How to make charcoal at home

by Dan Gill

You really can make your own charcoal at home - even if you live in the suburbs! If you use the indirect method, which burns the gasses, and use a clean burning fuel (such as natural or LP gas) the emissions are mostly water vapor with very little smoke. It is not difficult to do and, even when burning waste wood to provide the carbonizing heat , the process requires less time and attention than barbecuing a rack of ribs in a wood burning smoker.

Introduction

Why would anyone ***want*** to make their own charcoal? For one thing, good hardwood lump burns hotter and cleaner (but faster) than briquettes and is much easier to light. You also know where it came from, what it contains and what was done to it en route. There are endeavors other than barbecue which require high quality natural charcoal: It is still the preferred fuel for forges and blacksmithing. Folks who make their own fireworks and black powder need specialty charcoals with specific burning properties such as that made from willow or grapevine.When grilling or even barbecuing in most pits with charcoal and wood, the quality of the charcoal is really not that critical. There is enough airflow to dilute impurities. Now that I have a Weber Smoky Mountain, though, charcoal quality, impurities and additives become very important. It is a great little cooker and will do everything folks say it will, BUT there is precious little airflow and the meat is bathed in smoke for hours. What you burn, you eat! I have read how briquettes are made by the major manufacturers. That leaves me either burning to coals, which is impractical for the small amount of coals needed by the WSM, or making my own lump, which is just a way to burn to coals and store them for use as needed. Being somewhat of a skinflint, I would rather utilize the resources at hand and make my own lump as opposed to buying it. My objective in this endeavor was to use existing technology to design a simple, cheap, reliable and efficient method for the small scale production of charcoal for home use utilizing readily available materials and minimizing the release of pollutants.

How to make Charcoal:

> *Timing is important. Plan to start your burn on the hottest, muggiest day of the year with a comfort index of at least 105 and air quality just above the minimum to sustain life. These conditions won't affect the charcoal process at all but will ensure that the experience is memorable.*

There are two basic methods of making charcoal: direct and indirect:

- The direct method uses heat from the incomplete combustion of the organic matter which is to become charcoal. The rate of combustion is controlled by regulating the amount of oxygen allowed into the burn and is stopped by excluding oxygen before the charcoal itself begins to burn. This is the ages old method used by colliers to make charcoal in a pit, pile (clamp) or, more recently, in metal or masonry chambers (kilns). See the links below for more information.
- The indirect method uses an external heat source to "cook" organic matter contained in a closed but vented airless chamber (retort). This is usually carried out in a metal or masonry chamber (furnace). The indirect method results in a higher yield of high quality charcoal with less smoke and pollutants and requires less skill and attention than the direct method.

For my first tests, I decided to try the indirect method. There had been some posts on a pyrotechnics newsgroup describing a procedure for making small quantities of willow or grapevine charcoal in a cookie tin or five gallon bucket. For the furnace, I used a 55 gal oil drum with the top cut out and a 12" wide X 10" high hole cut in the lower side for maintaining the fire. I used two iron rods stuck through the sides about 8" from the bottom to support the retort. I also kept the top which had been cut out. After the fire was well established , the top was placed on the drum and supported by rods to help hold the heat in yet allow a good draft. The retort was a 16 gal. steel drum with lid and I cut about six 3/8" holes in the bottom with an acetylene torch. I burned it out well in the furnace to eliminate petroleum residues. These drums are used for lubricants such as transmission fluid and gear grease and are readily available.

After the retort was loaded with air dried hickory the top was sealed and the drum was placed in the furnace or burn barrel. Wood scraps and bark were placed under the retort and around the sides and lit with newspaper assisted by a little burnt motor oil to get things off to a fast start. There was right much smoke for the first hour, but as things heated up and the moisture was driven off, it burned so clean that all you could see were heat waves. With the vent holes located in the bottom of the retort, the vapors and gasses were discharged into the hottest part of the fire and burned.

I stopped the first test too soon and only had about 1/3 charcoal. The rest was charred chunks of wood. The second test burned for about 3 hours, until the gasses had just stopped burning around the holes in the bottom. Results: 56# of wood yielded 17 1/2# charcoal or 32% by wet weight. Assuming an EMC (equilibrium moisture content) of 12%, The yield exceeds 35% on a dry matter basis. This is very good as most direct burns result in 20 to 25% at the best. I got over 2 1/2 five gallon buckets of good lump and only one large (4"X6") chunk showed signs of incomplete conversion with some brown in the center.

I was going to run a series of trials to compare the indirect method with direct (bottom lit) and direct (top lit). After several burns using the retort, I decided that there were such obvious advantages to the indirect method that I abandoned studies of direct burns. The retort method is easy, reliable, and does not require the skill and attention of direct burns. The equipment and materials which I used are readily available worldwide. As the gasses and volatiles are discharged into a hot bed of coals, I believe that most of the pollutants are burned, adding to the furnace heat. I also suspect that yield and quality are better. From what I have read, 35% by dry weight is excellent; the resulting charcoal burns hot and clean; you can almost light it with a match.

The direct method also appears to be more compatible with heat recovery and waste wood utilization systems. I live on a farm in Virginia and my wife operates a small sawmill. Disposing of slabs and wood waste is a serious problem. I can burn a lot of the hardwood slabs in my indoor masonry heater/cooker. We have not found an economical use for pine slabs (we can't give them away) and have started burning them in a field. This is obviously a wasteful and polluting practice. My ultimate goal is to build a small masonry furnace that would hold several 55 gallon drum retorts and recover heat for domestic space heating during the winter. Charcoal could be a marketable by-product. I would burn pine slabs and waste wood in the furnace and make charcoal from hardwoods in 55 gallon drums. This approach appears to be very energy efficient as the gasses released by destructive distillation are utilized.

For more details and pictures, go to my Charcoal Log and Results Page.

Further information and links

The 'stoves' discussion group deals mostly with small wood, charcoal or biomass burning stoves for developing countries. There have been several interesting discussions about charcoal making stoves but real information is hard to find. Start with Stoves Mailing List Archives for April 1997 The thread starts with a discussion of the World Bank paper (which I have bookmarked below) and resurfaces periodically in the archives up to present.

Finnish research site Nice picture of a metal kiln but not much info.

Step by step direct method of making charcoal in a 55 gal drum. Simpler than MsBelindas (quoted below) in that the barrel is not turned over in the process.

World Bank paper on issues concerning charcoal in developing countries.

Lots of links: the best ones are linked below in this document.

Making Charcoal: A startup business opportunity
for an Interesting 'quasi-scientific' look at charcoal check out "the skinny on..... charcoal"

Fuel for the Fires: Charcoal Making in the Nineteenth Century
Excellent description of the pile or clamp burning method.

Brief description of a small indirect retort.

The old art of charcoal making

Excellent description of charcoal making in England 1000 years ago.

MsBelinda's post to the Azstarnet BBQ list:

Hello fellow smoker/bbq/grillers! Here is the recipe, as requested, to make your own Lump Wood Charcoal (thereby saving yourself tons of cash, and successfully robbing the "Kingsford Mafia"..) To make 30-40 lb of charcoal, you will need:

- A clean 55 gallon metal drum with the lid cut off roughly (you will be able to reuse this drum many, many times)
- Enough seasoned wood to fill said drum, chopped into big fist-size pieces (ok..say 5"x5", and the wood just needs to be a couple months seasoned, although the dryer the wood, the faster the process..)
- A bag of sand
- 3 or 4 bricks
- A case of beer(optional)
- Time and patience
- Start by punching/cutting 5 holes in the bottom of the drum which are each 2" square. Try to keep them towards the center. Put the drum down on the bricks, placed so it is off the ground and fill it with the wood. Start a fire in the drum. When it is going well, put the top back on to reflect back the heat. Since it was cut off roughly, there will be slight gaps to allow the a draft.
- Now, turn the whole thing over, placing it back onto the bricks. (This is where you might need the case of beer to convince several men to help you lift the sucker. It will be heavy. And mind the lid doesn't fall off!) Wait, consuming the beer as necessary. The smoke will start out white. This is the water vapor burning off. Next the smoke will go blue/grey which is the

alcohols and phenols burning off. Then the smoke appears yellow, which is the tar burning off. Finally the smoke will clear and you will just see waves of heat. When this happens, Carefully remove the bricks out from underneith. Take the sand and make a pile around the bottom lid, plugging up the bottom draft. Also, cover the top with either a piece of turf or a large piece of metal. Use the sand to seal around the turf/metal so no air can get into the drum. We are trying for a closed system here. If air/oxygen/fire-fuel DOES get into the drum, the charcoal will just burn up. Not what we want. Also, try not to let the sand fall down into the drum through the holes. Allow the drum to cool (2-3 hours). Then turn back over, pry off the top and remove your charcoal. If there is a spark, the charcoal may "catch", but just douse it with some water. The charcoal will still be hot enough to dry out. Repeat above process as necessary.

- Thanks to my Bodger brother-in-law, Don Whiting, who taught me how to do this.
  (P.S. A "bodger" is a pole-lathe wood turner. He makes nifty beesoms as well...)
  Best of luck to you all with the above process.
  Hogs and quiches from Cheshire (by way of Palm Desert!)
  Belinda

Note: I found two discussions about making charcoal by indirect methods. Both were on pyro newsgroups and this is most informative:

After reading a note, I can see that this was the weekend to make charcoal. A couple of weeks ago I went to a local winery and picked up a load of fresh grape vine prunings which I converted to charcoal on Sat. I used a very simple, yet effective, method to make the charcoal which consisted of a 32 gal steel drum with removable lid (furnace), a 5 gal steel bucket/lid (retort can) and a welded steel grate.

I cut a 5x8 hole in the bottom-side of the large drum which allows me to feed scrap wood into the fire burning in the bottom of this drum. The grate sits in the bottom of the large drum and allows the 5 gal can a solid resting spot with enough room for a fire underneath (about 8"). The 5 gal can was first burned in the furnace to remove any paint, asphalt roofing cement, plating or other undesirable contaminants. Of course, the gasket in the lid also is burned up in the process. A couple of 1/4" holes were drilled in the bottom of the can and it was then loaded with grape vine. The lid was held in place by using about 6 of the securing tabs.

The 5 gal can was placed on the grate and the 32 gal lid was used as a damper and to help hold the heat in. More wood was loaded into the fire. After about 45 min the grape starts breaking down, in the absense of oxygen, and the steam and flammable gases began to escape from the vent holes in the bottom of the can. This gas jet is directed at the hot coals/flames and really adds to the intensity of the fire with a very noticeable blow-torch sound which lasts about 10 min. Flames are also present around the lid. After the escaping gases/flames stop, I continued the cooking for another 5 min, just to be sure all the wood was converted to charcoal.

The 5 gal can was removed, cooled down and then opened. Perfect, black, hard grapevine sticks. These crush much easier than mesquite. I weighed 3632 g of grapevine which yielded 709 g of charcoal in one 5 gal bucket. The volume in the bucket decreased by about 30%. After 5 loads I ended up with a 5 gal can of moderately crushed grapevine charcoal. There were no traces of ash or uncarbonized wood in any of the 5 batches.

I should mention that this is a joint venture that X and I are working on. X supplied the drums, I did the cutting/welding. We have a fellow pyro who is going to supply us with some willow that we will convert that into charcoal soon. For most of my pyro needs I am quite happy with the coconut shell charcoal supplied through KSI, but it will be fun to experiment with grapevine, willow, pine and any others that seem interesting. We already have mesquite airfloat.

I suppose that some of you will think that its a little whacky to be making your own charcoal, but I think that charcoal is a larger variable in most pyro compositions than most people think and that there is an uncertainty about what is the "real" makeup in a bag of commercial charcoal. Its only after experimenting with different charcoals that one notices that there really is a difference in charcoals. This new "tool" will allow us a way to easily make inexpensive charcoal from various types of wood. A smaller version could be easily made by using 1 and 5 gal cans.

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Dan Gill dgill@myhost.ccsinc.com
7/8/98

The Ethyl A. Pigg Memorial Cooker

View from the cooking side on the all-season porch.

The Pit

The Ethyl A. Pigg memorial cooker may not look much like a barbecue pit but it provides heat for the house in winter and is ready to smoke cook meat over hardwood coals year round regardless of the weather. Until the energy crisis in the seventies, we always grilled our steaks on a cast iron Sportsman grill in the fireplace (in those days, true barbecue or smoke cooking was just not something that you did at home). Then we stuck wood stoves in the fireplaces and had to start grilling outside. This put severe limitations on when we could enjoy steak cooked over charcoal. When I was designing the house, I wanted to include an indoor cooker of some kind but could find no plans or guidance so I designed a big masonry wood stove with cooking grates. I then tried to convince our housewright and skeptical masons that it would work.

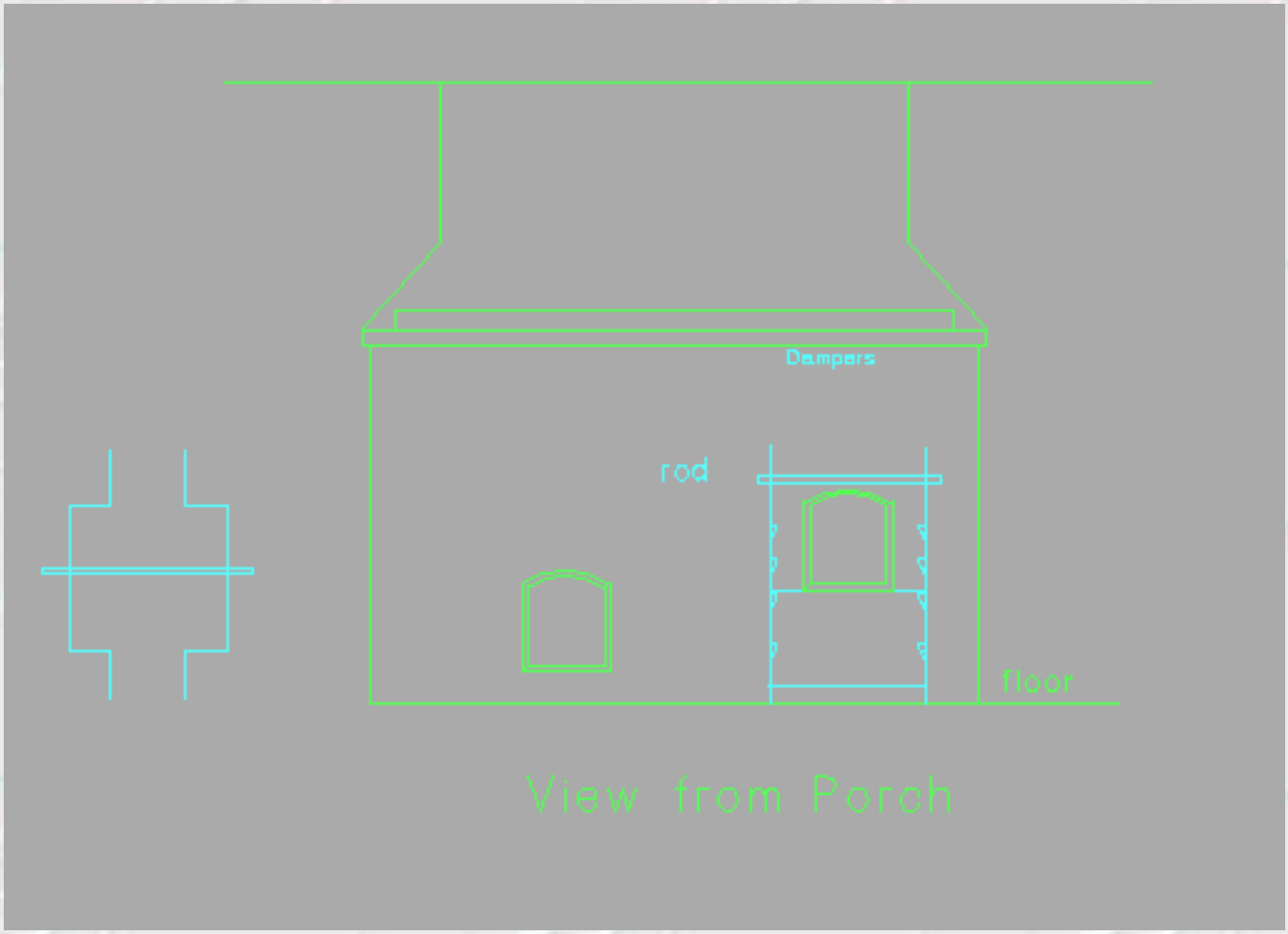
The chimney wall of old brick laid in Flemish bond is designed to radiated heat from the two flues. The fire door for the cooker is on the left and the fireplace on the right. The mantle is walnut with full dovetails.
The floor is true random width pine with runs up to 17" wide.

The heater/cooker is basically a see-through fireplace with cast iron doors. The door on the family room side is located just above the hearth for tending the fire and for viewing it from the room. On the porch, the door is higher and provides access to the cooking area. We used two 24" chimney dampers so that the draft could be controlled from either room and the closed damper functions as a smoke shelf. Outside combustion air can also be adjusted from either side.

The firebrick lined interior is 24 1/2" wide and 26" deep to accommodate two 12" x 24" cast iron grates on each of four levels. Brick ledges extend 1" into the firebox to hold the grates and are beveled to allow the grates to pivot up for changing levels. The bottom level is used for the option of elevating a fire and the other levels are for cooking. Centered just below the dampers and 3 1/2' above the floor, a 1 1/4" iron rod provides a place to hang pots or meat.

Finding the right doors proved to be quite a problem! They should be air tight wood stove type doors and at least 16" square for easy access. We wanted an arched top 16" wide single door or 24" wide double door made of cast iron. Locally made steel doors were an option but they would not have been compatible with our early colonial house design. There are still a few foundries around which would pour anything we wanted but we could not locate a pattern. Most of the small foundries have gone out of business and the patterns have been lost. After months of searching, we finally gave up and used single barbecue doors . They are cast iron with an arched top but are only 12" wide. As they are not air tight, they tend to smoke if the upper dampers are closed too tightly.

These are minor problems you do not want to smother or smolder a cooking fire and I have gotten 40 pound hams and 20 pound turkeys into the cooker with no problem. I will probably have the proper doors made next year.



In practice, we start the fire when it starts turning cool in October and keep it going all winter. The thick masonry acts like a thermal flywheel. It absorbs heat and radiates it to the porch and (to a lesser extent) the house. The radiant heat is wonderful and the porch is the best place to be on a cold winter morning. Any time I want to cook, it is simply a matter of regulating the fire - letting it burn down to coals and either adding seasoned smoking wood or pre-burned from the fireplace.

In summer, I light the fire far enough ahead of time to warm the brick some and get coals. If I am really in a hurry I light some charcoal. There is so much mass that the brick absorbs the heat so that the house does not heat up, even with an extended burn.

The fire can be regulated for slow smoke cooking which, as I found out, is an art in itself. The first time I tried to barbecue was for a going-away party for our eldest daughter, Shelley, who had

joined the Air Force. Shelley had been responsible for raising our dinner, Ethyl the pig, and everyone had mixed emotions about eating a pig with a name and personality whether they had known Ethyl or not. On the morning of the party, I fired up the cooker with hickory and then discovered that a forty pound shoulder would barely fit through the cooker door. With Ethyl finally in the cooker and the fire adjusted I went about my business for a couple of hours. While I was gone Ethyl started heating up and dripping fat on the hot fire. When I checked on her I was met by a roaring wall of flame as someone yelled "Dan done cremated Ethyl!". I tried to regulate the fire but had too much hot burning wood so during the day I had to extinguish Ethyl several more times. As it turned out, we had the party and the pork was just a little crisp on the outside but delicious. Shelley did take exception to my toasting the pig first though.

Since that first experience, I have learned to keep a low, slow cooking fire off to one side and my cooking has steadily improved. The first time I barbecued chicken, it had been cooking along nicely for about a half hour when I realized that I really did not know when it should be ready. I asked a friend if he knew about the folks on TV who say "we do chicken right". After an affirmative answer, I asked, "Well ---, How long do you reckon they cook it?"

Two years have passed since the cremation of Ethyl. I have become somewhat of a BBQ addict, having read the Jamison's *Smoke and Spice* and having joined two Barbecue mailing lists and a chat network. I have also chased the Smoke Ring around cyberspace. The Ethyl A. Pigg Memorial Cooker has proven to be a fantastic success and is used almost every day, if only to cook hot dogs for lunch. I believe that brick cooks better than most steel pits because of the mass. I can cook briskets for 17 hours without them getting dry or I can crank up the fire and cook a standing rib roast to rare with a crust. We roast oysters when we can get them and smoke cook fish to perfection. Maybe if I gain weight and grow a beard, I can become a *real* "pitmaster"!

Dan Gill
Revised 7/13/97

Visit the Barbecue Page and the Smokehouse

HOME See Also Sunderland

BBQ Mailing List Survival Guide and Smoke-Cooking FAQ

BARBECUE

Ordinary meat, fish and poultry may be transformed into wonderfully flavorful foods by applying smoke, heat and seasonings according to the ancient arts of smoking. As an art dependent upon a plethora of variables, what follows should be regarded as guidelines. Smoking of meat may generally be divided into the following processes:

Cold smoking is done at temperatures of 120º F. or less
Low temperature smoking at 120º to 200º
Barbecue happens from 200º to 275º
Smoke cooking occurs from 275º up

Hone your Quelinary skills

Join the BBQ mail lists
(Subscribe or unsubscribe)

The BBQ mailing lists provide a forum for people interested in the art of slow smoke cooking to share recipes and discuss techniques, equipment, and experiences via e-mail. The subject matter tends to attract an interesting (and sometimes volatile) mix of characters with expertise ranging from rank beginners to professional pitmasters and competition cookers. A form of community has evolved and though discussions occasionally get heated, or off topic we have become friends with a common cause: to make better BBQ and have fun doing it. The volume and quality of information which has passed through the lists is incredible but few people have the time to search back through the archives. Newcomers are often bewildered by obscure references and insider jokes, and may even develop cancles and forget where the door is. This Survival guide is intended to assist those folks with the terminology and personalities they are likely to encounter as well as general guidelines to the principles and equipment of real BBQ.

Dave Linebacks' BBQ mailing list dealing mostly with traditional methods

Garry Howard's list is more tolerant but don't mention boiling or liquid smoke! To join, send an email to listserv@netrelief.com In the body enter: SUBSCRIBE BBQ

The FAQs are Here

Providing answers to Frequently Asked Questions

General principles of Barbecue

Equipment

Resources

Recipes and procedures

Stories

Something Different Coffee House & Deli

Check it out!

How to make SCRAPPLE

NEW NEW

How to make your own CHARCOAL!

Visit the
The SMOKEHOUSE

See how we cure country hams and bacon and make bagged sausage in Virginia

---

The Great Texas Barbecue Pilgrimage

Long as you are here
visit Dan Gill's Homepage

or visit the PIT
An indoor masonry cooker and heater

Please e-mail me your feedback, comments, or suggestions. dgill@velvitoil.com

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Thanks to long time list member Garry Howard for the Smoke Ring

Last revised 4/5/2000
by Dan Gill

Charcoal Making Log and Results

Test one 6-28-98
indirect "retort" method - moderately successful

Materials:

Furnace: 55 gal drum with lid cut out and a 12" wide by 10" high opening in the side at the bottom. Holes were burned about 8" up on the sides to put two 3/8" electric fence rods in for the retort to rest on. The idea was to be able to pull the rods out at the end of the burn and allow the retort to settle in the ashes to exclude air.

Click here for ***PICTURE***

Retort: 16 gal oil drum with sealable lid. 6, 3/8" holes were burned in the bottom with a torch to allow gasses to escape.

Wood: 51.5# of air dried chunks (+/- 20% EMC not measured). Mostly hickory ranging up to 3" thick.

Heat source: hardwood slabs and bark in bottom and around sides. Newspaper and burnt motor oil as accelerants.

Misc: Welders gloves, shovel, platform scales,

Conditions: overcast, spitting rain occasionally. temp about 80 deg.F breezy with variable winds 8-12 mph

Procedure

2:40 started fire. Rods started to soften and bend within 10 minutes allowing retort to settle against one side.

3:00 (+20 min) After the fire was going good, I placed two rods across the top of the furnace barrel and positioned the cut-off top to hold heat in yet allow good draft.

3:30 (+50 min) Roaring sound as gasses burned off through holes in bottom of retort and around

leaks in top.

3:40 (+1 hr.) No smoke - nothing but heat. Click here for ***PICTURE***

3:45 (+1 hr. 5 min) Tried to pull rods to allow drum bottom to settle in ashes to seal but they had melted too much to pull out. Fire mostly burned to coals.

3:50 (+1 hr. 10 min.) Outgassing stopped rather abruptly.

4:00 (+1hr. 20 min.) Carefully dumped over burn barrel to remove retort. Could hear charcoal clinking inside. Retort was fairly heavy (not a good sign). Set retort upright in dirt and packed dirt around base to exclude air. Left to cool. Click here for ***PICTURE***

7:00 (+4hrs. 20 min.) Retort cool to the touch. removed top. Contents had not settled much. Smaller pieces and the outside of larger pieces had become charcoal; larger pieces were still brown indicating incomplete conversion.

Results: The burn was stopped too soon yielding about a five gallon bucket of good charcoal and a lot of charred chunks of wood. Possibly the fire had cooled some so that the retort stopped outgassing and I thought the burn was complete. There was no sign of ash or any indication of flame in the retort.

Test #2 7-7-98
Indirect "retort" method - highly successful

Methods and materials as above except as noted.

Wood: 56# of 2 yr. old hardwood (mostly hickory) air dried to about 29% EMC.

Used 1/2" square hardened rod to hold up retort.

Conditions: 80º F. light wind.

Procedure

2:35 (start) lit fire with newspaper and some burnt motor oil.

3:10 (+35 min.) Outgassing starts. Added enough wood during the burn to keep temp up.

5:00 (+2 hrs 25min.) Outgassing about complete. Pulled rods to allow can bottom to settle in coals and ashes sealing holes.

6:00 (+3 hrs 25 min.) Lifted retort can - feels light indicating a complete burn. To ensure an oxygen-free condition and to facilitate faster cooling, I removed the retort from the furnace barrel and placed it on dirt, pulling dirt up around the bottom.

7:35 (+ 5 hrs.) Can cool enough to handle. Opened top and found the results of a good burn. Volume had decreased by about 1/3 and all of the wood appeared to have converted to charcoal.

Results: 56# of wood yielded 17 1/2# charcoal or 32% by weight. This is very good as most direct burns result in 25% at the best. I got over 2 1/2 five gallon buckets of good lump and only one large (4"X6") chunk showed signs of incomplete conversion with some brown in the center.

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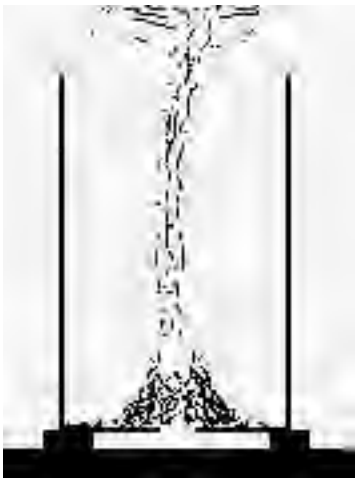
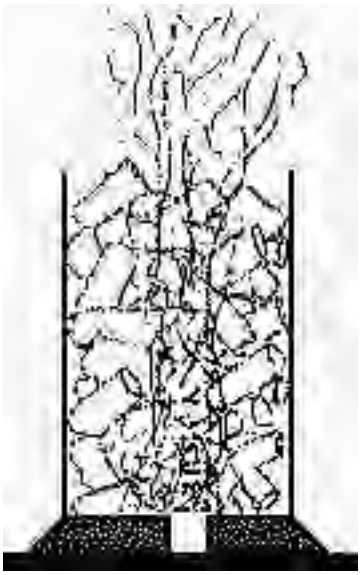
7/8/98

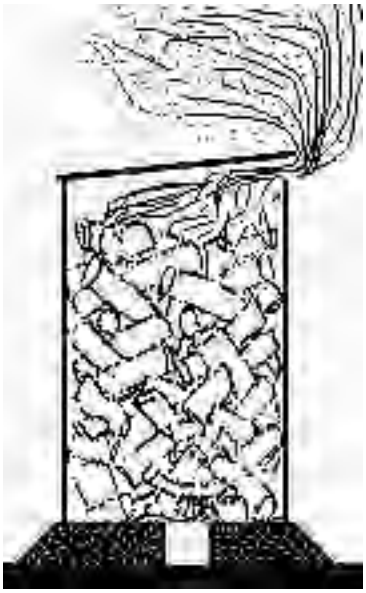
Making your own charcoal



1. Using a cold chisel prepare the drum by making five 50mm (2in) holes in one end and completely removing the other. Knock-up the cut edge of the open end to form a ledge (Note, the lid will have to placed back on this ledge and made airtight).
2. Position the drum, open end upwards, on three bricks to allow an air flow to the holes in the base.
3. Place paper, kindling and brown ends (incompletely charred butts from the last burn) into the bottom of the drum and light.



4. Once it is burning well, load branchwood at random to allow air spaces until the drum is completely full. Keep the pieces to a fairly even diameter but put any larger ones to the bottom where they will be subjected to a longer burning.



5. When the fire is hot and will clearly not go out, restrict the air access around the base by using earth placed against it, but leaving one 100mm (4in) gap. Also place the lid on top, leaving a _small_ gap at one side for smoke to exit.
6. Dense white smoke will issue during the charring process. When this visibly slows, bang the drum to settle the wood down, creating more white smoke.

7. When the smoke turns from white (mainly water being driven off) to thin blue (charcoal starting to burn) stop the burn by firstly closing off all air access to the base using more earth, and secondly by placing the lid firmly on its ledge, and making it airtight by the addition of of sods and soil as required. The burn will take between three and four hours.
8. After cooling for about 24 hours, the drum can be tipped over and the charcoal emptied out onto a sheet for grading and packing.

Source: Traditional Woodland Crafts. Raymond Tabor. Published by Batsford,London,UK ISBN 0-7134-7138-7

energy issues

The World Bank Group.....FPD Energy Note No. 1.....April 1995

Burning Charcoal Issues

Robert van der Plas

Introduction

Charcoal plays an important role in both the energy sectors and the economies of most African countries. However, the inefficiencies inherent to the production and use of charcoal, rapid urbanization(1), and the preference of urban dwellers for charcoal place a heavy strain on local wood resources. This in turn has severe environmental consequences. The use of charcoal cannot be stopped; but, experience has shown, it can be reduced through implementing a variety of measures that promote the sustainable production of wood and efficient use of charcoal through incentives at the local level. Players in the charcoal market need to be guided so that they can make efficient use of the resources. This should have a high priority in the development plans for most African countries. The World Bank can help by allocating more funds for the realization of these plans.

Significance of Charcoal

Charcoal plays a considerable role in African economies; however, governments and development agencies seldom perceive this.

Key Market

The value of the charcoal market for 26 Sub-Saharan African countries for which we have known data exceeds $1.8 billion per year. In energy terms, charcoal consumption in many African countries is higher than gross electricity consumption (although the value of the electricity market

is usually much higher than that of charcoal).

Employment

Charcoal making provides a considerable amount of employment in rural areas; it allows for a quick return on investments and is often practiced in conjunction with agricultural activities. In Kenya and Cameroon, for example, some 30,000 people are engaged in the woodfuels sector; in C“te d'Ivoire, as many as 90,000.

Why Do Users Like Charcoal?

Charcoal is a relatively inexpensive fuel that perfectly suits the users' needs.

A Modern Fuel?

Many Africans consider charcoal a modern rather than a traditional fuel. For them, not having to use firewood and agricultural residues, represents an improvement in the quality of life. Like firewood, charcoal can be purchased in the preferred quantity. But unlike firewood, it burns without smoke; does not decompose even after extended storage; does not create dangerous flames around cooking vessels; and requires a simple stove whose heat output is relatively easy to control.

Inexpensive

Charcoal is also probably as close as many householders in poor countries will come to modern fuels, since petroleum fuels (kerosene, LPG, natural gas) and electricity are - and are likely to remain - too expensive. When charcoal users switch to kerosene, they double their fuel expenditures, and this sum is at least doubled again when they switch to LPG or electricity. Costs of cooking equipment also increase dramatically with the comfort levels associated with modern fuels. Thus, unless disposable incomes increase considerably, most Africans will continue using woodfuels.

Why Do Others Dislike Charcoal?

Inefficient Fuel

Charcoal is a very inefficient fuel to produce. It does not make much sense to waste energy, not even if it is traditional, indigenous, and renewable. Evaluation of hundreds of traditional kilns in Madagascar and Rwanda showed charcoaling efficiencies of only about 8 to 9%. In several

countries, higher production efficiencies of 8 to 20% have been reported. The very low efficiencies obtained in practice can be increased considerably through a systematic effort to help charcoalers become more professional; efficiencies of up to 28% have been observed in practice.

Inefficient Stoves

Charcoal is also inefficient in use. Although charcoal stoves are more efficient than firewood stoves (20 to 35% vs 10 to 25%), they are much less efficient than modern-fuel stoves such as kerosene (35 to 50%), LPG (45 to 65%) and electric stoves (75 to 85%). The combined production and use inefficiencies have important consequences. A significant increase in wood consumption could result when urban households switch from firewood to charcoal; cooking with charcoal uses more wood than cooking with firewood, sometimes even three to four times more.

CO_2 Emissions

Since the burning characteristics of charcoal and mineral coal are very similar, charcoal use results in high volumes of CO2 emissions, as well as of CO and CH4 (but not SOx).(2) However, if charcoal were produced on a sustainable basis (without causing deforestation), it would be neutral to the carbon cycle; the burning of charcoal would simply release timescale CO2 back into the air.

No Market Incentives

Environmentalists feel that charcoal production should be stopped altogether because of its destructive nature as presently practiced. However, urban dwellers in some developing countries have a strong appetite for charcoal, and attempts to ban the production or the use of charcoal have been mostly unsuccessful mainly due to the interplay of commercial interests.(3) Since operators can use free raw materials (wood from natural forests or clear fellings) and turn them into a marketable commodity in high demand, they do not have much respect for the sustainability of the resource.

Institutional Inadequacies

Woodfuels - and thus also charcoal - fall between the organizational cracks. Frequently very little coordination and collaboration are evident between energy and forestry ministries since energy ministries are more concerned with electrification and the supplies of petroleum products, and forestry ministries are more concerned with the production of wood in industrial plantations and conservation of wood resources in natural forests. In general, developing countries lack the organizational capacity to formulate effective regulations for woodfuels or even to apply the existing inadequate rules to improve the functioning of the woodfuel market chain. Arbitrary interventions in the woodfuel sector have resulted neither in effective regulation nor in control of

the sector.

How Should the Charcoal Issue be Addressed?

Demand for charcoal is increasing; this cannot be reversed easily. At best, the rising consumption trend can be leveled off, and planners can hope that substitution takes place before wood resources run out. This will involve: facilitating substitution with modern fuels, increasing end-use and transformation efficiencies, introducing economic pricing, enhancing the management of natural resources, and introducing an incentive framework involving local participation.

Substituting with Modern Fuels

Switching from woodfuels to petroleum-based fuels such as kerosene and LPG is affordable now for any upper- and middle-echelon households. Further improvements in pricing and delivery (particularly of LPG) are required to enable households lower on the income scale to make the switch away from traditional fuels. Electricity is not a substitute for woodfuels; although electricity is affordable and practical in many areas for lighting, communications, and possibly for refrigeration, few households, rural or urban, will be able to afford to cook with electricity if it is priced at cost-reflective tariffs.

Substituting with Briquettes

Substitution of lower-grade fuels for traditional fuels can be facilitated as well. Briquettes made of agricultural waste may, for example, compete with traditional fuels if they are of sufficient quality and are priced correctly. This would allow the conversion of low-grade residues to marketable fuels.

Improved Stoves

Increasing end-use efficiency requires the promotion of improved stoves. Traditional stoves are normally made by the informal sector; models with higher heat transfer efficiencies should be developed in collaboration with end-users and stove producers, and manufactured and marketed by the private sector.(4)

Transformation Efficiency

Improved kilns do not require a large capital outlay; they simply require better understanding and control of the carbonization process. Drying of wood, better stacking methods, and better process control, in combination with a chimney to force inverted draft, can increase carbonization efficiency from 9% to over 20%. However, some charcoalers are reluctant to pursue these

improvements since it takes more time and effort to prepare the kiln and control the carbonization process; where the wood is basically free, the charcoaler is better off poorly preparing several traditional kilns in quick succession. Increasing the efficiency of carbonization thus requires regulatory measures, systematic training, and demonstration programs for traditional charcoalers at their habitual work sites.(5)

Pricing

Prices of charcoal in real terms have declined or stayed at about the same level for some 10 to 20 years. This fails to give clear signals to governments that the resource base is declining, or incentives to users and producers to use charcoal more efficiently. Wood prices should reflect their cost of production, and levying taxes may be a good way of achieving this. Taxes on charcoal should be based on the wood inputs rather than on the charcoal output. Revenues earned should largely be invested back into the local communities rather than flowing into the central treasury. Regulatory measures should also be put in effect, such as the devolution of control of wood resource to the local population.(6) Development of the market should be left to the private sector, once prices are right and a control system is in place. In contrast to other regulatory measures, this can work, as it is in the local population's interest to manage their surrounding environment and resource.

Management Plans for Natural Resources

Sustainable management plans are required to ensure that resources are not over-harvested. These should be based on detailed knowledge of the standing stock (species, growth characteristics, etc.) and an exploitation plan that maximizes wood output and minimizes degradation of the resource base. Such plans need to be verified by the local population in collaboration with local authorities.

Institutional Strengthening

Institutional strengthening of the public sector is needed to create capacity to design and implement policies and programs in the traditional energy field. Stumpage fees should be levied to finance the implementation of the management of resources by the local population. Substantial input is required from the government, particularly in the field of policymaking and regulations, but actual implementation should be left entirely to the private sector.

Endnotes

1. The 1994 World Development Report shows 5.5% annual urban growth during the period 1980-92 (page 222 and 223).
2. See "CO2 Emissions by the Residential Sector: Environmental Implications of Inter-fuel Substitution" (Industry and Energy Department Working Paper, Energy Series No. 51).
3. In Ghana, a total ban on production from the Afram plains (largely failed, despite much

government attention); in Thailand, a ban on the transport of more than 2 bags at the time except with a permit (general noncompliance); in Rwanda, total ban on the production from the Southeastern Savannah zone (quite successful); in the Gambia, a total ban on the use of charcoal (partly successful); in Mauritania the number of transport licenses was limited (failure).

4. See "What Makes People Cook with Improved Biomass Stoves?" (World Bank Technical Paper 242).
5. See "Rwanda Project Carbonization, Etat D'Avancement" (ESMAP Report, October 1993).
6. See "Niger - Household Energy Project" (forthcoming FPD Energy Note).

To return to main text, use the Back key on your browser.

Energy Issues is produced by the Energy Practice Management Office, which disseminates information about recent and ongoing energy activities of the World Bank Group.

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ESSENTIALS

- 100 Top Trees of North America
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- How to ID a Tree
- Forestry Photographs
- A Forestry Glossary

Fall Color
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Best Books
Tree ID
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Puzzles/Quizzes

Chainsaws

Making Charcoal

Making Charcoal: A Startup Business Opportunity

Introduction

More On Charcoal

- Marketing Considerations
- Startup Considerations
- Charcoal as a Forest Product (see page 27) pdf

Related Resources

- Income Opportunities
- Firewood
- Non-Timber Forest Products

Elsewhere on the Web

- Non-Timber Forestry Links
- Dan Gill's Charcoal How To
- The Skinny on Charcoal

Charcoal is a formless mass of carbon and can be made from most carbonaceous materials. It is one of the oldest of man-made fuels and has been prepared under the ground for a thousand years. Charcoal is still a major source of energy throughout the world.

Much like the old process, the modern commercial process is to heat wood with little or no air present which takes special but simple equipment. In the United States, wood is the primary material used for charcoal and is generally procured in the form of residue like sawmill slabs and edgings. Sawmills love to find users of this material because of environment problems with burning and disposal. Where there are sawmills, there is available raw product.

It has been estimated that there are nearly 2,000 charcoal-producing units in the United States, including brick kilns, concrete and masonry block kilns, sheet steel, kilns, and retorts (a steel metal building). The state of Missouri produces a lot of this national charcoal product (they have until recently had less stringent environmental regulations) and 98 percent of all

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charcoal is produced in the eastern United States.

While charcoal can be made from any number of natural materials, hardwoods such as hickory, mesquite, oak, maple, and fruitwoods are favored. They have unique aromas and tend to produce a better grade of charcoal. Better grades of charcoal come from raw materials with low sulfur content.

Uses of charcoal may surprise you. Besides being the fuel that cooks steaks, hotdogs, and hamburgers on a Sunday picnic (see BBQ Forum), charcoal is used in many other processes. It is used in certain metallurgical "purifying" treatments and as a filter to remove organic compounds such as chlorine, gasoline, pesticides, and other toxic chemicals from water and air.

Activated charcoal, which has a super adsorptive surface, is growing in use. It is used in purifying and refining metals and in the gas masks that were used during the Gulf War. NutraSweet(tm) uses activated charcoal to transform the product into a powder. Activated charcoal is used as an antidote for many types of poisons and is touted as an effective anti-flatulent.

Most charcoal manufacturers sell their product as a briquette. This market has been dominated by several companies to include Kingsford and Royal Oak. They do not make "lump" charcoal which is an alternate product that has advantages and has potential as a startup business.

More on Market Considerations

More on Startup Considerations

Other Sites:

Charcoal Making in the 19th Century
Dan Gill's How to Make Charcoal at Home
About's Barbeque and Grilling Site

An online publication (pdf) with self-help suggestions for rural entrepreneurs is *Income Opportunities in Special Forest Products*. It is printed by the United States Department of

Agriculture, U.S. Forest Service, Agricultural Information Bulletin 666. This publication discusses charcoal as well as many other forest income producing opportunities.

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The SMOKEHOUSE

Ham's substantial, ham is fat
Ham is firm and sound.
Ham's what God was getting at
When He made pigs so round

----- Roy Blount Jr.

This is the old smoke house full of hams, bacon, and bagged sausage being cured and smoked over hickory. Pork has been cured this way on farms in the Tidewater area of Virginia for hundreds of years.

What is it

Before Frigidair, Ford and Safeway became everyday words, farm families had to rely on ancient methods to preserve food for survival. Hogs were raised for meat on most farms and were processed in winter for meat through out the year. The weeks between Thanksgiving and Christmas became the traditional time for "hog killin's" in most parts of the country. Harvest was over, the weather had turned cold but not too cold, hogs were fat on acorns and crop residues and the ones killed obviously did not have to be fed hard earned corn over the winter. It was also nice to have fresh pork and sausage for holiday gatherings.

Hog killing time was a ritual that involved everyone capable of helping. It was hard, intense and specialized work and everyone had their jobs that had to be done quickly and properly. Often a family would need the meat from several hogs to last the year and sometimes several neighboring families would get together and process a small herd.

Every part of the hog was used, except the squeal. After chilling overnight, the carcass was cut into the major portions and trimmed. Some parts were best eaten fresh such as the brains and tenderloins. Whatever was not to be eaten fresh had to be processed so it would keep. Heads, necks, livers and some other organs were cooked down and made into delicacies such as scrapple and liver pudding. Trimmings were ground into sausage; some of which was eaten fresh but most was either fried and packed in lard or cured and fermented. Most of the large cuts such as hams, shoulders, loins and bacon were taken to the smokehouse to be cured with salt and smoked.

By World War II rural America was changing rapidly. Small family farms were not able to compete economically and young folks were better off getting jobs in town. Disposable income, transportation, refrigeration and commerce made many activities, which only a few years earlier had been necessary for survival, optional for lifestyle. The extended family largely disappeared and with it a vast learning resource for future generations. Most of the values, traditions and country wisdom of countless generations died with the old folks. Something like 98% of the American people are now THREE generations removed from the farm! I came along at the tail end of the era and experienced some of the traditions and heard some of the teachings. These pages are an attempt to at least pass on the little that I was exposed to.

CURING PORK VIRGINIA STYLE

CURING BEEF

RELATED TOPICS

Cold Smoking

Cold smoking is carried out in a smokehouse or chamber at temperatures of 100º F. or less. The historic objective was to help in preserving meat or fish that had already been brined or cured with salt. Gentle heat dried the surface and the natural anti-microbial properties of smoke helped protect the meat from spoilage. Smoky taste was a secondary consideration and skill was required in the selection of wood and management of the fire to avoid strong and bitter flavors.

Today, the primary objective of cold smoking is to develop the intricate flavors resulting from the skilled application of seasonings and smoke. Temperatures exceeding 120º F starts the cooking process and cooked meat does not cure or keep well. It is still necessary to cure or salt any meat or fish that is to be cold smoked because it will spend many hours in the danger zone of 40º to 140º F. which favors the growth of food poisoning and spoilage bacteria.

Why Bother?

Our forefathers cured meat in order to survive. We can buy fresh pork or beef any time. So why should we bother with learning obsolete techniques? The short answer is flavor: Nothing smells or tastes as wonderful as a properly cured two-year-old country ham. Curing meat is an art form: I derive a great deal of pride and personal satisfaction from successfully manipulating raw materials, environmental factors, and ingredients to produce something that is uniquely "mine". Finally, there is respect for our heritage. When my father was young, every farmer raised hogs and cured their own meat. Every region and every individual developed methods which worked for them and resulted in characteristic flavors. Lifetimes of experience were passed down through the generations. Much of this knowledge has been lost. My goal is to pass on the little bit that I have been taught before it, too, is lost forever.

The Basics

Until the relatively recent availability of refrigeration, folks had to eat their meat fresh, preserve it, or slow the rate of decomposition. Freshly killed meat is not very good and tends to be tough. Muscle fibers have to go through the complex biochemical changes we call rigor-mortise and relax before they become tender. This process requires about twelve hours during which the meat needs to be chilled as much as possible but not frozen. The old timers would say that you had to take the "animal heat" out before it was fit to eat. Even if they could keep the meat cool, they needed it to last as long as possible and used available means to control microbial growth. Meat temperatures below 38° F slow the growth of bacteria in general and favor "good" microbes, which enhance flavor and keeping qualities, at the expense of "bad" microbes which produce toxins, smell bad and make us sick. Exposing meat to hardwood smoke helps a little. Smoke has anti-bacterial properties which, in conjunction with the surface drying effect from the associated heat, extend the keeping qualities of meat and enhance flavor.

The basic method of preservation is to use salt - lots of salt! If you take a piece of fresh meat and cover it with salt; water comes out and salt goes in. This is called "taking salt" and is the fundamental principle of the curing process. Eventually, meat gets so dry and salty that spoilage bacteria can not survive, even at warm temperatures. We could spend a lot of time talking about osmosis and how the salt gets in and the water gets out, but those who came before were only interested in keeping the meat cool enough for it to "take salt" before it spoiled (or became "tainted").

Mummified meat helps stave off starvation but does little to improve the quality of life. Folks found that they could add things to salt that improved texture, flavor and color. In formulating curing mixtures, sugars are used to enhance the action of salt, improve flavor and keep the meat more moist and soft during aging. Nitrates and nitrites are often included as anti-bacterial agents as they are particularly

Welcome

To The Q Man's Page

This page is dedicated to the joy of Barbeque. Your host for this Q page is the Q Master, Danny Gaulden. Danny has been Q-ing for over 20 years and his experience and expertise on the subject of barbecuing is very rich indeed. So pull up a chair and see if you can pick up some tips from the Q Master.

To learn more about the Q Master, go to Danny Gaulden's bio page.

Danny hosted what has become known as a "Q Camp". A very appreciable student, Rock, has had some exceedingly good things to say about the Q-Man. To find out what Rock had to say go here.

The Q-Fest '97 was held on June 14-17, 1997. Many memebers of the BBQ discussion list were in attendance. A page has finally been added with comments from those participating in the Q-Fest '97. Please continue to check the Q Fest page for the latest. We will be adding tentative plans for the Q Fest '98 when they are available.

Q-FEST '98 UPDATE!!!

Due to the almost overwhelming number of requests received by the Q Man to move the event to a somewhat cooler time of the year for our region, the Q-Fest has been tentatively scheduled for October. We will continue to update you as plans are made.

The Q-Man owns and operates a local restaurant. While it is a Dairy Queen, it is not your normal, everyday, run of the mill Dairy Queen. This one has the best BBQ anywhere around, according to many sources. We invite you to check out the link to the DQ and to view the picture page. You will be able to see for yourself the mouthwatering morsels available from the hands of Q Master, Danny Gaulden.

IT IS ALMOST DONE.

The Tips or FAQ Page and Recipes Page. We are hard at work completing these pages for you. We will have plenty of information on the FAQ Page and a couple of recipes to temp you on the Recipes Page.

Pecan wood is now available through Danny's supplier. Check the Pecan wood page for more information.

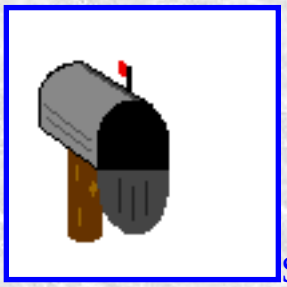
The Smoke Ring

Thanks to Rick Thead for the Smoke Ring logo photo

This website is a member of **The Smoke Ring**, a linked list of BBQ websites. To visit other sites in the ring, click on one of these links.

[Next Site | Skip Next | Next 5 | Previous | Skip Prev | Random]

Click Here for information on how to join the ring or look at a complete list of Smoke Ring members.



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Last updated February 6, 1998

FAQ OF THE INTERNET BBQ LIST

A Listing of the Frequently Asked Questions of the BBQ List

Version 2.0

Foreward

To view the recipe tables in this document correctly, you will need Netscape Navigator 3.x or higher or MS Internet Explorer 4.x or higher

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Update history:

Version 1.0 issued September 21, 1997

Version 2.0 issued June 10, 1998

This document is a compilation and summary of frequently asked questions and answers posted to the Rick Thead BBQ List. We hope this list of questions and answers will help you improve your barbecue skills. This FAQ was edited and is maintained by Bill Wight. Please direct comments, corrections or suggested additions to: wight@odc.net.

Credit is given for each answer provided in this document where the author was known. Special thanks for extra effort goes to Ed Pawlowski, Harry Jiles, Danny Gaulden, Rick Day, Jeff Lipsitt, Billy Maynard aka Belly, Rodney Leist, Kit Anderson, David Westebbe aka EskWIRED, David Klose, Rick Otto, Tom Kelly and Garry Howard.

The embedded Mini-FAQ is mainly the work of Ed Pawlowski.

BBQ List FAQ Team consists of the following members: Ed Pawlowski, Lloyd Carver, Tom Kelly, Garry Howard, Rock McNelly, Rodney Leist, Dan Gill, Vince Vielhaber, Alex Baker and Bill Wight.

The FAQ BBQ graphic at the top of this page was stolen from Garry Howard's BBQ Web page and modified.

[Go to the Table of Contents]
[Go back to the BBQ FAQ Home Page]
[Comments or Suggestions]

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Let's Q!

Home of the BBQ FAQ and More

This site has been accessed 140045 times since Sept 7, 1997.

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- Vince's Smoked Turkey
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oklahomajoes.com

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BBQ Mailing List Survival Guide and Smoke-Cooking FAQ

Homemade Smokers and Smokehouses

Maintained by Vince Vielhaber

Smokers and Smokehouses!!

Smokin Jim's Pits

The style of pits that I have are similar to the OK Joe. I have 2 pits on a trailer. The first one has a verticle cooking chamber (16" dia) and the other is just an offset horizontal pit. Both of the horizontal chambers are 36" long. I built both of these out of 3/8" thick 18" diameter steel pipe.

Big Jim Whitten's Q Pits

Both are gas fired and use a cast iron pot above the burner to hold the wood. It is offset and I cook mostly at 375 degrees except briskets I cook at 475- 500 degrees for 4 hours. The smaller cooker is an old propane tank 32" x 84" with a 30" x 48" grate. The larger one is 12' long x 4' dia and is divided into 2 seperate chambers with 2 cooking surfaces in each. The grates are 42' x 48" each. There is also two stove top burners on the rear.

Double D's Homemade Smoker

This smoker was built out of 18" steel pipe with 3/8" wall thickness and 1/4" plate.

Jack Oudiz' ECB Cart.

I needed some work space to go with my ECB so I designed a mobile cart that can easily be moved out of the way for charcoal loading, etc. The cart simply lift up and over out of the way for easy access to the ECB. The whole cart cost about $35 in lumber and hardware and is built out of pine 1x4 with 2x2 legs. The top is redwood 1x4 slats. The hole is cut out to 17.5 in. to fit over the 17 in. diameter ECB. I cut it with a jig saw once the table was assembled. Use a nail and string to draw the circle. I also modified the ECB by lowering the handles about 1.5 in. to fit under the cart top. I canibalized an old rusty Red Flyer kid's wagon for the wheels. Whole thing took me about 4 hours to build using drill, skill saw and jig saw. After dumping my water pan into the coals one too many times, I simply used longer screws and placed a few washers in back of each of the water pan supports to extend them. Now no way that pan is going anywhere. An easy 10 min fix.

More pictures. There are some I haven't put on the page yet.

Want your's pictured?

Send me your home made smoker and smokehouse pictures. Include a small blurb about it too.

Last revised 7/15/97
by Dan Gill

United States
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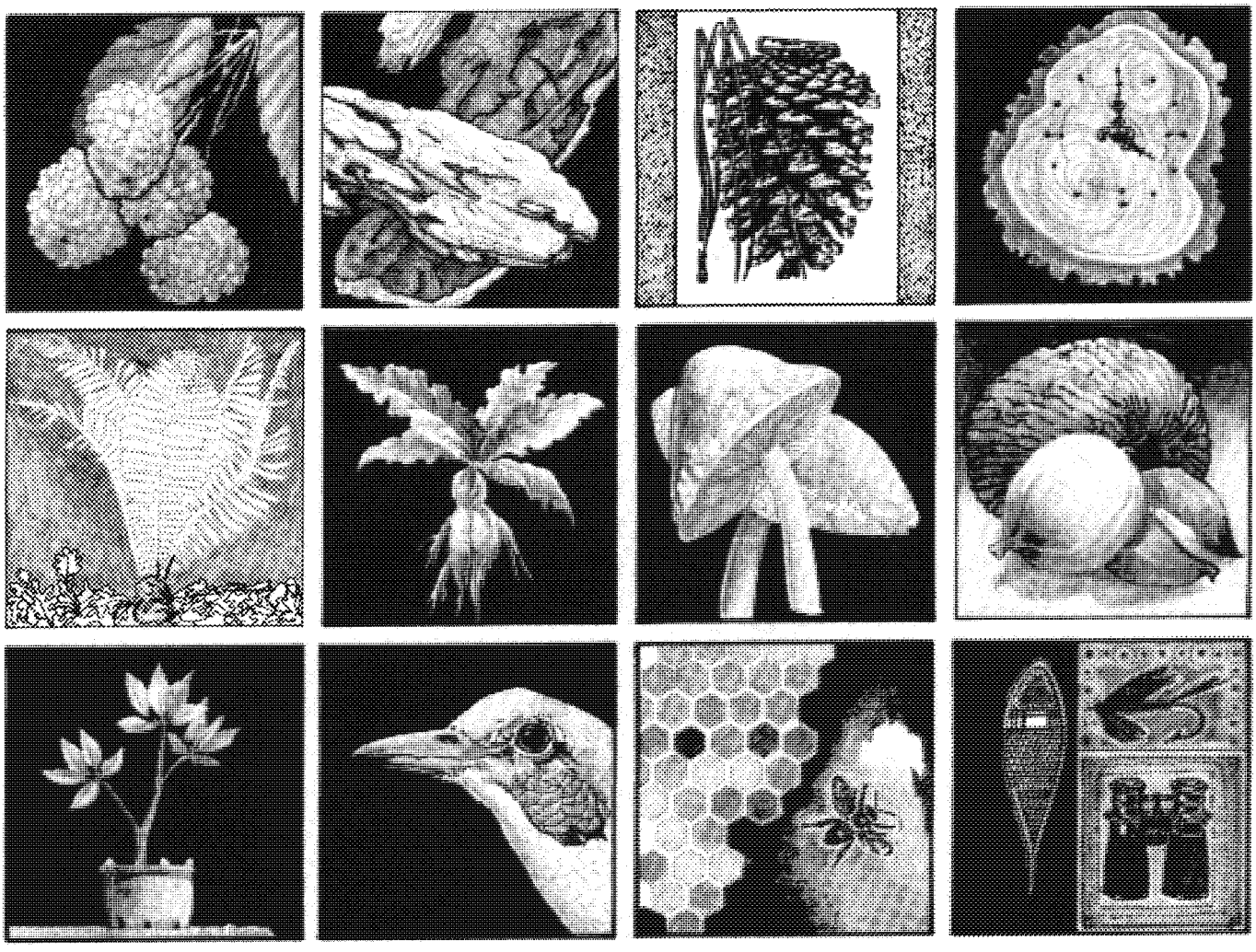
Bulletin 666

Income Opportunities in Special Forest Products

Self-Help Suggestions for Rural Entrepreneurs



United States Department of Agriculture

Forest Service

Agriculture Information Bulletin 666

Washington, D.C
May 1993

Income Opportunities in Special Forest Products

Self-Help Suggestions for Rural Entrepreneurs

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International system of units (SI conversion factors)

English unit	Conversion factor	SI unit
acre	4,046	square meter (m^2)
board foot	0.002	cubic meter (m^3)
bushel (U.S.)	0.004	cubic meter (m^3)
Fahrenheit (°F)	(°F–32) 0.55	Centrigrade (°C)
foot (ft)	0.3048	meter (m)
gallon (U.S. liquid)	0.004	cubic meter (m^3)
hectare	1,000	square meter (m^2)
inch (in.)	25.4	millimeter (mm)
pound per square inch (lb/in^2) (stress)	6,894	Pascal (Pa)
pound per square foot (lb/ft^2) (weight)	4.88	kilogram per square meter (kg/m^2)
pound per square foot (lb/ft^2) (stress)	6.89	kilopascal (kPa)
pound per cubic foot (lb/ft^3) (weight)	1.60	kilogram per cubic meter (kg/m^3)
ounce (oz) (U.S. fluid)	0.00003	cubic meter (m^3)
quart (U.S. dry)	0.001	cubic meter (m^3)
ton (metric)	1,000	kilogram (kg)
yard cubic (yd^3)	0.9	meter (m)

Preface

This publication was made possible through research sponsored by the USDA Forest Service, State and Private Forestry, and conducted by the Midwest Research Institute (MRI) between May 1991 and March 1992. David R. Schumann was the project manager for the State and Private Forestry Division. Margaret G. Thomas served as project leader at MRI.

The MRI is an independent, not-for-profit organization that performs contract research and development for government and private sector clients. The research and support staff combine expertise and resources to carry out projects in more than four dozen scientific and technical disciplines. The Economics and Management Sciences Section of MRI provides expert assistance on rural development, strategic plans for economic and industrial development, management and business studies, market and feasibility analysis, and industry competitive assessment.

Special acknowledgments go to many contributors. At MRI, David Reisdorph assisted in gathering technical material on several forest topics. LaDene Morton and Howard Gadberry consulted on selected forest product topics, and James Damico assisted in locating and collecting extensive resource materials. The original production of this report was very capably supervised by Alice Crews and assisted by Cheryl Bender. At the Forest Products Laboratory, the final production of this report as an Agriculture Information Bulletin was efficiently implemented by the staff of the Publishing Center.

Finally, the authors wish to express appreciation to the many individuals who responded to our surveys and requests for information and photographs related to special forest products. Their generosity in time and effort is what made this publication possible. These individuals are noted in the contributor lists in appendixes at ends of chapters. We also wish to thank the owners of the several small enterprises who provided us with profile information. Their willingness to be discussed brings the ideas and opportunities of this publication to life for others.

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Summary

For many rural areas, the path to sustainable economic development will include innovative approaches to natural resource conservation, management, and utilization. This publication describes special forest products that represent opportunities for rural entrepreneurs to supplement their incomes. The types of products discussed in this publication include aromatics, berries and wild fruits, cones and seeds, forest botanicals, honey, mushrooms, nuts, syrup, and weaving and dyeing materials. Each chapter describes market and competition considerations, distribution and packaging, equipment needs, and resource conservation considerations, and presents a profile of a rural business marketing the products. In general, products suitable for very small or part-time operations are described. A suggested role for each type of microenterprise within a broader rural economic development framework is also mentioned. Each chapter concludes with a list of contributors and additional resources.

This publication supersedes USDA Agriculture Information Bulletin No. 278, "Special Forest Products for Profit: Self-Help Suggestions for Rural Areas Development," published in 1963.

Contents

Introduction

Times have been hard in rural America, and the search is on to find ways to increase job and income opportunities for rural residents. There is growing awareness that for many rural areas the path to sustainable economic development will include innovative approaches to natural resource conservation, management, and utilization.

In the past, the focus on our Nation's forest resources has been to view them primarily as sources of timber. Compared to all that has been written about timber management and traditional timber products, discussion of nontimber or special forest products has been almost nonexistent. One purpose of this publication is to encourage a closer look at our Nation's forests and woodlands as intricate systems capable of sustained generation of a wide diversity of goods and services.

In reality, in every region of the country there are nontimber commodities and services that represent opportunities for rural entrepreneurs to supplement their incomes. Rural areas with access to public or private forest resources, State and private forestry specialists, and rural economic and small business development organizations need to explore these new avenues in special forest products. The intended audience for this publication includes just these individuals: forestry specialists, community leaders, rural economic development professionals, and small business development specialists who can effectively link potential entrepreneurs with new forest-based opportunities and the technical and financial assistance they need to take advantage of these opportunities.

The types of special forest products discussed in this publication include aromatics; berries and wild fruits; charcoal; chips, shavings, excelsior, sawdust, bark, and pine straw; cones and seeds; cooking wood, smoke wood, and flavorwood; decorative wood; forest botanicals as flavorings, medicinals, and pharmaceuticals; greenery and other floral products; honey; mushrooms; nuts; recreation and wildlife; specialty wood products; syrup; and weaving and dyeing materials. Each chapter includes a brief description of products and services, market and competition considerations, distribution and packaging, equipment needs, resource conservation considerations, and a profile of a rural business marketing the products. In general, products suitable for very small (one- to two-person) or part-time operations were the types selected for discussion in the text. A suggested role for each type of microenterprise within a broader rural economic development framework is also mentioned. Each chapter concludes with an appendix that presents contributors and additional resources for use in exploring each alternative.

Advice for New Entrepreneurs[1]

Starting any new enterprise can be risky both from a financial and a personal viewpoint. Before investing money, time, and energy into a potential new venture in special forest products, the new entrepreneur should complete a **personal evaluation, a market evaluation, and a project feasibility evaluation.**

The **personal evaluation** should walk a potential entrepreneur through his or her reasons and primary goals for considering the special forest products industry. It is important to clearly identify and prioritize these goals and the special resources and skills that an individual can bring to a new venture. Prioritizing goals is necessary because an individual may be expecting more from the new enterprise than can probably occur. For example, if a certain level of supplemental income is the most important goal, the economic feasibility of certain products may simply be too low to meet that goal and the individual may be better off seeking extra income from other employment. On the other hand, an inventory of resources and skills may indicate underutilized human resources, such as family members, whose labor could effectively subsidize a small enterprise that would otherwise not be cost-competitive.

The **market** and **project feasibility evaluations** are very critical as well. These steps are made more difficult by the fact that the formal markets for special forest products are more limited than for more traditional forest products. This means that market information is more difficult to obtain. Nonetheless, questions about the market to be answered include **who** will buy the product, **what** exactly will be sold, and **when** the harvest and sale would occur.

For the **market evaluation**, potential entrepreneurs need to identify their potential market, or buyers, through a number of approaches. The contacts and resources in

[1] We acknowledge assistance, in this section, from Chris Schnepf, Area Extension Forester, University of Idaho Cooperative Extension Service, Coeur d'Alene, Idaho, who provided a draft of a paper entitled "Special Forest Products: Considerations for Harvesters."

this publication are a good starting place. Special forest product buyers may advertise through specialty magazines, local newspapers, or trade shows.

After locating a buyer, it is very important to clearly document the product specifications before harvest, then plan to meet or exceed these requirements. The markets are small, and one careless mistake in failing to deliver what a buyer was requesting may be enough to drop a small producer out of the market. Examples of product specifications include: how much material, what quality, what characteristics (size, color, etc.), what prices, what insect or other damages are allowable, interest in and price reductions for lower quality material, and packaging and shipping requirements.

For many special forest products, it is critical to coordinate the timing of the harvest with the requirements of the buyers. This is especially important when dealing with products that have a limited shelf life, such as mushrooms or floral greenery, or products that have fairly seasonal demands, such as charcoal. Close attention must be paid to all applicable State and Federal regulations, particularly regarding edible products, potential noxious weeds, and products to be shipped out of State.

The **project feasibility evaluation** addresses the technical and the financial feasibility concerns of the potential enterprise. Technical concerns include **where** and **how** the products will be found, harvested, packaged, and distributed.

The location of harvest sites will vary with the product and the forest land resources available in a region. Many successful special forest product entrepreneurs do not themselves own forest land; in fact, most of them may not. Harvesting from State and Federal forests, from forest industry lands, and from private forest land owned are all possibilities. Permits are usually required to harvest commercially from public lands. There is a growing interest in leasing land, which allows an individual to manage an area of forest for the sustained production of several special forest products.

The watchword for the future of the special forest products industry will be sustainable harvesting. Research is needed to answer most of the important questions about regeneration, long-term ecological impacts, and user conflicts from harvesting many of the products discussed in this publication. Until the pace of research on these nontraditional forest products quickens, guidelines for recommended harvest locations and methods will vary from one region to another. It is the responsibility of the harvester to learn all he or she can about the products and their forest stewardship responsibilities.

For the **financial evaluation**, a budget needs to be carefully developed, hopefully with the assistance of a forest specialist and a business planning specialist. At a minimum, the budget should itemize fixed and variable costs (including interest) and expected gross and net revenues. A careful inventory of resources already owned and time requirements (how much is available and when) is needed.

When all is finished, the potential entrepreneur needs a clear accounting of the hourly wage he or she could realistically expect to receive for the potential operation. The entrepreneur needs to ask, “Could I make more money at other available jobs or enterprises?” and “Do other advantages, such as being my own boss or spending time in the forest, compensate for lower wages?”

Needless to say, all of the above information from the personal, market, and physical and financial feasibility evaluations needs to be carefully developed and documented. Market information, budgets, harvest sites, and the host of project feasibility information needed will be impossible to sort out and evaluate if not documented. This becomes even more critical if an entrepreneur seeks assistance in evaluating his or her idea (and such assistance is highly recommended) or in financing the project. A clear business plan is the single most important documentation needed by any individual approaching a rural banker with a request for a loan.

Technical and managerial assistance in these evaluations is available from a wide variety of public sources committed to an area’s rural economic development, agriculture, forestry, and small business development. Examples of these sources include forest service staff, county extension agents, local and regional economic development organizations, small business development centers, State departments of agriculture and economic development, banks, State universities, and local community colleges. The brief overview above and the brief summaries in the publication that follows in no way can substitute for direct, localized information and assistance to the potential special forest products entrepreneur.

Additional Resources

The U.S. Department of Agriculture's Office for Small-Scale Agriculture publishes fact sheets on mushrooms, beekeeping, herbs, woodlots, and a number of other small-scale rural enterprises. The Office for Small-Scale Agriculture also publishes a quarterly newsletter, a directory, and a video on small-scale agriculture. To obtain further information on these publications and the video, contact the Office for Small-Scale Agriculture, Room 342-D, Aerospace Building, Washington, DC 20250–2200. (Telephone: 202–401–4640 or Fax: 202–401–5179)

Chapter 1—Aromatics

Description of the Product and Its Uses

Essential oils are the concentrated aromatic oils of plant leaves, flowers, seeds, bark, roots, and the rinds of some fruits. They vary in strength but are always very potent, and often smell best when diluted (as in other oils, colognes, and shampoos). Those essential oils obtained from trees are generally produced by a lengthy steam distillation process applied to either the chopped wood or the leaves and branch ends of the tree (table 1–1). There are other methods of producing oils from citrus fruits, flowers, and herbs as well (see appendix).

Table 1–1. Aromatic oils

Balsam fir oil	Spruce oil
Birch oil	Cedarwood oil Texas
Cedar leaf oil	Cedarwood oil Virginiana
Hemlock oil	Wintergreen oil
Sassafras oil	

Essential oils have a great many uses and may be obtained from cultivated or wild plants. Examples of plants cultivated for their oils (among other uses) include peppermint, spearmint, mentha citrate, basil, clary sage, dill, tansy, wormseed, lemongrass, hops, and a host of other oil crops that are generally grown under contract (angelica, anise, chamomile, coriander, parsley, and tarragon). One commercial source of essential and fragrance oils (Frontier Herbs) lists over 50 essential oils: 25 oils used in cooking and over 20 oils used in potpourri crafting, cosmetics, and massage, among other uses. The most common essential oils used as insect repellents are the oils of cedar, lavender, eucalyptus, pennyroyal, and citronella. They are mostly used on pets and humans to repel fleas and mosquitoes.

Oils of commercial importance obtained from trees and wild plants include cedar leaf oil (from eastern white cedar or arborvitae, *Thuja occidentalis* L.), and from western redcedar (*Thuja plicata* Donn.), balsam fir oil (*Abies balsamea*), hemlock oil (from eastern or Canadian hemlock, *Tsuga canadensis*), spruce oil (from *Picea* species), cedarwood oil Virginiana (from *Juniperus virginiana*), cedarwood oil Texas (from *Juniperus mexicana*), sweet birch oil (*Betala lenta*), and wintergreen oil (from checkerberry wintergreen, *Gaultheria procumbens*). Some of this last group of oils will be discussed in this section.

Cedar leaf oil has been an item of commerce for over 100 years. Thuja cedar leaf oil is produced from the ends of branches and adherent leaves of the eastern arborvitae and western redcedar. It is a common ingredient in pine and cedar blends which are used in room sprays, talcs, and insecticides. It is a component in embalming fluids, microscope slide slips, industrial cleaners, deodorants, pharmaceuticals, cleaning fluids, salves, liniments, perfumes, shoe polishes, and soaps. Perhaps its largest use is in the preparation of patent medicines. For example, it is used in Vicks Vap-O-Rub, a cold-remedy salve that helps clear the nose and loosen the chest. A rather recent use is in the reodorizing of sawdust in "sawdust logs" or instant fire logs.

The main areas of production of cedar leaf oil have traditionally been in New York, Vermont, eastern Quebec, and southeastern Ontario, although some distillation has taken place in the Upper Peninsula of Michigan and in British Columbia (western redcedar).

Balsam fir oil is used in fragrance formulation, particularly in industrial and household products such as detergents, room fresheners, household cleaners, and disinfectants.

Hemlock oil and spruce oil are used for household products, detergents, and soaps. Hemlock oil is not well defined, since there are four hemlock species native to North America, but true hemlock oil is obtained exclusively from eastern hemlock. Spruce oil is obtained from the young branches and adherent leaves of black and white spruce. Spruce oil has a pleasant, pine needle odor and is a major constituent in pine and cedar blends such as sprays, deodorants, soaps, and disinfectants. Both oils are used for personal care products and some cosmetics. There are many blends of hemlock, spruce, and fir needle oils that are produced, and the terms spruce and hemlock oils are often used interchangeably.

Cedarwood oil Virginiana is obtained from steam-distilling sawdust, waste shavings, old stumps, and chipped logs of eastern redcedar. Most of the production comes from North Carolina. This oil is widely used in the fragrance industry in products such as soaps, air fresheners, floor polishes, and sanitation supplies. It is also used in deodorants, insecticides, mothproof bags, floor polishes, and janitorial supplies. In addition, a large percentage of the oil is used as a starting material for cedrol and cedryl acetate.

Cedarwood oil Texas has different uses and does not compete in the marketplace with cedarwood oil

Texarome distillation plant for extracting natural oils. Courtesy of Texarome, Leakey, Texas. (SFP–13)

Virginiana. The chemical composition of the oils is similar, but Texas cedar oil is used almost entirely as feedstock for the manufacture of chemical derivatives of the oil, whereas cedarwood oil Virginiana is used mostly as is in fragrance formulas. Unlike the cedarwood oil Virginiana, the cedarwood oil Texas is not a by-product from the furniture industry—the Texas cedar is felled almost exclusively for land clearing to increase grazing lands for cattle ranching. Cedar trees from such clearing operations are sold to the distillation plants. It is estimated that 70 to 80 percent of this oil is used for cedrol isolation and subsequent acetylation.

Sweet birch oil is primarily produced in eastern Pennsylvania and in South Carolina. It is used in the flavor industry in the manufacture of chewing gum, dentifrice products, and baked goods. It has also been used as an antirheumatic medicant and as a disinfectant. Since the wide availability of synthetic methyl salicylate, the demand for natural methyl salicylate oils has decreased greatly.

Wintergreen oil is produced from the leaves of the low-lying evergreen plant called checkerberry wintergreen. It is used in flavoring chewing gum, other confections, soft drinks, and dentifrice products. In addition to a limited fragrance use (in fern and cypress perfumes), it has been used in a number of over-the-counter pharmaceuticals and personal care products, in particular, to reduce the swelling of tissues. A tea brewed from wintergreen leaves has been used to treat rheumatism, dysentery, and delayed menstruation, and to promote milk flow in nursing mothers.

In addition to the above wild plant oils, erigeron oil (from *Erigeron canadensis*, a common weed in the Midwest known as marestail), pennyroyal oil (from *Hedeoma pulegeoides*), and goldenrod oil (from *Solidago odora*) have all been used to some degree as fragrances. Sassafras oil, from the bark of the root of the sassafras tree, is used for scenting soaps.

Market and Competition Considerations

Essential oils are at the core of the $10 billion U.S. food flavorings and cosmetic industry. Despite their being a very small volume commodity, the oils and their chemical derivatives have a strategic importance because of their irreplaceability in certain formulas that have been well established and on the retail market for years. Most of the users of essential oils are located in highly developed and industrial countries such as the United States, Europe, and Japan.

There are nonetheless severe drawbacks to entering the essential oils and aromatics business. China (mainland) has historically been an aggressive promoter of crops with extractable essential oils. Theoretically, China's State-owned or subsidized producers have the lasting power to bankrupt most private competition in the free world. Small producers in the United States also must contend with a virtual price control by a few large companies on the East Coast.

More recently, since the beginning of the current economic depression, the prices for essential oils have fallen at the same time that consumption has decreased. For example, cedarwood oil Texas has dropped from a total production of 600 drums per month to 350 drums per month, and this oil is one of the highest volume oils. The price for cedarwood oil Texas is now at 1975 levels ($2.75 per pound). The same is happening for a number of other essential oils. A low-grade Chinese cedarwood oil is being offered in New York at $1.70 per pound, which is below the cost price of any of the Texas producers.

Global competition and marketing have another peculiar pitfall. The currency exchange rate and the black market value of the U.S. dollar in certain essential oil-producing countries are such that these countries can afford to sell their goods for very low U.S. dollar prices. One can perhaps expect similar situations to occur with goods and commodities from Eastern Europe and the Commonwealth of Independent States (CIS) as soon as these countries return to some degree of production; many of these countries are essential oil producers.

There are two options available to the entrepreneur desiring to enter the essential oils market. The first is to enter the market in a fairly major way, for example, with an investment in an essential oil distillation plant of between $1 million and $2 million. Such a plant would need to be set up to process 50 tons of raw material a day. According to Mr. Gueric Boucard of Texarome, a fragrance material producing these conditions would

need to be met for this strategy to succeed (Boucard, personal correspondence):

1. The raw material must be either site-specific (for example, Texas cedarwood, Virginia cedarwood, and cedar leaf) or must be of a good chemovariety that produces a high yield of oil and can be raised as a fully mechanized crop (for example, basil oils, spice oils, tea tree oils, lemongrass oils, and coriander oils). In either case, the biomass by-products of the distillation must have enough value that the overall cost of the oil itself is drastically reduced. Such value might be either as boiler fuel or as cattle feed additive. Ideally, boiler fuel materials would not only generate the steam for the distillation but also generate enough electricity needed to grind the materials and operate the plant.
2. The raw materials must be processed in a sufficiently large volume to achieve economies of scale, yet such volume should not constitute more than 25 percent of the current world production in the first phase.
3. The most cost-efficient and automated distillation technology must be selected for the job.
4. The plant should be designed to include a vacuum-refining section with a fractionation column to allow the redistillation of the oil to remove dark colors and resins or to fractionate the oil into its different constituents. This would allow reblending to meet a customer's exact specifications.
5. Preferably, a new producer should have a contract in hand for at least part of the production before going into business. Alternatively, the new producer could be in business with a line of products that will use the oil.
6. A new producer should start with sufficient operating cash to produce for at least 6 months without sales. (Large producers in the United States have been known to have sold oils for a full year below their manufacturing cost price in order to put a new producer out of business.)
7. The new trend in the flavor and fragrance industry is to keep inventories to a minimum and rely on essential oil dealers to deliver the raw materials on time as needed, out of their own inventory. For this reason, producers must be able to offer substantial quantities of merchandise "ex warehouse" and available for immediate delivery, for example, spot New Jersey, spot Amsterdam, and spot Marseille. This requires considerable credits for product inventory, shipping, and warehousing costs.
8. Preliminary calculations need to show that the oil can be produced for one-half to two-thirds of its lowest list price during the past 10 years.

