

New England Forests: The Path to Sustainability

CHAPTER 9 • CULTIVATE NEW BUSINESSES



A TECHNICAL REPORT BY NEW ENGLAND FORESTRY FOUNDATION

INTRODUCTION

This project documents both the existing value and potential of New England's working forest lands: Value – not only in terms of business opportunities, jobs and income – but also nonfinancial values, such as enhanced wildlife populations, recreation opportunities and a healthful environment. This project of the New England Forestry Foundation (NEFF) is aimed at enhancing the contribution the region's forests can make to sustainability, and is intended to complement other efforts aimed at not only conserving New England's forests, but also enhancing New England's agriculture and fisheries.

New England's forests have sustained the six-state region since colonial settlement. They have provided the wood for buildings, fuel to heat them, the fiber for papermaking, the lumber for ships, furniture, boxes and barrels and so much more. As Arizona is defined by its desert landscapes and Iowa by its farms, New England is defined by its forests. These forests provide a wide range of products beyond timber, including maple syrup; balsam fir tips for holiday decorations; paper birch bark for crafts; edibles such as berries, mushrooms and fiddleheads; and curatives made from medicinal plants. They are the home to diverse and abundant wildlife. They are the backdrop for hunting, fishing, hiking, skiing and camping. They also provide other important benefits that we take for granted, including clean air, potable water and carbon storage. In addition to tangible benefits that can be measured in board feet or cords, or miles of hiking trails, forests have been shown to be important to both physical and mental health.

Beyond their existing contributions, New England's forests have unrealized potential. For example, habitats for a wide variety of wildlife species could be enhanced by thoughtful forest management. Likewise, wood quantity could be increased and the quality improved through sustainable forest management. The virtues of improved forest management and buying locally produced goods are widely extolled, but what might that actually look like on the ground? More specifically, how could enhanced forest management make more locally produced forest products available to meet New Englander's own needs, as well as for export, improve the local and regional economies and provide the greatest social and environmental benefits?

The purpose of this project is to document that potential by analyzing what we know about how improved silviculture can enhance wildlife habitat, the quantity and quality of timber, recreational opportunities, and the environment. The best available data from the US Forest Service, state forestry agencies and universities was used to characterize this potential.

The technical reports produced for this project document the potential for:

- Mitigating climate change;
- Increasing timber production to support a more robust forest products industry;
- Restoring important wildlife habitat;
- Replacing fossil fuels with wood to produce thermal energy;
- Reducing greenhouse gas emissions, not only by substituting wood for other fuels, but also wood for other construction materials;
- Enhancing forest recreation opportunities and related tourism;

- Expanding production of nontimber forest products;
- Maintaining other forest values such as their role in providing clean air and potable water – taken for granted but not guaranteed;
- Enhancing the region’s economy by meeting more of our own needs with New England products and retaining more of the region’s wealth within the New England economy; and
- Other related topics.

These technical reports are viewed as “works in progress” because we invite each reader to bring their own contributions to this long term effort of protecting, managing and enhancing New England’s forests. The entire set may be viewed at www.newenglandforestry.org. If you have suggested improvements please contact the New England Forestry Foundation to share your thoughts. These technical reports were used as the background to prepare a summary – *New England Forests: The Path to Sustainability*, which was released on June 5, 2014.

If you are not familiar with NEFF's work please visit www.newenglandforestry.org. Not already a member? Please consider joining NEFF – <https://41820.thankyou4caring.org>.

New England Forestry Foundation
 32 Foster Street, PO Box 1346
 Littleton, MA 01460

The New England Forestry Foundation is a recognized leader in conserving working forests, educating the public about forestry, and assisting landowners in the long-term protection and stewardship of their properties. For almost 70 years, we have demonstrated that well-managed working forests can provide landowners and the community with the prime ingredients for healthy living: clean air and water, sustainable production of an array of forest products, healthy forests for hiking and relaxation, a diversity of wildlife and habitats, periodic income, and renewable natural resources that help support rural economies.

Our Mission is to conserve New England’s working forests through conservation and ecologically sound management of privately owned forestlands in New England, throughout the Americas and beyond.

This mission encompasses:

- Educating landowners, foresters, forest products industries, and the general public about the benefits of forest stewardship and multi-generational forestland planning.
- Permanently protecting forests through gifts and acquisitions of land for the benefit of future generations.
- Actively managing Foundation lands as demonstration and educational forests.
- Conservation, through sustainable yield forestry, of a working landscape that supports economic welfare and quality of life.
- Supporting the development and implementation of forest policy and forest practices that encourage and sustain private ownership.

THE PATH TO SUSTAINABILITY



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CULTIVATE NEW BUSINESSES: New England's Nontimber Forest Products: Practices and Prospects

Prepared by Craig Ten Broeck

Part of a larger project on the potential of New England's forest lands coordinated by R. Alec Giffen for the New England Forestry Foundation. Component parts include the following of the larger effort:

1. **KEEP NEW ENGLAND FORESTED:** Assessing the Current Conservation Status of New England's Forests by Jerry A Bley
2. **GIVE WILDLIFE HOMES:** Potential of New England's Working Forests as Wildlife Habitat by Jerry A. Bley
3. **PROVIDE MORE RECREATION:** Forest Recreation Trends and Opportunities in New England: Implications for Recreationists, Outdoor Recreation Businesses, Forest Land Owners and Policy Makers by Craig Ten Broeck and Aaron Paul
4. **PROTECT US FROM CLIMATE CHANGE** by R. Alec Giffen and Frank Lowenstein
5. **CLEAN AND COOL THE AIR:** Forest Influence on Air Quality in New England: Present and Potential Value by Aaron Paul
6. **PURIFY OUR WATER:** The Potential for Clean Water from New England Forests by Aaron Paul
7. **GROW MORE WOOD:** The Potential of New England's Working Forests to Produce Wood by R. Alec Giffen, Craig Ten Broeck and Lloyd Irland
8. **CREATE LOCAL JOBS:** Vision for New England's Wood-Based Industries in 2060 by Innovative Natural Resource Solutions, LLC and The Irland Group
9. **CULTIVATE NEW BUSINESSES:** New England's Nontimber Forest Products: Practices and Prospects by Craig Ten Broeck
10. **PROVIDE MORE WOOD FOR BUILDINGS:** The Greenhouse Gas Benefits of Substituting Wood for Other Construction Materials in New England by Ann Gosline
11. **REDUCE USE OF FOREIGN OIL:** The Potential for Wood to Displace Fossil Fuels in New England by Innovative Natural Resource Solutions, LLC
12. **GROW AS MUCH AS WE USE:** Production versus Consumption of Wood Products in New England by Craig Ten Broeck

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A. Overview



Chanterelle Mushrooms Photo Courtesy of David Fuller, University of Maine Cooperative Extension

Do you have fond memories of harvesting berries with your family, collecting mushrooms in a forest with elders, making a small batch of maple syrup, or cutting evergreen boughs for holiday decorations? If so, you have participated in harvesting nontimber forest products (NTFPs). This practice is more commonly pursued than you might think.

‘Gathering in Thoreau’s backyard: nontimber forest product harvesting as practice’ reports the results of a random-sample general population survey of gathering by residents in the New England states of Massachusetts, Vermont, New Hampshire and Maine (Robbins, Emery, and Rice 2007). They asked people if they gathered wild plants from the environment and for what purposes. They received fully completed surveys from 1650 people, which was a good although not a perfect sample of the population of the surveyed states. Those responding tended to be more likely female and to have attained a higher education level than the demographic characteristics of the 2000 census population of the four-state survey area. Non-respondents are less likely to be forest visitors, so there might be a slight bias towards over-counting gatherers.

