represented 48 percent of the total alcohol (\$) dollar sales and 79 percent of the total alcohol volume sales. For the 2011-2012 fiscal year, Nova Scotia total beer sales were \$284.5 million a slight 0.6 percent decrease from the previous period. The fact that the total number of litres of beer consumed in Nova Scotia is declining, while the total (\$) dollar sales remains relatively level, could suggest that individuals are spending more (\$) dollars per litre unit of beer consumed and thus are buying more higher value, crafted or imported beers. Based on the Nova Scotia Liquor Commission 2011-2012 Annual Report craft breweries produced fewer than 15,000 hecto-litres (hl) of beer (packaged product to retailers) and brewpubs (on premise consumption) produced under 2,000 hl. The total 2011-2012 production of craft and brewpub beer in Nova Scotia was near 17,000 hl.<sup>8</sup>

### *Emergence of the Craft Microbrewery*

In the 70’s and 80’s the microbrewing industry was somewhat of a fringe beer sector and first established a strong market foothold in the New England, British Columbia, Ontario and Quebec beer markets. Today, craft beers are popular and well accepted in the mainstream beer categories. Along with the growth of the microbrewing industry, there has also been a hop production revival in Canada and North America.

The latest craft beer US market research by Mintel shows that; “While the economic downturn has affected consumer spending across many sectors, craft and craft-style beers are defying recessionary trends with an impressive upward trajectory. The Mintel research shows that US sales of craft beer nearly doubled between 2007 and 2012—increasing from \$5.7 billion in 2007 to \$12 billion in 2012. Moreover, the trend toward craft beer options is set to enjoy robust growth through 2017. Mintel forecasts the segment to grow to \$18 billion by 2017 — a result that will see the segment tripling in the decade between 2007 and 2017.”<sup>9</sup>

The March 2011 Economic Impact of the Nova Scotia Craft Beer Sector report identified from an input-output analysis that in 2009 the existing nine Nova Scotia craft brewers accounted for \$5.73 million in craft beer sales. The study also indicated that the craft beer sector growth will be likely be a result of shifting market share as the overall beer market in Nova Scotia will likely plateau by about 2024 and then stay level or decline slightly until 2029. Craft beer currently represents approximately 2% share of the NS beer market and craft brewers believe that it is achievable to

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<sup>7</sup><http://blogs.vancouversun.com/2012/03/27/canadians-drinking-more-wine-and-specialty-beer-says-statscan/>

<sup>8</sup> NSLC Annual Report 2011

<sup>9</sup> The rise of craft beer in the US - Craft beer sales have doubled in the past six years and are set to triple by 2017, Streetinsider.com CHICAGO, Jan. 23, 2013 /PRNewswire/

increase market share to 5% by 2020. The average annual trend growth rate for NS craft beer sector is estimated at 3.3% per year. A continuation at this rate is estimated to lead to 22.7 thousand hl or with accelerated growth scenarios potentially 34 thousand hl by 2029.<sup>10</sup> Some of this growth will result from increased production by existing microbrewers as well as the development of new microbrewers and brew pubs. Based on the Nova Scotia Liquor Commission 2011-2012 Annual Report of near 17,000 hl of production from the craft beer sector in 2011, it would indicate that the studies medium to high growth projections are currently being achieved and if the sector growth continues at this pace, near 40,000 hl could conceivably be achieved by 2029.<sup>11</sup> This would be the result of both new and expanding craft breweries and brew pubs in the province.

Over the last decade, small-acreage hopyards have been beginning to supply locally produced hops to the craft microbrew and brew pub sectors in Nova Scotia. Local hops contribute to the creation of locally branded beers and can give beers and ales unique regional characteristic and taste. This allows brewers to claim local hops inputs and benefit from the terroir of the region, creating a marketplace advantage (a value proposition) that is difficult for the large breweries to duplicate. The microbrewers don't really compete for the same consumer as the large macrobrewer; they seem to target small niches where they can create an advantage with consumers that appreciate specialty beers. Microbrewer Peter McAuslan of McAuslan Breweries in Montreal says; "Our whole plan was to never compete head-to-head with the large breweries. We would make beers that would appeal to an emerging consumer group that was interested in more flavourful, authentic, local products. So we always saw ourselves as being in a different beverage category than the beers made by the big brewers."<sup>12</sup>