These are fairly sizable conditions certainly, and care is advised in pursuing this strategy. Basically, there is nothing that can be raised and distilled in this country that cannot be done cheaper elsewhere. The only valid niche is where one is raising and processing a crop or material that has other value as well, for example, as a feed crop for cattle feedlot operations. Celery, coriander, and related crops with high oil seeds can be high-quality feed crops. In such cases, their oils become almost by-products.

This raises the second alternative for essential oils production that is probably more consistent with rural small business development. This alternative is to develop a very small-scale distillation process in conjunction with an herb or other botanical already being harvested or grown for other reasons.

For example, a producer of an herb such as rosemary might consider building a very small-scale "back yard" distilling operation capable of using excess harvests of this herb to produce a small quantity of oil. A small distillation unit capable of using about 500 pounds of excess herbs might produce a gallon of rosemary oil, which could be carefully and attractively bottled and sold. Even such a relatively small amount of production could add value to the business if this oil were bottled in half-ounce bottles and sold for several dollars a bottle, perhaps through a retail shop associated with the grower's business. Such a small-scale approach effectively raises the value of the oil from $30 per pound (its price on the world market) to about $150 per pound. The distillation process itself could be a drawing card for visitors and tourists.

The biggest problem for the very small entrepreneur trying to sell a manufactured oil is the reliability of his or her production. It is difficult to get enough production to convince a buyer—for example, a cosmetic company—to buy the product. A consumer-based product line cannot be introduced only to find that the oil for that commercial product is not in dependable supply. If a reliable supply and sufficient quantities of the raw material cannot be identified, the project will be dropped.

The "harvested from the wild" forest materials for aromatics are predominantly the eastern white cedar and balsam fir. In particular, cedar leaf oil production has almost always been a "pocket money" production controlled mainly by farmers who distill the oil in fairly crude equipment during times when they are not doing usual farm work. Cedar oil was selling at about $9.50 a pound in 1978, although the market can widely fluctuate. It is estimated that 25 metric tons were produced in Canada and the United States in 1984.

Other estimated levels of production based on 1984 estimates are as follows:

Fir balsam oil	10 metric tons
Cedarwood oil Virginiana	240 metric tons
Cedarwood oil Texas	1,400 metric tons

Estimated levels of production for some other oils, based on older 1979 data, were:

Hemlock oil	1,000 to 2,000 pounds
Spruce oil	4,000 to 5,000 pounds
Sweet birch oil	5,500 pounds
Wintergreen oil	2,500 pounds

The market trend for the above essential oils is currently a little downhill. The production of cedarwood oil Texas, for instance, has dropped by half, and the four plants producing this oil are all running at half capacity. The competition from China is strong, and other countries such as India and Indonesia are prepared to sell at a price below the U.S. cost price.

The primary buyers of aromatics in the flavor business are brokers and dealers, some of whom speculate in the purchase of raw materials. The companies that make the final product (perfumes, cosmetics, and foods) seldom get involved in purchasing the raw materials. Rather, it is the "recipe makers," or the intermediary companies, which are most often the point of contact for a small rural entrepreneur. These are the companies whose job it is to make "recipes" of flavors and fragrances which they, in turn, sell to the perfume, cosmetic, and food companies.

One of the hardest things in the essential oils business is getting a new product approved by an intermediary. It often takes a number of years for a user company to decide if a product is reliable, available, and wanted. Occasionally, though, one can find a smaller broker who will go out of his or her way to try to move an oil that has a new source.

Distribution and Packaging

Essential oils must be stored so that they remain unexposed to air, light, heat, and heavy metals. If allowed to deteriorate, they become less fragrant, more viscous, and darker. Because they have no fatty acids, rancidity is not a problem. Properly stored and sealed, most oils last for years and some reputedly improve with age.

Trucking freight rates are becoming disproportionately high in some regions. One producer gave as an example the fact that in 30 drum lots, it costs $45 per drum to ship by truck from Leakey, Texas, to the Port of Houston (250 miles) and $55 per drum to send the same drum from the Port of Houston all the way to London, England.

Equipment Needs, Costs, and Suppliers

A distillation unit that could achieve a very small-scale level of production would cost in the range of $5,000 to $10,000 and could be lease-purchased or bought. If purity and efficiency were not major concerns, it would also be possible to build a very small "home-made" distilling apparatus, since the overall concept is not complex. In fact, many of those in the cedar oil business design their own distilling equipment. The key is having a source of steam: the steam volatilizes the oil in the nodules of the boughs, and the steam-oil mix is put through a condenser. The oil and water separate and the oil is dipped off. Someone with a steam boiler can build a still with drums and chicken wire to hold the plant material.

Some kind of chopper is necessary to pulverize the plant material too. For example, it takes about two tons of eastern white cedar brush to fill a typical distilling tub, which means 4 to 6 days of hard work. Often the simplest of tools are used—a small axe, a handsaw to cut branches, and a machete. Depending on the season, the weather, and the quality of the brush, 2 tons yield anywhere from 20 to 40 pounds of oil (about 3 to 5 gallons).

Resource Conservation Considerations

Environmental concerns can become linked with the production of essential oils on a case-by-case basis. For example, the harvesting of Texas cedar currently is being affected in some regions because of the listing of the yellow-cheeked warbler and the black cap vireo on the endangered species list. These birds nest in cedar trees, and fines up to $50,000 are being levied for cutting a cedar tree in certain areas where birds have been sighted.

Special Factors

Society is becoming more careful about the toxicity or other adverse effects of materials. Many small companies are virtually uninsurable by insurance companies, and product liability for a small line of retail cosmetic products is very expensive. One lawsuit can bankrupt a small company at any given time.

Processing plants can require up to 2 years of preparation because of permit requirements and environmental constraints, chiefly related to air quality and water quality concerns.

There are a lot of shysters in the aromatics business. For example, "stretching" an oil with synthetic compounds

that are difficult to detect chemically is not uncommon. It has been rumored in the trade that a certain amount of the so-called natural birch oil has never seen a birch tree.

There is a labeling law in the United States related to the use of products in the food industry. All products that use the term "natural flavor" in the label must use compounds that are naturally derived. This requirement can create market opportunities in some instances. For example, there is a wild horsemint found in western Canada that is extremely rich in a compound called geraniol, which is a raw material used in the fragrance industry. If a manufacturer making a natural apricot oil that requires a little bit of geraniol uses geraniol from the horsemint plant, he or she can still continue to use the term "natural" in the labeling. A farmer in western Alberta, Canada, has begun production of wild horsemint.

Profile

Mr. Gueric Boucard is President of Texarome Inc., a small producer of fragrance materials located in Leakey, Texas. Texarome has developed a very efficient method of extracting the natural essential oil from the native Texas cedar trees and stumps discarded by local ranchers in their land clearing operations. Through a unique continuous distillation process that uses pure steam and no chemicals, the company is able to separate and collect nearly 100 percent of the oil contained in the ground-up wood. The spent wood is used as fuel for the steam boilers, and all of the process waters are recycled. The steam is used to power and heat a cogeneration-type refining plant for breaking up crude cedarwood oil into more valuable natural fractions of the oil and a pure white crystal called cedrol. Such fractions are used by perfume chemists to produce an array of naturally based perfume chemicals used in soaps, household products, and fine fragrances.

Texarome is now developing its own line of perfumes with the introduction of "Texas Fragrances," highlighted by a Texas "homegrown" perfume base of cedar. The company also custom distills and custom builds both conventional distillation plants and continuous distillation plants.

Considerations for a Rural Development Strategy

Essential oils, like many other specialty manufactured products, are almost certainly a product about which few bankers anywhere, much less bankers in rural areas, are likely to be knowledgeable. Similarly, rural bankers would have no easy way of obtaining statistics on such products. Therefore, securing financial assistance for these enterprises would almost certainly require that these products be introduced (along with several other natural resource-based enterprises) through a concerted education program throughout a rural region. Such a program might involve bankers, small business development centers, State departments of economic development and agriculture, a university center capable of the appropriate technology transfer, and community leaders.

Sasha and Grover Corwin at Texarome portable distillation plant. Courtesy of Texarome. (SFP–12)

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Bibliography

Barton, G.M. 1973. Wood chemistry of western conifers—questions and answers. Rep. VP–X–106. Vancouver, British Columbia: Western Forest Products Laboratory, Canadian Forestry Service. 28 p.

Bender, F. 1963. Cedar leaf oils. Publication No. 1008. Ottawa, Canada: Canadian Department of Forestry. 16 p.

Boucard, G.R. 1991. A continuous steam stripping process for the distillation of essential oils. Perfumer & Flavorist. 16:2–8.

Lawrence, Brian M., 1979. Commercial production of non-citrus essential oils in North America. Perfumer and Flavorist. 3:21–23.

Lawrence, Brian M. 1985. A review of the world production of essential oils (1984). Perfumer and Flavorist. Vol. 10, October/November: 5, 6, 8.

Minore, D. 1983. Western redcedar: a literature review. Gen. Tech. Rep. PNW–150. Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station.

Whitcomb, Francis and Patricia. 1978. Distilling oil from the tree of life. Yankee. 42(4):78–83, 122–23.

Resources

Chemical Marketing Reporter publishes monthly statistics on essential oils and their levels of import.

Drug and Cosmetic Industry—Fragrance Materials Suppliers Guide, Vol. 146: March 1990, p. 28(2).

Frontier Herb Cooperative, Box 299, Norway, IA 52318. 319–227–7991.

*The Herb Market Repor*t, 1305 Vista Drive, Grants Pass, OR 97527.

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Appendix A—Essential Oils as Natural Products

Essential oils are volatile odorous products obtained from natural raw materials by distillation, usually with water or steam, or, as in the case of citrus fruits, by a mechanical process. These products, which give to the plant its distinctive and often diagnostic odor, are complex mixtures of organic chemicals, the nature and relative proportions of which are determined by the genetics of the plant species and stage of development, environmental factors (such as climate), and agricultural factors (such as soil conditions, nutrition, time of harvesting, and postharvesting handling prior to distillation) (Bernath, 1986).

The chemicals present in essential oils may be classified as follows:

- Hydrocarbons of the general formula $(C_5H_6)n$-terpenes.
- Oxygenated derivatives of these hydrocarbons.
- Aromatic compounds having a benzenoid structure.
- Compounds containing nitrogen or sulfur.

These constituents are synthesized by the plant during its normal development, and the chemical composition of the oil is often characteristic of a given plant species. These oils are produced in special secretory structures such as glandular trichomes and oil or resin ducts (Fahn, 1979; Schnepf, 1974).

Essential oils have industrial application in providing an agreeable scent or flavor to many commodities, including perfumes, toilet articles, soaps, and confectionery. In addition, many volatile oils possess therapeutic properties and are used extensively in medical practice.

Commercial Extraction Methods

Aromatic Plants

In commercial practice, the removal of essential oils from plant material is accomplished by various methods, depending upon the quantity of oil present in the plant and the stability of the aromatic constituents of the oil. The tendency of some of these constituents to undergo changes when subjected to high temperatures makes it necessary in some cases to use special methods of extraction whereby the final product is obtained without decomposition or alteration (Guenther, 1972).

The four major extraction methods used are:

- Hydro- or water distillation—only water is used.
- Water and steam distillation—both water and steam are used.
- Direct steam distillation—only steam is used.
- Solvent extraction—a solvent is used.

In hydrodistillation, the plant material is in direct contact with water, while in steam distillation, live steam is used. In water-steam distillation, both water and steam are used, but the plant material is not in direct contact with water. In solvent extraction, the plant material is extracted with some solvent and then the solvent is removed to obtain the oil.

Each method of distillation can be carried out at reduced pressure, atmospheric pressure, or excess pressure.

Before distillation, the plant material is often field-cured, partially dried, or disintegrated to some extent. This latter disintegration process, commonly called comminution or size reduction, is used in the extraction or distillation of herbs or for their incorporation into food products (Heath, 1981). The reduction in particle size is to expose as many oil glands as is practically possible to the solvent or steam. It reduces the thickness of plant material through which diffusion must occur, greatly increasing the rate or speed of vaporization and distillation of essential oils.

For larger and fixed installations, steam distillation is the preferred method. Conventional operations use batch and semibatch systems. A more cost-effective continuous system is now in use at the Texarome plant in Leakey, Texas.

Solvent extraction techniques are also used for floral material, which is too sensitive for normal distillation methods. Enfleurage is another very long-established method of extracting delicate flora aromas by solution and adsorption into fat. The odorous fat is extracted with a solvent to recover the essential oil, and the residual fat may be used in the making of scented soap.

Recently, the liquid carbon dioxide extraction method and ultrasonics have been employed to increase the extraction rate and yield of essential oils.

Oleoresins

The nonvolatile flavoring constituents of herbs and spices are recoverable by extraction. In practice, a solvent is chosen that dissolves both essential oil and nonvolatiles present, the resulting solvent-free product being known as an oleoresin. Oleoresins have been used in the flavor industry for about half a century, and today oleoresins of many culinary herbs and spices are commercially available (Heath, 1981). Modern techniques using liquified gases such as carbon dioxide are used as well as the application of ultrasonics to increase the extraction rate and yields.

Quality Control

Quality control is the manufacturer's approach to maintaining the quality of the products produced based on precisely defined specifications. The large-scale production methods applied to so many products which are consumed involve a close and very critical control of all materials used, processing conditions, handling, packaging, and, of course, the end product. Of great importance to the end user is the color, preferably light or "water white" color of the oils. This result requires all stainless steel processing equipment and refining facilities. The most elusive quality criterion is the "odor" for which there is no analytical machine other than the human nose.

Small-scale Extractive Methodologies

Each of the three commercial distillation methods can be scaled down for smaller samples depending upon the amount of oil in the tissue. Industry most often uses amodified clevenger trap as described by the American Spice Trade Association (ASTA, 1968). This system is relatively inexpensive, requires only a moderate amount of plant tissue, and is easy to operate. This is probably the best system for growers and industry looking to quantify the essential oil content in aromatic plants. For very small amounts of sample tissue, Godefroot and others (1981) and Bicchi and others (1983) developed micro-scale extraction systems for research that required only 2 hours for complete analysis starting from 1 gram of tissue. Also, small amounts of samples can be extracted with an organic solvent and used straight for chromatographic analysis. Headspace analysis offers a potentially rapid method of extracting essential oils and requires very little plant material, but complete recovery occurs only for light volatile materials.

Bibliography

ASTA. 1968. Official analytical methods of the American Spice Trade Association. American Spice Trade Association, Inc., Englewood Cliffs, NJ: 8–11.

Bernath, J. 1986. Production ecology of secondary plant products. In: Craker, L.E.; Simon, J.E. (eds.). Herbs, spices and medicinal plants: recent advances in botany, horticulture and pharmacology. Phoenix, AZ: Oryx Press: 185.

Bicchi, A.; Nana, D.G.M.; Frattini, C. 1983. Improved method for the analysis of small amounts of essential oils by microdistillation followed by capillary gas chromatography. Journal of Chromatography. 279: 409–416.

Fahn, A. 1979. Secretory tissues in plants, New York, NY: Academic Press. 158 p.

Godefroot, M.; Sandra, P.; Verzele, M. 1981. New improved method for quantitative essential oil analysis. Journal of Chromatography. 203: 325–335.

Guenther, E. 1972. The production of essential oils. In: Guenther, E. (ed.). The essential oils. [city unknown], Florida: Litton Educational Company: 87.

Heath, H.B. 1981. Source book of flavors. Westport, CT: AVI Publishing Company Inc. 863 p.

Kesterson, J.W.; Hendrickson, R.; Braddock, R.J. 1971. Florida citrus oils. [city unknown, FL]: Florida Agr. Exp. Sta. Tech. Bull. 749. 6 p.

Lacy, M.L.; Stephens, C.T.; Green, R.J.; York, A.C. 1981. Mint production in the midwestern United States. [place of publisher unknown]: [publisher unknown]: North Central Region Extension Pub. No. 155.

Schnepf, E. 1974. Gland cells. In: Robards, A.W. (ed.): Dynamic aspects of plant ultrastructure, London: McGraw–Hill: 331.

Chapter 2—Berries and Wild Fruit

Description of the Product and Its Uses

North America possesses diverse native fruit trees and shrubs, the potential commercial possibilities of which have barely begun to be explored or appreciated. The most well known are probably the wild blueberry (*Vaccinium angustifolium*) and the big huckleberry (*Vaccinium membranaceum*). In the Pacific Northwest, the Himalayan blackberry (*Rubus procerus*) is a nonnative "escape" that is also common. Other popular wild berries are gooseberries, currants, strawberries, blackberries, blackcaps, and raspberries. Lesser known berries include lingonberries, juneberries, elderberries, mulberries, coralberries, salmonberries, and thimbleberries. Native fruits that are wild harvested include mayhaws, pawpaws, persimmons, chokecherries, crabapples, Oregon grape, and several types of wild plum. Staghorn sumac, prickly pear, deerberry, passionflower, and black cherry are also used for their berries and fruits (table 2–1).

Table 2–1. Berries and wild fruit with commercial potential

Blackberry	Currant	Mayhaw	Prickly pear
Blackcap	Deerberry	Mulberry	Raspberry
Black cherry	Elderberry	Oregon grape	Salmonberry
Blueberry	Gooseberry	Passionflower	Serviceberry
Chokeberry	Huckleberry	Pawpaw	Staghorn sumac
Coralberry	Juneberry	Persimmon	Strawberry
Crabapple	Lingonberry	Plum	Thimbleberry

Most types of wild berries and fruits are found only in certain regions of the country. For example, the pawpaw, a smooth, creamy fruit that tastes like a blend of banana, mango, and pineapple, is the northernmost member of the custard apple family and the largest North American fruit. The center of its native distribution is in the Kentucky and Ohio area, but it can be found as far south as northern Florida, as far north as southern Canada, and as far west as Nebraska and Oklahoma. The persimmon, which is used in breads and pies, is primarily found in Indiana and Illinois.

Many berries and wild fruits are used fresh in baking products. The most popular application for wild blueberries, for example, is still blueberry muffins. But other berries and wild fruits are gaining regional and even national and international markets as part of specialty berry and fruit products. Besides baked goods, these products can include jelly, jam, preserves, marmalade, pudding, butter, juice, salad dressing, syrup, sauce, candy, wine, cider, and even beer. A few, such as the juneberry (also called the serviceberry, Saskatoon, shadblow, and sarvis tree), can be found throughout much of North America. Pemmican, one of the staple foods of most of the Plains Indians, was made by pounding dried juneberries with buffalo meat. Today, serviceberries make delicious pies, jellies, and jams. They have a unique sweet flavor that tastes a little like almonds.

Prickly pear fruit is sold in many grocery stores. It can be eaten raw or made into preserves, marmalade, or syrup. Elderberries are used in elderberry blossom fritters, sauces, wines, and fruit juice or may be combined with other fruit for use in pies and tarts. Deerberries are reported to make delicious pies, jams, jellies, and marmalade. Mayhaw may be used in fruit juices and sherbet. Crabapples make excellent jellies or preserves, and black cherry makes fine pies, cider, and jelly (Payne et al., 1991).

Some native berries have medicinal or therapeutic uses as well. For example, in China, mayhaws are a very important cultivated crop, partly for their medicinal uses as a heart medication. There may be medicinal market opportunities in the United States as well for this and other native fruits and berries. Pawpaws have received attention lately because, in addition to food uses, the vegetative parts of the pawpaw plant contain compounds that exhibit highly effective pesticidal and anticancer properties (Callaway, 1992). They are also an excellent source of vitamin C. In fact, some USDA scientists have predicted the pawpaw may become one of our most valuable fruit trees. The American persimmon is also high in vitamins A and C. The berries of staghorn sumac are used in Appalachia to make a gargle to soothe a sore throat.

Market and Competition Considerations

There is some indication that new markets for specialty native berries and fruits may be opening up. Blueberries, huckleberries, and mayhaws are among the wild berries and fruits that have already been used by rural entrepreneurs and are briefly described.

Blueberries. The wild or lowbush blueberry is of great interest to many forest managers in the north central and eastern United States. The lowbush blueberry is a woody deciduous shrub native to northeastern North America. Lowbush blueberries are harvested commercially from native wild stock in Maine and eastern Canada. It is believed that some of our native lowbush blueberry barrens have been producing for 900 years. Between 1984 and 1988, an average of over 17.5 million kilograms of blueberries were produced in Maine alone, from over 10,000 hectares of land (Yarborough, 1991). Maine has had crops of lowbush blueberries approaching 50 million pounds. Most are flash-frozen, and some are exported as far away as Japan, where their color is prized as well as their taste.

Most of the U.S. wild blueberry crop under cultivation is dedicated to industrial applications. Nearly half of the U.S. commercially produced blueberries are now from wild bushes, and the major increases in volume have come from wild production. Cultivated blueberry production has increased at a rate of approximately 5 percent per year for a number of years, but production of wild blueberries has increased at double that rate. Per capita consumption of wild and cultivated blueberries has doubled in the last 10 years.

Only 2 to 3 percent is sold as fresh produce, almost exclusively in the Northeast in cities close to the growing areas of Maine and eastern Canada. Wild blueberries are especially appropriate for baking because their firm skin helps them maintain their shape throughout processing. They are a good source of nutrition (providing dietary fiber, vitamin C and other vitamins, and minerals including calcium, iron, and zinc) and are low in sodium and calories.

Particularly in northern Minnesota and in Maine, local residents regularly harvest wild blueberries. In especially good berry years or hard economic times, local blueberries appear for sale on roadsides and in supermarkets. In Maine, blueberry picking is one of many money-making activities for rural residents and Native Americans, some of whom have started mail order jam and jelly businesses based on wild blueberries.

Another opportunity from wild blueberry gathering is as a recreation and tourism activity. A survey of northern Minnesota resorts showed that 29 percent of the resort's visitors picked wild berries and felt that this added greatly to tourist experience in that region. Research has shown that it is actually cheaper to buy wild blueberries than it is to pick them (Shubat, 1987). It is apparent that the recreational benefits of wild berry picking (being outdoors in a peaceful setting, finding a natural food) are more important than potential commercial benefits in many cases. These recreational benefits can be creatively expanded, too. For example, the Annual Blueberry/Art Festival in Ely, Minnesota, is one of Minnesota's most popular art/craft festivals. It features foods that reflect the ethnic mix of the area, and blueberry delicacies include ice cream, muffins, pies, pancakes, pastries, and breads.

Huckleberries. The western huckleberry[2] is also becoming recognized as an important forest resource. In State or national forests where huckleberries are relatively accessible, wild huckleberry picking can be a significant boon to recreation and tourism. For example, in northern Idaho, many visitors come to certain areas expressly to pick and sell huckleberries. Many are retirees who come in campers, camp in the woods, and pick and sell huckleberries to local buyers and local restaurants to supplement their incomes. Pickers can earn from $12 to $18 a gallon for huckleberries, with $14 a gallon being an average. This equates to $1 to $2 per pound. It takes about 1-1/2 hours to pick a gallon of huckleberries, which are more time-consuming to harvest than wild blueberries because they grow individually rather than in clusters.

The local restaurants, in turn, offer special huckleberry products to the tourist trade. Huckleberry "raisins" and huckleberry chocolate candy are examples of unique products of northern Idaho and western Montana that have already found a commercial niche market.

Berry production is surprisingly high in some huckleberry fields. Yields of 100 gallons per acre have been reported, and over 75 gallons per acre are not unusual in a good huckleberry year. Research is being undertaken at the University of Idaho Agricultural Experiment Station to determine which varieties of huckleberries might be capable of farm cultivation.

As with wild blueberries, the market opportunity for a unique recreational experience may be just as great as the market opportunity for a food product. Berry picking has a high recreational value. During huckleberry season, thousands of additional vehicles may pass through a berry-rich ranger district during a single huckleberry-season weekend.

Mayhaws. The mayhaw is a member of the *Crataegus* family and is a variety of Southern hawthorn that yields yellow to bright-red fruits with a taste similar to a tart crabapple. It is one of the last wild U.S. fruit trees that has not yet been commercialized. It can be found in the southeastern United States, usually in wet, swampy areas due primarily to the fact that much of the uplands in the southeastern United States have been burned over at some point in history. Because the mayhaw tree is very heat-sensitive, wet, swampy areas are among the few habitats where they have survived.

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[2] Note: A poor-quality eastern fruit (*Gaylussacia*) is called "huckleberry" in the eastern United States and should not be confused with *Vacciniums*.

Mayhaws are used to make jellies, marmalades, preserves, salad dressings, wines, syrups, sauces, and desserts. There are probably already 10 entrepreneurs who are selling mayhaw products, even though there are probably fewer than 15 commercial acres of mayhaw trees in the United States.

Renewed interest in mayhaws is also occurring in Louisiana, Georgia, Alabama, and Mississippi. While mayhaw jelly has been renowned in the South for over a hundred years, entire recipe books have been developed to promote this native fruit in the last several years. Articles have been run in magazines such as *Southern Living* and *Louisiana Life* on the commercialization of the mayhaw as an orchard fruit. Some who are knowledgeable about the mayhaw feel that within 8-10 years, the tree will probably be found in commercial orchards.

Distribution and Packaging

It is worth noting that if the cost of labor, packaging, and shipping were added to the cost of harvesting wild berries, there would not be a general market for them as a fresh product. For example, fresh huckleberries would probably cost over $5 a pound if shipped fresh to major population centers. Commercial successes with wild fruits and berries have all relied on processed rather than fresh products since there are so many alternative commercially produced fresh fruits and berries (strawberries, raspberries, and cultivated highbush blueberries) that are less expensive.

Also, many of the wild berries, though delicious, have little or no shelf life. Some “die” in less than a day. But dried berries are a potential product with largely untapped possibilities, since drying extends the shelf life significantly.

Equipment Needs, Costs, and Suppliers

Most picking of wild berries and fruits is done by hand. However, some experienced berry pickers use small rakes to speed the process. The disadvantage of this technique is that it collects a lot of leaves and twigs, so the berries must be cleaned as well. Rolling across a wool blanket, picking out the leaves, or floating the leaves and twigs in water are all ways of cleaning. Some pickers beat on the bushes with a hoop-type cradle to catch the berries. A “huckleberry combine” has also been used, which is a wire arrangement to separate the ripe berries from everything else.

Flash freezing is not practical for the small producer. A producer has to be prepared to process hundreds of pounds, perhaps a thousand pounds per day, before flash freezing is economical, and some suppliers of freezing equipment recommend a thousand pounds per hour. Most people simply use very cold chest freezers and bag the berries frozen.

Resource Conservation Considerations

The major considerations in increased use of public lands for the harvesting of wild fruits and berries relate to potential conflicts with other uses and users, and the best management practices to increase yields.

Potential conflicts. Resource managers in two areas of the Gulf Coast are currently dealing with questions of potential use conflicts over the commercial harvesting of mayhaws. Lessons learned in these cases will no doubt be applicable to resource managers in many other regions of the country dealing with similar questions over wild harvesting for commercial use.

The Eufaula National Wildlife Refuge Area is a 250-acre wildlife refuge near Colquitt, Georgia. This refuge was recently acquired by the U.S. Fish and Wildlife Service and includes many mayhaw trees, the berries of which have historically been harvested by local residents. In the past few years, much of this harvest was sold to a local company called The Mayhaw Tree, Inc., which has created a market for mayhaw jelly and other products (see profile section of this chapter).

Normally, the U.S. Fish and Wildlife Service issues permits to individuals for collecting berries or nuts on refuge lands. In the case of the Eufaula area, which is physically quite removed from the offices of the U.S. Fish and Wildlife Service, the Service has elected instead to issue permits directly to The Mayhaw Tree, Inc. and the local IGA store, which are the two primary commercial outlets for the sale of the berries. There is currently no charge for these permits, even though the harvested berries are sold commercially, but the refuge manager has pointed out that this policy might need to change if the demand for picking were to become so great that there were user conflicts, in which case some charge for mayhaw collecting might be put into place, possibly on a bid basis.

The U.S. Fish and Wildlife Service observed the area closely in April and May of 1992 to determine the level of use and also to ensure that inappropriate uses of the wildlife refuge do not occur. The area includes sand dunes, longleaf pine, and wire grass habitat that is now relatively rare for the region. The refuge is also heavily populated by gopher tortoises and possibly by indigo snakes, which are both threatened species. The primary objectives for the U.S. Fish and Wildlife Service will be to limit public access and disturbance as much as possible. That portion of the tract that is heavily wooded with mayhaw trees is generally away from the tortoise

area and will continue to be open for berry picking but with certain restrictions, such as no vehicles. A workshop between area biologists and the public was held in February 1992 to discuss the issues.

In the State of Louisiana, a potential exists for conflict in the harvesting of mayhaws from several Wildlife Management Areas (WMA's). Louisiana currently has a regulation against the harvesting of hard mast (acorns, pecans, etc.) and various plant species, but has never addressed the soft fruits. In past years, individuals or families came into certain areas to gather mayhaws for their own use. But in 1991, interest in collecting mayhaws increased substantially. In one area, the Saline Wildlife Management Area, fairly large crews of as many as 15 men came into the area to harvest mayhaws.

At this point, the Louisiana Department of Wildlife and Fisheries saw a potential for conflict with other recreational users and abuse of a resource. There was also concern for damage to the trees and nesting songbirds. There are no regulations on harvest methods, and one method used is to pound the base of the trees with a sledgehammer or other heavy object to make the berries fall off, a practice which can split the wood of the tree and disturb any nesting wildlife.

In response to the concern voiced by the wildlife managers, legislation was passed by the State of Louisiana to keep the Department of Wildlife and Fisheries from limiting the volume of mayhaws for commercial use. The resulting regulations limit the recreational user to 5 gallons of mayhaws per person per day. This seems more than adequate for the home user. Individual members of a family are eligible for 5 gallons each. Commercial operators will be required only to obtain a permit from the district office or a field person, and the commercial harvest is unlimited. Hopefully, the permit will allow the department to track the actual amount of berries harvested. Damage to or removal of trees, shrubs, hard mast, and wild plants is now expressly prohibited without prior approval.

The berries are generally not considered to have important wildlife food value, although relatively little is known about which species depend on the berries. They are probably eaten by various passerine birds, turkeys, and deer, but, because they ripen in the spring when food is not generally a limiting factor for these populations, the mayhaws are probably not critical. Often they ripen when the land is inundated.

Resource management of blueberries and huckleberries. Resource management of the wild or lowbush blueberry in the wild is a subject of great interest to many forest managers in the north central and eastern United States. Berries do best in open, acidic sites, although they can also do well in fairly open wooded sites. The lowbush blueberry grows from seed and from underground rhizomes. New parent plants are started from seed, usually by birds and other mammals. After 3 to 6 years, the plants become branchy and stop producing as many berries. Any disturbance which prunes the branches encourages the spread of underground rhizomes, which in turn develop roots and new stems, which produce larger and more numerous berries than the parent plant. To maintain the open sites and to prune the branches, it has been felt that it was necessary to burn over lowbush blueberry areas. It is believed that some of our native lowbush blueberry barrens have been managed by burning for an estimated 900 years.

A few national forests, such as the Chippewa National Forest in Minnesota, develop and manage sites as blueberry picking areas. Periodically, a few hundred acres of blueberry area are burned in the Chippewa to encourage new and more productive growth of the native blueberries. Sites are selected for management based on the availability of existing plants, the accessibility of the site, and historical picking use. Late fall burning is preferred. However, burning has drawbacks. If the surface gets too hot, burning can destroy the organic layer of the soil, thereby exposing rhizomes to heat, drought, and extreme cold.

On good sites, up to 4,000 pounds of berries can be produced per acre. However, information regarding the location and ripening of berry sites has always been informal, low key, and by “word of mouth” in the Chippewa National Forest.

While many people think the huckleberry is a wild blueberry, the morphology and physiology of the big huckleberry (native to the Pacific Northwest) are very different and the plants have different management requirements. Huckleberry fields occupied an estimated 100,000 acres of Oregon and Washington forests about 20 years ago, and these fields owed their existence to wildfires that created conditions favorable to the growth of huckleberry plants. As fire prevention has succeeded, trees have invaded many of these high-quality huckleberry fields. The trees eventually form dense subalpine forests that crowd and shade the shrubs, eventually eliminating huckleberry production. However, unlike blueberries, huckleberry management does not recommend burning. Control of overstory trees is best done by killing individual trees.

Profiles

Litehouse Dressings. Litehouse Dressings of Sandpoint, Idaho, sells several huckleberry products to specialty stores in the Northwest.

The company purchases berries from local pickers for about $2 a pound during a 4-week summer season. They are processed and bottled by a specialty kitchen and

marketed by Litehouse Dressings. Jams, syrups, and chocolate-covered huckleberry candies have been sold. Fresh frozen berries are also sold in bulk in 20-pound bags to a few local Safeway stores, but the company does this more as a service since the berries are more valuable to them as part of value-added products.

The company has discovered that it can sell all the huckleberry products it can produce. The market is growing, and it is particularly strong among people who have lived in the region or who have traveled through the area and become familiar with the huckleberry. According to the company, quite a number of pickers gather berries as a major source of their annual income.

Beginning in 1991, the company started to put more emphasis into developing and marketing huckleberry products. Before that, their wild berry products were generally "peripheral" to the rest of the company's line of products. Litehouse Dressings set a target of 65,000 pounds of huckleberries, researched new products, redesigned labels and packaging, glassware, etc., and prepared to market the huckleberry products through specialty food distributors. (The company sells directly to a grocery wholesaler and sells direct as well.)

The company now offers huckleberry gift packs featuring jam, syrup, and wild berry-filled chocolates. They advertise in the summer through local and regional newspapers in northeast Washington, Canada, western Montana, and northern Idaho to buy as many huckleberries as pickers can obtain from surrounding national forests.

Flavor Fest Mayhaw Jelly. Mr. Glynn Carver and his brother, Randall, of Many, Louisiana, believe that there is a very good market for mayhaw jelly.

In 1991, the Carvers "spread the word" that they would purchase 100,000 pounds of mayhaw berries. Two buying stations were set up in the county, and the response from residents in this area of high unemployment was tremendous. Even though harvesting mayhaws is tough work, usually done by boat and most often in areas thick with brush, a procession of pickup trucks began arriving at the collection points. On a weekday, about 100 came through the busiest paying station, where the Carvers paid 85 cents a pound for cleaned mayhaws, slightly less if they had to do the cleaning. Most people brought in 5 to 10 gallons, about 30 to 60 pounds of berries. But some people brought in several hundred pounds, and two people each brought in 1,200 pounds at a time.

Most of the berries were picked from one 50-mile stretch of river bottom area along Louisiana's Little River. The procedure is generally to first clear the area around the trees of old berries and then shake the tree. The mayhaws fall into the water and are then scooped up with nets. To clean the berries, pickers roll the berries down a wet, tipped board. The leaves and grass stick to the wet wood and the berries roll down into a wire mesh net.

The first year, the juice was processed locally but sent to a commercial jelly production company for a market test. About 23,000 cases of mayhaw jelly were produced the first year and packaged under the label Flavor Fest Foods. The jelly is being sold through a mail order company and also through local grocery stores, where an 18-ounce jar sells for about $2.49.

The Carvers hope to purchase up to 500,000 pounds of wild harvested mayhaws in the future and to build a local processing plant somewhere in Grant Parish. In addition, the Carvers have been working with a local horticulturist to encourage commercial and backyard orchard growers. They have made over 100 selections of wild stock and the company is now selling grafted mayhaw trees. It is estimated that there are 200 varieties of mayhaw, many native to Louisiana and others of Chinese ancestry, where the mayhaw has been cultivated for 1,000 years. The Carvers are working closely with the Louisiana Agricultural Extension Service and the Louisiana Department of Agriculture and Forestry to encourage the planting of mayhaw orchards in Louisiana.

The Mayhaw Tree. The Mayhaw Tree, Inc. started in 1983 with "an idea, a pot, and a spoon," according to Ms. Dot Wainwright, one of the current owners.

That year, eight women in Colquitt, Georgia, got together to do something themselves about the economic stagnation of their small town and rural county. They investigated several alternative small business ideas, but found that they continued to come back to the idea of a mayhaw jelly business. The mayhaw thrives in the wild among the swampy bays, limestone sinks, and riverine wetlands of the Gulf coastal plain, and for as long as anyone could remember, local people had been gathering the tart, cranberry-sized fruits to make a remarkably tasty jelly.

This same group of women had already convinced the local Merchants' Association to sponsor an annual Mayhaw Festival in Colquitt, and the first one was scheduled for the next spring. The Mayhaw Tree, Inc. was incorporated in 1983, and the next crop of mayhaws was made into jelly under contract with deli workers in a supermarket and marketed directly to gift and specialty stores with the Mayhaw Tree label. In 1985, the company began producing its own jellies independently and also diversified its product line to include mayhaw syrup, green pepper jelly, cucumber jelly, salad dressing, and plantation ham sauce. Since that time, they have also added low-sugar mayhaw jelly, Vidalia onion jelly, pecans, and specialty cookies.

Today the company employs 8 people full-time and about 20 people part-time when the mayhaws come in for processing. The company relies on several dozen individuals and families to gather the mayhaws each

spring. Pickers are paid $5 a gallon for the berries. In 1985, the company spent $5,700 to purchase the berries. In 1991, the company spent about $12,500 to purchase about 2,500 gallons of mayhaws, a year when the crop was smaller than average.

To demonstrate to the community the economic impact of what some were condescendingly calling a cottage industry, the partners paid their pickers in $2 bills beginning in 1986. When these $2 bills began showing up in grocery stores, gas stations, and dentist offices, people began to understand the importance of "mayhaw money."

In general, there has been no difficulty getting enough berries. Each year the company tries to buy enough for that year's sales and one in addition. Those doing the harvesting include families, young couples, and older people who just want to make extra money. One person can gather 10 gallons a day if he/she is in a good area. One extended family can gather $700 to $800 worth of berries. This work has meant a lot to many people who use the money as supplemental income. Some harvesters gather on other people's land, then share the proceeds with the landowners.

The company works closely with the Georgia Department of Agriculture and helped organize the Georgia Specialty Food and Wine Association. The mayhaw products are marketed mostly through gift shows and food shows. For example, in one year the company will attend the Atlanta, Washington, D.C., Tampa, Dallas, Chicago, New York, and San Francisco gift shows. The company also has a retail mail order business, with most of their business occurring during the holiday season. In 1991, the company had almost $500,000 in sales, with shipments all over the country and international as well.

Considerations for a Rural Development Strategy

Native fruits played an important role in North America's human history, beginning with the American Indians and early European settlers who used fresh and dried fruits as well as extracts for medicinal and social purposes. Yet most of today's commercial orchards have fruit trees which are based on species that were introduced into North America. It is ironic the extent to which we have neglected the native fruits and berries of our forests and woodlands.

Where forest lands can be managed for the production of wild berries and/or fruit trees, one strategy would be to enhance the recreational and tourism value of wild harvesting. This could be done in conjunction with innovative interpretive programs to impart to visitors some of the historical significance of native fruits and berries and their uses by native Americans, early settlers, and current rural residents.

Of course, it would be important to have harvesting areas remain in as natural and uncommercial a setting as possible if the primary users are tourists and recreationists seeking a "wild and woodsy" experience. Also, a mix of sites may provide a better assurance of annual berry crops—in years when plants are subjected to either frost or drought, wooded areas protect plants better than open areas. Sites should be located less than 30 miles from a town or resort area, and should be able to be reached with a half-mile walk (Chaney, 1990). Any berry picking area should be herbicide-free as well.

One aspect of this strategy would be to focus on promoting local festivals and celebrations, native recipes and cooking traditions, and local history. It can be argued that the success of small businesses like The Mayhaw Tree, Inc. lies not from packaging mayhaw jelly but from packaging a distinctive cultural expression in a dignified and respectful way. People will pay a premium price for specialty products because these products allow them to participate in (literally, to get a taste of) a distinctive culture very remote from their own. And these same purchasers will reorder a product not because of its novelty (which wears off after the first purchase) but because of the quality which only small batch preparation and careful handling can confer—a quality absent from mass-produced foods (Hils, undated).

Another aspect of this strategy is to sell cultivars of native trees. For example, there is currently a rising market for the better varieties of pawpaw trees. But only a handful of nurseries in the country sell pawpaw cultivars, and many of these have up to a 2-year waiting list. There is also interest in North America's native fruit trees from many other countries. A few countries such as Italy and Japan, already have commercial plantings of pawpaws.

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Bibliography

Angier, B. 1974. Field guide to edible wild plants. Harrisburg, Pennsylvania: Stackpole Books. 256 p.

Bowen, Asta. 1989. The huckleberry book. Helena, Montana: American Geographic Publications. [No. of pages unknown].

Callaway, M. Brett. 1992. Current research for the commercial development of pawpaw [*Asimina triloba (L.) Dunal*]. Horticulture Science. 27(2):90, 191.

Callaway, M.B. 1990. The pawpaw [*Asimina triloba*], Publ., CRS–HORT1–901T. Lexington, KY: Kentucky State University.

Chaney, Constance. 1990. Managing wild blueberries for recreation on the Chippewa National Forest. Cass Lake, MN: U.S. Department of Agriculture, Forest Service, Eastern Region, Chippewa National Forest.

Coon, N. 1980. Using wild and wayside plants. New York: Dover Publications, Inc. 284 p.

Creasy, R. 1982. The complete book of edible landscaping. San Francisco, CA: Sierra Club Books. 379 p.

DeGomez, Tom; Forsythe H.Y., Jr.; Lambert, David; Osgood, Eben; Smagula Jack; Yarborough, David. 1990. Introduction to growing lowbush blueberries in Maine. Wild Blueberry Fact Sheet No. 220. Orono, ME: University of Maine Cooperative Extension Service. 4 p.

Dirr, M.A. 1983. Manual of wood landscape plants: their identification, ornamental characteristics, culture, propagation, and uses. Champaign, IL: Stipes Publishing Co. 825 p.

Fielder, M. 1983. Wild fruits: an illustrated field guide and cookbook. Chicago, IL: Contemporary Books, Inc. 271 p.

Gibbons, E.; Tucker, G. 1979. Euell Gibbons' handbook of edible wild plants. Virginia Beach, VA: The Donning Co. 319 p.

Halls, L.K., ed. 1977. Southern fruit-producing woody plants used by wildlife. Gen. Tech. Rep. SO–16. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station.

Hils, Ralph. [n.d.]. The mayhaw tree: an informal case study in homegrown rural economic development. In: Communities in economic crisis (Temple University). [Place of publication unknown]: [publisher unknown]: 158–170.

Janick, J.; Simon, J.E., eds. 1990. Advances in new crops. Portland, OR: Timber Press. [No. of pages unknown].

Kindscher, K. 1987. Edible wild plants of the prairie: an ethnobotanical guide. Lawrence, KS: University Press of Kansas. 276 p.

Medsger, O.P. 1978. Edible wild plants. New York: MacMillan Publishing Co. 323 p.

Minore, Don; Smart, Alan W.; Dubrasich, Michael E. 1979. Huckleberry ecology and management research in the Pacific Northwest. Gen. Tech. Rep. PNW–93. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station.

National Research Council. 1989. Lost crops of the Incas. Washington, DC: National Academy Press. [No. of pages unknown].

Organic Gardening. 1990. Calling all pawpaws. 37(7): 10 (September/October).

Payne, Jerry A.; Coder, Kim D.; Horton, Dan L. [and others]. 1991. Neglected native fruit trees and shrubs. In: Byers, P.L., ed. Proceedings of the 1991 Missouri small fruit conference; February19–20, 1991; Springfield, MO. Mountain Grove, MO: State Fruit Experiment Station, Southwest Missouri State University: 72–93.

Peterson, L. 1978. A field guide to edible wild plants of Eastern and Central North America. Boston, MA: Houghton Mifflin Co. 330 p.

Reich, Lee. 1991. Uncommon fruits worthy of attention: a gardener's guide. San Francisco, CA: Addison–Wesley Publishing Co. [No. of pages unknown].

Reich, Lee. 1992. Native American fruit. Organic Gardening, 39(2): 52–57.

Shubat, D.J.; Nevers, M.B. 1987. Use of prescribed burn, hexazinone, and ammonium sulfate for managing wild blueberry stands in northeastern Minnesota. Duluth, MN: Natural Resources Research Institute, University of Minnesota. 11 p.

Shubat, D.J. 1987. Management of native lowbush blueberry for recreational picking in northeastern Minnesota. Minneapolis, MN: University of Minnesota. Thesis.

Tull, D. 1987. A practical guide to edible and useful plants. Austin, TX: Texas Monthly Press Inc. 518 p.

Yarborough, David E. 1991. Effect of hexazinone on species distributions and weed competition in lowbush blueberry fields in Maine. Submitted to the Graduate School of the University of Massachusetts in partial fulfillment of the requirements for the degree of doctor of philosophy.

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Chapter 3—Charcoal

Description of the Product and Its Uses

Charcoal, a form of amorphous carbon, is produced when wood, peat, bones, cellulose, or other carbonaceous substances are heated with little or no air present. A highly porous residue of microcrystalline graphite remains.

Charcoal is a fuel and was used in blast furnaces until the advent of coke. Today most charcoal is used for recreational, restaurant, and home cooking in the form of charcoal briquettes. A small amount of charcoal is used in certain metallurgical processes and as a filter to remove organic compounds such as chlorine, gasoline, pesticides, and other toxic chemicals from water and air.

In 1961, the Forest Service counted nearly 2,000 charcoal-producing units in the United States, including brick kilns, concrete and masonry block kilns, sheet steel kilns, and retorts and ovens. Ninety-four percent of these were in the eastern United States and accounted for 98 percent of the Nation's charcoal production (Baker, 1985). Much of the lump charcoal produced today is produced in Missouri, where many manufacturers operate small kilns or retorts.

In States like Missouri, about 90 percent of the charcoal produced is made from sawmill slabs and edging strips, residue left from the manufacture of lumber, railroad ties, blocking, and other rough products. The charcoal market is very important to the sawmill operator because there is no other way to get rid of this material (which can become a fire hazard), since it is illegal to burn it in the open. It also accumulates rapidly: a circular sawmill in the Ozarks produces about a ton of slabs and edgings for every 1,000 board feet of lumber sawn. (This is a rough rule of thumb and varies according to the type of mill, products sawn, etc.) Some small mill owners depend on selling bundles of slabwood to the charcoal industry to sustain their sawmill operations when lumber prices are down. The remaining 10 percent of the charcoal produced comes from small roundwood or cordwood from forest thinnings (Bob Massengale, personal communication with author).

While charcoal can be made from any substance with high carbon content (including peat, bones, cellulose, nut shells, vines, or any number of natural materials common to forests), native hardwoods such as hickory, mesquite, oak, maple, and fruitwoods such as apple that have natural aromas are among the most popular materials for lump charcoal. For most uses, the better grades of charcoal come from raw materials with low sulfur content.

Before the advent of briquettes, charcoal was used in lump form, often screened to remove pieces smaller than one-half inch. This practice left behind a large volume of unusable fines. It was the accumulation of charcoal fines, the desire to produce a uniformly sized product with uniform burning rates, and the need to supply a cleaner product for home and recreational markets that led to the production of charcoal briquettes.

The process of making briquettes consists of dry-grinding the charcoal and mixing it with a starch solution to form a paste. In addition to the charcoal and starch, various amounts of coal, clay, and char from lignite or agricultural residues are used in the briquettes. The paste then goes to a double-roll rotary press, which delivers formed briquettes to a continuous dryer.

Activated charcoal is a highly porous form made by heating charcoal in a steam furnace to 1,800°F. The process results in a type of microscopic sponge—particles honeycombed with chambers that trap molecules of contaminants. Finely ground activated charcoal has a great deal of adsorptive surface: 1 ounce has a surface area equivalent to 6 football fields, and the same amount of superactivated charcoal has a surface area equal to 22 football fields.

The uses for activated charcoal have been multiplying in recent years. It is used for adsorption in refining processes and in gas masks. The brass and copper industries use activated charcoal for purifying metals. NutraSweet uses activated charcoal to change the substance from a yellow-sticky to a white-flaky consistency. Activated charcoal is a valuable antidote for many types of poison: its surface locks onto the surface of other substances, such as poison molecules, and thereby allows the poison to be moved safely through the digestive tract. There are some 700 applications of this type of charcoal. Finally, miscellaneous uses of charcoal include thermal insulation, a drawing medium for artists, a health remedy, and a substitute for lime in soil additives.

Market and Competition Considerations

Most producers of charcoal sell their product to be made into briquettes, generally to intermediary operations, such as Standard Milling in Kansas City, which process the charcoal either for briquette manufacturers, such as Kingsford, or other more specialized industrial uses.

The market for briquette charcoal has been dominated by a few "heavy hitters" of the industry such as Kingsford, Embers, and Royal Oak. As an alternative to charcoal briquettes, some small producers of lump charcoal are beginning to market their product directly to homeowners. Lump charcoal does have some advantages over briquettes. It is an all-natural, 100 percent hardwood product, without the additives that are used to make briquettes. Natural charcoal heats faster than briquettes, so food can be cooked over natural charcoal as soon as the charcoal begins generating heat, usually within 5 to 7 minutes after lighting it. Because there are no binders, lump charcoal can be lit with just a match and a piece of newspaper. This eliminates the need for lighter fluid, the burning of which can impart taste to food. The fact that natural charcoal can be easily ignited allows users to start with a small amount and add to the pile as more heat is needed. Natural charcoal can be smothered by closing off the air supply or putting it out with water, then reused at a later time. Finally, hardwood charcoal producers generally claim that natural hardwood charcoal retains heat longer than briquette charcoal, and that it is a more efficient fuel: 1 pound of hardwood charcoal produces heat roughly equivalent to 2 pounds of briquette charcoal.

However, consumer demand for natural hardwood charcoal is still limited. A major obstacle to wider charcoal use has been cost. Under current systems of production, natural hardwood charcoal is roughly twice the price of briquettes per pound, and because natural charcoal is lighter than briquettes, the consumer must store a greater volume of it to have the same number of pounds. It is also a bulkier product than briquettes because of its odd shapes and crushes more easily than briquettes. Therefore it is harder to package lump charcoal. Natural charcoal is a little harder to cook with because it heats hotter, which makes it easy to sear food rather than cook it. It also tends to become dusty and "flake off," whereas the briquette is a more compressed, dense product and has a longer burn.

Any entrepreneur hoping to make it big in the charcoal industry is probably not being realistic. Still, there appears to be some modest potential for local niche markets for natural hardwood charcoal. Tapping this market requires originality and very good, aggressive marketing.

But charcoal is a product that seems to lend itself to innovative marketing. Many small companies have succeeded with unique ideas related to charcoal products. For example, a small company recently developed a box containing charcoal briquettes and a fuse. The user lights the fuse, which ignites the box, which in turn ignites the briquettes. According to the Barbecue Industry Association, this product is probably going to be very successful. Another example is the new "quick light" product which is really nothing more than some briquettes sprayed or dipped in paraffin wax and perhaps with a little mineral spirits also, packaged in a 2-pound bag for the "use once" market. The bags usually have a vapor barrier to prevent volatiles from evaporating. If the bag is opened or torn, the "quick light" effect is lost.

There is also a possible market for other charcoal uses. Entrepreneurs would also do well to consider other charcoal products such as high-grade filter charcoal, used for air-filtration and water-filtration systems. Wood charcoal, unlike charcoal made from coal or petroleum products, contains little sulfur. Because of this, it can be used for air pollution control or drinking water filtration. To make high-grade filter charcoal, very small cells are needed. This can be produced from a very dense wood without many extractives. In the past, the biggest competition has come from coconut shell charcoal, but special burners now exist to bring certain native woods to within a purity comparable to that achieved with coconut shell charcoal, and much cheaper. For instance, manzanita is a fine-grain dense wood that makes superior charcoal for filtration.

Charcoal dust is also beginning to be used to mark foods for certain uses, such as pet food, while still in the slaughterhouse. It is used for hardening steel by packing the steel in charcoal dust. It can be used as a substitute for lime because of the high potash content and could be a little cheaper than lime.

Filter charcoal may also become a growth market. Calgon Carbon of Pittsburgh is one of the world's largest producers of activated carbon. The company earned $38 million on $285 million in sales in 1990, with a 19-percent gain in annual sales growth. One of the most important growth markets for filtered charcoal is with municipalities. Cities use filtered charcoal to remove chemicals, heavy metals, and other materials from the leachate from landfills. Filtered charcoal is currently expensive and has a one-time use: once loaded up with pollutants it is hard to dispose of it. But an entrepreneur selling lump charcoal to a large manufacturer of filtered charcoal should investigate this market.

Distribution and Packaging Considerations

For those who manufacture raw charcoal for sale to larger processors, distribution is simply a matter of identifying the nearest such milling operation and determining their requirements for the charcoal they receive. But distribution becomes a large factor for the small manufacturer who is trying to market lump charcoal or smokewood direct to stores. Small producers cannot generally use food brokers because the volume brokers require is generally beyond the production capacity of a small manufacturer. Either distributors must be found who will handle fairly small quantities, or the manufacturer must do the distributing himself or herself. This presents a challenge, since competition from the large briquette producers such as Kingsford Company is keen.

Transportation costs must be carefully assessed, since charcoal is charged by weight and can be quite expensive. Small manufacturers looking to market and distribute their product themselves would be advised to look first at their local and regional markets such as grocery store chains. They must be prepared to spend time "knocking on doors," getting to the right people in stores, and making a good sales pitch. In many cases, cooking demonstrations can be the most effective sales pitch, since people are impressed when they discover how easy it is to light natural charcoal and how quickly one can cook over it.

Charcoal producers who choose to package and distribute their charcoal themselves need to pay great attention to packaging. Unfortunately, the virtues of the good old-fashioned, environmentally safe bag generally do not overcome their drawbacks in today's competitive environment. The presentation of items in modern supermarkets is tremendously important in determining sales, and most owners and managers of grocery stores, liquor stores, and other retail outlets that would sell charcoal are not good at promoting products in "plain brown bags." Too often, the plain packaged items end up on the bottom shelf in the back of the store, where people don't see them.

In addition to visual appeal, paper packaging has another serious drawback. Failure to use polyethylene-lined or otherwise moisture-proof bags can mean disaster if the charcoal is stored for any length of time in a humid environment. If a paper bag sits in an unheated warehouse in a humid area, it can absorb enough moisture to weaken to the point of bursting. Having a 12-pound bag of charcoal break in a shopping cart does not improve the image of a product. There are definitely drawbacks to using attractively printed polyethylene bags: they are expensive and they are not biodegradable.

Some producers of hardwood charcoal are selling their product in plastic bags, which are not only waterproof and cleaner and handier than paper but also take advantage of the fact that hardwood charcoal provides something different in looks—the pieces are irregular and some are marked with the wood grain. The plastic bag packaging allows the buyer to see this difference. Wording and graphics on the package that emphasize the natural aspects of hardwood charcoal are also appealing to consumers.

Equipment Needs, Costs, and Suppliers

In addition to the raw materials to be used (whether wood or another carbon-based substance), an enclosed area is needed that is suitable for heating the material while allowing only the most minimal amount of air circulation. Some manufacturers make use of brick kilns, approximately 25 feet high and 30 feet in diameter. A kiln of this size has an annual production capacity of about 550 tons. There is some technique involved in knowing how to stoke the fire (by poking a steel rod in the vents of the kiln) and knowing how long to cook the charcoal. Such skills are not highly technical, but there is some element of folklore in how these skills are passed along.

Other charcoal producers use a type of retort, a metal enclosure which is often just a simple sheet-metal building. An entrepreneur could expect to pay between $40,000 and $80,000 for a retort, depending on design and how much of one's own labor the entrepreneur wished to put into building it. Various designs are available.

In addition to a kiln or retort, a sorting and crushing operation, as well as a bagging operation is necessary to market the charcoal. When the charcoal comes out of the retort, it is smaller than the original pieces of slab wood by about one-third, but it is not very broken. It must be broken down into marketable pieces, and this must be done in such a way so as not to generate too much dust. The pieces must be bagged and the bag sealed.

The retort and small-scale sorting and crushing equipment would likely either have to be made by a company that specialized in made-to-order machinery or made by the operator. Companies that work with the aggregate industry might be a good source of assistance. Bagging machines are readily available from bagging equipment supply companies. Because of the large variance in sizes of pieces, charcoal presents a bit of a problem but there are ways around this. An automatic bagging line could cost anywhere from $15,000 to $250,000.

Assuming a person was good with his or her hands and tools, the total start-up operation for charcoal production could begin at around $100,000 in equipment.

To get into the activated charcoal market would require much more expensive equipment. One of the newest pieces of equipment to produce high-grade filter charcoal is a clean smoke burner. This product, in the $70,000 range, takes roundwood (not chips) and burns it very efficiently. The Kleensmoke Inverse Pile Burning System, for example, also makes usable heat which can fire a boiler or be used for drying wood, lumber, or other products. Income from the heat generated could lower the cost of the charcoal produced.

Resource Conservation Considerations

The charcoal industry should be aware of air quality standards and requirements. The charcoal industry has been watching closely a review of air quality regulations which allow operation of Missouri-type charcoal kilns under a variance from standard emission levels. Recent actions by the Missouri Department of Natural Resources seek changes in the process weight rules, new definition of kilns, and clarification of repairs and alterations to kilns.

Profile

Mr. Earl Englebrecht is the owner of a small charcoal company in the small town of Gladwin, Michigan, located about 3 hours from Detroit. He entered the business after being laid off as an engineer at age 57. He heard of the company Sugartown Products, Inc. that had been in business for over 25 years and that had been started by a retired Dow Chemical engineer looking for retirement income. This individual had been a maintenance welding engineer for Dow Chemical for several years, and one area of his expertise (in addition to the welding) was the maintenance of the charcoal plant that Dow Chemical owned in Michigan's Upper Peninsula. As a result of that knowledge, the original owner had designed and built a number of retorts and had started selling what he produced. It was primarily sold in local markets, though there were a couple of outlets in Detroit and a couple in Ann Arbor too.

At the time Mr. Englebrecht bought the company, the business had about 80 customers. As a toolmaker, Mr. Englebrecht had the mechanical background needed to run the facility and not have to rely on outside maintenance people. In a few years, the business had grown to over 200 customers. In 1991, the market was down because of the recession. Nevertheless, gross earnings are projected at $40,000 to $45,000.

Mr. Englebrecht uses mixed hardwoods to make his charcoal. No foreign additives are used. He weighs and packs the charcoal into 10-pound bags using a bagging machine. A 10-pound bag retails between $5 and $7, depending on the locale. He will soon begin marketing a 2-pound bag as well and has plans to build a second retort. This will also allow him to expand his marketing into other parts of Michigan. He is also looking for uses of charcoal beyond barbecuing.

Using just one retort, Sugartown Products produces about 220,000 pounds of charcoal. The design of the retort is original and accounts for its high productivity.

> The briquette marketing business has been done so thoroughly and has so well ingrained people that when you say 'charcoal,' they automatically think of briquettes. We have an education problem to acquaint people with lump charcoal and how to use it. But once people get accustomed to using it, they will use it year-round. Some have even converted back from propane gas grills because they can taste the propane. Used properly, a 10-pound bag of charcoal will last longer than a 20-pound bag of briquettes.

Considerations for a Rural Development Strategy

Small charcoal producers could conceivably sell natural charcoal as a replacement for briquettes if they look to a local or regional market rather than a national market, and if they could make several products using their chipper. Another good strategy is to link up with a grill company or otherwise sell the product to a large company that can afford to do the marketing.

Another strategy, not specific to charcoal, would be to develop a combination retail and leased space grocery store for regional products. Instead of having buyers choose which products to buy and display, small entrepreneurs selling items for general household use would lease small amounts of store space. This would benefit small entrepreneurs who have been "locked out" of the grocery store market by the big food companies that are the only ones that can afford to pay the slotting fees and produce enough volume to compete in our current food distribution system.

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Bibliography

Baker, A.J. 1985. Charcoal industry in the U.S.A. Proceedings, ICFRO Meeting; 1985; Pretoria, Republic of South Africa. Forest Products Laboratory, USDA Forest Service, One Gifford Pinchot Drive, Madison, WI 53705–2398. 15 p.

Maldonado, Edwin D. 1983. Charcoal production: an opportunity for the Caribbean. Forestry Bull. R8–FB/U1. Atlanta, GA: USDA Forest Service, Southern Region. September.

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Chapter 4—Chips, Shavings and Excelsior, Sawdust, Bark, and Pine Straw

Description of the Product and Its Uses

A variety of products using chips, shavings and excelsior, sawdust, bark, pine straw, and related materials offer supplemental income opportunities for rural residents. Chips, shavings, and bark are usually obtained as by-products from a region's sawmills and secondary wood- processing plants. However, they may be directly produced by small entrepreneurs utilizing wood left from logging operations or wood from thinnings (table 4–1).

Table 4–1. Logging byproducts with commercial potential

Chips	Bark
Sawdust	Leaves
Shavings	Peat
Excelsior	Pine straw

Animal Bedding and Litter Products

Chips, shavings and excelsior, and sawdust from pine, cedar, cottonwood, aspen, basswood, and other woods can be used in animal bedding and litter products. Some of these products have secondary markets as compost. Animal bedding and litter products are used within both the pet and livestock industries. Birds, cats, dogs, small animals (for example, hamsters), reptiles, and amphibians are all associated with litter products, and most of these products use wood shavings. Within the livestock industry, bedding materials are used for stalled horses and cows as well as for many commercial poultry and swine operations.

Cedar tends to be the material that people think of first as a bedding material, since it is used for dog bedding and for small caged animals and is frequently seen in pet stores. Cedar has the advantage of acting as a repellent against fleas and ticks. However, cedar is not used for bedding for scent dogs. Nationwide, pine is probably the dominant wood material sold for animal bedding to both pet stores and livestock and poultry producers because it is the least expensive and easiest to use. Cottonwood is more absorbent than pine, and because of its relative purity (no tannins) it is becoming a popular bedding for use at horse and cattle shows.

In the Northeast, particularly in the State of New York, most sawmills and secondary wood processors have little difficulty finding buyers of the chips, sawdust, and shavings they produce because of use of these products by the dairy industry. In some cases, stocks of sawdust and other byproducts tend to build up in mill yards during the warmer months when farmers do not use much bedding. But even this is becoming less of a problem, since some farmers are beginning to stockpile these materials to ensure adequate supplies when needed. In the Southeast and in the Midwest, however, markets and alternative uses for sawdust are less well developed because it is a less common bedding material. In fact, vast quantities of this material are available. Many mills, because of environmental constraints, consider wood residues an expensive disposal problem.

Soil Conditioners, Amendments, and Mulches

Bark, wood chips, and pine straw have a variety of markets as soil conditioners and amendments, and as decorative landscape mulching products.

For example, finely milled pine bark is sold both as a mulch and as an acidic soil amendment. As a soil amendment, it is valuable because it decays very slowly and encourages root growth. Some experts think there are antifungal chemicals in pine bark that reduce rot and diseases of plants when incorporated into the soil. Shredded hardwood bark is a useful product for mulching and erosion control. Bark mixed with chips can be processed as mulch. And chips composted with sewage sludge can produce potting soil.
Douglas-fir bark is sold in very large quantities throughout the Pacific Northwest.

Pine straw sold for mulch to garden and nursery stores, landscape businesses, and strawberry producers is a good source of supplemental income to landowners in many southern States, particularly Louisiana, North Carolina, South Carolina, Florida, and Georgia. Longleaf and slash pine produce the preferred straw because of their longer needle length, which makes them easier to bail and transport.

Other Products

Chips, shavings, and related wood residues can also be used to make a number of secondary wood products such as particleboard, cedar closet board, fireplace logs made

of sawdust and wax or starch, fuel pellets, and molded products. As mentioned, wood chips, sawdust, and bark can also provide bulking material for composting sewage sludge (Schumann, 1979). Wood shavings can also be used as packing material and in gift packaging where "all natural" products are being marketed.

Market and Competition Considerations

Animal Bedding and Litter Products

There are about 12,500 pet stores across the country, most of which handle some type of animal bedding or litter products. There is obviously a market for this type of product, yet there is also already a fair amount of established competition. *Pet Supplies Marketing Magazine* is a good source of information about the pet industry, and their *1991 Buying Guide and Directory* lists about 25 companies currently dealing in wood shavings as absorbents, litter, and bedding materials.

According to the 1990 Pet Supplies Marketing Survey of independent pet retail outlets across the Nation, the pet industry has managed thus far to resist much of the recession that has affected the rest of the economy. Gross sales of nonfood pet products (a category which would include pet bedding and litter products) in 1990 increased considerably over sales in both 1988 and 1989 for each pet category.

In 1990, about 71 percent of all pet stores sold bird products, 59 percent sold cat products, 64 percent sold dog products, 64 percent sold small animal products, and 49 percent sold reptile/amphibian products. While the nonfood products category includes not only bedding and litter but all other nonfood items such as cages, waterers, and toys, the data do indicate that buyer interest in these products remains quite strong. This would appear to be especially true for birds and small mammals.

The pet industry is still one in which the small entrepreneur who comes up with a new idea or better product can do quite well. Examples are the hooded cat box with a charcoal filter on top, and the new super-absorbing cat litter which has become a very successful update of an old product. Those following the national trends toward recycling and home composting might find a special niche for wood-based litter products, for example, since many litter products sold today would not be appropriate for composting.

The other major market for animal bedding products is in the commercial livestock industry. A regional buyer who could be interested in purchasing these types of materials in bulk would be owners, breeders, or producers of livestock such as turkeys, chickens, swine, horses, or cattle. Large animal bedding offers as big a market as that of the pet industry. For example, wood shavings used in poultry houses are turned every 8 weeks. A large poultry producer would need large amounts of shavings from large mill operations. There are also opportunities to reuse poultry and livestock litter as a soil amendment or as fuel.

A strategy of marketing animal bedding to producers of large animals as opposed to pet stores would avoid the expense of packaging the bedding materials. This could well be a more practical route to pursue with this product, particularly for the individual who is just starting out with an animal bedding product. By talking with farm supply people, animal husbandry specialists in the State university system, farmer cooperatives, and others, a list of leads could be developed and direct contacts made to determine local and regional markets for these materials in bulk form. Once reliable sales were found, it might also be possible to find a wholesaler to purchase any excess production at a reduced cost but one that would still allow the entrepreneur to cover transportation costs. A trailer truck will carry 70 to 120 cubic yards of shavings, depending, of course, on the size of the trailer.

The Oklahoma Redcedar Association has come together as an organization designed to help landowners and businesspeople develop markets for redcedar, a species that has been looked upon as a "weed" in the past. Several mills in Oklahoma produce redcedar shavings sold for animal bedding, fresheners, potpourri, drilling mud additives, and wood fiber/plastic composites. A large amount comes from neighboring States such as Arkansas. There are also several bedding mills in Oklahoma producing cottonwood shavings for the livestock industry from short (52 inches) roundwood bolts. A 4-cubic-foot bag of cottonwood shavings retails for between $3 and $4.

Soil Conditioners, Amendments, and Mulches

Finely milled, clean softwood bark (pine, spruce, fir) is currently selling for $18 to $20 a cubic yard in the areas of the country where it is readily available, primarily in the southeastern United States. It is becoming more accepted as a substitute for peat moss and is much cheaper. The pH of softwood bark, generally around 3.8 or 4, is almost exactly that of peat moss. The chemistry of bark is almost identical to peat moss, and bark does not decompose as fast. Furthermore, bark tends to be more uniform than peat moss, which varies depending on where and how it is collected. Since the landscape industry already knows how to use peat moss, there is little change required in production techniques.

Many of the soilless growing media used by the greenhouse industry already contain some quantity of bark, anywhere from 10 percent to 60 percent. The bark is considered a primary component of these media. The nursery industry is becoming a larger buyer of pine bark, readily substituting it for peat moss.

Materials applied as mulches, such as pine straw and bark, protect or improve the texture of the soil and create more favorable conditions for plant growth. Mulches reduce weeds, reduce the evaporation of water in the soil, reduce crusting of the soil (thus improving absorption and percolation of water to the roots), and gradually break down to release organic matter. Mulches help maintain a more uniform soil temperature by acting as an insulator to keep the soil warm during cool spells and cooler during the summer. They also help prevent wind and water erosion and reduce compaction of the soil.

Hardwood bark is less suitable as a soil amendment because of the presence of tannins and growth inhibitors and its high pH. Hardwood bark must be composted before being added to the soil.

Pine straw has become one of the most widely used mulches for residential, industrial, and highway landscape projects, particularly in the southeastern United States. Unlike pine bark, pine straw does not wash away or float out of beds. Because of the interlocking of individual needles, it even holds on reasonable slopes. It is not easily blown away, and unlike leaves, peat moss, or grass clippings, it does not crust or thatch over, a process that prevents the easy movement of air and water to the soil. Clippings can also remain excessively wet during certain periods, which may damage a plant's root system. Pine straw always allows for easy penetration of water, air, and fertilizer to the soil. It is more economical than living ground cover plantings and usually costs less than other mulches. It is easy to apply and is relatively free of insect and disease pests.

It is generally applied at a rate of 1/2 pound per square foot initially, then at 1/4 pound per square foot for annual maintenance.

Distribution and Packaging

Animal Bedding and Litter Products

Setting up some system of distribution of the product is often one of the greatest challenges to a new entrepreneur who wants to be successful with any pet industry product. Where the pet industry is concerned, it may not be practical to bypass local distributors and set up one's own distribution system. In the case of animal bedding, the product is so bulky it requires a fairly large amount of space and most pet stores have very little shelf space. For this reason, most products sold at pet stores get to the stores through a wholesaler, who, in effect, serves as the independent pet store owner's warehouse. The wholesaler and distributor normally takes 35 percent as his or her margin on these products. Therefore, new entrepreneurs must remember that when they find a store willing to buy their product not to ask their manufacturers' price. Rather, they should sell at a 35-percent markup. In this way, when they find a distributor willing to take them on, the distributor's margin is protected.

Pet product distributorships tend to be quite regional, and most will handle pet shops and farm and garden stores that carry a pet line and are within about 300 miles of the distributor's warehouse. Therefore, it is not necessary for manufacturers of animal bedding products to be near population centers. In fact, several of the largest are in rural areas. There are over 100 distributors who are members of the Pet Industry Distributors Association (PIDA), and they are located throughout the United States. A list of these distributors is available from the PIDA. "Getting it to the pet store" may also require advertising in trade journals, attending trade shows, etc.

Direct sales to commercial livestock operators may require high transportation costs. A shipment by the semiload is generally required if an animal bedding product operation is to be cost efficient. The producer marketing to commercial livestock operators needs to find enough buyers in his or her own region who will carry the product in bulk form to make transportation economical. In the case of the cottonwood shavings bags, for example, transportation costs generally confine the market area to a 150-mile radius.

Most distributors will not repack bulk items unless it is economical for them to do so. So the small producer of chips or shavings must also decide whether to invest in equipment and labor to package or bale the materials or to sell in bulk to a company already in the business of supplying pet stores or other buyers of shavings (for example, companies that specialize in mail order buying that use large quantities of packing materials).

Most animal bedding or other wood shavings producers purchase their slab wood from sawmills at cordwood prices. It would be desirable to be able to find cordwood cut specifically for this purpose in some regions, but it is usually difficult to find individuals willing to go into the forest and cut cordwood for delivery to a small operator. The work is hard and the pay is not very high. Consequently, most people who are producing for the animal bedding market are purchasing their wood from area mills.

Soil Conditioners, Amendments, and Mulches

A potential entrepreneur would be advised to get in touch with local and regional nurseries, landscape companies,

and grounds maintenance companies, to establish a market for the materials. Also, being a source of bark material to manufacturers of artificial growing media would be a good potential market.

Equipment Needs, Costs, and Suppliers

A continuous sawdust dryer machine to allow small sawmills to convert wet green sawdust to dry sawdust in a cost-effective manner is being patented and will be available in the near future (see Resources). Dry sawdust is worth four to five times the value of wet sawdust.

The typical machine needed to create shavings is a Jackson Wood Shaving Mill, which costs about $30,000. Adding the cost of a building and vehicle and the initial inventory of wood, an estimated $100,000 would be required to start a wood shaving operation, excluding packaging.

The production of high-quality bark (soil amendments, for example) is greatly affected by the kind of debarking procedure used. A clean debarking system will yield bark which has less than 10 percent wood in it, and which is ideal and immediately salable. Anything with more than 10 percent wood must be composted first. If not composted, the decomposition of the wood in the soil will tie up nutrients, thereby "stealing them" from any plant roots in the same area.

Resource Conservation Considerations

Since chips, shavings, sawdust, and bark are usually a by-product of existing mill operations, no special resource conservation considerations are indicated. The increasing pressure on public landfills has been instrumental in encouraging some States such as Florida to pass laws restricting waste wood deposits. Much of this material is being ground and chipped into inexpensive mulch and ground cover products.

There are advantages and disadvantages to pine straw harvest that will vary with each forest stand. The harvest of the straw reduces fire hazard, but on the other hand, pine straw suppresses the growth of underbrush which would otherwise compete with trees for water and nutrients. The pine straw also acts as a long-term nutrient reservoir, and its removal may be detrimental in sandy soils where longleaf pine stands often grow. Harvesters should take only the top layer of straw, leaving the layer where needles are decomposing.

Special Factors

Chips sold as bedding to poultry producers must have a moisture content of 12 percent or less, be free of bark, and be free of pesticides. Most large poultry producers test the litter product twice a year for pesticides. No treated lumber products can be used for these materials.

Profiles

Zeager Brothers

Mr. Charlie Zeager of Zeager Brothers in Middletown, Pennsylvania, has developed two new types of mulch products. One is a landscape product which is a combination of bark and much less expensive wood chips. Using a patented process, the company darkens the chips so that they blend in color with the bark. The product is 20 to 25 percent less expensive than straight bark. The mulch is sold in bulk wholesale to landscape contractors and garden centers and is sold retail to public and private institutions such as hospitals, schools, colleges, and industrial and apartment complexes that have grounds to maintain. Most is sold within 150 miles of the company. Labor costs in the area are relatively high, so it is not economical to bag the product since most of the sales are local.

A newer mulch product is one called "wood carpet," made out of wood chips in such a way that the wood fibers knit together to form a loose mat. It is sold to playgrounds and schools as a playing surface, and to horse farms and horse tracks as a training surface. The chips are laid down about 10 to 12 inches thick, with good drainage, and the wood fibers tend to catch together. The surface provides a cushion to reduce injuries in the case of falls. It will not flame up or freeze up. It is also accessible to wheelchairs.

The company has been aggressively educating the public about the new product, and company representatives typically attend 20 to 30 trade shows a year. Freight costs to ship the product tend to be high, and operations need to be as close to the market as possible. Currently there is nationwide demand for the product and there are three other locations producing it for Zeager Brothers.

Oregon Wood Cents

Mr. Harlis Gardner of Oregon Wood Cents is a semiretired logger who has been in the wood shaving business for about 4 years. He has been pursuing markets in the Pacific Northwest for both animal bedding and packaging materials using a specially designed machine. This machine, developed and being patented by Mr. Gardner, makes shavings that are shaped like long springs or coils. These coiled shavings are uniquely suited to both animal bedding and packaging because they are light, buoyant, and biodegradable. The shape of the shavings keeps them from packing down.

Mr. Gardner obtains his wood from mill trimmings and log ends of cedar and spruce. He uses the cedar for

animal bedding and the spruce for packaging material. The coiled wood shavings can be sold for about $10 per 12-cubic-foot bag, which makes the product competitively priced with Styrofoam. His machine allows him to make about $200 worth of shavings a day. He plans to add additional cutting stations to increase that amount fourfold as business develops.

The cedar shavings are a natural flea and tick control. Mr. Gardner has also been working with the University of Oregon in testing the insect repellent qualities of cedar oils. The spruce shavings are used for packaging because they are slightly lighter than the cedar.

As more companies discover the market advantages of being environmentally conscious about every aspect of their business operation, Mr. Gardner feels the advantages of biodegradable packing material will become evident. Companies that are leading the field in environmental sensitivity might even start developing their own packing material. Companies selling fruits and vegetables that need packing materials are especially promising markets for wood packing materials.

With proper financial backing and a good wood source, entrepreneurs in other parts of the country could consider entering the bedding or packaging material market with a similar shaving machine. In addition to selling the shavings to the two types of markets, Mr. Gardner is currently marketing his machine, which can be developed for $7,000 to $20,000, depending on how sophisticated the operation is intended to be. Mr. Gardner is also available for consultation.

Machine for shaving wood developed by Harlis Gardner of Oregon Wood Cents, Sweet Home, Oregon. Courtesy of Harlis Gardner. (SFP–14)

Harlis Gardner of Oregon Wood Cents. (SFP–15)

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Bibliography

Hamilton, Rick; Levi, Dr. Mike. 1987. Alternative sources of income from your timberland. Forest Farmer. July–August: 17–19.

McNeill, Danny; Howe, Paul. 1984. Pine straw market offers extra forest income. Forest Farmer. Sept.: 12–13.

Natarella, Nicholas. 1990. This mulch does more: try pine bark as a soil improver. Flower and Garden Magazine. 34: 49. July–August.