Those surveyed were asked ‘during the last five years, have you collected any tree or plant materials around woodlands; for example, mushrooms, berries, cones, or moss?’ More than a quarter (26.3%) of those responding said that they had. In response to the same question about gathering over the last 12 months, nearly one fifth (17.9%) responded that they had gathered forest products. The authors classified these people as participating in gathering on a regular basis. The study authors compared the rate of participation in gathering nontimber forest products with the rate of participation over 12 months for other outdoor activities from the

survey results of the National Survey on Recreation and the Environment (Cordell 2004). A selected subset of that information is shown in Table 1.

Table 1. Public participation rates in various outdoor activities

Activity	Rate of participation*
NTFP Collection	17.8
Golfing	16.7
Primitive Camping	16.0
Basketball Outdoors	14.0
Hunting	11.4
Tennis Outdoors	10.5
Backpacking	10.3
Horseback Riding	9.6
Mountain Climbing	6.3

* NTFP collection as a percentage of New England population based on survey by Robbins, Emery, and Rice (2007). All other percentages for national population per the National Survey on Recreation and the Environment.

The Robbins, Emery and Rice survey showed that NTFP gatherers come from diverse backgrounds including wealthier and poorer populations, white and non-white populations, had a variety of educational backgrounds and represented both rural and urban areas. Interestingly, a majority of NTFP gatherers were classified as urbanites (55.6%).

Devoted gatherers often know a great deal about the biology and ecology of species they collect and try to maintain populations of species over the long term to provide a future source of plant material. Gatherers seeking high valued products are often secretive about their activities fearing competitive harvesting by others. This has made collecting data difficult regarding the harvest and value of some gathered NTFPs.

There are a variety of definitions of NTFPs. The US Forest Service has defined a NTFP as any product “constituting or derived from trees, shrubs, forbs, non-vascular plants, fungi, and microorganisms that live in forest or grassland ecosystems.” The US Forest Service describes these products as falling into four categories: edibles, florals, medicinals and ornamentals. For this report we have added crafts to the ornamental category and a fifth category--‘ceremonial’ to better cover NTFPs used in New England. Using these categories, examples of NTFPs found in New England forests are listed in Table 2.

Table 2. Examples of NTFPs found in forest environments by categories*

<p>Edibles</p> <p>Syrups, candies, sweeteners, nuts, mushrooms, spring greens, gums and berries</p>	<p>Sugar Maple Syrup Mushrooms Fiddleheads Wild Leeks Beaked Hazelnut Beechnuts Honey Spruce species (resin used as gum) Elderberry High bush blueberry Low bush blueberry (forest openings) Indian Cucumber Huckleberries</p>
<p>Florals</p> <p>Baskets and flower arrangements</p>	<p>Ferns Mosses Mountain Laurel</p>
<p>Medicinals</p> <p>For treating colds, sore throats, sores of the mouth, healing small wounds, cuts and scrapes, antifungal and antibacterial properties</p>	<p>Ginseng Balm-of-Gilead Flag Root Goldthread Pine species (resin used in first aid salves) Spruce species Balsam Fir</p>
<p>Ornamentals and Crafts</p> <p>Wreathes, swags, baskets, containers, decorations, potpourri, sachets, incense, Native American-style canoes, furniture, Christmas trees, seedlings for landscaping</p>	<p>Brown Ash Paper Birch Balsam Fir Pine species (cones used in crafts) Spruce Species Alder Eastern White Cedar Red–Osier Dogwood Princess Pine</p>
<p>Ceremonial Uses</p> <p>Ceremonial Tobacco used by Native Americans</p>	<p>Red-Osier Dogwood</p>

* Synthesis of selected species and uses from Baumflek, et al. (2010) and Bennett (2010) as well as others added based on knowledge of New England NTFPs. Species selected are those that grow in and are dependent on the conditions in New England forest environments.

The reasons for collecting NTFPs fall into two broad categories: noncommercial and commercial. Noncommercial collecting can be for household subsistence, to maintain cultural

and family traditions, to obtain spiritual fulfillment, maintain physical and emotional well-being and for scientific learning. Commercial harvesting of NTFPs occurs at greatly varying scale from the individual who is trying to earn supplemental income by harvesting floral products or medicinal herbs, to the Indian basketmaker crafting intricately woven fancy baskets selling for thousands of dollars, to the well-organized, capitalized enterprises harvesting maple sap to make syrup and sugar products.

Gathering NTFPs is usually a seasonal pursuit whether for personal use or as a commercial enterprise. For example, harvesting fiddlehead ferns occurs in the spring, balsam fir needles and tiny branches for making fragrant pillows are collected throughout the year, while balsam fir tips for holiday decorations are harvested in the late fall. These businesses are cottage industries often pursued by individuals, family members or a small group of people. The income derived is usually a supplement to other incomes, but is often critical to financial survival in rural areas. Most commercially valuable NTFPs are sold by gatherers to businesses that take on the processing and marketing functions. Some states have laws regulating the sale of NTFPs for commodities such as ginseng, making it easier to collect information on harvest levels and value.

The federal government and states have laws and regulations controlling and in some cases prohibiting removal of plants from public lands. Various federal acts require that renewable resources, including NTFPs, be considered in forest management planning. At various times, federal land managers in California, Wisconsin and the Rocky Mountains have allowed for the sale of Christmas trees; national forests in Appalachia sold mountain laurel; and national forests in Colorado and New Mexico sold coniferous wildlings. Other products offered for sale by national forests have included pine cones, boughs, ferns, peat and burls. The Forest Service handbook allows national forest managers to grant individuals free use to special forest products for personal use. Indian basketmakers have had long standing agreements with private forest land owners to collect brown ash from their properties for basket making.

It is difficult to estimate the economic value of NTFPs to the national and regional economies owing to the fact that there are hundreds of products that make up this category and lack of broad-based systems for tracking their combined value (McLain and Jones 2005). In 1998, the retail value of medicinal plant products sold in the US, many of which came directly from forests, was estimated at \$4 billion dollars (see McLain and Jones 2005). Chamberlain, et al. (2002) estimated the 2001 value of forest harvested ginseng from a four-state area at \$18.5 million. The USDA National Agricultural Statistics Service reported the 2013 gallons of maple syrup production in Connecticut, Maine, Massachusetts, New Hampshire and Vermont at nearly two million gallons (USDA National Agricultural Statistics Service News Release, June 2013). Using the US average 2012 price per gallon of \$39, the estimated value of New England maple syrup production in 2013 would be \$77 million. Maple syrup is the most thoroughly tracked nontimber forest product in New England owing to the extent of the industry and its longstanding importance to the regional economy.

While there are dozens of nontimber forest products gathered in New England, this report focuses on the current practice and prospects for seven products: maple syrup and sugar; balsam fir tips for holiday decorations and other uses; fiddleheads; ginseng, wild mushrooms and cultivated Shiitake mushrooms, brown ash and sweet grass for basket making, and paper birch bark for canoes, mirror and picture frames, containers and decorative items. These products are socially, culturally, and economically important to the New England regional economy to

varying degrees. For example maple sap and balsam fir support robust industries while wild-simulated ginseng is grown on a small scale in Vermont.

All of these NTFPs are subject to over harvesting unless gatherers follow traditional harvesting practices and use common sense. Some NTFPs, such as balsam fir and ginseng, lend themselves to woods-cultivation through applying principles used in agriculture such as controlling spacing, reducing other plant species competition, ensuring the proper amount of light and in some cases providing supplement nutrition in the form of compost or fertilizer.

The practice and prospects for each of these NTFPs is discussed from the standpoint of their current economic value, if known, and potential in New England's working forest lands over the next 50 years under sustainable management practices. The harvesting and sale of NTFPs could be increased by making more available technical and business assistance to potential entrepreneurs. Research could also support successful growing and sustainable management practices for NTFPs.