Brian Titus, of Garrison Brewery, says; "the goal is a brew made with 100 % local ingredients."<sup>13</sup> Another brewer interviewed for this report commented; "*We buy and use local hops occasionally. We didn't this year because there wasn't enough available. If there were enough, we would use more. The big problem is that they aren't processed into pellets. They have to be processed or they don't last and it is difficult to switch back and forth. If we use local hops that are available only for a few weeks, we have to use them in a special brew.*"

There is no doubt that the success of the microbrewer is eating into the traditional market share held by the giant macrobrewers and it is not going unnoticed. The larger beer companies are moving to get into the market sector by creating their own craft beer companies like Molson's Six Pints Specialty Brewing Company. Many of the large brewers are also moving to reposition beer brands as crafted beers. According to a recent press release, Molson's intention for the company is to "nurture and grow specialty and craft beer brands." The large beer companies have also been actively purchasing smaller brewers such as Ontario's Creemore Springs in 2005 and Vancouver

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<sup>10</sup> 2011 Economic Impact of the Nova Scotia Craft Beer Sector report

<sup>11</sup> NSLC Annual Report 2011

[http://issuu.com/nslc/docs/nslc\\_ar\\_2012\\_issuu\\_nov28?mode=window&viewMode=singlePage&backgroundColor=%230069af](http://issuu.com/nslc/docs/nslc_ar_2012_issuu_nov28?mode=window&viewMode=singlePage&backgroundColor=%230069af)

<sup>12</sup> <http://www.cbc.ca/news/business/smallbusiness/story/2011/10/12/f-smallbiz-craft-brewing.html>

<sup>13</sup> Bruce Erskine, June 4, 2009 The Chronicle Herald.ca Business

based Granville Island Brewing in 2009.<sup>14</sup> This should be good for the local hop industry as this strategy could increase the demand for locally produced hops in the future.

*The growth of the small-scale hopyard is closely linked to the growth of the microbrewing sector and its willingness and ability to purchase and use locally produce hops.*

### Hop Supply and Price

The 1991-2006 average price (US\$) for dried hops was \$ 1.80 per lb, the 2011 price was \$2.75 per lb.<sup>15</sup> A 2006 warehouse fire in Yakima, Washington destroyed 10,000 (200 lb) bales of hops and in 2007 Europe experienced a hop crop failure. As a result, in the following years hop prices spiked as high as \$30 per lb and many brewers had problems sourcing hops. Some brewers locked into multi year contracts to assure supply at prices between \$15-\$30. Local brewers indicate that there are still shortages for some hop varieties and they currently are paying \$5-\$25 per lb for hops depending on varieties. Brewers have trouble with inconsistency of hop supply as it affects the input costs of beer and reduces profit. Brewers like hop price stability and consistency.

According to the 2012 US Department of Agriculture (USDA) Hop Stocks Report since 2007 hop stocks in the USA have steadily increased to a high of 121 million lbs in 2011 almost double the 2009 numbers of 65 mil lbs. <sup>16</sup> The 2012 numbers have dropped 3% to 117 million lbs. One of the challenges for hop growers is shifting hop preferences in the market making it difficult to determine which hop varieties to grow. In Atlantic Canada the only supply of hops commercially available is in the fresh hop format. The supply does not meet the needs of the market at this point. No one locally is currently supplying any volume of dried or pelleted hops to brewers unless the hopyard is part of a microbrewery operation. Future hop sales will depend on the continued interest in craft beers, the growth in the craft sector, the growth in organic beer production and the ability of the industry to supply the varieties, quantities, quality, hop volumes and in the form required by the microbrewery market in Atlantic Canada. Hop brokers are reporting that European buyers started buying larger volumes of North American hops in 2012. This could create more hop variety shortages in the future and create new supply opportunities with local microbrewers.