Pope, Thomas E. 1990. Pine straw mulch in the land scape. Pub. 2425 (5M). Baton Rouge, LA 70803: Louisiana Cooperative Extension Service, Louisiana State University.

Schumann, David R. 1979. Composting sewage sludge: a market for forest products residue. NA–FR–14. Portsmouth, NH: Northeastern Area State and Private Forestry.

Wilson, G. B..; Parr, J.F.; Epstein, E.; Marsh, P.B.; Chaney, R.L.; Colacicco, D.; Burge, W.D.; Sikora, L.J.; Tester, C.F.; Hornick, S. J .1980. Manual for Composting Sewage Sludge by the Beltsville Aerated-Pile Method. Request from Dr. James F. Parr, Building 005, Room 414, BARC–West Beltsville, MD 20705. 301–344–4281.

Resources

"On the Continuous Sawdust Dryer." Dr. W. B. Stuart, Associate Professor, Department of Forestry, Virginia Tech, Blacksburg, VA 24061–0324. 703–231–7674.

"On Harvesting and Utilizing Eastern Redcedar." Dr. Steven Anderson, Associate Professor of Forestry, 239 Ag Hall, Forestry Department, Oklahoma State University, Stillwater, OK 74078. 405–744–9431.

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Forest Murphy, Director, Sandhills State Forest, P.O. Box 128, Patrick SC 29584. 803–4986478.

National Bark and Soil Products Association, 13542 Union Village Circle, Clifton, VA 22024. 703–830–5367.

National Woodland Owners Association, 374 Maple Avenue East, Suite210, Vienna, VA 22180. 703–255–2700.

Oklahoma Redcedar Association, c/o Carl Bode, P.O. Box 273, Geary, OK. 73040.

Pet Industry Distributors Association, 5024–R Campbell Boulevard, Baltimore, MD 21236–5974. 301–931–8100.

Examples of Active or Innovative Companies

Les Bilyue, President, Midway Wholesale Distribution Inc., 13140 56th Avenue South, Seattle, WA 98178. 206–243–4926.

Dick Ernst, Ernst Corporation, 2417 Saratoga Road, Waukesha, WI 53186. 414–544–4760.

Terry and Ginger Gregory, 515 North Market Street, Belle Plaine, MN 56011. 612–248–3489.

Robert Hicks, Owner, Rocking Horse Ranch, Route 3, Box 148, Seminole, OK 74868. 405–382–8190; 405–273–0094.

Kiley's Wood Shavings, Hillsboro Wood Products Inc., Hillsboro, OH 45133. 800–344–1164.

Walter Lampp, Fulghum Industries, P.O. Box 909, Wadley, GA 30477. 912–252–5223.

David Martin, DMLS, Box 232, Lake George, NY 12845. 518–668–5407.

Larry McDonald, Smithton Industries, P.O. Box 158, Smithton, MO 65350. 816–343–5391.

Larry Mohrfield, L/M Animal Farms, Pleasant Plain, OH 45162. 513–877–2131.

Bill Raynor III, Osage Products Company, Box 314, Eldon, MO 65026. 314–392–5000.

Gary Schiavi, Northeast Products, P.O. Box 98, Old Route 9, Warrensburg, NY 12885. 518–623–3161.

Alfred Sczepanski, S&S Wood Products, Independence, WI 54747. 715–985–3122.

Sid Ward, Ward Lumber, P.O. Box 154, Jay, NY 12941. 518–946–2214.

Equipment Sources

Jackson Lumber Harvester Company Inc., Highway 37 North, Mondovi, WI 54755. 715–926–3816.

Chism Machinery Company Inc., P.O. Box 211, South Avenue, Derry, NH 03038. 603–432–5811; fax 603–432–8851.

A basic fact sheet for the first-time entrepreneur entering the pet industry is being developed by *Pet Supplies and Marketing Magazine*.

Chapter 5—Cones and Seeds

Description of the Product and Its Uses

Decorative cones. A wide variety of cones are used in floral, wreath, and potpourri products. They are used in gift and fragrance items, as ornaments and table decorations, and in a variety of small niche markets such as jewelry, bird feeders, etc. Cones can be waxed and used as fire starters and decorations or crushed and molded into Presto-log shapes for fire starters. Cones from redwood, Douglas-fir, hemlock, ponderosa pine, sugar pine, longleaf pine, loblolly pine, slash pine, white pine, red pine, jack pine, Jeffrey pine, and black and white spruce, among others, are all marketable. Each market readily substitutes new varieties for cones that are in short supply.

Many manufacturers of cone products, especially potpourri manufacturers, obtain their cones from seed cleaning plants after the seed has been removed. However, certain soft cones (for example, Norway spruce) are too fragile to go through the seed extraction process, while other cones are so large (for instance, sugar pine) that they can only be obtained from local wildcrafters. In the floral market, large cones are generally more marketable. In the potpourri market, small, midsized, and large cones may all be used. Hemlock is considered a premium cone for the potpourri market because it is light and has a good shape. Small pine cones are generally more valued for making wreaths. The scales from fir cones, particularly noble fir, are also salable products and used in the potpourri industry.

Seed cones. The major users of seed cones tend to be Federal government agencies such as the Forest Service and the Bureau of Land Management; large private landowners such as Weyerhaeuser, Boise Cascade, and Louisiana Pacific; independent seed companies; and State seed tree nurseries. While some of the seed cleaning plants associated with various large and small forest seed companies, paper companies, and State seed tree nurseries harvest their own green pine cones for seed, others buy the cones and thus represent good markets for cones.

For Federal agencies, the amount of seed cones purchased is closely related to timber harvest levels, general forest health, and special reforestation projects. In the case of the Forest Service, seed cones are usually purchased a few years in advance of major planned timber sales so that the seeds can be extracted and planted in nurseries a couple of years before the timber is cut. In this way, young trees are ready to be planted in an area immediately after harvest.

Originally, seed cones were purchased in bulk with no way to identify where they came from. But trees with a genetic makeup that allows them to grow well at one elevation and range will likely do more poorly in a different elevation and range. Today most seed buyers realize that seeds need to be planted at the same elevation in which they were grown. Federal agencies such as the Forest Service and most seed cone buyers only buy certified seed, and the certification documents the tree species, the seed zone in which the trees were growing, the watershed, and the elevation. Certification is done on-site by an independent certification agency.

The Forest Service may also request collection from specific numbered, tagged, and mapped trees if the seed is to be used for tree improvement stock. Eventually, the Forest Service plans to get all its tree improvement stock seed from seed orchards in a certain elevational range. Some large timber companies are already at the stage of collecting from their own seed orchards.

Minimum and standard rates for collecting permits for seed cones and dry cones are published for each Forest Service region. Each national forest within a region has some flexibility to set permit charges higher than the minimum rates. For example, in Region 6 (the Pacific Northwest), the Rogue River National Forest set 1991 rates as follows: seed cones—10 cents per bushel; dry cones (except sugar cones)—20 cents per bushel; sugar pine cones—5 cents each. (Dry cone permits are more expensive than seed cone permits because the decorative cone market represents a higher value market.)

On the other side of the country, the State of New York's Department of Environmental Conservation in 1991 purchased white pine cones for $7 a bushel, red pine cones at $18 a bushel, larch cones at $22 a bushel, and balsam fir cones at $24 a bushel. The department may purchase up to 500 bushels of a particular cone in a good year. Other years the department is able to collect all that it needs without an outside contract. The cones are purchased on the open market, and in the Northeast most cone gathering is done on private land. After extracting the seeds, the State sells its cones at a price of about $10 per 2 bushels, often to craft stores. The craft stores may, in turn, resell them at 10 to 15 cents apiece. New York typically sells 200 to 300 bushels a year. Damaged cones are ground up and sold as mulch for landscaping. Red pine and Norway spruce are two cones that seem to be in good demand in the Northeast.

Some Forest Service districts issue fairly large contracts with companies or private individuals to collect seed cones. The best avenue for small entrepreneurs interested in seed cone harvesting, at least in the Pacific Northwest, generally is to work for one of the larger seed companies or seed brokers. The large timber companies generally harvest their own seed cones.

Market and Competition Considerations

The cones must be carefully labeled. Seed cones in particular need to be collected before they have stayed on the ground very long or become broken or discolored. They cannot be harvested in the winter, of course. The Forest Service will pay top dollar for seed cones, and after the seeds are extracted, the spent cones can often be repurchased by an individual for resale to other markets.

Decorative cones. Prices paid for decorative pine cones vary year to year, from place to place, and by cone variety. Prices for cones vary markedly but typically range from 37 to 52 cents per pound for semidried cones. But while the decorative cone market is not very stable, it has generally seen a fairly steep upward curve the past 2 years. One cone broker reported that he had sold 1.5 million cones in 1991 to 400 different buyers, with about 6 primary buyers who, in turn, marketed to several hundred accounts each. This was twice the volume this broker had sold in 1990; still he did not feel the market had peaked yet. In fact, he expected an increase of another 100 percent in the market in 1992.

There are four primary places in the United States for decorative cone sales—Tennessee, Minnesota, the East Coast, and California. The market for large cones seems to be becoming stronger, while the market for small cones is dropping off. Currently, the lodgepole pine cone is one of the largest selling cones worldwide because of its availability. In the South, the longleaf pine cone is the cone in greatest demand because of its size.

Outside the United States, the European market is becoming particularly attractive. For cones and most botanical products, successful entrepreneurs have noted that, as a rule of thumb, whatever amount the United States uses, Germany can be expected to use about 10 times that amount. However, increased competition in cones from Guatemalan and other Central and South American dealers is also anticipated.

A list of dealers in botanical products, including cone buyers, has been prepared by Miller (1988). These buyers generally purchase cones for resale to the floral and craft and potpourri markets, and they generally provide Wildcrafter Price Sheets upon request. These sheets include buying price and annual needs in terms of volume and form. The wildcrafter should be prepared to submit representative samples of the cones to be collected and a statement of the approximate quantity that can be gathered. Purchase orders should be obtained for quantities over 1,000 pounds.

It is generally better for the wildcrafter of any special forest product to sell to brokers or wholesalers rather than to try to deal directly with large manufacturers. These individuals perform an important function in keeping the supply smoothed out and the market steady, which ultimately benefits the wildcrafter. A wholesaler or broker can also meet the large quantities needed, and deal with the host of other problems that can come up when dealing with large companies.

For example, a medium-sized company buying cones for holiday gift packs may purchase 30 trailer loads of cones a year, or about 72,000 bushels, at between $0.50 and $1.50 per bushel. A broker is needed because it would be impossible for most small entrepreneurs to develop a supply this large. Furthermore, the broker performs an important service in coordinating the conflicting demands that a large manufacturing company can place on a supplier. For example, there are about eight large companies (each having over 200 employees) that manufacture potpourri products in the United States and that purchase large volumes of cones. Each of these companies may have a purchasing agent, a warehouse manager, a scheduling person, and an individual line manager, all of whom have different agendas and demands to be met. The small cone supplier trying to deal directly with all the parties in a large company would soon find the coordination and management problems simply too burdensome. In contrast, brokers, wholesalers, or “middlemen” specialize in dealing with such problems.

It should be noted that while some wholesalers will buy any size cone shipment, others only buy in fairly large quantities themselves. Cones are often purchased by the case or, more frequently, by the trailer load (about 2,400 bushels), at bulk prices, sometimes for only a few cents per cone. Quantities purchased are typically from 2,000 to 20,000 pounds. For this reason, dealing with a cone broker or forming a local cooperative may be the best approach to entering the cone market, since several harvesters may need to work together to fill a purchase order. For example, it may be feasible to gather 200 to 400 pounds of cones at a particular location, but a wholesale buyer may be only interested in buying quantities of 2,000 pounds or more. Again, a broker can be used to build a larger shipment.

As cone markets expand, some form of trade association or network will likely be needed to help keep the market stable and prices high enough to provide fair wages for wildcrafters. For such products to help supplement rural incomes, a coordination mechanism is needed in order that the labor costs rather than the buyer’s price will

dictate the cone costs. It takes five people 5 days to pick a trailer load of large pine cones with each individual gathering about 100 bushels a day, and they might each earn $200 a day in a good location. A wildcrafter has to make a minimum of $75 a day to stay with the work. Good wildcrafters can average about $120 a day.

Below is a list of cone prices in the Pacific Northwest in fall 1991 (table 5–1). Prices paid harvesters were about 15 percent less. The prices assume delivery in Oregon and Canada for the most part.

In Wisconsin in the fall of 1991, wildcrafters were earning the following prices for cones: white spruce cones, $2.50/bushel; red pine cones, $1.75/bushel; Norway spruce cones, $1.50/bushel; black spruce cones, $0.50/bushel; and tamarack cones, $1/pound. Cone buyers in the Southeast typically paid between $0.50 and $1.50 per bushel in 1991 for a trailer load of cones (2,400 bushels). The State of Minnesota sells usually $8,000 to $10,000 worth of cones per year at about $2 per bushel.

Seed cones. The markets in seed cones have been declining in the past few years. Reforestation of native forests and export markets have traditionally been the two major uses of the seed, and with the establishment of seed orchards by Federal agencies, domestic timber companies, and even in foreign countries, the demand for wild collected seed has dropped considerably. One large seed company on the West Coast has reported that 1991 was the first year that the market limited the amount of seed collected. In previous years, it was the amount of seed available that was always the limiting factor. There was a time when this company collected between 300,000 and 400,000 bushels of seed cones a year, but today this figure is significantly smaller.

Crops are very cyclical and very seasonal. The cones must be harvested during a very narrow window of time, generally starting in mid to late August and continuing through September. (About the time hunting season starts, cone collectors get out of the woods.) There is a small increase in interest in forest species that are not traditionally commercial timber species, such as vine maple and alder, because these species are now being included in more reforestation plans, but their volume is not significant.

Even though demand is declining, however, there is always going to be some interest in the product, and for people who live in rural communities near forest resources, there will probably always be some opportunity to gather and sell seed cones.

Seed companies generally have designated agents or producers in many rural communities in the forest regions, and these individuals, in turn, solicit help from the general public (for example, through newspaper notices or posted signs) when the time comes to collect seed cones. The producer receives payments, quality standards, and materials from the company, and this individual, in turn, may have 10 to 100 people collecting cones under his or her authorization on behalf of the company. The producer checks the cones against the quality standards and weighs the cones at a designated buying station, then pays for the cones on the spot. The cones accumulate at the buying station, and the company sends out trucks to pick up the cones and bring them to the company headquarters. The producers are paid a commission for the seed cones at that time. A large seed company may have several producers in a region.

There are large variations from year to year in the prices seed companies can pay for seed cones. In 1991, one seed company in the Northwest was paying $10 per bushel for ponderosa pine seed cones and $20 per bushel for Douglas-fir seed cones.

Table 5–1. Cone prices in the Pacific Northwest in fall 1991

Cone	Price per pound (unless otherwise noted)	Cone	Price per pound (unless otherwise noted)
Alder	$1.80	Knobcone pine	$0.12 each
Hemlock	1.50	Lodgepole pine	$0.40
Larch	$1.80	Longleaf pine	$0.15 to $0.25
Giant Sequoia	$0.60	Ponderosa pine	$0.30 to $0.45
Incense cedar	$1.80	Sugar pine	$0.45 to $0.60
Western redcedar	$1.50	White pine	$0.70
Douglas-fir	$0.25 to $0.35	Black spruce	$0.70
Digger pine	$0.45 each	Norway spruce	$0.10 each
Jeffrey pine	$0.18 each	Sitka spruce	$0.65
KMX pine	$0.45	White spruce	$0.40 to $0.65

Cones from evergreen trees provide a ready and abundant source for floral, wreath, and potpourri products. Photo courtesy of Jill Bauermeister, USDA Forest Service. (90CS2438)

A good seed cone picker can make $100 a day or even as much as $200 a day. Most of the volume of cones collected tends to come from a relatively small group of pickers. One company estimated that in a given year up to 2,000 individuals might try collecting cones for them, but only a few hundred actually make any significant money from seed cones. The most successful tend to be individuals who are closely tied to the secondary forest products market, wildcrafters who also collect other forest products at other times during the year. In a few cases, rural families looking for supplemental income opportunities in the fall pick each year.

Seed cone collectors must have no difficulty climbing the trees and shaking the branches to release the green cones. The green cones are picked up in bags and buckets. Seed counts, which vary by species, must also be made. After collecting seed cones, the cones are sent to extraction plants where the cones are heated sufficiently to cause them to open. The cones are then thrashed to get the seed out, and the spent cones are often sold to the decorative market.

Distribution and Packaging

Burlap, polypropylene sacks, and boxes are the normal packaging materials for cones. Boxes are generally used on large or premium (fragile) cones that might get damaged in freight.

Small quantities of cones, as little as one case, can be sent UPS to retailers as “floral packs.” For example, a case of ponderosa pine cones (200 per case) is sold by Northwest Botanicals for $10, and a case of about 40 large (10- to 14-inch) sugar pine cones is available for $22.

Equipment Needs, Costs, and Suppliers

Most of the cone harvesting that is done in the forest is done by hand. Cones can be gathered directly from under some trees, primarily pine and spruce trees. Cones usually must be gathered soon after falling or they will turn black. If the previous year’s fall is collected, it will have to be well cleaned before being sold. Small cones are often raked from branches, or ground cloths can be laid and the trees shaken or the branches beaten. Occasionally, seed collectors need spurs and a safety belt in order to climb the tree. A portable vacuum backpack can also be used and the product sifted later to separate the cones from other debris.

Investing in equipment for a small seed cleaning operation could be a profitable alternative enterprise for some entrepreneurs. A small seed cleaning operation can be set up for around $50,000.

Wildcrafters need to obtain brush permits or permission from landowners before beginning a cone harvest. The U.S. Bureau of Land Management (BLM), State departments of natural resources, the USDA Forest Service (USDA FS), and most railroad companies will issue brush permits for gathering. These permits range in cost from free to a couple of cents per pound (based on wet weight harvest).

Resource Conservation Considerations

No special concerns related to cone harvesting have been identified by forest managers. However, a standardized permit system is needed. Stewardship agreements on tracts would be another alternative.

Some State laws regulate the movement of seed between States. Prospective shippers or importers of seed should check with their county extension agent or nearest State or Federal seed laboratory concerning applicable restrictions.

Special Factors

The market for seed cones is not very large. Picking seed cones on government land often requires proof of insurance as well as a contract in hand.

In certain cone species, crops can vary greatly, with several years of excellent production followed by several years of poor production. There are often large seasonal variations in the availability of certain cones, and each genus and species has different cycles. There are regional differences as well. Drought often reduces the harvest significantly.

There are no national, uniform guidelines for these brush permits that the harvesters require when collecting cones from national forests. Such guidelines, particularly in national forests, are needed to help stabilize the cone market. Prices need to be arrived at carefully. Setting the price too high encourages some less ethical wildcrafters to simply steal cones or otherwise get around the requirements for a permit. Private seed cone buyers are quick to point out that while most of the time the Forest Service is sympathetic to the need to keep permit fees quite reasonable, in a few cases the permit fees charged for seed cones from a given national forest are considered to be much too high.

Profile

In 1984, Neil Dahlke of Bandon, Oregon, became disabled after getting caught in a fire line during a slash burn operation that left him with tissue damage to his lungs and a breathing difficulty requiring frequent, very expensive medication. As a former prospector, farmer, hunter, and professional fisherman, he had experience in self-employment and was quite familiar with the diversity of the forests. After careful research, he started harvesting cascara bark and then soon added decorative cones and mushrooms. Today he wildcrafts not only cones but herbs, bark, moss, mushrooms, and other edibles such as fresh watercress and dried juniper berries as well. His most recent new product is the preparation of alcohol suspension products from forest botanicals for a pharmaceutical company.

A special forest products entrepreneur needs to plan his or her harvests around the seasons. In May and June, Dahlke collects early morel mushrooms. As soon as the cones are dry, he collects sugar pine cones and ponderosa pine cones. In the fall, he collects matsutake mushrooms. The cones are marketed through a broker. The other products are marketed through large metropolitan buyers.

While his mushroom business is the largest part of his enterprise (he regularly markets hundreds of kilos of dried morels), the cone business has been one of the fastest growing. In 1990, Dahlke was able to ship nine 48-foot semitruckloads of cones, primarily ponderosa.

Ponderosa pine cones harvested by West Coast Botanicals, Inc. Photo courtesy of West Coast Botanicals, Inc., Bandon, OR. (SFP–16)

At West Coast Botanicals, pine cones are packed in polypropylene bags, and the bags are sewn shut and weighed on site. Background: 10,000 pounds of bagged ponderosa pine cones; foreground, sugar pine cones. Photo courtesy of West Coast Botanicals, Inc. (SFP–20)

He expects to be able to market 12 to 15 truckloads of cones in the future.

When he first started collecting cones, much of the harvesting occurred on Forest Service land. However, because the permit system is not uniform across the national forests, there is a tremendous diversity in

charges for the picking permits. When the forests to which he had been going for cones began charging as much as 20 cents each for cones that were only worth that much to the wildcrafter (whereas in another region they may have been only charging a nickel a cone), he stopped harvesting in the public forests.

Instead, Dahlke now has a contract to harvest cones from a 103,000-acre tract of timber company land. He pays the timber company 10 percent of whatever the harvesters are paid. For example, in 1991 he averaged between 9,000 and 10,500 pounds per load of ponderosa pine cones. The value to the wildcrafter was about 25 cents per pound, or $2,250 to $2,625 per load, and the price received by the landowner was 10 percent of that, or $225 to $262 per load.

Most wildcrafters can pick at least 300 pounds of cones per day, for a daily earning of $75; they can pick for about 5 months long. Dahlke has cone contracts with between two and four different crews with 5 to 7 people per crew working during the summer. They may be college students or retired individuals, and very little training is required.

Dahlke is very conscientious about the quality of cones collected. They are packed in polypropylene bags, sewed, and weighed on-site, and the weight is written on the bag. He also makes sure that insofar as possible the people who do the harvesting are local, many of whom desperately need the work because of the reduction in the timber industry. He feels very strongly about promoting rural development within the communities of his region.

Considerations for a Rural Development Strategy

Cones are just one of many harvestable products that can be gathered from a forest. A strategy which sought solely to sell cones would not be sufficient for starting a small rural business. The large volumes of cones required to sell to large cone buyers make it difficult for most small entrepreneurs to compete. However, cones could be one of several forest products that are harvested, and collecting and adding value to cones through the manufacture of cone products could be a part of the community's strategy. A small business fashioning cones into a number of products, e.g., wreaths, painted cones for table decorations, or waxed cones, would be a possibility. (Craft shops and florists may pay twice as much for painted cones, for example.) Even then, though, cones would represent only a small fraction of the total number of products that would need to be developed.

Another part of the strategy that would be important would be to follow the trend in marketing directly to the retail stores. Large chains like Safeway (there are over 4,000 Safeway stores), Ben Franklin, or K-Mart are selling more and more craft items in their floral sections. Drop shipments to such stores would be an important way to maximize value received by such a rural business.

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Bibliography

Miller, Richard Alan. 1988. Native Plants of Commercial Importance. Grants Pass, OR: OAK, Inc. 343 p..

Sample Sources

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New York State Department of Environmental Conservation, Saratoga Tree Nursery, 431 Route 50 South, Saratoga Springs, NY 12866. 518–885–5308.

Herbal Green Pages, The Herbal Connection, 3343–0 Nolt Road, Lancaster, PA 17601–1507. 717–898–3017.

Mountain Farms, Inc., 125 Candlewood Isle, P.O. Box 108, New Fairfield, CT 06812. 203–746–1842. Pine cones and pods for craft supplies.

Sierra Pinecone Company, P.O. Box 250, Avery, CA 95224. 209–795–1163. Supplies and accessories for making holiday and other decorations using pine cones.

Publications for the Professional Craftsperson

Potpourri from Herbal Acres, Box 428, Washington Crossing, PA 18977. Editor: Phyllis Shaudys. This is one of the oldest quarterly herb newsletters in print. It is primarily devoted to herb crafting topics: fragrant, culinary, and decorative. Strong networking focus. Excellent resource for the crafter and retailer. $18/year.

Potpourri Party Line, 7336 Berry Hill, Palos Verdes Peninsula, CA 90274. Editor: Dody Lyness. This fine quarterly is primarily for floral and fragrance artists and designers. Excellent resource for herb artists and crafters. $12.50/year.

Chapter 6—Cooking Wood, Smoke Wood, and Flavorwood

Description of the Product and Its Uses

Woods such as mesquite, alder, apple, cherry, pecan, and hickory are used as natural flavor enhancers in grill cooking either in homes or restaurants. The market for cooking wood is in the form of sawdust, chips, chunks, and roundwood. The chips and chunks are primarily for the residential consumer; the sawdust, primarily for the smoking and liquid smoke business; and the roundwood, for the restaurant trade. Usually, chips are used in conjunction with charcoal, while chunks are used by themselves as a fuel source for smokers (table 6–1).

Table 6–1. Wood used as natural flavor enhancers in grill cooking and food processing

Alder	Mesquite
Apple	Oak
Bigleaf maple	Sugar maple
Cherry	Tan oak
Hickory	Vine maple
Madrone	

Market and Competition Considerations

Apart from charcoal, a number of small entrepreneurs have tried entering the cooking wood (also called smokewood or flavorwood) business in the past few years. The cooking wood can be either in the form of chips, chunks, or roundwood (firewood) size. The industry enjoyed a period of very rapid growth several years ago, and many small companies entered the market because it is a relatively easy operation to put together, requiring only a wood chipper and a bagging plant. The annual gross sales in cooking wood is estimated at $18 million to $20 million.

Mesquite wood in particular enjoyed a high popularity in chip and chunk form because of good marketing. Mesquite wood is an example of a product which people are willing to pay more for because it looks good, smells good, and doesn't come off on one's hands. Even the word "mesquite" has a healthy and appealing sound to it, some feel.

At present, however, the market for cooking wood has leveled off to modest growth. There are already several cooking wood products on the market, and a few relatively large companies in Texas dominate the market. There are also several small companies around the country. But for every company that has been able to stay in business, a couple of dozen have not made it. Any new entrepreneur had better "know the business" before getting into the cooking wood industry.

For example, a new entrepreneur must be prepared to enter with sufficient volume to make enough money to stay in business. The retail price of cooking wood runs between $3 and $3.50 for a 5-pound bag; the profit may be only $0.06 to $0.08 a pound. A very large volume is required to keep a business going. An operator must be prepared to ship out at least a truckload a week (about 40,000 pounds) year-round to make a profit.

Quality control is also critical for cooking wood. At one point several years ago, there was a problem with green wood and wood infested with insects. It must be dried, treated for insects, and packaged well.

The hardest hurdle for the small producer of natural charcoal or smokewood is "getting it on the shelf." Getting the grocery store buyer to agree to place a new item on the shelf requires paying a "slotting allowance" to get the item into the system. This could be perhaps $5,000 an item.

While the cooking wood products have a place on the shelves now, it will take several years for this industry to grow. While this niche market also has some potential and consumers have been trying new wood products for cooking, the flavorwood or smokewood industry is very, very small in comparison with the charcoal briquette market. For example, about 25 million pounds of smokewood are sold annually in this country, compared to about 90 tons of charcoal briquettes. The cost of chunk wood is about 10 percent higher than charcoal just because the volume of product being produced is so much less.

In the opinion of the Barbecue Industry Association (BIA), there are not yet very many users of new cooking woods. Several small businesses in the past few years have started quickly, with little investment, and gone out of business just as quickly. Only a few have succeeded over the long haul. However, as in the charcoal business, if one can come up with a unique product (such as, a new

flavor) and a reliable distribution and marketing system, he or she will have a good chance. For example, wood briquettes are a new item on the market that are used in place of charcoal and are especially appealing to the environmentally conscious consumer who wants no lighter fluid associated with charcoal. The wood briquettes are held together with beeswax, which ignites easily.

Sawdust from mesquite and hickory is sold to companies that produce liquid smoke. This product is primarily manufactured by two or three companies, such as Red Arrow. Chips and sawdust of flavorwoods are also sold to the meat smoking industries, such as Jimmy Dean.

The avenue for marketing this product is likely through the National Food Brokers Association and its annual meetings, attended by smoked meat companies. Also, within each State are probably lists of smoked meat products and their producers.

Distribution and Packaging

Successful cooking wood businesses distribute one of three ways: direct to chain restaurants, through food brokers, or through specialty markets, such as the gift market. The food brokers are the mechanism that will generate the most volume; however, this approach requires a large volume and close quality control. The food brokers may contract for three to four trucks a week during the peak season, which shuts out a lot of small producers. However, it does offer the opportunity for small producers to sell to established companies.

It is particularly important for the entrepreneur in the charcoal or cooking wood business to identify logical tie-ins, such as grill manufacturers; fish, meat and poultry producers; and barbecue contests and campgrounds as outlets to distribute and promote the product.

Packaging is primarily done by the cubic inch, although Safeway and other merchandisers are using weight. Caution is advised if weight is used, for if the wood is semidry, it may lose enough weight in storage or shipment to fall below the specified package weight, which brings problems with deceptive advertising laws from the Federal Trade Commission. Volume is the most practical means of packaging because a woodlike mesquite will lose about one-half of its weight when dried from the green state but only about 5 percent of its volume. It is advisable to always package with about 5 to 10 percent more wood by volume than what the label states.

Various types of packaging can be used. There are plastic packages with and without air holes, paper packages with wax interior coating without holes, and also a net-type sack for use with chunks. One of the keys to good packaging is to correctly screen the wood to eliminate most of the fines and loose bark. This alleviates the problem of fines, sawdust, and bark falling out either in the marketplace or in a customer's home. The fines can be sold as another product.

It seems best to market a product in a package that has holes. This would be a stopgap measure in case damp wood gets through the production system.

Using mesquite as an example, mesquite wood weighs about 2 pounds per 100 cubic inches. A good package might be a 100- to 200-cubic-inch (2- to 3-pound) package and also a 500-cubic-inch package (approximately 10 pounds). The small size would go to consumers who only want a lightweight package, and the larger would go to the consumer who (1) buys in "bulk" to save having to buy all of the time or run back to the store at the last moment and (2) thinks, whether true or not, that one saves in cost per unit whenever one buys larger packages.

Equipment Needs, Costs, and Suppliers

Wood drying. Cooking wood must be dried before packaging and shipping. Options are to only harvest and package wood from standing trees that have been dead long enough that the wood is already well dried, or to harvest and then dry green wood. Depending on climate, the time lag between harvest and shipment may suffice to dry the wood sufficiently. If the wood is bulk-piled, it should be covered during heavy rains.

Although expensive, one can dry or partially dry wood using a number of methods. Some companies use old grain or rice dryers. Another way is to use a rotary drum dryer, typically used in the particleboard industry, which rolls the chips or chunks in a long cylindrical chamber while hot air is passed through the chips. The saturated hot air is purged from the system out of the far end. Because they are rather expensive, commercial dryers are not generally feasible for the small entrepreneur.

Regardless of the method of drying, the wood must be dried to the proper moisture content, about 14 to 20 percent for mesquite. This will alleviate potential problems of odor and mildew in the marketplace.

The rate of wood drying is primarily a function of wood size, temperature, retention time, and chamber size. Approximate time of drying should be worked out while one sizes the equipment. Saving enough dry wood to sell while allowing green wood to dry out is important in stabilizing a small business's cash flow.

Chunking and chipping. Cooking wood is chipped and chunked in a variety of ways. One mesquite wood company has the dry wood cut into disks with a cutoff circle saw. The disks are about 2 inches thick. These

disks are then run through a chunker which splits them into six to eight chunks about 2 inches in diameter. The product is then screened into different-size fractions. The small particles are sold as chips. The fines and sawdust are sold to the meat smoking and the liquid smoke industries. Other companies use a regular wood chipper to produce uniform-sized chips like pulpwood chips.

Insect control. All insects on cooking wood must be killed. If not, they will come out of the package in stores, homes, and restaurants and can ruin a business. Most companies are using insecticide chemicals such as aluminum and magnesium phosphide fumigants or methyl bromide. At the time of printing of this publication, methyl bromide has been scheduled by EPA to be phased out by year 2000. The Texas Department of Agriculture has approved these two chemicals (and only these two) for treatment of mesquite cooking wood.

Another way to kill insects is with heat. It is necessary for the wood to reach a temperature of 150°F for 2 to 3 hours or 120°F for 10 to 12 hours to effectively kill insects. One can kill the insects and dry the wood at the same time. Once the wood is treated, it must be isolated from untreated wood while it is being processed and stored or else insects will reinfest quite readily.

A wide variety of equipment for turning out cooking wood, from very labor-intensive to very advanced, can be found. The more successful entrepreneurs tend to be those whose equipment investment is relatively small, either with homemade equipment or adapted equipment. It is important to minimize overhead and remain very flexible. Some use three or four small chippers or small dryers instead of large pieces of equipment. Facilities to keep the wood out of the weather, and possibly a special area to treat the wood for insects, are also needed. Most do not collect their own wood. Local people will supply it. In the case of mesquite, most ranchers are glad to have the wood taken off their land and do not charge anything for it. A bare minimum of $20,000 for a chipper would be necessary.

The wood is supplied at firewood prices of $60 to $80 a cord for mesquite and somewhat more for fruitwoods. The average retail sale is one to three bags per week per store at a large chain. A Mom and Pop store would sell considerably less. Each bag that sells for $1.20 would net perhaps $0.40. It is easy to see how, given the tiny market and the fact that there are already several substantial companies in the business, it is not a strong market potential.

Most of the cooking wood industry is labor-intensive. It is a cottage industry, requiring small-scale equipment and a lot of handwork in sizing and bagging.

Resource Conservation Considerations

No special resource conservation considerations are needed.

Profile

When George Wartsbaugh, owner of Barbecue Wood Flavors in Ennis, Texas, began producing mesquite chunks for cooking in 1984, he believed that if his small company could cut and sell 500 cords of wood a year, it would be doing a lot of business. At that time he was using mesquite wood that he was hired to clear from range in his region of Texas, and cutting the mesquite wood into chunks out in his backyard. He merged his company with Weber Grill a few years later and from that merger gained the critical marketing arm needed to reach the people they needed to reach. Today, Barbecue Wood Flavors sells millions of pounds a year and has become very successful, selling hickory and mesquite chunks and a wide variety of fruitwood chips that are purchased from many regions of the country. In fact, they are probably the Nation's largest manufacturer of wood chunks and the second largest producer of chips. During peak season, the company has about 24 employees.

The company buys woods such as alder, apple, and cherry for about $100 per cord. Packages are 1 to 3 pounds in weight and retail for $0.79 to $2.00 per package, with retailers normally making 20 to 40 percent profit margin. There is now enough demand for flavorwoods that several charcoal companies have entered the market, and Barbecue Wood Flavors also provides "private label wood" for several stores and charcoal companies.

Considerations for a Rural Development Strategy

In this business, the lower the overhead, the better the potential success rate. A "quick in, quick out" strategy built around a unique product is also an approach. New flavors that offer as natural a cooking process as possible are preferred. Another approach, discussed in the charcoal section, would be for a community to start a combination retail and leased space grocery store. Instead of having buyers choose which products to buy and display, small entrepreneurs selling items for general household use would lease small amounts of store space (Wartsbaugh, personal communication).

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Bibliography

Fabricant, Florence. 1988. Smoke gets in your fries: Restaurants turn to in-house smoking. Nation's Restaurant News. August 1: 22: 11 (col. 1).

Greenspan, Dorie. 1990. Hooked on salmon: The great taste of smoked salmon gets better. Connoisseur . December: 220: 96 (col. 4). Includes list of suppliers and smokers.

Ross Ryan, Nancy. 1988. Smoke catches fire: The flavor and texture of smoked food is catching on like wildfire. Restaurants and Institutions. September 30: 98: 78 (col. 4).

Shapiro, Laura. 1989. Barbequeing goes gourmet. Newsweek. 61: 61; July 3.

Resources

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Ken Rogers, Head, Texas Forest Products Laboratory, P.O. Box 310, Lufkin, TX 75901. 409–639–8180. (A packet of about 20 articles on all aspects of harvesting mesquite for cooking wood is available. Inquire as to cost.)

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Chapter 7—Decorative Wood

Description of the Product and Its Uses

Many marketable items can be fashioned from unusual parts of trees or from trees that are unique to a given locality. Burls from redwood, maple, buckeye, madrone, manzanita, red elm, and many other species may be valuable. Spalted wood and any of the woods with curly grain or bird's eye figure are in demand. Trees such as tulip poplar that have been struck by lightning have been used as decorative wood. Red-heart box elder; diamond willow from Bebb willow (*Salix bebbiana*) and from feltleaf (*Salix alaxensis*), littletree (*Salix arbuscoloides*), Park (*Salix monticola*), and Scouler (*Salix scoulerana*) found in Alaska; bald cypress wood and knees; stump butts from tupelo gum and black gum; grafted fruitwoods; and even old knots and stumps of pine have market niches (table 7–1).

Table 7–1. Decorative woods or tree parts from which marketable items can be crafted

Bigleaf maple	Oregon myrtle
Cypress knees	Pecky cypress
Diamond willow	Redshank
Hazel whips	Redwood burls
Juniper	Sitka spruce roots
Madrone	Walnut crotches
Manzanita	Wormy chestnut
Mountain mahogany	Yew
Oregon ash	

Examples of local woods that have enjoyed popularity in the decorative wood market include bigleaf western maple, madrone, manzanita, mountain mahogany, oregon ash, black walnut, oregon myrtle, yew, black locust, persimmon, and pecky cypress.

Burls are typically the best single source of decorative wood because they have the best figuring. A burl is produced in a tree where an injury or other external stimulus has affected the growth pattern of the tree, causing it to grow a deformity which results in a beautiful wood. It may be found on the trunk, as in the case of a redwood, or from the root part of the tree and up around its base, as in the case of a maple. The resulting patterns may be wavy, swirled, marbled, or feathered; they may have eyes or be spotted. All of these characteristics are valued by wood crafters and wood turners.

Crotch wood of any tree that has a fancy "flame" or "feather" appearance in the grain pattern is also of interest to wood turners or furniture makers. Some of the more spectacular effects are found in walnut trees. Gun stock manufacturers, for example, will pay very well for the perfect "feather."

Spalted wood is in very high demand within decorative wood markets. Spalting occurs when some hardwood trees, notably maple, birch, and beech, begin to decompose. Bacteria will sometimes create "ink lines" or "zone lines" in the wood during this decomposition, and these lines create a very decorative appearance. When properly dried, wood that would not even have made good firewood can become a valuable piece to the right person. The wood must be cut before the decomposition process goes far enough to actually weaken the wood, however.

The possibilities for decorative wood products are limited only by imagination and ingenuity. Some of the largest markets are for musical instruments, decorative boxes such as jewelry boxes, and wood turning materials for artists, sculptors, and craftspersons. Tabletops, gun stocks, table and floor lamps, table legs, candleholders, ashtrays, bowls, platters, cutting boards, vases, plaques, centerpieces, planters, birdhouses, carved animals and birds, matchbox holders, note pad or napkin holders, Christmas ornaments, letter openers, and religious figures are all made from decorative woods.

Market and Competition Considerations

There is plenty of demand for this kind of material. Most hardwood stores have no trouble selling figured wood. Over the past 10 years or so, many more opportunities have opened to market decorative woods nationally, since there are many people looking to purchase unusual woods for craft products and special wood products.

The major U.S. markets are established wood turners, hardwood retail stores (especially in metropolitan areas), craftspersons, and special wood product manufacturers. Most of the burl products and many of the decorative woods are marketed both wholesale and retail through classified advertisements in woodworking magazines. These include *Woodshop News*, *Woodworking Magazine*, *American Wood Turner*, *The World of Wood*, *Wood Magazine*, *Fine Woodworking*, or *The Woodworkers Journal*.

While the real markets in the future may well be export markets, (particularly Italy and Japan), few new entrepreneurs would have the experience or the dependable supplies to export. The experience is critical because it is very easy to lose money in the export trade: some people will take advantage of anyone in the wood business who they think does not know what they are doing. Dependable supplies are critical because a minimum of about 1,280 cubic feet of burl wood, for example, is required to fill an oceangoing container. Most people who want to sell burls would be better off just to collect a few and sell them either to someone who is accumulating them for export, sell them themselves, or, if they are located near a major urban area, sell them to local hardwood stores or through classified ads.

Anyone wanting to learn more about the local woods and the market for these woods would be advised to contact area hardwood stores and any local or State wood turning association. A professional wood turner might purchase several tons of a certain type of decorative wood, especially if he/she owns the gallery or store. Most wood turners work with a number of different woods and are interested in experimenting with new woods.

Decorative wood can be sold as burls, turning squares, and occasionally as lumber. Burls are generally bought and sold by the pound. Frequently, craftspeople making a living in wood turning will want to purchase an entire burl if they find the wood they are looking for. A 2-foot diameter burl or one weighing as much as 5,000 pounds may be purchased if it is exactly what the craftsperson has been wanting. For this reason, it is important to leave burls as large as possible, for the wood turner who designs the final products to be made from the burl will want to cut certain sections in a certain way and will generally want the largest chunk possible. It would also be critical to be experienced in "cutting for figure," that is, identifying where and how to cut the wood for market.

Decorative wood is typically obtained either from private individuals who harvest the trees from their own land or through local sawmills and individual loggers. Someone wishing to market a burl or other decorative wood should begin by visiting local mills and other sources to become familiar with the local woods. They should contact local woodworking stores or one of the 43 local chapters of the American Association of Wood Turners.

Prices vary according to the type of wood and its quality. For example, in the case of Pacific Coast maple burl, it may be worth anywhere from 10 to 50 cents a pound to the harvester. An average price would be between 25 and 35 cents a pound.

Dealers in decorative wood typically run advertisements in local papers describing what they are interested in buying and place advertisements in special woodworking newsletters to find buyers for their wood. Amounts from small sizes up to tons may be of interest. Green, fresh-cut wood may be desired. Other people prefer seasoned wood (although it is probably impossible to completely dry a large burl).

Holace Nelson, astride a shaving horse, using a draw-knife to remove bark and shape a grip on a walking stick of diamond willow. Photo courtesy of Holace Nelson of Holly Industries, Inver Grove Heights, Minnesota. (SFP –18)

Working through sawmills to selectively purchase decorative wood requires close and ongoing coordination. Once a log arrives at the sawmill, it is usually destined for the chipper. To save a few logs because they have value as decorative wood is often not perceived as being worth the trouble for the sawmill operator. Ideally, such logs should be identified by the loggers in the area where the harvest is occurring and the logs set aside in the sorting area.

It may be desirable to work with loggers to help them identify figured wood. There are frequently instances in which people do not appreciate the value of a section of figured wood and it is cut off and disposed of. Other times, the wood may be set aside but the dealer is not contacted for several months, during which time fungi can practically destroy the wood. Many times, a dealer or a wood turner can get a good deal because loggers just want to get rid of the burl. Someone with his or her own self-loading short logging truck would be in the best situation to buy direct from loggers in this way.

Promising logs can easily yield eight times their cost when they are purchased in the field, after they are harvested but before they go to the sawmills. For example, out of the best logs of bigleaf western maple, it

Diamond willow handmade products. Foreground: walking sticks, stools, cribbage board, match holder. Background: letter openers, vases, key chain fobs, pen and candlestick holders. Photo courtesy of Holace Nelson of Holly Industries, Inver Grove Heights, Minnesota. (SFP–19)

would be possible to net over $1,000, or about $10 a board foot for green wood. A prime specimen of "redwood lace" would sell for $12.50/board foot, green. Figured material can be sold rough sawn.

The possible inconsistency of supplies of decorative woods is a factor that must be carefully considered by a potential entrepreneur. For example, preparing a catalog of woods could be a risky affair if supplies were not ensured. Also, it would be wise to consider secondary markets for quantities of unsold decorative wood. For example, some dealers in decorative woods convert unsold supplies to home construction items such as flooring or trim.

Distribution and Packaging

Distribution varies greatly according to the type of wood. Some are sold through woodworking magazines. Others are sold at county fairs and expositions.

Shipping is usually done by Consolidated Freight if over 70 pounds; under 70 pounds, UPS is used. For the very large burls, special hoisting equipment and shipping arrangements are needed. Even a small amount of burl wood is cost-effective in shipping.

For the highest quality wood destined for the export market, demand is high enough that the high cost of shipping is less of a consideration than one might think. The cut surfaces are waxed with a sealant or emulsified paraffin, and the wood is pressure-washed and tagged for inventory.

Equipment Needs, Costs, and Suppliers

A company entering the decorative wood business could either purchase wood from the mills already cut or do the cutting itself. Doing the cutting allows much greater control over the cut but requires a band saw mill, 18-inch planer, table saw, radial arm saw, kiln, and space to store several thousand board feet to air dry. The kiln can be just a dehumidifier, heater, and fan, and the space to do a slow 6-week to 6-month drying process. Small logging trucks can be used to pick up and deliver the logs in many locations.

Quality used machinery can be purchased through *Woodshop News*, other trade magazines, and market bulletins published by State forestry agencies.

Resource Conservation Considerations

Burls should only be taken from trees that are being harvested for other purposes. In the future, it will become increasingly important that buyers know the source and supplier of decorative woods. An environmentally aware public will become increasingly discerning that "rare" woods, for example, teak, should not be harvested except under sustained yield management plans. As another example, in the case of bald cypress knees, this same public is beginning to question the desirability of disfiguring or harvesting a tree that is such an integral part of many wetland areas, given the national concern over the rapid disappearance of so many of our wetlands. A "clean green" tag or some identification of woods harvested on a sustainable basis would be a wise marketing approach in such cases.

Profile

In Minnesota and some neighboring States, a few species of northern willow are susceptible to fungal diseases that cause the formation of a diamond-shaped scar in the wood where the fungus kills the cambium layer and the growth occurs around the scar. The scars that result leave very attractive and interesting reddish, concave

diamond shapes of various sizes, anywhere from a foot to a quarter of an inch, in the white wood. The fungus also causes the wood to twist and grow in unique, distorted shapes to overcome the fungus. The wood remains lightweight and strong and is ideal for novelty items because it is not hard and can be readily carved.

Holace Nelson of Holly Industries in Inver Grove Heights, Minnesota, is a retired fire fighter from St. Paul who has taken advantage of this decorative wood to develop a number of products, including hiking and walking sticks, wall and table vases for dried flowers, candlesticks, cribbage boards, letter openers, and hat racks.

Nelson harvests his willow from open, unfenced land that is unposted. The willows are generally considered to be scrub trees of little value, and the ones that have the diamond markings are trees that were diseased in the past. The harvesting procedure does not kill the tree, since willows regenerate readily. The diamonds are readily apparent through outward appearances of the bark, and the stems that are harvested are those that are most interesting. Both straight and crooked wood is useful. The wood is generally gathered in the winter when the ground is frozen, the swamps are accessible, and the moisture content of the wood is at its lowest. But the best time to harvest it may be during the growing season, before the growth has been slowed by hot weather and the bark has adhered to the wood. During this time, the bark can be readily stripped off.

The objects are worked and carved using small power tools—hand grinders, high-speed drills with small burrs, palm-held sanders, a pneumatic sander, drill press, etc. Novices can readily remove bark with a pocket knife, however.

There is a lot of variation in the pieces, and, hence, in the cost of the items produced. For example, 4- to 4-1/2-foot finished hiking sticks would range from $15 to $60. A cribbage board might be $20 to $30.

Nelson does not advertise or actively market his products. His main marketing activity entails traveling to the State fair each year, where he sits on his shaving horse and roughs out his hiking sticks using a two-handled draw knife. The fair draws over a million visitors a year, and Nelson has been going long enough to have a loyal following of repeat customers. He also goes to a few festivals. He receives a lot of requests to market his diamond wood objects through retail stores, but has generally chosen not to do so because the prices would become too high in a retail shop. He prefers the independence of his own approach to his business and marketing.

His single greatest source of sales comes from these partially finished hiking sticks. He provides a sheet of instructions and some sandpaper, and the buyer finishes the stick himself or herself. These sell for between $6 and $12 apiece. In 12 days at the State fair last year, he sold about 800 unfinished sticks as well as about 150 finished sticks, 25 vases, 100 letter openers, 20 to 30 small stools made from the diamond willow and slab oak, and numerous other small items such as key chains and cross-section curio pieces of the wood.

There are a number of small companies and individuals that produce decorative diamond willow for retail sale, plus many hobbyists who produce diamond willow art for their own use.

Considerations for a Rural Development Strategy

The decorative wood market ties in well with tourism and the design of touring routes. Woods that are unique to a region have tourist appeal.

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Bibliography

Beals, Harold O.; Davis, Terry C. 1977. Figure in wood—An illustrated review. Project No. 905. Auburn, AL: Agricultural Experiment Station, Auburn University.

Bingham, Karen. 1982. Carving diamond willow canes. Creative Crafts. June: 49–50.

Hoadley, Bruce R. 1980. Understanding wood. Newtown, CT: The Taunton Press Inc.

Nish, Dale L. 1980. Artistic woodturning. Provo, UT: Brigham Young University Press.

Peck, Dave. 1986. Diamond willow. Alaska Magazine. March: 82–83.

Resources

Art Bennett, Oregon Crafted Fine Wood, 282 West Everett Street, Sutherlin, OR 97497. 503–459–4601. Specialty processor of root burls for ornamental uses, clocks, and furniture.

American Woodworker, Rodale Press Inc., 33 East Minor Street, Emmaus, PA 18098. 215–967–5171.

Fine Woodworking, Box 5506, Newtown, CT 06470–5506. 203–426–8171.

Bruce Forness, Sr., International Wood Collectors Society, P.O. Box 1102, Chautauqua, NY 14722. 716–753–7944.

Casimer Grabowski, 19705 Southwest 134th Avenue, Miami, FL 33177.

Gil Lynch, Handcrafted Oregon Hardwoods, P.O. Box 1628, Myrtle Creek, OR 97457. 503–863–3042. Artisan who specializes in carvings and turned designs from spalted wood and aged material found at old logging sites.

Dale Nish, Craft Supplies, 1287 East 1120 South, Provo, UT 84606. 801–373–0917. Sells tools for woodworking. Familiar with world-renowned wood turners. Has a series of videos.

Popular Woodworking, E G W Publishing Company, 1320 Galaxy Way, Concord, CA 94520. 415–671–9852. For subscriptions, address is Box 6086, Concord, CA 94524.

Mary Redig, Administrator, American Association of Wood Turners, 667 Harriet Avenue, Shoreview, MN 55126. 612–484–9094.

Woodshop News, Pratt Street, Essex, CT 06426. 203–767–8227.

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Chapter 8—Forest Botanicals as Flavorings, Medicinals, and Pharmaceuticals

Description of the Product and Its Uses

Culinary Uses

Forests contain a wide assortment of plants that have market potential as food seasonings or flavorings. Herbs are used as seasonings to add flavor, aroma, or color to other foods and as ingredients in beverages such as herbal coffees, teas, or soft drinks. Botanicals used as natural food preservatives are expected to become more important in the future. Other botanicals can be harvested as edible greens, roots, and tubers. Edible flowers that can enhance the appearance of foods are also found.

According to Appropriate Technology Transfer for Rural Areas (ATTRA) (Adam, personal communication), greens and other edible plants commonly harvested from the forested mountains of the Ozarks include amaranth (*Amaranthus retroflexus*), bracken and other ferns (*Pteridium aquilinum*), burdock (leaves, roots) (*Arctium lappa*), carpenter's square (*Scrophularia marilandica*), chickweed (*Stellaria media*), chicory (*Cichorium intybus*), dandelion (leaves, flowers, root) (*Taraxacum officinale*), henbit (*Lamium amplexicaule*), lambsquarters (pigweed) (*Chenopodium album*), milkweed (pods, flowers, shoots) (*Asclepias syriacus*), black mustard (*Brassica nigra*), peppergrass (*Lepidium* spp.), plantain (*Plantago major*), pokeweed (*Phytolacca americana*), purslane (*Portulacca oleracea*), sassafras (leaf, roots for tea) (*Sassafras albidum*), sheep sorrel (*Rumex acetosella*), sow thistle (*Sonchus arvensis*), watercress (*Rorippa nasturtium-aquaticum*), wild garlic (*Allium vineale*), wild leek (*Allium ampeloprasum*), wild mint (*Mentha* spp.), wild onion (*Allium cepa*), winter cress (*Barbarea verna*), and violet (leaf (*Viola* spp.).

Other plants with potential culinary use include arrowhead (*Sagittaria latifolia*), asparagus (shoots) (*Asparagus officinalis*), beebalm (leaves for tea) (*Monarda didyma*), bellflower (*Campanula rapunculoides*), bellwort (*Uvularia perfoliata*), bitter cress (*Cardamine* spp.), cattail (*Typha angustifolia*), daylily (buds) (*Hemerocallis fulva*), and elderberry (flowers) (*Sambucus canadensis*).

Herbs and Spices

- Aspen leaves
- Baby's breath
- Bay leaves
- Blueberry leaves
- Catnip
- Celery seed
- Chervil
- Chicory root
- Horsetail
- Labrador tea
- Marjoram
- Mullein
- Princess pine
- Raspberry
- Rose leaves and hips
- St. John's wort
- Tarragon
- Thistle
- Thyme
- Yerba santa

Edible Greens, Roots, or Tubers

- Amaranth
- Arrowhead
- Asparagus
- Beebalm
- Bellflower
- Bellwort
- Bitter cress
- Bracken and other ferns
- Burdock
- Carpenter's square
- Cattail
- Chickweed
- Chicory
- Dandelion
- Daylily
- Elderberry
- Fiddlehead fern
- Goatsbeard
- Greenbrier
- Henbit
- Horsetail herb
- Jerusalem artichoke
- Lambsquarters (pigweed)
- Maple
- Milkweed
- Miner's lettuce
- Mustard
- Nettle shoots
- Oxalis
- Peppergrass
- Plantain
- Pokeweed
- Prickly pear
- Purslane
- Salmonberry
- Sassafras
- Sheep sorrel
- Sow thistle
- Spiderwort
- Spring beauty
- Sumac
- Violet
- Watercress
- Wild yam
- Wild mint
- Wild onion
- Wild leek
- Wild garlic
- Willow
- Winter cress
- Yucca

Other familiar edible wild plants which may have agroforestry potential include fiddlehead fern (*Matteuccia struthiopterio*), goatsbeard (*Tragoposon* spp.), greenbrier (*Smilax* spp.), horsetail herb (*Equisetum arvense*), jerusalem artichoke (tubers) (*Helianthus tuberosus*), maple (immature seeds) (*Acer* spp.), miner's lettuce (*Claytonia perfoliata*), nettle shoots (*Urtica urens*), oxalis (*Oxalis* spp.), prickly pear (pads) (*Opuntia humifusa*), spiderwort (*Tradescantia virginiana*), spring beauty (tubers) (*Claytonia virginica*), salmonberry (shoots) (*Rubus spectabilis*), sumac (fruits for tea) (*Rhus glabra*), wild yam (*Dioscorea villosa*), willow (*Salix* spp.), and yucca (immature seeds) (*Yucca* spp.). Some of this latter group are considered rare delicacies.

Medicinal and Pharmaceutical Uses

Forest botanicals are also used in the manufacture of a great many medicinal compounds and pharmaceuticals as well as nutritional supplement products.

Medicinal compounds used for naturopathic remedies include a large number of herbs used to make teas, oils, and other products that are alleged to have curative or therapeutic effects on many common ailments. Some of these products may possess no real medicinal properties, yet have long-term established markets and represent a continuing economic opportunity.

Other botanicals do possess specific physical chemistries of interest to manufacturers of pharmaceutical drugs. While modern medical technology has enabled pharmaceutical manufacturers to synthesize many natural chemical compounds, there is renewed interest in exploring medicinal applications of a great many new plant chemicals.

In the future, it will likely become more important to make a distinction between medicinals and pharmaceuticals because the difference in economic opportunities represented by the two types of compounds will become increasingly great. Some experts feel that demand for botanical products that possess desired pharmaceutical chemistries will become much more important than demand for alleged medicinals in the not-too-distant future (Miller, personal communication).

In addition, many botanicals with medicinal uses are also used as foods, in cosmetics, in dyes, as dried florals, and for a variety of other uses (fungicides, insecticides, animal products, and aromatics). Some of these uses are discussed in other chapters.

A complete listing of the hundreds of native plants with medicinal or food-related properties is far beyond the intent of this publication. Also, a great many botanicals lend themselves to small farm production as crops and are therefore less likely to be good prospects for forest harvesting. For example, chamomile, peppermint, garlic, and raspberry have widely accepted medicinal qualities but are relatively easy to grow as crops so are not likely to become agroforestry alternatives for landowners.

Medicinal Materials

Balm of Gilead buds
Balsam gum
Birch oil
Biscuit root
Bitterroot
Black cherry bark
Black haw roots
Bloodroot
Boneset
Camas bulbs
Cascara bark
Cattail flowers and root starch
Cohosh
Dandelion root
False hellibore roots
Foxglove leaves
Ginseng root
Goldenseal
Indian breadroot
Jerusalem oak seed
Jimsonweed leaves
Mayapple or mandrake roots
Oregon grape roots
Oregon tea
Princess pine or pipsissewa
Quinine conks
Sassafras oil and root
Scotch broom
Skunk cabbage roots
Snakeroot
Spruce gum
Storax gum from sweet gum
Sumac
Western yew
Wild garlic
Wild ginger
Wild mint
Wild onion
Wintergreen oil
Witch hazel bark and leaves
Yellow dock root

The plants listed below do have commercial potential for wildcrafting as medicinals, pharmaceuticals, or food-related uses, based on those knowledgeable in the field. The life zone, description, history, chemistry, uses, harvesting, reforestation, marketing, and toxicity of most of these botanicals are detailed in *Native Plants of Commercial Importance* (Miller, 1988).

Table 8-1 lists herbs which have some forage potential. Not all of these are usually found in forests, but those that are not may have agroforestry potential in certain locations.

Table 8–1. Botanicals with commercial potential[a]

Herb/spice	Part used	Region	Major use in marketing
Angelica (*Angelica atropurpurea*)	Root	East Coast	Food flavoring and fragrance in cosmetics
Bay (*Umbellularia californica*)	Leaf	West Coast	Common household spice—perfumes
Bergamot (*Monarda fistulosa*)	Herb	North America	Cosmetics—flavor additive for fruity citrus
Blackberry (*Rubus fruticosus*)	Leaf	North America	Food flavoring, tea ingredient
Black cohosh (*Cimicifuga racemosa*)	Root	East Coast	Pharmaceutical—female disorders (menstrual)
Blessed thistle (*Cnicus benedictus*)	Herb	North America	Pharmaceutical—increases gastric secretions
Black haw (*Viburnum prunifolium*)	Bark, stems, root	East, Midwest	Pharmaceutical—antispasmodic, flavoring
Blue cohosh (*Caulophyllum thalicatroides*)	Root	East Coast	Pharmaceutical—female disorders (labor)
Blood root (*Sanquinaria canadensis*)	Herb, root	East Coast	Pharmaceutical—dental aids; antitumor
Borage (*Borago officinalis*)	Herb	North America	Pharmaceutical—increases milk in mothers
Burdock (*Arctium lappa*)	Root	North America	Major produce in Asia—antimicrobial activity
Calamus (*Acorus calamus*)	Root	North America	Major cosmetic fragrance—mild central nervous system depressant
Cascara Sagrada (*Rhamnus purshiana*)	Bark	Pacific Coast	Laxative—sunscreen preparations
Catnip (*Nepeta cataria*)	Herb	North America	Animal toys—tea flavoring—mild sedative
Chapparal (*Larrea tridentata*)	Herb	Southwest	Pharmaceutical—cancer
Chickweed (*Stellaria media*)	Herb	North America	Multivitamin additive (iron)—cosmetics
Chicory (*Cichorium intybus*)	Root	North America	Coffee substitute/additive
Coltsfoot (*Petasites fridadus*)	Leaf	West Coast	Tobacco substitute/additive
Dandelion (*Taraxacum officinale*)	Root	North America	Coffee substitute/additive
Devil's club (*Oplopanax horridum*)	Root	Pacific Coast	Industrial grade panax ginseng
Desert tea (*Ephedra nevadensis*)	Herb	Southwest	Pharmaceutical—bronchial dilator
Echinacea (*Echinacea angustifolia*)	Root	North America	Pharmaceutical—blood purifier
Elder (*Sambucus nigra*)	Flower	North America	Eye and skin lotions—food flavoring
Eucalyptus (*Eucalyptus globulus*)	Leaf	West Coast	Expectorant and flavoring agent
False hellebore (*Veratum viride*)	Root	Northwest	Pharmaceutical—hypertension
Ginseng (*Panax quinquefolium*)	Root	North America	Foods and cosmetics—longevity herb
Goldenseal (*Hydrastis canadensis*)	Root	East Coast	Pharmaceutical—eyewash, uterine hemorrhage
Horehound (*Marrubium vulgare*)	Herb	North America	Cold and cough medicines—food flavoring
Horsetail (*Equisetum arvensa*)	Herb	North America	Source for silica—pet food flavoring
Kinikinnick (*Arctostaphylos uva-ursi*)	Leaf	Mountains	Pharmaceutical—urinary antiseptic
Licorice (*Glycyrrhiza glabra*)	Root	North America	Food flavoring—cough drops and syrups
Lobelia (*Lobelia inflata*)	Herb	East Coast	Pharmaceutical—expectorant, central nervous system depressant
Lovage (*Levisticum officinale*)	Root	North America	Food additive—fragrance (like celery)
Mayapple (*Podophyllum peltatum*)	Root	East Coast	Pharmaceutical—pain killer (danger)
Marshmallow (*Althea officinalis*)	Root	North America	Pharmaceutical—mucous inflammation
Mistletoe (*Phoradendron flavenscens*)	Herb	North America	Decorative—pharmaceutical, sedative
Mormon tea (*Ephedra nevadensis*)	Herb	Southwest	Pharmaceutical—antispasmodic
Mugwort (*Artemisia vulgaris*)	Herb	North America	Pharmaceutical—bring on menstrual period
Mullein (*Verbascum thapsus*)	Herb	West Coast	Eardrops, eyewash—bronchitis, asthma
Nettle (*Urtica urens*)	Herb	North America	Shampoos—food ingredient, tea
Oregon grape (*Berberis aquifolium*)	Root	West Coast	Chemistry and use similar to goldenseal
Passionflower (*Passiflora incarnata*)	Herb	East, Midwest	Flavoring, sedative
Pennyroyal (*Mentha pulegium*)	Herb	North America	Insect repellant—antispasmodic
Pipsissewa (*Chimaphila umbellata*)	Herb	Northern (high)	Urinary antiseptic—food additive (root beer)
Plantain (*Plantago major*)	Herb	North America	Antiseptic, eyewash—flea repellant
Poke (*Phytolacca americana*)	Root	East Coast	Pharmaceutical—skin cancers, rheumatism
Prince's pine (*Chimaphila umbellate*)	Herb	North America	Food flavoring in root beer

Table 8–1. Botanicals with commercial potential[a]—con.

Herb/spice	Part used	Region	Major use in marketing
Queen-of-the-meadow (Eupatorium purpureum)	Herb	East Coast	Pharmaceutical—breaks fever
Rosehip (*Rosa canina*)	Buds	North America	Vitamin C—bioflavonoid, food flavoring
St. John's wort (*Hypericum perforatum*)	Herb	North America	Hypericum red dye
Sarsaparilla (*Smilax regelii*)	Root	Southwest	Food additive (root beer)—rheumatism, tonic
Scullcap (*Scutellaria lateriflora*)	Herb	North America	Pharmaceutical—nervine, sedative
Shepherd's purse (*Capsella bursa-pastoris*)	Herb	North America	Pharmaceutical—stop hemorrhaging (birth)
Slippery elm (*Ulmus rubra*)	Bark	East Coast	Laxative—food flavoring
Tansy (*Tanacetum vulgare*)	Herb	North America	Insect repellant
Valerian (*Valeriana officinalis*)	Root	North America	Pharmaceutical—sedative (valium)
Vervain (*Verbena hastata*)	Leaf	North America	Pharmaceutical—expectorant, tonic
Walnut (*Juglans nigra*)	Hull	North America	Brown dye
White oak (*Quercus alba*)	Bark	East Coast	Pharmaceutical—burns and sore mouth
Wild cherry (*Prunus serotina*)	Bark	East Coast	Pharmaceutical—worms and expectorant
Wild ginger (*Asarum canadense*)	Root	Northwest	Pharmaceutical—stimulant, carminative
Wild lettuce (*Lactuca scariola*)	Herb	North America	Pharmaceutical—opiate compounds
Wintergreen (*Gaultheria procumbens*)	Leaf	East Coast	Methyl salicylate source—food flavoring
Witch hazel (*Hamamelis virginiana*)	Bark	East Coast	Astringent and hemostatic ointments, washes
Woodruff (*Asperula odorata*)	Herb	North America	Cosmetic fragrance—food flavoring
Wormwood (*Artemisia absinthium*)	Leaf	North America	Food additive—pillows (sachet)
Yarrow (*Archillea millefolium*)	Flower	North America	Cosmetic—food flavoring, teas
Yellow dock (*Rumex crispus*)	Root	North America	Red dye—skin disorders, iron source
Yerba santa (*Eriodictyon californicum*)	Leaf	West Coast	Pharmaceutical flavoring—food flavoring

[a]Miller (1985).

Market and Competition Considerations

Culinary Uses

It is estimated that the United States presently imports over 10 times the volume of herbs and spices that it exports, primarily because most spices and herbs require special dehydration to control the quality of the volatile oils, and the hand-drying of these crops is very labor-intensive, which gives great advantage to developing countries with very cheap labor. Nonetheless, the market for native American herbs and spices that might be wild-crafted or "forest farmed" appears to be promising. There is presently a large and growing demand from food manufacturers and spice companies for herbs and spices, and these markets should continue to grow for many years.

Direct (retail) marketing and also bulk marketing are discussed in *The Potential of Herbs as a Cash Crop* (Miller, 1985). Direct (retail) options for the wildcrafter or forest farmer include the roadside stand, U-pick operation, roadside market, farmers' market, "peddling," gift basket, and mail order. Also covered are direct sale to retailing outlets, local and small specialty manufacturers, and restaurants.

Herbs may have the best potential as cash crops in areas that are not suited to more familiar farm crops. Areas with limited water and relatively poor soil sometimes can produce as much income per acre with herbs as the most fertile areas with abundant water can produce income per acre with traditional farm crops. If lease-holder systems continue to evolve toward forest farming, small acreages of herbs may become a familiar sight in forests.

The market for the harvest and sale of wildcrafted fresh greens is more limited. For one reason, fresh wild greens are delicate, far more so than mushrooms, for example. They crush easily, just by their own weight, and they wilt easily. Just 2 hours in the hot sun will ruin them. One of the larger businesses in the Northwest in wild edibles had only very modest success with wild greens, even when it limited foragers to those plants that were safest to identify, such as miner's lettuce and sorrel. Plant identification is more difficult than for other edibles (like morel mushrooms, for example). The harvester must have a very good knowledge of botany to be trained to forage for edible greens. Just one error with greens, such as mistakenly getting hemlock leaves into a batch of edible greens, would create enormous difficulty for the entire "wild edibles" industry.

Nevertheless, wild harvested greens can be marketed. For example, a cooperative network of growers and harvesters in Michigan specializes in exotic produce items. Among the wild harvested spring greens and potherbs sold by mail order are miner's lettuce, wild leeks (ramps), fiddleheads, cattail shoots, cattail kittens, and stinging nettles. All of these have potential for commercial cultivation or for management on forest lands as food products. Also marketed by the cooperative network are wild harvested fresh mushrooms and dried mushrooms; dried blueberries, cherries, cranberries, currants, and tomatoes; organic wild rice; and edible flowers, among other items.

There are two primary markets for fresh products—gourmet restaurants and their associated food service operations, and grocery stores. Grocery stores would be the more dependable market, since restaurants are an "iffy" market and sell wild edibles as a fad or novelty as much as anything else. However, the economy does have a great effect on people's eating habits, and caution is advised in beginning a business related to cooking greens. A major education effort might be necessary as a part of any marketing area. The secondary market is direct mail order to individuals.

Medicinal and Pharmaceutical Uses

The continuing popularity of natural remedies and nutritional supplements and the growing interest in plant-derived chemical compounds for pharmaceuticals are creating important new market opportunities for forest botanicals. Many medicinal plants sold as alternative health care products or nutritional supplements are readily marketable through herb and botanical buyers or, in some cases, directly to the retail market. Furthermore, while sales of medicinal plants to mainstream pharmaceutical firms provide only a limited market presently, one need only consider the phenomenon of the anticancer substance taxol and its source, the Pacific yew tree, to realize how quickly that market can change with the discovery of an important new drug derived from chemical compounds found in plants.

In addition, specialists in native plant marketing emphasize that for almost all pharmaceutical products from botanicals, the European market is about 10 times as large as the U.S. market. For example, the European market for goldenseal and cascara sagrada bark (used for laxatives) is more than 20 times that in the United States.

Ginseng provides perhaps the most familiar example of the potential market for a forest botanical used for medicinal purposes. Ginseng is used as a nutritional supplement and as an ingredient in skin cremes. It is widely believed to improve circulation, increase vitality, and mitigate the effects of aging. Ginseng is widely consumed in oriental countries, and the United States

Bee pollen is being marketed by companies such as Montana Naturals International, Inc., as a preventive medicine and nutritional supplement. Photo courtesy of Montana Naturals International, Inc.

Granulated bee pollen and capsules of bee pollen royal jelly and propolis. Propolis is purported to have antiviral, antibacterial, and antifungal properties. Photo courtesy of Montana Naturals International, Inc. (SFP–1)

exports significant amounts. In 1990, the United States exported over 1 million pounds of ginseng (over 843,700 pounds to Hong Kong alone) worth over $80 million.

Another example of a major drug plant from the forest that is harvested for major export markets is cascara sagrada bark from the west coast.

Medicinal plants for the herbal and alternative health care markets are marketed primarily through small regional botanical or herb buying houses that process and package the plant parts for final processors or the retail market. The annual *Whole Foods Source Directory* lists a number of different wholesalers, retailers, and manufacturers for each herb and spice as well as sources for warehousing and transportation. These firms typically publish buying and selling catalogs that list the types and quantities of plant materials they purchase and sell. The firms provide guidelines on the proper collection and shipping methods to use. Examples are given in the appendix. Most large buyers of medicinal plants are located on the coasts.

Marketing of medicinal plants is characterized by small start-up firms. The popularity of herbal and alternative health care products makes new product market entry relatively easy. Producers who have sufficient quantities of plant material that has been harvested correctly to produce a consistent, high-quality product may be able to produce a direct retail product with processing and packaging assistance.

Producers marketing medicinal plants need to familiarize themselves thoroughly with Federal and State regulations regarding health care products. In general, if the product is marketed only as a food substance/nutritional supplement, with no medical claims, then the product will not have to undergo the extensive testing and certification required of pharmaceutical drugs.

Pharmaceutical firms that produce prescription and over-the-counter drugs are another market for certain medicinal plants. While many biologically based drugs have been replaced with synthetic drugs, there are still drugs produced from cultivated or wild medicinal plants. For example, reserpine, used to reduce hypertension, is produced from *Rauwolfia serpentine*, and colchicine, which relieves gout, is produced from meadow saffron (*Colchicum autumnale*). Recent discoveries, such as the cancer-fighting potential of taxol, are creating renewed interest in exploring chemical composition of forest plants. However, since pharmaceutical firms seek synthesized compounds if possible (for quality control purposes), the market for medicinal plants used in prescription and over-the-counter drugs is still very small. But if a plant compound cannot be artificially synthesized, then these firms will first seek cultivated plants grown under very uniform growing conditions and then wild plants if they cannot be field-grown.

The *OPD Chemical Buyers Directory* (the "Green Book") lists sources of supply for biological chemicals and related process materials. The OPD also issues a bimonthly magazine and a weekly paper, the *Chemical Market Reporter*, which contains information on botanicals, companies dealing in these products, price fluctuations, and related information.

The following rules of getting started have been suggested by those most familiar with the marketing of wild harvested botanicals:

1. Don't talk to a buyer until you have something ready to sell. Most people make the mistake of trying to contact a large buyer to try to find out from them if it is worth their while to try to wildcraft a product and sell it. But most buyers are not interested in talking to anyone about that. They are only interested in buying. A broker, however, will work with a small harvester, grade the product, and give advice.
2. Do a feasibility study that will produce a large enough volume of materials to actually sell, such as 2,000 pounds. Any company interested in buying in very small volumes (hundreds of pounds) probably is not a true reflection of the market anyway.
3. Always send samples of your product, and be able to back these up with at least 2,000 pounds of materials to sell.
4. If you are intending to make a career out of specialty forest products, find a buyer in your region and "get in line." Work at modest levels of production if necessary for several years while moving up the line. Consider these early years as schooling, and any financial setbacks as tuition and book fees. If you break even, consider it a pretty cheap education. If you try to crowd (that is, get to the top of a buyer's list), people who do not like your ethics are going to avoid doing business with you. Greedy people are generally not in the industry longer than about 2 years.
5. Realize you must learn the craft and business slowly and from the ground up. Many people get into trouble trying to hire other people to do the actual harvesting, for example. But this is exactly what the entrepreneur needs to learn first for himself or herself. No one can start out from scratch and expect to immediately become a "wheeler dealer." Everyone needs to start out at the lowest rungs of the ladder, or they will miss some valuable lessons, and maybe lose the whole ball game.

There are various ways for harvesters to notify wholesalers that they have botanicals available for sale. A bulk sheet mailer is one way, accompanied by a sample. This may lead to a buyer offering to buy the product on the spot, perhaps for a minimum quantity of anywhere between 500 and 5,000 pounds. The 500-pound buyers

are usually the regional wholesalers and cooperatives, including some of the chain food stores, small manufacturers or local marketers, and most buying clubs and cooperatives. The standard method of purchase is either spot buying (on specials) or on contract, whereby the farmer/wildcrafter ships on a monthly or bimonthly basis. The 5,000-pound buyers may also be regional wholesalers, but ones who include processing as part of their services to manufacturers. Large manufacturers may use these wholesalers to process their products for interfacing such things as tea bagging machinery. They most often prefer to buy 5,000- to 10,000-pound quantities on a monthly or bimonthly basis. The import/export houses are the large wholesales houses, often oriented toward trade agreements, and are involved in both the import and export of natural resources. Most are in cities with major ports. A typical wholesale house might buy more than 200 tons of a crop, although it might buy in smaller quantities when opening a new market (Miller, 1985). Ideally, the harvester would also secure a contract harvest for the next year.

Another and somewhat better way to proceed is to work with a broker who will sell the product for a percentage fee. It would be folly for a single wildcrafter to contact a major pharmaceutical company, for example, and inquire as to the market for some botanical if the wildcrafter was only capable of producing one-fiftieth the volume that the company needed. The broker may be able to pull together the needed quantity. Often the broker has the necessary contacts and experience to get the best price for the product and will also arrange to handle billing and collection for 10 percent of gross sales after collections.

The market data that follows (table 8–2) were taken from *Native Plants of Commercial Importance* (Miller, 1988), a publication that also details the life zone, description, harvest methods, reforestation, marketing, and toxicity of each plant. Data reflect 1987 and 1988 estimates where available. This list, presented in Table 8–2, is not meant to be comprehensive but, rather, representative.

New ventures should begin with a feasibility study that is large enough to test the market and develop an accurate cost-of-goods produced figure and determine the viability of the harvesting techniques. This will determine if the market will actually support the time and labor required to find, harvest, and process the materials.

Table 8–2. Sample list of forest botanicals and their markets as medicinals

Botanical (by region)	Estimated domestic market	Wholesale price to harvester (per lb)
Northeast		
Mandrake root	250 tons	$0.90
Stinging nettle	NA	$0.45 to $1.30
Pokeweed	NA	NA
St. John's wort	NA	$0.60 to $1.65
Sassafras root bark	Over 400 tons	$0.35 to $0.85
Wild cherry bark	NA	$0.40 to $1.25 [a]
South		
Black cohosh root	Under 50 tons [b]	$0.80
Bloodroot [c]	200 tons [d]	NA
Blue cohosh root	Under 30 tons [b]	$0.70
Ginseng root	NA	NA
Goldenseal root	NA	NA
Passionflower herb	NA	$0.65
Prince's pine herb	NA	$1.90
Slippery elm bark	100 tons	$2.50
White oak bark	200 tons	$4.35
Wintergreen herb	NA	NA
Midwest		
Black haw bark	NA	$4.40 [e]
Burdock root	Over 50 tons	0.60
Catnip herb	Over 400 tons	$0.65 to $1.30
Coltsfoot herb	Under 40 tons	$0.40 to $1.80
Echinacea root	50 tons [f]	$3.75
Horsetail herb	NA	$0.35 to $1.60
Northwest		
Cascara sagrada bark	2,000 tons	$0.12 to $1.75 [f]
False hellebore root	NA	$1.50
Oregon grape root	NA	$0.85 to $1.40
Wild ginger root	NA	$1.40 [g]
Southwest		
Chaparral	200 tons	$1.00 to $1.40 [h]
Mormon tea herb	NA	NA
Mullein	Over 400 tons	$0.35 to $0.80 [i]
Pennyroyal	NA	$0.48 to $0.65
Yarrow	NA	NA
Yellow dock root	NA	$0.15

[a] Thin bark worth more than thick bark; higher prices for tea bag cuts.
[b] Some export opportunity to Germany.
[c] Highly toxic.
[d] Estimated world market use—2,000 tons.
[e] In powdered form.
[f] Varies greatly depending on the age of the bark, its moisture content, the time of the year, and the quantity shipped.
[g] Dry weight; much of the weight is lost in drying.
[h] For leaf only and less than 10% stem.
[i] In baled form; higher price for chipped.