B. Maple Syrup and Sugar

Europeans learned the practice of making maple syrup and sugar from the Native Americans. During the Colonial-era maple sugar was a valuable export commodity. Still today, the maple industry continues to thrive producing a product valued in its own right and as a sweetener added to other products.

While technology has made the syrup making process more efficient and productive it still requires long hours and hard work in the late winter and early spring to produce syrup. There are many small, independent sugarmakers, however, the majority of syrup made in New England and New York is produced by about 50 large operations (Perkins, personal communication).



In South Korea pasteurized maple sap made from the Big Leaf Maple is consumed for purposes of purging the digestive system. Maple sap has been used to make coffee, obviating the need to add sugar, depending on how you like your coffee. It has also been used to make maple beer. Maple sugar in the form of creams for toast, etc. and as candy remains popular among people who enjoy the unique taste of maple sap products.

A University of Rhode Island research team has discovered 54 beneficial compounds in pure maple syrup, five of which have never been seen in nature before (University of Rhode Island 2011). One of the researchers, Navindra Seeram, said "I continue to say that nature is the best chemist, and that maple syrup is becoming a champion food when it comes to the number and variety of beneficial compounds found in it. It's important to note that in our laboratory research we found that several of these compounds possess anti-oxidant and anti-inflammatory properties, which have been shown to fight cancer, diabetes and bacterial illnesses." He went on to say that

“These discoveries of new molecules from nature can also provide chemists with leads that could prompt synthesis of medications that could be used to fight fatal diseases.”



Photo Courtesy of Kathryn Hopkins, University of Maine Cooperative Extension

Timothy Perkins, Ph.D., Director of the University of Vermont Proctor Maple Research Center, in June 2007 testified before the House Select Committee on Energy Independence and Global Warming. He told the Committee that Quebec Province in Canada produces 80% of the world’s maple syrup. Prior to 1900 Canada produced only 20 percent. In characterizing the state of the New England maple syrup industry relative to the Canadian industry he said “While much of this change has been driven by changing land-use and employment in the US, changes in sap collecting technology, and Canadian

subsidies aimed at growing the maple industry, climate change is likely to also be partly responsible for the huge increase in Canadian production, especially in the last 30 years.” He sees the current New England maple industry and its practitioners primarily under threat from these economic forces and secondarily by the changing environmental conditions.

In 2013, the New England states were responsible for 60 percent of US maple syrup production. Vermont alone was responsible for 40 percent of national maple syrup production. Using the 2013 production figure for Vermont of 1,320,000 gallons if sold at the 2012 price of \$39 a gallon the total Vermont direct income would be \$51,480,000. Perkins in his testimony said the total economic impact of maple syrup for the Vermont economy from all aspects of the industry is nearly \$200 million each year (Perkins 2007).



Photo Courtesy of Kathryn Hopkins, University of Maine Cooperative Extension

Sap flow from maple trees in the late winter and early spring is controlled by small fluctuations in daily temperatures. Below freezing nights need to be followed by warm above freezing days to get the sap flowing. The warm days cause a thawing of the frozen sap and air bubble expansion within the vessels of the tree resulting in

pressure and the outward flowing of sap through tap holes drilled by sugarmakers. The two percent sugar in the sap is concentrated by boiling to make maple syrup, which is 66 percent pure

sugar. Perkins says that small changes in the day-to-day temperatures will have large consequences on sap flow and the resulting productive capacity of trees.

Perkins reported to the Committee in his testimony that “Historical evidence of the timing of the season, derived from two independent sets of survey data, show that the maple sugaring season has shifted significantly over the past several decades throughout the northeast.” Over the last 40 years, the New England season is beginning earlier in the calendar year and ending sooner with a net loss of about three days, which is 10 percent of the total season duration over this period. (Perkins said in a recent conversation (August 2013) that these same trends he described in 2007 are continuing.) He told the Committee that these changes are consistent with observed changes in regional climate over the period. Even acknowledging the season-to-season variability, the trend in a shorter sugaring season is significant and is linear over the time period and areas studied.

Perkins related (August 2013) that “there is some more recent research suggesting that sap yields may become considerably higher in the interim period. In short, although most producers collect only in the spring season, there is also a fall maple season (not utilized for several reasons). As the spring season shifts closer to the start of the calendar year the fall season does the same. Eventually those two seasons will merge into one larger season, with likely higher yields, before gradually shrinking in duration again.”

His view is that “In the short term (< 50 yrs.), use of high-yield maple production techniques may help to offset yield losses resulting from a reduction in season duration.” But, the maple industry will become untenable between 50 to 100 years out as the required diurnal temperature fluctuations for sap flow become less prevalent due to climate change.

Even with the decreasing number of days of sap flow in recent years producers have been able to offset potential sap loss because of improved technologies including plastic tubing systems and vacuum extraction, along with overall improved system management. Plastic tubing in combination with vacuum systems and improved spout and tubing sanitation practices allows more sap to be pulled out of the tree during the sugaring season. Perkins says that producers not using vacuum systems are experiencing lower sap yields over the last decade. He also said that the vacuum systems are not hurting the tree by extracting more sap during the short sugaring season.

Perkins believes that climate change will affect forest composition and alter the maple sugaring season in several ways. He summarized the conclusions by other researchers telling the Committee that “In the long-term (100+ years), climate change is expected to shift forest composition, resulting in a loss of the maple-beech-birch as a dominant forest type throughout much of New England and New York.” He also said that “...given possible future temperature regimes predicted by existing models, a loss of the maple industry in the US within the next 100 years would appear to be inevitable. In the long-term, the migration of the maple resource will render even hobby maple production impossible in the US” The rate of these changes is highly dependent on the rate of warming over the next several decades.

Sap can be collected from birch trees, but the shift in forest composition will eventually result in its loss from New England. Red maple also produces sap, but the changing climate will affect its sap production the same as the sugar maple will be affected by the loss of the necessary diurnal freeze-thaw cycles in the spring that forces sap flow.

He makes a further concerning observation that "... even a small northward shift in the distribution of maple will have a large negative impact on the domestic maple industry. More importantly, the fall foliage season, which relies on maple species for the brilliant display of red and orange colors, and which annually contributes billions to the northeast tourism-based economy, would be greatly impacted by a shift in tree species composition."

Maple syrup producers in New England can expect to continue to make a living tapping sugar maples with the typical season to season variations in production they have experienced in the past. As Perkins suggests use of high-yield maple production techniques may help to offset yield losses resulting from a reduction in season duration, so those currently relying on maple syrup products as an important source of income should be able to do so for the rest of their lives. However, those who would like to follow them in this New England syrup-making tradition may find that the diminishing maple tree resource and shortened tapping season makes doing so no longer financially viable.

C. Balsam Fir Tips for Holiday Decorations and Other Uses

Balsam fir (*Abies balsamea*) occurs throughout the northern New England states of Maine, Vermont and New Hampshire and is also found in western Massachusetts and northeastern Connecticut. Aside from its use for lumber and pulpwood, balsam fir has many nontimber uses that enable landowners to derive benefit from the tree before it reaches suitable size for use as timber or pulpwood.