### Hop Sales Opportunity

The potential markets for locally grown hops include, but are not limited to:

1. *Microbreweries and Small Local Brew Pubs*
2. *Macrobrewers (Large brewers)*
3. *The Home Brewing Market*
4. *Specialty Product Markets*

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<sup>14</sup> <http://www.cbc.ca/news/business/smallbusiness/story/2011/10/12/f-smallbiz-craft-brewing.html>

<sup>15</sup> [http://www.nass.usda.gov/Statistics\\_by\\_State/Washington/Historic\\_Data/hops/hops.pdf](http://www.nass.usda.gov/Statistics_by_State/Washington/Historic_Data/hops/hops.pdf)

<sup>16</sup> USDA Hop Stocks 2012 Report (NASS) March 22, 2012 - ISSN: 1949-1484

### Microbreweries and Small Local Brew Pubs

Making beer at any scale is the result of following a beer recipe. Consistency within beer brands is an expectation held by the beer consumer. Therefore, few brewers are willing to drastically change their hop ingredients except on a small scale, or with specialty and limited batch runs of beer. The risk for a brewer in using a new and local hop supplier is that the hop performance is unknown and batch results and beer quality may be affected. Dried hop pellets are standardized and offer consistency to brewers so that the results of their recipes will be consistent and turn out as expected. Consistency throughout the year and from year to year is a key concern with hop buyers. Craft microbrewers produce small volumes of beer annually and are experienced working with small batches of beers and ales and are more likely in line with the small-scale hop producers supply capacity.

### Macrobrewer Needs

While the macro brew market for hops exists, it is a mature market with well-defined supply channels and market supply relationships. Selling to larger brewers would require large hop volumes on a consistent basis. As larger brewers develop more craft beers, markets may open up for more sales of local hops. This is not a market that could be supplied by the region's hop industry at this time.

### Home Brewer Needs

The home brewing market remains strong and home brew supply stores are increasing in numbers in the region. Hop products for the home brewer require smaller packaging (2-5 oz.), but the return per pound can be much higher than in other markets. This would be the most profitable market in which to sell hops if there is way to establish a large enough volume. It would require direct selling and a website, or alternatively markets could be developed with local home brew suppliers and outlets. The higher return could help to compensate for the added harvest and processing cost incurred by a small-scale hopyard.

### Specialty Products

Specialty hop products are primarily ornamental, value added, specialty food or products like pillows. This market is based on products that producers can create and on the markets that can be developed.

### Nova Scotia Microbrew Hop Opportunity

Based on the Nova Scotia Liquor Commission 2011-2012 Annual Report, Nova Scotia craft breweries produced just fewer than 15,000 hl of beer (packaged product to retailers) and brewpubs (on premise consumption) produced less than 2,000 hl. The total production of craft and brewpub beer is approximately 17,000 hl annually. Assuming brewers use one pound of dried hops per hectoliter of beer produced, the total hop opportunity with Nova Scotia microbrewers and brewpubs in 2011-2012 was approximately 17,000 lbs of dried hops. This hop usage could

range considerably as each brewer uses different hop volumes in their production. The total hop market could be expected to double with the addition of New Brunswick, Newfoundland and Labrador, and Prince Edward Island microbrewers.

If craft beer growth projections in NS continue as anticipated by the industry, the market for hops should more than double by 2029.

### Hop Returns

Dried hops have a lower market return than fresh hops. Local brewers report paying between \$5 and \$25 per lb for dried whole cone and pelleted hops depending on the variety. The 2010 New England Feasibility and Market Study used a \$15 per lb return for dried pelleted hops in their feasibility assessment.<sup>17</sup> The feasibility of hopyard production in Nova Scotia and the payback on investment will depend on a combination of the returns the marketplace will pay for locally produced hops, and the quality and yields that can be achieved on a per acre basis.

The table below compares potential hop dollar return verses pounds of hops produced. There is no acreage associated with this example. The hop farm's total annual return is dependent upon the hop varieties produced, whether hops are sold fresh or dried and the return received per lb of hops.