Harvesting, Drying, Storage, Packaging, and Distribution Considerations

Harvesting

It is generally felt that a minimum of a 2- to 4-acre stand of plants is necessary to harvest efficiently. The harvester should be prepared to spend 50 percent of time actually searching for the worthwhile patches. Only minimum harvests of 500 pounds dry weight are regarded as economically feasible.

Wildcrafters should take special care to get permission from landowners prior to any harvesting. To avoid problems (for example, claims of poaching), it is a good idea to also alert local authorities that you are in an area harvesting.

Plants must be harvested from areas that have not been sprayed or otherwise contaminated by road dust, etc.

Perhaps the most underutilized resource is the slash material left by loggers. By following logging crews, one can salvage whole plants, barks, roots, and leaves. By working with logging crews, it is possible to increase the awareness of timber operators of the value of some of the "trash" species, and the salvage work can help clean up a cut area. Loggers can also alert wildcrafters to new areas where the plants being sought grow.

Each product will require different processing and packaging procedures. Communication with a buyer is essential to ensuring that the product is harvested, processed, and packed correctly.

Drying and Storage

Drying is one of the most critical steps in the processing of crude botanicals. Removing moisture not only prevents molding but also inhibits the chemical reactions that otherwise would reduce the plant's end use. Each part of a plant—leaf, herb, root, bark, or flower—must be dried to the correct percentage of moisture required for both storage and transport. The drying process must also be done in such a way as to prevent either the loss of volatile oils (natural flavors) and/or the loss of cosmetic integrity (color or appearance) of the product. This requires close monitoring of both airflow and temperature.

A detailed discussion of airflow, temperature, and vapor pressure considerations in drying herbs and species is contained in Miller (1985). Also discussed are sun-cure and shade-drying methods, a solar drying system, rack drying, a drying shed design, packaging and storage, tags and labels, and trucking. Recommendations are given for the temperature, method of drying, problems to avoid, storage method, and packaging method for about 100 herbs and spices.

If heat is not available, the crop should be covered with tarps to slow the change in temperature. At the same time, good air circulation is critical during storage to prevent spoilage. Bags will need to be off the floor (for example, on pallets) and away from walls.

All products will lose weight as they lose moisture. Crops stored for longer than 6 months will need to be reweighted before shipping. Harvesters should adhere to good marketing principles and ship a little more product than they bill for.

Distribution

Where processed herbs and spices are concerned, proximity to the market is not as important as with many other commodities. Once dried, botanicals are relatively easy and lightweight to store and transport. The high prices received for them generally make it economical to ship long distances. A 10-ton load of wheat may be worth $2,000 or less, but a similar load of herbs may be worth $10,000.

Buyers of medicinal plants are located nationwide, and several new firms and grower cooperatives (primarily for herb production) recently have been established. Shipping can normally be handled by conventional package or contract shippers.

Where fresh greens are wildcrafted, distribution time to local or regional markets must be minimal. Fresh food of any type will probably require special containerized packaging, and delivery time will be critical. While such arrangements are possible, they will be more costly than for dried botanicals and should be justified by the sales.

Depending on the quantities, wild greens may be packaged using any of the usual food container options. Dried greens can be packaged in plastic bags. There are a variety of inexpensive wood and shook box containers to accommodate the usual "flat" and "basket" quantities. Long-distance shipping may require temperature-controlled containers.

Producers interested in manufacturing a final retail medicinal plant product should identify potential regional retailers. Natural medicinal plant products normally are retailed through health food or natural food stores in metropolitan areas. Drug stores and grocery stores are beginning to stock some medicinal plant products, such as herbal teas, but few are using small, locally produced products yet.

Equipment Needs, Costs, and Suppliers

All forest products that are being collected on a commercial scale from public lands require permits. The permit process typically involves purchasing a local map, obtaining a legal description of the land and the owner(s) (such as a private timber company, national forest, or private individual), obtaining permission from the landowner, and obtaining a permit validation at the sheriff's office. It is important to carry the permit at all times during harvest operations.

Harvesting wild herbs for botanicals calls for hard work, since often the plants are widely scattered over large areas. Large-scale forage operations should be based on an aerial photograph to determine the potential size, quality, and the ease of access to the crop in question. A "motorcycle scout" may do an on-site evaluation. It is also essential to identify a good staging area where the crops will be dried and processed.

Of course, where edible materials are concerned, the single most important requirement is the training given the harvester. In the worst-case scenario, improper plant identification could result in inadvertent poisoning. Equally important is the forager's knowledge of the plants and their habitats. Like all plants, wild greens generally have seasons during which they are at their best for harvesting.

Good training of workers is also needed to ensure appropriate harvesting methods. Harvesting and processing of relatively small areas can usually be achieved by small teams. Most wildcrafters need to make a minimum of $75 a day to make the work worthwhile. They frequently need to advance money to access remote locations and to obtain the necessary brush permits. Harvesters must often live on forest floors or in other temporary housing.

Basic equipment for foraging would include implements for cutting and digging and containers in which to hold the plants as they are gathered, such as baskets or bags. Harvesters generally carry burlap or woven polypropylene sacks. A wire can be used to hold the sack open, and a shoulder strap will keep the wearer's hands free to work. Most foragers have developed "specialized" tools for particular applications. In general, the equipment is not expensive or difficult to find. It will depend on the species being harvested.

Typically, roots, bark, leaves, or flowers are collected. A variety of hand tools may be used by the harvester, such as shovels, rakes, axes, and chain saws. Bark is removed by hand stripping, using a sharp knife. Roots and rhizomes are dug with a shovel or an asparagus knife.

Light machinery such as a plow, potato digger, or lifter may be used for more deeply rooted plants, and a shrubbery digger can be used on deeply rooted plants. Occasionally, a come-along or gas-powered weed eater equipped with a saw blade may be needed, or even a specialized and prototype piece of light machinery. A small chipper is an important tool for bark and roots to break them into premilling forms and to make the crop easier to dry quickly. Much of this equipment may be available from used farm yard equipment dealers for relatively little money.

Occasionally, renting a piece of commercial equipment may be advised. Industrial-sized vacuums fitted with a rake at the hose end can be used for harvesting flowers. A portable backpack-type vacuum/blower may be used to pull material into bags for drying.

Commercial ventures will usually require a covered, heated building for drying: air, solar, and heat dryers may be needed. Crops that are to be dried in the sun will require tarps. In some cases, a baler and other farm equipment can be used in areas where there is easy access.

A truck with high sidewalls and/or a trailer will be needed to move materials to the staging area. If a purchase order has already been obtained, an operator will want to have a truck waiting at the staging area to receive the bagged or boxed material and ship it directly to a weigh station and on to the buyer. In such cases, a generator will be useful to provide lighting.

A chapter on processing in *The Potential of Herbs as a Cash Crop* (Miller, 1985) discusses in detail milling grades and standards, premilling procedures, types of milling machinery, separation and cleaning processes, and layout considerations for a milling room. Recommended screen sizes and standards for some of the more important herbs and spices are given. A recent paper gives a detailed description of the requirements and costs of a centralized processing facility for botanical cash crops (Miller, 1991). Included in the paper are warehousing, electrical, lighting, milling machinery, sifting machinery, sacking requirements, support equipment, and budget requirements. Sources of used machinery for such an operation are also listed.

Resource Conservation Considerations

For perennials not injured by collection, wildcrafting (picking from the wild population) is sustainable. Rosehips is a good example: locally abundant, the plant is unharmed by the collection of its fruits. But for many other botanicals, sadly, this is not the case. American ginseng, for example, is now threatened, as is lady slipper, the collection of which has been banned by the

American Herbal Products Association and the International Herb Growers and Marketers Association.

Even plants that are easily grown and locally abundant can be so severely overcollected that their populations are not sustainable. Many wildcrafted plants are now becoming harder to find.

Any plan to pursue botanicals on a commercial basis must include a reforestation plan. Each botanical has its own needs for resource protection to ensure that it is not overharvested. The owner or manager of a given area must also be assured that the crop will be regenerated for the future. Many medicinal plants are fragile and some are rare. Some species are also slow growing.

There is also an unfortunate tendency to harvest endangered species of edible plants. Even though it is against the law to pick them, most people do not know what the endangered plants are in a region. If a particular rare plant becomes a "fad," for example, in the time it might take authorities to track down pickers, an entire community of plants could be lost. Hundreds of pounds can be removed in a few hours, roots and all.

Several healthy plants should always be left to spread and continue natural production. Plant physiology departments in local universities may have good suggestions on regeneration of specific species. In addition, recommendations for reforestation of several key commercial forest plants are contained in Miller (1988).

Several national organizations concerned with the conservation of native plants are beginning to take strong positions advocating that large suppliers of plant materials take action to ensure that only propagated and cultivated, not wild-harvested, materials are sold. Groups like the Nature Conservancy are strongly discouraging the buying and selling of wild-harvested native plant materials through the nursery trade. A trend to discourage (and, in fact, to blacklist) firms that sell certain wild-dug or harvested nursery stock has already become clearly established.

There are no doubt dozens of plant species whose commercial wild harvest can be accomplished on a sustainable basis. Most edible greens are cut, not dug up, and there is usually only one cutting per year of an individual plant. Nevertheless, it is reasonable to assume that strong forces will be brought to bear on wild medicinal plant harvesting if the industry does not take strong steps to ensure there is no reduction in the long-term viability of all native plant populations. It would be advisable to begin action on developing cultivated sources of woodland botanicals, perhaps through forest farming or leasing operations.

Nutritional supplements made from bee royal jelly, ginseng, and wild huckleberries. Photo courtesy of Montana Naturals International, Inc. (SFP–2)

Profile

Ron Hague started Montana Naturals International, Inc. nearly 10 years ago in Arlee, Montana. Hague had a strong background in finance and business administration, including international studies. He spent nearly 11 years in the field of public health, including work with the Center for Disease Control in Atlanta and the World Health Organization in Switzerland before returning to the western United States with the intent of starting his own small business. His interest in preventive medicine and self-help health care, combined with a business opportunity in a tiny Montana town of only 80 residents, started him in pharmacognosy and the manufacturing of nutritional supplements.

In the early years, the company (then called Montana Pollen and Herbs) focused on bee products from seven to eight beekeepers, primarily bee pollen and bee propolis. (Bee propolis is a product bees make from the resins of fir and poplar trees. It is believed to have antiviral, antibacterial, and antifungal properties that keep the hive sterile; the bees use it to seal the hive and also to coat any foreign materials which might contaminate the hive.)

After an early success with these bee products, Hague began to look more closely at health issues such as chronic fatigue and stress. An herbalist in Colorado was enlisted to formulate "Pure Energy," a combination of pollen and royal jelly from Northwest beekeeping operations plus an Indian herb called gotu kola and Siberian ginseng. The product provides a stimulant that is an alternative to caffeine.

The company now carries hundreds of inventory items and has been especially successful in export markets. In addition to developing formulas, the company does the drying, sifting, cleaning, milling, tumble mixing, tablet pressing, encapsulation, polishing, and packaging of the products. Today Montana Naturals International, Inc. sells a wide variety of nutritional supplement products through health food stores in all 50 States and 25 foreign countries. They have a staff of about 30 and had sales of about $3.1 million in 1990. International sales are particularly strong. In 1990, about $560,000, or 16 percent of total sales, were international. In 1991, this figure is expected to be over $750,000, and by 1992 the company expects to do over $1 million in sales to other countries.

Many of the botanicals used are from North America. Among the herbs used are American ginseng (cultivated by Montana growers) and wildcrafted goldenseal. Almost all of the herbs used are purchased from distributors such as Botanicals International, Star West Botanicals, and San Francisco Herbs, companies which, in turn, purchase the products from wildcrafters and growers. (The company found that working directly with wildcrafters was too difficult. Wildcrafters were not sufficiently reliable for the company's needs. Too much contracting time was needed to work with so many independent producers, and Montana lacked a facility for sterilizing the botanicals.)

A relatively new product based on native and wildcrafted goldenseal was developed recently by Montana Naturals for General Nutrition, a large health food manufacturer with about 1,100 stores around the country. Montana Naturals International recently supplied about 12,000 bottles of this supplement to General Nutrition. The company is also considering a long-term project to add a line of Native Indian herbal remedies that would be wildcrafted in forests and plains.

Considerations for a Rural Development Strategy

A great many edible and medicinal plants grow in forested areas of this country, but relatively few have been wildcrafted on a commercial scale. A number of herbs and spices which have good market potential for small farmers should be considered for forest farming ventures.

The key to success in marketing herbs for a rural area will be the development of centralized processing facilities to add value to the products locally. Nearly all botanicals need to be processed to some degree once they are harvested. This may involve washing, drying, grading, sifting, etc. Processing leaves, roots, and bark from a field harvest condition into a usable product for direct consumption (as foods or medicinals) or further manufacture (by pharmaceutical companies, for example) is critical to a successful venture in these products.

A processing facility located at a centralized point of collection would be important to a rural region pursuing this category of special forest products. Processing bulk botanicals increases both market options and profit margins. More wholesale buyers in the United States would purchase domestically produced botanicals if they could, and many retail stores would buy products from a centralized processing facility. In addition, such a facility could provide a centralized point of marketing for local and regional farm and forage crops. It could also provide an educational center for the region by directing farm, forest farming, and wildcrafting activities.

Harvesting cooperatives, organized in the manner of the old farmers' Grange halls, are one possible strategy for pursuing forest medicinals as an economic venture.

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Lawrence Lowe, Kentucky Division of Forestry, 627 Comanche Trail, Frankfort, KY 40601. 502–564–4496.

Richard Alan Miller, Northwest Botanicals Inc., 1305 Vista Drive, Grants Pass, OR 97527. 503–476–5588. Richard Alan Miller offers consulting services, specializes in the marketing and processing of herbs and spices as alternative crops in agricultural diversification programs designed for rural economic development. His markets include foods, drugs, cosmetics, and dried florals.

Daniel Parent, Senior Forester, NYS/DEC, 7291 Coon Road, Bath, NY 14810–9728. 607–776–165.

Christopher Steele, General Manager, Michigan Marketing Association, 618 North Seymour Street, Lansing, MI 48933. 517–371–2411. FAX 517–371–9089.

Bibliography

Adam, K. 1991. Information Specialist for Appropriate Technology Transfer for Rural Areas (ATTRA), personal communication with author, July.

Adams, Patrick J. 1987. Oil extraction and processing of herbs and spices. In: Simon, James; Grant, Lois, eds. Proceedings of the second national herb growing and marketing conference; 1987 July; Indianapolis, IN. Lafayette, IN: Purdue Research Foundation: 132–135.

Akerle, O.; Heywood, V.; Synge, H. eds. [n.d.] The conservation of medicinal plants. New York: Cambridge University Press.

Albright, Letha. 1989. Oriental crops for Ozark forests. Missouri Farm. March/April: 40–41.

Anon.. 1989. The forage and uses of goldenseal root. Herb Market Report 5(6): 4–8.

Anon. 1990. The market: American ginseng trends. Herb Market Report, December. p. 7.

Anon. 1991. Life, death, and yew. Harrowsmith/Country Life, January/February. p. 123.

Bathrick, R. 1988. Ginseng memo. American Agriculture, April. p. 48B.

Beyfuss, Robert L. Undated. American Ginseng Production in New York State. Cornell Cooperative Extension of Greene County.

Breeden, Paul. 1978. Wild foods: a beginner's guide to identifying, harvesting, and cooking safe and tasty plants from the outdoors. New York: Four Winds Press. 182 p.

Bye, Robert A., Jr. 1981. Quelites: ethnoecology of edible greens—past, present, and future. Journal of Ethnobiology 1: 109–123.

Craker, Lyle E.; Simon, James E., ed. 1987. Herbs, spices, and medicinal plants, Vol. 2. Phoenix, Az: Oryx Press. 255 p.

Craker, Lyle E.; Simon, James E., ed. 1989. Herbs, spices, and medicinal plants: recent advances in botany, horticulture, and pharmacology, Vol. 4. Phoenix, AZ: Oryx Press.

Duke, James A. 1989. Ginseng: a concise handbook. Algonac, MI: Reference Publications Inc.. 274 p.

Ebeling, Walter. 1986. Handbook of Indian foods and fibers of arid America. Berkeley, CA: University of California Press. 924 p.

Eichenberger, M.D.; Parker, G.R. 1976. Goldenseal (Hydrastis canadensis L.). Distribution, phenology, and biomass in an oak-hickory forest. Ohio Journal of Science. 76(5): 204–210.

Foster, Steven. Undated. The markets for native American plants: Some considerations, P.O. Box 32, Berryville, AR 72616.

Foster, Steven, ed. 1992. Herbs of commerce. Austin, Texas: The American Herbal Products Association.

Foster, Steven. 1991. Harvesting medicinals in the wild. Herbal Gram. 24: 10–16.

Foster, Steven; Dube, James A. 1990. A field guide to medicinal plants—Eastern and Central North America. Boston, MA: Houghton Mifflin Company.

Fox, Jeffrey L. 1985. Stalking and preserving U.S. wild plants. BioScience. 35: 276–277.

Freeman, Sally. 1991. Herbs for all seasons—growing and gathering herbs for flavor, health and beauty. New York: Penguin Books USA. Includes sections on herbalism and its folklore; when to cultivate and harvest herbs, how to use herbs as seasonings, herbal cosmetics, herbal fragrances; sources of seeds; gardener supplies; and a special section on modern health uses of herbs.

Fuller, Doug. [In press] Wild medicine: An overview of the U.S. native medicinal plant trade and its conservation implications. To be available from Traffic USA, 1250 24th Street NW., Washington, DC 20037.

Gibbons, Euell. 1962. Stalking the wild asparagus. New York: David McKay Company.

Hankins, A. 1988. Wild-simulated ginseng cultivation. The Business of Herbs. January/February: 4, 27–29.

Hardacre, J.V. 1962. The wildcrafters goldenseal manual. Rockville, IN: Laurence Barcus, Publ.: 1–21.

Harding, A.R. 1972. Ginseng and other medicinal plants. Columbus, OH: A.R. Harding Press.

Harrington, Harold D. 1967. Edible native plants of the Rocky Mountains. Albuquerque: University of New Mexico Press.

1988. Herbs '88. In: Kestner, Arlene K.; Buehrle, Maureen A., eds. Proceedings of the third national herb growing and marketing conference; 1988 June; [Place of conference unknown]. Mundelein, IL: International Herb Growers and Marketers Association.

1989. Herbs ’89. In: Simon, James; Kestner, Arlene; Buehrle, Maureen. Proceedings of the fourth national herb growing and marketing conference; 1989 July; [Place of conference unknown]. Mundelein, IL: International Herb Growers and Marketers Association.

HSU’s Ginseng Enterprises Inc. 1989. Company information. T6819 County Highway W, Wausau, WI 54401.

Kindscher, Kelly. 1992. Medicinal wild plants of the prairie. University Press of Kansas, ISBN 0–7006–0526–6 (cloth), $25.00; ISBN 0–7006–0527–4 (paper). $9.95.

Kirk, Donald R. 1970. Wild edible plants of the western United States, including also most of southwestern Canada and northwestern Mexico. Healdsburg, CA: Naturegraph Publishers. (Copyright Donald R. Kirk).

Konsler, T.R. 1983. Ginseng: A production guide for North Carolina. Raleigh, NC: North Carolina Extension Service.

Konsler, T.R. 1986. Woodland production of ginseng and goldenseal. Paper presented at the first national herb growing and marketing conference; 1986; Lafayette, IN. Mundelein, IN: International Herb Growers and Marketers Association.

Kowalchik, C.; Hylton, W.H. 1987. Rodale’s illustrated encyclopedia of herbs. Emmaus, PA: Rodale Press. 227 p.

March, Kathryn G.; March Andrew L. 1986. The wild plant companion. Lakewood, CO: Meridian Hill Publications.

Mead, George R. 1972. The ethnobotany of the California indians. Greeley, CO: Museum of Anthropology, University of Northern Colorado.

Medsger, Oliver P. 1939. Edible wild plants. New York: Macmillan. (Revised 1947).

Meuninck, Jim; Duke, James. 1988. The basic essentials of edible wild plants. Merrillville, NY. [Publisher unknown].

Miles, Karen. 1987. Herb and spice handbook. Norway, IA: Frontier Cooperative Herbs. 319–227–7976. Includes an extensive description of herbs and spices, oils, herb cookery, herbal crafting, body care, regulations and quality control, and a bibliography.

Miller, Richard Alan. 1985. The herb and spice markets. The Herb Market Report 1:1. February.

Miller, Richard Alan. 1985. The potential of herbs as a cash crop. Kansas City, MO: Acres USA.

Miller, Richard Alan. 1988. Native plants of commercial importance. Grants Pass, OR: OAK, Inc.

Miller, Richard Alan. 1991. A centralized processing facility for botanical cash crops. Paper available from Northwest Botanicals, Inc., 1305 Vista Drive, Grants Pass, OR 97527, 503–476–5588. 12 p. $3.

Mohney, Russ. 1975. Why wild edibles? Seattle, WA: Pacific Search.

Moore, Michael. 1979. Medicinal plants of the mountain west. Santa Fe: Museum of New Mexico Press.

Morton, Julia F. 1963. Principal wild food plants of the United States, excluding Alaska and Hawaii. Economic Botany 17: 319–330.

Morton, Julia F. 1975. Cattails (Typha spp.)—Weed problems or potential crop? Economic Botany. 29: 7–30.

Murphy, Edith Van Allen. 1959. Indian uses of native plants. Palm Desert, CA: Desert Printers.

National Research Council. 1984. Amaranth: modern prospects for an ancient crop. Washington, DC.: National Academy Press.

Niethammer, Carolyn. 1974. American Indian food and lore. New York, NY: Collier Macmillan.

Persons, Scott W. 1986. American ginseng: green gold. Pompano Beach, FL: Exposition Press of Florida, Inc.

Sievers, A.F. 1949. Goldenseal under cultivation. Farmers Bull. No. 613. Washington, DC: U.S. Department of Agriculture.

Singer, S.R. 1990. Current status of the U.S. ginseng export program. Endangered Species Tech. Bull. 15(1): 9.

Sweet, Muriel. 1962. Common edible and useful plants of the West. Healdsburg, CA: Naturegraph Company.

Thie, Krista. 1991. A plant lover’s guide to wildcrafting. White Salmon. Washington: Longevity Herb Press.

Tyler, Varro E. 1987. The new honest herbal. New York, NY: Lippincott.

Wade, C. 1983. Ginseng: Miracle healer from the orient. Kansas City, MO: Acres U.S.A.: 22–23, 31.

Walsh, Charles. 1986. Foraging in Alaska. Fairbanks, AK. [Publisher unknown].

Weil, Andrew, M D. 1990. Natural health, natural medicine, New York, NY: Houghton Mifflin.

Williams, L.; Duke, J.A. 1978. Growing ginseng. Farmers Bull. 2201. U.S. Department of Agriculture, Science and Education Administration. Washington, DC: U.S. Government Printing Office: 3–9.

Witty, Helen, ed. 1976. Billy Joe Tatum's wild foods cookbook and field guide [for mountainous Arkansas]. New York: Workman Publishing Company.

Organizations

Agricultural Marketing Service (AMS). Contact: W. H. Crocker, Room 2503–S, AMS, USDA, Washington, DC 20250. The AMS fruit and vegetable division Market News Branch provides information on nationwide terminal markets. Many of these larger markets offer up-to-date reports on fresh cut herb prices and shipment sizes. The markets list herbs as well as oriental vegetables and other specialty produce. Herbs are regularly listed at the New York, Boston, Miami, San Francisco, and Los Angeles terminal markets, but 15 other AMS reporting centers also list herbs. These are Atlanta, Baltimore, Buffalo, Chicago, Cincinnati, Columbia (SC), Dallas, Denver, Detroit, Honolulu, New Orleans, Philadelphia, Pittsburgh, Seattle, and St. Louis.

American Herb Association, P.O. Box 1673, Nevada City, CA 95959. This educational association promotes public education about herbs and herbal products, offers quarterly newsletter and source directories. Contact for current information. Individual membership $20/year, USA; $28/year, foreign.

American Herbal Products Association (AHPA), P.O. Box 2410, Austin, TX 78768. 512-320-8555. This was once strictly an herbal products manufacturers' trade group, but recently they have broadened their membership to include retailers of herbal products. This organization offers up-to-date information on the Food and Drug Administration (FDA) and other legal and regulatory issues affecting the herbal products sector of the industry. In addition, they offer advertising opportunities, a newsletter, monographs of various herbs, a membership directory, and good public relations. Contact for membership information. This organization would be an excellent information source for both manufacturers and retailers of herbal products.

The Ginseng Research Institute of America, 500 Third Street, Suite 208–2, Wausau, WI 54401. 715–845-–7300.

Herb Research Foundation (HRF), 1007 Pearl Street, Suite 200, Boulder, CO 80302. 303–449–2265. This independent, nonprofit educational and research organization is dedicated to raising funds for research and providing reliable scientific data for members, the public, and the media. It encourages research on common botanicals, folk medicines, and other herbal products. Its aim is to foster ties between the American herbal community and the world scientific community. Members may access in-depth information on herbs through HRF's inexpensive literature searches. Members also receive *HerbalGram*, the well-known quarterly that presents research reviews from the scientific literature, follows legal issues, market trends, and media coverage of herbs. This is a fine publication, a must for those with an interest in botanical medicine or research.

The International Herb Growers and Marketers Association (IHGMA), 1202 Allanson Road, Mundelein, IL 60060. 708–566–4566. This large trade organization offers membership to growers, retailers, wildcrafters, wholesalers, researchers, and extension service personnel. Offers members a bimonthly newsletter containing trade news, marketing and growing hints, technical information, and more. Membership Directory, special seminars and workshops, discounts on conference fees and trade show booth are all benefits. Excellent information source for products, suppliers, etc.

The Lloyd Library, 917 Plum Street, Cincinnati, OH 45202. 513–721–3707. This private library was founded in 1864 by John Uri Lloyd and his brothers. All were pharmacists with a deep interest in botanical medicine. Today this remarkable library contains 180,000 books and 120,000 pamphlets, many of them exceedingly rare. According to UNESCO, the library contains the world's largest collection of pharmacopoeias. They carry many hard-to-find (and extremely expensive) foreign and domestic scientific and technical journals. This is the largest botanical library in the United States. It is open to the public free of charge 8:30 a.m. to 4:00 p.m., Monday through Friday.

National Agricultural Library, USDA Reference Section, Room 111, Beltsville, MD 20705. 301–344–4479. Quick bibliographies (QB) are available on a wide variety of herbal topics including botanical medicine, herb growing, marketing, etc. These searches cover primarily current listings and are abstracted from the USDA's on-line data base, AGRICOLA, one of the world's most extensive agricultural data bases. While not absolutely exhaustive, these bibliographies are very extensive and are of value to anyone seeking current literature on herbal topics. Send a return mailing label for each QB selected. Document delivery services are also available at very reasonable prices. Contact for complete information on services/searches.

National Appropriate Technology Assistance Service, P.O. Box 2525, Butte, MT 59702. 1–800-428-2525.

National College of Naturopathic Medicine, 11231 Southeast Market Street, Portland, OR 97215. 503–255–4860.

National Wild Foods Association, 3404 Hemlock Avenue, Parkersburg, WV 26104. Contact Edelene Wood, 304–428–9590. Offers information on preparation and lore of wild foods in all 50 States.

Office of Small-Scale Agriculture, Cooperative State Research Service/USDA, Washington, DC 20250–2200. Contact: H. W. Kerr Jr., Director. This office provides information to small-scale and specialty agricultural producers. Herbs are definitely included. Offers a good handout sheet listing numerous sources and resources for the grower and marketer. Excellent source.

Produce Marketing Association (PMA), 1500 Casho Mill Road, Newark, DE 19714–6038. 302–738–7100. Can provide herb market bibliographies to nonmembers for a $20 search fee plus $10 for printouts up to 10 pages, and $1/page for additional pages. Contact for details.

The Society for Economic Botany, P.O. Box 368, Lawrence, KS 66044. International, multidisciplinary, scientific society that fosters research on economically useful plants of the past, present, and future including, of course, herbs. Members receive quarterly journal, *Economic Botany*. Individual membership, $30.

Wilderness Leadership International, Outdoor Eduquip, Box 770, North Fork, CA 93643 (advertises first correspondence course in edible wild plants).

Publications

Alternative Agriculture News, 9200 Edmonston Road, Suite 117, Greenbelt, MD 20770. 301–441–8777. Published by the Institute for Alternative Agriculture, this monthly newsletter offers news and resources for those who are interested in organic production, sustainable agriculture, etc. Membership, $15/year. Recommended for organic growers.

American Ginseng Trends published by Future Concepts, Inc., P.O. Box 1982, Wausau, WI 54402–1982.

Botanical Series is a series of booklets on plants published by the American Botanical Council and available ($1.25 per copy) from Steven Foster, P.O. Box 106, Eureka Springs, AR 72632.

The Business of Herbs, Route 2, Box 246, Shevlin, MN 56676. 218–657–2478. Contact: Paula or David Oliver. Bimonthly journal featuring interviews, marketing hints, industry news, new products, ideas, plant profiles, business tips, sources and resources for growers, retailers, wholesalers, wildcrafters, educators, researchers, artists, and designers. Ornamentals, culinaries, fragrants, medicinals, and other botanicals featured. $20/year, USA; $23, Canada; foreign, $28 (please remit in U.S. funds).

Direct-Marketing Registry: Ethical Wildcrafters & Organic Growers of Medicinal Herbs. Available for $6 from the Rocky Mountain Herbalist Coalition, 412 Boulder Street—Gold Hill, Boulder, CO 80302. 303–442–2215. Highly recommended.

Foster's Botanical and Herb Reviews, P.O. Box 106, Eureka Springs, AR 72632. 501–253–7309. Contact: Steven Foster. This quarterly reviews books, periodicals, and computer resources, both technical and popular. Reviews cover economic botany, ethnobotany, taxonomy, herb use, cultivation, etc. Of great interest to those with a scientific or commercial interest in herbs. $10/year.

Greenhouse Grower, 37841 Euclid Avenue, Willoughby, OH 44094. 216–492–2000. Horticultural trade magazine for greenhouse growers. Covers bedding plants, vegetables, ornamentals, specialty crops, etc. $12/year.

Grower Talks, P.O. Box 532, Geneva, IL 60134. 312–208–9080. Editor: G. V. Ball. Monthly trade journal for the bedding plant industry. Covers new products, new plants (ornamentals), industry notes, greenhouse production. $19/year, USA; $25/year, Canada.

The Herb Companion, Interweave Press, 201 East Fourth Street, Loveland, CO 80537. 303–669–7672. Editor: Linda Ligon. Full-color bimonthly magazine for herb enthusiasts. Covers all aspects of the herbal arts: gardening, cooking, crafting, and more. Excellent new magazine. $21/year, U.S.; $26, Canada.

The Herb Market Report, 1305 Vista Drive, Grants Pass, OR 97527. Editor: Richard Miller. Monthly newsletter for herb growers and wildcrafters. Marketing hints, crop profiles, resource reviews. $12/year. Fine resource.

The Herb Quarterly, P.O. Box 548, Boiling Springs, PA 17007. 717–245–2764. Editor: Linda Sparrowe. One of the oldest general interest herb publications in the United States. Covers all aspects of the herbal arts. Beautifully illustrated, highly artistic. Recommended. $24/year, $45/2 years.

The Herb, Spice, and Medicinal Plant Digest. Contact: L. E. Craker, Department of Plant and Soil Sciences, Stockbridge Hall, University of Massachusetts, Amherst, MA 01003. Quarterly publication with a scientific focus, covering research news, business notes, and other materials of interest to commercial herb producers and researchers. Also available from HSMPD is the very useful *Directory of Specialists in Herbs, Spices, and Medicinal Plants*. This directory lists university, extension service, and industry personnel who are specialists or researchers in various herb-related endeavors. Second edition, May 1989. Price: $6.

The Herbal Connection and *The Herbal Green Pages*, The Herbal Connection, 3343 Nolt Road, Lancaster, PA 17601–1507. 717–898–3017. *The Herbal Connection* is a bimonthly newsletter, available for $24 a year. *The Herbal Green Pages* ($15) is an annual herbal business and resource guide that includes 2,000 listings, both wholesale and retail.

HerbalGram, P.O. Box 12602, Austin, TX 78711. 512–331–8868. Editor: Mark Blumenthal. Although the *HerbalGram* quarterly is the official publication of the HRF, it is now published jointly by The American Botanical Council, a nonprofit educational organization dedicated to informing the public more fully about herbs and botanical products. Subscriptions to *HerbalGram* can be made independently. $25/year, $45/2 years.

The Herban Journal, 2346 Charlack Avenue, Overland, MO 63114. Editor: Gayle Brown. Bimonthly newsletter for herb enthusiasts covering crafting, growing, herbal products, and more. $10/year.

Herban Lifestyles, 84 Carpenter Road, New Hartford, CT 06057. Editor: Chris Utterback. Bimonthly newsletter. Covers all aspects of the herbal arts. Unique, artistic, interesting! $18/year, U.S.; $21, Canada; sample, $3 (U.S.).

Herbs!, Clearwater Communications, P.O. Box 3524, Spokane, WA 99220–3524. 509–535–1158. Full-color bimonthly magazine with a focus on medicinal herbs, herbal products, and herbology. The publication is designed for both the trade and the general reader with a serious interest in medicinal plants. Well-known writers and in-depth information. $12/year, add $5 for foreign subscriptions.

Hortideas, Route 1, Box 302, Gravel Switch, KY 40328. Editors: Pat and Greg Williams. Monthly periodical offers a roundup of horticultural news, research notes, technical, and general information. Covers all aspects of horticulture. Many items to interest the herb grower. $15/year, U.S.; $17.50/year, Canada.

The Magick Garden, 6303 Creamery Road, McFarland, WI 53558. Editor: Linda Gannon. Bimonthly journal of herbal art and folklore. A must for lovers of ancient herblore. $12/year. Sample, $2.

New Farm, The Magazine of Regenerative Agriculture, 222 Main Street, Emmaus, PA 18098. 215–967–5171. Editor: George Devault. Published seven times per year. Covers organic and alternative agricultural topics. $15/year, U.S.; $19/year, Canada.

OPD Chemical Buyers Directory is produced by Schnell Publishing Company, Inc., 80 Broad Street, New York, NY 10004–2203. 212–248–4177.

Sage Advice, The Cottage Press, Box 626, Trumansburg, NY 14896. Quarterly newsletter dedicated to herbal arts and crafts. $10.50/year.

Smith's Natural News, P.O. Box 9038, Denver, CO 80209. Editor: Ellen Smith. Quarterly newsletter dealing with herbs, nature, ecology, natural healing, and living. $8/year.

Whole Foods, 195 Main Street, Metuchen, NJ 08840–2737. 201–494–2889. Editor: Daniel McSweeny. Monthly trade magazine focusing on the needs of natural foods retailers. Lots of interesting information for sellers of herbal health and cosmetic products. Also publishes the annual *Source Directory* that includes suppliers, manufacturers, wholesalers, brokers, and publishers. An excellent resource. $30/year.

Additional Resource Persons

Robert Beyfuss, Cooperative Extension, Greene County, Mountain Avenue, HCR 3, Box 906, Cairo, NY 12413–9503. 518–622–9820.

Mike Birmingham, NYS/DEC, 50 Wolf Road, Albany, NY 12233–4253. 518–457–7370.

Anthony G. Hankins, Extension Specialist, Virginia Cooperative Extension Service, Virginia State University, Box 540, Petersburg, VA 23803. 804–524–5962.

T. R. Konsler, Department of Horticultural Science, North Carolina State University, Raleigh, NC 28732; or Mountain Horticultural Crops Research and Extension Center, 2016 Fanning Bridge Road, Fletcher, NC 28732–9216.

Mary Peddie, Rutlands of Kentucky, Box 182, Jail Street, Washington, KY 41096. 606–759–7815.

Dr. C. Richard Roberts, Department of Horticulture/Landscape Architecture, University of Kentucky, Lexington, KY 40546-0091. 606–257–3374.

Phyllis Shaudys, Pine Row Publications, Box 428, Washington Crossing, PA 18977. 215–493–4259.

Robert Wilson, Technical Specialist, Appropriate Technology Transfer for Rural Areas, P.O. Box 3657, Fayetteville, AR 72702. 501–442–9824, 1–800–346–9140.

Videos

Edible and Medicinal Herbs by Dr. Sharol Tilgner. Wise Woman Herbals, P.O. Box 328, Gladstone, OR 97027, 503–239–6573.

Edible Wild Plants by Jim Meuninck and Jim Duke with practical tips of foraging and preparation of 100 wild edible plants, medicinal herbs, and wildflowers. Media Methods, 24097 North Shore Drive, Edwardsburg, MI 49112. 616–699–7061. $18.95

Herb Publications of Regional Interest

The Herbal Gazette, Route 1, Box 105, Checotah, OK 74426. Editors: Betty Wold and Barbara Downs. This quarterly is for herb growers in the south central region (Arkansas, Missouri, Kansas, Texas). Covers all aspects of herb growing, marketing, and use with a regional focus. $7.50/year.

Ozark Resource Center, HC 3, Brixey, MO 65618. Has information on the biodiversity of the Ozarks region.

Elizir Farm Botanicals, General Delivery, Brixey, MO 65618. 417–261–2393. Specializes in seeds of Ozark native plants and Chinese medicinal plants.

Windy Pines Natural Farm, Route 1, Box 245, Dix, IL 62830. 618–266–7351. Specializes in native medicinal plants of southern Illinois.

Foster's Botanical & Herb Review, P.O. Box 106, Eureka Springs, AR 72632. 501–253–7309.

Wholesale Buyers of Botanical Products

The following buyers are listed in *Native Plants of Commercial Importance*, Richard Alan Miller, 1988, Grants Pass, Oregon: OAK, Inc.

American Mercantile Corporation, Inc., P.O. Box 240654, South Bend, IN 38124.

Aphrodisia Products, Inc., 45 Washington Street, Brooklyn, NY 11201

Bee Creek Botanicals, P.O. Box 12006, Austin, TX 78711.

Bernard Associates, Inc., 2596 Bay Road, Redwood City, CA 94063.

Bio Botanica, Inc., 75 Commerce Drive, Hauppauge, NY 11787.

Botanicals International, Inc., 2550 El Presidio Street, Long Beach, CA 90810.

E. L. Scott & Company, One World Trade Center, Suite 2347, New York, NY 10048.

Fmali Company, 831 Almar Avenue, Santa Cruz, CA 95060.

Folexco Inc., 25 Davis Street, South Plainfield, NJ 07080.

Frontier Herb Cooperative, Box 299, Norway, IA 52318. 319–227–7991.

Golden Bough Herbs Ltd., 103-326 East Kent Avenue, South Vancouver, BC V5X 4N6 CANADA.

Great Northern Botanicals Association, P.O. Box 362, Helena, MT 59624. 406–442–1623.

Herbarium, Inc., 11016 152nd Avenue, Kenosha, WI 53140. 414–857–2373.

KHL Flavors, Inc., 3702 48th Street, Long Island City, NY 11104.

The Lebermuth Company, P.O. Box 4103, South Bend, IN 46624.

Louis Furth, Inc., 52-15 Flushing Avenue, Maspeth, NY 11378.

Ludwig Mueller Company, Inc., Two Park Avenue, New York, NY 10016.

Meer Corporation, 9500 Railroad Avenue, North Bergen, NJ 07047.

M. F. Neal & Company, 1900 East Franklin, Richmond, VA 23201.

Meridian Trading Company, 1245 Pearl Street, Suite 210, Boulder, CO 80302.

Nature's Sunshine Products, P.O. Box 1000, Spanish Fork, UT 84660.

Nature's Way, 10 Mountain Springs Parkway, Springville, UT 84663.

North American Spice & Herb Company, 250 West First, Suite 201, North Vancouver, BC V7M 1B4, CANADA.

Northwest Botanicals, Inc., 1305 Vista Drive, Grants Pass, OR 97527.

San Francisco Herb & Natural Food, P.O. Box 40604, Emeryville, CA 94140.

San Francisco Herb Company, 240 14th Street, San Francisco, CA 94103.

Schonfield & Sons Inc., 12 White Street, New York, NY 10013.

Starwest Botanicals, Inc., 11253 Trade Center Drive, Rancho Cordova, CA 95670.

Trout Lake Farm, 149 Little Mountain Road, Trout Lake, WA 98650. 509–395–2025.

Turtle Island Herbs Inc., Gold Hill—Saline Star Route, Boulder, CO 80302. 303–442–2215.

The Whole Herb Company, 250 East Blithedale, Mill Valley, CA 94941.

Wilcox Natural Products, Inc., 123 West Howard Street, Boone, NC 28607.

Large Buyers of Botanicals and Extracts

The following companies are listed in the 1991 *OPD Chemical Buyers Directory* (Schnell Publishing Company Inc., 80 Broad Street, New York, NY 10004–2203, 212–248–4177) as selling one or more of the following: botanicals and extracts, cosmetic botanicals, herbs and spices, homeopathic extracts and tinctures, flavors and enhancers, gums and stabilizers, oleoresins, oils, and pharmaceuticals:

Active Organics, Inc., 6849 Hayvenhurst Avenue, Van Nuys, CA 91406. 818–786–3310, fax 818–786–3313.

Ampak Company, Inc., 481 Main Street, Suite 502, New Rochelle, NY 10801. 914–633–9800, fax 914–633–9804.

Andard-Mount (London) Ltd., West Africa House, Ashbourne Road, London, England W5 3PQ. 01–991–5150, fax 081–991–5001.

William Bernstein Company, Inc., 15 Park Row, New York, NY 10038. 212–233–5922, fax 212–233–5925.

Bio-Botanica, Inc., 75 Commerce Drive, Hauppauge, NY 11788. 516–231–5522 or 1–800–645–5720, fax 516–231–7332.

Botanicals International, Inc., Division of Zuellig Botanicals Inc., 2550 El Presidio Street, Long Beach, CA 90810. 213–637–9566, fax 213–637–3644.

Chart Corporation, 787 East 27th Street, Paterson, NJ 07504. 201–345–5554.

The Fanning Corporation, 1775 West Diversey Parkway, Chicago, IL 60614. 312–248–5700, fax 312–248–6810.

Folexco, Inc., 25 Davis Street, South Plainfield, NJ 07080. 201–769–8400, fax 201–769–8404.

Freeman Industries, Inc., 100 Marbledale Road, P.O. Box 415, Tuckahoe, NY 10707–0415. 914–961–2100, fax 914–961–5793.

Hauser Chemical Research, Inc., 4750 Nautilus Court, Boulder, CO 80301. 303–530–4750, fax 303–530–7083.

Herbarium, Inc., 11016-152nd Avenue, Kenosha, WI 53142. 414–857–2373, fax 414–857–9501.

International Sourcing, Inc., 121 Pleasant Avenue, Upper Saddle River, NJ 07458. 201–934–900, fax 201–934–8291.

Koster Keunen, Inc., Bourne Boulevard, P.O. Box 447, Sayville, NY 11782. 516–589–0456, fax 516–589–0120.

Lebermuth Company, Inc., P.O. Box 4103, South Bend, IN 46624. 219–259–7000 or 1–800–648–1123 Ext. 222, fax 219–258–7450.

Meer Corporation, 9500 Railroad Avenue, North Bergen, NJ 07047. 201–861–9500, fax 201–861–9267.

Particle Dynamics, Inc., 2601 South Hanley Road, St. Louis, MO 63144. 314–968–2376, fax 314–968–5208.

Penta Manufacturing, P.O. Box 1448, Fairfield, NJ 07007. 201–575–747, fax 201–575–8907, Santell Chemical Company.

E. L. Scott & Company, Inc., 1 World Trade Center, Suite 1313, New York, NY 10048. 212–432–0100, fax 212–432–7700.

Strahl & Pitsch, Inc., 2230 Great East Neck Road, West Babylon, NY 11704. 516–587–9000, fax 516–587–9120.

F. H. Taussig, Inc., 111 Brook Street, Scarsdale, NY 10583–5192. 914–472–6464, fax 914–472–1846.

Tri-K Industries, Inc., 27 Bland Street, Emerson, NJ 07630. 201–261–2800, fax 201–261–1432.

Weinstein Chemicals, Inc., 666 Baker Street, Suite 331, Costa Mesa, CA 92626. 714–754–0901, fax 714–754–0936.

Whole Herb Company, Inc., P.O. Box 1085, Mill Valley, CA 94942-1085. 415–383–6485, fax 415–381–1747.

Wilcox Natural Products, P.O. Box 391, Boone, NC 28607. 704–264–3615, fax 704–264–2831.

Chapter 9—Greenery, Transplants, and Floral Products

Description of the Product and Its Uses

The Pacific Northwest has probably been more active than any other region in the use of public and private forest lands to provide a diversity of decorative floral greenery, transplants, and forest botanicals for the floral market. A few of the most commonly harvested products for the floral market are mentioned below (table 9–1). The appendix has more information on several of these.

Beargrass (*Xerophyllum tenax*). Once used commercially only for making baskets, beargrass is not a true grass but rather a lily. Its long-stemmed, coarse, low-lying leaves are finding great popularity in floral arrangements. These leaves are durable and accept many natural and manmade dyes. This product has been touted by some floral greens wholesalers as the highest volume European export of all the special forest products.

Ferns. Sword fern (*Polystichum munitum*) is probably the most commonly harvested fern, at least in the Pacific Northwest. Ferns are harvested year-round, but quality during early spring is usually poor.

Evergreen huckleberry (*Vaccinium ovatum*). Evergreen huckleberry is primarily used in floral sprays. The best months for picking are May and July. One form has deep green, glossy leaves, and the other, known as "red" huckleberry, has red-tinged leaves.

Moss. There are numerous varieties of moss. Sheet moss, angel hair moss, and antler moss, for example, are purchased from harvesters in the Upper Great Lakes. The latter two types are found on dead or dying branches of tamarack or spruce in swampy areas. The best time to harvest moss is in summer, when it is more likely to be found dry. Otherwise, the needed drying process may not be worth the cost.

Salal (*Gaulteria shallon*). Long regarded by timber managers as a weed, salal is a shrubby evergreen with glossy, green, leathery leaves. It is harvested year-round, but it must be inspected for leaf deformities, spots, and insect damage before harvest. It is used by the floral market in several forms and sizes.

Scotch broom (*Cytisus scoparius*). This green plant is harvested from September through May, since buyers want straight shoots without new leaves or blooms.

Other widely used plants are baby's breath (*Gypsophila paniculata*), holly (*Ilex* spp.), and the boughs of nearly every evergreen tree species in the Pacific Northwest. These include the Pacific silver fir, subalpine fir, Noble fir, lodgepole pine, western white pine, Douglas-fir, juniper, incense cedar, and the western red cedar. Cattails, deer fern, manzanita, Oregon boxwood, pearly everlasting, and corkscrew willow are also harvested. In addition, entire trees and plants are frequently dug and sold to landscape and garden centers.

Table 9–1. Commonly harvested forest floral and greenery products for commercial markets

Agave stars	Deer tongue	Manzanita	Rhododendron
Alder tops	Dogwood	Mistletoe	Salal
Baby's breath	Dragonwood trees	Mountain hemlock	Scotch broom
Beargrass	Dwarf Oregon-grape	Mountain laurel	Smilax
Birch tops	Evergreen huckleberry	Ocotillo stems	Spanish moss
Bittersweet	Fir boughs	Oregon boxwood	Sphagnum moss
Blueberry or Rocky Mountain juniper	Galax	Pachistima	Spruce boughs
Brittlebrush	Gopherwood	Palmetto spears	Sumac
Cattails	Holly	Pepper berries	Sword and long fern
Cedar boughs	Ironwood tops	Peppergrass	Teasel
Cedars, particularly Port-Orford	Leucothoe	Pine boughs	Vine maple
Chaparral stems	Lotus pods and seeds	Princess pine	Wax myrtle
Club moss	Magnolia	Pussy willow	White birch bark
Creosote stems			

Nationwide, the most widely sold specialty forest product may be evergreen boughs used to make wreaths. Many States have large wreath-making industries. For example, in Minnesota the bough and wreath business amounts to an estimated $10 million in sales for both commercial and individual entrepreneurs. There are hundreds of local people who cut boughs, primarily from balsam and white pine, and sell them to local buyers who represent bough and wreath companies. Not all wreath making is for the holiday market, either. For example, birch branches and other materials are used to make twig-type wreaths that are sold year-round.

An example of relatively new products being harvested in the upper Midwest are birch, ironwood, and alder tops. Trees of about 3-inch diameter at the base and about 6 to 10 feet tall are harvested for their branch formation. The tops are shipped out of State, where artificial leaves are added. These trees are then used as decorative "lifelike" trees in shopping malls and hotel lobbies. Estimated production is 80,000 to 100,000 trees annually.

Some floral products that are harvested, such as pepper-grass and baby's breath, are actually considered noxious weeds in some of the States in which they grow.

The forest land being harvested may be either publicly owned or privately owned. According to the study by Schlosser and Blatner (1989), harvesters secure a high portion of their picking rights through harvest lease arrangements.

Harvesting entire trees and other forest plants for sale to nurseries and garden centers as transplants has become a rapidly growing component of the special forest products industry, particularly in the Northwest. For example, in 1991 the Randle Ranger District in Washington sold 900 transplants; by April 1992 that same number had already been sold. The most popular species have been mountain hemlock, lodgepole pine, subalpine fir, and noble fir. Vine maple (popular for its stressed appearance, which gives individual trees "character") also has been popular with landscapers. Demand for transplants of beargrass and cattail roots for nursery stock has also been increasing. Even very small seedlings can be harvested from the forest and used for various purposes—as free promotional gifts from realtors, for example.

Market and Competition Considerations

Markets have been steady or increasing for many floral, greenery, and transplant products. A 1989 study of special forest products and producers west of the Cascade Mountains in Washington, Oregon, and British Columbia estimated that total annual sales that year were over $47.6 million. The total value of the special products industry (sales plus wages and salaries, profits, taxes, etc.) was estimated at over $128 million (Schlosser and Blatner, 1989).

In Washington's Randle Ranger District alone, the annual volumes of plant materials harvested under permit with the Forest Service have included 7,000 pounds of huckleberry brush and 5,000 pounds of pearly everlasting. In the past, the Forest Service has generally sold these products under a commercial use permit system. Under the permit system, the Forest Service establishes prices at the beginning of the season as well as the conditions for the permit. (Information is summarized on a "green sheet.") Most permits have a 2-week time limit, and there are minimum purchase amounts under the permits. (For example, a harvester may be required to purchase $600 worth of beargrass.) A description of information required when filling out a specialized forest products harvesting permit and the green sheet permit conditions for forest greens and boughs are given in the appendix.

In the Randle Ranger District, harvesters pay the Forest Service between 5 and 10 cents per bunch for many of the floral products. (A bunch is equal to between 3/4 and 1 pound, depending on the plant.) The following are what buyers were paying in 1991 for these products (table 9–2).

Table 9–2. Buyers 1991 prices for specialty forest products

Item	Price/pound	Price/bunch	Price each
Beargrass	$1.00-$1.60[a]	Avg = $0.65	
Salal	$1.00	$0.90	
Ferns			3/4 to 1 cent
Scotch broom	$0.32[b]	$0.32	
Huckleberry brush	$0.48		
Moss[c]			
Sheet	$0.50		
Angel hair	$2.00		
Antler	$2.00		
Boughs			
Noble fir	$0.32		
Cedar	$0.17		

[a]Depending on the month, with December prices being highest.
[b]In September when not flowering.
[c]In Wisconsin.

Generally, buyers sort and box the various materials and then sell to one of a few large floral houses. Several small buyers may sell to the same company.

Transplants can be profitable for harvesters. The Randle Ranger District charges harvesters $1 apiece for trees between 1 and 6 feet high, and $2 apiece for trees over 6 feet high. The average price that harvesters receive for

these trees at nurseries is about $15. Trees under 1 foot are sold from the national forests for only a nickel apiece. Vine maple that the Forest Service sells for $0.50 each (and a private timber company may sell for $2.50) can be sold for $15 as well. It should be noted that the district uses these proceeds to offset needed maintenance and forest rehabilitation (for example, rehabilitation of huckleberry areas).

Success in the floral trade business generally requires emphasizing diversity and avoiding overdependence on seasonal products. A company may deal primarily in floral greens but use other products to fill the gap. Many of the products in the floral industry started out as weeds. For example, peppergrass is regarded as a weed in Florida, but the floral industry likes to use it, partly because it is unique to people not residing in Florida. Pepper berries are another example: there are huge tracts of land in Florida with invasive pepper berry trees and most landowners are glad to have people harvest them. Pepper berries are currently being shipped out of Florida by the ton.

Every area has interesting plants that grow locally. Some plants, like grapevine, grow wild in virtually every State. Most of the sheet moss used by the floral industry currently comes out of Tennessee and West Virginia. However, it also grows in upstate New York. It is possible that an entrepreneur in New York could start harvesting and selling locally grown sheet moss to wholesalers if the price were competitive. Certain grasses that can be dyed and numerous other examples of entrepreneurial opportunities exist. For example, the market for dried florals is relatively undeveloped. Many wild plants that have reached the mature, seed stage have interesting and decorative pods that can be used in dried floral arrangements.

Two notes of caution are needed. First, it is important with wild harvested floral products that an individual do a trial run to determine just how much time and expense is involved in the harvesting, drying, processing, packaging, and distribution of the product. Second, a lot of people make the mistake of pricing their product based only on what retailers are currently paying for similar products. But the price should be low enough to protect future profit margins of wholesalers as well as retailers. When this is not done, it becomes impossible to expand the business because one cannot sell to wholesalers for the same price as to retailers. If the entrepreneur reduces the price enough to interest a wholesaler, he or she must be able to immediately make up the difference in greater volume, but too often there is no way a small company can quickly produce enough to fill a large company's orders. Being able to sell to wholesalers is important because, for these types of products, the most successful entrepreneurs will be those who make their profits through volume rather than by selling at a high per unit basis. This strategy requires a commitment to building a business slowly rather than trying to "get rich quick."

Distribution and Packaging

An entrepreneur with a new idea has to find wholesalers or jobbers who handle a volume of different floral or potpourri products. The Wholesale Florist and Florist Supplies Association in Arlington, Virginia, is a potential source of information on wholesalers. However, to become a member, a wholesaler must do at least $250,000 in business.

Channels of product distribution and distribution regions of floral products from the Pacific Northwest are discussed by Schlosser and Blatner (1989). In the case of Northwestern products such as salal, ferns, and huckleberry, it was found that only 17 percent of the floral greenery being harvested was sold in the region. About 52 percent was sold in other regions of the United States. About 28 percent was exported, with the vast majority of the exports going to Europe (Walls et al., 1991). On the other hand, some products such as baby's breath and leatherleaf fern that are widely used by florists in the Pacific Northwest are actually imported from Florida or Central America.

Beargrass in particular is an important export product that is largely sold overseas to Holland and Germany. Beargrass is typically sold in boxes of 28 inches by 12 inches by 5-1/2 inches, containing 40 bunches of beargrass of about 1/2 pound each, or about 20 pounds of beargrass. Prices vary greatly according to availability and demand. But a U.S. company that sells one or two boxes a week to U.S. buyers might sell upwards of a thousand boxes a week to Europe. (In general, consumers in the United States buy about 2 pounds of floral products annually, compared to 14 pounds annually for Europeans.)

Some industry spokespersons feel that the evergreen bough market in Europe is virtually controlled by producers in Denmark. Trade barriers in foreign markets have been a major concern of U.S. evergreen bough marketers, particularly European claims of concern over disease and pest control related to fir boughs, which U.S. companies believe to be unfounded.

Indications are that exports to Europe and Pacific Rim countries would increase substantially if more efficient means of product preservation were developed for the more perishable greenery products. Boughs must not be allowed to dry out. Cedar especially will sour if not kept damp and cool. There are also indications that European buyers are increasingly demanding that all packaging materials be biodegradable.

While some in the nursery business feel that many forest transplants do not survive well or grow well in microenvironments quite different than where they grew, most large nurseries in reality will only buy from reputable, experienced harvesters who guarantee the viability of their trees, and to replace any that die. Skilled harvesters often go into an area in October, cutting back the roots of the trees that they will return to dig in the spring. They also have special techniques to reduce stress, like using burlap that has been treated with vitamin B-1 to reduce shock.

Labor and Equipment Needs

The harvesters of the greenery products in the Northwest are mostly Cambodians and Mexicans. Typically, they are self-employed, part-time seasonal workers. If the harvests occur on national forests, the harvesters are responsible for obtaining the necessary brush permits, usually from the county sheriff's office. Harvesters generally sell to a broker or buyer who checks, weighs, and pays for the products either at a buying station or at a company location. Greens are appraised and sold by the bunch, boughs by the ton, and trees for boughs on a per tree basis based on size. The company is generally required to have a State hauling permit as well.

Driers and digital scales are generally the most expensive items for a wholesaler, but they are not needed when a business is just getting started. The driers cost about $8,000 apiece and the scales cost about $900. Some wholesalers dealing with natural products use a drier originally developed for peanut farmers for drying peanuts.

Resource Conservation Considerations

Resource managers should require that holes be filled in and the area scuffed up to camouflage the filled holes. Also, managers should be aware that experienced harvesters can dig and remove a tremendous amount of plant material in a very short time. A two-member team can dig and remove one 6-foot tree within between 40 seconds and 1/2 minute. Two people can remove 200 to 250 trees in 3 hours. A family of four can pick 400 pounds of salal in 4 to 5 hours.

Poaching is still a large problem in many national forests. One special forest products specialist with the Forest Service estimated that the Forest Service is getting paid for only one-fourth of what is being removed from the public forests. Beargrass, salal, and firewood may be the most frequently poached items.

Land managers should also be aware that by selectively selling small evergreens, vine maple, or other floral products out of an area that is scheduled for a timber sale, much of the material that would otherwise have to be removed as slash from an area can be removed by harvesters, thereby benefiting both them and the public agency. It is important that the harvesters have access to the area enough in advance of the timber cutting that they can salvage as much as possible. (For example, boughs can be cut out of an area in the fall and the logging done in the spring.) The effort involved for a precommercial thinning operation can also be greatly reduced if an area is opened first for cutting Christmas trees.

Some Forest Service districts have begun using a highly modified timber sale contract called a "stewardship contract" as a mechanism to sell units of precommercial thinning size stands of Noble fir and other species to contractors under this form of contract. Both the Forest Service and the participating contractors have been satisfied with such arrangements. The stewardship contract is designed to allow the contractor to develop stands of trees for boughs, Christmas trees, and other products to suit his or her needs and to maintain the area over a 6-year period. With this longer time horizon, the contractor is able to develop an inventory or materials to fill orders as the market demands. Near the end of the contract period, the contractor is required to precommercially thin the units, which saves the Forest Service an estimated $80 to $120 an acre. The contracts themselves earn about $300 per acre, for a total earnings of nearly $400 per acre. The concept has been very successful in the Gifford Pinchot National Forest, for example, where it has been used since 1988. The region is in the process of developing a specific contract for other special forest products.

Some forest lands that are managed by State departments of natural resources are also being managed for floral greenery products. For example, the Washington Department of Natural Resources sells boughs, brush, and Christmas trees under lease or sale contracts. Leases, generally on a per acre cost basis, are the most common method of sale. Demand for brush leases has been rapidly rising. Leaseholds range from 40 to nearly 6,000 acres and annual rent averages $1.90 per acre.

Any harvester should be certain a product is (1) not on the rare or endangered species list and (2) bountiful and reproduces rapidly. Done correctly, harvesting methods applied to plants used in the floral trade amount to pruning and do not kill the parent plant. In the near term, there appears to be no large concern about overharvesting. However, it does require time for the plants to regenerate. For example, it takes beargrass about 3 years to fully grow back after the core of the plant has been cut off. As the market for floral greenery products expands, the potential may well increase for overharvesting or mismanagement of the resource. Harvesters need to be educated about the resource and their craft and be taught methods of sustainable harvesting.

Special Factors

It has been suggested that, pound for pound, special forest products may be worth more in many areas than the timber value of trees growing in the same spot. Some Forest Service personnel feel that the price the Forest Service charges for brush permits is so low that the materials are being virtually given away.

Further, it has been suggested that permits are seldom checked by the Forest Service. There is also no system to weigh the materials collected to ensure that only the amount specified in the permit has been actually harvested.

Large private timber companies that could lease land to harvesters have been slow to try it because of concern over liability for injuries to harvesters on their property. One possible solution would be for the companies to sign with a buyer network or cooperative which would assume liability for personal injury or property damage while on the private lands (Walls et al., 1991).

Many harvesters do not speak English. Harvesters must be educated about the legal process for gaining the right to harvest in specific areas owned by public and private entities, and their responsibilities in the use of public facilities. Methods must also be found to ensure better cooperation among harvesters and others who use the forests.

Research is needed on cultivation techniques, the control of leaf diseases, and finding ways to make local greenery more appealing to regional consumers. Colleges and universities also need to get involved in researching claims such as those affecting the export of evergreen boughs to Europe.

Profile

Don Fineout is owner of Natural Crafts, Inc. of Williston, Florida, a supplier of a wide variety of products to potpourri and floral markets. Although the business started with virtually nothing only 5 years ago, it has grown to become a multimillion dollar company, with $300,000 to $400,000 in equipment, employing 35 people, and shipping materials all over the world. In 1991, the company had a 322 percent increase in business.

The company has been especially successful in the floral trade. They have been able to become cost competitive with overseas floral prices by keeping labor costs competitive, by focusing on volume, and by achieving cost efficiencies in packaging and shipping. Their company is the largest UPS shipper in their 11-State district.

Natural Crafts is currently the largest shipper of Spanish moss in Florida. Numerous other Florida products are shipped, including palmetto spears, peppergrass, dragonwood trees, wax myrtle trees, hickory nuts, date nuts, lotus seeds, lotus pods, pepper berries, poke root, and deer tongue. A few products, like sheet moss, are harvested in other States and shipped to them for wholesaling. The company also sells grapevine wreaths produced locally out of natural Florida grapevine.

Local harvesters are encouraged to bring in interesting and abundant materials that have potential value to the potpourri and floral markets. If there is sufficient quantity available, samples are sent to numerous potential distributors. Distributors are always looking for new and different natural products to offer retailers. If there is interest, the company can usually sell a large volume of the product. As an example, Natural Crafts recently introduced hickory nuts to the potpourri industry. The market expanded from nothing to over 30,000 pounds of hickory nuts in just 1 year.

The company's harvesting is done by local people all around the State. Many of the harvesters have permission to harvest from private lands on a regular basis. They are paid on the spot for what they bring in. For some, it is an important source of supplemental income. But for many, it is the family's only source of income. A typical family might bring in 1,500 to 2,000 pounds of Spanish moss a week. The company pays 20 cents a pound for the moss and the family is able to make $300 to $400 a week. A number of these are Mexican families who have had a hard time finding work between farm jobs. Some are transients, but others have been harvesting for the company for years.

The company deals in very large volumes. Natural Crafts annually ships 10 tons of poke root, 2,000 tons of Spanish moss, and 30,000 to 40,000 tons of deer tongue. They can sell as many hickory nuts, lotus seeds, and many other products as harvesters bring in. Products are also shipped to Italy, France, Belgium, Holland, China, and Japan. In 1990, an estimated 20 tons of peppergrass were sold to Germany.

Mr. Fineout works entirely through distributors and sells to 45 different private labels. The company has never once needed to advertise. Dealing through distributors is preferable to dealing directly with retailers because they are paid by the distributor rather than by each of 200 retailers. Also, the distributor is in a position to know the customer a lot better.

Mr. Fineout feels that any area in the country has numerous naturally growing or agricultural products that, if looked at in a new light, probably could be harvested, processed, and sold to the flora and/or potpourri markets if prices were kept realistic.

Considerations for a Rural Development Strategy

One important component for a development strategy to add value to floral products would be to systematically work to educate the floral industry about the different uses of natural products. Floral industry design schools are strong determinants of future demand in arrangements. A marketing effort aimed at these institutions would be very important to the long-range strength of these products in the market. At the same time, close coordination would be needed between the harvesting process and the floral industry to be certain that a material is not being promoted for arrangements during a time of low supply in storage or in the field.

Information on how to cultivate private lands for materials suitable for the floral industry is needed by small timberland owners. There is little literature available on how to grow many of these plants and what sort of productivity to expect in different areas.

An infrastructure conducive to the harvest and storage of floral greenery is needed in conjunction with any strategy. During high periods of harvest, especially for seasonal products, available storage can be quickly filled. The development of hydrocooling and cold storage stations throughout a forest region should be investigated.

Floral greenery houses and harvesters could benefit from a cooperative to help improve the quality of the product and thereby generate higher prices for the producer and less waste for the buyer. At the same time, harvesters cannot concentrate on a single crop because of the seasonal nature of special forest products. A cooperative would allow producers a facility in which to sort and grade material, pack it, and store it for shipping during months of low supply and high demand, and thereby maintain a steady supply of product and a more stable income. A cooperative would also allow a vehicle to develop value-added industries that would put more money back into the rural communities. Or, materials could be "branded" to ensure name recognition of high-quality goods or services provided by a cooperative.

The stewardship contract would be one mechanism that could be expanded to realize more value for floral industry products. The stewardship contract is used for a longer-than-normal period, typically 6 years, and the bidder has the opportunity to do whatever he or she would like within the 6-year period to manage the materials. The contract also specifies the residual conditions required on the ground, (for example, preference to certain species such as Noble fir) at a specified spacing. The Forest Service has received up to $300 an acre for stewardship contracts governing combination boughs and trees, and is saving about $100 an acre in labor costs for the thinning. The contract system is being expanded to include harvesting of floral greens such as salal and ferns, but it has not been nearly as attractive or as profitable as the Noble fir business. Leasing 10 or 15 acres for about 12 years to individual households to grow and harvest many of these species is being considered.

The use of traveling educational and marketing exhibits about such specialty agroforestry products as floral greenery has also been recommended (Walls et al. 1991). These displays could be used at trade shows, fairs, and seasonal events to create a diverse and multicultural demand for a wide range of agroforestry products. More trade shows and educational workshops on cultivation, harvesting techniques, and marketing would also benefit the industry.

Finally, established product grades are needed for many special forest products. These would make appraisal of raw material easier.

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Bibliography

Budd, W.W.; Duchhart, I.; Hardesty, L.H.; Steiner, F., (ed.). 1990. Planning for agroforestry. Papers presented at an international symposium held at Washington State University, Pullman, on April 24–27, 1989, Elsevier Science Publishing Company, Inc., New York, NY. [Page nos. unknown].

Buhaly, Joseph G. 1981. Harvesting evergreen brush and ferns. Extension Bulletin 0721, Cooperative Extension, Washington State University, Pullman, WA.

Blatner, Keith A.; Schlosser, William E. 1990. The special forest products industry 1989. Information Series No. 39. Available from the Impact Center, Washington State University, Hulbert 104, Pullman, WA 99164–6214. 509–335–6653.

Drake, Elizabeth; Beltran, Delana. 1983. Directory of forest products. Pullman, WA: Washington State University Cooperative Extension.

Edsall, Marian S. 1985. Roadside plants and flowers. The University of Wisconsin Press, Madison, WI.

Karel, Leonard. 1973. Dried grasses, grains, gourds, pods, and cones. The Scarecrow Press Inc., Metuchen, NJ.

Oregon State University Cooperative Extension Service. 1963. Woodland handbook for the Pacific Northwest: a guidebook for Pacific Northwest woodland management. Oregon State University, Corvallis, OR.

Schlosser, William; Blatner, Keith; Chapman, Roger. 1991. Economic and marketing implications of special forest products harvest in the coastal Pacific Northwest. Department of Natural Resource Sciences, Washington State University, Pullman, WA.

Silber, Mark; Silber, Terry. 1987. The complete book of everlastings: Growing, drying, and designing with dried flowers. New York: Alfred A. Knopf, Inc..

USDA Forest Service. 1991. Categories of special forest products. U.S. Department of Agriculture, Forest Service, Olympic National Forest, Olympia, WA.

Walls, James; Freed, James; Myer, Joel; Crimp, Peter; Freed, Beth; Foseide, Julie; Coots, Jody. 1991. Agroforestry research project 1991. Cooperative Extension, WSU/Mason County, 9 Federal Building, Shelton, WA 98584. 206–427–9670.

Resources

Canadian Sphagnum Peat Moss Association, 460 Park Avenue South, Dept. FG, New York, NY 10016.

Archie Clapp, Director, Wholesale Florist and Florist Supplies Association, 5313 Lee Highway, P.O. Box 7308, Arlington, VA 22207. 703–241–1100.

Floral and Nursery Times, 629 Green Bay Road, Wilmette, IL 60091. 708–256–8777. Trade newspaper.

Florists Review Magazine, 3641 Southwest Pass, Topeka, KS 66611. 913–266–0888.

Flower News and *Floral Mass Marketing*, 549 West Randolph Street, Chicago, IL 60661. 800–732–4581. *Flower News* is the weekly publication for the floral industry; *Floral Mass Marketing* is a bimonthly publication directed to the floral and nursery product buyers at supermarkets, discount stores, variety stores, and top volume garden centers, as well as their wholesale suppliers.

Ingeborg Reed, Minnesota Everlasting Cooperative, 301 Pineywood Lane, Carlton, MN 55718. 218–384–3702.

Supermarket Floral Magazine, 7950 College Boulevard, Overland Park, KS 66210. 913–451–2200.

Sample Buyers

A Moment in Time, Botanicals, 9865 Mesa Rim Road No. 208, San Diego, CA 92121. 619–546–3111, fax 619–546–3110. Manufacturer of air-dried roses, peonies, coxcomb, and freeze-dried flowers. Tina Ellis, Owner.

American Oak Preserving Company, P.O. Box 187, North Judson, IN 46366. 219–896–2171, fax 219–896–3055. A variety of gyps, painted items, dyed and preserved foliage, wreaths, eucalyptus, bouquets, accent items, and new decorative product line. Charles K. Vorm, President.

Apache County Dry Goods, 1106 Second Street No. 195, Encinitas, CA 92024. 619–943–9369, fax 619–436–7158. Natural tree trunks, poles, and branches for the art tree and display industries, painted line, and natural grass. Craig Arnold, Owner.

Appalachian Root & Herb, Inc., 37 Center Street, Rainelle, WV 25962. 304–438–5211, fax 304–438–5211. Natural green sheet moss, dyed preserved lycopodium and reindeer moss, Spanish moss, grapevine wreaths. A.T. “Tim” Thomas, President.

Arty Imports, Inc., 3004 Irving Boulevard, Dallas, TX 75247. 214–630–7232, 800–527–0015, fax 214–951–7349. Handwrapped and poly-stem flowers, freeze-dried and parchment flowers, foliage sprays and vines, greenery and flowering plants, cactus, fruit, vegetables, berries, poinsettias, holly, PVC Christmas trees, wreaths, garlands, picks, mushroom birds, dough flowers. Don Rosenbaum.

Brush Across Texas, Dameron Manufacturing Corporation, 201 West Wall, Suite 401 East, Midland TX 79701. 915–699–1118, 915–682–5911, fax 915–684–8023. Bleached, preserved, dyed fillers: gypsophelia, German statice, broom bloom, yarrow, lapidium, wheat, pine cones, pods. Rodger S. Dameron, President.

Colorado Evergreen Florist Brokerage, Inc., 1120 North Lincoln Avenue, Loveland, CO 80537. 303–667–7550, 800–388–5459, fax 303–663–2276. Incorporate all natural and dried materials including dried flowers, preserved flowers, foliage, moss, natural and preserved trees, and wreaths. Jan K. Earle, President.

Horticultural Sales Company, 2059-I Blount Road, Pompano Beach, FL 33069. 305–975–0822, fax 305–977–0611. Rattanware—natural, painted; Christmas—wicker, vines, pine cones, wreaths; dried foliage—pods, mosses, oak leaves, cattails, baby's breath, statice, mushrooms, eucalyptus; trees—natural trunks, palm, bamboo, topiary, canvas; pottery—handpainted earthenware, large stoneware. Marc L. Cummins, President.

Meadowland Floral, Inc., P.O. Box 770440, Cleveland, OH 44107. 216–741–4499, fax 216–741–9299. The "Meadowland Creations™" line of natural dried floral decoratives; the exclusive "Four Season Wreath Program," "Amish Country" wheat decorations; cornhusk wreaths, eucalyptus bushes, table arrangements, swags, and a variety of dried floral materials; "Best Bow™" hand-tied Christmas bows in waterproof red velvet, traditional plaids, and contemporary fashion colors. Steve Zupan, President.

Mirsky, Inc., P.O. Box 874, Beaverton, OR 97075. 503–628–3167, fax 503–628–0647. Dried flowers, preserved foliage, herbs, roses, hydrangeas, wildflowers, greens; "EnviroPak"—the natural wrap. Helen Mirsky, President.

Quality Growers Floral Company, Inc., P.O. Box 1640, De Leon Springs, FL 32130. 904–734–3433, fax 904–734–0910. Moss. Mark Wickham, Owner/President.

Timber Stand Improvement Stewardship Contract

RANDLE RANGER DISTRICT
GIFFORD PINCHOT NATIONAL FOREST

The Randle Ranger District of the Gifford Pinchot National Forest has been testing a new concept of Timber Stand Improvement. So far, the district has sold 19 units of precommercial thinning size stands of Noble fir and other species totaling 884 acres to 10 different contractors for a total price of $252,337.68. The stewardship contract is designed to allow the contractor to develop stands of trees for boughs, Christmas trees and other products to suit his/her needs and maintain the area over a longer period of time; in this case for six years. Near the end of the contract period the contractor will be required to precommercially thin the units. Not only is the idea favorable to the Forest Service because the thinning is accomplished and revenue received, but it is favorable to the contractor because they can develop an inventory of materials to fill orders as the market demands.

Normally, precommercial thinning costs the Forest Service $80-120 an acre. Using this highly modified version of the 2400-3 Timber Sale Contract, an average earnings of nearly $300.00 per acre has been realized and the costs of precommercial thinning have been avoided, which makes the total saving nearly $400 per acre. Receipts from the contract are distributed as normal timber sale receipts. (The 2400-3 Contract is less than ideal for this type of operation, but it has proved to be workable in lieu of a better alternative.) The potential for even greater returns are certainly available if the unit selections are carefully made prior to sale. This concept should have a wide application throughout the range of Noble and Shasta red fir areas in Washington and Oregon once approved for operational use in the Forest Service.

For additional information, contact: Jim Riley, Randle Ranger District, Gifford Pinchot National Forest, Randle, WA 98377 or call (206) 497-7565.

Green Sheet Permit Conditions[a]

FOREST GREENS

* Quantity listed below is accepted by permittee as final.
* This sale is final and not subject to refund.
* State fire laws are applicable.

No debris to be left in the road.
Do not plug ditches or culverts.
Debris will be scattered outside of road surface, ditchers, top and bottom of fill or cut bank to 5 ft from water mark on stream.
Debris will be scattered outside of road surface, ditches, fill or cutbank, and 5’ above water mark on stream.

This permit must be in purchaser’s possession when cutting or transporting Forest Products.
Transporting vehicle must contain a valid permit.

Hauling permit #31453453

Vehicle License # Make Year

Any contract violation will result in contract termination.

No products to be removed within 200 feet of roads or campgrounds.
No picking of brush up to 50 feet from roadway.

1 bunch = 7/8 pound
1 sack = 2 bushels
Ferns 1 bunch = 50 pounds

Pack out all garbage

Product removal areas are non-exclusive to one Purchaser.

Purchaser will furnish Forest Service with receipts for bunches/sacks sold.

[a]Randle Ranger District, Gifford Pinchot National Forest

BOUGHS -

* Quantity listed below is accepted by permittee as final.
* This sale is final and not subject to refund.

Boughs may be cut only from the lower half of each tree.
Boughs need to be cut in bottom 1/3 of crown, (leave 3" stub) middle 1/3 of crown. Boughs may be tipped (18-24").
No cutting on trees under 8’ tall.
On trees over 15', no cutting on top 1/3, tipping only on middle 1/3, must prune to 3" on bole on bottom 1/3.
On trees over 15 feet, no cutting on top 1/3; tipping only on middle 1/3; at least one fork shall be in each branch cut and no cuts made closer than 18' on lower 1/3. Tipping is defined as cutting 30 inches or 1/2 of limb length, whichever is less.
On trees 8-15 feet, tipping only on bottom 1/2 of tree.
Tipping is defined as cutting 30 inches or 40% of limb length, whichever is less.
Tip prune lower branches. Lower third of crown only.

Do not climb in trees.
No felling or climbing of trees.

No debris to be left in the road.
Do not plug ditches or culverts.
Debris will be scattered outside of road surface, ditches, top & bottom of fill or cut bank & 5 ft from water mark on stream.
Debris will be scattered outside of road surface, ditches, fill or cutbank, & 5 ft above water mark on stream.

No cutting with chainsaws.
Cut only with clippers or saw.