Balsam Fir Wreath Photo Courtesy of David Fuller, University of Maine Cooperative Extension

David Fuller, nontimber forest products expert for the University of Maine Cooperative Extension, in his article "Nontimber Forest Products: Goods from the Maine Woods" (Fuller 2012) lists balsam fir uses: holiday decorations such as wreaths; balsam fir pillows; weather sticks; resin as a cementing agent; incense, flavorings, and medicinal uses. He relates that a Canadian firm, Buckley's since 1919, makes cough syrups using balsam fir pitch (see www.buckleys.ca/products/index.htm). The Buckley's web site states that Canada balsam is used as an ingredient "This is a liquid oleoresin from *Abies balsamea* (Pinaceae). This plant is found in Canada and Northern US from Virginia to Minnesota. Balsams have traditionally been used as an expectorant for coughs and sore throats." Also used in their cough syrups is pine needle oil. The site says "Pine Needle Oil has historically been used as an expectorant for the treatment of coughs and chronic bronchitis." Both balsam fir and spruce have been used as flavorings to make jellies used with lamb.

Maine made 'fancy goods' from balsam fir were sold to tourists as early as the 1870's (Fuller 2012). Shaker women in New Gloucester, Maine made fir pillows. The pillows are made of ground and dried tiny branches and needles. They continue to be a favorite tourist gift due to their enduring smell that can last a decade or more. Maine Balsam Fir Products – Since 1983, located in West Paris Maine, is a husband and wife business run by Wendy and Jack Newmeyer

with, as they say, “a little help from our friends.” They offer a wide range of balsam fir pillows and sachets, see www.MaineBalsam.com. Pillow covers are offered in ‘collections’ such as ‘special sentiments’ with messages, ‘country’, ‘whimsical’, ‘lodge’, ‘Christmas’ and ‘heirloom’. Jack harvests 50 percent of the balsam fir tips they use year round from their 100 acre woodlot and relies on nearby small family farms to supply the other 50 percent. Wendy is the product designer, cuts all of the fabric and oversees her team of stitchers and packers, serves as the marketing ‘department’, bookkeeper, drying room specialist and facility tour guide. They relate that their annual gross income is around \$250,000 from which they net a \$50,000 a year income. They said they were not reluctant to talk about finances since it is unlikely many other people will run out to start a competing business as it’s a lot of hard work!

Other balsam fir products are still popular today with tourists such as weather sticks. Weather sticks mounted outdoors can ‘predict’ approaching weather changes by tipping up for fair weather and down for coming precipitation. They are made from small branches from which the bark is easily peeled. Fuller relates that they were traditionally used in Maine lumber camps as weather change predictors.

During World War II balsam fir resin was used as a transparent cement to fix gun sights and optical equipment. It has also been used to fix cover slips for prepared microscope slides (Fuller 2012). It has been used as an ingredient in varnish and for its fragrance value, and is still used as an ingredient in a cough syrup (Fuller 2012). Ground balsam fir needles are also used to make incense. Maine has had a balsam fir incense industry since 1931 (Fuller 2012).

The epicenter of the holiday wreath making industry is eastern Maine’s Washington County. Companies such as Whitney Wreath, Worcester Wreath Co. and Kelco Industries annually make more than one million balsam fir wreaths and other holiday decorations that are shipped to mail order customers around the world.

Thousands of people are employed seasonally for about six weeks to gather balsam fir tips and to make wreaths. Tips are gathered from private and industrial lands usually after the first of November when there has been three consecutive 20 °F cold nights, which causes the needles to ‘set’ as the tree goes dormant until spring. Harvesting before setting can cause needles to shed. After setting, tippers break 12 to 20 inch long branches from the mid-section of a balsam fir by hand and stack them for transport to wreath making facilities.

Balsam fir can also be managed in naturally occurring stands to produce a continuous supply of tips. Stands are ‘weeded’ of other trees, the fir themselves thinned to 8 to 10 feet apart and topped at about 10 to 12 feet. This provides ready access to trees and branches for tipping.

Fuller estimates the value of balsam fir products in Maine to be \$25 million dollars. Maine wreaths are used at Arlington National Cemetery to honor those who served in the US armed forces. There are also many cottage industry scale wreath makers who derive seasonal income from making balsam fir wreaths and various other holiday decorations including swags, garland, kissing balls, doorway arches, grave blankets, table centerpieces and floral decorations (Fuller 2012). Holiday decorations using balsam fir are also made in Vermont, New Hampshire, Massachusetts and Connecticut.

The Three Rivers Wreath Company in Franklin, New Hampshire (www.3rwc.com/about-us.aspx) advertises “Like the blacksmith with his anvil, three rivers hand-crafts the beauty of

nature with the creativity of the human soul and imagination into every product it makes. Three Rivers prides itself on passion, dedication, and personal attention given to everything it creates. Just as no two snowflakes are alike, each hand-made wreath possesses its own unique form and likeness guided by nature's balsam fir.”

It is likely that climate change will have significant impacts on the distribution of the balsam fir resource by the end of this century. In an article published in 2010 in *Biodiversity Research Projecting the distribution of forests in New England in response to climate change* the authors conclude that regional warming will result in a 71 – 100% loss of the boreal conifer forest late in this century (Tang and Beckage 2010). The boreal forest includes balsam fir. The boreal forest type may still be found in western Maine and at higher elevations in part because higher levels of CO₂ may actually favor its survival, but in general higher temperatures will limit its distribution. If this scenario comes to pass, the companies in Down East Maine and elsewhere in New England will have to source balsam fir from western Maine and perhaps Canada at greater expense. This may in the longer term lead to a shift in the location of these businesses to the most northern parts of New England and favor production of holiday decorations for the US market by Canadian firms.

D. Fiddleheads (Ostrich Fern)

Fiddleheads are northern Maine’s iconic spring green. They are the emerging fronds of the ostrich fern (*Matteuccia struthiopteris*). When the fiddlehead fully unfurls the fronds have a feathery look to them, hence the name “ostrich fern.” They are harvested when the little rolls of the fern emerge an inch or two above the surface of the ground. In the comprehensive report on “Culturally and Economically Important Nontimber Forest Products of Northern Maine” the authors declare fiddleheads to be collected by the greatest number of gatherers of any NTFP (Baumflek, et al. 2010). Gathering takes place from late April to early June.



Ostrich Fern frond, known as fiddlehead. Photo Courtesy of David Fuller, University of Maine Cooperative Extension

Fiddlehead gathering is an important pursuit for all Maine Indian tribes. Gatherers use them as a traditional spring food and sell them roadside as well as to local grocery stores providing an important source of seasonal income.

Fiddleheads are found in moist soils along rivers and streams typically under a hardwood over story. In Maine, they are prevalent along the St. John, Penobscot, Kennebec and Sandy Rivers. For the most part fiddleheads are a sustainable NTFP because of their widespread abundance and varying emergence time. Thoughtful gatherers only harvest half of the fiddleheads from an emerging crown, but the next gatherer following along might do the same and so on leading to local depletion. Fiddleheads can be transplanted to a moist location such as a pond bank and managed for harvest. Harvesting is done by hand-breaking the frond rather than cutting which

can damage other fronds below the soil that have not yet emerged. As with any harvesting on private property it is important for gatherers to ask permission of the landowner before entering on their property to collect fiddleheads.

Fiddleheads should not be eaten raw due to the fact that the Centers for Disease Control determined a 1994 outbreak of foodborne illness was the result of eating raw or undercooked fiddleheads (Bolton, et al. 2013). Symptoms included diarrhea, nausea, vomiting, abdominal cramps and headaches. This foodborne illness typically lasts 24 hours but in some cases lasted for three days. Fiddleheads can be frozen after blanching and canned for use throughout the year. Cooking methods include boiling, sautéing and pickling.

Typical prices are in the range of \$5 a pound roadside or in local convenience stores and can sell for \$15 a pound when shipped to the west coast. Wells Canning, in Wilton Maine, processes approximately 25,000 pounds a season for sale all over the US (Personal communication, David Fuller, University of Maine Cooperative Extension). Because fiddleheads are so dispersed across northern Maine and sought after by so many gatherers for both non-commercial and small scale commercial sale, it is difficult to estimate the overall economic value of this NTFP to the Maine economy.