Yield - Lbs	Return \$2/lb.	Return \$5/lb.	Return \$8/lb.	Return \$10/lb.	Return \$15/lb.
100	\$200	\$500	\$800	\$1000	\$1500
500	\$1,000	\$2,500	\$4,000	\$5,000	\$7,500
1000	\$2,000	\$5,000	\$8,000	\$10,000	\$15,000
1500	\$3,000	\$7,500	\$12,000	\$15,000	\$22,500

### Maritime Hop Production

In recent years there have been a number of new hopyards established in New Brunswick, Nova Scotia and Prince Edward Island. The hopyards in the Maritimes are all relatively small scale and most are less than 1 acre in size. The largest hopyard in the region is the Happy Hopyard, near Anagance, New Brunswick, which currently is growing 10 acres of hops.

There are many challenges a small-scale hop producer faces:

- Access to labour for harvest.
- Investment into automation for hop harvest and processing.
- Trellis systems and hop varieties have not been proven for the region.

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<sup>17</sup> 2010, Rosalie Wilson, 2009-2010 Feasibility and Market Research Study for Commercial Hop Production in New England

- Access to processing infrastructure: small-scale cleaning, drying, processing and pelletizing equipment.
- Production of quality and yield volumes necessary to be commercially viable and to supply market needs.
- Access to markets for the hops produced.

Small-scale hop producers in Nova Scotia will have to overcome these challenges to be profitable. There will be a strong expectation from local brewers that local hop suppliers will have the capacity to deliver hops at the quality, price and volumes promised. Shorting brewer's hops causes a loss in beer sales, hard feelings and does not build loyalty and long-term market relationships and sales.

### Marketing Models

- 1) Direct Sales: Growers can sell direct to microbrewers and brew pubs. This requires direct marketing efforts and ongoing communication with brewers. It is particularly important when selling wet hops to ensure that brewers are ready to receive wet hops. This requires regular visits to brewers and the building of strong relationships.
- 2) Alliances with Brewers: Developing alliances and ties between brewers and the hop grower. This also requires marketing and ongoing communication with brewers. This may involve a financial investment or establishing contracts for hop delivery.
- 3) Alliances with Other Growers: A developing alliance with other growers is a way to ensure that specific hop varieties and volumes can be supplied to the marketplace. The alliance could pool product and share the cost of harvesting, processing equipment and marketing.
- 4) Start a Microbrewery: There is always the option for a hopyard to start its own microbrewery and use its own hops. This is often the case in Europe and it can be tied to an agri-tourism experience. People can buy beer and learn the beer value chain from the hopyard field to the end beer product.
- 5) One Desk Selling: Serious consideration should be given to an organized approach to the marketing of the Maritime region's hop supply. This would help to prevent potential price-cutting and ensure a better hop supply to the customers.

### Competition

Hops sell in a commodity marketplace and the production volumes needed in the Atlantic Region by microbrewers is relatively small. It is difficult for local hop growers to compete on price with large hop suppliers from outside of the region. However, hop producers from outside of the region cannot offer microbrewers locally produced hops that have the unique terroir of the region. This is the region's value added in the marketplace. To limit the outside competition and to maximize the sales opportunity, the region's growers should work together to establish a collective volume of marketable hops, to ensure product consistency and quality, and that local hops are delivered to the local microbrewers as promised. It is possible that a common brand could be established that over time would build a reputation in the marketplace similar to what is being done in the Nova Scotia wine sector with "Tidal Bay".



### Market Conclusions

There is a small but growing market opportunity for locally produced fresh (wet) hops with the regions microbreweries. While the market for fresh hops has volume limitations, this market is not being satisfied and has at present has much room for growth. The total wet hop opportunity is limited to how much brewers can use when the hops are available and fresh. Microbrewers traditionally utilize imported pelleted hops, which are standardized and easy for them to use. There is a potential market opportunity to supply dried local hops and replace the imported whole cone and pelleted hops that are currently being used by the regions microbreweries. This will over time require further drying infrastructure and investment into processing equipment to create hop pellets for year round use by the microbrewers. Long-term hopyard success in Nova Scotia will depend on the relationships that can be established between the hopyard producers and the market (the microbreweries). The growth of the craft-brewing sector looks good in the future and should result in increased opportunity for local hop sales. It will also be important that research continues into hop variety trials, production systems and best management practices to increase annual hopyard yields to supply the volumes and varieties of hops that brewers require. Anyone planning on developing a hopyard without talking to other growers and the microbrewers in the region will risk producing a product that has no market.