No cutting of white pine or within 200 feet of developed campground or trail.

* State fire laws are applicable.

This permit must be in Purchaser’s possession when cutting or transporting boughs.
Transporting vehicle must contain a valid permit.

Hauling permit #31453453

Vehicle License # Make Year

The Forest Service (persons name and phone number) will be notified before cutting begins and thereafter notification will be made on a daily basis as to cutting locations.

Hauling only between 7:30 AM - 4:30 PM - Monday through Friday.

Any contract violation will result in contract termination.

Directory of Forest Products Including Fern, Evergreen, Huckleberry, Moss, Salal, Scotch Broom

Acknowledgements

We wish to thank several individuals whose interest and contributions have resulted in a directory which not only supplies useful information about minor forest products (also known as specialized forest products), but is also up-to-date with respect to personal safety, practical instructions for acquiring maps and permits, and covers the legal requirements to harvest such products.

Dick Moulton of the WSU/Grays Harbor Cooperative Extension was extremely helpful in supplying basic reference materials, and insightful suggestions. His contributions were valuable in forming the core material of the directory.

James Freed of the WSU/Shelton Cooperative Extension was instrumental in pointing out the potential problems of those who will use the directory with respect to safety, and possible violations of law.

Bob Tanner of the Simpson Timber Company took a more than ordinary interest in the creation of this directory. His expertise and understanding of the material were decisive in the handling of permit and legal data.

Dale Mattson of the Mason County Sheriff's Department contributed detailed information concerning the legal aspects of forest products harvesting. His perspective added greatly to the credibility of the directory.

Doug Scoggins of the Timberlands Patrol, Grays Harbor County Sheriff's Office supplied current legal definitions applicable to minor forest products. Additionally, he stressed the importance of proper training in land navigation and suggestion on how "not to get lost" in the forest.

Jim Hillery of Weyerhaeuser Company was helpful in his general evaluation of the material and brought to our attention the existence of Firewood Finders, an organization which facilitates getting firewood permits.

If the following material manages to be more than simply helpful, it is due to the interest of the above individuals.

INTRODUCTION

Collecting forest products can be economically and personally rewarding. There are some basic principles to bear in mind, however, in order to carry out these activities legally, safely, and in accordance with sound ecological practices.

No forest products operation can--begin until one has obtained a permit for doing so. For step-by-step instructions on how to do this, turn to the next page.

Only such items as mushrooms, berries, and cones or seeds do not require a permit. All others, including salal, huck, pulpwood, firewood, cascara bark, moss, ferns, plug poles, and boughs do require permits.

Once the legal requirements have been met, then the remaining concerns are basically:

1) Learning how to effectively collect products

2) Learning how to navigate in the woods in safety

3) Learning how to harvest these products with least damage to the land

It is not possible to overstress the importance of practicing GOOD ECOLOGY. Simply put, if one does not show respect for the areas in which he works, the likelihood of being able to come back to the same place the next year is greatly diminished. If you violate the woods, you have destroyed not only yours and other people's future income, you have destroyed a beauty that cannot be easily replaced.

GOOD PICKIN'

Elizabeth A. Blake
and
Delana M. Beltran

1983

INSTRUCTIONS FOR
OBTAINING A PERMIT

STEP I In order to obtain a permit it is necessary to know the legal description and owner of the land on which harvesting will take place. To get that information, the following should be done:

A. Purchase a METSKER'S MAP. These maps are available at sporting goods stores, Benson Office Supply in Aberdeen, The Vidette newspaper office in Montesano, and other locations as well.

There are two kinds of such Metsker's Maps, the County and the Township maps. The county map gives a larger overview of the county under consideration than does the township. It is suggested both be purchased, for the township map will give ownership and a better legal description. The cost of such maps presently ranges from $3.00 to $4.00.

B. If you desire great detail of the area in which you wish to work, then the Section map is necessary. These are quite expensive, but are available to study at the following locations without cost:

WSU/Grays Harbor Cooperative Extension
Montesano Court House
Montesano, WA.

Grays Harbor County Planning Office
Montesano Court House
Montesano, WA.

STEP II If it has not been possible to obtain an exact legal description and legal owner's name from Step I, then the Assessor's Office will have such information. This office is also located in the Court House in Montesano. After you have located the exact area intended for harvesting on the Metsker's Map, then a visit to the Assessor's Office will reveal the legal description and landowner's name required for a permit.

STEP III Once you have the name of the legal owner, then a visit to the owner's local office is necessary to obtain a permit.

Normally large timber companies have permit forms on their premises, although sometimes it is necessary to first get a permit form from the local sheriff's office and then take it to the legal owner. You will then give the required information as to the precise location of the area in which you intend to harvest forest products.

IF THE LANDOWNER DOES NOT ALREADY HAVE THE LAND IN QUESTION UNDER PERMIT, OR IF NO OTHER REASONS EXIST TO PREVENT YOUR HARVESTING A SPECIFIC PRODUCT, THEN HE WILL SIGN YOUR PERMIT. SOME FEES ARE COLLECTABLE AT THIS TIME.

Next, with the signed permit in hand, a visit to the sheriff's office in the county where the land is located is required. The sheriff will require proof of identity and other information. If these requirements are met, he will then validate the permit.

STEP IV It is important to carry the permit on one's person at all times, so that if a harvester is asked to prove his right to be on certain land, or his right to transport forest products is questioned, the harvester has means of proving his right to do SO.

NOTE : The preceding information is specific to Grays Harbor County; in other counties office locations may be obtained from the telephone directory.

REFER TO THE SPECIALIZED FOREST PRODUCTS ACT IN THE APPENDIX OF THIS DIRECTORY.

SAFETY TIPS

I. CHOOSE YOUR COMPANIONS. Your life could depend on those with whom you go into the woods to work. If they are dependable, and in good health, they will be able to help you if an emergency arises.

II. BEFORE LEAVING HOME to go into the forest to work, TELL SOMEONE. Tell that person 1) Who is going, 2) Where you're going, 3) When you'll be back, 4) What kind of transportation you are using to go in.

III. TAKE ALONG A SMALL EMERGENCY KIT which includes some or all of the following items: food, water, matches, bandages, a light plastic tarp, flashlight, compass, a candle, and extra clothing. If care is given to the selection and packing of these items they will constitute only a small pack, which can be carried on the back.

IV. WEAR GOOD BOOTS in the woods. Often these can prevent twisted ankles or a broken leg. Other clothing should be selected which is loose fitting as well as versatile for use in different kinds of weather.

V. LOOK BACK OFTEN once you're in the forest, and study the route along which you've traveled. Mentally mark junctions in the trail and remember any significant landmarks. If it is advisable, such as in mushroom picking, to separate in order to not cover the same ground, then call to your companions from time to time, locating their position by sound. Stay within hearing distance of companions.

VI. OBSERVE NATURAL COURTESY AND THE RIGHTS OF OTHERS. If you encounter other people in the forests engaged in the same activity as yourself (in non-permit activities), be pleasant. If you meet with a hostile attitude you are very likely encroaching on someone's "territory". In such cases you should leave that area to avoid any difficulty.

SAFETY TIPS (Continued)

VII. IF YOU DO NOT SEE ANYTHING that you can positively recognize . . . . . YOU ARE LOST. The next thing you should do is sit down and think. Retrace in your mind every step you have made, up to your present location. By sitting you are conserving vital energy. By thinking it out, the mistake is usually remembered and the trail is found.

VIII. IF THE RIGHT ROUTE BACK IS NOT FOUND then plan to spend the night outdoors. Make camp early, near water if water is to be found. Gather ten arm-loads of firewood. Put dry insulation of some kind between you and your clothing. If you've brought extra clothing, put it on. Eat some of the food you have brought. Devise a make-shift tent with the plastic tarp in your emergency pack, then light a fire in a safe manner. Keep the fire burning during the time you're lost, its smoke will draw attention.

If you are injured, or still lost the next day, improve your camp and wait for a rescue party.

If someone in your party becomes lost, contact the Timberlands Patrol, Search & Rescue Section, Telephone: (206) 249-3711.

F O R E S T P R O D U C T S

NOTE: Physical descriptions will be given for select products only. Consult the appropriate buyer in order to view samples of the product and get detailed instructions on the quality desired for products not described.

BARK (Cascara):

DESCRIPTION: The Cascara is a bushy tree, and the leaves tend to cluster. These leaves are somewhat oval in shape and are finely notched. They are a glossy green on top, and pale green underneath. The bark of the tree is light gray, mottled with a darker gray color. Although it has green flowers in the spring, these are not too noticeable, but the blue-black berries of late summer and fall are quite showy.

GENERAL INFORMATION: The bark of the cascara tree is collected during the growing season when removal is easy. Bark should come off tree with ease, and the underneath side be a bright, golden yellow color. It should be dried quickly in the sun to avoid mildew. Companies will sometimes buy the bark undried, or "green", but the price is quite low. After it has been dried (a couple of days in the sun will usually be sufficient) then it should be put into gunny sacks and crushed. State law requires that no tree be harvested until it is first cut down, leaving at least a six inch stump.

Cascara bark requires a permit from the owners of the land on which the trees are located. When trees are located, then go to the owner, and request a permit. There will be a small charge for such land use.

OTHER INFORMATION: Price varies from year-to-year. In 1983 it brought .35 per pound dried, and .10 per pound "green".

SEASON: When sap begins to run: between May and September.

BERRIES (WILD):

(BLACKBERRY)

DESCRIPTION:

(Trailing blackberry): This berry has a large, elongated fruit with a delicious flavor. Leaves are alternate and consist of three leaflets usually. Flowers are white and have five petals with green sepals (a small, modified leaf) beneath. At first the fruit is hard and green, changing slowly to red, and when ripe becomes glossy black.

(Himalaya blackberry): It has a larger fruit than the "Trailing" blackberry, and also has larger leaflets in alternate arrangements of three on each leaf, which are coarse-toothed on the margins. The stems are woody, and have stout thorns. Flowers of this berry are white. Later, green berries appear, then turn red, and when ripe are a purplish-black.

(Evergreen blackberries): These may be distinguished by their reddish stalk and quite pointed leaves. The "Evergreen" is large, about the same size as the "Himalaya", but usually not as sweet.

GENERRAL INFORMATION: Many restaurants and private households buy blackberries for their excellent flavor to use in desserts or jam. The usual procedure for selling the berry is to go from door-to-door with the berries. It is only the large Himalaya or Evergreen varieties which fruit in late summer or fall that are bought commercially.

OTHER INFORMATION: Call the buyer (see index) before taking berries to them. Some years they do not purchase berries. The price will also vary from year-to-year, and at times, during the season as well.

SEASON: The small spring blackberry ripens about June, while Himalaya or Evergreen variety ripens late summer and early autumn.

BERRIES (Continued):

(HUCKLEBERRY)

DESCRIPTION: Huckleberries vary in form from a low vine-like bush to upright shrubs. There is a "blue" huckleberry and a "red" huckleberry. As a rule the "blue" is found at higher elevations, but can occasionally be found at sea level. The leaves are small, alternately arranged, dark green on top and lighter beneath. Flowers are urn-shaped and are either pinkish or white.

GENERAL INFORMATION: There is a limited sale for these berries to resorts and areas catering to tourists. At times, a single mountain restaurant will take two or three hundred gallons, but such instances are rare.

SEASON: It is found in the Cascade, Siskiyou, and Blue Mountains where it ripens from July into September, depending on altitude and season.

BOUGHS (CHRISTMAS):

DESCRIPTION: No description is given for boughs. Go to your buyer in advance to view samples of each variety.

GENERAL INFORMATION: Boughs are gathered for ornamental purposes; they are used in making wreaths and other decorations used during the Christmas Season.

OTHER INFORMATION: Each buyer (see index) has their own specifications as to type and condition of boughs they will purchase. Price, particularly, not only varies from year-to-year, and within a single season, but will also vary from buyer to buyer. Therefore, the following information is general, and a visit to the buyer with whom you intend to do business is absolutely recommended prior to starting your bough operation.

(Blueberry juniper):	Should be healthy and green with blueberry on it. Presently averages about $ .21/lb.
(Douglas fir):	Should be healthy and green, presently averages about $ .08/lb.
(Incense cedar):	Should be healthy and green with a yellow blossom on it. Presently averages about $ .30/lb.
(Jack pine):	Should be healthy and green, presently averages about $ .10/lb.
(Noble fir):	Should be healthy and green, presently averages about $ .20/lb. Some buyers of this product contract out and have their own cutters located in high altitude areas.
(Port Orchard cedar):	Should be healthy and green with no dead needles. Price varies between $ .12/lb to $ .21/lb.
(Princess pine):	Should be healthy and green, presently averages aboaut $ .14/lb.
(Red cedar):	Should be healthy and green, presently averages about S .12/lb.
(Silver Tip):	Should be healthy/green. $ .14/lb.

SEASON : October 1st to December 10th.

CONES:

DESCRIPTION: No description is given because a wide variety of cones are bought for the purpose of Christmas ornament. Call buyer (see index) to determine whether cones are presently being purchased, and if so the type desired.

OTHER INFORMATION: The PONDEROSA cone, which is found mostly in Eastern Washington, Oregon, and Northern California, is usually saleable, the average price being about $ .01½ each.

SEASON: Spring.

FERN:

DESCRIPTION: "Sword" fern is the most commonly bought variety of fern, however, discuss the possibility of other kinds with the buyer for there is an occasional demand for additional varieties. "Sword" ferns are single stems surrounding a root core, and many such stems will form a clump, or cluster. The distinguishing feature of the "sword" fern is that each leaf is composed of many individual leaflets, each having a lobe at the base of the stem.

GENERAL INFORMATION: These ferns are to be found throughout our southwestern Washington area. Their habitat is almost any damp, shady place, but normally will not be prolific where salal is dominant. It is important to bear in mind that although ferns may be found year-round, the condition varies greatly. Do not, for example, begin to pick fern too early in the spring, for the tips are too tender and the fern will wilt (curl) before reaching the buyer.

OTHER INFORMATION: Buyer's specifications and prices will vary slightly, but the following general information may be used as a guideline:

(Sword fern): Fern should be green and healthy, and about arm's length (26" to 27" long). It should not have bug chewed areas on it. There should be a minimum of seeds; buds on the back side. 51-52 blades to a single stem.

Some buyers prefer bunches of only 25 stems. For this the price averages $ .28/bunch.

Other buyers want 50 to 52 stems to a bunch. For this size bunch the price presently ranges between $ .45/bunch and $ .55/bunch.

(Long fern): This fern should be green and healthy, and measure 30" in length. Don't strip buds.

SEASON: All year round (early spring normally not good)

FIREWOOD:

GENERAL INFORMATION: A permit is required for firewood and these may be obtained through the following agency:

Bob Matthews
FIREWOOD FINDERS, INC.
406 Security Building
Olympia, WA. 98504
(206) 786-1515

Most, but not all, landowners allowing the harvesting of firewood utilize Firewood Finders for the purpose of assigning permits. The necessary information required to get a permit may be determined by calling Firewood Finders before going into their office. Both private and commercial permits are handled through this agency.

OTHER INFORMATION: Firewood is generally sold by the cord, the dimensions of which are shown below:

a unit of firewood equal to
128 cubic feet in a stack
measuring 4x4x8 feet.

Dry firewood brings better money than green firewood. Another factor effecting the price of firewood is the location in which it is sold. For example, in Seattle, or other large cities, firewood brings a higher price than in small towns where residents can more easily obtain wood themselves from nearby forests. In 1983 the price varied from $50.00 per cord in more rural areas to $75.00 per cord in urban areas of Washington.

HUCKLEBERRY (HUCK):

DESCRIPTION: No description is included. Consult the buyers (listed in index) for specifications.

GENERAL INFORMATION: Huckleberry is found throughout the southwestern Washington area. This product is used in floral sprays, and unlike picking "Sword" fern (which requires quite a lot of skill if done right), "huck" can be picked by most anyone. The "huck" plant varies in size from two or three feet in the open to fifteen or twenty feet in the shade. Land for picking "huck" must be obtained through permit.

OTHER INFORMATION: Buyer's specifications and prices will vary slightly, but the following information may be used as a guideline:

(Huckleberry): It should be flat, deep green in color, and have no bug bites. Additionally, it should have no berries or blossoms, nor be coated with salt spray. Avoid black spots. Length differs according to buyer, but ranges between 18" and 30" (check buyer to determine length he wants). Price varies from about S . 43 for l-5/8# bunch to $. 60 for l-3/4# bunch.

("Huck" Tips): Each stem should have 5 good leaves and a 3" stem, and be both healthy and green. Price for tips is approximately $ .35 per bunch, with 32 stems in each bunch.

(Papoose "huck"): This is the small variety and should be 18" in length, green and healthy. It averages about $ .40 for a l-3/4# bunch.

SEASON: Huckleberry may be picked all year round, but the best season for top quality "huck" is between July 1st and May 10th (avoid mid-May and June).

MOSS:

DESCRIPTION: There are numerous varieties of moss, and generally, only one variety is purchased commercially. It is imperative that the buyer be consulted before deciding to pick moss so that samples may be examined.

GENERAL INFORMATION: Moss suitable for sale is best found in damp environments, like swamps. In such places the moss grows thick and green allowing pickers to fill bags quickly and consequently make higher earnings.

Moss should always be dry before taking it to the buyer for if it is wet, or damp, the buyer will refuse it. Because of this, summer is the principle season for picking moss. Even though collecting moss is in itself easy, the fact that the work is often performed in swampy areas means one must contend with insects and humidity.

Care should be given to work out a system to get your bags out of the area once they're full, for two people working for four hours can normally fill forty or more bags. This can present a problem when it is time to quit if some thought has not been given to stockpiling full bags in a central location for easy transfer to the truck. A permit for land use is required for moss.

OTHER INFORMATION: Prices vary, but usually bring $1.50 per bag. These bags should be requested from the buyer before going to pick. There is (at present) no charge for them, although the buyer does keep track, and expects them to be returned.

SEASON: As stated, summer is the best season because it is then one is likely to find the moss dry. It is good at other times of the year, but is not dry enough to collect.

MUSHROOMS:

DESCRIPTION: No description is given here because of the danger in misunderstanding the description. Before picking mushrooms, and certainly before eating them, one must ABSOLUTELY IDENTIFY IT AS SAFE TO EAT. Certain varieties of mushrooms can cause sickness, and even death.

GENERAL INFORMATION: Mushrooms have become a good source of income during the late summer and fall in recent years. The principle variety purchased is the Chanterelle, although the Pine Mushroom brings more money. The problem with the pine mushroom is that it is not so abundant as the Chanterelle and cannot be located as easily.

Gathering mushrooms is relatively easy, but there are some basic ground rules to follow. These are:

1) NEVER PULL A MUSHROOM FROM THE GROUND; use a sharp knife to cut the mushroom a little above the ground, leaving the bottom part of the mushroom still embedded in soil. The part beneath the ground is the part which enables more mushrooms to grow, it is the part which reproduces.

2) DO NOT PLACE MUSHROOMS IN CLOSED CONTAINERS OR PLASTIC BAGS. The best materials for containers would be straw, paper, cloth, or a hard open plastic-type bucket which is commonly used. The latter type bucket should also be lined with paper (like a brown paper bag).

3) AFTER PICKING, CLEAN BEFORE TAKING TO BUYER. The cleaning process is simple. An old, soft brush or simply the hands, should be used to remove excess dirt, leaves, sticks, and debris which has clung to the mushrooms. When this is done, put mushrooms in cardboard boxes for easier weighing by the buyer, and take to the buyer.

OTHER INFORMATION: There is no need to list buyers for this product in the index, for these change yearly. Although some buyers will stay in business over a span of a few years. Look for signs stating "Mushrooms bought here" or some similar announcement. These are posted on trees or sign posts throughout the countryside. Usually the prices between buyers is similar, differing at any one time by no more than $ .10. Price per pound varies, usually $1.00±/#.

SEASON: Late August through mid-November.

PLUG POLES:

GENERAL INFORMATION: Plug poles are alder trees of a specific dimension. The exact length is 8' or so long and the diameter is measured to specification using a guide which is obtained from the buyer. Some general comments on the process of cutting plug poles for the beginner are:

1) When selecting the site on which you intend to cut poles, bear in mind that you will have to haul them out. Consequently, requesting permits for land where it's necessary to walk back in to cut is unwise. Trees growing relatively close to the road are preferable.

2) Do not take trees which do not meet the requirements of the buyer, for he will reject them when you take them to the mill.

3) Stay in good communication with the buyer about his current needs, for buyers of this product do not work on a year-round basis, and often have to shut down their mill for long periods of time.

OTHER INFORMATION: Price varies from year-to-year and before proceeding to cut, one should call the buyer and ask for prices. Remember that stumpage of $ .06 (present rate) per pole will also have to be paid on these trees to the permit holder (legal landowner) at the time they're taken to the mill.

SEASON: There is no season as such, but there is a period in which the buyer purchases plug poles. This period is approximately November through May, but may vary.

SALAL:

DESCRIPTION: Salal is a shrubby evergreen that forms a cover over the forest floor. It ranges from thin, single shoots growing near the ground to bushes up to 10 feet or more feet in height. Leaves are egg-shaped and usually finely toothed, tough, and leathery in appearance. These are deep green on the surface and whiter underneath. Flowers appear from early spring to mid-summer, and are borne on stubby racemes (a short stem separate from the leaves); flowers are white or pinkish. The fruit is nearly black, and shaped similar to the roundish flower.

GENERAL INFORMATION: Good money can be made picking salal if several factors are kept in mind. First, it requires a large area of land in order to have sufficient salal on an ongoing basis, and a permit must be obtained for such land. Much of the good land is already under permit, and has been for many years. Therefore, it is wise to check with the land owner to see if there is any land available before deciding to pick salal.

Next, it is important to closely inspect land being considered for salal, because from a distance all salal tends to look good; a closer look sometimes reveals bug eaten, diseased leaves. Then, it does require some experience before a picker can earn good money; the beginner will be disappointed at his earnings for some months until the necessary skills are acquired.

OTHER INFORMATION: The following specification and price information will vary from buyer-to-buyer, and season-to-season:

(Salal (large)): Salal should be green and healthy, without spots. Nest buyers want a mixture of 'sprays' and single stems with no less than 5 leaves on each stem. The stem length depends on buyer's requirements, but it ranges from 16" to 32", the average being perhaps 28". If it is sold loose the price is approximately $ .60/l-5/8#: if bunched, it will bring between $. 75/1-5/8# and $ .85/l-5/8#.

(Papoose Salal): Small variety, should be green and healthy; about 18" in length.

continued. . .

SALAL (Continued):

(Lemon Leaves): Lemon Leaf Salal is green and waxy, a few 18" sprays, and not to exceed 30" in length. It should meet all the specifications as large Salal. The price averages $ .60/l-5/8#.

(Salal Tips): These should be green and waxy; a minimum of 5 leaves to a spray and a 3" stem. Price is around $ .45/bunch, and each bunch should have 32 stems in it.

SEASON: All year round; sometimes it becomes dried out due to excesses of the weather, however, or inferior during the dormant season. Often it is necessary to wait until the new growth has matured in the spring before picking again.

SCOTCH BROOM:

DESCRIPTION: Scotch broom is a branched evergreen shrub that reaches a height of about 10 feet, and frequently grows in dense thickets covering many acres. Leaves are tiny and needlelike, growing sparsely on dark green stems. Bright yellow flowers cover the plant in the spring: these are pealike and about 1" in length. Flowers later give way to hanging green pods fringed with a hairy covering, which becomes blue-black upon ripening.

GENERAL INFORMATION: This plant grows in great abundance in Washington, and requires very little skill to harvest. This product is used by florists for greenery throughout the United States and there is usually a steady market for it.

OTHER INFORMATION: Buyers want tender shoots which are straight; there should be no dead branches included, and it should be 32" in length after picked: buyers will usually accept after a minimum of two weeks. Prices vary slightly between buyers, ranging from $ .30/2# bunched, to $ .35/1-7/8# bunched.

SEASON: September through approximately April or May.

MISCELLANEOUS:

GENERAL INFORMATION: There are several other products which can bring money; however, these are either low in their profit value, or have to be shipped to the buyer. For that reason, these will simply be named. If one is interested in pursuing any of the following items then it is recommended that time be given to research the market, locate specific buyers, and determine from those buyers the specifications and quantities of the product they would llke:

Tree Burls

Foxglove Leaves

Wild Ginger

Wild Mint

Mistletoe

Oregon Grape

Douglas Fir Tree Pitch

Pussy Willows

Wild Flowers

Assorted Roots For Pharmaceuticals

PERMITS & REGULATIONS

The importance of complying with legal regulations effecting specialized forest products and the obtaining of permits to carry out harvesting of these products is again stressed here for the consideration of those intending to collect such products for sale.

On the following pages is a complete copy of R.C.W. 76.48, 1979 edition, which addresses the legal regulations applicable to specialized forest products. This material clearly outlines the penalties for violating the laws regulating forest products. Clearly, these laws are not to be ignored.

Following the regulations is the Buyers' Index for products listed in the 'Products Section'.

Chapter 76.48
SPECIALIZED FOREST PRODUCTS

Sections

76.48.010 Declaration of public interest. It is in the public interest of this state to protect a great natural resource and to provide a high degree of protection to the landowners of the state of Washington from the theft of specialized forest products. [1967 ex.s. c 47 § 2.]

76.48.020 Definitions. Unless otherwise required by the context, as used in this chapter:

(1) "Christmas trees" shall mean any evergreen trees or the top thereof, commonly known as Christmas trees, with limbs and branches, with or without roots, including fir, pine, spruce, cedar, and other coniferous species.

(2) "Native ornamental trees and shrubs" shall mean any trees or shrubs which are not nursery grown and which have been removed from the ground with the roots intact.

(3) "Cut or picked evergreen foliage", commonly known as brush, shall mean evergreen boughs, huckleberry, salal, fern, Oregon grape, rhododendron, and other cut or picked evergreen products.

(4) "Cedar products" shall mean cedar shakeboards, shake and shingle bolts, and rounds one to three feet in length.

(5) "Cedar salvage" shall mean cedar chunks, slabs, stumps, and logs having a volume greater than one cubic foot and being harvested or transported from areas not associated with the concurrent logging of timber stands (a) under a forest practices application approved or notification received by the department of natural resources, or (b) under a contract or permit issued by an agency of the United States government.

(6) "Processed cedar products" shall mean cedar shakes, shingles, fence posts, hop poles, pickets, stakes, or rails; or rounds less than one foot in length.

(7) "Cedar processor" shall mean any person who purchases and/or takes or retains possession of cedar products or cedar salvage, for later sale in the same or modified form, following their removal and delivery from the land where harvested.

(8) "Cascara bark" shall mean the bark of a Cascara tree.

(9) "Specialized forest products" shall mean Christmas trees, native ornamental trees and shrubs, cut or

picked evergreen foliage, cedar products, cedar salvage, processed cedar products, and Cascara bark.

(10) "Person" shall include the plural and all corporations foreign or domestic, copartnerships, firms, and associations of persons.

(11) "Harvest" shall mean to separate, by cutting, prying, picking, peeling, breaking, pulling, splitting, or otherwise removing, a specialized forest product (a) from its physical connection with or contact with the land or vegetation upon which it was or has been growing, or (b) from the position in which it has been lying upon such land.

(12) "Transportation" means the physical conveyance of specialized forest products outside or off of a harvest site, including but not limited to conveyance by a motorized vehicle designed for usc on improved roadways, or by vessel, barge, raft, or other waterborne conveyance. "Transportation" also means any conveyance of specialized forest products by helicopter.

(13) "Landowner" means, with regard to any real property, the private owner thereof, the state of Washington or any political subdivision thereof, the federal government, or any person who by deed, contract, or lease has authority to harvest and sell forest products of the property. "Landowner" does not include the purchaser or successful high bidder at any public or private timber sale.

(14) "Authorization" means a properly completed preprinted form authorizing the transportation or possession of Christmas trees, which form contains the information required by RCW 76.48.080, and a sample of which is filed before the harvesting occurs with the sheriff of the county in which the harvesting is to occur.

(15) "Harvest site" means each location where one or more persons are engaged in harvesting specialized forest products close enough to each other that communication can be conducted with an investigating law enforcement officer in a normal conversational tone.

(16) "Specialized forest products "permit" shall mean a printed document in a form specified by the department of natural resources. or true copy thereof, signed by a landowner or his duly authorized agent or representative (herein referred to as "permittors"), and validated by the county sheriff, authorizing a designated person (herein referred to as "permittee"), who shall also have signed the permit, to harvest and/or transport a designated specialized forest product from land owned *or* controlled and specified by the permittor, located in the county where such permit is issued.

(17) "Sheriff" means. for the purpose of validating specialized forest products permits, the county sheriff, deputy sheriff, or an authorized employee of the sheriff's office.

(18) "True copy" means a replica of a validated specialized forest products permit as reproduced by a copy machine capable of effectively reproducing the information contained on the permittee's copy of the specialized forest products permit. A copy is made true by the permittee or the permittee and permittor signing in the space provided on the face of the copy. A true copy will be effective until the expiration date of the specialized forest products permit unless the permittee or the permittee and permittor specify an earlier date. A permittor may require the actual signatures of both the permittee and permittor for execution of a true copy by so indicating in the space provided on the original copy of the specialized forest products permit. A permittee, or, if so indicated, the permittee and permittor, may condition the usc of the true copy to harvesting only. transportation only, possession only, or any combination thereof. [1979 ex.s. c 94 § 1; 1977 ex.s. c 147 § 1; 1967 ex.s. c 47 § 3.]

76.48.030 Unlawful acts. It shall be unlawful for any person to:

(1) Harvest specialized forest products as describcd in RCW 76.48.020, in the quantities specified in RCW 76-.48.060, without first obtaining a validated specialized forest products permit;

(2) Engage in activities or phases of harvesting specialized forest products not authorized by the permit; or

(3) Harvest specialized forest products in any lesser quantities than those specified in RCW 76.48.060, as now or hereafter amended, without first obtaining permission from the landowncr or his duly authorized agent or representative. [1979 ex.s. c 94 § 2; 1977 ex.s. c 147 § 2; 1967 ex.s. c 47 § 4.]

76.48.040 Agencies responsible for enforcement of chapter. Agencies charged with the enforcement of this chapter shall include, but not be limited to, the Washington state patrol, county sheriffs and their deputies, county or municipal police forces, authorized personnel of the United States forest service, and authorized personnel of the departments of natural resources, fisheries, and game. Primary enforcement responsibility lies in the county sheriffs and their deputies. [1979 ex.s. c 94 § 3; 1977 ex.s. c 147 § 3; 1967 ex.s. c 47 § 5.]

76.48.050 Specialized forest products permit—Expiration—Specifications. Specialized forest products permits shall consist of properly completed permit forms validated by the sheriff of the county in which the specialized forest products arc to be harvested. All specialized forest products permits shall expire at the end of the calendar year in which issued, or sooner, at the discretion of the permittor. A properly completed specialized forest products permit form shall include:

(1) The date of its execution and expiration;

(2) The name, address, telephone number, if any, and signature of the permittor:

(3) The name, address, telephone number, if any, and signature of the permittee;

(4) The type of specializcd forest products to be harvested or transported;

(5) The approximate amount or volume of specialized forest products to be harvested or transported:

(6) The legal description of the property from which the specialized forest products are to be harvested or transported, including the name of the county, or the state or province if outside the state of Washington;

(7) A description by local landmarks of where the harvesting is to occur, or from where the specialized forest products are to be transported;

(8) Any other condition or limitation which the permittor may specify. [1979 ex.s. c 94 § 4; 1977 ex.s. c 147 § 4; 1967 ex.s. c 47 § 6.]

76.48.060 Specialized forest products permits—Required— Forms—Filing. A specialized forest products permit validated by the county sheriff shall be obtained by any person prior to harvesting from any lands, including his own, more than five Christmas trees, more than five ornamental trees or shrubs, more than five pounds of cut or picked evergreen foliage, any cedar products, cedar salvage, processed cedar products, or more than five pounds of Cascara bark. Specialized forest products permit forms shall be provided by the department of natural resources, and shall be made available through the office of the county sheriff to permittees or permitters in reasonable quantities. A permit form shall be completed in triplicate for each permittor's property on which a permittee harvests specialized forest products. A properly completed permit form shall be mailed or presented for validation to the sheriff of the county in which the specialized forest products arc to be harvested. Before a permit form is validated by the sheriff, sufficient personal identification may be required to reasonably identify the person mailing or presenting the permit form and the sheriff may conduct such other investigations as deemed necessary to determine the validity of the information alleged on the form. When the sheriff is reasonably satisfied as to the truth of such information, the form shall be validated with the sheriffs validation stamp provided by the department of natural resources. Upon validation, the form shall become the specialized forest products permit authorizing the harvesting, possession and/or transportation of specialized forest products, subject to any other conditions or limitations which the permitter may specify. Two copies of the permit shall be given or mailed to the permittor, or one copy shall be given or mailed to the permitter and the other copy given or mailed to the permittee. The original permit shall be retained in the office of the county sheriff validating the permit. In the event a single land ownership is situated in two or more counties, a specialized forest product permit shall be completed as to the land situated in each county. While engaged in harvesting of specialized forest products, permittees, or their agents or employees, must have readily available at each harvest site a valid permit or true copy of the permit. [1979 ex.s. c 94 § 5; 1977 ex.s. c 147 § 5; 1967 ex.s. c 47 § 7.]

76.48.070 Transporting or possessing cedar or other specialized forest products—Requirements. (1) Except as provided in RCW 76.48.100 and 76.48.075, it shall be unlawful for any person (a) to possess, and/or (b) to transport within the state of Washington, subject to any other conditions or limitations specified in the specialized forest products permit by the permittor, more than five Christmas trees, more than fivc native ornamental trees or shrubs, more than five pounds of cut or picked evergreen foliage, any processed cedar products, or more than five pounds of Cascara bark without having in his possession a written authorization, sales invoice, bill of lading, or specialized forest products permit or a true copy thereof evidencing his title to or authority to have possession of specialized forest products being so possessed or transported.

(2) It shall be unlawful for any person (a) to possess and/or (b) to transport within the state of Washington any cedar products or cedar salvage without having in his possession a specialized forest products permit or a true copy thereof evidencing his title to or authority to have possession of the materials being so possessed or transported. [1979 ex.s. c 94 § 6; 1977 ex.s. c 147 § 6; 1967 ex.s. c 47 § 8.]

76.48.075 Specialized forest products from out-of-state. (1) It is unlawful for any person to transport or cause to be transported into this state from any other state or province specialized forest products. except those harvested from that person's own property, without: (a) First acquiring and having readily available for inspection a document indicating the true origin of the specialized forest products as being outside the state, or (b) without acquiring a specialized forest products permit as provided in subsection (4) of this section.

(2) Any person transporting or causing to be transported specialized forest products into this state from any other state or province shall, upon request of any person to whom the specialized forest products are sold or delivered or upon request of any law enforcement officer, prepare and sign a statement indicating the true origin of the specialized forest products, the date of delivery, and the license number of the vehicle making delivery, and shall leave the statement with the person making the request.

(3) It is unlawful for any person to possess specialized forest products, transported into this state, with knowledge that the products were introduced into this state in violation of this chapter.

(4) When any person transporting or causing to be transported into this state specialized forest products elects to acquire a specialized forest products permit, the specialized forest products transported into this state shall be deemed to be harvested in the county of entry, and the sheriff of that county may validate the permit as if the products were so harvested, except that the permit shall also indicate the actual harvest site outside the state.

(5) A cedar processor shall comply with RCW 76.48-.096 by requiring a person transporting specialized forest products into this state from any other state or province to display a specialized forest products permit, or true copy thereof, or other document indicating the true origin of the specialized forest products as being outside the state. The cedar processor shall make and maintain a record of the purchase, taking possession, or retention of cedar products and cedar salvage in complianee with RCW 76.48.094.

(6) If, pursuant to official inquiry, investigation, or other authorized proceeding regarding specialized forest products not covered by a valid specialized forest products permit or other acceptable document, the inspecting law enforcement officer has probable cause to believe that the specialized forest products were harvested in this state or wrongfully obtained in another state or province, the officer may take into custody and detain, for a reasonable time, the specialized forest products, all supporting documents, invoices, and bills of lading, and the vehicle in which the products were transported until the true origin of the specialized forest products can be detcrmined. [1979 ex.s. c 94 § 15.]

76.48.080 Contents of authorization, sales invoice, or bill of lading. The authorization, sales invoice, or bill of lading required by RCW 76.48.070 shall specify:

(1) The date of its execution.

(2) The number and type of products sold or being transported.

(3) The name and address of the owner, vendor, or donor of the specialized forest products.

(4) The name and address of the vendee, donee, or receiver of the specialized forest products.

(5) The location of origin of the specialized forest products. [1979 ex.s. c 94 § 7; 1967 ex.s. c 47 § 9.]

76.48.092 Surrender of copy of specialized forest products permit to permittee following stipulated use—Penalty. Following the stipulated use of a true copy of a specialized forest products permit, an agent or employee of a permittee shall surrender said copy to the permittee. A wilful failure to surrender the same to the permittee is a gross misdemeanor and punishable as provided by law. [1979 ex.s. c 94 § 8; 1977 ex.s. c 147 § 14.]

76.48.094 Cedar processors—Records of purchase, possession or retention of cedar products and salvage. Cedar processors shall make and maintain a record of the purchase, taking possession, or retention of cedar. products and cedar salvage for at least one year after the date of receipt. The record shall be legible and shall include the date of delivery, the license number of the vehicle delivering the products, the driver's name, and the specialized forest products permit number or the information provided for in RCW 76.48.075(5). The record must be made at the time each delivery is made. [1979 ex.s. c 94 § 9; 1977 ex.s. c 147 § 11.]

76.48.096 Cedar processors—Obtaining from suppliers not having specialized forest products permit unlawful. It shall be unlawful for any cedar processor to purchase, take possession, or retain cedar products or cedar salvage subsequent to the harvesting and prior to the retail sale of such products, unless the supplier thereof displays a specialized forest products permit, or true copy thereof, which appears to be valid, or obtains the information pursuant to RCW 76.48.075(5). [1979 ex.s. c 94 § 10; 1977 ex.s. c 147 § 12.]

76.48.098 Cedar processors—Display of valid rcgistration certificate required. Every cedar processor shall prominently display a valid registration certificate, or copy thereof, obtained from the department of revenue pursuant to RCW 82.32.030 at each location where such processor receives cedar products or cedar salvage.

Permitters shall sell cedar products or cedar salvage only to cedar processors displaying registration certificates which appear to be valid. [1979 ex.s. c 94 § 11; 1977 ex.s. c 147 § 13.]

76.48.100 Exemptions. The provisions of this chapter shall not apply to:

(1) Nursery grown products.

(2) Logs (except as included in the definition of "cedar salvage" under RCW 76.48.020), poles, pilings, or other major forest products from which substantially all of the limbs and branches have been removed, and cedar salvage when harvested concurrently with timber stands (a) under an approved forest practices application or notification, or (b) under a contract or permit issued by an agency of the United States government.

(3) The activities of a landowner, his agent, or representative, or of a lessee of land in carrying on noncommercial property management, maintenance, or improvements on or in connection with the land of such landowner or lessee. [1979 ex.s. c 94 § 12; 1977 ex.s. c 147 § 7; 1967 ex.s. c 47 § 11.]

76.48.110 Violations—Seizure and disposition of products—Disposition of proceeds. Whenevcr any law enforcement officer has probable cause to believe that a person is harvesting or is in possession of or transporting specialized forest products in violation of the provisions of this chapter, he may, at the time of making an arrest, seize and take possession of any such specialized forest products found. The law enforcement officer shall provide reasonable protection for the specialize forest products involved during the period of litigation or he shall dispose of such specialized forest products at the discretion or order of the court before which the arrested person is ordered to appear.

Upon any disposition of the case by the court, the court shall make a reasonable effort to return the specialized forest products to their rightful owner or pay the proceeds of any sale of specialized forest products less any reasonable expenses of such sale to the rightful owner. If for any reason, the proceeds of such sale cannot be disposed of to the rightful owner, such proceeds, less the reasonable expenses of the sale, shall be paid to the treasurer of the county in which the violation occurred. The county treasurer shall deposit the same in the county general fund. The return of the specialized forest products or the payment of the proceeds of any sale of products seized to the owner shall not preclude the court from imposing any fine or penalty upon the violator for the violation of the provisions of this chapter. [1979 ex.s. c 94 § 13; 1977 ex.s. c 147 § 8; 1967 ex.s. c 47 § 12.]

76.48.120 False, fraudulent, stolen or forged specialized forest products permit, sales invoice, bill of lading, etc.—Penalty. It shall be unlawful for any person, upon official inquiry, investigation, or other authorized proceedings, to offer as genuine any paper, document, or other instrument in writing purporting to be a specialized forest products permit, or true copy thereof, authorization, sales invoice, or bill of lading, or to make any representation of authority to possess or conduct harvesting or transporting of specialized forest products, knowing the same to be in any manner false, fraudulent forged, or stolen.

Any person who knowingly or intentionally violates this section shall be guilty of forgery, and shall be punished as a class C felony providing for imprisonment in a state correctional institution for a maximum term fixed by the court of not more than five years or by a fine of not more than five thousand dollars, or by both such imprisonment and fine.

Whenever any law enforcement officer reasonably suspects that a specialized forest products permit or true copy thereof, authorization, sales invoice, or bill of lading is forged, fraudulent, or stolen, it may be retained by the officer until its authenticity can be verified. [1979 ex.s. c 94 § 14; 1977 ex.s. c 147 § 9; 1967 ex.s. c 47 § 13.]

76.48.130 Penalties. Any person who violates any provision of this chapter, other than the provisions contained in RCW 76.48.120, as now or hereafter amended, shall be guilty of a gross misdemeanor and upon conviction thereof shall be punished by a fine of not more than one thousand dollars or by imprisonment in the county jail for not to exceed one year or by both such fine and imprisonment. [1977 ex.s. c 147 § 10; 1967 ex.s. c 47 § 14.]

76.48.140 Disposition of fines. All fines collected for violations of any provision of this chapter shall be paid into the general fund of the county treasury of the county in which the vioiation occurred. [1977 ex.s. c 147 § 15.]

76.48.900 Severability—1967 ex.s. c 47. If any section, provision, or part thereof of this chapter shall be adjudged to be invalid or unconstitutional, such adjudication shall not affect the validity of the chapter as a whole, or any section, provision, or part thereof not adjudged invalid or unconstitutional. [1967 ex.s. c 47 § 15.]

76.48.901 Severability—1977 ex.s. c 147. If any provision of this 1977 amendatory act, or its application to any person or circumstance is held invalid, the remainder of the act, or the application of the provision to other persons or circumstances is not affected. [1977 ex.s. c 147 § 16.]

76.48.902 Severability—1979 ex.s. c 94. if any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected. [1979 ex.s. c 94 § 17.]

76.48.910 Saving—1967 ex.s. c 47. This chapter is not intended to repeal or modify any provision of existing law. [1967 ex.s. c 47 § 16.]

BUYER'S INDEX:

BARK (CASCARA)

Callison's, Inc.
202 Ocean Avenue
Raymond, WA. 98577
(206) 942-2682

Esse's Tree Seed Corp.
(Pacific Coast Bark Co.)
401 Seventh South
Montesano, WA. 98563
(206) 249-3503

BERRIES (WILD)

Esse's Tree Seed Corp.
401 Seventh South
Montesano, WA. 98563
(206) 249-3503

- Various restaurants
- Private Households

BOUGHS (CHRISTMAS)

Hiawatha, Inc.
E. 681 Johns Prairie
Shelton, WA. 98584
(206) 426-4562

Sherwood Forest Farms
135 N.W. Prindle
Chehalis, WA. 98532
(206) 748-6676

Hillcrest Evergreen
1716 Ridge Road
Shelton, WA. 98584
(206) 426-6346

FERNS

Hiawatha, Inc.
E. 681 Johns Prairie
Shelton, WA. 98584
(206) 426-4562

Hillcrest Evergreen
1716 Ridge Road
Shelton, WA. 98584
(206) 426-6346

G. R. Kirk Company
No. Pacific Terminal Grnd.
South Bend, WA. 98586
(206) 875-5691

Washington Evergreen
West "H" & Monroe
Shelton, WA. 98584
(206) 426-4313

BUYER'S INDEX (Continued):

HUCKLEBERRY (HUCK)

Hiawatha, Inc.
E. 618 Johns Prairie
Shelton, WA. 98584
(206) 426-4562

Hillcrest Evergreen
1716 Ridge Road
Shelton, WA. 98584
(206) 426-6546

G. R. Kirk Company
No. Pacific Terminal Grnd.
South Bend, WA. 98586
(206) 875-5691

Washington Evergreen
West "H" & Monroe
Shelton, WA. 98584
(206) 426-4313

MOSS

Hiawatha, Inc.
E. 681 Johns Prairie Road
Shelton, WA. 98584
(206) 426-4562

PLUG POLES

Beerbower Spool Manufacturing Co.
Rt. 1, Box 152
Elma, WA. 98541
(206) 482-2601

SALAL

Hiawatha, Inc.
E. 618 Johns Prairie
Shelton, WA. 98584
(206) 426-4562

Hillcrest Evergreen
1716 Ridge Road
Shelton, WA. 98584
(206) 426-6546

G. R. Kirk Company
No. Pacific Terminal Grnd.
South Bend, WA. 98586
(206) 875-5691

Washington Evergreen
West "H" & Monroe
Shelton, WA. 98584
(206) 426-4313

BUYER'S INDEX (Continued):

SCOTCHBROOM

Hiawatha, Inc.
E. 681 Johns Prairie
Shelton, WA. 98584
(206) 426-4562

Hillcrest Evergreen
1716 Ridge Road
Shelton, WA. 98584
(206) 426-6546

NOTE: Buyer's for products not listed in the Buyer's Index are discussed in main text under specific product, e.g., mushroom buyers often change yearly, and roadside signs will easily direct seller to a local buyer.

Beargrass: A "New" Product From the National Forests

Beargrass (Xerophyllum tenax) is one of a number of so-called minor forest products which has recently become extremely popular in the Pacific Northwest. Easily recognized when flowering, this plant is a common component of forests in alpine and subalpine areas, It can be readily found in almost any site, from clearcuts to old growth forest. Its greatest numbers can generally be found in open areas or clearcuts; dense canopy cover results in the least number of plants. However, observation suggests that the plants with the best color and vigor appear to be those which are located in areas with at least partial shade.

Relatively little is known about the reproductive characteristics of this species. In the past, reforestation activities focused on at least reducing if not eliminating it from harvest units because of the rapid site capture by this plant. Units treated with fire or scarification to control beargrass usually resulted in rapid and successful beargrass re-establishment and enhancement with reduced tree growth or survival. Today, some suspect that flowering has a relatively limited impact on reproductive success. Field observation suggests that vegetative reproduction, similar to that of strawberries, may play a significant role in reproductive success within timber stands and disturbance, particularly of the root mass, may be important in more open sites.

History of Beargrass Sales - Until three years ago the sale of beargrass on the National Forests was relatively unknown. Apparently, what started the trend and increased demand was the forest greenery businesses. Approximately eight firms in Washington State, primarily located around the Seattle/Tacoma area, were purchasing beargrass and sending it to the eastern U.S. and Europe for use in floral arrangements. These buyers were purchasing the beargrass from Southeast Asian harvesters, who traveled and harvested in family groups. They would spend a week or so in an area, pick all the beargrass they could, return home, clean and sort it, and then sell it and return for more. Initially the Forest Service was not prepared for this activity. There were no rates established, no one knew what the impacts would be, no one had any idea what quantities were available much less what people were looking for. For the past several years a variety of programs have been tried. Some districts have developed specific contracts and actually have advertised bid sales. Other districts will sell only limited quantities on a 2400-4 Greensheet permit. Others, including Zigzag, have established designated areas with designated sale limits and limit the number of permits available as well as the location and quantities available.

Prices also exhibited this same scattered pattern. With no regional direction, districts established prices ranging from $0.01 per pound to $0.25 per pound. There was no continuity between districts on the same forest; prices ranged from $0.25 per pound at Randle and Packwood to $0.05 per pound at Mt. St. Helens on the Gifford Pinchot. On the Mt. Hood prices also varied but much less so. Zigzag established a price of $0.15 per pound whereas other districts were generally between $0.05 and $0.15 per pound.

What is Harvested - Only a very small portion of the plant is actually harvested. Buyers are interested in those leaves which are undamaged, have a bright green color and are about 30 inches in length. Although color and lack of damage limit the number of plants suitable for harvest, leaf length is the true limiting factor. Only the older, larger plants have leaves which meet this length criteria; only the leaves which are located in the center of the clump generally meet all three criteria. This usually involves a maximum of a dozen or so leaves which means that the majority of the plant usually remains undisturbed.

Methods of Harvesting - There are apparently two main methods of harvesting; one using a knife to cut the leaves, the other involves simply pulling the leaf blade from the sheath. Both methods target the leaves at the center of the clump and attempt to remove as much of the leave blade as possible. The harvested leaves are bound together in bunches slightly larger than a silver dollar with each bunch weighing perhaps a half

pound to a pound. The bunches are gathered together and placed in a 30-32 gallon plastic garbage sack and removed from the woods. As each sack may contain in excess of 100 bunches at one half to one pound per bunch, each sack could weigh a hundred pounds or more. The bunches will usually remain in the sack until the bunches are cleaned and sorted for sale to the buyer.

Buyers - There are apparently about a dozen companies or individuals, all located in the State of Washington, who purchase beargrass on a fairly regular basis. Some have been in the forest greenery business for many years and sell a variety of forest greenery. It is estimated that those firms buy and ship an estimated 150 to 200 thousand pounds of beargrass per week if the material is available and of acceptable quality. One firm in particular has stated that they ship out one container per week with the container containing between 20 and 25 thousand pounds of beargrass.

Product Value - Beargrass has become quite valuable as a salable product. Currently the Mt. Hood National Forest charges $0.15 per pound. The prices paid by buyers varies significantly between buyers, the season of the year, and the quality of the beargrass. In addition, prices can fluctuate significantly depending upon market demand, product availability, and contract price. Generally prices average around $0.50 per pound. One buyer stated that it was not unknown for his company to pay $5,000 to $10,000 to one group of harvesters for the beargrass that they picked several days before. Several robberies involving quantities of beargrass have been reported and some individuals have been caught harvesting beargrass without permits and had it confiscated. When sold at auction, the beargrass, totalling 10,000 pounds, was sold for $0.475 per pound or $4750.00.

Impacts - To date, no one has reported any obvious impacts to either the beargrass population or the plants themselves. Field personnel monitoring harvest activity report that is it often difficult to locate plants which have had leaf blades removed. As intensive harvesting is relatively new, there is no information on long term impacts. There is concern for the possible long term impacts and limited studies have been proposed and/or implemented.

The Future - There is an increasing consistency in how different forests and districts are dealing with beargrass sales. A uniform price policy is developing and districts are developing programs that are similar in structure if not operation. Because of the value of the material there will likely be tighter controls on the sales to assure payment for quantities removed. Quantity will probably be determined by weighing. And there will likely be more sale sold through the bidding process rather than on a direct sale basis. There is an increasing interest at not only the Forest level but also at the Regional office and National levels as well.

Information Required for a Specialized Forest Products Harvesting Permit

The following information is required when filling out a Specialized Forest Products Harvesting Permit:

1. Amount, unit, and forest product being harvested - Be as specific as possible, especially on the forest product being harvested. If brush is being picked, list each kind of brush. If boughs or Christmas trees are being cut, the word "evergreen" or "conifer" is not adequate. Be very specific with the kind of bough or tree that is being harvested. The unit measure refers to bundles, pounds, tons, etc.

2. Legal description - The legal description is required and must be approved by the Assessor's Office prior to being approved by the Sheriff's Department. The Assessor's Office may require a parcel number in addition to the legal description.

3. Local landmarks - Local landmarks is defined as the general area of the harvest, and the information is mandatory for approval by the Sheriff's Office.

4. Date of permit - The harvesting permit must have a beginning and ending date. The beginning date should be the date it is filled out, the ending date should be the date that the landowner wants the permittee to be done harvesting on his property. The permit is valid until December 31st of the year it is issued unless a prior expiration date is listed. For the protection of the landowner, consider limiting the time the permittee is allowed to harvest on the property.

5. Name of permittee - Permittee is the person(s) harvesting the forest product(s). Print name and address (include both mailing and pemanent address), and telephone number.

6. Name of permitter - Permitter is the landowner. Print name and address (include both mailing and permanent address), and telephone number.

7. Signature of permittee - Signature must include all names listed in the permittee block.

8. Signature of permitter - Signature must include landowner, or in the case of a business, the signature of an authorized representative. The representative must have a letter authorizing his signature filed with the Sheriff's Office prior to signing any permits.

9. Permitter's original signature on true copy required if box is checked - This box must be checked if the landowner wants the permittee to notify him/her when allowing another person to operate under the permit.

10. Attachment made a part of this permit - There must be an attachment with this permit if the landowner puts an X in this box.

11. Signature block for deputy approval - Each harvesting permit must be approved and signed by the Sheriff's Office prior to any harvesting.

12. Other conditions - Defined as other restrictions not listed above, optional and at the discretion of the landowner.

13. TRUE COPY - If the permittee wants someone to help with some aspect of the harvesting procedure, they need to follow the instructions on the yellow (permittee) copy of the permit, under the area entitled TRUE COPY. The yellow copy is not to be written on, a photocopy should be made and handed out to. the helpers of the permittee with instructions as followed under this section. If the box is checked requiring, the original signature of permitter, permittee must take all copies back to permitter for approval and signature prior to handing out to helpers.

Rate Schedule for Miscellaneous Forest Products — Sample 1

Minimum for any permit will be at least $10.00

Beargrass - minimum amount — 4,000 lbs.
x$.15 per lb.
2 weeks — $600.00 total
4 weeks — $1.200.00 total

Ferns- minimum amount — 200 bunches
50 fronds per bunch — x$.05 per bunch
3 months — $10.00 total

Vinemaples- as transplants, minimum amount — 100 trees
x$.50 per tree
3 months — $50.00 total

Cones- minimum amount — 100 bushels
For seed, all species — x$.1O per bushel
3 months — $10.00 total

FOREST GREENS

MINIMUM AMOUNT — 200 lbs.
Salal, Ore. Grape. Huckleberry etc. — x$.05 per pound
3 months — $10.00 total

Moss — same as Forest Greens

Burls- Minimum amount — 10
x$l.00 each
$10.00 total

Dry cones:

sugar pine-minimum amount 200
x$.05 each
10.00 total

All other species-minimum 50 bushels
x$.20 each
$10.00 total

Christmas Trees $5.00 each

Transplants:
Shrubs including vinemaple $.50 each
Trees $2.00 each
No conifers will be sold as transplants after Oct. 31

Boughs $10.00 ton

Cedar fence posts and rails - purchaser splits:
posts(max. 9ft. x 32in. circumference) $.45 each
Rails(max. 12ft. x 20in. circumference) $.6o each

Cedar shake boards and bolts - purchaser splits:
Shake boards $.13 each
Shake bolts $65.00 cord

Other Convertible Products:
House logs - Appraised as sawlogs and sold at auction in a commercial timber sale.
Miscellaneous poles 2" to 5" dib small end- min. $10.00 pmt.
Green $.50 each
Dead $.30 each
Round Posts up to 8in. dib small end x 10ft. long-
Cedar $1.00 each
Other Species $.75 each
Small Poles (bean, orchard, and hop poles)-
Less than 2 in. dib $.10 each

Stakes to 3in. butt diameter-

Snowfence and Hop stakes _____ $.10 each

Fuelwood _____ $5.00 cord

Cascara Bark and Yew Bark-

Dry _____ $.10 lb.

Green _____ $.05 lb.

Pitch: Douglas Fir _____ $.20 Gallon

Medicinal Forest Products Other Than Cascara and Yew-

Green weight _____ $.05 lb.

Yew billets 3 1/2 ft. x 3in. x 3in. _____ $.30 each

Yew bow staves 6 1/2 ft. x 2 1/2 in. 3in. _____ $.40 each

Pulpwood (cut for cord measurement) _____ $1.00 cord

Pulpwood _____ $2.00 MBF

Cord measurement as refered to above shall be the standard cord of 8ft. X 4ft. x 4ft., with a cubic volume of 128 cubic feet.

Rate Schedule for Miscellaneous Forest Products-Sample 2

Products	Minimum Rate	Unit of Measurement
Christmas Trees: (commercial sales)		
Noble fir and Shasta red fir	$ 2.00	Each under 6 feet
	4.00	Each over 6 feet
Douglas-fir and other	1.00	Each under 6 feet
	2.00	Each over 6 feet
Christmas Trees (Personal Use, cut or live):		
Noble fir and Shasta red fir	4.00	Each
Douglas-fir and other	2.00	Each

	Minimum Rate	Unit of Measurement
Burls	1.00	Each
Seed cones: All species	0.10	Bushel
	0.20	Per 2-bushel feed sack
Dry cones:		
Sugar pine	0.05	Each
All other species	0.20	Bushel
Bark: Cascara and Yew:		
Green	0.05	Pound
Dry	0.10	Pound
Seedlings: Natura (Up to 1 foot)	5.00	Per 100
Transplants: Live shrubs & plants	0.50	Each
Small trees 1 to 4 feet	1.00	Each
Over 4 feet	2.00	Each
Boughs	10.00	Ton
Pitch: Douglas-fir	0.20	Gallon
Ferns	0.05	Bunch (50 fronds

Forest Greens:		
Huckleberry, Salal, Oregon Grape, and so forth	0.05	Pound (1 bunch - 7/8 lb.)
Sphagnum Moss	0.50	sack (2 bu.)
Medicinal Forest Products (Other than Cascara and Yew bark) Bear Grass and other	0.05	
Green Weight	0.05	Pound

Rate Schedule for Miscellaneous Forest Products—Sample 3

9350- Forest Products Appraisal From BLM California

Use the following minimim values for miscellaneous forest or vegetative products or small negotiated sales when no better information is available. Minimum price per contract is $10.00.

Floral Greenery	
Ferns (bunch [50 fronds])	$.05
Huckleberry (bunch [1-5/8 lb.])	.10
Mistletoe (pound)	.10
Juniper Berries (bushel)	.50
Specialty Items	
Creosote Stems	
0-4' long (l0/bundle)	.25
Over 4' long (each)	.10
Ocotillo Stems	
0-5' long (each)	.75
Over 5' long (each)	1.00
Chapparal Brush Stems (10 stems)	.35
Brittlebush (each)	.20
Grass (bunch)	.05
Agave Stars (each)	.65
Moss (pound)	.10
Tree Boughs (pound)	.10
Decorative Trees	
Pine-Douglas-fir (bushel)	.50
Arrow Bolts	
Port-Orford Cedar	
Prime Stock (cord) (straight grain-28" + diameter)	25.00
Inferior Stock (cord)	15.00
Fence Posts (8' or less)	
cedar (post)	.25
Lodgepole (post)	.15
Juniper (post)	.25
8-20' (lineal foot)	.05
Sawlogs	
Isolated trees - (minimum volume)	
Softwoods (MBF)	25.00
Hardwoods (MBF)	25.00
Chiplogs (MBF)	5.00

Poles	
Douglas-fir and Pine (lineal foot) 0-19'	$ .05
20' or over (MBF @ fair market value)	
Cedar (lineal foot) 0-19	.10
20' or over (MBF @ fair market value)	
Fuelwood (no value for sawlogs)	
Softwoods (cord)	7.50
Hardwoods (cord)	15.00
Ironwood (permit) (maximum 1/4 cord)	10.00
Palo Verde (permit) (maximum 1/4 cord)	10.00
Mesquite (permit) (maximum 1/4 cord)	10.00
Christmas Trees	
0-8' (tree)	5.00
Over 8' (lineal foot)	1.00
Pinyon Pine Xmas tree (tree)	1.00
Single tree Xmas permits	1.00
Manzanita (ton) Non-commercial	5.00
Mohave Yucca (ton)	11.00
Burls (Based upon sale of entire tree)	
All species except redwood (MBF)	40.00
Manzanita (each)	.15
Red Shank (each)	.35
Redwood (determine locally)	
Pinyon Pine Nuts	
1st 25 pounds	free use
Over 25 pounds (permits)	2.50

Chapter 10—Honey

Description of the Product and Its Uses

Honey is the sweet, viscous substance made by the common honeybee, *Apis mellifera*, from nectar gathered from flowers. Honey is used as a food product alone or as a sugar substitute in other food products. Honeybees in the United States produce about 250 million pounds of honey a year, a crop valued at $200 million.

In addition to the honey itself, honeybees also produce 4 million pounds of beeswax annually and other by-products such as bee pollen and royal jelly. Beeswax is sold as a by-product for candles, polishes, and as a component in cosmetics. Royal jelly—a secretion of the glands of the worker bee—is the queen bee's sole source of nourishment. It is promoted in retail sales as a nutrient and as a source of energy.

There are many valuable nectar and pollen sources for bees. Many bee flowers are blue, yellow, or purple—colors *Apis mellifera* can easily distinguish. The single most common nectar source in North America is probably white clover. Others (by season) include:

Early-Season Sources

Skunk cabbage (*Symplocarpus foetidus*)

Alders (*Alnus* spp.)

Buckbrush, snowberry (*S. albus*)

Willows (*Salix* spp.)

Maples (*Acer* spp.)

Serviceberry (*Amelanchier* spp.)

Pin cherry (*Prunus pensylvanica*)

Dandelion (*Taraxacum officinale*)

Plum (*Prunus domestica*)

Sour cherry (*Prunus cerasus*)

Apple (*Pyrus malus*)

Pear (*Pyrus communis*)

Cranberry (*Vaccinium macrocarpum*)

Main Nectar Flow

Black locust (*Robinia pseudoacacia*)

Raspberries (*Rubus* spp.)

Buckwheat (*Fagopyrum esculentum*)

White clover (*Trifolium repens*)

White sweet clover (*Melilotus alba*)

Anise hyssop (*Agastache* spp.)

Linden (*Tilia* spp.)

Bee bee tree (*Evodia danielli*)

Purple loosestrife (*Lythrum salicaria*)

Fall Nectar Flow

Goldenrod (*Solidago* spp.)

Asters (*Aster* spp.)

Still other important sources include asters, basswood, berries, chicory, cucurbits (cultivated cucumbers and their large-flowered relatives), fruit tree blossoms, mustards, ragweed, and vetch. Warm-climate plants include citrus, cotton, black mangrove, mesquite, palmetto, sourwood, and tupelo tree. A variety of wild and domesticated flowers, including those of sweet yellow clover, elm, alfalfa, wild rose, sunflower, prickly poppy, penstemon, cinquefoil, and thistle, are foraged by bees. Given a choice, the foraging honeybee will always choose the richest nectar available.

Bees need nectar and pollen over as long a period as possible to produce maximum honey crops. Therefore a polyculture of tree species with a succession of flowering periods is best for honey production. Willows and maples (February–March) are the most commonly exploited early-season species; basswood and sourwood (June–July) are among the latest; and most other species flower sometime between these.

Each floral source lends a slightly different flavor to the honey made from it, and each honey has its own bouquet. The experienced palate, like that of a good wine taster, can distinguish among 80 varieties of honey. Many regional "specialty" honeys have been developed, such as Texas mesquite honey and tupelo honey in Florida, and

honey from raspberries, cranberries, and blueberries along the east coast. Regulations of the Food and Drug Administration require that 51 percent of the nectar from a particular crop must be present in order to name-label honey, for example, raspberry honey.

California accounts for 70 percent of all hive rentals, with hives coming to that State from as far away as Florida. Ninety-five percent of all honeybees rented for crop pollination are used for apples, cherries, melons, almonds, alfalfa, plums, avocados, blueberries, cucumbers, pears, sunflowers, cranberries, vegetable seeds, and kiwi. Nut crops in particular depend on pollination. Bees also pollinate many wild plants that provide essential wildlife food and erosion control.

It takes about 50,000 bees to produce a pound of honey. One bee will only make about a tablespoon of honey in its lifetime. In a good year, the yield of honey per bee colony will be over 100 pounds.

Honey, the most popular beehive product, can be produced in many ways. The simplest is merely to cut out pieces of the comb containing honey. This “cut comb” may be wrapped with plastic or enclosed in a plastic sandwich box. Liquid honey is extracted from combs by centrifugal force with specially built extractors. Because of these equipment needs, a beginner should not try it.

Pollen is a protein that is essential in the food of the bee larva. It is sometimes trapped and sold. Propolis—a resinous substance bees use to fill holes and gaps—is an additional source of income. However, small-scale entrepreneurs should make sure to have a market. Beeswax is a useful by-product but not for beekeepers with just a few colonies. The wax is sold as a by-product for candles and polishes, and as a component in cosmetics. Production of royal jelly is labor-intensive and markets are limited. Some honeys are sold unfiltered and uncooked.

Perhaps the most important role of the honeybee, however, is the pollination of virtually all plants, plants that not only provide fruits, nuts, and vegetables, but provide feed for beef and dairy cattle. Only in the last century have people begun to recognize the value of bees as pollinators, and this includes honeybees and over 3,500 species of wild bees in North America. The contribution of bees as pollinators of cultivated crops far outweighs the value of the hive products. Honeybee pollination affects about every third mouthful of food or drink consumed. Well-timed honeybee pollination gives farmers a way of ensuring uniformity of size and maturation date, which adds significantly to the yield and market value of a great many agricultural crops. As an example, without honeybees the average yield for an acre of almond trees would be about 500 pounds. Rental hives for pollination can boost the crop yield to 2,500 pounds.

Market and Competition Considerations

There are an estimated 250,000 beekeepers in the country. Of these, only about 2,000 are considered commercial beekeepers—beekeepers with 300 or more beehives. The rest are hobbyists. Florida led the Nation in 1990 in honey production volume, with nearly 21 million pounds and an estimated value of $9.8 million. Other major producing States are California, North Dakota, and South Dakota.

Most of the honey produced by the large commercial beekeepers is sold or put under loan to the Federal government through the honey price support program. Most of it ultimately goes into the bakery trade, with the Government absorbing the difference between the market price and the support price. Imported honey started entering the country in the early 1980's at prices well below what processors could offer. Key producers are China, Argentina, Mexico, and Canada.

Because of the national trend toward healthier, more natural foods, demand for honey is rising on a per capita basis. For the small rural entrepreneur looking for supplemental income from beekeeping, the most productive strategy might be to aim for a market niche with a high-quality regional or specialty flavor of honey. Producing a variety of both honey and other bee products is also a good strategy. Specialties such as whipped or blended honey, creamed or pure honey, flavored and unflavored honey, and fruit spreads mixed with honey are all being developed for gourmet markets. Propolis, sometimes called bee glue, and bee pollen can be packaged and sold by the pound to manufacturers of natural health foods. Bee pollen is said to be in demand in Japan as an aphrodisiac. Beeswax is sold for candlemaking and other products. Some in the bee business specialize in selling queen and worker bees to other apiaries, with honey and beeswax being by-products.

Beekeeping’s profitability depends on many factors, and the decision to enter this occupation should be made carefully. Beekeepers should know about bee biology, flora, and management, and possess business ability. They should understand they are subject to factors beyond their control—market prices and weather elements ranging from drought to floods and temperature extremes.

Entrepreneurs intent on commercializing should decide whether to be migratory or nonmigratory and select locations that offer opportunities for pollination rentals;

production of honey, beeswax, or pollen; and/or packaging queen bees.

Raising bees for honey extraction is most practical in areas with long growing seasons. For example, in North Dakota the bees can collect nectar from the alfalfa fields and sweet clover in the spring and later from the sunflower crops. An apiary in Tallahassee, Florida, has over 2,000 hives in the Apalachicola National Forest and is successful in producing high volumes of famous "tupelo honey," which has a unique flavor and is popular with honey enthusiasts. Bees will fly up to 7 miles to find food, though a 1-mile range is more common and certainly less taxing for the bees. Rural areas near enough to metropolitan areas to have regional markets might also be more competitive in the specialty markets.

There is also the potential for exports to Europe or to the Mideast. In some Arab countries, for example, people eat honey at least twice a day as a religious act. For this custom, the honey must be of the best quality. Tests for quality vary by custom, too. For instance, the three-part test for purity used by some Arabs involves the following: (1) a drop of honey in the eye should not sting (2) a drop of honey in the sand should not form a film and (3) pure honey should not soak through a piece of paper.

However, it is important to note that the direct value to agriculture of honeybee pollination is much greater than the value of honey produced. (A 1989 study by Cornell University put the direct value of honeybee pollination at nearly $10 billion per year.) For every $1 paid beekeepers in pollination fees, the added value to the crop is more than $60.) So important is the pollination aspect of beekeeping that most commercial beekeepers could not survive if they did not make their bees migratory. The blooming season of any one plant in any single location is simply too short to produce enough honey to make the enterprise worthwhile. About 2 million rentals occur annually, involving 1 million hives. Any new entrepreneur in the beekeeping business should consider ways to rent out hives to orchards and farmers in the spring to pollinate their fruit, vegetable, legume, and oilseed crops. It should be kept in mind that pollination and honey production are separate enterprises of the beekeeper that seldom coexist on any one crop.

New beekeepers should be prepared to contract with area orchard growers to rent hives. In using the honeybees as pollinators, beekeepers often travel with their hives to various parts of the country to provide pollination services to orchards and other crop producers. "Migratory beekeepers" fall mainly into two geographic groups: those who travel extensively up and down the East Coast and those who move back and forth from the Plains and Mountain States to California's Sacramento and San Joaquin Valleys. For example, a large honey producer in Montana sends eight semiloads of bee colonies to California from October to March to pollinate the fruit crops and then returns them to Montana to produce Montana honey.

About 70 percent of all bee rentals go to California, the Nation's largest user of honeybee colonies for pollination. Nearly 700,000 colonies are rented in the spring by California almond growers alone. Some 200,000 of those colonies must come from outside the State to meet the demand.

On the East Coast, migratory beekeepers travel even more extensively. During the winter, the bees pollinate Florida's citrus groves. Then the beekeepers follow the spring north, with pollination stops that include New York State's apple orchards, Maine's blueberry barrens, and Massachusetts' cranberry bogs.

Packaging and Distribution

Most commercial honey producers are located in sparsely populated States and sell most of their production through wholesale channels like cooperative marketing programs. There are also "handlers," individuals (usually also beekeepers) who buy bulk honey from other producers. For example, the Silverbow Honey Company of Moses Lake, Washington, rents out as many as 20,000 bee colonies per year for pollination purposes. In addition, the company bottles honey purchased from all Pacific Northwest and most Mountain States as well as imports from Hawaii, China, Russia, Argentina, and Canada. The company is experimenting with new fruit-flavored honey syrups.

Equipment Needs, Costs, and Suppliers

A would-be beekeeper should learn as much as possible about beekeeping before purchasing bees and bee equipment. Observing honeybees close up with an experienced beekeeper is an excellent way to learn about beekeeping.

A beekeeper can get started by (1) purchasing an established beehive (2) buying new equipment and packaged bees with queens from bee supply companies or (3) obtaining bee equipment and capturing a swarm. Beekeepers can collect swarms by making their interest known to extension agents, police departments, beekeepers, and others who might receive swarm calls. Information on availability of bees also can be obtained from beekeeping groups and trade journals.

One new hive with bees and basic equipment costs about $150. Hive parts are cut to standard dimensions that mimic the space bees naturally leave between their combs. The following equipment is essential:

1. Beehive, including bottom board (wooden stand on which the hive rests); frames and foundation; hive body or brood chamber ("super"); queen excluder; honey supers; inner and outer covers.
2. Smoker, used to calm bees and reduce stinging.
3. Veil and gloves, for protection.
4. Feeders, which hold sugar syrup that is fed to bees in early spring and in the fall.

Honey-extracting equipment for the hobbyist is specialized and represents a one-time investment of about $500 for new equipment. The basic tools for extracting honey include:

1. Uncapping knife—a heated knife for slicing off the cappings from combs of honey.
2. Uncapping tank—a container for receiving the cappings.
3. Extractor—a drum containing a rotating wire basket. Honey is flung out of the combs onto the sides of the tank and drains through a spigot.
4. Strainer—a mesh of coarse screen or cloth directly under the extractor spigot to filter out large debris.
5. Storage tank—a large tank with a spigot, or honey gate, at the bottom.

The most obvious and essential "supply" in making honey is, quite naturally, the honeybee itself. An efficient hive houses 80,000 to 100,000 bees and in a good year produces anywhere from 50 to 100 pounds of honey, depending on the region of the country. A colony stays strongest when the queen is changed every year or two.

For those who want to package the honey themselves for the retail market, supplies include jars or plastic containers, lids, and paper labels. These costs range roughly from 10 to 30 cents per container.

Migratory beekeepers who operate on a large scale usually move their hives on long flatbed trucks, expensive pieces of equipment to own and operate, slightly less so if rented. Those who rent bees on a smaller scale can ship bees, but the containment and climate control concerns make this an expensive proposition as well.

Bee Management

To survive, bees need honey as a carbohydrate source, pollen or pollen substitutes for protein, and water as the universal solvent. A colony also needs lots of comb space for storing the food and rearing brood. Lack of adequate space can lead to swarming, which cuts honey production.

Setting equipment for beehive in place. Courtesy of USDA Forest Service. (USDA/0185 x 0032.17)

For successful wintering, a colony should have a young queen, a large cluster of adult bees, 40 to 60 pounds of honey, and several combs of pollen. Each colony should have a two-story standard hive, one brood chamber, and one honey super—the removable section where the bees store their honey.

Starvation is a principal cause of colony losses. Bees die in cold climates not from freezing but from starving to death. If the temperature is extremely cold, they cluster and starve because they do not move around to eat the honey that they have stored. If bees are short of honey, they should be fed a syrup of two parts granulated sugar to one part water. Lack of pollen can be compensated for by purchasing pollen substitutes from bee supply dealers.

The occasional pesticide spraying of isolated plants or gardens may kill only a few bees, but when entire fields and orchards are sprayed or dusted, the resultant bee loss can be devastating. In such cases, beekeepers will usually see a large accumulation of dead and dying bees at hive entrances.

To find out about spraying in advance, beekeepers should keep a sign on each beehive with their name, address, and telephone number. Given a few days' warning, there are several things that can be done to minimize the effects of a harmful spray:

1. The beehive may be moved to a temporary location at least 2 miles from the spray area.
2. The hive entrance can be draped with a damp burlap. This protects the beehive from effects of a direct "hit." The burlap cover should stay only for the duration of the application.
3. The hive may be left in place and some loss of bees accepted.

The best way is to work with the farmer and the pesticide applicator in developing programs that safeguard pollinating insects. Some general guidelines are:

1. Insecticides should not be applied to open blossoms. Honeybees visit not only blossoms on cultivated crops but also those of orchard ground cover and noncultivated plants.
2. The safest time to apply insecticides is late afternoon after bees stop foraging. Early morning applications are also less dangerous to bees than those in midday.
3. An insecticide may be selected that has the least impact on nontargeted insects and animals.

Honeybees, like all creatures, are subject to infectious diseases. To lessen their spread and minimize harm, beekeepers should learn as much as possible about healthy, normal colonies so that they can recognize signs of diseases. Most common brood diseases are American foulbrood, European foulbrood, and chalk brood. Among adult bees, Nosema disease is one of the most serious. Two parasitic mites, *Acarapis woodi* and *Varroa jacobsoni*, recently replaced more traditional adult and brood diseases as the most serious ailments. These mites can shorten the already brief (about 40 days) life span of the honeybee. Many States now require certification that bees entering their borders are mite-free. The Varroa mite feeds off the blood of adult bees and larvae, either killing them or causing defects. The mite was first discovered in Wisconsin in 1987 following a routine inspection of hives and is assumed to have spread from Asia through Europe. It has since spread to over 40 States. The State of Florida has taken the lead in using the pesticide Fluvalinate to treat mite-infested hives.

If disease is suspected, the county extension agent or State apiary inspector can help. *Who's Who in Apiculture* lists State apiary inspectors.

Here are a few simple rules for avoiding diseases in honeybees:

1. Do not buy honey for feed from an unknown source; such honey may carry organisms that cause American foulbrood disease.
2. Buy package bees and queens only from reputable dealers.
3. Buy used bee equipment only after consulting with the State apiary inspector.
4. Look for signs of diseases each time the beehive is opened. Early detection can avoid costly replacements.

Besides watching for parasitic mites, beekeepers have been keeping an eye on the range expansion of Africanized honeybees. Subject of many scary media stories, these bees are more likely to sting in defense of their nests than the domestic European honeybees. However, a chance encounter with an Africanized bee foraging on blossoms is no more likely to result in a sting than with a domestic honeybee.

Based on experience in South and Central America, honey production in the United States is likely to show a temporary decline after the arrival of the interlopers. Beekeepers may experience more difficulty in transporting pollinator colonies because of these bees' sensitive nature. Also, hobby and sideline beekeepers may find it more difficult to obtain apiary locations in nonrural areas.

From a biological viewpoint, one defense would be to increase the numbers of European honeybee colonies to compete with the other. State and Federal researchers are working with beekeepers to develop methods to minimize the impact of the Africanized bees.

Potential entrepreneurs may need to plan for more intensive management practices to maintain desirable bees.

Other Factors

Taking advantage of their special skills, many beekeepers "moonlight" as swarming-pest control specialists (bees, wasps, and hornets) to augment the income earned from their hives. Sometimes the swarms can be taken and resold to other beekeepers.