E. Ginseng

For three thousand years the root of the perennial ginseng plant (*Panax quinquefolius*) has been an important component of Chinese medicine. Roots have been exported from the US since the mid 1700's. According to the US Department of Commerce in 1858 the US exported 350,000 pounds of dried wild ginseng roots (Beyfuss 2002). Dried ginseng roots are reputed to lower blood sugar and cholesterol levels, protect against stress, enhance strength and promote relaxation (Harrison, et al. undated). Although some European and Asian studies appear to support these claims American researchers remain skeptical (Harrison, et al. undated). It is classified by the US Food and Drug Administration as a "generally recognized safe food", but it is not a drug and should not be taken as such. It is a component of dozens of over the counter herbal remedies available from drug stores. However, many of the products in American drug stores do not contain any American grown ginseng, but ginseng from China or Korea.



Wild ginseng is found from northern Georgia to southern Quebec and from the east coast to the Midwest. American ginseng is listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora ([CITES](#)). The listing covers the export of whole live or dead plants, whole and sliced roots, and parts of roots, but excludes powder or manufactured finished products (e.g. teas, capsules, extracts, and confectionary products). American ginseng can be harvested in 19 States, but is illegal to harvest roots on most state lands

and National Park Service land. Harvest and permitting requirements vary on US Forest Service land.

Wild ginseng is listed under various state classification systems in New England and for all of the states its occurrence is not common. For example, in Maine and Rhode Island it is listed as 'endangered'; in New Hampshire it is listed as 'threatened'; in Vermont it is on the 'watch list'; and in Connecticut and Massachusetts it is listed as a species of 'special concern'.

Both Vermont and Maine have state laws regulating ginseng harvest, certification and sale. The State of Vermont issues a Ginseng Collector's Permit for collecting wild ginseng. Collectors are required to obtain permission to collect ginseng from the landowner unless they are collecting on their own land. A Ginseng Dealer's Permit is required to buy wild or cultivated ginseng harvested in Vermont. If a Collector wants to export their ginseng from Vermont then they also must obtain a Ginseng Dealer's Permit. Harvesting must take place between August 20 and October 10. Only plants with at least three five-leaf prongs may be harvested and the seeds from the plant must be planted in the locale from which the ginseng was harvested. In Maine harvesting wild ginseng is discouraged because wild populations are not large enough. There are two licenses, one for ginseng growers and the other for dealers, both of which must be renewed annually. Those wanting to grow ginseng must first have a state inspector visit the site to make sure that there are no wild ginseng plants in the immediate area. Both Vermont and Maine have state inspection and certification programs for harvested ginseng to ensure that export of ginseng meets the requirements (CITES).

The Vermont Woodland Ginseng company is cultivating wild-simulated ginseng (vermontginseng.com). Their website advertises "We grow only American Ginseng in our wild-simulated, mountain environment and we know you'll find our quality to be of the highest and to meet traditional Asian, European and the new US Organic standards. Because we offer our ginseng direct from our farm to you without middlemen we can provide the best prices as well." Their product is certified organic and sells for \$25 an ounce.

The core of its range is in the mountains of central Appalachia. In the northeast it grows under the dense shade of hardwood trees, most commonly sugar maple. While ginseng can be field cultivated under shade provided by wood lathe or shade cloth, growing it in this manner essentially makes it an agricultural crop requiring intensive inputs of labor, materials and chemicals. The field grown ginseng roots are not as prized as forest grown and can easily be identified by the character of the root, therefore they command substantially lower prices than wild harvested or woods-cultivated roots. Ninety percent of US field grown ginseng is produced in Wisconsin, primarily from Marathon County. Field grown ginseng has been declining in recent years. Most US ginseng is exported through Hong Kong where it is then distributed to other locations in the Far East where it finds its way into toothpaste, soft drinks, tea, candy, chewing gum and cigarettes (Harrison, et al. n.d.).

Ginseng thrives in a climate with 40 to 50 inches of annual precipitation and an average annual temperature of 50 °F (Harrison, et al. n.d.). These are the climatic conditions typical of New England. Where ginseng is found growing in the wild it can be easily over harvested as it is a slow growing herb. Careful gatherers take only older plants leaving smaller ones to develop, but because of ginseng's reputation as "green gold" it is subject to over harvesting, often by people trespassing on public or private lands. Ginseng is ready to harvest when it is five years of age; at

which time it has at least three or more prongs or leaflets. Harvesting takes place when its berries turn red in the fall. West Virginia law requires a ginseng digger to replant the berries from the parent plant in the same spot from which it was removed to help perpetuate the species. The plant is dug out of the ground and the root removed. At harvest the roots are two to six inches long and ¼ to ½ inch thick.

Recent prices reported by Randy Dye, State Forester for West Virginia, ranged from a low of \$200 to a high of \$700 a pound with an average of around \$400. He said that 4,920 pounds of ginseng were harvested during the 2011 season generating approximately \$2 million dollars to the state's economy. Sellers must sell to a registered West Virginia ginseng dealer.

While no permit is needed to dig ginseng in West Virginia, a digger must carry written permission from the landowner allowing them to harvest ginseng on the property. Digging ginseng is prohibited on state-owned lands in West Virginia. This report only focuses on ginseng in forest environments where it can be wild harvested, wild-simulated grown or woods-cultivated, usually on a small scale. Harvesting of wild ginseng may lead to its extirpation in an area. However, where it has been harvested in West Virginia, it continues to be a time-honored tradition handed down from generation to generation. Robin Black of the West Virginia Forest Service, who has worked with the department's ginseng program for 20 years, said she's not worried about ginseng digging ever ceasing. She said "In fact, in many areas of West Virginia, digging provides a second or third income for many families especially during tough economic times. Ginseng digging is a great way for families to get out into the forest together, learn about the importance of sustaining a native species and make some extra money."

The wild-simulated method is the easiest and least expensive way to cultivate ginseng, but also the slowest to produce a root crop. A good wild-simulated planting site will have a high hardwood shade canopy, some slope for drainage and a rich forest soil high in organic matter. After some clearing of the planting site with a rake to expose soil, seeds are planted thinly with minimal disturbance to the forest floor, covered with soil and forest floor duff, and allowed to grow naturally. This produces a root crop that is indistinguishable from wild roots. Most of the labor is in digging the roots. One person can reasonably plant an acre or more each year without mechanized equipment. Even steep hillsides can be utilized since there is very little disturbance to the forest floor (Persons 1998). The planted site should be visited bi-weekly to weed and check on the plant growth. Persons projected a nine year budget for a half acre of wild-simulated ginseng to have expenses of \$9,690 to include seed, labor, materials and equipment, and drying; a gross profit of \$24,000 (80 pounds of roots at \$300 per pound based on 1998 prices) with a net profit of \$14,310 at the end of nine years. Growers using this approach would plant a series of sites to have a yearly harvest.