### Section Checklist

		✓
1.	Build relationships with brewers to determine their future hop needs.	
2.	Communicate with brewers as to when fresh hops will be available to them.	
3.	Maximize yields to better meet the demand in the marketplace.	
4.	Monitor the annual hop price by variety and supply availability.	
5.	Explore the creation of relationships with other growers to collectively market hops.	
6.	Negotiate the price for hops in advance with customers.	

### Useful Resources

Hop Union is a supplier of hop and value added hop products. <a href="http://www.hopunion.com/">http://www.hopunion.com/</a>
National Agricultural Statistics Service <a href="http://www.nass.usda.gov/Statistics_by_State/Washington/Historic_Data/hops/hops.pdf">http://www.nass.usda.gov/Statistics_by_State/Washington/Historic_Data/hops/hops.pdf</a>
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Freshops Hop Order Sheet <a href="http://www.freshops.com/cgi-bin/shopper.cgi?search=action&amp;category=HOPS&amp;keywords=all&amp;template=PDGCommTemplates/hops.html">http://www.freshops.com/cgi-bin/shopper.cgi?search=action&amp;category=HOPS&amp;keywords=all&amp;template=PDGCommTemplates/hops.html</a>

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<b>Hop Testing Lab</b>
<b>A &amp; L Laboratories Inc.</b> 2136 Jetstream Rd., London, ON N5V 3P5 Tel: (519) 457-2575 Toll Free: 1-(855)-837-8347 Email: <a href="mailto:alcanadalabs@alcanada.com">alcanadalabs@alcanada.com</a> <a href="http://www.alcanada.com/">http://www.alcanada.com/</a>

*Associations and Organizations*

<p><b>Maritime Hop Growers Cooperative Limited</b> 35 McInnis Road, Malagash, NS B0K 1E0</p>	<p><b>Ontario Hop Growers Association</b> <a href="http://ontariohopgrowersassociation.ca/news/">http://ontariohopgrowersassociation.ca/news/</a></p>
<p><b>Ontario Craft Brewers</b> 1-75 Horner Avenue Toronto, Ontario M8Z 4X5 Tel: (416) 494-2766 Email: <a href="mailto:info@ontariocraftbrewers.com">info@ontariocraftbrewers.com</a></p>	<p><b>Association des Microbrasseries du Quebec</b> Tel: (513) 543-9501 Website: <a href="http://www.ambq.ca">http://www.ambq.ca</a> Email: <a href="mailto:info@ambq.ca">info@ambq.ca</a></p>
<p><b>British Columbia Craft Brewers Guild</b> Tel: (250) 717-1091 Internet Site: <a href="http://bccraftbeer.com">http://bccraftbeer.com</a></p>	<p><b>ACORN</b> P.O. Box 6343, Sackville, NB E4L 1G6 <a href="mailto:admin@acornorganic.org">admin@acornorganic.org</a> <a href="http://www.acornorganic.org">http://www.acornorganic.org</a> 1-866-322-2676</p>
<p><b>Hop Growers of America</b> PO Box 1207, 301 W. Prospect Place Moxee, WA 98936 USA Phone: +1 509 453 4749 Email: <a href="mailto:info@usahops.org">info@usahops.org</a> <a href="http://www.usahops.org/">http://www.usahops.org/</a></p>	<p><b>Canadian Organic Growers National Office</b> 39 McArthur Avenue, Level 1-3 Ottawa, Ontario K1L 8L7 Tel: 613-216-0741 Toll-free: 1-888-375-7383 Fax: 613-236-0743 Email: <a href="mailto:office@cog.ca">office@cog.ca</a> <a href="http://www.cog.ca/about/contact-us/">http://www.cog.ca/about/contact-us/</a></p>
<p><b>American Organic Hop Growers Association</b> <a href="mailto:info@usorganichops.com">info@usorganichops.com</a> <a href="http://www.usorganichops.com/AOHGA/index/index.html">http://www.usorganichops.com/AOHGA/index/index.html</a></p>	<p><b>Oregon Hop Commission</b> PO Box 298 Hubbard, Oregon 97032 USA Phone: 503-982-7600 FAX: 503-982-7602 <a href="mailto:info@oregonhops.org">info@oregonhops.org</a> <a href="http://oregonhops.org/culture1.html">http://oregonhops.org/culture1.html</a></p>
<p><b>Northeast Hop Alliance</b> 100 Eaton Street • Morrisville, NY 13408 Phone: 315-684-3001 x125 <a href="http://www.northeasthopalliance.org/">http://www.northeasthopalliance.org/</a></p>	