Beekeeping has become a much more sophisticated and technical business in the last few years. The unwary entrepreneur must be prepared to contend not only with the obvious and omnipresent dangers of bee stings but also with various pest and disease problems, crop failures because of weather, low prices because of imports, and even marauding bears. And much has also been made in recent years about the northward migration of so-called Africanized "killer" bees.

These bees have been migrating northward since 1956 when they were accidentally released in Brazil. However, these tropical strains are ill-suited to cold weather and are probably incapable of sustaining life in at least the northern two-thirds of the United States. Wild honeybee colonies become easy targets for swarms of Africanized bees, which kill the queen and replace her with their own queen, gradually taking over the hive. But beekeepers are able to control the stock of their colonies by regularly "requeening," or replacing one domestic queen with another.

Profile

Dean Gary of Biz-zz Bee Farms in San Antonio, Texas, began as a beekeeper in 1982. At one point, he was running 400 hives and packaging honey for resale to grocery stores, produce markets, health food stores, and other customers. Gradually, however, he came to the realization that it was not practical or efficient to try to "do it all;" that is, to produce, package, and sell the honey. As his business grew, he recognized that his real niche was in selling rather than in producing. Most farmers and ranchers are not salespeople, but this was a skill at which he excelled.

In 1986, Mr. Gary began to gradually shift his business away from the bee business and into honey buying and reselling. By 1991, he was almost exclusively wholesaling uncooked mesquite honey. He pays other producers between 50 and 55 cents a pound for their honey, which includes picking up the honey at the beekeeper's facility and saving their drums. He can sell it in bulk for between 80 and 85 cents a pound. Currently he sells 40 to 50 drums a year.

Mr. Gary buys honey from about 30 producers who produce anywhere from 5 gallons to 100 barrels of honey. The market for unfiltered, uncooked raw honey and also specialty honey (such as mesquite honey) has been increasing. The rising interest in raw honey has been partly a result of marketing work his company accomplished in the past few years. Mr. Gary also continues to bottle and sell to several small health food stores and grocery stores.

While a very small producer might find it efficient to package and distribute his or her own honey locally, anyone wanting to grow will likely need to make connections with an end packager or someone like himself who buys bulk honey. Direct store delivery is a great amount of effort. The exception is someone who has two or three established outlets—stores that will buy all the producer wishes to package and sell, and a big enough family to help with the business so that additional labor does not have to be hired.

Honey is stored and sold in specially lined 55-gallon drums, or 5-gallon pails approved for food containment. Around San Antonio, the competition among buyers for raw honey is quite intense, and there are many buyers for as little as a pail or as much as 10 barrels.

It is very important for a new producer to know and remember that honey production, like any farming venture, is strictly dependent on the weather. In the semiarid Southwest, this is especially true. Someone running about 60 hives might produce 11 barrels of honey in an excellent year. The same 60 hives in 1991 would have produced no more than 2 barrels of honey. The rain must not only come, but also come at the right time to produce the blooms. If there is only enough honey to keep the bees alive, there will be none to sell. However, with proper care there is no reason to expect that the hives and bees will be lost, even in a bad year. It is very difficult to forecast in the business, and it is not a good opportunity for someone who has to recover a part of his or her investment in a certain year.

A newcomer to the honey business who chooses to sell honey to a buyer should also know that a reputable buyer will (1) pay on the spot (2) pick up the honey and (3) return the drums or leave drums of equal value. In particular, producers should be aware that some buyers offer to pay in 30 to 45 days, which they claim is the length of time required to bottle and sell the honey. A producer should look for a buyer within 150 miles of the operation.

Although almost anyone can be a beekeeper, it does take hard work. About 400 hives are the maximum for a couple to undertake unless additional part-time help can be found. Someone aiming for $1,200 to $1,500 a year supplemental income might keep under 100 hives. A small to medium investment in the bee industry might be $3,000 to $5,000, which would be enough in the Texas area to start out with about 100 hives.

Ground cover and blooming trees that produce pollen and nectar are, of course, critical to the honey business. Most hives in the San Antonio area are located where the bees have access to the mesquite tree, mostly growing on privately owned lands. The mesquite tree is the largest producer of honey in Texas as well as in several southwestern States. There is also a large market for pollen, beeswax, and royal jelly. However, someone must know the basics of beekeeping before undertaking development of any of these other products. Pollen is particularly difficult to produce because it must be collected so quickly after the bees bring it into the hive. It is also easy to take the pollen at the wrong time for the bees. A pollen cleaner mechanism is now available. Royal jelly is currently selling for over $200 a kilo.

New equipment is not necessary or even desirable. From a cost-effectiveness point of view, it is far smarter to visit many financial institutions and find out who is in the bee business, who wants to get out of it, and buy good used equipment from someone willing to talk about the bee business. Local bee organizations, unfortunately, are not always willing to talk to anyone they perceive as an outsider.

In another part of the country, Bill Merritt of Merritt Apiaries has been a full-time, commercial beekeeper for nearly 20 years. His beeyard is located along the Ochlockonee River in Wakulla County, Florida. But much of the time, his 2,000 hives are located in the Apalachicola National Forest, where the bees have access to tupelo trees. The resulting "tupelo honey" has become famous among honey enthusiasts for its unique flavor. Gallberry, palmetto, and other plants are also good sources of pollen in the region.

Considerations for a Rural Development Strategy

Many of the most desirable forage trees of bees have higher value for other uses so that honey production is simply a secondary product of their growth. For example, tulip poplar is both an important timber species and one of the most important honey trees in much of the Eastern United States. Timber production can also be combined with grazing as in the use of honey locust in pastures. Many tree species such as tulip poplar, sourwood, basswood, and tupelo produce high-quality honey that fetches a premium price. These and other valuable honey species are also grown as ornamental shade trees which could be marketed to the landscaping industry.

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Bibliography

The ABC and XYZ of Bee Culture. 1990. Medina, OH: A.I. Root and Company. First published in 1897, this encyclopedia includes history, anatomy, hive styles, and glossary for large-scale bee cultivation. $25. 703 p.

Attfield, Harlan. 1990. A beekeeping guide. 40th ed. VITA Tech. Bull. No. 9, 1815 North Lynn Street, Suite 200, Arlington, VA 22209. 703–276–1800. Includes construction details for small-scale equipment, and discusses site selection, hive care, and clothing.

Coggeshall, William L.; Morse, Roger A. 1984. Beeswax: Production, harvesting, processing, and products. Ithaca, New York: Wicwas Press, 25 Hanshaw Road, Ithaca, NY 14850. This publication discusses chemistry and mechanics of beeswax production; utilization of beeswax; and other information.

Cooperative Extension Service. 1983. Beginning beekeeping for Kentuckians. Extension publication ENT–41. Lexington, KY: University of Kentucky. 26 p.

Delaplane, Keith S. 1991. Honey bees and beekeeping. Bull. 1045. Athens, GA: University of Georgia, College of Agriculture, Cooperative Extension Service. 23 p.

Donovan, Robert E. 1980. Hunting wild bees. Tulsa, Oklahoma: Winchester Press. Distributed by Roots Windmill Press, Box 1151, Medina, OH 44258. Discusses bee hunting, harvesting wild honey, beekeeping fundamentals, and making/using beehives.

Gentry, Curtis. [Publication year unknown] Small scale beekeeping. Peace Corps AT Dev. Series: Manual M–17. Washington, DC: Peace Corps Information Collection and Exchange, 806 Connecticut Avenue NW., Room 701. Covers basics of beekeeping; project planning, honeybee characteristics, hive products, disease and pest control, and plans for building equipment.

The Hive and the Honey Bee. 1975. Hamilton, IL: Dadant & Sons, Inc., 51 South Second Street. Technical compendium includes history, equipment, management, anatomy, behavior, pollination, disease, honey processing and plants, and pesticide poisoning. $16.25, 700 p. Also available from agAccess Book Catalog, P.O. Box 2008, Davis, CA 95617. 916–756–7177.

Kelley, Walter T. 1985. How to keep bees and sell honey. Clarkson, KY: Walter Kelley Company. A good and entertaining primer for the beginning beekeeper.

Miller, Dr. C.C. 1980. Fifty years among the bees. New Berlin, NY: Molly Yes Press. The book provides practical tips, gadgets, and gimmicks.

Morse, Roger A.; Hooper, Ted (ed.). 1985. Illustrated encyclopedia of beekeeping. Available through agAccess, P.O. Box 2008, Davis, CA 95617. 916–756–7177. Discusses recreational and commercial beekeeping management, biology, history, and includes a list of foraging plants. Includes regional discussions also. $35. 432 p.

Sammataro, D.; Avitabile, Alphonse. 1985. The beekeepers handbook. Charlevoix, MI: Peach Mountain Press.

Stelley, D.G. 1983. Beekeeping: an illustrated handbook. Davis, CA: agAccess Book Catalog, P.O. Box 2008. This publication includes products, pesticides, diseases, common nectar plants, equipment, and marketing. $12.95. 244 p.

Tompkins, Enoch; Griffith, Roger M. 1977. Practical beekeeping. Pownal, Vermont: Garden Way Publishing, Department 8600, Schoolhouse Road. Good coverage of different topics related to beekeeping. 214 p. $8.95 plus $2 for postage and handling.

Vivian, John. 1986. Keeping bees. Charlotte, VT: Williamson Publishing, P.O. Box 185. Good coverage of most beekeeping topics including planning, management, equipment, diseases, national and international sources of information, and suppliers. 238 p. $10.95 plus $1.25 for postage and handling.

Periodicals

American Bee Journal, Dadant & Sons, Inc., 51 South Second Street, Hamilton, IL 62341. 217–847–3324. Monthly magazine for hobbyists and professional beekeepers. Subscription, $14.

Bee Science Review, Wicwas Press, P.O. Box 817, Cheshire, CT 06410, $20/year.

Gleanings in Bee Culture, A. I. Root Company, 623 West Liberty Street, P.O. Box 706, Medina, OH 44256. 216–725–6677. Monthly apiculture magazine. Subscription, $14.

Honey Market News, Market News Branch, F&V Div., AMS, USDA, Room 2503, South Building, 14th and Independence Avenue, SW, Washington, DC 20250.

The Speedy Bee, P.O. Box 998, Jesup, GA 31545. 912–427–4018. Monthly newspaper for the beekeeping and honey industry. Subscription, $12.50.

Associations

American Bee Breeders Associations, P.O. Box 12, Claxton, GA 30417. 205–548–2313. Mrs. R. V. Harrel, Secretary. Fifty members include commercial beekeepers, researchers, hobbyists. Encourages development of better bees through better queens. Seeks to maintain uniform trade practices and principles in production/sale of package bees and queens. Annual meeting.

American Beekeeping Federation, 13637 Northwest 39th Avenue, Gainesville, FL 32606. 904–322–0012. Frank Robinson, Secretary/Treasurer. Eighteen hundred members include commercial/avocational beekeepers, suppliers, bottlers, and packers. Sponsors educational services, workshops, conferences, and contests. Provides bimonthly newsletter, membership directory, and classifieds. Ladies' Auxiliary has annual meeting.

American Honey Producers Association, Box 368, Minco, OK 73059. 405–352–4126. Glenn Gibson, President. Six hundred members include commercial/avocational beekeepers. Lobby to represent beekeepers in agricultural research or Federal programs.

Apiary Inspectors of America. Eighty-five members include State/provincial apiarists, researchers, and individuals. Active in research meetings and publishes newsletter. Contact Mr. I. Barton Smith Jr., Maryland Department of Agriculture, Plant Protection Section, 50 Harry S. Truman Parkway, Annapolis, MD 21401. 401–841–5920.

Bee Industries Association, 102 Broadway, Hamilton, IL 62341. 217–847–3324. C.C. Dadant, Secretary. Twenty members are manufacturers of wooden beehives and supplies. Sponsors annual convention.

Eastern Apicultural Society of North America, c/o Liz Rodrigues, 157 Five Point Road, Colt Neck, NJ 07722. 201–462–4591. EASNA has 1,600 members including hobbyists, honey producers, honey packers, and equipment manufacturers. Provides educational services, conferences, and a quarterly journal.

North American Apiotherapy Society, 15621 Aitcheson Lane, Laurel, MD 20707. 301–253–5313. Members include beekeepers, scientists, physicians, and others interested in therapeutic use of honeybee products. Information dissemination, quarterly newsletter, and annual symposium.

Western Apicultural Society of North America, 13 Alder Street, Apt. B, P.O. Box 681, Woodland, CA 95695. 916–666–4053. Ron Neese, Treasurer. WASNA has 225 members including hobbyists, honey producers, honey packers, and equipment manufacturers. Provides educational services, convention, and Western Apicultural Society Journal 4 to 5/year.

Resources

Thomas Donnelly, Delaware County Extension Service, New York State Route 10, P.O. Box 184, Hamden, NY 13782. 607–865–6531.

Dr. Malcolm T. Sanford, University of Florida, 0740 IFAS, Building 970, Gainesville, FL 32611-0740. 904–392–1801, Ext. 143.

Dr. Thomas Webster, Atwood Research Facility, Kentucky State University, Frankfort, KY 40601.

Alan White, Sullivan County Extension Service, 59 North Main Street, P.O. Box 670, Liberty, NY 12754. 914–292–6180.

USDA Research Facilities

Five USDA laboratories are studying breeding, behavior, and benefits of wild and domesticated bees.

Carl Hayden Bee Research Center, Dr. Eric H. Erickson, Entomologist, Director, 2000 East Allen Road, Tucson, AZ 85719. 602–629–6380. Studying life-style of the honeybee, how bees communicate with pheromones, visual cues and vibration, honeybee nutrition, and the effect of toxins on bees.

Bee Breeding and Stock Center Laboratory, Dr. Thomas E. Rinderer, Geneticist, Research Leader, Rural Route 3, Box 82–B, Ben Hur Road, Baton Rouge, LA 70808. 504–766–6064. Research on breeding honeybees that tolerate harsh climate, disease, insects, and other hazards.

Beneficial Insects Laboratory, Dr. Hachiro Shimanuki, Microbiologist, Chief, BARC-East, Building 476, Room 200, Beltsville, MD 20705. 301–504–9100. Studies bee diseases, pests, and nutritional needs. Provides bee diagnostic services.

Bee Biology and Systematics Laboratory, Dr. Franklin D. Parker, Entomologist, Research Leader, Utah State University, UMC53, Logan, UT 84322. 801–750–2525. Research involves alternatives to honeybees as pollinators, and wild bees.

Honey Bee Research, Dr. William T. Wilson, Entomologist, Research Leader, P.O. Box 267, Weslaco, TX 78596. 512–968–3159. Studies mites that infest breathing tubes of honeybees. Designs mite control measures and tracks spread of mites.

Sources of Bee Supplies

The A. I. Root Company, P.O. Box 706, Medina, OH 44258–0706. 800–289–7668.

Brushy Mountain Bee Farm, Inc., Route 1, Box 135, Moravian Falls, NC 28654. 800–233–7929.

Dadant & Sons, Inc., 161 Tillman Street, P.O. Box 397, Hahira, GA, 31632–0397. 912–794–2785.

Dadant & Sons, Inc., 190 Mary Street, Umatilla, FL 32784. 904–669–2622.

Rossman Apiaries, Inc., P.O. Box 905, Moultrie, GA 31776. 800–333–7677.

The Walter T. Kelley Company, Clarkson, KY 42726. 502–242–2012.

Chapter 11—Mushrooms

Description of the Product and Its Uses

The mushroom plant is composed of mycelium, a network of living fibers so small as to be invisible to the naked eye. Mushrooms are fungi. More specifically, they are saprophytes, which means that they live on dead and decaying material. Mushrooms convert decaying matter into their own food. When climatic conditions (temperature, light, moisture, and food supply) are right, the mycelia form small buds that grow into the fruits we know as mushrooms. The mushrooms, in turn, form spores that are spread by wind to other decaying matter. These spores then germinate to form new mycelium to repeat the life cycle.

The major commercial use of mushrooms is for food. Many species are inedible or poisonous, however, so the ability to identify these is critical to harvesting and cultivation. In addition to food, mushrooms are being developed for other uses. For example, the shiitake has been used in the biopulping process, and research has been conducted on ways of using fungal strains to reduce some of the toxic materials in municipal dumps. Some have use as dyes for textiles, and others are being used in medical research (table 11–1).

Table 11–1. Forest mushrooms with commercial uses

Agaricus	Lactarius	Polyporus
Armillaria	Lepiota	Puffballs
Boletas	Lions mane	Rozites
Chanterelles	Lyophyllum	Russula
Clavaria	Matsutake	Shiitake
Craterellus	Morels	Sparassis
Fistulina	Oregon white truffles	Sweet tooth
Hedgehog	Pleurotus	Verpa

Market and Competition Considerations

Forest-Harvested Mushrooms

In the early 1980's, a commercial market for wild edible mushrooms began developing in the Pacific Northwest when a few enterprising harvesters began exporting chanterelles to European canneries at the same time that a depressed timber industry had many rural people eager to supplement their incomes. The volume of wild mushrooms picked and sold increased dramatically, with annual volumes of up to 7 million pounds being blanched, chilled, packed in brine in large containers, and flown to Europe for canning.

Although numerous mushroom species are commonly collected, the most important wild ones from a commercial standpoint are the chanterelle (*Cantharellus cibarius*), morel (*Morchella conica*, or "blacks," and *Morchella esculenta*, or "yellows"), matsutake (*Armillaria ponderosa*, or "pine mushroom," and *Tricholoma matsutake*), boletus (*Boletus edulis*), and hedgehog (*Dentinum repandum*, or sweet tooth). Additional wild varieties that are harvested on a recreational basis include the meadow mushroom (*Agaricus campestris*), the fried chicken mushroom (*Lyophyllum multiceps*) (so called for its flavor when cooked), the orange delight, the shaggy mane (*Caprinus commatus*), the chicken of the woods (*Laetiporus (Polyporus) sulphurCus*), the gem-studded puffball, and the cone-shaped morel (*Morchella augusticeps*). The Northwest Wild Mushrooms Association listed 41varieties of wild mushrooms as safe for fresh market sales in 1984.

Chanterelle

The most important wild mushroom has been the chanterelle (the common golden or yellow chanterelle). In a good year, an estimated 4 million pounds of chanterelles are marketed from Oregon and Washington. Roughly one-eighth are marketed fresh. The rest are canned. The price to the picker averages $1 per pound for cannery grade and $1.50 per pound for fresh. The average wholesale price was $3 per pound for cannery grade and $4 per pound for fresh shipments in 1991.

Morels

Blacks and yellows are commonly marketed. In a good year, the Oregon harvest may be 500,000 pounds, 80 percent of which are dried prior to sale. The price to the picker averages $3 per pound. The sale price leaving the State averages $6 per pound fresh weight.

Matsutake

The estimated annual harvest of matsutake from Oregon and Washington is 35,000 pounds. This contrasts with a Canadian harvest of 250,000 pounds. The price to the picker varies widely, depending on the grade, but averages $6 per pound.

Boletus

The "king" is one of the most sought-after wild mushrooms, but unfortunately marketing it becomes a race with the fly larvae that invade the base of the stem and quickly destroy the mushroom. Several other species of boletus are marketed occasionally.

Hedgehog

This mushroom is a relative newcomer but is now generally available in season.

Until recently, both public and private forest landowners in Washington and Oregon usually ignored wild mushroom harvesting on their lands. The emergence of the commercial mushroom picking industry has attracted the attention of forest landowners. The Forest Service has implemented fee systems for selling wild mushrooms to commercial harvesters. Several systems are either in the developmental stage or have been implemented. Some timber companies allow mushroom harvesting on their land without fees, while others try to discourage trespassing and mushroom theft.

Russell (1990) has written one of the few papers on production, marketing, and regulation considerations of wild mushrooms. Domestic, fresh, forest-harvested mushroom markets are expanding steadily. Restaurants, health food stores, a few large grocery companies, farmers' markets, and other outlets are selling forest mushrooms in season. Harvest figures are difficult to obtain because regulatory laws and crop statistics, until recently, were nonexistent. The first annual wild mushroom report, prepared by the Washington State Department of Agriculture and the Washington Agricultural Statistics Service, has begun to track production, however. In Oregon, the sale of domestic and wild mushrooms is one of the fastest growing produce industries in the State. The total annual value of wild mushrooms exported from Oregon normally exceeds $6 million, mostly in sales to Germany.

In 1989, 20 licensed buyers and 4 licensed processors (dealers) in Washington reported buying 257,700 pounds (130 tons) of wild mushrooms with a wholesale value of $652,247, or $2.53 per pound. The bulk of these mushrooms came from two counties, and 97 percent of the crop was chanterelles. The next most popular species was boletus, with 4,060 pounds harvested for an average price of $5.99 per pound. The most valuable species was matsutake, with 2,600 pounds harvested with an average price of $13.99 per pound.

Picking and selling wild edible mushrooms provides supplemental seasonal income for many. It is estimated that Washington has from 700 to 900 commercial mushroom pickers whose earnings range from a few dollars to $3,000 – $5,000 in a good season.

The State of Washington passed a Wild Mushroom Harvesting Act in 1988 that requires an annual license for persons who buy and process wild mushrooms for market. It is the only State or province in North America known to have a law for commercial harvesting of wild mushrooms. Buyer and dealer licenses are $75 and $375, respectively. Pickers are exempt. The buyers must send a monthly form to the State Department of Agriculture that includes (a) site of purchase (b) amount by weight of each species obtained (c) approximate location of harvest site (d) date of purchase (e) price paid to harvester and (f) name, address, and license number of dealer to whom the mushrooms are sold. The State intends to publish annual harvest totals as well as a description of where processed wild mushrooms are being sent.

In Europe, there is much more interest in the wild mushroom than in the United States. For example, millions of pounds of mushrooms are shipped to Germany from the United States.

There has been a big increase in competition among dealers of forest-harvested mushrooms in the past few years. For one reason, Japanese companies are now represented in the Northwest. It is believed that the Japanese already control the matsutake market. The Japanese have been known to bid higher for this mushroom than the current market price in Japan in order to corner the U.S. market, and gamble that by the time the mushroom arrives in Japan, the price would be higher there and they would make a profit. It should be noted that American dealers are not permitted to sell directly to the Japanese consumer, only to Japanese dealers.

Cultivated Mushrooms

Cultivated mushrooms are a promising new industry, with many new businesses developing every year. The more popular cultivated varieties are the shiitake, chanterelle, oyster, and enoki. Work is progressing on the cultivation of matsutake as well.

There are as many methods of cultivation as there are varieties of mushrooms. Each has its particular requirements. Because these are so varied, this section will briefly summarize cultivation of the shiitake since interest in its production in private forest lands has been quite high and it now has the greatest potential in terms of both indoor and outdoor cultivation. It can be cultivated in virtually every part of the country and in both small and large operations.

Mushroom cultivation is an excellent method of increasing the profitability of a forest with little disruption of the existing ecosystem. For example, firewood or pulpwood may sell for $30 to $40 per cord. The same wood-producing shiitake might be worth $500.

Shiitake

The shiitake (*Lentinula (Lentinus) edodes*) has been popular for centuries in Japan, where it is known as the forest mushroom and originally grew wild on the shii tree (closely related to the oak). It has been prized for its flavor and use in folk medicine. The Japanese slowly learned how to cultivate it, and Japan currently produces over 90 percent of the world's shiitake. But in the last 20 years, hundreds of shiitake growers have begun cultivating the mushroom in the United States as well.

Since the 1940's, worldwide demand for shiitake mushrooms has placed its market volume second only to that of the common white mushroom (*Agaricus brunnescens*). The texture of shiitake is more chewy, and the odor more aromatic, with a pleasant garliclike flavor. It tastes good either fresh or rehydrated from dried mushrooms, and is a dietary source of protein, vitamin D, B vitamins, and minerals. Markets for fresh and dried shiitake already exist in the United States, particularly in large cities where the bulk of the sales go to oriental restaurants and oriental, gourmet, and health food stores.

Of all the cultivated mushrooms, the shiitake has seen the greatest growth in the last decade in terms of both indoor and outdoor cultivation. Its market potential is great because of its unusually high nutrition value and the fact that it can be cultivated in virtually every part of the country in both small and large operations.

The first step in growing shiitake, as well as any other mushroom, is selecting the growing medium. Although a wide variety of media are reportedly used (including hay and rice), the most popular method is to use wood as a medium. A wide range of trees can be used, but there is general agreement that oaks work well, particularly white oak. Logs are cut from living, decay-free trees during the dormant season when the wood contains the maximum amount of stored carbohydrates. The diameter of logs should be from 3 to 6 inches. The bark layer should remain intact. Raising shiitakes allows use of wood that would otherwise be unmarketable, and wood cut to thin overgrown woodlots. In States such as Texas, such overgrown hardwoods cover millions of acres in the State, providing an unlimited resource for shiitake production.

Inoculation is the placement of spawn into the logs so that the shiitake fungus can begin to grow. This should be done within 2 weeks of harvesting the logs. Spawn comes either as wooden plugs made from hardwood dowels or as sawdust. There are several inoculation techniques, but most commonly holes are strategically placed around the log and the holes are filled with the spawn plugs.

The first "fruiting" will normally occur between 6 and 18 months after inoculation. During this incubation period it is critical to monitor and maintain the environmental conditions, including moisture, light, and temperature.

Successful mushroom marketing involves direct marketing to grocery chains, restaurants, health food stores, and retail sales to consumers. The article by Green (1988) is useful in analyzing potential markets during the early planning stages of a new production. Once a sufficient number of growers are active, a marketing cooperative is generally beneficial to consolidate some production, grading, and packaging activities at a central location. Via a co-op, sales can be made to larger volume users such as large grocery chains and to larger food processors and restaurant chains. Wholesale prices in 1990 were anywhere from $3.50 to $10 per pound in the Southeast, with retail prices between $9 and $12 a pound in cities.

Matsutake

This native American mushroom has great potential, since Japanese have paid over $100 a pound for it.

Chanterelle

Sales are estimated at 10 million pounds a year worldwide and are a big factor for rural development.

Distribution and Packaging

All types of mushrooms are at their best when not subjected to long storage. Harvesting, shipping, and marketing should be accomplished as quickly as possible. Even under the best conditions, mushrooms do not keep fresh more than 1 week after harvest. Immediate cooling is essential for prolonged shelf life. Most shippers refrigerate after packing. A few use vacuum cooling.

For short periods of time, mushrooms can be stored at 34°F with relative humidity at 90°F. Shiitake and enoki will keep for about 2 weeks at 34° to 36°F .

To meet most consumer needs, mushrooms are packaged in 8-, 10-, 12-, and 16-ounce packages. A 4-ounce bag size may be needed in farmers' markets to sell to first-time buyers. The 8-ounce package is generally most popular. Mushroom boxes must be vented so that air can circulate. Since mushrooms give off heat, venting helps minimize spoilage. The average price for a custom-designed box is 50 to 75 cents.

Most growers sell their products to two sources: direct to roadside or farmers' markets or to shipping point firms, which include cooperatives, brokers, or other grower-packers. From grower-packers, the product is marketed for export or sold to direct sale, wholesale, or retail markets, which, in turn, market directly to the public

or to other consumers such as food processors or restaurants.

Mushrooms of lower quality or freshness can be dried, packaged, and sold in the retail and restaurant markets. A tremendous quantity of mushrooms is used in the processed food industry in the dry form where visual quality is not as important.

Equipment Needs, Costs, and Suppliers

Forest Harvesting

One advantage of mushroom picking is that a picker with a car and reasonable woods lore can become an independent business person. However, it may be cause for concern if pickers are not thoroughly acquainted with each species they are collecting. The influx of Southeast Asians into Washington has brought an increase in the picker work force, since similar mushrooms were available in the homelands of these individuals. It is possible to pick and sell mushrooms to buyers without being fluent in English. The greatest majority of pickers are nomadic, following the seasons and the rain.

The buyers are not hard to find. There are buying stations scattered around the region, sometimes several, and word gets around. Some of the buyers are from the local area but many of these people are nomadic, too. It takes a lot of experience to be a good buyer—not only must the buyers be able to identify the mushroom, but they must be able to recognize quality and they must be skillful with people. A sample information sheet for mushroom pickers is included in the appendix.

Commercial Production

In addition to the space in which to grow the shiitake (outdoors or indoors), the basic requirements for cultivation include logs or other growing media, mushroom spawn, and various miscellaneous tools and supplies such as drills for coring the wood. A general estimate of these fixed start-up costs, based on the inoculation of 500 logs, is slightly more than $500.

There are many firms that supply mushroom spawn, tools, and information to both professional and hobbyist cultivators (see section on suppliers, buyers, and producers). Regional suppliers can usually be located through local associations and extension offices.

The basic strategy in mushroom farming is to introduce the fungus of choice into a suitable substrate while excluding other fungi that would compete for the same space. Fungus growth can be divided into two stages: a vegetative stage and a fruiting (reproductive) stage when the mushrooms are produced. The basic steps for growing shiitake are (1) obtaining logs and spawn (2) inoculating (3) laying (4) raising and (5) harvesting and marketing. The appendix lists sources of growing information. It should be noted that different strains of shiitake can have very different characteristics, and it may be necessary to try a few to find the strain that works best in a given situation. In addition, some buyers (the Japanese, for example) are very particular about which strains they want.

Resource Conservation Considerations

Potential for Overharvesting Wild Mushrooms

It is not yet known whether picking affects the productivity of future generations of mushrooms. Indications are that the answer depends on the weather. But the intensity of harvesting wild edible mushrooms has reached the point of valid concern about possible degradation of the resource itself.

European forests have recently experienced declining wild mushroom crops after decades of heavy harvesting, and the rising popularity of the wild mushrooms of North America stems in part from this diminished European supply. However, it has been pointed out that the declining European mushroom harvest may be just part of the larger overall deterioration of these forests, caused largely by air pollution (Denison and Donaghue, 1988).

Tours and examinations of recently burned areas of the Malheur National Forest (July 1991), where commercial morel collecting had occurred, revealed that even in a heavily picked area, sufficient morels were in place to produce spores to disperse the species. While it was not possible to evaluate the vigor of the subterranean mycelium that produces the morels, there was no reason to believe that the picking had damaged it. There was, however, a concern that the encampments of pickers in random camps with no sanitary or other facilities had a definite detrimental impact on the area. It has been recommended that some rare mushrooms, such as black chanterelles, should not be harvested anywhere in the Pacific Northwest until it has been determined what level of harvest provides for sustained yield.

Needed Regulation in Harvest Methods

There is not yet even a definite answer to the question of whether it is better to harvest a mushroom by cutting it off at the stem or by pulling it out. Further guidelines are needed on harvest methods. The way in which harvesting is done will also affect a forest's ecology over the

long run. Commercial picking operators generally make a clean sweep of timber stands. Some use rakes to disturb the duff, a method which should certainly be discouraged. For example, large crews have been observed using rakes to dig up the turf and duff sometimes over a foot deep to find matsutake mushrooms. This digging certainly changes the forest ecology. There seems to be an emerging consensus that Federal and State laws should prohibit disturbing the duff or not replacing it, or digging deeper than 2 inches. Of course, it would not be easy to enforce such a law.

An additional area for regulations regards the size of mushrooms that could be picked. Many feel that small chanterelles (less than 1 inch cap) should not be picked. The reason is that most restaurants do not want them and they are not regarded as a quality product. Picking the little ones means they do not throw their spores. Also, leaving them for even a few weeks can make a big difference in size.

Forest Management Practices

The single most destructive forest practice from the point of view of those in the wild mushroom business is timber clearcutting. Some individuals maintain that once an area is clearcut, mushrooms will not be found for about 15 years. Some crops in certain localities have been reduced substantially because of clearcutting. The mushroom industry feels that a study needs to be done to assess whether it might not be true that more money can be attributed to nonforest products from multispecies forests than can be obtained from the trees alone. The tree can only be harvested once in 60 years. Products like the mushroom can be harvested frequently. In addition, pickers do not need heavy machinery.

Conflicts Between User Groups

There are currently no mushroom harvest restrictions in Washington or Oregon, and increasing conflict and competition is occurring between recreational and commercial pickers, with commercial pickers harvesting during the week and tending to clean out recreational pickers' favorite patches by the weekend. Some recreational pickers reportedly have been ordered away from certain areas or otherwise confronted or intimidated by commercial pickers. Resource harvests may need to be rotated to allow light harvest (recreational), commercial harvest, and recovery years.

Denison and Donaghue (1988) have described the question of harvesting from public forests from the viewpoint of the pickers, brokers, and landowners (generally the taxpaying public or shareholders of large companies) involved in the mushroom question. This paper points out that although the economic need of the picker and broker may be great, the economic need of the forest landowner is perhaps greater, since maintenance of the forests requires a continuing annual investment.

Leasing Picking Rights

The national and State forests have been trying different leasing and permitting systems to deal with wild mushrooms pickers. One may sell 3-day and 30-day commercial harvesting permits and allow free personal use permits with a limit of 5 gallons. Mushroom buyers using Federal land as a purchasing station may be required to have a $100 annual permit and to only purchase mushrooms from pickers who have valid Federal harvesting permits. Another system may allow up to two annual permits for family or personal use for 50 pounds of mushrooms, or a 3-day commercial permit to allow harvest of 100 pounds at an appraised price. The Washington Department of Natural Resources leases land to individuals or leaseholders at a bid price. Other agencies with responsibility for wildlife or parks usually allow recreational picking but not commercial harvesting.

In the opinion of mushroom pickers, the Forest Service's system of "leases to pick" is detrimental to the industry. The approach has been to look at mushrooms as a forest product just like timber. However, the mushroom supply cannot be measured. And while rain, snow, heat, and cold do not hurt timber, sudden weather shifts can devastate a mushroom crop. In the worst case, after a dealer has a lease, he or she could find nothing to harvest. The only ones who will take this risk in bidding for leases to pick are companies with lots of money. A better arrangement, in the opinion of pickers, would be to charge according to how many pounds of mushrooms are harvested.

The picker also becomes responsible for forest dangers. If a forest fire results from someone's carelessness, the picker has to pay for the forest fire. There is virtually no small company that could survive such a fire. This policy has encouraged some companies to create bogus companies to protect their assets. Here again, in the opinion of some mushroom pickers, a bonding company should be used instead.

Licensing

The State of Washington requires licenses rather than leases. This licensing process requires dealers to fill out records telling the amount harvested and the county where the harvesting occurs. However, this system is prone to error because there is no guarantee that the county where the picker harvested the mushroom is the same county where the mushrooms were sold to the dealer. Dealers also fear that if word gets out about mushroom areas, European companies will descend on

these areas, bringing their own people and bidding prices way up, even taking the whole crop. The market in Europe is so much stronger that this is viewed as a real possibility. European mushroom dealers also have all the needed infrastructure already in place, and their governments will loan them money to expand.

The alternative would be to keep such statistics completely confidential and thereby ensure the cooperation of the dealers and pickers.

Dealers also do not want to be slowed down with a lot of paperwork because the product must be moved so fast. Each year's weather is so different, too, that it makes it very difficult to draw conclusions from annual sales data.

There would also be resistance among dealers to tracking sales, since dealers want to protect the identities of their buyers.

Public Health Concerns

In the State of Washington, mycologists and others have expressed concern that poisonous mushrooms could accidentally slip into the market because the State has no regulations or inspections of mushrooms sold to the public. Pickers are not certified in any way, although various guides have been published to identify poisonous mushrooms (Puget Sound Mycological Society, 1972). In contrast, French mushroom markets are closely regulated by certified mushroom inspectors, and access to the market is carefully controlled. Sellers must live within the local area serviced by the market, which is only open July 1 to November 15. It has been recommended that sales of any and all food and drug resources from the national forests be made only to brokers or processors who are properly licensed, and that these processors should only employ harvesters holding current valid health cards.

Profile

Sharon Krogmeier of K.P. Spring Oak in West Point, Iowa, attended a shiitake-growing seminar about 6 years ago and became interested in growing mushrooms. While she and her husband do not own their own woodlands, her sister's family does, and she knew she could get a dependable and free supply of white, red, and black oak logs.

The Krogmeiers started out with 200 logs and relatively little investment. They ordered their spawn through the Geode Shiitake Mushroom Producer's Association, which was formed in January 1991 because of the growing interest in Iowa in mushroom cultivation. The Krogmeiers' initial supply of wood was free, they already had a garage in which to store the logs and to force the fruit, and the family could supply all the needed labor. First-year harvests were so satisfying that they quickly increased in production to their current 3,000-log operation.

Presently, they cut about 600 to 700 logs a year, which are inoculated soon after being cut, left to sit for about 6 months outside, and then brought into a 12- by 24-foot garage where they are soaked in water for about 24 hours and then placed in a controlled environment (temperature around 80°F and humidity around 85 percent) where the mushrooms rapidly emerge. This size of an operation requires 15 to 20 hours a week in labor from one person and allows a net profit of $10,000 to $12,000 in a good year. This is a good source of supplemental income. Sharon Krogmeier also runs a child care center and her husband is a heating and plumbing contractor.

The mushrooms are harvested and sold through the Geode Shiitake Mushroom Producers Association. Between one-quarter pound and one-half pound of mushrooms can be obtained from each log. The association can sell virtually any amount that is grown, providing it is of good quality. Most of the mushrooms are sold to food processing companies. Currently, the association sells the shiitake mushrooms for about $6 a pound, withholds 20 percent ($1.20) for association costs, and pays producers the remaining $4.80 per pound. The markets have stayed very strong.

Having the association do the marketing for the producers has been a big help to the shiitake mushroom producers in the State. Some producers are planning for 10,000-log operations and larger. There are also many with relatively small (300-log) operations. Many producers are using vacant pole buildings, which they insulate and heat. In general, buildings can house two logs per square foot.

Many shiitake producers use limbs that are too small for loggers or they purchase wood by the cord. The logs must be "live wood," cut during the dormant season between fall and spring, and disease-free. The logs will last 3 to 5 years after they are inoculated and they are inoculated only once. Every 3 months or so after fruiting, they are resoaked and then put back into production. In the last few years, the Krogmeiers have begun buying some of their logs at about $0.80 to $1.00 a log. They plan to maintain a 3,000-log operation.

Considerations for a Rural Development Strategy

One useful role for rural development interests would be to free restaurants from the stigma of serving a well-recognized wild mushroom. The ordinary Mom and Pop

restaurant in a rural area thinks it is not allowed to serve chanterelles, for example, because they are "foreign substances," for instance, not purchased from a licensed grocery dealer. Most are scared that they will be fined. But in Seattle restaurants, wild edibles are sold all the time. Getting this attitude changed would be a way to support the local economy with a forest product, since local pickers could then sell direct to local restaurants. The local restaurants could improve their specialty reputations with delicious native foods that would cost the consumer about one-fourth the price of what they would pay in a big city. There would still be a need for some system to ensure safety, however.

Contributors

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Bibliography

Acker, Randy. 1986. Harvesting wild edible mushrooms in Washington—An issue paper. Prepared for the Wild Edible Mushroom Task Group. Coordinated and edited by Ken Russell, Forest Pathologist, Washington State Department of Natural Resources, Olympia, WA. November.

Anderson, Steven; Marcouiller, Dave. [n.d.] Growing shiitake mushrooms. Stillwater, OK: Oklahoma State University Extension Service No. 5029. Contains a sample cash flow analysis for an outdoor operation.

Arora, David. 1986. Mushrooms demystified, 2d ed. Ten Speed Press, Berkeley, CA, $24.95.

Chang, S.; Hayes, W., eds. 1978. The biology and cultivation of edible mushrooms. agAccess Book Catalog, Davis, CA. 819 p.

Chang, S.T.; Miles, P.G. [Publication year unknown.] A new look at cultivated mushrooms. BioScience 34(6): 358–362.

Denison, William C.; Donaghue, John. 1988. The wild mushroom harvest in the Pacific Northwest: Past, Present and Future. Unpublished paper.

Duggleby, John. 1989. Into the woods to start a food company. Adweek's Marketing Week 30:(1): 26.

Flegg, P.B.; Spencer; D.M.; Wood, D.A. 1985. The biology and technology of the cultivated mushroom. Wiley, Chichester, NY. 347 p.

Food, Fuel, and Fertilizer from Organic Wastes. 1981. Washington, DC: National Academy Press, 27–37.

Genders, Roy. 1982. Mushroom growing for everyone. agAccess Book Catalog, Davis, CA. 216 p.

Green, Judy. 1988. Doing your own market research. Farming Alternatives, Resource Sheet No. 6, 443 Warren Hall, Cornell University, Ithaca, NY 14853. 607–255–9832.

Handbook for commercial mushroom growers. 1982. Pennsylvania State University, agAccess Book Catalog, Davis, CA. 176 p.

Harris, Bob. 1986. Growing shiitake commercially. Mushroompeople, Inverness, CA 94937.

Harris, Bob. [Publication year unknown]. Growing wild mushrooms. Mushroompeople, Inverness, CA, $6.

Hawksworth, Sutton & Ainsworth. 1983. Ainsworth & Bisby's diction of the fungi, 7th ed. agAccess Book Catalog, Davis, CA. 443 p.

Ingle, Schuyler. 1988. Mycotopia. Harrowsmith. Camden House Publishing, Charlotte, VT. May/June: 68–73.

Jenster, Dr. Per V.; Hankins, Andy; Myslewicz, Laura; Harvey, J. Dale II; Coakly, Peter. 1988. Agricultural entrepreneurship: growing shiitake mushrooms for profits. Center for Entrepreneurial Studies, McIntire School of Commerce, University of Virginia, Charlottesville, VA 22903.

Kaye, Geraldine C. 1986. Wild and exotic mushroom cultivation in North America, 2d ed. Farlow Reference Library and Herbarium of Cryptogamic Botany, Harvard University, Cambridge, MA 02138, 32pp. A directory including publications, organizations, suppliers, and researchers dealing with exotic mushroom cultivation. Available from Mushroompeople, Inverness, CA, for $7.50.

Kerrigan, R. 1982. Is shiitake farming for you? A technical manual for the commercial farmer and the home grower, Far West Fungi, Goleta, CA 93116, 22 p.

Kozak, Mary Elle. 1989. To market, to market.... Shiitake News, p. 8.

Kozak, M.E. [and others]. 1989. Growing shiitake mushrooms in a continental climate. Field and Forest Products, Inc., Peshtigo, WI 54157.

Krieger, Louis C.C. 1967. The mushroom handbook, New York: Dover Publications, Inc. 560 p.

Kuo, D.D.; Kuo, M.H. 1983. How to grow forest mushroom (shiitake). Mushroom Technology Corporation, Naperville, IL 60565. 108 p.

Leatham, G.F. 1982. Cultivation of shiitake, the Japanese forest mushroom, on logs: a potential industry for the United States. Forest Products Journal 32: 29–35.

Lincoff, Gary. 1981. Audubon Society field guide to North American mushrooms. New York: Alfred Knopf Publications. $12.50.

Mushrooming your forest management profits with imperial forest mushrooms (shiitake). [Publication year unknown]. Available from Carolina Agro–Tech Corporation, Route 5, Box 84E, Henderson, NC 27536.

Mushroom: The journal of wild mushrooming. Box 3156, University Station, Moscow, ID 83843. Quarterly.

Mushrooms. The packer: 1989 produce availability & merchandising guide. Overland Park, KS: Vance Publishing Inc., p. B–192–6.

Mushrooms in forestry. Forestry Canada, Pacific Forest Research Center, 506 West Burnside Road, Victoria, BC V8Z 1M5 CANADA.

Przybylowicz, P.; Donaghue, J. 1989. Shiitake growers handbook: the art and science of mushroom cultivation. Kendall/Hunt Publishing Company, Dubuque, IA, 217 p. Available from agAccess, Davis, CA, for $21.50.

Puget Sound Mycological Society. 1972. Mushroom poisoning in the Pacific Northwest. Misc. Pub. Puget Sound Mycological Society, 200 Second Avenue North, Seattle, WA 98109. 7 p.

Rice, Miriam C. 1980. Mushrooms for color. agAccess Book Catalog, Davis, CA. 150 p.

Rogers, Ken. [n.d.] Shiitake mushrooms—a forest product from woods to supper table. Available from the Forest Products Laboratory, P.O. Box 310, Lufkin, TX 75901.

Royce, Daniel J. 1987. Mushroom fact sheet. Pennsylvania State University, College of Agriculture, Cooperative Extension Service, University Park, PA. 2 p.

Royce, Daniel J.; Schisler, Lee C.; Diehle, Douglas A. 1985. Shiitake mushrooms: consumption, production, and cultivation. Interdisciplinary Science Reviews 10(4): 329–335.

Rugen, Christine. 1990. Mushroom culture: a list of contact people and supply sources. Appropriate Technology Transfer for Rural Areas (ATTRA), P.O. Box 3657, Fayetteville, AR 72702.

Russell, Kenelm. 1990. Forest fungi manufacturing, marketing and regulatory considerations. Presented at the Special Forest Products Workshop, February 8–10, 1990, Portland, OR. Mr. Russell is Manager/Forest Pathologist, Forest Health, Washington State Department of Natural Resources, Olympia, WA.

San Antonio, James P. 1981. Cultivation of the shiitake mushroom. HortScience: 151–156.

San Antonio, J.P.; Hanners, P.K. 1983. Spawn disk inoculation of logs to produce mushrooms. HortScience 18: 708–710.

Schlossar, William; Blatner, Keith; Baumgartner, David. [n.d.] Directory of special forest products buyer/processors in the Pacific Northwest and coastal British Columbia. Bulletin Department/CES, Washington State University, Pullman, WA 99164–5912.

Schultz, Warren, Jr. 1982. Gourmet mushrooms—faster. Organic Gardening: 51–55.

Shiitake Mushroom Marketing Guide, Forest Resource Center, Route 2, Box 156 A, Lanesboro, MN 55959.

Shiitake Mushrooms. 1989. The proceedings of a national symposium and trade show (Table of Contents, May 3–5, 1989, St. Paul, MN). Available from Center for Alternative Plant and Animal Products, St. Paul, MN, $20.

Shiitake News. Forest Resource Center, Lanesboro, MN 55959.

Sims, Grant; Bostian, Kelly. 1990. Mushroom lady: finding fungus for science and supper. Alaska 56(6): 48.

Singer, R. 1961. Mushrooms and truffles. New York: Interscience Publishers, Inc.

Stamets, P.; Chilton, J.S. 1983. The mushroom cultivator. Olympia, WA: Agarikon Press. 415 p.

Steineck, Hellmut. 1981. Mushrooms in the garden, 2d ed.. agAccess Book Catalog, Davis, CA. 152 p.

Yoo, B.W. 1976. How to grow oak tree mushroom shiitake. Dr. Yoo Farm, College Park, MD 20740. 21 p.

Resources

Keith Blatner, Economist, Washington State University, Pullman, WA 99164. 509–335–2811.

Dr. Harold Burdsall or Tom Volk, USDA Forest Service, Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI 53705. 608–231–9234.

Milo Burnham, Cooperative Extension Service, Box 5446, Mississippi State University, Mississippi State, MS 39762. 601–325–3036.

Bill Denison, Northwest Mycological Consultants, 702 Northwest Fourth Street, Corvallis, OR 97330. 503–754–3451.

The Forest Resource Center has compiled and published the Shiitake Mushroom Marketing Guide for Growers to help growers effectively market their produce. The Center also publishes the Shiitake News to exchange ideas and update growers on new developments that affect the industry. Forest Resource Center, Route 2, Box 156A, Lanesboro, MN 55949. 507–467–2437.

Fungi Perfecti, P.O. Box 7634, Olympia, WA 98507. 206–426–9292. Paul and Cruz Stamets. Promotes cultivation of high-quality gourmet mushrooms. The Stamets are currently growing Ganoderma lucidum, a medicinal wood-rotting fungus prized by oriental people. Have also worked with oyster mushrooms, shiitake, morels, and others. Fine scientists.

Geode Shiitake Producers Association, 4809 Avenue O, Fort Madison, IA 52627. 319–372–1692.

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Dr. Ralph Kurtzman, 573 Harbor Way, Richmond, CA 94801. 415–233–0555.

Pacific Forestry Centre, brochures on Harvesting Edible Wild Mushrooms in British Columbia and Mushrooms in Forestry, 506 West Burnside Road, Victoria, BC V8Z 1M5. 604–363–0600.

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Society for Economic Botany, Dr. George Constantine, College of Pharmacy, Oregon State University, Corvallis, OR 97330.

The Texas Forest Service has assembled a 75-page packet of information on growing shiitake mushrooms, sources of spawn and equipment, management procedures, and economic and marketing ideas. The cost of this packet is $4; checks should be made payable to the Texas Forest Service and sent to the Forest Products Laboratory, Highway 59S, P.O. Box 310, Lufkin, TX 75901. Phone 409–639–8180.

Associations

America Mushroom Institute, 907 East Baltimore Pike, Kennett Square, PA 19348. 215–388–7806.

The Canadian Wild Mushroom Association, P.O. Box 80794, Burnaby, BC V5H 3Y1.

Forest Resource Center, Route 2, Box 156A, Lanesboro, MN 55949. 507–467–2437. Jerome Deden, Executive Director.

North American Mycological Association, 3556 Oakwood, Ann Arbor, MI 48194. Ann Bornstein, Membership Secretary.

Suppliers, Buyers, and Producers

Allied Mushroom Products Company, P.O. Box 490, Tonitown, AR 72770. 501–361–5938.

American Type Culture Collection, 12301 Parklawn Drive, Rockville, MD 20852.

Carolina Agro-Tech Corporation, Route 5, Box 84E, Henderson, NC 27536. 919–438–2674.

Cascade Mushroom Company, Matt and Ellen Briggs, 530 Northwest 112th Avenue, Portland, OR 97229. 503–644–0962.

Dr. Yoo Farm, Box 290, College Park, MD 20740.

Elix Corporation, Route 1, Box 133-1A, Arvonia, VA 23004.

Far West Fungi, Box 1333, Goleta, CA 93116.

Farlow Reference Library and Herbarium of Cryptogamic Botany, 20 Divinity Avenue, Harvard University, Cambridge, MA 02138.

Field and Forest Products Inc., N3296 Kozuzek Road, Peshtigo, WI 54157.

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Don and Bonnie Grandorff, 31465 Berlin Road, Lebanon, OR 97355. 503–451–2536.

H-S Farming Company, P.O. Box 724, Heraldsburg, CA 95448. 707–838–4570.

The Kinoko Company, Box 6425, Oakland, CA 94621.

Kurtzman's Mushroom Specialties, 815 Harbor Way, No. 12, Richmond, CA 94804.

Madam Mushroom, Coast Mt. Res., P.O. Box 217, Satsop, WA 98583. 206–482–2722.

Mushroom Technology Corporation, Box 2612, Naperville, IL 60565.

Mushroompeople, P.O. Box 159, Inverness, CA 94937. 415–663–8504.

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Pacific Mushrooms Inc., John Barnes, 2608 Roosevelt Boulevard, Eugene, OR 97402. 503–688–5645.

Pennsylvania State University, 2111 Buckhout Laboratory, University Park, MD 16802.

Rainforest Mushroom Spawn, International Division, P.O. Box 1793, Gibsons, BC V0N1V0, CANADA.

Sohn's Oak Forest Mushrooms, Box 20, Westfield, WI 53964.

Table Mountain Mushrooms, John Donaghue, 1810 Northeast Seavy, Corvallis, OR 97330. 503–745–5886.

Tucker's Evergreens, Roy Tucker and Jerry Eastbourne, 4902 Highway 20, Sweet Home, OR 97386. 503–367–5625. (They deal in everything from mushrooms to Oregon grape root and cascara bark.)

Western Olympic Mushroom Corporation, 21067 Bucoda Highway, SE, Centralia, WA 98513. 206–278–3441.

Picking Edible Mushrooms in the National Forest

To pick edible mushrooms for resale in the National Forests, you must obtain a forest product collection permit, (such as the permit distributed by the Umatilla National Forest) (UMA MPP–1). You can obtain these permits at the local U.S. Department of Agriculture, Forest Service office. Although rates are subject to change, the following permits and rates can be issued: 3 day—$10; ,7 day—$20; seasonal or annual—$150. Note: This permit is not authorization for you to camp in established national forest campgrounds.

To obtain an edible mushroom picking permit, you must agree to the following general conditions:

1. Mushrooms for resale are collected only from the National Forest lands indicated on the permit and only on the dates indicated on the permit.

2 Permits must be kept with the permittee at all times when collecting, transporting, or selling edible mushrooms.

3. Permits cannot be transferred or used by others.

4. Payment for permit cannot be refunded. The permit expires on the indicated date regardless if mushrooms are collected.

5 Members of Congress or the resident Commissioner will not be admitted to any share or part of this permit or to any benefit that may arise from it, unless it is made with a corporation for its general benefit (18 USC 431,433).

6 The USDA Forest Service reserves the right to revoke this permit for noncompliance of permit conditions.

7. The permittee and those accompanying the permittee shall indemnify and hold the USDA Forest Service harmless from any claims, loss, cost, injury, expenses, attorneys' fees, damages, or liability caused by or arising from the exercise of this permit.

After you have obtained your mushroom permit, the following information will help you have a pleasant and safe visit during your stay in the National Forest.

Camping

Large groups must have a free industrial camping permit. Small groups are welcome to camp in any dispersed camping area. Camping within developed recreation sites for nonrecreation purposes (commercial mushroom pickers and buyers) is prohibited. All developed campgrounds have a 14-day-stay limit. We have no trash removal facilities, so when you leave the campground, take your trash with you.

Road and Area Closures

A free map showing the road and area closure locations throughout the forest can be obtained at the local Forest Service office.

Wilderness Areas

Several wilderness areas exist within the forest. Commercial picking of mushrooms is not allowed in these areas as it is in violation of the Wilderness Act of 1964. For more information on wilderness areas, contact the local Forest Service office.

Fire Danger

Campfires or warming fires are allowed in the forest unless you are directed otherwise by forest officials. A responsible person must attend open fires at all times. Completely extinguish fires before leaving the area.

General

Many forest roads are narrow and winding with limited visibility. Please drive safely and at speeds appropriate to road conditions.

Do not park vehicles in front of gates on forest roads. These roads are used by emergency vehicles for fire suppression. If a vehicle is parked in such a manner that it impedes emergency traffic, the vehicle will be removed at the owner's expense.

Salvage of timber from previously burned areas will be taking place in prime mushroom picking locations. Exercise caution when collecting mushrooms in any areas where logging activities are occurring.

The Forest Service does not have any information on mushrooms or their locations. For more information on mushroom species that are safe, edible, and choice, contact the County Extension Office.

If you have questions or need to report an incident, please contact the local Forest Service office.

Sample Price List on Fresh and Dehydrated Wild Mushrooms

Northwest Botanicals, Inc.
SPECIALIZING IN MARKETING, PROCESSING AND COTTAGE INDUSTRIES

1305 Vista Drive
Grants Pass, OR 97527
(503) 476-5588

10-08-91

RE: FRESH AND DEHYDRATED WILD MUSHROOMS - PRODUCE MARKET

Dear Produce Buyer:

We represent a number of small buying stations and foraging collectives from the Pacific Northwest, now gathering a variety of regional wild mushrooms. Previous marketing was strictly limited to fresh produce.

A major dehydration facility was constructed in 1987, and a number of different wild mushrooms were successfully dehydrated and marketed in 1988. This included pasteurization. We now have sufficient experience and volumes to offer both fresh and dehydrated mushrooms to the mass market.

BOLETES *(Bofetus* spp.) - Dried boletes have a deep, rich taste that dominates soups and sauces for polentas and pastas. Very popular with the European market, and are quite large (6 to 12 inches). Used in soups, sauteing, stuffings, pizza, and baking. Available in both the fall and spring. **Price:** $ 8.00/# (fresh, 8# pack), $60.00/# (dehydrated), FOB OR.

CHANTERELLES *(Cantharellus cibarius)* - Dried chanterelles tend to lose some of their flavor when dehydrated. If the soaking water that they were reconstituted in is used when they are cooked, they retain more flavor. Used in baking, chowders, marinating, omelettes, pizza, sauteing, and soups. Available in both the fall and spring. **Price:** $6.00/# (fresh, 7-8# pack), $70.00/# (dehydrated), FOB OR.

MORELS *(Morchella angusticeps)* - Dried morels are a favorite all over the world as they lose none of the flavor or aromatic smell as when fresh. Not offered fresh due to fast drying problems. Used in chowders, deep frying, omelettes, pastas, sauces, sauteing, and soups. Available only in the spring, but inventories are available from the last harvest. **Price:** $75.00/# (dehydrated), FOB OR.

Other wildcrafted mushrooms available upon request.

CONTACT: Richard Alan Miller
Agricultural Consultant.

Generic Permit Form for Mushroom Harvesting in National Forests

Picking Edible Mushrooms in the National Forest

To pick edible mushrooms for resale in the National Forests, you must obtain a Miscellaneous Forest Product Collection Permit (UMA MPP-1). You can obtain these permits at the local U.S. Department of Agriculture, Forest Service office. Although rates are subject to change, the following permits and rates can be issued: 3 day--$lO; 7 day--$2O; seasonal or annual--$l5O. Note: This permit is not authorization for you to camp in established National Forest campgrounds.

To obtain an edible mushroom picking permit, you must agree to the following general conditions:

1. Mushrooms for resale are collected only from the National Forest lands indicated on the permit and only on the dates indicated on the permit.
2. Permits must be kept with the permittee at all times when collecting, transporting, or selling edible mushrooms.
3. Permits can not be transferred or used by others.
4. Payment for permit can not be refunded. The permit expires on the indicated date regardless if mushrooms are collected.
5. Members of Congress or the resident Commissioner will not be admitted to any share or part of this permit or to any benefit that may arise from it, unless it is made with a corporation for its general benefit (18 USC 431,433).
6. The USDA Forest Service reserves the right to revoke this permit for noncompliance of permit conditions.
7. The permittee and those accompanying the permittee shall indemnify and hold the USDA Forest Service harmless from any claims, loss, cost, injury, expenses, attorneys' fees, damages, or liability caused by or arising from the exercise of this permit.

After you have obtained your mushroom permit, the following information will help you have a pleasant and safe visit during your stay in the National Forest.

Camping

Large groups must have a free industrial camping permit. Small groups are welcome to camp in any dispersed camping area. Camping within developed recreation sites for nonrecreation purposes (commercial mushroom pickers and buyers) is prohibited. All developed campgrounds have a 14-day-stay limit. We have no trash removal facilities, so when you leave the campground, take your trash with you.

Road and Area Closures

A free map showing the road and area closure locations throughout the forest can be obtained at the local Forest Service office.

Wilderness Areas

Several wilderness areas exist within the forest. Commercial picking of mushrooms is not allowed in these areas as it is in violation of the Wilderness Act of 1964. For more information on wilderness areas, contact the local Forest Service office.

Fire Danger

Campfires or warming fires are allowed in the forest unless you are directed otherwise by forest officials. A responsible person must attend open fires at all times. Completely extinguish fires before leaving the area.

General

Many forest roads are narrow and winding with limited visibility. Please drive safely and at speeds appropriate to road conditions.

Do not park vehicles in front of gates on forest roads. These roads are used by emergency vehicles for fire suppression. If a vehicle is parked in such a manner that it impedes emergency traffic, the vehicle will be removed at the owner's expense.

Salvage of timber from previously burned areas will be taking place in prime mushroom picking locations. Exercise caution when collecting mushrooms in any areas where logging activities are occurring.

The Forest Service does not have any information on mushrooms or their locations. For more information on mushroom species that are safe, edible, and choice, contact the County Extension Office.

If you have questions or need to report an incident, please contact the local Forest Service office. Thank you and enjoy your visit.

Chapter 12—Nuts

Description of the Product and Its Uses

Nuts are a dry fruit consisting of a kernel or seed enclosed in a woody shell. The nut itself is widely used in candies, baked goods, and ice cream. It is an excellent source of protein. The shells of various nuts also have many industrial uses, including use as cleaning abrasives and as additives to chemical products such as glues, paints, and explosives. Uncracked nuts are also used as a decorative material for centerpieces and gifts (table 12–1).

Table 12–1. Nuts commonly used for food and commercial purposes

Beechnut	Hickory
Butternut	Pecan
Chestnut	Persmmon
Golden chinquapin	Piñon pine
Hazel nut	Walnut

Acorns

There are more than 60 species of oak trees throughout North America, and all produce edible acorns. Oaks are broadly divided into two groups: red (or black) oaks, which produce nuts with a bitter taste (a result of high tannin content), and white oaks, which contain less tannin and are considerably sweeter. The annual nut crop from oak trees in North America surpasses the combined yearly yield of all other nut trees, both wild and cultivated. Acorns provide a complete vegetable protein, up to 7 percent by weight in some species of oak. More than half their bulk consists of energy-rich carbohydrates.

Beechnuts

The American beech (*Fagus grandifolia*) is found primarily in the Eastern United States. The European beech (*F. sylvatica*) also produces edible nuts and has become naturalized both in the Northeast and in western coastal States. Beechnuts are small and triangular and are found within the small burrs that appear after the beech tree's leaves begin to fall. They are best gathered from lower branches just prior to dropping, before small animals have a chance to forage. The meat of the beechnut is sweet and nutritious, with nearly 20 percent protein content.

Black Walnuts

Black walnut (*Juglans nigra*) trees are most commonly found in the central and east central States, with some additional stands found in northern California. The flavor of the black walnut is much stronger and richer than that of the English walnut, and because of this it has established uses in several baking and ice cream products. The nuts are also used as a primary ingredient for many candies and as a topping. The kernels are high in fats, protein, and carbohydrates and compare favorably with meat in amounts of vitamin A, vitamin B, and riboflavin.

The shell of the black walnut is one of the most difficult shells to crack. While this creates a challenge for processors, it also creates market opportunities. The hard shell is an important product in its own right.

- Metal cleaning and polishing. Processed eastern black walnut shell is the perfect medium for cleaning jet engines, electronic circuit boards, ships, and automobile gear systems. This soft grit abrasive is well suited for air blasting operations, deburring, descaling, and polishing operations because of its elasticity and resilience, giving great durability. Eastern black walnut shell is nontoxic and dust-free and can be used on plastic, aluminum, and soft alloys, leaving the surface smooth without scarring.
- Oil well drilling. Black walnut shell is used widely in oil well drilling for lost circulation material in making and maintaining seals in fracture zones and unconsolidated formations.
- Paints. The paint industry uses the shells for new plaster-effect paint. Paints and varnishes mixed with this light-bodied agent are far superior to ordinary sand paint. It covers plaster, wallpaper, brick, and wallboard and conceals surface cracks and gouges. The paint goes directly over taped and filled joints, and the surface can be repainted with flat wall paint if desired.
- Explosives. Black walnut shell is used by explosives manufacturers as a filler in dynamite. It is compatible with other materials and works well in this use.
- Cosmetic cleaners. Black walnut shell is ideal as the gritty, rough agent in soap, cosmetics, and dental cleansers.

Eastern black walnuts on the vine. Photo courtesy of Jim Jones, Hammons Products Company, Stockton, Missouri. (SFP–9)

There is great competition for black walnuts among squirrels, so harvesting at the right time is critical, usually after first frost. The nuts are enclosed in smooth, green husks. In time, the husk will soften to a mealy consistency and turn black. At this point the hull can easily be rubbed off, but this is a messy job and the hulls will severely stain any skin or clothing that comes in contact with it. In some States, such as Missouri, the Farmers Association operates walnut hulling machines in season, and it costs a few dollars to have walnuts hulled, usually in units of 100 pounds. Corn shelling machines are also effective in removing the husks from walnuts. The hulling procedure generally is followed by a cleaning operation to remove the remaining husk residue. This operation can range from hosing down the nuts while spread out on the grass to soaking and agitating the nuts in a bucket or tub of water.

It is legal to sell uncracked walnuts. In many States, it is illegal to sell the nutmeats unless the process of extracting them is done in an approved facility and in accordance with State laws governing the manufacturing and sale of food. For further information on this subject, the appropriate State agency should be consulted.

Butternuts

A close relative of the black walnut and otherwise known as the white walnut, the butternut (*Juglans cinerea*) ranges farther north, extending into New England and parts of Canada, but not as far south. The butternut ranks among the highest in food energy of edible nuts, with 27.9 percent protein, 61.2 percent fat, and 3,000 calories to the pound. They are also among the tastiest nuts.

Hickory

The two most desirable nut hickories are shellbark hickory (*Carya laciniosa*) and shagbark hickory (*C. ovata*). Both have sweet nuts that vary in size and are encased in hard, thick husks that turn from green to brown in the fall.

Pecans

The pecan (*Carya illinoensis*), a member of the hickory family, is the most widely used tree nut. Wild pecan groves are predominantly found in the lower Mississippi Valley, predominantly in Oklahoma, Alabama, and eastern Texas, but as far north as Illinois and the Ohio Valley area. They grow naturally nowhere else in the world. Commercially, pecans are grown throughout the southern portions of the country. Pecan trees begin to bear when they are about 10 years old. Pecan orchards in general are developed in connection with some inter-planted cash or feed crop, until the orchards reach bearing age. Both the nuts and shells are used. For example, the ground shells are used as plywood filler.

Pine Nuts

Pine nuts are not true nuts since they lack the woody coverings identified with nuts. The mountainous and western portions of the country provide the bulk of the country's edible pine nuts. Pine trees that bear edible fruit include the ponderosa, Coulter, sugar, and Digger pines, but the most popular is the common or Colorado piñon (*Pinus edulis*) and the closely related single-leaf piñon (*P. monophylla*), both commonly found in the Southwest. Seeds of these pines have the size and appearance of puffed rice: elongated, white kernels a centimeter or so long and half as wide. Wild Colorado piñons do not bear full crops until they are about 75 years old.

Processing

Acorns

After removing caps and shells, acorns can be eaten raw or roasted. To roast, nuts should be baked at 250° to 300°F for 1 hour. For more bitter acorns, boil kernels whole for 15 minutes and pour off water. The discarded water will be brown with tannin. Add fresh water, boil another 15 minutes, and continue this process until the

water is only slightly tinted. Once tannin is removed, roast nuts as described above.

Beechnuts

Beechnuts have a thin shell that can be peeled with a fingernail. Fresh nuts spoil quickly and should be dried in full sun for a day or two or roasted in a slow oven.

Black Walnuts

The walnut husk must be removed before decomposition begins to saturate the shell and cause the meat to be bitter. The decomposition yields a black juice that causes this bitterness, as well as creating a truly indelible dye that stains clothes and skin.

In the absence of processing machinery, removing the husks and shells of black walnuts is a messy and cumbersome job at best. A good summary of suggestions is available (Pastoret, 1990). One way is to place the nuts on a hard surface and step on them or run an automobile over them. The nuts are then cleaned by washing them in a garbage can several times, and the hulled nuts are dried in shallow layers for a couple of weeks and stored in their shells in mesh bags in a cool place. Cool storage is necessary because the oil in the nuts can become rancid. Some experts still suggest the old-fashioned method of rock and hammer to crack the nuts. There are walnut crackers available for purchase that crack one nut at a time.

Nuts can be hulled and bagged and sold to nut processors who clean the outside of the nut and dry the nut to exact moisture specification. Processors crack the shell by running the nuts through large steel wheels; the nutmeats and shells are then passed through another series of rollers with sawlike teeth which are used to separate the nutmeats from the shells. Nut kernels are graded into various sizes, passed before an electric eye to remove low-quality kernels, and then sent over inspection belts. They are then sterilized, boxed, sealed, and prepared for shipment.

Butternuts

Butternut trees bear early—at just 2 or 3 years of age. The fruit has a thin, green outer husk covered with fine, bristly hairs that give off a near-permanent brown dye. The inner surface of the husk produces an equally strong orange dye, so rubber gloves are advised in working with this nut. The inner nut is oval, with a deeply ridged and pitted shell that is almost as difficult to crack as black walnut. The thin, fragrant, oily kernel inside can go rancid quickly, so it is important to shell and use butternuts soon after they have been husked and dried. They are sweet and delicious straight from the shell, raw or roasted, or baked in cakes or pastry.

Hickory Nuts

Hickory nuts should be gathered as soon as they fall and then hulled and placed on screens to dry. When the kernels are crisp, they should be stored in a mesh bag in a cool, airy place. Like walnuts, hickories keep well in the shell once husked and dried. They are easier to crack than walnuts or butternuts, but the job still calls for real force.

Pine Nuts

The largest and tastiest pine nuts are produced by the piñon pine. Piñon nuts are most easily harvested in late September or October during dry weather, when most of the moisture in the cones makes the nuts easy to remove. The best method of gathering is to shake available branches and gather the cones as they fall into a tarp laid beneath the branches. They can be eaten raw or roasted in a low-heat (300°F) oven until the shells turn brittle. After roasting, the shells can be cracked using a rolling pin.

Market and Competition Considerations

Black Walnuts

Some rural residents buy black walnuts from farmers and others then sell them to companies. Nutmeats sell for $6 per pound or more, and uncracked walnuts range in price from $0.75 to $1.25 or more per pound.

There are only two known plants in the United States that commercially shell black walnuts. They are located in Lodi, California, and Stockton, Missouri. The plants purchase the nuts from area farmers. In addition to the commercial distribution of nutmeats (black walnuts retail for as much as $3 per pound, nearly twice as much as commercially grown English walnuts), these plants also market the shells. The shells are used as fuel in cogeneration power plants, and because they are so hard, they are marketed as additives in abrasive and chemical products. The black walnut shells bring from $60 to $90 per ton. Most nuts for personal consumption are sold seasonally, from fall through winter. This falls shortly after the harvesting season for most nuts, when the meats are at their freshest.

Pecans

A few nut companies specialize in selling nuts from trees that grow wild, rather than the specially bred papershell pecans grown commercially in the Southeastern United States. The papershell pecans are larger, but many feel that the wild pecans have a sweeter flavor and a higher oil content.

Pine Nuts

The average market value of the pine nut is estimated at about $500,000 a year.

Distribution and Packaging

Typically, nutmeats are distributed by small local growers or harvesters to larger regional processors and distributors. These operations generally package the nuts for sale to bakeries, candy makers, food stores, and sometimes through mail order catalogs. Vacuum packaging is the preferred method of packaging, which keeps the natural flavor much longer.

Resource Conservation Considerations

The use of nut-bearing crops as part of an agroforestry management plan results in little or no tillage and provides a permanent cover during both growing and dormant seasons. This, in turn, creates lower runoff rates and soil loss. It also means there will be a reduction in fuel consumed in plowing and tilling, a reduction of pesticides, and a reduction of soil compaction. Finally, any type of tree cultivation has a tremendous potential to reduce the buildup of carbon dioxide, the most important gas in the creation of the so-called "greenhouse effect."

Black Walnuts

Black walnut trees require a minimum permanent spacing area of 50 feet square. They are usually grown on a wide spacing, with crops of wheat, milo, soybeans, or fescue grown between the rows.

Pecans

Pecan trees require a minimum permanent spacing area of 50 feet square.

Pines

Pines are slow to bear. Estimates for the time required for the first crop typically range from 15 to 20 years. However, individual members of some species have been known to bear within 5 years or take as much as 70 years. The pine requires minimal care, being highly adaptive at finding nutrients and storing water. More important than fertilization and water, pines require ample sunlight and soil with good drainage.

In-shell eastern black walnuts ready to be processed. Photo courtesy of Jim Jones, Hammons Products Company. (SFP–11)

Profiles

Hammons Products Company

Ralph Hammons took a natural resource—black walnuts, which had grown wild in the Ozarks and throughout the central and eastern parts of the United States, uncultivated and unharvested—and turned it into the world's largest business of its kind. As a small grocery store owner in 1945, Hammons recognized that there was an abundant supply of black walnuts in the area and that a market for them was needed. That year he purchased 3 million pounds of nuts and shipped them to a plant in the State of Virginia. The success of this venture, combined with the high cost of freight and the good supply of black walnuts in the Midwest, started him thinking seriously about building a processing plant in Stockton, Missouri. Thus, Hammons Products Company was born in 1946.

Today Hammons Products Company is still family owned and managed and annually processes most of the Nation's eastern black walnuts. They buy millions of pounds of wild black walnuts each year from a large portion of the Midwest and Southeastern United States. Still, the black walnut industry is only 2 to 3 percent the size of the English walnut industry in terms of pounds harvested.

The company buys all its nuts on the open market. It provides a contractor at each of 200 to 250 buying stations throughout the range of the walnut and a hulling machine to remove the green husk from the nut. The contractor receives a commission from operating the machine and buying the crop for the company. The company provides bags and a truck to pick up the nuts and to bring them to either the storage or central processing facility.

Bagged eastern black walnuts.
Photo courtesy of Jim Jones, Hammons Products Company. (SFP–10)

Harvesters receive $8 per hundred pounds of walnuts. A pickup truckload might take two people about 5 hours to collect in a good year and make a total of $60 to $65, which means the average harvester in a good year would be making about $6 an hour. Many of the harvesters are people who simply have a history and tradition of being prudent and do not want to let the nuts "go to waste." Often, weather conditions can be a major factor in the loss of a good crop if weekend weather is poor.

All wild nut crops vary dramatically from year to year. Consequently, it would be very difficult for a large company to enter the marketplace in wild nuts. By way of example, in 1990, the company was only able to purchase 6 million pounds. In 1991, it was able to buy 12 million pounds. By contrast, in 1982 the company had one of its best years after buying 49 million pounds of walnuts.

The crop is a truly organic one—the trees receive no fertilizer. However, the yield of nutmeat is very small—only 6-1/2 to 9 percent of the nut can be recovered and sold as nutmeat.

The company hopes to increase the yield in the next few years. Some managed plantations have yielded an average of 20 percent on their native black walnut crops (Slusher, personal communication). The company sponsors research on walnut culture and production, and is active with the Missouri Department of Agriculture. The company has been working to develop improved processing machinery and tree care and also to improve genetics for the tree. Within 2 years, some new patented trees are going to be available for sale to the public.

The company has several different plants and divisions in addition to the nutmeat plant:

- The shell plant processes the hard outside shell of the nut, producing valuable shell products.
- The feed plant uses the nutmeats that do not meet the company's high-quality standards. These nutmeats are blended with shelled corn to produce an animal feed called cornwal. Because of the high fat content of the nutmeats, the processed cornwal is extremely high in nutritional value. It is further mixed with other ingredients to produce a variety of specialized complete feeds.
- The "Missouri Dandy Pantry" is the mail order and retail sales division, offering not only black walnuts but also a variety of other nutmeats and specialty gift items. The "Pantry" caters to the needs of individual mail order customers and industrial gift givers. The primary retail store is located next to the plant in Stockton, Missouri.
- The Land Management Division researches and demonstrates how landowners can better use black walnut trees as a cash crop. The result of the division's long-range projects will be a greater, more stable supply of nuts.
- The Arkansas Division of Hammons Products Company in Gravette, Arkansas, is a high-volume production facility that processes both black walnut kernels and shell products.

Lodi Nut Company

The Lodi Nut Company in Lodi, California, processes almonds, English walnuts, pistachios, pecans, and macadamia nuts, but black walnuts have always been the main focus of the company. Virtually all of the black walnuts purchased by the company come from wild trees. The black walnut is indigenous to California, but most of the trees in the State were planted about 50 years ago along State highway corridors under the Works Progress Administration.

The nuts are harvested annually throughout much of the State. Buying agents advertise in local papers, telling

people how much the company is paying for sackfuls of the nuts and providing the sacks. Paying stations are identified, mostly in feed stores. Harvesters collect the nuts and bring them to the agents, where they receive about $2.50 per sack. A standard potato sack full of black walnuts may weigh anywhere from 20 to 100 pounds, depending on the moisture content of the nut, the hull thickness, and other factors.

Hundreds of different individuals in California depend on picking black walnuts to supplement their incomes. Most of the harvesters have been doing it for years. The work is hard, but the company will buy all that people harvest. In an average year, the company purchases over 100,000 sacks. In drought years, the harvest has been down to around 60,000 sacks. The company is finding that the number of people willing to put in the manual labor required to pick up the nuts is diminishing.

The nuts are most famous for their use in ice cream (the source of the flavor in maple nut ice cream), particularly in the southeastern United States. However, the company often sells out their supply of shells before they sell all the nutmeats. For example, the company currently is under contract with NASA to provide shells to be used to clean the surface of the space shuttle. The shells are used as a grit for nonslip surfaces, as filler in oil drilling to plug pressure leaks, to fill bean bags, and to polish shell casings.

Some uses are so specific that no other shells have been found to substitute for the black walnut. One interesting example is that crushed black walnut shells are the only material found thus far that is both hard enough and absorbs shock well enough to be used to fill special padded arms on machines used to hold and shake the nuts from commercial English walnut trees. In 1990, this market used up 95 percent of the company's supply of black walnut shell.

Considerations for a Rural Development Strategy

Apart from the black walnut, there is currently little or no commercial foraging of native American nuts. However, it is interesting to note that the market for black walnut shells is strong, and there may be other applications of nut shells that could be identified. There is also the potential for a greater agroforestry role for nut- producing trees. Finally, the collection and processing of wild edible nuts has potential to be part of a broader community project or nature learning experience.

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Bibliography

Bradley, J. 1990. 'Growin nut' in the Cedar Creek Valley. Ag Opportunities, Newsletter of the Missouri Alternatives Center. June–July: 1,3.