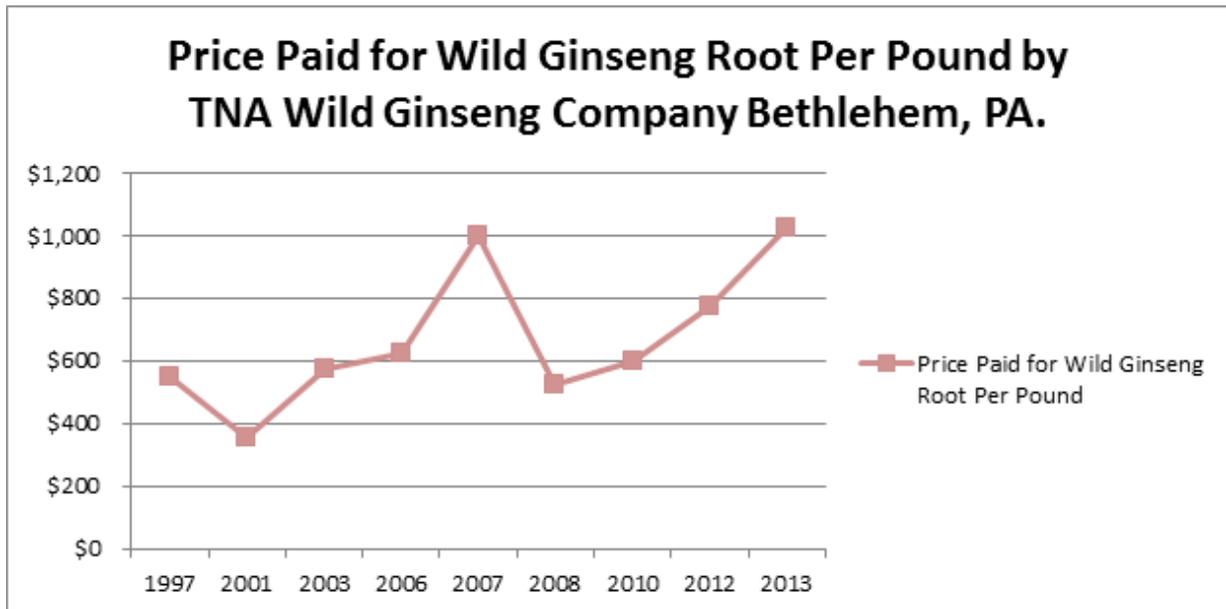
The woods-cultivated method is more intensive than the wild-simulated approach and involves disturbing a forest site by cutting down small trees, removing rocks, stumps and roots and tilling beds with a rototiller. It is essentially like creating a garden in the woods. Equipment includes an ax, chainsaw, rake, shovel and backpack sprayer. Typically a small plot of say 1/10th acre would be developed in this way. Woods-cultivated ginseng is almost always graded higher, bringing a much better per pound price than artificial shade-grown roots (Persons 1998). It also develops a marketable root in 6 to 8 years as opposed to 6 to 12 years for wild-simulated grown. Persons projected a six year budget for a half acre of woods-cultivated ginseng to have expenses of \$24,135 to include seed, labor, materials and equipment with more pesticides used, and drying; a

gross profit of \$30,000 (300 pounds of roots at \$100 per pound based on 1998 prices) with a net profit of \$5,865 at the end of six years. Growers using this approach could also plant a series of sites to have a yearly harvest.

Growing ginseng in the woods is clearly not a get-rich-quick scheme. It requires substantial manual labor and growing sites are subject to damage from wildlife, fire and wind storms and may be attractive to poachers. But, it does offer an industrious individual the opportunity to make some supplemental income.

“In recent years the world market price for field cultivated ginseng has dropped to near the actual cost of production. The prices of woods cultivated and wild simulated ginseng, on the other hand, have risen to levels that can be extremely profitable for landowners with suitable forest stands (Beyfuss 1999).” Beyfuss also said in his article that “American Ginseng is gaining popularity among American and European consumers. Eventually a market for ‘organic’ ginseng can be expected to develop, as western people become more familiar with this product. Woodland cultivation is the only possible way to grow ginseng ‘organically’. Currently, the production of woodland ginseng is so limited that almost all of it is exported to Asian countries. It will most likely continue to be in great demand since the Chinese market alone is enormous.”

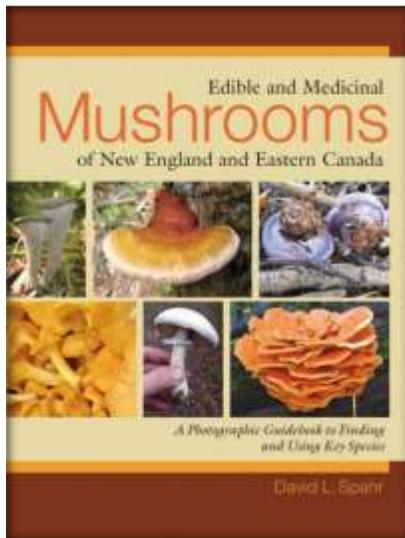
TNA Wild Ginseng Company (www.TNAWildGinseng.com) located in Bethlehem, Pennsylvania posts a pricing history for wild ginseng on their website. Prices vary from year to year, depending on the time of year and are also based on the quality of the roots.



The TNA Wild Ginseng Company also lists 2013 prices paid for wild-simulated ginseng (dried roots that are 10 to 15 years old and not treated with pesticides 2 years before harvest) as ranging from \$500 - \$800 per pound. 2013 prices paid for woods-grown ginseng (dried roots 7 to 12 years old treated with legal pesticides only) range from \$120 - \$400 per pound.

There are opportunities for small entrepreneurs to expand ginseng production in New England because of the continuing strong Chinese market. It is likely that this type of forest-based business with sufficient technical assistance could, over time, become a multi-million dollar source of direct income for industrious individuals from New England's forests.

F. Wild Mushrooms and Cultivated Shiitake Mushrooms



A search of the Internet uncovers a wealth of information on gathering wild mushrooms and cultivating mushrooms in New England. There are mycological associations that lead mushroom identification and collecting walks and small businesses that do the same for a fee that may include overnight accommodations and meals featuring mushrooms. There are also hundreds of wild mushroom gatherers who make a part time income collecting and selling wholesale and retail. The Mushroom Growers' Newsletter, which has been serving growers since 1992, lists over two dozen commercial mushroom growers and sellers for the New England states.

State departments of forestry and Cooperative Extension offices can also provide information on mushroom collecting and growing or may be able to provide contacts for people with experience to share. The Rhode Island Department of

Environmental Management has a publication "How can I generate income on my forestland? Gathering Wild Mushrooms as a sustainable land-based business." The publication lists organizations and other sources of information for getting started.

Harvesting wild mushrooms is an activity that can start in the early spring as hunters look for morels and continue into late summer and early fall as they search for chanterelles. David Spahr author of "Edible and Medicinal Mushrooms of New England and Eastern Canada" lists on his website the "more safe and common mushrooms" to include by category:

Mushrooms with Gills, Ridges or Teeth—Chanterelle, Black Trumpet, Small Chanterelle, Hedgehog, Horse and Meadow Mushroom, Parasol Mushroom, Shaggy Mane, (White) Matsutake, Blewit, and Oyster Mushroom.

Mushrooms with Pores—King Bolete, Two Colored Bolete, Maitake, Chicken of the Woods, and Dryads Saddle.

Other Mushrooms—Morels, Puffballs, Lobster Mushroom, and Aborted Entoloma.

Medicinal Mushrooms—Maitake, Reishi, Turkey Tail, Chaga, Artist's Conk, Chanterelle, Black Trumpet, Small Chanterelle, Hedgehog, Horse and Meadow Mushroom, Parasol Mushroom, Shaggy Maine, (White) Matsutake, Blewit, and Oyster Mushroom.

Mushrooms are not only used as a food and to enhance flavor in recipes, but they are also sought for their medicinal value and used for dyes. Mushrooms are prized by some professional chefs who will collect mushrooms themselves or buy from trusted sources. Thousands of New Englanders collect mushrooms for their own use. Neophyte mushroom gatherers should seek out

people recognized for their expertise and experience; these people can often be found as members of a local or state mycological society. Because there are hundreds of different mushrooms in New England woodlots and some that resemble commonly eaten mushrooms are poisonous it is important to be accurate in species identification. In 2008, two Maine chefs were poisoned and needed emergency medical care after eating wild mushrooms sold as edible to them by a forager.