<p><b>Hop Researcher</b></p> <p><b>Aaron Mills Ph.D. - Research Scientist</b> Agriculture and Agri-Food Canada Ave. (Crops &amp; Livestock Research Center) 440 Ave University Charlottetown, PE C1A 4N6 E-Mail: <a href="mailto:Aaron.Mills@agr.gc.ca">Aaron.Mills@agr.gc.ca</a> Phone: 902-566-6837</p>
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Glossary of Terms

**ALPHA ACIDS** - These are a major component of the soft resins that provide the main bitter compounds associated with beer. The alpha acids content varies widely amongst hop varieties from levels of 3-4% in aromatic type hops to levels of 13-14% in the bitter hops

**AROMA** - Aroma is a strong hop varietal characteristics. There appears to be a general relationship between the type and heaviness of a hop aroma and the flavor and aromatic properties of beer.

**BETA ACID** - A soft resin component, beta-acids are not bitter in the natural or isomerized form. Some of the oxidation products do provide bitterness, and the beta-acids can be chemically transformed into light stable bittering forms.

**BINE** - A long flexible stem of climbing vines.

**CONE STRUCTURE** - There are certain physical properties of hop cones while unimportant in the brewing process, are strongly characteristic of a particular variety. Light loose cones are much more prone to shatter during harvesting while heavy dense cones pick beautifully as they roll well and hang together.

**DISEASE REACTION** - Varieties can display a wide range of reaction to various hop diseases. Of great importance is the fungal disease downy mildew.

**DRY BALING** - Some varieties are more difficult to dry than others and some tend to shatter more than others when being baled.

**GROWTH HABIT** - Hop varieties vary widely in structural aspects such as general vigor, lateral length, and the overall vine structure. These types of characteristics can make a variety more or less easy to pick and handle.

**LUPULIN** - Hop lupulin may vary in color from pale yellow to an intense golden color. It is not known if lupulin color affects brewing performance, but it is a fairly strong characteristic of a variety. It is certain that the bitter hops have much greater quantities of lupulin than the aromatic types.

**MATURITY** - This is a statement of the time in the hop harvest season at which the particular variety reaches optimal maturity.

**OAST** - A kiln used for drying hops.

**PEDIGREE** - More modern hop varieties can often be traced back through two to three generations of crosses often involving other known hop varieties. It is important to note that the qualities of a hop variety are only partly determined by the genes it receives.

**PICKABILITY** - This is another characteristic, which is of direct concern to both grower and brewer. If a hop is known to pick well, one can expect a good clean sample. If a hop is difficult to pick, one is more likely to see shattered cones and a higher proportion of leaf and stem in a sample.

**STORAGE** - Cold storage and anaerobic conditions can delay hop oxidation. Some oxidation of essential oil components is necessary to produce compounds thought to be important in beer flavors, so controlled aging is important for hops required for both bittering and aromatic properties.

**TERROIR** - Is the expression of the unique characteristic synergies that are created as a result of the combination of a plant, regions geography, soils and climate.

**YIELD** - This is the kiln dry weight of hops normally produced by a variety in commercial production in the U.S. On an average, the aromatic types tend to be lower yielding and more highly priced than the bitter types.