Brown, Armstrong. 1981. Nut tree growing in Kentucky. University of Kentucky, College of Agriculture, Cooperative Extension Service, Room S–105, Agricultural Science Building–North, Lexington, KY 40546.

Campbell, D. 1990. Three tiers for agroforestry: crops, nuts, and wood. I.D.E.A.S., Guelph, Ontario: Ontario Ministry of Agriculture and Food: 84–86.

Gardner, Bruce. 1990. Still kicking—Kentucky nut revived by former workers. Paducah (Kentucky) Sun, September 30.

Garrett, H.E.; Kurtz, W.B.; Slusher, J.P. 1986. Walnut trees and crops: profitable diversification. Adapt, 100: 100–102.

Garrett, H.E.; Kurtz, W.B.; Slusher, J.P. 1992. Walnut agroforestry. University Extension, University of Missouri–Columbia, Pub. No. G5020, $0.50, Columbia, MO 65211.

Hill, Deborah B. 1987. Serendipitous crops. Natural Resources Newsletter 6(3): 5–6, Department of Forestry, University of Kentucky, Lexington, KY.

Krautwurst, Terry. 1988. A fall field guide; nuts; a handbook for those who, to paraphrase the late Euell Gibbons, love to reap what they have sown. Mother Earth News, September–October: 80(6).

Kurtz, W.B.; Garrett, H.E.; Kincaid, W.H., Jr. 1984. Investment alternatives for black walnut plantation management, Journal of Forestry 82(10): 604–608.

Lanner, Ronald M. 1981. The Piñon pine: A natural and cultural history. University of Nevada Press, Reno, NV. 208 p.

Looker, D. 1990. Relax and make money. Farm Futures. January: 10–11.

MacDaniels, L.H. [Publication year unknown.] Nut growing in the Northeast. Cornell Cooperative Extension Service, Distribution Center C, 7 Research Park, Cornell University, Ithaca, NY 14850.

Muhm, D. 1990. Investment for the 21st century. Farm Futures, January: 10–11.

Noweg, T.A.; Kurtz, W.B. 1987. Eastern black walnut plantations: An economically viable option for conservation reserve lands within the corn belt. Northern Journal of Applied Forestry 4(3): 158–160.

Nut tree growing in Kentucky. 1987. Extension Publication ID–77. University of Kentucky, Lexington, KY. 19 p.

Pastoret, James. 1990. Home production of black walnut nutmeats. The School of Natural Resources, 1–24 Agriculture Building, University of Missouri–Columbia, Columbia, MO 65211, 314–882–7242.

Reich, Lee. 1988. Pines for eating; tasty nuts are produced by a number of hardy species. Horticulture. February: 66:18(7).

Resources

Phil Ahrens, General Manager, Ahrens Nursery, Rural Route 1, Box 351, Huntingburg, IN 47542. 812–683–3055.

Earl Douglas, Red Creek, NY 13143. 315–754–6621 (hybrid chestnut trees).

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Organizations

Missouri Nut Growers Association, Route 1, Nevada, MO 64772.

Northern Nut Growers Association, 9870 South Palmes Road, New Carlisle, OH 45344.

Chapter 13—Recreation and Wildlife Recreational Enterprises

Description of the Product and Its Uses

The management of forests for recreation and wildlife-based enterprises has the potential to benefit both private forest owners and rural residents in general. Such recreational activities such as camping, horseback riding, cross-country skiing, spelunking, touring historic or archeological sites, rafting, and mountain biking offer possible supplemental income opportunities. Both consumptive and nonconsumptive wildlife-based enterprises can be developed for commercial hunting, fishing, and appreciative use activities such as wildlife observation, bird watching, photography, the informal or formal field education of schoolchildren and adults, and even basic and applied scientific research (table 13–1).

Developing recreation-based enterprises or charging for recreational access will not be a solution for all forest landowners. Entrepreneurs must have a thorough and objective understanding of the characteristics, merits, and potential pitfalls of these enterprises before making an investment decision.

Market and Competition Considerations

The overall demand for recreation continues to grow, although not as rapidly as it did in the 1960's and 1970's. Societal trends have a strong impact on recreation, and in the United States entrepreneurs should be advised that there are strong indications that past patterns are shifting. The “baby boom” generation that first flooded schools and colleges, then the labor force, and then the housing market is now in its forties. These are typically the most productive (and demanding) years of life. At the same time, the median workweek length has been increasing, a higher percentage of women are in the work force, and Americans are approaching a period of economic restraint to make up for the massive debts incurred at the Federal level. All of these trends imply some important changes in demand for recreation services in our society (Godbey, 1986).

In the future, recreational activities are likely to become more planned and deliberate because an older, more highly educated public will become more selective in their purchases. For the same reason, the quality of the recreational experience, including level of maintenance, aesthetics, and safety, will rise in importance. Shorter but more frequent trips nearer to home are likely to be the rule. Demand for vigorous physical activities is high and is expected to remain strong in the near future. A continued increase in interest in exercise will also lead to increased demand for close-to-home opportunities for bicycling, jogging, walking, and observing nature.

Hunting and Fishing

Hunting is still a popular sport in the United States, but participation rates for hunting have been declining over time. The total number of hunters is also beginning to decline. The major problem is limited access to land on which to hunt, particularly in the eastern United States.

Wildlife normally belongs to the State and cannot be sold, but landowners can sell access, assuming they abide by all State game regulations. Many landowners,

Table 13–1. Recreation enterprises and facilities with potential for generating supplemental income

Archery ranges	Campgrounds	Hunting preserves	Raising fish and game
Bait and equipment shops	Conference facilities	Nature areas and trails	Rock climbing
Bed and breakfasts	Duck blind rentals	Organizational camps	Ski resorts
Bird watching and sightseeing	Farms and ranch vacations	Orienteering	Stables
Boat and dock rentals	Fish and game processing	Outfitters	Swimming lakes
Boating	Fishing lakes	Photographic tours	Target, trap, and skeet ranges
Cabins	Guide services	Picnic areas	Training, boarding, and leasing dogs

particularly in the Eastern and Southeastern United States, have found they can charge access and/or service fees for recreational use if, through habitat maintenance and enhancement, their property can produce sustainable densities of game species, if a good recreational experience can be provided to the hunter, and if access can be controlled. The resource base need not all be on private land, either. A relatively small property that provides access to national or State forest lands could support a hunting club.

Hunting lease operations are becoming widely accepted. The simplest type of arrangement is a basic access fee agreement, formalized with a written lease. It can provide a supplementary source of income to a landowner without large investments of time or money. Most hunting lease operations lease on an annual payment basis. However, a few enterprising landowners are leasing their properties for 5 years but are receiving payment when the lease is signed. Examples of lease prices in several States are shown in Table 13–2. These data represent 1987 to 1989 data (Bromley, 1990).

In 1985, the average hunter in the Southern States spent $604 per year, but only 9 percent of this—about $54 per year—was spent on land leasing and ownership, far less than the $296 per year spent on equipment or the $211 spent on food, lodging, and transportation. It seems likely that, if necessary, hunters would pay more to acquire something as important as a good place to hunt (Tjaden, 1990).

In some situations, a lease of $2 per acre per year can add 15 to 20 percent to the net present worth value of timber investments (Guynn and Busch, 1987). But there are other advantages to leasing land for hunting besides income. Through leasing, the landowner can control the number, activity, and location of recreationists on his or her property. Hunters who have paid for hunting rights have a proprietary interest in the land and are usually willing to watch for uninvited hunters, timber thieves, and other intruders. The landowner can thus gain control over property that may have been trespassed or vandalized in the past. The landowner both protects his or her property and has the security of knowing exactly who is on the land during the various hunting seasons. The user, of course, benefits from reserved, uncrowded hunting or fishing areas.

With fee hunting, the hunter usually pays on a daily basis to hunt geese, ducks, small game, deer, big game, pheasants, quail, or exotic species on a hunting preserve. A hunting preserve is land acreage either owned or leased upon which pen-reared game birds or other game animals are released over a period of 5 or more months for the purpose of sport hunting. Preserves are licensed by the State wildlife agency. They are most numerous in the East and Upper Midwest. The best sites for hunting preserves are farmland with some timber. (However, timber acreage is good as a buffer area between hunting courses, but it is not suitable as wildlife cover in a hunting preserve.)

A hunting preserve may be a commercial or a noncommercial enterprise. A noncommercial hunting preserve provides quality hunting for one group of hunters on a nonprofit basis. It may be on land leased to a private co-op preserve that is supported by its co-op members and operated by a group of organized sportsmen, or it may be a do-it-yourself hunting preserve. In either case, the organization needs to be incorporated and carry liability and property damage insurance. Co-op preserves usually contract with a game breeder for biweekly delivery of game (pheasants or bobwhite quail, for example).

A commercial hunting preserve is one designed to provide a profit for the owner/operator who furnishes quality hunting to those willing to pay for it. It can be open to the public on a daily fee basis or on a membership basis. Commercial preserves require both a large personal and financial commitment, although the largest financial outlay is land. The most successful operators are those who obtain a year-round income from a combination of activities, such as boarding and training dogs, breeding game, farming, camping, fishing, picnicking, field dog trials, riflery and archery, and clay target shooting. To be profitable, each commercial operator must decide on the proper mix of activities offered, based on skills, location, and facilities. Perhaps the most important requirement is to have the financial resources to operate at a loss for at least 3 years.

Rates at commercial preserves vary from State to State and for species hunted, but a 2-day hunt on the East Coast with one-half day of pheasant hunting (36 birds), a 1-day quail hunt (100 birds), and a one-half day chukar hunt (50 birds) might cost between $1,800 and $2,000. Other ranges of prices and activities (again on the East Coast) are 1-day hunts including 100 quail or 36 pheasants or 50 chukars for $400 per person; a 1-day duck hunt for $12 per duck released with a 20-duck minimum; or a dove shoot for $40 per gunner per day (Tjaden, 1990). Usually, along with this type of shooting preserve, there are supporting goods and services offered such as pickers, taxidermy, licenses, meals, lodging, ammunition and other shooting supplies, and sporting clays. There may also be fishing tackle, bait, boarding and training of dogs, boat rentals, and guide services, to name a few. It is also possible to combine hunting programs with other wildlife-based recreation activities that are nonconsumptive, but it requires careful management and diplomacy because of strong antihunting sentiments held by many recreationists.

Fee fishing operations offer an opportunity to supply the growing demand for sport fishing. Some entrepreneurs recommend that a small admission fee be charged

Table 13–2. Private hunting lease prices, 1987–89

State	Game hunted	Typical fee	
Alabama	All game	$2/acre/year lease fee	
	Deer, turkey, dove	$2.20-$3.17/acre/year ($30-million total)	
Arkansas	All game	$1.45/acre/year lease fee	
Connecticut	No information		
Delaware	Deer	$3-$5/acre/year	
	Waterfowl, dove	$500-$2,500/blind/year	
	Quail, pheasant	$20-$100/half day	
Florida	Deer, wild hogs	$3-$5/acre/year for large tract (500-2,000 acres)	
	Quail	$20-$35/day	
	All game	$2.75/acre/year lease fee	
Georgia	Deer	$2-$15/acre/year ($120-million/year a conservative estimate)	
		$200-$300/day, including meals, hospitality, and lodging	
	Quail	$200-$600/day; may include dogs, guide, meals, lodging, and hospitality	
	General hunting: deer, ducks, etc.	$1,000/member/year	
	All	$2/acre/year	
Kentucky	All	$1.81/acre/year	
Louisiana	Deer	$5/acre/year	
	Ducks	$4/acre/year; $250-$1,800/640-acre section/year	
	Turkey	$5/acre/year	
	All	$3.62/acre/year	
Maine	Deer, moose, ruffed grouse, woodcock	Private hunting lodges provide guides, a tradition in Maine. Leasing of hunting rights is rare. Major landowners have formed Great North Woods, which sells access passes for roads and camping facilities; Great Northern Paper Company sells season or daily permits to use roads.	
Maryland	Deer, wild turkey	$3-$5/acre/year	
	Deer, quail	$3-$5/acre/year	
	Waterfowl	$80-$100/acre/year (marsh)	
		Up to $8,000/blind/hunter/season	
Mississippi	Deer and turkey	$2.50/acre/year	
	Quail	$150/half day	
	Waterfowl	$30/hunter/day	
	Dove	$10/hunter/day	
New Hampshire	No leasing reported, but private clubs operate shooting preserves.		
North Carolina	Quail, rabbit	Variable	
	Deer	$1.38/acre/year	
	Dove, waterfowl	$10/hunter/day	
South Carolina	Deer, turkey	$1.69/acre/year	
	Quail	$150/hunter/half day	
	Waterfowl	$30/hunter/day	
	Dove	$10/hunter/day	
Tennessee	Deer and other game	$1.50/acre/year	
	Quail	$2-$3/acre/year	
	Deer, turkey	$3/acre/year; $200-$500/hunter/year	
	Dove	$5-$10/hunter/day; $20-$40/acre/year	
	Waterfowl	$30-$80/hunter/day; $30-$300/acre/year	
Virginia	Deer, turkey	$2/acre/year; hunting lodges may charge $900/hunter for a 6-day package that includes lodging, meals, transportation, and guide	
	Waterfowl, pheasant, quail	$10/acre/year; $80/hunter/day	
West Virginia	Deer, pheasant, chukar	$10/hunter/day, plus a charge/animal bagged; or corporation private club membership of $1-$5,000 or $500-$1,000/person	
	Deer, turkey	$10-$30/hunter/year	
11 southern States (AL,-AR, FL, GA, KY, LA, MS, NC, SC, TN, VA)	Deer	$2.30/acre/year	
	Quail	$1.39/acre/year	
	Rabbit	$0.83/acre/year	"Typical" fees to private landowners
	Waterfowl	$12.77/acre/year	
	Turkey	$1.73/acre/year	
	Dove	$11/acre/year	

Horseback riding on a forest trail. Photo courtesy of Jill Bauermeister, Forest Service. (00–CS–3578)

(for example, $1 to $2 for adults and half price for children under 12) with a charge per fish or per pound of fish caught (for example, $2 per pound) (Kiely, 1990). If a particular location has an area large enough to be sectioned off, a "fly fishing only, catch and release" area can be added and a fee charged for time. (However, catch and release areas require constant surveillance and supervision and are not as profitable as "catch 'em and keep 'em" ponds.)

Other services available at fee fishing enterprises might include bait sales, picnic and camping sites, fish cleaning, rod and reel rentals, swimming, lodging, and in some cases, boat and motor rentals. Operations near large urban centers would have the greatest potential for success.

In summary, a few fishing and hunting business opportunities are as follows:

- Leasing land for hunting privileges
- Boat/motor rentals
- Hunting preserves
- Sporting clays
- Leasing water for fishing privileges
- Duck blinds
- Leasing land for trapping privileges
- Game and fish processing
- Organized hunts
- Habitat improvement
- Guide services
- Raising fish and game for stocking purposes
- Taxidermy
- Room and board for hunters and anglers
- Ammunition and fish bait
- Boarding and training of dogs

Nonconsumptive Uses of Wildlife

Most city-dwelling Americans who yearn for more contact with nature and look forward with great anticipation to vacation opportunities to "head for the hills" are willing to pay for access to back-to-nature experiences. However, most of them are not seeking game or fish. The fact that the majority of people enjoy wildlife without hunting has led many States to try to find ways for landowners to capture more of the economic value of wildlife viewing and similar nonconsumptive activities as important components of tourism and recreation development programs. The landowner or recreation host who can show his or her guests a variety of animals in attractive natural settings will have the advantage over those who cannot.

As defined in the 1985 *National Survey of Fishing, Hunting and Wildlife Associated Recreation*, "nonconsumptive" wildlife-related recreation means the observing, photographing, and feeding of fish and wildlife, and three out of four persons in the United States are involved in these appreciative uses. Expenditures (including bird seed for backyard feeders, binoculars, cameras, and film) by nonconsumptive participants 16 years of age and older totaled over $14 billion in the United States in 1984.

In a study done by the U.S. Fish and Wildlife Service, it was found that 47 percent of the people who took the kind of trips to natural areas for nonconsumptive activities indicated that woodlands were visited most often. For the landowner in the urban outskirts, the demand for nonconsumptive uses of wildlife could be met by providing areas for bird watching and general observations of other animals in their normal habitat. Along with this, supplies for photography, guides, and seed, etc., can be sold. A small store in the back of a barn would do just fine (Tjaden, 1990).

In rural areas, private farm and forest lands shelter a great variety of interesting natural resources that, if managed properly and in conjunction with other goods

and services, can attract an affluent clientele interested in enjoying the beauty of forest lands. Just as bed-and-breakfast establishments advertise their existence near antique shops and historic sites and hotels provide their guests with jogging trail maps, so landowners interested in developing an appreciative clientele could offer naturalist guide services and develop trail maps of nearby habitats and lists of species that may be seen (while cautioning guests to avoid disturbing wildlife, particularly in their breeding season). School districts and other institutions may also pay for the privilege of bringing classes to private habitats if the quality of information services is high.

General Recreation

Other recreational enterprises that are possible in rural forest regions include campgrounds and summer camps, horse stables, swimming and fishing lakes, ski resorts, and snowmobile courses. Unfortunately, current data on the market potential and financial feasibility of these types of enterprises are largely unavailable. In fact, as an example, a 1992 bibliography (McLellan and Adams, 1992) on literature concerning private nonindustrial land and its use for recreation listed 62 entries under the section on "campgrounds," and the most recent was a 1981 publication.

Table13–3 lists several recreational facilities and the perceived financial potential of each, developed in the early 1980s by Douglas Knudson (1984). The table refers to the general situation as perceived by the author at that time.

Since campgrounds are probably the best known of these enterprises, they are discussed in some detail below.

Table 13–3. Financial potential for private recreational facilities

Very high potential	Campgrounds for travelers Destination campgrounds Urban recreation facilities Organization camps Amusement parks
High potential	Resorts Horse stables Swimming lakes and pools Boating facilities Vacation center complexes (camping, swimming, boating) Downhill skiing
Medium potential	Nature study Picnicking Fishing Some hunting (preserves, leases) Off-road vehicle trails and courses Interpretive activities
Low potential	Back-country recreation use Large area activities—hunting, remote camping, boating
Almost no potential	Driving for pleasure Wilderness Wild and scenic rivers preservation Trails Special scenic/natural features preservation

Source: Knudson, 1984.

Campgrounds

Many parents today are eager to share the outdoors with their children and to have time together as a family on camping vacations. Particularly in rural forested regions, campgrounds can offer an inexpensive alternative getaway experience for young families. Weekend camping is also popular, reflecting the national travel trend toward shorter, closer-to-home vacations.

The camping industry has responded by providing a number of amenities that make camping more accessible and comfortable. Today most private campgrounds offer modern plumbing, hot showers, electricity, utility hookups, and access to swimming pools and laundry facilities. Some commercial campgrounds offer miniature golf, tennis, croquet, horseshoes, fishing, boating, and even restaurants, hot tubs, and saunas.

One route for entrepreneurs interested in the campground market is to enter a campground franchise. For example, Kampground of America (KOA) currently has about 600 franchised campgrounds, including 50 in Canada and a few in Mexico. These may vary in size from 50 sites to 800 sites. KOA facilities always include a convenience store, clean rest rooms, and hot individual showers. They usually include swimming facilities, a laundry, a game room, and recreation facilities on the campground. Many operate as a base camp and tie in with natural attractions in the area, perhaps even providing transportation to those attractions (for example, a national park). In addition to campsites, more than 350 KOA campgrounds now also offer simple log cabins that sleep four to six individuals and rent for $20 to $30 a night. Other KOA campgrounds offer kitchen facilities with stoves, sinks, and tables.

KOA sells the rights to use the KOA logo, and belonging to the franchise gives the campground owner access to the marketing, advertising, and management expertise KOA has gained in 30 years as a camping company. The franchise provides national advertising and an annual directory. Individuals may purchase an existing KOA,

build a new campground, or convert from an independent to a KOA campground. Each campground has a protected territory to prevent competition among KOA owners.

While there is no evidence that well-managed franchised campgrounds are more or less profitable than well-managed campgrounds without a franchise name, the promotional efforts and quality guarantee of a parent company can definitely help if the basic package of facilities and services represented by the company is what the customer is seeking. This characteristic of reliability and predictability is viewed as a key to success.

However, the cost to join a franchise may be high. KOA, for example, requires payment of about $25,000 as a nonrefundable franchise fee. Costs vary depending on whether the operation is a conversion, a resale of an existing campground, or a new campground. During operation, the holder of the franchise pays the KOA company an 8 percent royalty plus a 2 percent advertising assessment based on camper registration fees. In addition, there is an annual renewal fee of several hundred dollars.

Over the years, the average investment required to develop and operate a quality campground has risen (as it has for other commercial recreation facilities). There are relatively few shoestring or part-time operations today that are run with much success. Many enterprises start too small and never build up enough clientele to be successful. Most financially successful campgrounds represent investments of $250,000 to $500,000 in land, facilities, and improvements.

Financing has been a persistent problem for the recreation industry, although lending institutions are becoming more supportive. Problems that concern lenders include the seasonal nature of many recreation and tourism businesses, the limited managerial ability of operators, and the limited equity involved in the mortgages. New owners must often put up personal collateral. Loans may be easier to obtain for those who are associated with a nationally known franchise (Knudson, 1984).

Besides starting with a large enough investment, there are other keys to success in the campground business that are just as important. Location is closely identified with profitability. Accessibility to population centers, resort areas, and/or major highways seems to be important. Prior experience in the campground business is also important. The types of special or convenience services offered (for example, grocery or snack services, fishing, and mountain bike trails) can have an effect. Hot showers and flush toilets are generally expected, although primitive camp sites may also be offered.

There are many drawbacks to entering the campground business. Private campgrounds have traditionally had to charge more than public campgrounds. In fact, government competition through subsidized low-cost camping has caused many operators to drop out of the campground business after years of marginal operation. Financing and insurance are often hard to get. Local, State, and Federal requirements regarding public health, sewage, water, safety, taxes, and liability have been difficult for many businesses to meet. The business is extremely demanding of time, especially during the season. The manager must be able to do some of everything, from fixing a septic system to displaying merchandise attractively. Good hosting and management skills, and patience and friendliness with people are absolutely essential. One of the key competitive advantages that private campgrounds can offer over public campgrounds is a greater degree of personal attention from the campground owners and staff, and it is critical to a campground's success to maximize this advantage.

To reduce the impact of low-occupancy days, many campgrounds offer seasonal or year-round rates. Campgrounds often take on the look of a trailer park under this arrangement, but, on the other hand, regular customers often make a special effort to keep their places neat.

Many recreation businesses have organized in order to promote their mutual interests and to have a greater voice in state and local government. There are campground associations in many States. The major national organization is the National Campground Owners Association.

Other Recreation Businesses

Vacation complexes, organization camps, guest ranches, and ski resorts are among the oldest elements of the recreation industry in forest areas. Many such enterprises have their base of operations on private lands but use public lands, especially national forest lands, for some activities. Fishing and swimming lakes and ponds, off-road vehicle trails, riding stables, and picnicking areas are other attractions. As discussed in the wildlife enterprise section, there are shooting preserves and many leased hunting lands that take advantage of forest lands.

Sporting clays are becoming very popular in some areas because they offer the sport and challenge of shooting without the limitation of seasons and without killing any wildlife. Sporting clays offer a variety of simulated game shoots as the shooter stalks through the forest and field, attempting to shoot clay pigeons that simulate a rabbit, duck, quail, or other game species. Usually the course consists of 50 targets released from 10 stations. Targets are released in variations of singles, pairs, and simultaneous pairs. The typical course costs $15 for the 50 targets and takes about an hour to complete.

At least 50 to 100 acres generally should be set aside for a sporting clay enterprise. The initial cost is in establishing trails through the woods and setting up the spring-loaded throwers. The sport can be as simple or elaborate as desired. The cost of building the trails could even be offset by selling firewood removed. For landowners who are contemplating a shooting preserve, the addition of a sporting clays activity gives diversity and extends their income opportunities.

It should be pointed out that some of these recreational activities might support a club activity on a seasonal basis. For example, acreage that is leased to a hunting club in the fall might be leased to a horseback riding club in the spring and summer.

Risk Recreation

"Risk" or "adventure" recreation differs from traditional outdoor recreation by posing elements of real or perceived physical danger to the participant. Possible income-producing risk recreation ventures related to forest lands might include the following:

- Adventure travel
- Hang gliding
- Canoeing
- Kayaking
- Hiking
- Orienteering
- Mountain biking
- Ropes courses
- Rappelling
- Ski touring
- Skydiving
- Bicycle touring
- Backpacking
- Hot-air ballooning
- Caving
- Mountaineering
- Ice climbing
- Rafting
- Mountain running
- Snowshoeing
- Rock climbing
- Winter camping
- Wilderness trekking

The income opportunities for risk recreation generally are either through fees for access to private land or through commercial operations. A variety of program elements might make up a recreation package. For example, a weekend introductory ski-touring package might include sales and rental, transportation, lodging, a pass to ski on groomed trails, meals, and classes. A package for more experienced participants might include transportation to and from a trailhead, winter camping, and a guided back-country ski tour on ungroomed trails.

In general, the profitability of recreational access ventures can vary greatly among divergent geographic, cultural, land use, and clientele situations. Information on patterns of demand should be used in assessing the feasibility of marketing recreational opportunities. For example, nature photographers require access to scenic views or wildlife populations. Cross-country skiers require a more extensive land area than picnickers and may be willing to travel longer distances to participate.

Commercial recreation ventures generally require sizeable acreage, large capital investments, and well-trained labor. Furthermore, the real costs of increased liability and management must be considered. People paying for recreation have a legal claim to safety in most cases, making a vendor much more liable for death or injury to recreationists than for trespassers. Some stables have been driven out of business by liability insurance costs.

Marketing

Advertising in well-known hunting magazines is very effective for hunting operations. These include *Field and Stream*, *Outdoor Life*, *Ducks Unlimited*, *Wildfowl*, *Gun Dog*, *American Hunter*, and *Peterson Hunting*. Ads generally run for a part of the year (for instance, from July through December for waterfowl hunting). Each ad should list services offered, address for a free brochure, and a telephone number. The brochure is very important, as is the treatment which someone inquiring on the phone receives.

Most fair-sized cities have annual shows for sports enthusiasts. Operators should rent space in at least two shows per year and pass out "free admission" coupons where appropriate (for example, for fishing). Trade shows help expand the marketing area and may be done in conjunction with a local chamber of commerce.

Press releases and personal contacts with outdoor writers are inexpensive ways to get the word out to people about a recreation enterprise. Many outdoor writers welcome material for their columns. Most States have an outdoor writers association, and their mailing lists can usually be acquired.

Flyers, brochures, and posters can be distributed locally. Boy Scouts, Cub Scouts, retirement villages, churches and synagogues, and sporting goods stores are good starting points. Small ads in local newspapers are good for recreation operations. The ads can also include "free admission" coupons. Local television shows can provide good opportunities for marketing as well.

Equipment Needs, Costs, and Labor Needed

Achieving the appropriate quality of recreational experience requires the basics of clean, comfortable lodgings, good food, and a quality of naturalness. Structures should be designed to complement the landscape wherever possible. Wildlife habitat improvements of an obviously artificial character such as nesting boxes made of plastic pipe, wire, and old tires should be avoided. Trails should be rustic, and signs should be tasteful and low profile.

Equipment needs vary according to the sophistication of the operation. For example, in the case of a fishing operation, the facility needs a small building for checking customers in and out, and, associated with that building, should be space to store and sell bait, lend stringers, clean fish, and store ice. The operation must be as clean, neat, and attractive as possible.

Labor needs will vary according to the type of enterprise being considered. For example, guides must be carefully selected and trained, since they are the individuals who spend the most time with customers. Retirees or college students often make good guides. When possible, entrepreneurs should consider employing family labor. Other ways to hold down labor costs are to swap help in an operation with friends or neighbors in exchange for hunting, fishing, or other recreational opportunities.

A recreation enterprise may require a significant investment in both facilities (often more than $200,000) and new skills, including specialized management. A certain sensitivity to social processes and the social needs of groups of people is often also necessary. People who pay for recreational access are likely to be seeking high-quality experiences and may expect special considerations. The landowner who shares those expectations will be better able to anticipate particular needs and provide for them. In addition, marketing skills are exceedingly important in the success of recreation enterprises. Many cooperative extension or small business development centers offer courses in management.

Special Factors

Liability insurance rates vary widely for recreational enterprises. Some landowners are able to get amendments to comprehensive farm policies at reasonable rates. Landowners with lease hunting operations have found the use of the National Rifle Association Club policy competitive. Some independent insurers are also getting into the market, so it would be wise to "shop around" for insurance quotes. Also, prior to the establishment of any recreational enterprise, it would be essential to consult the local planning and zoning board as well as an insurance company and an attorney for details on these types of ventures.

Many States have cooperative programs that offer landowners some form of economic inducement to allow recreational access. In these programs, the landowner agrees to make property accessible to recreationists in exchange for free technical services, wildlife plantings, signs for delineating property boundaries, and law enforcement patrol. For example, the Department of Wildlife and Parks in the State of Kansas encourages private landowners to enter their land into a public access program that allows recreational hunting. The agency posts the lands, assumes liability for recreational activities, and provides law enforcement. North Carolina offers landowners direct payment for their access rights on a per-acre basis. In Iowa, "Pheasants Galore" is a private-sector initiative that provides landowners with as much as $250 per hunter when overnight bed and breakfast services are included in the hunting package. In addition to service fees, participating landowners receive group liability insurance and reduced advertising costs. In New England, snowmobile routes are leased to the State, which collects fees from snowmobilers, accepts the liability, and pays the landowners.

Protection of property from illegal fishing or hunting is essential in providing the proper business environment for wildlife enterprises. Lack of control over property is usually the greatest limiting factor in preventing owners from developing wildlife opportunities on their properties. Strongly enforced, effective trespass laws are essential to the development of wildlife enterprises on wildlands. Most States need to increase the amount of fines and penalties for poaching and trespass.

Resource Conservation Considerations

For fishing and hunting operations, basic decisions must be made concerning the carrying capacity and sustainable yield of an area's land and water resources and the economic relevance of this yield to the success of the operation. (Partial exceptions to this would be highly intensive put and take operations.) Another factor to consider is the size of the home range of the animals. Species whose populations vary widely because of poor or good annual reproduction are more difficult to manage for wildlife recreational enterprises.

If a forest landowner is fortunate enough to host a population of a threatened or endangered plant or animal species, the survival of the species must take precedence over its value as an attraction. But if a buffer zone between the imperiled species' principal range and the conflicting human activities can be provided, it may be possible for the landowner to gain a special market niche by providing a chance of seeing a rare creature at a distance.

A side note to consider with fee hunting or leasing operations is planting wildlife food and cover crops under the Conservation Reserve Program (CRP). This program, a part of the 1985 farm bill, was designed to retire highly erodible, marginal cropland. Landowners may retire cropland to either trees, permanent wildlife habitat, permanent native grasses and legumes, or combinations of permanent covers. The CRP program gives landowners an opportunity to establish wildlife habitat and use that habitat to establish a fee-hunting system.

Profile

An interesting example of a regional tourism approach that could build on several recreation enterprises in a rural region is Linda Elkinton's Back Roads Adventures (BRAD). BRAD is a new and innovative travel business in West Virginia that developed as a way to match visitors and tourists with the unique scenic, historic, cultural, and natural resources of a rural area. Linda Elkinton and a friend established a bed and breakfast on the friend's homestead along the Greenbrier River in Pocahontas County, West Virginia. After considering the kinds of resources that could be tapped in the isolated rural area plus their own travel experiences and those of others, they concluded that the experiences sparking the most enthusiasm during visits to new and foreign places are ones that involve personal interaction with people intimately associated with the land and its history. People who can personally share information or demonstrate skills unique to the area, who can effect an exchange of ideas and philosophies, and who can relate to visitors the value of an area's resources were seen as the key to successful tourism.

In early 1986, Ms. Elkinton spent 4 months conducting informal interviews with persons living in three north central West Virginia counties (Monongalia, Marion, and Preston). She had no difficulty identifying some 150 persons who (1) possessed skills that reflected unique aspects of rural life in the area or had special knowledge and experience with interesting features of the natural environment; (2) were entertaining communicators and interpreters of their skills and expertise; and (3) welcomed the opportunity to interact with individuals and/or small groups of visitors for short periods of prearranged time in their shops, homes, or outdoors.

One to two-hour sessions were designed with many of these individuals, including landowners, wood carvers, weavers, muzzle loader rifle makers, glass sculptors, potters, basket weavers, silversmiths, and "home brew" makers. Special arrangements were made to explore various local features with personal guides, mostly active and retired professionals from local communities. They included business people, farmers, teachers, and people in the natural sciences.

The service was designed primarily for individuals, families, small groups, and visitors to travel through the area to prearranged locations for personal encounters related to traditional culture, craftsmanship, and rural life of an area. Working in the Morgantown/Fairmont area and in the Canaan Valley/Elkins area of West Virginia, BRAD has developed contracts with 70 adventure providers and guides and makes available over 100 backroad adventures. Examples of the activities are as follows:

Exploring the Outdoors with a Personal Guide

Edible wild plants and roadside herbs
Hunting with a camera
Hiking a gentle mountain trail
Mountain wetlands adventure
Collecting wild mushrooms
Stargazing
Mountain fly-fishing
Seining for minnows

Unique Features of Rural Mountain Life

Folk medicine and herbal remedies
Making home brew
Sheep, wool, and the spinning wheel
Growing shiitake mushrooms
Mining for coal

Outstanding Local Craftspeople

Basket weaving—white oak, wild vines
Hand weaving—traditional and contemporary
Quilt making and patchwork
Muzzle loader rifle construction
Original design pottery
Botanical designs in clay
Deep base relief in wood
Hand braiding of rugs
Silversmithing

Mountain Music

Mandolin, guitar, and fiddle
The hammer dulcimer
Saturday night country music show
Bluegrass in the mountains

The outdoor/nature study adventures are conducted on both public and private lands. Included in the private land category are: Winter Botanizing and Nature Study, Identifying Wild Birds of Spring, Seining for Minnows, Butterflies and Insects, Exploring the Unusual Courtship of Woodcock and Snipe, Tree-Tapping and All About Maple Syrup Making, Growing Culinary Herbs, Hunting Wildlife with a Camera, Growing Shiitake Mushrooms, and Identifying Fall Insects by Sound.

In addition, the service makes reservations for overnight stays at local country inns, bed and breakfasts, or other accommodations and recommends dining facilities in the area. Both one- and two-day packages are available. Van, motorcoach, or limousine travel can also be arranged.

All adventure providers and the guides are paid for the time they spend with BRAD clients. The fees for the adventures are based on the type of adventure activity

and the number of people involved. The typical fee for a two-hour self-guided adventure tour for one person is $30. A couple pays $40. An adventure involving a personal guide costs $35 to $40. About 30 percent of the fee is returned to the adventure providers/guides when they meet with individuals, couples, and small groups, and 70 percent is returned when specially arranged activities are provided for large groups. This means that guides receive an average of about $10 per hour for their services and informal discussions (arranged with artists, for example) pay about $5 per hour. The remainder of the fee goes to BRAD.

In its first 2 years of operation, BRAD served some 200 groups in 90 different personal arrangements, and an estimated 800 persons participated in group arrangements. The service responded to about 1,000 direct requests for information and distributed approximately 40,000 informational flyers.

The greatest difficulty BRAD has encountered to date has been securing start-up capital for the business. Neither government, private foundation funding, established lending institutions, nor other more traditional sources of venture capital have been available. The company was formally incorporated in June 1986, and 1,000 shares of common stock were issued and sold to 32 persons who are now the shareholders. This capital, along with an $8,000 private loan and the fees generated during the first few years, has financed the corporation to date.

Income levels are still not sufficient to support a full-time staff or to purchase the advertising needed to draw East Coast urban visitors who comprise the major target market. However, the initiators are confident that they have hit upon a very important strategy that reaches several objectives, namely:

- To provide activities to enable interested residents and visitors to learn about a rural area and values.
- To provide employment and sources of additional income to people who significantly contribute to protecting and preserving the rich and diverse cultural heritage of a region.
- To increase financial support for important natural, cultural, and historic features that may be threatened by development.
- To open new areas of tourist activity and promote a positive image of life in rural areas.

Considerations for a Rural Development Strategy

The Back Roads Adventures example shows how outdoor/nature study experiences can be effectively woven into a broader rural economic development strategy that can provide extra money to many different residents in a rural region. Those involved with BRAD see many opportunities for fee-generating activities related to nature study and outdoor recreation. Successful recreation and wildlife recreation enterprises are, ultimately, businesses based on both human and natural resources. Any enterprise that can tap grassroots resources has important implications for preserving natural resources, cultural resources, and history as well as for economic development.

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Bibliography

Anderson, Steven; Porter, Michael; Bidwell, Terry. 1990. Lease hunting opportunities for Oklahoma landowners. OSU Extension Facts No. 5032. Forestry Department, 013 Agriculture Hall, Oklahoma State University, Stillwater, OK 74078. 405–744–5437.

Bahals, J.E. 1989. Harvesting vacationers. Farm Futures. January: 34H.

Bassett, B.; Freiling, D. 1988. Fee hunting—extra income? University of Missouri–Columbia and the Extension Service, MP635, 15 p.

Bates, T. 1991. The 1990 Farm Bill and its effects on forestry. Forest Farmer. February: 56–58.

Belt, D.C.; Vaughn, G. 1988. Managing your farm for lease hunting. Extension Bulletin No. 147: 16.

Berke, Joseph; Berke, Carol. 1991. The accidental tourist. New Business Opportunities. October: 44–45.

Bishoff, G. (ed.). 1985. National outdoor outfitters market report. National Outdoor Outfitters News 10(8): 10–13.

Bromley, Peter T. 1990. Wildlife opportunities: species having management and income potential for landowners. In: Proceedings, income opportunities for the private landowner through management of natural resources and recreational access; 1989 April 9–12; Wheeling, WV. Morgantown, WV: West Virginia University Extension Service and College Park, MD: Cooperative Extension Service, University of Maryland System, R.D. No. 740: 105–112.

Bromley, P.T.; Jones, E.J.; Hamilton, R. 1991. It is possible to have both wildlife and productive forests. Forest Farmer. February: 56–58.

Byford, James L. 1978. Extra farm income through hunting. Pub. No. 677. Knoxville, TN: Agricultural Extension Service, University of Tennessee: 19.

Carlton, R.L. 1974. Leasing property for hunting. Leaflet. Athens, GA: Cooperative Extension Service, University of Georgia: 155.

Chadwick, N.L.; Progulske, D.R.; Finn, J.T. 1986. Effects of fuelwood cutting on birds in southern New England. Journal of Wildlife Management. 50(3): 398–405.

Darst, P.; Armstrong, G. 1980. Outdoor adventure activities for school and recreation programs. Minneapolis, MN: Burgess Publishing Company.

[Publication year unknown]. Enhancing rural economies through amenity resources. Washington, DC: Natural Resources Division, Congressional Research Service, Library of Congress. George H. Siehl, Specialist, 202–707–7284.

Ewert, A. 1985. Emerging trends in outdoor adventure recreation. In: Proceedings, 1985 national outdoor recreation trends symposium II; 1985; Myrtle Beach, SC. Athens, GA: National Park Service: 155–165.

Fitzhugh, Lee, 1987. Ranching for wildlife in California. Wildlife Extension, University of California–Davis, Davis, CA 95616.

Geist, V. 1988. How markets in wildlife meat and parts, and the sale of hunting privileges, jeopardize wildlife conservation. Conservation Biology 2(1): 15–26.

Godbey, Geoffrey. 1986. Some selected societal trends and their impact on recreation and leisure. Literature Review: The President's Commission on Americans Outdoors, pp. D–1 to D–8, December, U.S. Department of Commerce, NTIS PB88–243621.

Guynn, D.C.; Busch, F.A. 1987. Hunting leases for income and access control. Forest Farmer. March: 60–61.

Hicks, L.L. 1985. Multiple use on western private industrial timberlands. Transactions of North American Wildlife Natural Resources Conference. 50: 211–214.

Hunter, M.L., Jr. 1990. Wildlife, forests, and forestry. Prentice Hall, Englewood Cliffs, NJ (front matter only).

Jackson, Jeffrey J. 1985. Leasing wildlife land. The American Tree Farmer. March–April: 8–9.

Jackson, J.J. 1988. Wildlife enterprises for the southern forest farmer. Forest Farmer, June: 9–11.

Jackson, J.J. 1989. Hunting enterprises for forest farmers. Forest Farmer. July/August: 24, 28.

Joiner, S.; Shell, J. 1990. Legal liabilities of hunting clubs. Arkansas Game and Fish. Fall: 26–27.

Kiely, Jack. 1990. Fee fishing: income opportunities for rural areas. In: Proceedings, income opportunities for the private landowner through management of natural resources and recreational access; 1989 April 9–12; Wheeling, WV. Morgantown, WV: West Virginia University Extension Service and College Park, MD: Cooperative Extension Service, University of Maryland System, R.D. No. 740: 297–300.

King, M.M. 1989. Wildlife: A valuable commodity for forest landowners. Forest Farmer. June: 6–8.

Knudson, Douglas. 1984. Outdoor recreation. New York: McMillan Publishing Company: 608 p.

LaPage, W.F. 1979. Market analysis for recreation managers. In: Land and leisure: concepts and methods on outdoor recreation, 2d ed., Chicago, IL: Maaroufa Press: 259–265.

LaPage, W.F. 1980. The camping market and the camping industry. In: Proceedings, campgrounds and camping 1980 conference, November 1978, Land between the lakes, Brandon, Spring, TN, Southern Illinois University, Carbondale: 56–62.

LaPage, W.F. 1981. A further look at the informal interview as a technique for recreation research. Journal of Leisure Research 13(2): 174–176.

LaPage, W.F.; Begins, M.I. 1981. American campground industry 1979 economic analysis and 1980 occupancy data. Reston, VA: National Campground Owners.

LaPage, W.F.; Begins, M.I. 1981. Satisfaction monitoring for quality control in campground management. Res. Pap. NE–484. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 6 p.

LaPage, W.F.; Ryan, D.J. 1980. Federal outdoor recreation research: Its private sector impacts, Chapter 9 in Appendix 4 to The 3d Nationwide Outdoor Recreation Plan, U.S. Dept. Interior, HCRS: 231–254.

Lease Hunting Can Succeed Because of Good Management. 1991. High Plains Journal (Oklahoma, Texas, New Mexico). January 7: 6–B.

Long, Patrick T. 1991. Tourism on our terms: rural community tourism development impacts and policies. A report prepared for the Western Governors' Association, University of Colorado at Boulder, College of Business and Administration. June

Marion, W.R., and C.A. Gates. 1988. Hunting lease arrangements in Florida and the Southeast. Florida Cooperative Extension Service Cir. No. 793, 19 p.

McLellan, Robert W.; Adams, A.M. 1992. Use of nonindustrial private land for recreation. Compiled for U.S. Department of Agriculture, Soil Conservation Service and the Department of Parks, Recreation, and Tourism Management, Clemson University, Clemson, SC.

Minnesota Extension Service Tourism and Home-Based Business Publications: Contact the Distribution Center, Minnesota Extension Service, University of Minnesota, 3 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108, 612–625–8173.

Community Travel and Tourism Marketing, How to develop a marketing plan: analyzing your current situation, identifying products, selecting target markets, setting objectives, carrying out promotional strategies, and evaluating results. (CD–FO–3372), $1.50.

Developing a Bed and Breakfast Business Plan, (CD–BU–3462), $1.50.

Evaluating Tourism Advertising with Cost-Comparison Methods. Describes designing and coding ads and calculating their efficiency: Cost per inquiry, cost per visitor, and return on advertising investment. (CD–FO–3372), $1.50.

Family-Based Business: Establishing an Ambiance in a Bed and Breakfast, (HE–FO–3219), $0.50.

Family-Based Business: Starting a Bed and Breakfast, (CD–FO–3225), $0.50.

Resort Interiors. Discusses evaluating a resort's interior, including furniture, beds, floor coverings, lighting, and surface materials, and developing a plan for upgrading. (CD–FO–3630), $1.00.

So Your Community Wants Travel/Tourism. Guidelines for Attracting and Serving Visitors in Your Community. Talks about the components of tourism, hospitality, knowing the area as a key to attracting people and keeping them there, and getting a community organized to attract tourists. (CD–BU–3443), $1.50.

Tourism Advertising: Some Basics. Discusses setting an advertising budget, creating a message, and the pros and cons of various kinds of advertising. (CD–FO–3311), $2.00.

NSFF. 1987. Hunting "frequency and attitude" survey summary. Riverside, CT: National Shooting Sports Foundation: 60.

Oklahoma State University Videotape Library. [n.d.]. Management for a lease hunting operation, 07 Ag Hall, Oklahoma State University, Stillwater, OK 74078, 90 minutes. 405–744–4050.

Opening your lands—hunters, anglers...and cash! 1985. American Tree Farmer Magazine. September–October.

Patterson, G. 1990. Who speaks for wildlife? Arkansas Game and Fish. Fall: 6–9.

Payne, J. 1990. Wildlife enterprise opportunities on a limited land base. Rangelands 12(5): 272–274.

Powell, J.; Bahr, S. 1988. Ranch recreation as a source of supplemental income: (part 1) planning the ranch recreation operation. Wyoming Stockman Farmer. October: 20–21.

Powell, J.; Bahr, S. 1988. Ranch recreation as a source of supplemental income: (part 2) assessing farm and ranch recreation potential. Wyoming Stockman Farmer. November: 8–11.

Powell, J.; Bahr, S. 1988. Ranch recreation as a source of supplemental income: (part 3) marketing ranch recreation opportunities. Wyoming Stockman Farmer. December: 16–17, 28.

President's Commission on Americans Outdoors. 1987. Americans and the outdoors. Washington, DC: U.S. Government Printing Office.

Rodiek, J.E.; Bolen, E.G. (eds.). 1991. Wildlife and habitats in managed landscapes. Washington, DC: Island Press (front matter only).

Schenck, E.W.; Arnold, W.; Brown, E.K.; Witter, D.J. 1987. Commercial hunting and fishing in Missouri: management implications of fish and wildlife markets. Transactions of the 52d North American Wildlife and Natural Resource Conference: 516–524.

Shaw, W.W.; Mangun, W.R. 1984. Nonconsumptive use of wildlife in the United States. Publication 154. U.S. Department of the Interior, Fish and Wildlife Resource. 20 p.

Stankus, Jan. [n.d.]. How to open and operate a bed and breakfast home. The Globe Pequot Press, Chester, CT 06412.

Tall Timbers Quail Laboratory, available publications. 1990. Tall Timbers Research Station, Tallahassee, FL.

Task Force on Recreation on Private Lands. 1986. Recreation on private lands: issues and opportunities. Dirksen Senate Office Building, Washington, DC. 67 p.

Tjaden, Robert L. 1990 An urbanizing perspective: use of forest and woodland alternatives. In: Proceedings, income opportunities for the private landowner through management of natural resources and recreational access; 1989 April 9–12; Wheeling, WV. Morgantown, WV: West Virginia University Extension Service and College Park, MD: Cooperative Extension Service, University of Maryland System, R.D. No. 740: 78–91.

[n.d.]. Tourism USA—guidelines for tourism development. U.S. Travel and Tourism Administration, U.S. Department of Commerce, 14th and Constitution Avenue NW., H1520 Room 1865, Washington, DC 20230.

U.S. Department of the Interior, Fish and Wildlife Service. 1985. National Survey of Hunting, Fishing, and Wildlife-Associated Recreation. Washington, DC: U.S. Department of Agriculture, Fish and Wildlife Service. Issued November 1988.

Wiggers, E.P.; Rootes, W.A. 1987. Lease hunting: views of the nation's wildlife agencies. Transactions of the 52d North American Wildlife and Natural Resources Conference. p. 525–529.

Resources

Kampground Owners Association (KOA), East Arizona Biltmore Circle, Suite144, Phoenix, AZ 85016. 602–973–2889.

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National Association of State Departments of Agriculture, 1616 H Street, NW, Washington, DC 20006. 202–628–1566.

National Forest Recreation Association, Route 3, Box 210, Highway 89 North, Flagstaff, AZ 86004–9426. 602–526–4330.

National Park Service Recreation Resources Assistance Division, P.O. Box 37127, Washington, DC 20013–7127. 202–343–3762.

National Wildlife Federation, 1400 16th Street NW, Washington, DC 20036–2266. 202–797–6800.

National Woodland Owners Association, 374 Maple Avenue East, Suite 204, Vienna, VA 22180. 703–255–2700.

North American Gamebird Association, Inc., P.O. Box 2105, Cayce West, Columbia, SC 29171. 803–796–8163.

Wildlife Information Center Inc., 629 Green Street, Allentown, PA 18102. 215–434–1637.

Chapter 14—Syrup

Description of the Product and Its Uses

Maple syrup is a sweetener, famous for its use on pancakes and waffles. It is made by boiling the sap of maple trees until it thickens into sugary, sweet syrup. About 30 to 40 gallons of sap are usually needed to make 1 gallon of pure maple syrup.

Pure maple syrup can only be made from the kinds of maples found in North America. While there are native maples on other continents, only North American maples have sap with the flavor cursor that creates the taste of maple.

The sugar maple (Acer saccharum), also known as hard or rock maple, is by far the species most often tapped for sap production. Black maple (Acer nigrum) is so similar to sugar maple that most foresters treat it as a variety of the same species. It is possible to make syrup from the sap of other maples such as red maple (Acer rubrum) and silver maple (Acer saccharinum), and even the box elder (Acer negundo) and the white birch (produced in Alaska). But the higher the sugar content of the sap, the fewer gallons of sap it takes to make syrup, and the sugar maple can yield 50 percent more sap with a higher sugar content than any other species. (A major drawback of the "soft" maples is that the buds—red and silver—develop much earlier in the spring than hard maples, and this changes the sap. Before the end of the sugar maple sap flow season, it is unusable.)

By far the greatest source of sugar maples for syrup production in the United States are trees growing on private lands. Those in the industry feel that there are so many trees available on private lands that there is little reason to turn to public forests. For example, in Wisconsin, less than 5 percent of the State's sugar maples are being tapped.

In general, State and national forests are not perceived as being very accessible to syrup producers, due largely to foresters' concerns about tearing up the terrain during the late winter months when activity in the woods is necessary but the ground is most easily disturbed. However, there is some production coming from publicly owned trees. A few producers tap sugar maples in the Green Mountain and the White Mountain National Forests. A special use permit is required, and the sap is taken to private lands to be made into syrup.

Maple trees become dormant in the winter and store food as liquid starches and sugars. In late winter as temperatures begin to rise, the trees start to mobilize these stored sugars, and the sap begins to move up the trunk to the branches. A combination of cold nights (20°F to 32°F) and warm days (45°F to 55°F) brings on the greatest sap flow.

Both sap flow and sweetness are influenced by heredity and environmental factors. Chief among these is a large crown with many leaves exposed to sunlight during the growing season for maximum sap and sugar production. Trees whose crowns have diameters greater than 30 feet can produce as much as 100 percent more syrup than those with narrower crowns and can produce sap as much as 30 percent sweeter than narrower crowned trees. Sap flow is further increased by large stem diameters, which develop from big crowns.

For these reasons, a good sugaring tree has characteristics somewhat different from those of a good timber tree. In a sugarbush (a woodland where syrup production is the major activity) the trees should be fairly widely spaced, so that they will grow in diameter and produce large crowns without gaining great height. Also, if trees are being grown for syrup, there is no concern about side branches or multiple stems. On the other hand, a long straight clean bole is important for timber production. Also, drilling holes in a tree for syrup production definitely reduces its timber value.

Trees generally smaller than 10 inches in diameter (measured at 4.5 feet above the ground) are not tapped. A tree is usually 40 or 50 years old before it reaches a size for maple syrup production. Overtapping damages a tree's health. The following guidelines are suggested:

Table 14–1. Sugar tapping guidelines

Tree diameter	Number of sugar taps
10 to 15 inches	1
16 to 20 inches	2
20 to 25 inches	3

Growth rate rather than diameter should determine the number and depth of taps—only young, vigorous trees can produce new wood fast enough to cover the hole caused by tapping.

Not many years ago, the only way to collect sap was with buckets, and the only way to remove water from sap was by boiling it. New technologies have affected both the collection and processing of the syrup, however. Plastic tubing and vacuum pumps are now being used by the larger producers to speed the collection process and make it less labor-intensive. A reverse osmosis process can now be used to remove water from the sap, which makes the production process less energy intensive and may even make syrup production from other types of maples cost effective in the future.

The trees are tapped similarly whether the sap is collected in buckets, bags, or plastic tubing on a vacuum system. If tubing is used, the land must have suitable slope. Ten percent is optimal. For maximum vacuum and sap flow as well as ease of collection, the land must also face toward a few central collection points. Collection points should be accessible to roads and near the sugar house.

If tubing is used, a plastic spout is placed in the tap hole (instead of a metal spout on which a bucket would hang) and it is tapped higher. An 18-inch drop line attaches to a lateral line 5/16ths inch in diameter and connects to a main line up to 2 inches in diameter. The downhill runs terminate in a tank at the bottom of a hill, which may or may not be in the sugar house. A vacuum pump can be added at the bottom of the hill to create a negative pressure within the tubing system, which evens out the sap flow over time and allows more sap to be collected from the trees. The tree still gives up only a small percentage of its reserves, and there is no indication that the vacuum pump system harms the tree.

The sugar content of the maple sap is measured by drawing off a sample of sap and floating an instrument called a hydrometer in it, which measures sap sweetness. Generally, sap is above 1 percent sugar by weight. Occasionally, a tree will have as much as 4 percent sugar. By dividing 86 by the percentage of sugar, one can calculate the number of gallons of sap that will be required to produce a gallon of syrup. (For example, if sap with a 2 percent sugar content were used, one would need 43 gallons to make 1 gallon of syrup.) It is conceivable, with very large crowned trees in a very good year, to make 100 gallons of syrup from only 200 taps.

Once the sap is running, the maple sugaring operation demands a lot of attention. The sap must be collected frequently either from the buckets or tanks and brought to the evaporator pans. Sap allowed to sit in containers can begin to ferment or become contaminated. Spouts should be removed soon after sap flow stops.

The ideal location for evaporator pans is inside an enclosure (called a “sugar house” in New England). The pans should have a minimum clearance of 4 feet from all outside walls. Steam vents in the roof and both air intake and exhaust vents for the smoke from the fire or other heat source are needed. It is very important that the structure be kept as clean as possible, since the syrup is a food product. Storage tanks should be kept close to evaporators, and the sap must be kept cold until it is boiled.

There are USDA standards which divide marketable syrup into the following categories: US Grade AA (Fancy), US Grade A, US Grade B, and Ungraded. There are six standards relating to (1) color, (2) clarity, (3) weight, (4) sweetness, (5) flavor, and (6) purity. Each of these can vary according to the location of the sugarbush. The type of soil is especially important in determining flavor.

Market and Competition Considerations

The annual production of maple syrup is 10 to 12 million pounds in the United States and 35 to 40 million pounds in Canada. About two-thirds of all the syrup made in the world is made in Canada. Quebec alone produces three times the amount of syrup as the whole United States. However, most of the syrup made in Canada, as well as in the United States, is sold by large American food companies such as Borden and Heinz.

The total U.S. maple syrup production and value in 1991 was estimated at 1,545,000 gallons and $39,279,000, respectively. Vermont is currently the leading producer State followed by New York, Wisconsin, and Maine. Massachusetts, Michigan, Minnesota, New Hampshire, Ohio, and Pennsylvania, and Wisconsin all have active State maple syrup producers associations as well.

There have been some recent problems in the market due to very cyclical production, and syrup producers in 1991 found themselves in an oversupply situation. The market is expected to stabilize in a couple of years, however. The prices received by New England maple syrup producers averaged $25.78 per gallon for retail, wholesale, and bulk sales of the 1991 maple syrup crop, down 29 cents per gallon from the 1990 average. In New Hampshire and Vermont, prices dropped 3 and 2 percent, respectively. Maine syrup prices were off 6 percent from 1990, but the price in Massachusetts rose 6 percent. Table 14-2 shows recent price data for four New England states.

There are generally few agroforestry activities that are more productive economically, given that the activity occurs at a time of the year when the farmer or timber producer cannot do a whole lot else because the ground is wet and soft. Many dairy farmers are also maple syrup

Table 14–2. Prices of maple syrup, by type of sales and size of container, 1990–1991

Type of sale and container size	Maine		Massachusetts		New Hampshire		Vermont	
	1990	1991	1990	1991	1990	1991	1990	1991
	Dollars							
Retail								
Gallons	35.40	34.00	33.90	33.60	33.30	32.20	30.90	29.80
1/2 gallons	19.10	18.70	18.60	18.60	18.70	18.00	17.60	17.10
Quarts	10.60	10.20	10.10	10.10	10.10	10.30	10.10	9.75
Pints	6.25	6.00	6.50	6.50	6.30	6.15	6.10	5.95
1/2 pints	3.80	3.70	4.20	4.10	3.75	3.70	3.75	3.75
Wholesale								
Gallons	27.90	26.70	26.70	27.00	28.50	28.70	28.40	24.80
1/2 gallons	15.40	15.30	15.60	15.20	16.00	15.40	15.70	14.40
Quarts	8.90	8.35	8.70	8.85	8.95	8.75	8.75	8.30
Pints	4.90	4.65	4.90	5.05	5.25	5.05	5.15	4.70
1/2 pints	2.80	2.85	3.10	2.90	2.75	2.90	3.10	2.90
Bulk (pounds)	1.35							
Grade A								
Light amber		1.45	2.35	1.75	1.85	1.60	1.95	1.70
Medium amber		1.25	2.10	1.55	1.70	1.50	1.65	1.55
Dark amber		1.20	1.60	1.35	1.20	1.30	1.25	1.20
Grades B and C		0.85	1.20	1.15	0.90	1.00	0.85	1.05
All sales—equivalent per gallon	17.80	16.70	31.80	33.70	33.70	32.80	26.50	26.00

Source: New England Agricultural Statistics Service, 22 Bridge Street, Room 301, P.O. Box 1444, Concord, NH 03302–1444. 603–224–9639.

producers, and dairy prices have been so deflated that, even with the seasonal downturn in maple syrup prices, many dairy farmers have been helped considerably by their syrup business.

The demand for maple syrup has remained strong, and it continues to benefit from an excellent image as one of nature's cleanest, purest products. This image has been very good for the maple industry. The industry has also been able to capitalize on the "romance" associated with maple syrup production. Syrup is also a luxury, gourmet product, and luxury items are often "recession proof."

The success or failure of a maple syrup operation will largely depend on how good a producer is at retail marketing. It is essential that the producer have access to a retail market and be willing to engage in creative marketing. The consumer is being asked to spend between 10 and 15 times what he or she would pay for an alternate, artificially flavored syrup. Creative marketing is essential to make people understand why the "real thing" costs so much more. Avenues for direct sales include direct farm sales, mail order, farmers markets, flea markets, and local supermarkets. One of the best ways to sell syrup is to have the public come directly to the farm to purchase the syrup, perhaps in conjunction with a restaurant or tourism activity. This approach requires access to a large population center or other tourist attractions in the area, however. Sometimes a large company will buy a large amount from one producer to give as holiday presents to employees.

There are some who sell all their syrup in bulk, but this means that not much profit will be made. It is also possible to sell sap directly to other producers. The sap is priced according to its sugar content—at 2 percent it might be priced at 25 cents a gallon. At 3 percent, it might be priced at 35 cents a gallon.

U.S. producers currently cannot easily make a good return on investment in the wholesale market because it is too difficult to compete with Canadian prices. Anyone trying to only wholesale the syrup may have a hard time just breaking even.

Tapping maple trees with a battery tapper. Photo courtesy of Paul Sendak, USDA Forest Service, Northeastern Forest Experiment Station, Burlington, Vermont. (SFP–7)

Tapping maple trees with a drill. Photo courtesy of Paul Sendak, USDA Forest Service. (SFP–8)

Maple sugar, maple cream, maple candies, and even unusual items such as maple barbecue sauce, maple sparkling water, and maple hot sauce are other products that can be made. While companies such as Log Cabin that produce artificially flavored syrup use only 2 percent pure maple syrup, the total amount of pure syrup purchased for flavoring in these products is not insignificant.

Maple festivals are popular in many maple-producing States. Several States and the International Maple Syrup Institute have had maple promotion activities over the past few years, and these have definitely stimulated demand for the product. Overall, demand for syrup has remained strong.

Canada is regarded as being much better organized in its marketing efforts than the United States. Public and private cooperatives (which the Canadians term "syndicates") are effective organizations, and most producers sell through some type of syndicate. Because they control so much syrup, syndicates have a lot of power in the marketplace. Typically, the syndicates pay the producers a certain percentage up front at the start of the year for their syrup and then pay a dividend at the end of the year when they know the actual syrup prices.

In the United States, the best sources of marketing advice are the State maple syrup producers associations and the cooperative extension service. Members of the State maple syrup producers associations are automatically members of the North American Maple Syrup Council (NAMSC). There is also an International Maple Syrup Institute (IMSI). The council and the institute sponsor considerable research as well as provide marketing information.

Packaging and Distribution

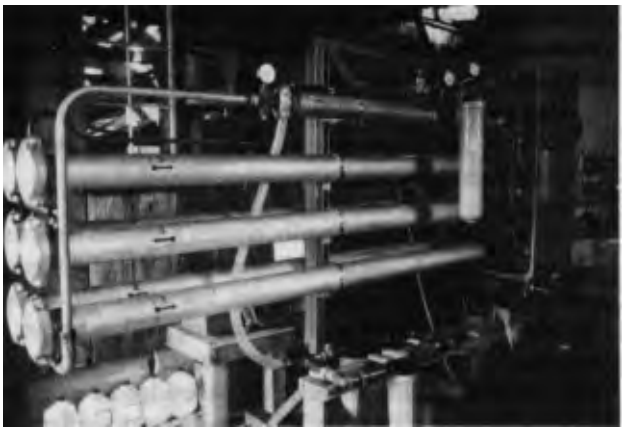
Syrup is packaged for retail at between 180°F and 200° F. Tin, hard plastic, and glass containers are used in a variety of sizes. Few customers purchase syrup by the gallon. Most customers buy pints or quarts. Some producers feel it is important to know the weight of the containers and fill by weight rather than volume, using 11 pounds per gallon as the standard.

Most part-time producers market their syrup directly from their sugar house. This requires a fair amount of drive-by traffic. The syrup retails for an average of $30 per gallon from the sugar house.

It is impossible for producers to retail through the large grocery store chains unless they are very large producers. In New Hampshire, for example, only two packers sell to Safeway, IGA, and similar stores. The packers buy syrup by the trailer truckload at quantities well beyond the reach of most new entrepreneurs.

Equipment Needs, Costs, and Suppliers

Opinions on the size of commercially profitable sugaring operations vary from area to area. In some areas, producers with fewer than about 500 taps are generally considered hobbyists, while producers with 2,000 or more taps are considered "serious" syrup producers. A level of 3,000 to 4,000 taps is considered large. Even large producers are seldom making their living exclusively from syrup, however.



Reverse osmosis system for making maple syrup. Photo courtesy of Paul Sendak, USDA Forest Service. (SFP–6)

Minimum levels for profit are estimated at anywhere from 30 to 90 taps per acre. The widely accepted "target minimum" for a cost-effective undertaking is 40 taps per acre. Below that number, the trees are just too scattered to make collection worthwhile, whatever collection system is being employed. The only exception to this target that would justify fewer trees per acre would be in a situation where easy access to roadside trees was possible.

Sugarbushes that are fully stocked with sugar maple commonly have about 100 taps per acre. Each tap should be capable of yielding a yearly average of a quart of syrup, which amounts to 25 gallons of syrup per acre per year. At $30 per gallon retail, annual gross income would be $750 per acre. Sugarbushes that have fewer taps per acre (60 to 80) often have more and sweeter sap per taphole, as much as 1-1/2 or 2 quarts of syrup per tap, or 25 to 40 gallons of syrup per acre.

While many people picture horse-drawn sleds or wagons being drawn through the woods and buckets of sap being emptied into a gathering tank, the maple syrup industry in reality has changed. Most commercial producers today use plastic pipelines in closed dropline aerial systems to reduce labor needs, achieve more sanitary collection and transportation of sap, and eliminate road upkeep, among other reasons. Vacuum pumps are used to help move sap through the lines. In addition, new technology has changed the syrup processing system. Reverse osmosis is now frequently used by larger producers to remove the water from the maple sap in combination with the traditional open-pan evaporator systems.

It is estimated to take between $7 and $10 a tap to fully equip a sugarbush (not including the sugar house), and those estimates assume that the producer is able to use existing tractors and wagons and a building. For about $10,000 it would probably be possible to purchase an evaporator, filter tanks, a collection system, a gathering tank, and a storage tank. The single largest investment is the evaporator, which may cost $5,000 to $6,000. A 1,500- to 2,000-tap operation "from scratch" (that is, no existing vehicles, buildings, etc.) might cost between $35,000 and $50,000.

Syrup making often is part of a family farm operation. The sugar maple business is very labor intensive, and many producers find that it is getting increasingly difficult to get dependable seasonal help. When the sap is running, the operation can be a 7-day, late-night effort for up to about 6 weeks. This is one reason why more and more producers are turning to new technologies as a substitute for labor. Many producers above the hobbyist level are investing in the plastic tubing with pumps, trucks, tanks, and storage as well as the actual evaporating equipment. Good used equipment can be found, and new equipment manufacturers often carry large inventories of used equipment as well.

Tubing collection systems can reduce labor demands somewhat, but a 1,000-tap operation (producing an estimated 250 gallons of syrup, worth about $7,500) would probably be the limit for a two-person crew to handle. With the more sophisticated systems, some attention is needed to monitor the systems. For example, attention to detail and natural laws is required to make the tubing and vacuum system work properly. It is also necessary to maintain the very highest standards of cleanliness to avoid contaminating the sap. Good housekeeping distinguishes the high-quality syrup. Finally, the sap must be processed soon after it is collected. It does not keep.

The syrup business is also very energy intensive. Wood and oil are the most frequently used fuels, with oil being the more expensive alternative.

Other Factors

The sugar maple depends on a certain amount of sustained cold in the winter to survive. The cold zone for winters may be gradually moving north. In fact, some researchers estimate that by the year 2000, the "warmer" winter climate will have moved 300 miles north.

Sugar maple is a fairly good "compartmentalizer." If it has a wound, discoloration may occur 18 inches above and below the tap hole. The wood is usually fairly sound so long as rot does not set in before the hole seals up, which usually happens fairly quickly in a healthy tree. The discolored maple wood can be unusual and attractive. There may be special uses for it in the decorative wood market.

Resource Conservation Considerations

Generally speaking, those in the syrup industry feel that the country's sugar maple trees are not as healthy as they used to be. The last good year for maple syrup production industrywide was 1981. Since then, good production has occurred, but it has been localized. Many in the industry feel that this is due at least in part to acidic deposition in our Nation's maple forests.

In addition to acid rain and snow damage, many in the syrup industry are concerned about the United States losing many of its best sugar maple trees to housing developments and insect damage. No one is planting many sugar maples because it requires 40 to 75 years for a sugar maple to mature. Insects are a factor because when premature defoliation occurs, the loss of leaves can deplete the starch reserves in the tree. When this happens, the tree should not be tapped until it regains its vigor. Early recognition of pests (such as the forest tent caterpillar) is essential to good management.

Because of its high shade tolerance, sugar maple can persist for long periods of time with little growth. Crowded young trees remain as poles too small to tap, and trees with small crowns have too little leaf area to produce sweet sap. Young sugar maples, however, have remarkable recuperative powers, and trees released from overhead shade and side competition can double or quadruple their growth if the crown of leaves is still vigorous. In fact, the thinning of young maple trees to allow more space and growth is one of the most rewarding activities in managing the sugarbush. Thinning at other stages in the life of a sugarbush must be approached with more caution to reduce the risk of a number of "shock" factors.

Protection is sometimes as necessary as thinning in a sugarbush. The trees should be protected from livestock and excess wind. Suitably located wind mantles or windbreaks are helpful.

Valuable ornamental or shade trees generally are not tapped because wood decay organisms, ordinarily of little consequence in an entire grove of trees, can enter taphole wounds and endanger the tree. However, trees that are not overtapped can produce without jeopardizing their health. The number of taps must be based on the vigor of the tree.

Profile

Charles Buck, a dairy farmer in Jefferson, New York, started making maple syrup about 30 years ago with two old, second-hand evaporators and about 1,000 buckets. In the early years, most of the syrup was wholesaled because there wasn't much of a retail market. At that time, there was a lot of competition in the area. In fact, at one time more maple syrup was being produced on a square-mile basis in Jefferson, New York, than anywhere else in the world. He helped start one of the first maple festivals in their county about 26 years ago, a festival that has continued to this day.

About 12 years ago, the family bought a second farm that had a newer sap house and a larger operation. By then they had built a small retail market, but with their added production they needed a larger market, so they began wholesaling to roadside stands and stores throughout New York State. Since then, they have added a weekly farmers market in New York City and a brisk mail order business. They sell many personal and corporate gifts, particularly during the holiday season.

The Bucks' operation currently consists of two 5- by 14-foot evaporators, and a very large reverse osmosis machine that allows the processing of up to 26 gallons of syrup per hour. Sap from about 17,000 taps comes into the sap house; 7,000 taps are theirs, and they purchase sap from about 10,000 additional taps. Some buckets are still used, but more and more the operation has gone to tubing in order to reduce labor costs. Mr. Buck, his wife, daughter, and son-in-law run the maple syrup operation of the farm. Some seasonal help is needed, especially during the holidays. In addition to maple syrup, the farm maintains 150 head of dairy cows.

In Buck Hill Farms' best year, they produced 4,200 gallons of syrup. Average annual production in the past few years has been somewhat less—3,600 to 3,700 gallons—because the weather has been warming up so fast in the spring.

The farm has continued to sell to both wholesale and retail markets. The wholesale market presently is only fair due to the large surplus from Canada. Their wholesale market includes a small amount (5 percent) of sales of "off flavor" commercial syrup sold by the barrel and used in chewing tobacco. The remaining 95 percent of their sales are divided nearly equally between wholesale and retail canned syrup markets. They have succeeded in staying in the wholesale market by having a very efficient operation, but Mr. Buck attributes the farm's success in weathering the low prices of 1991, brought on by the Canadian surplus, to their retail market. The retail market accounts for about half of the farm's gross sales. Retail prices at the farm in 1991 were $32.50 a gallon ($2.95 per pound). This compares to prices on the wholesale market in the spring of 1991 of between $1.25 and $1.50 a pound, depending on the grade.

In addition to selling both tin and plastic containers of maple syrup, the farm sells maple cream, maple sugar, granulated maple sugar, maple-coated popcorn and peanuts, maple vinegar, and maple barbecue. Retail

sales are made out of one end of the sap house. A few other products like honey and pancake mix are sold as well. In late March and early April, visitors come to watch the maple operation.

Considerations for a Rural Development Strategy

Syrup, an all-American product, was first produced by Native American people before Europeans arrived in America. Rural areas with access to the maple resource could take advantage of the "romance" associated with this product by making the story and production of syrup part of the culture and history of a rural area.

Contributors

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Tony Gasbarro, Department of Forest Products, Forest Research Laboratory 105, Corvallis, OR 97331-5709. 503–737–4257.

Roy Hutchinson, Editor, Maple Syrup Digest, P.O. Box 240, Canterbury, NH 03224. 603–783–4468.

Thomas Martin, Senior Forester, New York State Department of Environmental Conservation, P.O. Box 220, Warrensburg, NY 12885–0220. 518–623–3671.

Frank Parks, Senior Forester, New York State Department of Environmental Conservation, Jefferson Road, Stamford, NY 12167. 607–652–7364.

Donald Peterson, Forest Products Marketing Specialist, 518 West Somo Avenue, Tomahawk, WI 54487. 715–453–2188.

Theodore Peterson, National Wood Products Extension Program, Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI 53705–2398. 608–231–9330.

Lynn Reynolds, North American Maple Syrup Council, W10010 Givens Road, Hortonville, WI 54944. 414–799–6672.

Paul Sendak, Northeastern Forest Experiment Station, P.O. Box 968, Burlington, VT 05402. 802–951–6774.

Lewis Staats, Uihlein Sugar Maple Research and Extension Field Station, Bear Cub Road, Lake Placid, NY 12946. 518–523–9337.

Bibliography

Branch, Diana, ed. 1978. Tools for homesteaders, gardeners, and small-scale farmers. Emmaus, PA: Rodale Press, Inc., front matter: 392–396.

Hill, Deborah B. 1988. Have maples, will sugar.... In Natural Resources Newsletter. 7(2): 1–4, University of Kentucky, College of Agriculture, Cooperative Extension Service, Lexington, KY 40546.

Houston, David R.; Allen, Douglas C.; Lachance, Denis. 1990. Sugarbush management: a guide to maintaining tree health. Gen. Tech. Rep. NE–129. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Huyler, Neil K., 1975. Tubing vs. buckets: a cost comparison. Res. Note NE–216. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 5 p.

Lancaster, Kenneth F.; Walters, Russell S.; Rye, Arthur H. 1982. Collecting maple sap with plastic tubing. NA–FR–23. [Location unknown]. U.S. Department of Agriculture, Forest Service, Northeastern Area.

Morrow, Robert R. 1981 Sugar bush management. New York State College of Agriculture and Life Sciences, Cornell University, Information Bulletin 110. Write to the Distribution Center, 7 Research Park, Cornell University, Ithaca, NY 14850. $1.

Northeastern Forest Experiment Station. 1982. Sugar maple research: sap production, processing, and marketing of maple syrup. Gen. Tech. Rep. NE–72. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 109 p.

Sendak, Paul E.; Bennink, John P. 1985.. The cost of maple sugaring in Vermont. Res. Pap. NE–565. Burlington, VT: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 14 p.

Winch, F. E., Jr.; Morow, R. 1989. Production of maple syrup and other maple products. Information Bull. 95. Ithaca, NY: Cornell Cooperative Extension Service, Cornell University.

Resources

Professor Melvin R. Koelling, Department of Forestry, 126 Natural Resource Building, Michigan State University, East Lansing, MI 48823. 517–355–0090.

A Maple Syrup Producers Manual is in the process of being updated and will be available through the North American Maple Syrup Council in late 1992 or early 1993. Interested individuals should contact Russell Davenport, Davenport Maple Farm, Route 1, Tower Road IIIA, Shelburne Falls, MA 01370. 413–625–2866.

Maple Syrup Digest, Roy Hutchinson, Ed., P.O. Box 240, Canterbury, NH 03224. 603–783–4468. Has many sources of new and used equipment listed. Field editors in 12 U.S. locations and 2 Canadian provinces are as follows:

Connecticut. Paul M. Williams, P.O. Box 81, South Woodstock, CT 06267. 203–542–2090.

Maine. Vicki Schmidt, P.O. Box 282, Kents Hill, ME 04349. 207–377–6275.

Massachusetts. James Graves, R.D. 1, Shelburne Falls, MA 01370. 413–625–9066.

Michigan. James Graves, R.D. 1, Baatz Road, Maple City, MI 49664. 616–228–5835.

Minnesota. Wanda Patzoldt, 3001 Horseshoe Lake Road, Grand Rapids, MN 55744. 218–326–5769.

New England. Sherb Doubleday, Newport, VT 05855. 802-334-2793.

New Hampshire. Frank H. Owen, 35 Bridge Street, Colebrook, NH 03576. 603–237–4432.

New York. Lloyd Sipple, R.D. 2, Box 126, Bainbridge, NY 13733. 607–967–7208.

Nova Scotia. Maxwell Spicer, Spencers Island, NS B0M1S0 CANADA. 902–392–2823.

Ohio. Ture Johnson, Box 241, Burton, OH 44021. 216–834–4206.

Ontario. Bill Robinson, Rural Route 2, Auburn, Ont., CANADA.

Pennsylvania. Jim Tice, R.D.1, Box 29, Mainesburg, PA 16932. 717–549–5257.

Vermont. Ray Foulds, 5 Clover Street, South Burlington, VT 05403. 802–864–6305.

Wisconsin. Roland Jorns, 4518 Highway T, Egg Harbor, WI 54209. 414–868–3161.

Larry Myott, County Extension Agent, East Gate, Building 4, Fort Ethan Allen, Winooski, VT 05404. 802–656–4420.

Dr. Mariafranca Morselli, Research Professor Emeritus, Botany Department, 225D Marsh Life Science Building, University of Vermont, Burlington, VT 05405. 802–656–0427. Ask for a copy of their most recent Maple Publications Reprint Request List.

The Vermont Agricultural Experiment Station provides a "Maple Research Publications List," an abbreviated list of publications available from the UVM Extension Service. Contact the UVM Extension Service, Chittenden County Office, Fort Ethan Allen, 4A Laurette Dr., Colchester, VT 05446.

Vermont Maple Industry Council, Morrill Hall, Extension Service, University of Vermont, Burlington, VT 05405. 802–325–3203.

Vermont Department of Agriculture, State Office Building, 116 State Street, Montpelier, VT 05602. 802–828–2430.

Wisconsin Maple Syrup Producers Council, Route l, Aniwa, WI 54408, provides information and also a video on maple syrup production for small producers that can be purchased or rented.