In 2011, Maine passed a law requiring mushroom foragers to be trained and certified because of the huge increase over the last decade of foragers selling both exotic cultivated and wild-harvested mushrooms to restaurants, farmer's markets and specialty food stores. The wild mushroom certification program requires that someone in the chain between the forest floor and the consumer be certified as a trained and competent mushroom identifier. The certified person can be the forager who collects the mushroom, the broker who buys from the forager or the chef or market employee who buys the mushrooms from the forager or broker (Marley 2011). The program is intended to be self-funded, but the Governor insisted the fee not exceed \$20 for training for a five-year certificate. The limited fee reduces the chances the law will be implemented through the certification program until such time as adequate funding is provided.

Wild gathered mushroom prices vary depending on species. One Maine wild mushroom gatherer said "Chicken of the Woods mushroom can sell for up to \$12.50 a pound wholesale, while Matsutake can sell for as high as \$20 a pound (Kamila 2012)." David Spahr, author and forager from Washington, Maine, said that on a good day he can expect to make \$200 to \$300 selling forest gathered mushrooms to local restaurants, but local markets can only take so much at any one time. Income for a day's work will be variable and is seasonal depending on mushroom availability, which can change dramatically from day to day. As with other NTFPs, wild mushrooms provide an opportunity to supplement other incomes for those who are willing to expend time and energy in the woods searching for them.

Oyster Creek Mushroom Company in Damariscotta Maine purchases mushrooms from local gatherers for sale across the US and to markets in Europe and Japan (www.oystercreekmushroom.com/). The website says "Finding knowledgeable pickers is the biggest problem we have. We can easily sell everything people bring us, along with everything we can grow ourselves." However, Oyster Creek Mushroom Company owner Candice Heydon says that the seasonal market for wild gathered mushrooms is highly variable and she warns pickers to call her in advance of harvesting to make sure there is a current market for the varieties they want to pick. She says her income as a buyer is also highly variable ranging from doing very well in some years to just barely paying the bills in other years. This is a result of the year to year availability of various mushrooms and the markets for them. She has been in the business for 20 years and many of the pickers who sell to her are regulars. They are generally people who have other sources of income such as digging clams and switch to gathering mushrooms during the mushrooming season, which in Maine is September, October and early November. Heydon tries to sell as much as she can at five local farmer's markets and to local restaurants before taking mushrooms to the Boston market. She says the most valuable mushroom is the Matsutake, with prices for the top of five grades in the range of \$15 to \$17 a pound from a Japanese food buyer at the Boston market. David Spahr, author of *Edible and Medicinal Mushrooms of New England and Eastern Canada*, says "Matsutake is an important ceremonial mushroom in Japan, often given in wooden presentation boxes to celebrate autumn.

fruit by submerging logs in cold water such as a running stream or in a tank for 12 hours. Forcing a portion of the logs at any one time can allow for a continuous harvest during the fruiting season. Once a log has produced a crop of mushrooms it is allowed to rest so that the mycelium can replenish the energy required for fruiting. The mushrooms are three to six inches in diameter when ready for harvest.

Shiitake has become very popular in the US, so the demand is high. It has an excellent shelf life, and can be refrigerated for a month or more in paper bags. 2013 wholesale prices are in the range of \$4 to \$8 per pound and retail from \$8 to \$15 a pound for top grade. A grower in Union Maine, Russell Morton, makes the point that Shiitake growers can cultivate their own market and increase production as they grow their market. He thinks it is possible for a lone entrepreneur to grow a local market, especially if they have access to good restaurants and a flow of tourists, sufficient to provide a full time income. An important consideration is access to oak logs at reasonable cost or better yet from one's own woodlot. Even a small growing operation might need 4,000 to 6,000 logs to sustain a full time business. He relates that a fellow grower with a stand at a country fair sold 250 pounds of battered and deep fried Shiitake in one day. He ended up calling Morton seeking more mushrooms.

Regional warming may shift the range of the oak-hickory type by 60 to 120 miles northward and will increase its area by 149 – 431 percent depending on different assumptions about the level of greenhouses gases in the atmosphere by the end of this century (Tang and Beckage 2010). While climate change may adversely affect the maple syrup and balsam fir-dependent holiday decoration industries it will likely result in more extensive areas of the oak-hickory type providing a resource to support Shiitake cultivation. As can be seen from the map, Connecticut, Rhode Island and eastern Massachusetts have extensive areas in upland oak that could support Shiitake cultivation.



Russell Morton of Union Maine standing near his oak logs for Shiitake growing with a tub used to hold cold water for shocking mycelium laced logs into fruiting

As with ginseng, industrious entrepreneurs can create a supplemental source of income by taking advantage of nontimber forest resources with the potential to create a multi-million dollar Shiitake industry in New England. The wild mushroom industry will continue to remain strong and is certainly a multi-million dollar industry in its own right, but with a high degree of year to year variability.

G. Brown Ash

Brown ash (*Fraxinus nigra*) is central to the cultural traditions of Native Americans in northern Maine. According to Wabanaki creation myth, people came forth from the bark of an ash after Gluskap, the Creator, shot an arrow into the tree (Baumfleck 2010). Brown ash prefers moist sites and is typically found growing along stream banks and in swamps. Trees are often harvested in winter to prevent damage to fragile wetland soils. The log is pounded by turning and striking with a mallet to separate growth rings in circular layers. These layers are further split length wise to a width suitable for basket making by pulling the strips through sizing gauges with sharp blades. They are scraped smooth and kept in a moist storage until needed to prevent drying, which makes them brittle. The sapwood from which splints are made readily accepts colorful dyes.



Brown Ash Basket. Photo Courtesy of David Fuller, University of Maine Cooperative Extension

Sweet grass (*Hierochloe odorata*) is a perennial growing to three feet high from dense mats in moist meadows and wetlands. While not a NTFP, it is discussed with brown ash because it is frequently used by Native Americans by itself or along with brown ash splints in basket making. Sweet grass is harvested in late July through September after the plant has gone to seed; helping to perpetuate the species. The stems are sniped close to ground, which allows for regrowth in succeeding years (Baumfleck 2010). It is often braided and dried before use.

There are concerns about future availability of both brown ash and sweet grass. Basketmakers report that getting permission to harvest brown ash on private land is becoming increasingly difficult because of shifts in landowner attitudes (Baumfleck 2010). Sweet grass gatherers also express concerns about availability due to poor harvesting techniques, soil erosion and destruction of habitat caused by development (Baumfleck 2010).

Baskets made from ash splints have been used by Native Americans for thousands of years and even up until the 1960s for harvesting potatoes in northern Maine. Today, they are works of art commanding hundreds and even thousands of dollars. Weavers often use an over-one-under-one weaving pattern, but other patterns can be used. Sweet grass and dyed ash splints are often interwoven to create decorative patterns.

In Maine, basketmakers 20 years ago formed the Maine Indian Basketmakers Alliance to preserve the ancient tradition of ash and sweetgrass basketmaking among the Maliseet, Micmac, Passamaquoddy and Penobscot tribes. Goals of the non-profit alliance are to:

- Preserve and document the tradition of basketmaking among the four tribes.
- Expand markets for baskets in Maine and beyond.
- Ensure a supply of high quality brown ash and sweetgrass for present and future generations.

- Provide outreach, education and apprenticeships to younger members of the tribes to ensure continuation of the traditions.

The University of Maine Hudson Museum hosts an annual Maine Indian Basketmakers Sale and Demonstration at the Collins Center for the Arts. The one day event offers an opportunity to purchase one-of-a-kind art, and a chance to learn about Maine Indian culture and traditions. It is held in collaboration with the Maine Indian Basketmakers Alliance with baskets for sale and demonstrations featuring the work of more than 50 artists from Maine’s four tribes.