*Home Brewer Supply*

**Noble Grape Urban Winery** (8 locations NS and NB)  
[www.noblegrape.ca](http://www.noblegrape.ca)

*Breweries Atlantic Canada*

**NEW BRUNSWICK BREWERS**

<p><b>Picaroons Brewing Co.</b>                      115 Melissa Street                      Fredericton, New Brunswick                      Phone: (506) 457-9082                      Fax: (506) 459-5115                      Brewer: Sean Dunbar  <a href="http://www.picaroons.ca/index.asp">http://www.picaroons.ca/index.asp</a></p>	<p><b>Pump House Brewery Ltd.</b>                      5 Orange Lane                      Moncton, New Brunswick                      Phone: (506) 855-2337                      Fax: (506) 384-4204  <a href="http://www.pumphousebrewery.ca/">http://www.pumphousebrewery.ca/</a></p>	<p><b>Moosehead Beer</b>                      PO Box 3100, Station B, 89 Main Street                      Saint John, New Brunswick                      Phone: (506) 635-7000                      Fax: (506) 635-7029  <a href="http://www.mooseheadbeer.com">http://www.mooseheadbeer.com</a></p>
<p><b>Big Tide Brewing Company</b>                      47 Princess Street                      Saint John, NB E2L 1M1                      Wendy Papadopoulos – Brew master                      Phone: 506-214-3311  <a href="http://www.bigtidebrew.com">http://www.bigtidebrew.com</a></p>	<p><b>Tapps Brewpub and Steakhouse</b>                      78 King St., Saint John, New Brunswick                      Phone: (506) 634-1957                      Brewer: Bruce Madsen</p>	

<b>NOVA SCOTIA BREWERS</b>		
<p><b>Big Spruce Brewing (Organic Beer)</b> Nyanza, Cape Breton Jeremy White</p>	<p><b>The Columbia Brewery</b> 3055 Agricola St. Halifax, Nova Scotia Phone: (902) 453-1867</p>	<p><b>Oland Breweries</b> 3055 Agricola St. Halifax, Nova Scotia Phone: (902) 453-1867 Fax: (902) 453-4070</p>
<p><b>Hart and Thistle Gastro Brew Pub</b> 1869 Upper Water Street, Halifax, NS B3J 1S9 Phone: (902) 407-4278 manager@hartandthistle.com <a href="http://www.hartandthistle.com">http://www.hartandthistle.com</a></p>	<p><b>Paddy's Brewpub &amp; Rosie's Restaurant</b> 320 Main Street Wolfville, Nova Scotia Phone: (902) 542-0059 Fax: (902) 678-3069 Brewer: Wayne Shankel</p>	<p><b>Maritime Beer Company</b> Sleeman Breweries Ltd. 612 Windmill Drive Dartmouth, Nova Scotia Phone: (902) 468-3135 Brewer: Kirk Annand</p>
<p><b>Granite Brewery</b> 1222 Barrington Street Halifax, Nova Scotia Phone: (902) 422-4954 Fax: (902) 423-2793 Brewer: Kevin Keefe <a href="http://www.granitebrewery.ca">http://www.granitebrewery.ca</a></p>	<p><b>Paddy's Pub and Rosie's Restaurant</b> 42 Aberdeen Street Kentville, Nova Scotia Phone: (902) 678-3199 Fax: (902) 678-2337 Brewer: John FitzGerald</p>	<p><b>Alexander Keith's Nova Scotia Brewery</b> (Labatt) 1496 Lower Water Street Halifax NS Phone: 902-455-1474 Brewer: Graham Kendall</p>
<p><b>Rudder's Seafood Restaurant &amp; Brew Pub</b> 96 Water Street Yarmouth NS B5A 4P9 Phone: 902-742-7311 Brewer: Randy Lawrence, Mike Ferguson <a href="http://www.ruddersbrewpub.com/">http://www.ruddersbrewpub.com/</a></p>	<p><b>Rogues Roost</b> Spring Garden &amp; Queen Halifax, Nova Scotia Phone: (902) 492-2337 Fax: (902) 420-0763 Brewer: Lorne Romano <a href="http://www.roguesroost.ca/">http://www.roguesroost.ca/</a></p>	<p><b>Hell Bay Brewing Company</b> 8299 Highway 331 Cherry Hill NS B0J 2H0 Phone: 902-646-0039 <a href="http://www.hellbaybrewing.com/">http://www.hellbaybrewing.com/</a></p>
<p><b>Rare Bird Pub &amp; Chedabucto Bay Brewing Company</b> 80 Main Street Guysborough, Nova Scotia Phone: (416) 203-8492 Brewer: Nicholas Deny <a href="http://www.rarebirdpub.com/brewery">http://www.rarebirdpub.com/brewery</a></p>	<p><b>Sea Level Brewing Company</b> The Port Pub 980 Terry's Creek Road Port Williams NS B0P 1T0 Phone: 902-542-5555 Brewer: Randy Lawrence</p>	<p><b>Propeller Brewing Company</b> 2015 Gottingen St Halifax, Nova Scotia Phone: (902) 422-7767 Fax: (902) 422-4999 Brewer: John Allen <a href="http://www.drinkpropeller.ca/">http://www.drinkpropeller.ca/</a></p>
<p><b>Garrison Brewing Company</b> 1149 Marginal Road Halifax NS B3H 4P7 Phone: 902-453-5343 Brewer: Daniel Girard <a href="http://www.garrisonbrewing.com/">http://www.garrisonbrewing.com/</a></p>	<p><b>John Shippey's Brewpub</b> 1869 Upper Water St, Halifax, Nova Scotia Phone: (902) 423-7386 Fax: (902) 423-5857 Brewer: Greg Nash</p>	

**PEI BREWERS**

<p><b>Murphy's Brewing Company</b>                  449 University Ave                  Charlottetown, Prince Edward Island                  Phone: (902) 894-7827                  Fax: (902) 368-3806</p>	<p><b>Prince Edward Island Brewing Company</b>                  2 Walker Drive Charlottetown.                  PE C1A 8S6                  Tel: 902-629-2739                  Fax: 902-629-6658                  info@peibrewingcompany.com  <a href="http://www.peibrewingcompany.com">http://www.peibrewingcompany.com</a></p>	<p><b>MicroBrasserie Charlevoix</b>                  37 St-Jean Baptiste                  Baie-Saint-Paul, Prince Edward Island                  Phone: (418) 240-2332                  Fax: (418) 240-2205                  Brewer: Frederick Tremblay</p>
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**NEWFOUNDLAND AND LABRADOR BREWERS**

<p><b>Yellow Belly Brewery and Public House</b>                  288 Water Street &amp; 1 George Street                  Box 323 St John's, NL A1C 5J9                  Brew master: Liam McKenna                  709-757-3784  <a href="http://www.yellowbellybrewery.com/">http://www.yellowbellybrewery.com/</a></p>	<p><b>Quidi Vidi Brewing Company</b>                  35 Barrows Rd., Quidi Vidi                  St. John's, NL                  Canada A1A 1G8                  800-738-0165  <a href="http://www.quidividibrewery.ca">http://www.quidividibrewery.ca</a></p>	<p><b>Molson Breweries</b>                  P.O. Box 5308, Circular Road                  St. John's, Newfoundland                  Phone: (709) 726-1786                  Fax: (709) 726-2382</p>
<p><b>Duke of Duckworth</b>                  P.O. Box 62, Stn. C                  St. John's, Newfoundland                  Phone: (709) 739-6344                  Brewer: Paul Dandeno</p>	<p><b>Stonehouse Brewpub</b>                  Water Street                  Carbonear, Newfoundland                  Phone: (709) 596-5586                  Brewer: Nick Murray</p>	<p><b>Freshwater Brewing Company</b>                  St. John's, Newfoundland                  Phone: (709) 596-5586                  Fax: (709) 596-3271                  Brewer: Nick (Doc) Murray</p>
<p><b>Fog City Brewing Company</b>                  Avalon Mall, 48 Kenmount Rd. PO                  Box 8035                  St. John's, Newfoundland                  Phone: (709) 726-4950                  Brewer: Cory Power</p>		