Basketmaking classes are taught throughout New England (see www.beebes.net/basket/basclas.html).

Given the limitation of the distribution and availability of the brown ash resource and the highly skilled nature of the crafters making baskets it is not likely that significant future growth in income will occur from use of this nontimber forest product. However, it is likely to continue as an important source of cultural identify and income for the relatively few highly skilled basketmakers in the region.

H. Paper Birch (White Birch)

If you Google “crafts made from birch bark in New England” you will see an interesting array of products.

Paper birch (*Betula papyrifera*) is found in mixed hardwood and coniferous forests and often lines the banks of streams. It needs light to established itself and so is found in disturbed areas and where fire has created openings in the over story. While there are other birches, the paper birch’s distinguishing characteristic is its white bark which peels from the tree in horizontal strips.



Photo courtesy of Henri Vaillancourt, www.birchbarkcanoe.net .

The leaves, bark, twigs and sap have been used for medicinal purposes. The bark is actually made up of several layers glued together by a powdery, white substance called betulin. Betulin can be extracted from the bark using alcohol and incorporated into tinctures that can be taken internally or infused into warm oil to make a topical salve (Baumfleck 2010). Studies have not been conducted regarding the safety for these uses. It has been used to treat warts, eczema and other skin conditions. However, betulinic acid made from betulin has been found in some laboratory studies to have antitumor activity and so may prove effective as an anticancer agent, but this use will need to be the subjected to clinical trials to prove its efficacy.

Paper birch's bark is rot resistant making it ideally suited for canoes. A New Hampshire canoe builder states his experience on his website: "Since 1965, Henri Vaillancourt has been involved in the building and research of traditional Indian birch bark canoes and other aspects of Native material culture. His handmade canoes are built along the lines of the birch bark canoes once used by the Malecite, Abnaki, and Algonquin tribes, as well as those developed by the French during the Fur Trade period . They are sought after by museums and collectors throughout the US, Canada, Europe, and Japan and are known for their elegance of line and fineness of construction" (see www.birchbarkcanoe.net/).

Steve Cayard, a Maine builder, states on his website: "Steve is a non-native, self-taught builder who, through his careful research and passion for the craft, and with his appreciation of its cultural context, has developed strong ties with the native tribal communities and builders whose traditions he borrows from. In return, he has offered his knowledge and skills to native groups who have sought him out to help them further their own efforts to revitalize this central facet of traditional Wabanaki culture" (see stevecayard.com/).

Birch bark has been used by crafters to also make baskets, containers, frames for mirrors and pictures, birdhouses and other decorative items such as signs. 'Welcome Home', a furniture store in Rangeley Maine, has a variety of home decor items for sale that feature birch bark. Pictures of a few products are included below. Picture frames contained US sourced birch bark but were made in China. Signs using birch bark were made in Stratton Maine.



Birch bark faux wallpaper is a tribute to the beauty of the bark itself and at least in one instance the real bark has been used to cover a wall in a New York City restaurant.

One enterprise, Spirit of the Woods, in western Maine sells birch bark (see www.birchbarkstore.com/birch-bark-sheetsflats.html). They offer it in various sizes and can provide it on a custom basis. Sample prices are: Birch Bark 10" x 20", five sheets for \$60.00 and 20" x 20' \$33.50—ships free to lower 48 states.

New Hampshire Woods Creations advertises birch and dried flower creations for weddings and home (www.etsy.com/shop/NHWoodscreations).

In Vermont, Long View Birch Bark advertises “the best way to find exactly the bark you are looking for is to select it yourself at our shop in Westminster, VT. “Have us ship or deliver it if you can’t visit us, we still enjoy selecting and packing orders.” “From our shop in Westminster, Vermont, we travel throughout the state and into New Hampshire, Massachusetts and New York to visit the landowners, foresters and loggers who supply us with birch bark” (www.birchbarkvt.com/).

Given the limited occurrence of the birch bark resource in the region it is not likely that significant future growth in income will be realized. However, it is likely to continue as an important source of income for a relatively small number of crafters in the region. Beyond the time frame of this project, which is the next 50 years, birch may be adversely affected by climate change. As mentioned in the section on maple syrup, in 100 years climate change may result in a shift of forest composition resulting in a loss of the maple-beech-birch type as a dominant forest type throughout much of New England and New York.

I. Other NTFPs

This report has highlighted a small but important number of NTFPs, but it is not an exhaustive review as there are potentially hundreds of products, some of which might not have even been discovered yet. Some have been alluded to such as pine needle oil used in Buckley’s cough syrups. Spruce has been used as a flavoring in gin. Spruce resin has been chewed as a long-lasting gum that has antiseptic properties (Baumflek, et al. 2010). It has also been used in commercial preparations of cough syrup in the 19th and early 20th centuries (Baumflek, et al. 2010). Eastern white-cedar boughs are used to make wreaths, potpourri and sachets (Baumflek, et al. 2010).

J. Conclusions

Wood fiber from New England’s forests to make lumber and paper is the dominant use and largest source of economic activity. NTFPs such as maple syrup and balsam fir tips are significant sources of economic activity to local economies and provide thousands of people with seasonal employment. Other NTFPs have sustained cottage industries that continue to provide supplemental income to industrious New Englanders. Brown ash and white birch used to make beautiful craft items that are eagerly sought after by tourists and locals alike contribute to the social and cultural milieu of the region. Balsam fir pillows and sachets are made by family businesses and with substantial hard work can provide a reasonable annual income for a rural life style.

NTFPs have played an important role in the lives of New Englanders since the time of early settlement. Even today, there exist extensive forests with a diversity of habitats suitable for the further development of NTFPs. The development of NTFPs is not limited by the extent or types of forest cover. There are adequate sites to develop more woods-grown ginseng, enough oak for Shiitake cultivation and a seasonal abundance of wild mushrooms to be harvested for export and local consumption. What is needed is a cadre of new entrepreneurs willing to take some risks to develop and effectively market both existing and new products.

While many NTFPs are crafted by local people, some raw materials are exported from the US to countries such as China and returned for sale often to tourists visiting the New England states. This results in lost opportunities to brand New England products as indigenous and to add economic value that circulates with the regional economy. David Fuller of the University of Maine Cooperative Extension sees the need to conduct a study to ascertain consumer preference for locally-made goods from New England NTFPs. The study could help to define how to better target the advertising and marketing of products.

While it is difficult to ascertain the total economic value of NTFPs to the New England economy it can be said with confidence that NTFPs currently generate over \$100 million dollars in direct economic activity from the products made from maple sap and balsam fir. Certainly, this direct economic activity results in a multiplier effect further benefitting the region. There is potential to further develop NTFPs and to market products locally and to the tourist trade. The products with the greatest potential are ginseng and Shiitake mushrooms. Each of these products could, with sufficient entrepreneurial effort, be multi-million dollar cottage industries. To realize this potential will require research by higher educational institutions and technical assistance by forestry departments and university Cooperative Extension programs. Success could lead to millions of additional dollars of income circulating in the New England economy.

Beyond the time frame of this project, but by the end of this century it is expected that the impacts of climate change will adversely affect the NTFP industries relying on sugar maples and balsam fir. This will result in a significant decrease in direct income to local economies as well as the loss of the beneficial multiplier effect of dollars circulating in those economies. However, climate change will likely favor the extension in New England of the oak-hickory type providing a more abundant and widespread oak resource for Shiitake cultivation. By the end of this century, climate change will likely cause a shift in where some NTFP businesses secure the raw materials they need to make their products. Due to entrepreneurial spirit of those in these industries new products will likely be developed to take advantage of NTFPs favored under the changed climatic conditions.

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