Maple Sugaring Instruction

Fully illustrated catalogs and instruction books are available for the novice maple sugarer from these companies:

G.H. Grimm Company, Inc., Box 130, Rutland, VT 05701

Leader Evaporator Company, Inc., 25 Stowell Street, St. Albans, VT 05478.

Small Brothers, Inc., P.O. Box 160, Dunham, Quebec J0E 1M0 CANADA.

Les Specialties Techniques De Valcourt, Inc., 746 rue St. Joseph, C.P.68, Valcourt, P.Q. J0E 2I0, CANADA.

Maple Producers' Equipment Directory
(Sources: "New England Farmer" and "Maple Syrup Digest")

EVAPORATORS

Grimm Evaporator Co., P.O. Box 130, Rutland, VT 05701
Grimm and Lightning Evaporators
J.G.D. Evaporators, Inc., 201 le're Ave., Ham-Nord GOP lA0
Leader Evaporator Co., Inc., 25 Stowell St., St. Albans, VT 05478
Leader, King, and Vermont Evaporators
Small Brothers USA, Inc., Rt. 78 E., P.O. Box 714, Swanton, VT 05488
Waterloo Evaporators USA, Inc., HCR 63, Box 35A, Barton, VT 05822

R.O. Units
Coster Engineering, Airport Road, Mankato, MN 56002
LaPierre Equipment Inc., 99 Rue de l'Escale, St-Ludger, Beauce, Quebec, Canada G0M lW0
Leader Evaporator Co., Inc. 25 Stowell St., St. Albans, VT 05478
Seprotech Systems, Inc., 2378 HoIly Lane, Ottawa, Ontario, Canada K1V 7P1
Small Brothers USA, Inc., Rt. 78E, P.O. Box 714, Swanton, VT 05488

Maco Stoker
Small Brothers USA, Inc., Rt. 78E, P.O. Box 714, Swanton, VT 05478

Gasifier
Enerchip, Inc., P.O. Box 213, White River Junction, VT 05001

MAPLE EQUIPMENT SUPPLIERS

Bascombs Sugar House, RR #1, Box 138, Alstead, NH 03602
Brodies Sugar Bush, HCR 75, Box 30, Westford, NY 13488
Brooks Maple Products, F8394 Bo-Di-Lac Dr., Minocqua, WI 54584
Coons Maple Supplies, P.O. Box 377, Monticello Rd., Richfield Springs, NY 13439
Countryside Hardware & Recreation, Inc., DeRuyter, NY 13052
Dansforth, U.S. Rt. 2, E. Montpelier, VT 05602
The Davenports, 57 Brink Rd., Van Etten, NY 14889
Firth Maple Products, R.D. #2, Spartansburgh, PA 16434
Hillsboro Maple Equipment Supply, Box 2480, Gully Hill Rd., Starksboro, VT 05487
H.W. Cook Farm Service, Inc., De Ruyter, NY 13052
Lamothe's Sugar House, 89 Stone Rd., RFD #3, Burlington, CT 06013
Lloyd Sipple, Bainbridge, NY 13733
Maple Hill Farms, R.D. #1, Box 279, Cobleskill, NY 12043
Reynolds Sugar Bush, Inc., Rt. 1, Aniwa, WI 54408
Roger Sage, 4449 Sage Rd., Warsaw, NY 14569
Schambach's Maple Syrup Equipment & Supplies, 7288 Hayes Hollow Rd., West Falls, NY 14170
Smada Farms, Inc., Rt. 41N, HC 75, Box 945, Greene, NY 13778
Sugar Bush Supplies Co., 2611 Okemos Rd., Mason, MI 48854
Sugar Shack, 3493 Baatz Rd., Maple City, MI 49664
Toad Hill Maple Products and Supplies, Charles Old Rd., Athol, NY 12810
Tyler Maple Farms, Westford, NY 13488
Wrights Sugar House, Little Chief Products, 28 Liberty St., Camden, NY 13316

BUCKETS

Aluminum: L'Hoir, Inc., St. Albans, VT 05478
Metal: All evaporator companies
Other: Plastic: Leader Evaporator Co., Inc. 25 Stowell St., St. Albans, VT 05478
Reynolds Sugar Bush, Inc., Rt. 1, Aniwa, WI 54408

THERMOMETERS

All evaporator companies
Maple equipment suppliers

THERMOMETERS (cont.)

Dial Made Syrup Thermometer
Rochester Manufacturing Co., Rochester, NY 14610
Evaporator companies
Maple equipment suppliers

AUTOMATIC DRAW OFF

All evaporator companies
Maple equipment suppliers

Thermoregulator
Fenwal Thermoswitch, 32-400°F, closes on temperature rise;
#47101 with following features; large dial & knob (6A);
armoured cable (11); connector (12);
Fenwal, Inc., Ashland, MA 01721

HYDROMETERS

All evaporator companies
Maple equipment suppliers

FILTER CLOTHS

Cartridge: Water Equipment Technologies, 832 Pike Rd., West Palm Beach, FL 33411-3847
Paper: Kopel Filter Paper Co., 2512 S. Damen Avenue, Chicago, IL 60608
All evaporator companies
Maple equipment suppliers

PLASTIC TUBING

Berliner Plastics, 1973 Lake Ave., Lake Luzerne, NY 12486
IPL Products, Ltd., Rt. 9N, P.O. Box 501, Plattsburgh, NY 12901
Lamb Natural Flow, P.O. Box 130, Rutland, VT 05701
Small Brothers USA, Inc., Franklin County Airport, Swanton, VT 05488
U.S. Maple, Inc., Middlebury, VT 05753
Most maple equipment suppliers

VACUUM PUMPS AND VACUUM UNITS

G.H. Grimm Co., Inc., Rutland, VT 05701
Leader Evaporator Co., Burlington, VT 05478
Small Brothers USA, Inc., Rt. 78E, P.O. Box 714, Swanton, VT 05488
Sugar Camp, Inc., Rt. 2, Box 337, Rapid City, Ml 49676
Most maple equipment suppliers

EVAPORATOR CLEANERS

Evaporator companies

LABELS

Maple Supplies Company, P.O. Box 895, Barre, VT 05641
Sugar Bush Supplies Co., Okemos Rd., Mason, Ml 48854
Wm. L. Chalmer Assoc., 150 Traverse Blvd., Buffalo, NY 14223
Maple equipment suppliers

SUGAR BOXES

Lafferty Box Co., Windsor, NY 13865
Lloyd Sipple, Bainbridge, NY 13733
Smada Farms, Inc., Star Route 41N, Greene, NY 13778
Thoma Box Co., Clinton St., Buffalo, NY 14203
Most maple equipment suppliers

CONTAINERS

All evaporator companies

Cans:
Maple Supplies Co., Rt. 302E (Kenco Bldg.), P.O. Box 895, Barre, VT 05641
New England Container Co., 75 Jonergin Drive, Swanton, VT 05488
Prime Container Corp., 40 Marble St., W. Rutland, VT 05777

Ceramic:
David Dobson, Ltd., P.O. Box 5013, Dept. D., Burlington, VT 05401

Glass:
Empire Bottle Co., Cedar Street, Syracuse, NY 13202
M.R. Crary Corp., P.O. Box 122, 219 Washington Square, Syracuse, NY 13208

Plastic:
Kress Creations, Inc., 349 Christian St., Oxford, CT 06483
Sugar Hill Maple Containers, Main St., Sunderland, MA 01375
The Bacon Jug Co., Inc., R.D. #2, Box 580, Littleton, NH 03561

Sealers:
Grimm Evaporator Co., Rutland, VT 05701

Shippers:
Binghamton Container Co., Binghamton, NY 13902
All evaporator companies

SPECIAL EQUIPMENT

Hydrometers, filters, containers, thermometers, felts
Maple equipment suppliers
Evaporator companies

PELLETS FOR TAPHOLE STERILIZATION

Maple equipment suppliers
R.M. Lamb, P.O. Box 368, Rt. 49, Bernhards Bay, NY 13028

REFRACTOMETERS, HAND

1. Syrup
   a. Hand refractometer sugar scale 45-70%; Golberg model
   American Optical Co., Buffalo, NY 14215

   b. Sugar refractometer; range 50-80%.
   Lafayette Radio, P.O. Box 222, Jamaica, NY 11431
   Evaporator companies
   Maple equipment suppliers

2. Sap
   a. Hand refractometer; sugar-scale 0-30%
   American Optical Co., Buffalo, NY 14215

REFRACTOMETERS, HAND (cont.)

b. Toko hand sugar refractometer-scale 0-32%
Laboratory Equipment Co., 649 Bryant St., San Francisco, CA 94107
Evaporator companies
Maple equipment suppliers

c. Sugar refractometer-range 0-32%
Lafayette Radio, P.O. Box 222, Jamaica, NY 11431
*Temperature compensated, higher-priced instrument.

TANK AND BUCKET COATING

Epoxy coating compound
Philadelphia Resins Co., Inc., 7637 Queen St., Philadelphia, PA 19118
Evaporator companies

ULTRAVIOLET FIXTURE

(Germicidal Lamp)

1. Bulb - 30 watt
   a. Syivania-#G30T8
   b. General Electric-#G307A
2. Reflector, any 36" flourescent fixture
3. Ultraviolet Disinfection Unit
   Reynolds Sugar Bush, Inc., Ainwa, WI 54408
4. UV light unit
   Bill Coombs, Box 186, Wilmington, VT 05363

FORESTRY EQUIPMENT FOR MAPLE PRODUCTION

Hand levels, tree marking paint, diameter tape, etc.
Ben Meadows Company, 3589 Broad St., Atlanta (Chamblee), GA 30366
Forestry Suppliers, Inc., 205 W. Rankin St., P.O. Box 8397, Jackson, MS 39204
Hi-Line-Utility Supply Co., 740 Creel Dr., Wood Dale, IL 60191
T. S. I., P.O. Box 151, Highway 206, Flanders, NJ 07836

USED EQUIPMENT

Bascom's Sugar House, RR #1, Box 138, Alstead, NH 03602
Brodies Sugar Bush, Westford, NY 13488
Roger C. Sage, 4449 Sage Rd., Warsaw, NY 14569
Smada Farms, Greene, NY 13778
Tyler Maple Farms, Box 77, Westford, NY 13488

No endorsement of these items is intended or implied over the products of others who may be engaged in the same business. This list is a buying guide only.

Chapter 15—Weaving and Dyeing Materials

Description of the Product and Its Uses

A great variety of native materials that may grow in or near native forests and woodlands can be used for weaving, decorating, or dyeing. While there are few examples of use of forest products for these applications on a commercial scale, a renewed appreciation of the potential for these products could be part of a broader focus of a rural area on weaving, dyeing, and related craft skills.

The predominant basketmaking material in the eastern half of the United States has historically been splints or splits from ash and eastern white oak trees. In addition to ash and oak, woods from maple, sassafras, spruce, aspen, and pine are commonly used. (In Sweden, pine is the preferred basketmaking material.) Apart from wood, a great many forest products can be used to weave. In the Pacific Northwest's rich basketry tradition, cedar bark, willow, and beargrass was primarily used. Some Northwest Indian tribes, such as the Makah and Lummi, still practice basketry with these materials (table 15–1).

Table 15–1. Forest products commonly used in weaving and dyeing materials

Alder bark	Oregon grape roots
Beargrass	Tan oak
Black or brown ash	White oak
Douglas-fir	White birch bark
Hemlock	Willow
Lichens	Yellowbark roots
Oak wood and bark	

Willow bark from birch, hickory, and poplar; vines from bittersweet, honeysuckle, and virginia creeper; leaves and grasses of cattails, rushes, sedges, and sweetgrass; roots of spruces, pines, and tamarack; leaf stalks of sumac; and needles of white, Ponderosa, and longleaf pine are also all popular weaving materials for natural basketry.

A great many native North American plants can be used for dyeing. A few examples of those that are found in forests include the following:

Alder (*Alnus tenuifolia*)
Alfalfa (*Medicago sativa*)
Arrowleaf Senecio (*Senecio triangularis*)
Asparagus (*Asparagus officinalis*)
Aspen (*Populus tremuloides*)
Aster, Purple (*Aster* spp.)
Aster, White (*Aster porteri* Gray)
Bee Plant (*Cleome serrulata*)
Bindweed (*Convolvulus arvensis*)
Bitterbrush (*Purshia tridentata*)
Black Medic (*Medicago iupulina*)
Black Walnut (*Juglans nigra*)
Black-Eyed Susan (*Rudbeckia* spp.)
Blazing-Star (*Liatris* spp.)
Bloodroot (*Sanguinaria canadensis*)
Bluebell (*Mertensia ciliata*)
Blueberry (*Vaccinium* spp.)
Blue-Flowered Lettuce (*Lactuca pulchella*)
Bracken Fern (*Pteridium aquilinum*)
Bulrush (*Scirpus acutus*)
Burdock (*Arctium minus*)
Butter-and-Eggs (*Linaria vulgaris* Hill)
Buttercup (*Ranunculus acris*)
California Laurel (*Umbellularia Californica*)
Cattail (*Typha latifolia*)
Chicory (*Cichorium intybus*)
Chokecherry (*Prunus melanocarpa*)
Cinquefoil (*Potentilla* spp.)
Clematis, White (*Clematis ligusticifolia*)
Cocklebur (*Xanthium italicum*)
Common Horehound (*Meeuvium vulgare* L.)
Common Mallow: see Mallow
Cottonwood (*Populus* spp.)
Cow Parsnip (*Heracleum lanatum*)
Creeping Harebell (*Campanula rapunculoides*)
Crownvetch (*Coronilla varia*)
Curly Dock (*Rumex crispus*)
Currant (*Ribes* spp.)
Dandelion (*Taraxacum officinale*)
Dodder (*Cuscuta* spp.)
Dogbane (*Apocynum cannabinum*)
Evening Primrose (*Oenothera strigosa*)
Eveningstar (*Mentzelia decapetala*)
False Lupine (*Thermopsis montana*)
Fireweed (*Epilobium angustifolium*)
Gaillardia (*Gaillardia aristata*)
Golden Wooly Aster (*Chrysopsis villosa*)
Goldenrod (*Solidago* spp.)

Goosefoot, Green (*Chenopodium* spp.)
Goosefoot, White (*Chenopodium* spp.)
Gumweed (*Grindelia squarrosa*)
Holly Grape (*Mahonia* spp.)
Horsemint (*Monarda menthaefolia* Benth)
Horsetail (*Conyza canadensis*)
Indian Paintbrush (*Castilleja miniata*)
Japanese Knotweed (*Polygonum cuspidatum*)
Kinnikinick (*Arctostaphylos uva-ursi*)
Knapweed (*Centaurea repens*)
Knotweed: see Matweed
Kochia (*Kochia scoparia*)
Ladies' Bedstraw (*Galium boreale*)
Ladysthumb (*Polygonum* spp.)
Leafy Spurge (*Euphorbia esula*)
Lupine (*Lupine* spp.)
Madrone (*Arbutus menziesii*)
Mallow (*Malva neglecta*)
Manzanita (*Arctostaphylos columbiana*)
Marshelder (*Iva xanthifolia*)
Matchbrush (*Gutierrezia sarothrae*)
Matweed (*Polygonum aviculare*)
Milkweed (*Asclepias speciosa*)
Miner's Candle (*Cryptantha virgata*)
Mistletoe (*Arceuthobium* spp.)
Mormon Tea (*Ephedra viridis*)
Mountain Mahogany (*Cercocarpus montanus*)
Mullein (*Verbascum thapsus*)
Oak Galls
Osage Orange (*Maclura pomifera*)
Oxalis (*Oxalis stricta*)
Peppermint (*Mentha piperita*)
Pepperweed (*Lepidium virginatum*)
Plantain (*Plantago* spp.)
Ponderosa Pine (*Pinus ponderosa*)
Povertyweed (*Ambrosia tomentosa*)
Prickly Lettuce (*Lactuca scariola*)
Prickly Poppy (*Argemone polyanthemos*)
Prostrate Knotweed: see Matweed
Purslane (*Portulaca oleracea*)
Rabbitbrush (*Chrysothamnus* spp.)
Ragweek, Common (*Ambrosia* spp.)
Ragweed, Giant (*Ambrosia trifida*)
Redroot Pigweed (*Amaranthus retroflexus*)
Rough Pigweed: see Redroot Pigweed
Russian Thistle (*Salsola kali*)
Sage (*Artemisia frigida*)
Sagebrush (*Artemisia tridentata*)
Salsify (*Tragopogon pratensis*)
Scouring Rush (*Equisetum arvense*)
Scurf Pea (*Psoralea tenuifolia*)
Sedge (*Carex* spp.)
Showy Daisy (*Erigeron speciosus*)
Snakeweed: see Scouring Rush
Snow-on-the-Mountain (*Euphorbia marginata*)
Soapwort (*Saponaria officinalis*)
Sow-Thistle (*Sonchus oleraceus*)
Spiny Goldenweed (*Haplopappus spinulosus*)
Squawbush (*Rhus trilobata*)
Sticky Geranium (*Geranium viscosissimum*)
Storksbill (*Erodium cicutarium*)
Sulfur Flower (*Eriogonum umbellatum*)
Sumac (*Rhus* spp.)
Sunflower, Aspen (*Helianthella uniflora*)
Sunflower, Common or Prairie (*Helianthus annuus*)
Sweet Pea (*Lathyrus* spp.)
Tansy (*Tanacetum vulgare*)
Tansy Ragwort (*Senecio jacobaea*)
Tassel Flower (*Brickellia grandiflora*)
Teasel (*Dipsacus sylvestris*)
Thistle, Canada (*Cirsium arvense*)
Thistle, Musk (*Carduus nutans*)
Trefoil Clover (*Trifolium* spp.)
Tumble Mustard (*Sisymbrium altissimum*)
Watergrass (*Echinochloa crus-galli*)
Wild Four O'Clock (*Abronia* spp.)
Wild Licorice (*Glycyrrhiza lepidota*)
Wild Rose (*Rosa* spp.)
Willow (*Salix* spp.)
Wiregrass (*Juncus balticus*)
Yarrow (*Achillea lanulosa*)
Yellow Loosestrife (*Lysimachia* spp.)
Yellow Sweetclover (*Melilotus officinalis*)
Yucca (*Yucca glauca*)

Even noxious weeds that may invade disturbed areas, such as bindweed (*Convolvulus arvensis*), have dye uses.

Materials for basketry can best be described by understanding the four basic types of basketry—splint, coiled, twined, and wicker basketry.

Splint basketry uses thin, flexible strips of wood, flat reed, cane, or bark. However, native woods and barks are considered by many basketmakers to be superior to reed and cane, which are products of the rattan palm and are imported materials.

Native trees that have been used for making splints are black ash (also called brown or water ash) and white ash, white oak, basket oak, white maple (swamp maple), northern white cedar, buckeye, hickory, poplar, elm, box elder, birch, and cypress. Barks used for making splints include birch bark, elm bark, smooth willow bark, smooth basswood bark, and the inner bark of hickory, white pine, and hemlock.

Ash splint basketry is the primary native basketry of the Northeast and Midwest. Black ash (called brown ash in New England) is one of the best materials for plaited basketry because it is among the easiest to make into splints and it will bend without cracking or breaking. It can be found from the southern border of New York State up to the Great Lakes and around the Great Lakes (including Wisconsin). Black ash cannot readily be

Splint basket adds a decorative touch to a table. Photo courtesy of the U.S. Department of Agriculture. (79CS0752)

planted and grows in wetlands and swamps in silty soil where many other trees do not grow. It is easily shaded out because it is not a large tree.

The ideal ash trees for making splints are 7 to 9 inches in diameter with at least a 6-foot section of trunk that is blemish free. Ash can be machine cut into splints or hand stripped into splints. Commercially made splints are good for weaving chair seats, but the best quality splint for basketmaking, whether of ash or any wood, are hand-split or pulled. The reason is that sawing cuts across the tree's growth rings, whereas hand stripping preserves the integrity of the wood fibers within the growth rings, thereby giving the splints greater flexibility and strength.

Preparing weaving materials, such as ash splints, is very labor intensive. The wood must be pounded after the bark is removed, and the splints are made using a draw knife, knife, ax, or wooden mallet. Step-by-step instructions for preparing ash splints for weaving are available (see Scheider, 1972, or Hart, 1976). Courses in preparing traditionally split or peeled splints using ash are also available (for example, contact Martha Weatherbee Basket Shop, Sanbornton, New Hampshire).

White oak, another excellent tree for splint making is primarily found in a range that extends from the State of New York State west to the Mississippi, south to Kentucky, and east to the Carolinas. The ideal tree is 4 to 8 inches in diameter with straight ridges on the bark and with a straight midsection of 5 to 6 feet with no twigs or branches. Preparing white oak is an involved process using an ax, wedges, froes, and knives, but a basket made of white oak can last 70 years or more. Detailed information concerning the splinting of white oak can be found in "Handling White Oak" (Bennett, 1974) or "Basketry of the Appalachian Mountains" (Stephenson, 1977). Courses are available from Connie and Tom McColley, Chloe, West Virginia.

Coiled basketry uses a series of connected spirals or rings that are wrapped or stitched together. **Twined basketry** refers to twisting weaving material together. Both types of construction typically use narrow strips that can be closely spaced. Native materials such as grasses, rushes, split willow shoots, weeping willow branches, honeysuckle, cattail leaves, and thin ash and oak splints can be used. The inner bark of basswood and the roots of the red cedar have been favorite materials of Indians for making cordage and coiled baskets. Paper birch is especially suitable for baskets because the bark peels readily into long strips that are used for stitching material. Wild grape vine bark is used as core material for coiled baskets. Many imported commercial materials such as round reed, fiber rush, Hong Kong grass, raffia, ropes, cords, and fibers are also used.

Wicker basketry applies to any round, shootlike material used in woven construction. The most common materials used today are round reed (an imported material) and willow. Red osier dogwood, grapevine, and any number of roots, barks, shoots, vines, and runners are all possibilities. Procedures for preparing willow branches are available (see TerBeest, 1985, or Hart, 1976).

Other woven items include chair bottoms, mats, and a great many decorative items that can be made from the same materials and use similar weaving techniques as those for basketmaking.

Market and Competition Considerations

Baskets made from ash and oak represent the major woven product made from native forest materials with sales that approach a level that could be considered an industry. Other native materials are used primarily by hobbyists in volumes that are relatively small. There is no commercial source of hand-split white oak, although thin strips of sawed and processed white oak can be obtained from some supply houses. However, it is doubtful that a rural entrepreneur could make a living gathering and preparing a material such as white oak splints for sale to buyers for weaving supplies. To sell competitively, it is necessary to produce repetitively, which requires dealing with materials that are standardized and can be obtained in volume. However, the process of finding and preparing splints is not standardized and is very labor intensive. Because of this, and because the cost of labor is so much cheaper in the Orient, native materials such as ash and oak splints are several times the price of cane and reed, which are

imported. A $10 reed basket made from oak or ash will cost $30 or $40.

Consequently, most baskets made for any kind of mass production are made out of cane and reed, and these materials account for about 75 percent of the materials sold by the supply houses. Nonetheless, most craftspeople who stay in basketmaking for 3 or 4 years eventually switch to native materials because they are more enjoyable to use and the baskets last much longer. Reed becomes brittle and breaks up after 10 years, while ash and oak stay hard but not brittle.

There is a national market for high-quality art and handcrafted objects from weaving materials. However, there are few local markets. Creating local or regional markets requires educated consumers to appreciate and value the quality and uniqueness of woven products made from native materials.

> Those wishing to get into basket supplies and basketmaking should do it because they love it, for it is not an easy industry in which to make a living. When she started years ago, my wife worked for 8 years, 12 hours a day, 7 days a week before netting $5,000 for a 12-month period. But we made it, and today we are one of, if not the largest shop, specializing in early American baskets. (Nathan Taylor, Martha Weatherbee Basket Shop)

Distribution

Each region of the country has its own market for weaving and basketry materials, and most people purchase their materials from supply houses that buy and sell basketry and other weaving materials. There are a half dozen wholesale buyers in the Nation who buy and sell basketry materials, primarily through catalogs. Most of these also operate a retail store. There are probably another half dozen stores that specialize in selling basketmaking materials but do not have catalogs. If a particular product is desired, the supply house will try to locate it. Otherwise, those with materials to sell generally contact the supply house rather than vice versa. A number of catalogs and publications advertise the suppliers (see Contributors).

Resource Conservation Considerations

It would not appear that the level of harvesting of forest products for weaving materials would be great enough, at least in the foreseeable future, to damage the resource. Of course, with a sudden wave of popularity in a very special material, such as cedar or spruce roots, it would be possible to damage isolated trees.

Profile

Tom and Connie McColley of Chloe, West Virginia, are self-taught basketmakers and teachers who have been making baskets for 15 years, specializing in white oak but also using honeysuckle, hickory bark, and a variety of other natural materials. They have taught their basket-making techniques throughout the Eastern United States, especially in Tennessee and West Virginia. Together they have pioneered a new system for producing large, abstract, urn-shaped baskets that have elevated their work to high artistic form.

Tom McColley scours the countryside for the desired white oak trees, since the tree must be chosen with great care if it is to have the necessary characteristics to make splints. He tries to do his searching on large tracts, over 100 acres, and the forests where he looks are usually privately owned lands. Landowner permission is always sought first. The ideal trees are small (from 4 to 9 inches in diameter) and very straight.

While Tom always offers to pay for any trees he finds, since West Virginia is “tree rich” and because the trees he is interested in are small, he has never actually had a landowner ask to be paid for any of the trees he has harvested for baskets. But Tom pays for the trees in his own currency—if he harvests several trees from one landowner, he makes a basket for them.

The McColleys cut and use about 15 trees a year. The work involved in preparing the splints from the tree must be completed within 2 to 3 weeks of cutting the tree. The preparation of the splints is extremely labor intensive and really constitutes two-thirds of the basketmaking process. After the tree has been cut, it is hand split, first using wedges and different sizes of froes, and eventually using hands alone to pull the wood apart. The goal is to take the fibers off the tree exactly in the way in which they grew, in the thickness of one growth ring. Because the weaving material is so thin, it must be very flexible and very strong. Splitting across the growth rings creates a weakness.

Baskets woven from handmade native materials are able to command a much higher price than those made from machine-produced splints that are available from basket supply shops. The baskets produced by the McColleys are sold primarily to collectors. Their baskets sell for between $65 and $3,500. The McColleys mainly market their baskets through two carefully selected craft shows on the East Coast a year and also through gallery displays.

The McColleys are relatively unusual in that their income and that of one part-time employee are completely derived from basketmaking. A key factor in their success as a business has been that, in addition to making

baskets, the McColleys teach basketmaking. About half of their annual income comes from producing baskets and half from teaching. They offer 5-day courses in basketmaking six times a year during the summer months. The tuition cost is $250. Attendees can also get room and board for the 5 days for an additional $140. The courses take up to 10 participants and in 1991 they were 90 percent filled. Most of the attendees are hobbyists. Only about 20 percent are professional or semiprofessional basket weavers. The entire process, from selecting the tree to making the baskets, is covered in the course.

In contrast to the McColleys, most basketmakers today use reed and cane, which are readily available imported materials that are considerably less expensive than native wood splint materials. But there is a growing interest in learning to use native North American materials for weaving. Many of those who come to the McColleys' course do so to experience working with white oak and other natural native materials. Many even come from areas where there is no white oak, such as in the Western States. The McColleys are thinking of providing hand-split white oak to a selected supply house if this proves economically feasible.

> There is a lot of demand both for traditional baskets (which are lower in price) and top of the line art basketry. But it is a lot of hard work. Also, you must constantly educate your buyers to understand what is different about baskets made from native materials compared to the baskets made from imported reed. But we have made a living out of it.
>
> Even when we were producing very traditional, functional work, 90 percent of our baskets were never used as serviceable containers. They are used as art and decorative objects.
> (Tom McColley)

Considerations for a Rural Development Strategy

There would appear to be very limited opportunity for generating income by harvesting forest products for weaving materials, since the materials themselves have limited market value. Even the largest basketmakers in the country are seldom larger than a family operation and may have only three employees.

The value must be added to the materials, either by turning them into marketable products or by capturing the educational, human interest, and tourism potential of the process itself. Based on the increasing interest in reviving old crafts, basketry and related crafts could be valuable components of a broader "folk art" strategy for a forest-based community.

One realistic rural economic development strategy for a rural forest-dependent community and region to pursue would be to develop an area's folk art—not just weaving but a number of skills and products related to forest products, lore, tradition, and handcrafts. A community undertaking such a strategy would encourage those who have unique skills to use them to harvest local materials, make authentic and high-quality products, and market them to audiences in the United States and abroad who can appreciate the historical and cultural linkages being developed. A further component of this strategy would be to teach the skills and supply others with the unique local materials used.

A range of different products made from local woods would be necessary. The skills would be demonstrated and taught, and the products would be sold in local markets and in nonlocal markets through a unique catalog. Innovation would be necessary in order to nail down the market, of course.

> It seems to me that if you're going to make a living on a small scale from the woods, you would do it today the way it has been traditionally done—and that is to be a craftsman of simple folk art.
> (Nathan Taylor, Martha Weatherbee Basket Shop)

Contributors

Kathy Halter, Royalwood Ltd., 517 Woodville Road, Mansfield, OH 44907. 419–526–1630.

Tom McColley, Route 3, Box 325, Chloe, WV 25235. 304–655–7429.

Robert McKnight, Day Basket Company, 110 West High Street, North East, MD 21901. 301–287–6100.

K. C. Parkinson, Connecticut Cane and Reed Company, 134 Pine Street, Box 762, Manchester, CT 06040. 203–646–6586.

Jim Rutherford, *Basket Bits*, P.O. Box 8, Loudonville, OH 44842.

Michael Sweetman, Adirondack Seat Weavers, Box 177, Fonda, NY 12068. 518–829–7241.

Nathan Taylor, Martha Weatherbee Basket Shop, NCR 69, Box 116, Sanbornton, NH 03269. 603–286–8927.

Bibliography

Adrosko, Rita J. 1971. Natural dyes and home dyeing, New York: Dover Publications, Inc.

Bennett, Jim. 1974. Handling white oak. Deer Track Crafts, 8215 Beeman Road, Chelsea, MI 48118.

Bliss, Anne. 1978. Weeds: A guide for dyers. Juniper House, P.O. Box 2094, Boulder, CO 80306.

Bliss, Anne. 1986. North American dye plants. Juniper House, P.O. Box 2094, Boulder, CO 80306.

Christopher, F. J. 1952. Basketry. New York, NY: Dover Publications, Inc. (contains chapter on vegetable dyeing).

Daugherty, Robin Taylor. 1986. Splint woven basketry, Interweave Press, 306 North Washington Avenue, Loveland, CO 80537.

Hart, Carol; Hart, Dan. 1976. Natural Basketry, Watson-Guptill Publications, 1515 Broadway, New York, NY 10036.

Krochmal, Arnold; Krochmal, Connie. 1974. The complete illustrated book of dyes from natural sources. New York, NY: Doubleday & Company, Inc.

Lampell, Miller; Lampell, Ramona. 1989. Oh Appalachia. New York, NY: Stewart, Taboree, and Chang.

Langsner, Drew. [n.d.] Green woodworking. Emmaus, PA: Rodale Press.

Law, Rachel Nash; Taylor, Cynthia, [n.d.] Appalachian white oak basketmaking—handing down the basket. Knoxville, TN: University of Tennessee Press.

McGuire, John. 1985. Old New England splint baskets and how to make them. West Chester, PA: Schiffer Publishing Ltd. Also contains sources of basketmaking supplies, lists of newsletters and newspapers, and related resource materials.

Meilach, Dona Z.; Menagh, Dee. 1979. Basketry today with materials from nature. New York, NY: Crown Publishers, Inc. (Contains a chart on dyeing plant materials.)

Mulford, Judy. 1986. Basic pine needle basketry, 2098 Mandeville Canyon Road, Los Angeles, CA 90049.

Schneider, Richard C. 1972. Crafts of the North American Indians. New York, NY: Van Nostrand Reinhold Co.

Stephenson, Sue H. 1977. Basketry of the Appalachian Mountains. New York, NY: Van Nostsrand Reinhold Co.

TerBeest, Char. 1985. Wisconsin willow—adventures of a basketmaker. Wild Willow Press, P.O. Box 438, Baraboo, WI 53913.

TerBeest, Char. 1988. Gifts from the earth—a basketmaker's field guide to midwest botanicals (700 Second Street, Baraboo, WI 53913, 608–356–9048). Wild Willow Press, P.O. Box 438, Baraboo, WI.

Tod, Osma Gallinger. 1972. Earth basketry. New York, NY: Crown Publishers.

Weigle, Palmy. 1974. Ancient dyes for modern weavers. New York, NY: Watson–Guptill.

Weigle, Palmy, ed. 1974. Natural plant dying, a handbook. Brooklyn, NY: Brooklyn Botanic Gardens. Plants and Gardens. 29: 2.

Wigginton, Eliot. 1986. The Foxfire Book. Garden City, NY: Anchor Press/Doubleday.

Newsletters

The Basketmaker. Quarterly. Sue Kurginski (editor). MKS Publications, Inc., P.O. Box 340, Westland, MI 48185–0340, 313–326–8307.

The Craft Report lists the craft shows.

Basket Bits, P.O. Box 8, Loudinville, OH 44642. $4 per back issue.

Martha Weatherbee Basket Shop News, NCR 69, Box 116, Sanbornton, NH 03269, 3 per year—$10.

Resources

Chereen La Plantz, Press De La Plantz, P.O. Box 220, Bayside, CA 95524. Knowledgeable about many native materials for weaving.

Oz the Stick Man, 8958 Geiser Road, Holland, OH 43528. 419–865–6698.

Royal Wood Ltd., 517 Woodville Road, Mansfield, Ohio. 419–526–1630.

Publications for the Professional Craftsperson

Craft and Needlework Age, Box 420, Englishtown, NJ 07726. 201–972–1022. Essentially a wholesale supplier's catalog. Good source of products and supplies for retailers.

Craftrends, P.O. Box 7950, Norcross, GA 30091. 404–441–9003. Editor: Jan Mollet Evans. Monthly trade journal for craft retailers. Supplies, trends, new products.

The Craft Report, P.O. Box 1992, Wilmington, DE 19899. 800–777–7098. Monthly trade paper for the crafts professional. Covers shows, marketing, business information, etc. Contact for latest price. Excellent resource for the professional craftsperson.

Specialists in Native Materials

Brown Ash

Adirondack Seat Weavers, R.D. 1, Box 177A, Fonda, NY 12068. 518–829–7241.

Day Basket Company, 110 West High Street, North East, MD 21901. 301–287–6100.

Jonathan Kline, 5066 Mott Evans Road, Trumansburg, NY 14886. 607–387–5718.

Martha Weatherbee Basket Shop, Eastman Hill Road, HRC 69, Box 116, Sanbornton, NH 03269–0116. 603–286–8927.

White Ash

Jeffrey Gale, R.D. 1, Box 124A, South New Berlin, NY 13843. 607–847–8264.

Elizabeth and Hugh Wilson, Wilson's Splints, P.O. Box 51, Paint Lick, KY 40461. 606-925-2195.

White Oak

Appalachian

Kathleen Dalton, Coker Creek, Route 2, Box 220—Coker Creek, Tellico Plains, TN 37385. 615–261–2157.

Connie and Tom McColley, The Basketry School, Route 3, Box 325, Chloe, WV 25235. 304–655–7429.

Richard Spicer, Poplin Hollow, Route 3, Box 146, Linden, TN 37096. 615–589–5126.

Hand-Drawn Splints

Day Basket Company, 110 West High Street, North East, MD 21901. 301–287–6100.

Ozarks

Doug McDougall, Woven Wood Basketry, HC66, Box 85B, Witter, AR 72776. 501–232–5980.

Willow

Bonnie Gale, English Basketry Willows, R.D. 1, Box 124A, South New Berlin, NY 13843. 607–847–8264.

Sandy Whalen, Whale–Inn Farms, 880 Moore Road, Milford, MI 48042. 313–685–2459.

Cedar Bark/Beargrass

Michelle Berg, The Basketry School, 3516 Freemont Place North, Seattle, WA 98108. 206–632–6072.

Sweet Grass

Flo Hoppe, Rome, NY. 315–339–0198.

Basketry Guilds

Arizona

Basket Artisans of Arizona, c/o Kathy Lewis, 7633 North 22nd, Phoenix, AZ 85020.

California

Bay Area Basket Makers Guild, c/o Susan Correia, 3624 Lorena Avenue, Castro Valley, CA 94546.

Los Angeles Basketry Guild, c/o Judy Mulford, 2098 Mandeville Cyn Road, Los Angeles, CA 90049.

Connecticut

Northeast Basketmakers Guild, c/o Pat Congdon, 430 Ridgewood Road, Middleton, CT 06457.

Florida

Florida Association of Basketmakers, c/o Jill J. Boles, One 120 Egan Drive, Orlando, FL 32822.

Venetian Society of Basketmakers, P.O. Box 1411, Venice, FL 34284–1411.

Georgia

Basketweavers Guild of Georgia, Bulloch Hall, P.O. Box 1309, Roswell, GA 30077.

Gwinett Basketmakers Guild, c/o Martha Moon, 2212 Valley Creek Circle, Snellville, GA 30278.

Illinois

The Basketry Arts Guild, c/o Linda Simmons, 506 Northwest First Street, Galva, IL 61434.

Land of Lincoln Basketweavers Association, Route 1, 2962 East 13th Road, Ottawa, IL 61350.

Indiana

Fort Wayne Basketmakers Guild, c/o Margie Underwood, 4605 North 635 West, Huntington, IN 46750.

Loganland Basketmakers Guild, Ronda Brugh, Editor of *Spoke X Spoke*, Rural Route 4, Box 462, Rochester, IN 46975.

Sugar Creek Basket Weavers Guild, c/o Patti Henson, 954 Jonathan Drive, Plainfield, IN 46168.

Iowa

Amana Arts Guild, P.O. Box 114, Amana, IA 52203.

Iowa Basketweavers Guild, c/o Frances Wight, 602 West Buchanan, Winterset, IA 50273.

Maryland

Deer Creek Basketry Guild, P.O Box 37, Pylesville, MD 21132.

Minnesota

Headwaters Basketmakers Guild, c/o Dianne Hegge, Route 3, Box 117, Fosston, MN 56542.

Missouri

Missouri Basket Weavers Guild, Laury Kremer, 2701 Peachwood Trail, St. Louis, MO 63129.

Nevada

Great Basin Basketmakers, c/o Mary Lee Fulkerson, 5055 Twin Springs Road, Palomino Valley, NV 89510.

New Jersey

New Jersey Basketweavers Guild, P.O. Box 224, Short Hills, NJ 07078.

New York

Westchester Area Basketmakers Guild, 316 Roaring Brook Road, Chappaqua, NY 10514.

North Carolina

North Carolina Basketmakers Association, P.O. Box 1626, Weaverville, NC 28787.

Ohio

Medina County Basket Weavers Guild, c/o The Wood Shed of Medina, 226 Washington Street, Medina, OH 44256.

Ohio Valley Basketmakers Guild, 1940 Gregory Lane, Cincinnati, OH 45206.

Western Reserve Basketry Guild, c/o Karen Sonderman, 4160 Darrow Road, Stow, OH 44224.

Wildwood Basketry Guild, Wildwood Cultural Center, 8500 Civic Center, Mentor, OH 44060.

Oregon

Columbia Basin Basketry Guild, P.O. Box 784, Oregon City, OR 97045.

Virginia

High Country Basketry Guild, P.O. Box 1143, Fairfax, VA 22030.

Washington

Northwest Basketweavers, Vi Phillips Basketry Guild, P.O. Box 5657, Lynnwood, WA 98048-5657.

Wisconsin

Prairie Basketry Guild of Wisconsin, c/o Barb Hantschel, 1355 Deane Boulevard, Racine, WI 53405.

Chapter 16—Specialty Wood Products

Description of the Products and Their Uses

A wide variety of special-purpose wood products are manufactured from locally available forest resources. Specialty wood products may be either rough or finished articles and may be made entirely or mainly of wood—everything from bat boxes to yardsticks (table 16–1). Many such products were originally manufactured in local shops when rural people, often farmers, became specialists at making one thing or another because a needed item could not be purchased in stores. This was the reason for the major turning industry that developed in southwestern Maine, for example. Most specialty wood producers today are officially classed as secondary wood processors, as distinct from mills producing primary, intermediate, or unfinished forest products such as cants, timbers, posts, ties, lumber, and panel products. Specialty products today are often produced directly from logs cut for the purpose, not from commercial lumber and plywood, and thus would not include most standardized wood furniture, shelving, cabinets, and millwork.

Although some establishments that produce special wood products are fairly large (more than 150 employees), most firms are smaller, with 2 to 30 employees being more typical. Despite continuing substitution of metal and plastics for traditional wood products, the list of specialty wood products, as noted in this chapter, is extensive.

Market and Competition Considerations

In many cases, converting standing timber into specialty articles adds substantial value, yielding products having many times greater unit value than standardized lumber. Even though many wood products face shrinking markets, specialized small producers can fill a niche, and eventually supply national and worldwide customers. Development of establishments to produce and market specialty wood products has proven to be a viable economic development strategy for communities near appropriate forest resources.

Considering the specialized nature of many wood products, the large number of firms successfully making and marketing their specialties is somewhat surprising. Some markets for wood products are either shrinking or growing rather slowly. But the market for other wood products is growing as the environmental movement and the demand for products made from sustainable and recyclable materials continues to grow. Many individuals will pay a higher price for a wooden rather than a plastic widget, feeling that trees are renewable while oil is not, and that one has no choice but to throw away a plastic widget when it breaks, whereas wood can be repaired.

Finding and holding market share seems to be one of the critical factors determining the feasibility of establishing or expanding any enterprise in specialty wood products. Successful firms are those that (1) develop a market niche, and (2) effectively build solid multilevel markets—OEM (original equipment manufacturer) contracts; wholesale distribution; and direct, catalog, or retail sales.

Competition in wood products is partly mitigated by product differentiation—many producers point to the unique features that distinguish their product lines. The modest number of firms that compete for these markets usually cite substitutes such as aluminum or plastics as the most serious competition. For many products (for example, wooden housewares, picture frames, and clothes hangers), overseas competitors pose a greater threat than other domestic producers. However, the quality, durability, and common sense of wooden products can eventually sell a product after customers become dissatisfied with inferior imitations.

One suggestion on identifying new market opportunities in specialty wood products is to look for items that were once made out of wood and used in the past to solve particular problems. Sources of such ideas include old retail store catalogs, museums, old farms, and even sects such as the Amish. There is often still a need for certain items, or a new use for tools and furnishings that have been around for many years. If reproduction of an old item is the goal, it is important that the item still be handmade.

One sign of success for producers of special wood products in New England is to have one of the large mail order companies carry an item in their catalog. L.L. Bean (Maine), Orvis (Vermont), and Lands End (Wisconsin) carry many specialty wood items. Many States issue special catalogs of locally (State) made items, and this should always be investigated. For example, L.L. Bean usually does at least one catalog a year featuring Maine-made items. Companies often must accept the rigorous inspection and no-quibble replacement policy.

Table 16–1. Special-purpose wood products

Almond knockers
Arrows
Barrels—tight/slack cooperage, staves, hoops, heading
Baseball bats
Baskets
Bat boxes
Battery separators
Bean shooters
Beehives, beekeeping supplies
Benches and chairs
Bentwood products, example: furniture
Bird feeders and houses
Blocks, tackle
Boats/canoes
Bow staves
Bowling pins
Bowls, turned and shaped
Boxes and crates
Buckets and tubs
Bungs
Butcher blocks
Candlesticks
Canes and walking sticks
Carvings
Cemetery baskets
Chessboards and sets
Chisel hammers
Clock cases
Clothes drying frames
Clothespins
Clubs, police
Countertops
Craft wood
Cutting boards
Decoys
Dishes and dish drawers
Dowels and turnings
Excelsior
Fence: split cedar post and rail, pickets
Fencing sections
Fishing poles
Flag steps
Floats and docks
Flooring
Florist materials
Frames: picture or mirror
Furniture (rustic, finished)
Game calls and blinds
Games, gift items, puzzles
Garment hangers and dryers
Gavels
Gazebo kits
Golf clubs
Grain measures
Gunstocks
Hammers, meat
Handles: turned and shaped
Hay forks
House logs
Incense sticks
Jacks, ladder
Knobs and handles
Ladders (roof, apple)
Lamps and parts
Landscaping floral planters
Lathing and slats
Lattices
Letters and numerals
Log homes
Mallets
Mashers, potato
Maul and sledge handles
Moth repellents
Novelties and toys
Nutcrackers
Paddles and oars
Paint stirring sticks
Pallets and skids
Pencil slats
Picnic tables
Plaques or trophies
Playground equipment
Pool cues and croquet sets
Pulley blocks
Reels and spools
Rollers
Rolling pins
Rulers and yardsticks
Scaffolds and staging planks
Seats, toilet
Shakes
Shingle hair
Shingles
Shoe trees and stretchers
Signboards
Signs (sandblasted, routed, burned)
Skis (snow, water, cross-country)
Slingshot crotches
Snow fence/nursery shade
Snowshoes
Spokes
Stakes (tree and garden)
Toothpicks
Toys
Traps
Trays
Trellises
Wedges for handles, tree felling
Windmill blades
Wood cremation urns
Wood snow scoops
Wood-burned designs
Wooden jewelry
Woodenware, household
Wreaths/roping

Barrels ready for testing. Photo courtesy of McGinnis Wood Products, Inc. (SFP–3)

Another way to identify new niches is to carefully and imaginatively examine mill waste. For example, shingle mills in Maine that saw native northern white cedar often have several waste wood pieces that can be used to make unique wood items. The cedar bolts (50-inch-plus lengths of log) must be squarely trimmed on the ends before being cut into shingle blocks. These cut-off ends ("lily pads") usually are discarded into a firewood pile. But if these ends are 4 to 5 inches thick, they can be used as steps in a walkway or cut in half and nailed together like steps to display small items. Likewise, when the shingle block is sawn, there are at least three 16-inch-long slabs from each block. Wise sawyers save the pieces with the bark on for birdhouse producers. (The shingle producers themselves could make these birdhouses [or cemetery boxes] out of the slabs in the winter when the demand for shingles slows down.)

After the block has yielded all the shingles that can be sawed, there is usually a triangular-shaped piece remaining, about 3 inches on a side and 16 inches long. This piece usually goes into the firewood pile also, but it could be cut into children's blocks. The sawing of the shingle itself produces long strings of fiber called shingle hair. When sawn with a carbide-toothed saw, a thin ribbon 1/32 inch or so by 16+ inches long is produced by each tooth passing through the block. Gift food companies can use the shingle hair as padding in their gift boxes and baskets. Finally, for shingle mills with saw edgers, the thin edgings can be bundled for kindling wood.

The foregoing is an example of looking at a primary processing operation to see if any of the waste is usable, especially if a little more work (sawing, shaping, sanding, drying, bundling) could make it so.

Distribution and Packaging

For most specialty wood articles, packaging plays only a small role. Heavy items such as fence sections or ladders are often distributed through lumber and hardware outlets and are palleted, strapped, or bundled for shipping. Many wooden products are sold individually, often without separate or special packaging. Typically, they require no special labeling or point-of-sale information. Gift, novelty, and craft items may be first packaged by the retailers. Some companies offer the option of clear wrap if the item may get dirty from customer handling.

Depending on the nature of the specialty wood product, the full range of conventional woodworking equipment may be required. Some of these products are made from logs felled specifically for a particular producer. This requires that the logs be barked, cleaned, and either sawed or split to obtain the raw material. Space, equipment, and time are required for air drying or kiln drying of most hardwoods used in the production of finished articles.

Profiles

Profiles of some successful enterprises devoted to making and marketing specialty wood products will illustrate the factors that must be considered when contemplating a new or expanded venture involving specialty woodworking. The four categories discussed here are (1) barrels; (2) wooden bowls, trays, and frames; (3) gunstocks; and (4) tool handles.

Barrels

McGinnis Wood Products, Inc.

McGinnis Wood Products, Inc. (MWP) of Cuba, Missouri, started making wine and whiskey barrels in 1987. Prior to expanding his plant to produce finished tight cooperage, Leroy McGinnis had operated a "green mill"—turning out staves that were delivered to barrel makers. But making only staves was somewhat seasonal, with cyclical ups and downs resulting from changing demands of the major cooperage firms.

To build a larger business that could also employ his son and two sons-in-law, McGinnis decided to expand to

Missouri white oak logs ready for processing into staves and heading. Photo courtesy of McGinnis Wood Products, Inc. (SFP–5)

Missouri staves stacked for dry kiln. Photo courtesy of McGinnis Wood Products, Inc. (SFP–4)

make high-quality cooperage bearing the MWP brand. With financial backing from a local bank, he purchased complete barrel-making machinery from Sweeney Cooperage in Vancouver, British Columbia. This Canadian firm had gone out of business in the early 1980's. The equipment was shipped to Cuba, Missouri, and set up to start turning out barrels by mid-1987.

Today the plant operates year round, with 48 employees at full capacity. The product line also includes blocks of rough staves, circled heading, and sets of kiln-dried, jointed, and bent staves that are sold to other barrel makers. The annual output of 25,000 barrels and hogsheads for the wine and whiskey trade constitutes the mainstay of this family-operated business. The majority of wood used is native Ozark white oak. In addition, some oak is obtained from Illinois and Kentucky. Last year MWP purchased logs worth about $1 million. Turning out a precisely fitted, tight barrel requires use of specialized woodworking machines and much hand-work—the ancient craft of the skilled cooper. The payroll for labor at MWP runs $5 million to $6 million a year.

The conversion of raw logs to barrels begins with washing and sawing the oak into rough stave bolts. The stave is then quarter-sawn with a “drum saw,” producing the familiar curved shape that becomes the circumference of the finished barrel. The green staves are next sent through a steam tunnel and bent end-to-end. Sets of staves are then carefully planed, fitted, and routed to receive the heads.

The heading mill involves flat sawing and planing to create circled barrel ends. Matched sets of staves are finally forced together over the heading, and steel hoops are applied to complete each coopered vessel. Bourbon makers usually specify black iron hoops, while wine makers (who age their products longer) prefer galvanized hoops.

Some European wine makers believe that American oak is too strong and “woody” to properly age their red wines. They would greatly prefer barrels made from French Limousin oak. But when the price of the best French barrels reached $650 a few years ago, all but a few vintners found the cost too high. In order to become more competitive in selling to the European wine industries, McGinnis sought a source of oak that would better satisfy their needs. In 1991, he went to Hungary to arrange trials of aging wines in Hungarian oak—a lighter and more porous wood than American white oak. Results thus far look promising. McGinnis is now importing oak logs from Hungary and exporting barrels at prices that wine makers on the continent can afford. Typical prices for barrels of Hungarian oak range from $160 to $275.

In addition, MWP has recently signed a 5-year contract to make and ship barrels to Scotland. These barrels are made from wood aged and air dried for 1 year. The Scots do not want the oak kiln dried. Barrels for Scotch to be aged 8, 12, or 20 years are larger than domestic barrels—actually a 66-gallon hogshead.

The market for tight cooperage is substantially smaller today than 20 years ago. Many old-line cooperage firms have left the industry. As recently as 1979, Seagram in Memphis used 1,600 to 1,800 barrels per day. Schenley and Blue Grass Cooperage in Louisville and Bourbon Cooperage in Lexington each accounted for 1,700 barrels daily. Today, all except Blue Grass Cooperage and

Independent Stave Company of Lebanon, Missouri, are gone.

Bourbon whiskey is required to be aged for 4 years in new, charred white oak barrels. After one use, these barrels can be used in aging blended whiskeys, or they are sold to be converted into oak chips for barbecue flavoring. Some used bourbon barrels are sent to California and Spain for wine, and others find their way to Scotland for malt whiskey. Bourbon makers last year purchased about $1.1 million worth of barrels. Requirements for the wine industry are somewhat smaller, but barrel consumption for aging of premium California red wines is growing at a healthy rate.

The organization of the barrel-making industry is slightly unusual. There are many plants that make only rough staves. These are typically small operations employing 10 to 25 persons. A few firms make finished staves and heading, but do not assemble complete barrels. Some plants specialize in reworking staves from barrels that have been used. A limited number of larger plants turn out finished tight cooperage.

Independent Stave Company

Independent Stave Company represents an integrated confederation relying on numerous, relatively small, widely scattered suppliers. Headquartered in Lebanon, Missouri, this firm operates about 20 plants that produce staves. These staves are shipped to be finished by the main factory or in a smaller barrel-making shop in New Florence, Missouri. The Lebanon factory employs 300 persons and is a major factor in the industry, turning out nearly 600,000 barrels a year.

Despite the contraction of the barrel-making industry and the dominant position of the larger cooperage firms, there is still opportunity for small entrepreneurs. Rough or finished staves are being made by eight additional firms throughout Missouri that are not affiliated with Independent Stave. Each of these stave plants is located in a small community and has 12 to 18 employees.

Perryville Stave Company

One highly successful enterprise is Perryville Stave Company of Perryville, Missouri. This firm concentrates on making staves and heading for whiskey and wine barrel makers. The plant is a bit larger than most stave makers—34 employees at full production. According to the plant manager, most of the white oak used is cut locally.

Because the plant is located near the Illinois border, about 20 to 30 percent of the wood now comes from out of State. The bark is removed and the logs are cut into blocks, which are quarter-sawn and then resawn flat in 5/4-inch thickness. Rough staves are stacked to dry several months before shipping to the barrel maker.

Because the cooperage industry in the United States shows only slight growth, the company has sought to gain a larger share of the export market—and with good success. Last year Perryville sent more than 125 containers (trailer loads) of staves to Spain for wine-aging barrels. The firm was recognized by the Missouri Governor for being one of the highest dollar exporters in the State. This suggests that plants limited to making staves and heading can grow and compete, not only within the United States, but overseas as well.

Firms that have aggressively marketed cooperage or staves wherever there was potential demand have carved out special niche markets that have yielded excellent profit. The success of several small firms proves that opportunity for growth exists, even in an industry that has suffered massive decreases in total barrel demand.

Wooden Bowls, Trays, and Frames

Production of turned and carved walnut bowls has long been one of the traditional woodworking specialties. Craftsmen in many forest areas continue to create appealing articles as fine gifts, kitchenware, or decorator items. Tastes and preferences in this market have changed slowly over the years, but a strong demand persists for examples of native craftsmanship.

Shepherd Hills Walnut Shop, Inc.

Ron and Randy Reid established a highly successful venture known as Shepherd Hills Walnut Shop, Inc. The first shop to market walnut specialties was located in Lebanon, Missouri. Area residents and flocks of Ozark tourists were quick to purchase and display the walnut wares from this initial marketing enterprise. The success of these early offerings led to expansion of the line of wood products—salad bowls, cutlery (tossing forks and spoons), desk accessories, and carved mirror and picture frames became staples of the firm.

Today, Shepherd Hills Walnut has expanded to operate three retail stores in popular tourist spots throughout the Ozark region. By concentrating on display and sales, these stores have grown to now employ 28 people. Annual sales run from $2 million to $4 million per year.

An interesting aspect of the enterprise is that Shepherd Hills markets but does not actually produce any of their wares. Rather, Randy and Ron Reid determine the design and style of wood products that will satisfy customer desires and contract with many independent woodworkers to make the article. Each craftsperson takes full responsibility for all aspects of production. They must locate suitable wood, ensure that the wood is properly and thoroughly dried and aged, and then supply the artistry and skill needed to create the products. The number of craftsmen producing for sale through

Shepherd Hills Walnut varies. Currently over 21 small woodcraft workers provide the variety of items for sale in the three stores.

Native Wood Products Inc.

A different and more traditional mode of wooden bowl and tray production can be found at Native Wood Products Inc. located just outside Ozark, Missouri. The plant now operated by F. G. Crain and Michael Crain was founded 30 years ago. For many years the factory has specialized in turned and shaped bowls made from regional black walnut—mostly cut in and around Christian County. Serving trays, carved frames, and wooden accessories were added along the way to provide diversified selection.

Within the last few years, customer preference developed for other woods. Today more than half of the company's output is in oak.

Overall, the market has proved cyclical, but shows no signs of drying up. The factory operates year round and employs 35 people at full capacity. One of the major drawing cards has been the appeal of signs along the highways—"Walnut Bowls—Buy Direct From The Factory." Seeing craftsmen at work turning and finishing the products has great appeal for tourists. All operations are performed at the plant. At various times of the year, everything from the sawmill through the final finishing can be observed.

Walnut and oak logs are first sawn to make blanks. All wood is air-dried and then run through the kiln to bring moisture down to about 8 percent. Thoroughly seasoned and dried wood is essential to obtain a smoothly turned or routed surface. All the equipment used is conventional woodworking machinery—no numerical control or computer-programmed routers are required.

The marketing strategy used by Native Wood Products has three thrusts. Roughly half of the output is sold direct at the factory. A system of manufacturer's representatives promotes sales through retail stores and gift shops throughout the country. Finally, Native Wood Products sells direct through wide distribution of its catalog.

Competition in the market for woodcraft articles in the past came largely from producers in regions traditionally known for woodworking. Today, a wide range of wooden housewares and gift items is being offered from foreign countries. Wood products from South America and the Pacific Rim offer stiff price competition for similar products made in the United States.

Gunstocks

Manufacture of production and custom gunstocks has long been centered in the Midwest. Only about a dozen firms specialize in turning out original stocks for arms makers and custom replacement stocks for sportsmen and gunsmiths.

The structure of this industry is somewhat unusual and has changed over the years. Gunstock makers operate on three levels.

- makers of seasoned and kiln-dried gunstock blanks;
- high-volume producers of original stocks for arms manufacturers and the military; and
- suppliers of custom gunstocks for sportsmen.

American Walnut Company, Inc.

The American Walnut Company, Inc., in Kansas City, Kansas, and **Midwest Walnut Company** in Council Bluffs, Iowa, are among the leading producers of kiln-dried gunstock blanks. In addition to black walnut, some blanks are cut from ash, cherry, red oak, and white oak. These blanks are shipped to plants where gunstocks are produced.

S&K Industries, Inc.

S&K Industries, Inc. moved to Lexington, Missouri, in 1971 and rapidly established a role as one of the largest makers of production gunstocks. Today, S&K produce all the wood stocks for Remington Arms, which accounts for about 60 percent of the specialty wood products that they produce.

From a relatively modest firm, S&K has grown to impressive size. The firm currently operates seven plants—four in Lexington and three in nearby Carrollton. Employment has swelled from less than 100 in the 1960's to 450 at full capacity today.

Special stock-making machinery was obtained when Remington decided to stop making their own stocks and have them made by S&K. Some 76 truckloads of special woodworking equipment, valued at $30 million, was moved from New York to Lexington to consolidate stock work.

In addition to gunstocks, the remaining 35 percent of S&K's production is devoted to making finished special wood products for other manufacturers. They produce all of the wood fittings for Steelcase office furniture and light fixture parts for Lightolier, Inc. Recently S&K has added a simple but highly lucrative line of trophy plaques and bases.

Reinhart Fajen

One of the leading makers of replacement and custom rifle stocks was established when Reinhart Fajen decided to forsake gunsmithing and stock finishing to specialize in manufacturing shaped and inletted gunstocks.

In the postwar years, Fajen had earned a wide reputation for fitting and finishing beautiful rifle stocks for gun fanciers. In the 1950's, Reinhart left the Kansas City area and set up a shop in Warsaw, Missouri. At that time, war surplus military rifles from many nations were readily available. By removing the service stock, replacing it with a sportier style stock, and applying a quality finish, a handsome and serviceable hunting rifle could be had at a fraction of the cost of commercial arms.

After restrictions were placed on importation and sale of surplus military rifles, the market reverted primarily to providing semifinished stocks for custom gunmakers and replacement stocks for gun fanciers. While rifle stocks were the mainstay of the trade, special shotgun stocks and handgun stocks were in growing demand. Two things distinguish a custom stock from a standard factory stock—elegance of design or functional form; and the care and skilled craftsmanship evident throughout its production. Gunstock buyers are critical and unlikely to be satisfied unless the product displays quality in every line.

The range of woods used to make stocks has grown far beyond the traditional American black walnut, although walnut is still highly favored. In search of stocks that are strong and light and that show eye-catching grain figures, many stocks are shaped from maple, English walnut, claro walnut, cherry, mesquite, laminated woods, and even black oak, or redwood. The wood is first sawn to a rough stock blank before aging and drying. Fajen insists on a full 6 months in the drying kiln. Slow drying—which some stockmakers attempt to rush—is the only way to ensure the proper moisture content for maximum strength and stability.

Stocks are shaped by a duplicating lathe guided from a master pattern. At the Fajen plant, this step may be performed using a Geiger numerical, controlled copying machine. For longer stocks, the Richardson or Zuckerman carving machines are generally preferred.

The number and variety of stock designs is astonishing. Fajen can make over 100,000 different stocks from his standing patterns. It is hard to imagine a production shop that could try to match this diversity. Craftsmen direct each cut made by the carving machine that contours the stock—a skill that requires years of experience.

The stocks are then routed internally to fit precisely the action and barrel of each particular rifle. Precision plunge routers can be employed to cut the wood to fit the action. If the action is to be glass-bedded, additional machining is required to accommodate and key in the epoxy resin and glass fiber bedding compound. The stock will be cut 1/16 inch oversize in both the lower action area and 2 inches of the barrel channel, with the remainder of the barrel “free floated” for maximum accuracy.

Both rifle and shotgun stocks are offered in three degrees of finish—Semifinished; Custom Fit; and Custom Fit and Finished. Semifinished stocks are 100 percent shaped, are 95 percent machine inletted, and are ready for final sanding and finishing. These stocks are primarily sold to gunsmiths who can perform the final critical fitting of the action and finish the stock with fine checkering or carving. Depending on the grade of wood used, semifinished rifle stocks range in price from $66 to $260. Shotgun stocks in Semifinished grade cover a wider price range from $35 to $189 for special trap styles.

Custom Fit stocks are 100 percent shaped and inletted to fit the particular barreled action and are ready for final sanding and finishing. This grade is marketed to sportsmen and gun fanciers who savor the prospect of finishing their own stocks.

Custom Fit and Finished stocks are hand fitted to the customer’s action, checkered with 18- to 22-line-per-inch patterns in the grip and forearm areas, and given a tough, moisture-resistant gloss finish. Grip caps, forend tips, swivels, and other accessories are optional. Custom fitting and finishing add considerably to the value of the stocks. One-piece rifle stocks in Custom Fit grade cost from $273 to $686. This means that roughly 3.75 board feet of walnut can be converted into a finished product worth 50 to 100 times the value of the wood.

Tool Handles

Production of turned and shaped wood tool handles and knobs is one of the all but invisible sectors in the specialty wood products industry. Yet a surprising number of handle plants continue to operate, and some even thrive and grow. There are handle makers in virtually every forested region, with some concentration in midwestern States.

Handle plant operators are quick to point out that wooden handles are slowly but inexorably becoming less common and essential. Nail guns are replacing hammers; axes are only used when the chain saw is not appropriate; shovels look puny compared to a backhoe; and the familiar posthole digger cannot keep up with the auger powered by a tractor’s power take off. Clearly, growing use of power tools reduces the demand for hand tools with wood handles. But a quick look at some of the

handle manufacturers in Kansas, Missouri, and Arkansas shows that there is still opportunity in this low-tech industry.

Bolder Handle Products

Bolder Handle Products in Doniphan, Missouri, has been in business for 12 years. There used to be more handle plants in Doniphan, but the number has dropped to five in recent years. The local hickory supply has been somewhat reduced, so today some hickory is brought in from Kentucky, and oak is purchased from Illinois.

Like many handle-making firms, Bolder Handle is a family concern, owned by Fred Allen and employing 12 persons. Fred's uncle, also in Doniphan, operates the James Allen Hickory Mill, which turns out both handle blanks and finished handles (all from local hickory).

Bolder Handle produces finished tool handles of all types, chiefly using native regional species. Striking handles (for sledges, axes, etc.) are made from hickory. Long-handled tools like shovels or hoes are matched with ash handles. Posthole diggers and wheelbarrows will have handles of oak. Handle designs are well established for the most part. Many replacement handles are made to Government or other specific standards. Handles produced for toolmakers such as True Temper or Stanley usually are custom-designed to match the proprietary style required by the tool designer.

Fairly conventional woodworking equipment is used in handle production. The only special machines required are duplicating lathes and pattern-copying Defiance lathes used to shape axe handles and a few other handles that do not have round profiles. After shaping and sanding, most handles receive a lacquer finish.

Bolder Handle elected to market primarily to Original Equipment Manufacturers (OEM) toolmakers. It is common practice for the tool firm to send a toolhead to Bolder and let them design and cut handles to fit their proprietary tools. As with most hickory mills, little goes to waste. All the sawdust and shavings are blown to a cyclone collector and sold to a St. Louis firm that makes liquid hickory smoke.

Other Companies

Quite a few other handle-making enterprises dot southern Missouri and Arkansas, some producing blanks for sale to toolmakers, while some find it more profitable to make a full line of finished replacement handles. Beamer Handle Company in Van Buren, Missouri, has 14 employees, and this plant produces turned and shaped tool handles from ash, red oak, hickory, and sycamore. Wm. House Handle Company, operating out of Cassville, Missouri, has been making a full line of handles for 36 years. Glen and Ken House have 20 employees and buy logs cut from all over southwest Missouri. Ash, hickory, and white oak logs are debarked, rough-sawn, and air-dried. Handles for claw hammers, hatchets, axes, and picks require use of duplicating lathes and a dowelling machine. Finished handles are marketed primarily to hardware chains, building materials stores, and lumber stores.

IXL Manufacturing Company, Inc.

The giant of the tool handle industry is the IXL Manufacturing Company, Inc. Located in Bernie, Missouri, IXL has been a major factor in handles since 1892. IXL makes handles for major tool producers and an extensive line of replacement handles. Many small handle plants ship blank handles to IXL for finishing. The plant manager is in general agreement that demand for wooden tool handles is declining. But in Bernie, that demand keeps 150 production workers busy turning out handles bearing the venerable trademark of IXL.

Special Factors

Many species of wood that at one time were unsuitable for carving can now be treated with a solution of polyethylene glycol-1000 (PEG) to eliminate as much as 80 percent of the wood's moisture-induced dimensional changes. PEG is a white, waxlike chemical that resembles paraffin and is often used in cosmetics. It readily dissolves in warm water and is nontoxic and noncorrosive. The PEG solution slowly diffuses into the wood and fills the space that would normally be occupied by water alone when wood is in the green condition and is swollen to its greatest dimensions. When the wet PEG-treated wood is dried, the PEG remains in the wood structure and prevents the wood from shrinking. However, this treatment should not be used when wood will be in contact with water again because the PEG will dissolve out of the wood again.

With PEG, applying standard finishes may be a problem. A person considering this approach should thoroughly study the procedure before undertaking any large-scale use.

Considerations for a Rural Development Strategy

Starting a specialty wood products co-op is one way a rural area can improve opportunities for this kind of product. If standards are high and items are in good taste, of high quality, and of regional significance, a co-op can get a good price for them. Starting a woodworking association in conjunction with the co-op is also a good idea. The co-op may be able to accommodate finished pieces of local artisans in a separate gallery.

There are even ways to make the co-op a visitor and tourist draw. For example, to capture more retail trade, the co-op could offer a play yard so that children could be supervised while their parents shopped.

A good example of the use of specialty wood products within a rural development effort is the Lewis County Woodcrafts Cooperative. This Chehalis, Washington-based co-op received a substantial part of its start-up costs from the Lewis County Economic Development Council, the Washington State Department of Community Development, and the Northwest Area Foundation. Its leaders are now helping to replicate the effort in Grays Harbor County and Forks, Washington.

The co-op's membership includes 120 individuals and small firms, and an additional 300 applicants are awaiting qualification. The participants were notified of the co-op's services through a local newspaper ad offering "marketing assistance for finished wood products," and respondents were asked to bring products for inspection as part of an assessment of their capacity, tools, and skills. At the start, over 150 one- and two-person firms showed up with over 500 marketable materials.

The majority of the skilled woodworkers who have become co-op members were out of work or underemployed, many from the timber industry. Most could make quality wood products but had virtually no marketing skills other than "tailgating" and peddling to nearby specialty shops. The co-op coordinator, Russ Mohney, has an extensive knowledge of markets for wood items that can be made locally. His role has been to provide market intelligence and product development assistance to members. The products have been developed in four distinct lines: institutional goods (for example, bookshelves), outdoor products (for example, planters), consumer goods (for example, crafts), and mass-produced commercial goods. The group also gathers mill ends and other wood scraps that had previously often been discarded by area mills, stores them in a small wood yard, and makes them available to members.

Revenues are generated from member dues, sales commissions, and sales of materials from the co-op store. Currently, demand is outpacing supply. The co-op expects to generate $1 million in sales of high value-added woodcrafts, furniture, toys, and other products by the end of the first year and forecasts that this may rise to $4 million by the end of the second year. The organization eventually intends to sustain itself mainly on a fee-for-service basis.

Advertising is crucial for any kind of co-op to be successful. The State can help if there is a tourism office or bureau. No agency (Federal, State, county, or regional) should be overlooked that could help get materials, processing, and marketing advice to an area. Such assistance can get a project going, help it overcome a manufacturing or marketing problem, or find new facilities if a product outgrows the home shop. Financial assistance as well as business management assistance may be necessary for specific co-op businesses or the coop itself.

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Tom Stout, President; Don Stout, Vice President, S&K Industries, Inc., Highway 13, P.O. Box G, Lexington, MO 64067. 816–259–4691.

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Other Resources

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Rex “S” Johnson, Utilization and Marketing Forester, 1100 West 22nd Street, Cheyenne, WY 82002. 307–777–7586.

Directories of secondary manufacturers of wood products are available from the Department of Natural Resources in most States. These are good sources of information on types of wood being purchased for various products in each State.

Subjects

ESSENTIALS

- 100 Top Trees of North America
- Forestry 101
- How to ID a Tree
- Forestry Photographs
- A Forestry Glossary

Fall Color
Tree Planting
Seedling Catalogs
Best Books
Tree ID
Employment
Glossary/Terms

Mapping/GPS
Smokey Bear
Forest Fire
Diseases
Insects
Arboriculture
Forest Photos
Puzzles/Quizzes

Chainsaws

Managing and Using a Forest for Firewood

Guide picks

Sites that will assist you in managing and using the forest to promote and procure firewood.

A Brief Firewood Primer

Using firewood for home heating from the Virginia Cooperative Extension Service

Cutting Firewood Safely

A PDF report on safely cutting firewood from OSU Extension.

Firewood: How to Obtain, Measure, Season and Burn

A primer on gathering preparing and storing firewood from OSU Extension.

Firewood

Another PDF report on firewood from the Tennessee Division of Forestry.

Gathering, Preparing and Storing Firewood

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Non-Timber Forest Products Income Opportunities

Many parts of rural America face tough economic times. Owning land can be be a blessing or a curse depending on your approach to its use and management. There is a growing awareness that, for many rural areas, the path to sustainable income has to include some creativity; going just a bit beyond the realm of traditional forestry and timber production. Hopefully this feature will start you off.

The discussion on non-timber or special forest products has been overshadowed by something called forestry and the management of timber. I plead guilty, having slighted non-timber special products in the past.

But timber management should not preclude thinking about other options for income from your forest. You can be certain that in every region of the country there are opportunities for supplemental income from the woods.

I want to preview some of these opportunities and give you a link or two to continue your quest for non-timber supplemental sources of income. This would include natural products found in the forest and methods of agroforestry that includes agriculture as a part of the forest condition.

What are Some of the Natural Products to be Found in Your Forest?

Special forest products that I want to highlight will include aromatics; mushrooms; and botanicals. Other naturally occurring

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products could be pine straw; cones and seeds; cooking wood, smoke wood and flavor wood; honey; nuts and fruit; syrup; and weaving materials. A great first book to explore is **Income Opportunities in Special Forest Products** and is free to read and download on the Internet.

I will also provide you with a link site to help you explore further on most of these products. Hopefully this will assist you in your developing a fruitful forest.

Aromatics

Essential oils are concentrated aromatic oils of plant leaves, flowers, seeds, bark, roots and the bark of some fruits. They have different strengths but are generally very potent and have to be diluted to be used.

Cedar D*istillation*
Courtesy Texarome,Inc.
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These aromatics have to go through a distillation process before they are ready to be used and purchasers of the product scour the country for just the right properties. You may have just the right raw material for the producer of these essential oils. Unfortunately, China is a major competitor in this market.

Essential oils are the core of the $10 billion U.S. food flavorings and cosmetic industry. They are highly dependent on certain oils because of certain irreplaceable formulas that are the basis for their sales. Examples of raw materials used for distillation are Texas and Virginia cedarwood, tea tree oils, lemongrass oils, balsam fir oil, hemlock and spruce oil, sweet birch

Mushrooms

Voss Picking Morels
Courtesy Tom Voss
© Tom Voss Morel Page

Mushrooms are fungi. They live on dead and decaying material and convert this material into their own food. When conditions are favorable the mycelia form small buds that grow into the edible part called a mushroom. And the major commercial use of a mushroom is food.

A forest-harvested market for wild edible mushrooms has developed in the Pacific Northwest. Up to 7 million pounds are annually blanched, chilled, packed in brine and flown to europe for canning. The most important wild ones are chanterelle, morel or "blacks", matsutake, boletus, shiitake and hedgehog. The Northwest Wild Mushrooms Association lists 41 varieties safe for fresh market sales.

Short storage is the key. Mushrooms do not keep more than 1 week after harvest. Immediate cooling is necessary.

Most growers sell their products to two sources: direct to roadside or farmers' markets or to shipping point firms, which includes cooperatives, brokers, or other packer. Lower quality mushrooms are sold to the processed food industry where visual quality is not as important.

Botanicals

There is a long list of forest grown botanicals (too long for this feature) and are used for food flavoring, beverages, and pharmaceuticals. They are generally collected for culinary use or for medical and pharmaceutical use.

The continuing popularity of natural remedies and nutritional

supplements and the growing interest in these substances for pharmaceuticals has expanded the market for botanicals. The European market for goldenseal and cascara sagrada bark is ten times the US market; the ginseng market is fueled by Asia. Consequently many botanicals are exported.

To get started in botanicals you must have the following:

- have something to sell and in large enough quantities.
- provide samples of your product.
- a buyer or market.
- understand that this is a slow process and takes much effort..

More on Agroforestry...

The USDA National Agroforestry Center is a site that can give you some good information on several types of cropping systems you can use in conjunction with your trees:

National Agroforestry Center - forest farming: Many products can be managed in your forest with some assistance. The USDA says that "In forest farming, high-value specialty crops are cultivated under the protection of a forest canopy that has been modified to provide the correct shade level. Crops like ginseng, shiitake mushrooms, and decorative ferns are sold for medicinal, culinary, or ornamental uses. Forest farming provides income while high-quality trees are being grown for wood products."

National Agroforestry Center - silvopasture: This concept is what I used to call range management. "Silvopasture combines trees with forage and livestock production. The trees are managed for high-value sawlogs and at the same time provide shade and shelter for livestock and forage, reducing stress and sometimes increasing forage production. In plantations of conifers or hardwoods for timber or Christmas trees, managed grazing provides an added products and income. Some nut and fruit orchards may also be grazed."

Alley Cropping: An agricultural crop is grown simultaneously with a long-term tree crop to provide annual income while the tree

crop matures. Fine hardwoods like walnut, oak, ash, and pecan are favored species in alley cropping systems and can potentially provide high-value lumber or veneer logs. Nut crops can be another intermediate product.

Links to Non-Timber Forest Products and Agroforestry Sites:

- **Income Opportunities in Special Forest Products**
- **CAN Sustainable Forest Economies Bookmarks**
- **Non-timber Forest Products Website**
- **Special Forest Products Website**

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About Shiitake Mushrooms

Wonderful Shiitake - Aphrodisiac, Immune Enhancer, Food: This feature deals with a fungi called Lentinus edodes, or Shiitake mushroom. It is a major item of produce in Asia and is associated with health benefits and cuisine. Learn about the mushroom and how to cultivate it.

About Making Charcoal - A Small Business Opportunity

You can make charcoal a business. Read this and find out if you really want to from your About.com Guide.

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About Pine Straw - The Money Making Mulch

An interview with a pine straw expert from your About.com Guide.

About American Ginseng - A Brief Blog New

Ginseng could be your next money-maker. Check out this short photo essay on Panax quinquefolium.

Agroforestry Glossary

An agroforestry glossary of terms from Bugwood...

Agroforestry - What is it?

"Agroforestry combines agriculture and forestry technologies to create more integrated, diverse, productive, profitable, healthy and sustainable land-use systems." So what does this mean? Check it here.

Association for Temperate Agroforestry

An organization created to promote the wider adoption of agroforestry by landowners in temperate North America...

Botanical Forest Products in British Columbia

The British Columbia (CA) Ministry of Forests released a report providing a comprehensive overview of the commercial harvest of more than 200 botanical forest products in British Columbia. This site gives good information on specific non-timber forest products and is appropriate for anywhere in North America

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How to make charcoal at home

by Dan Gill

You really can make your own charcoal at home - even if you live in the suburbs! If you use the indirect method, which burns the gasses, and use a clean burning fuel (such as natural or LP gas) the emissions are mostly water vapor with very little smoke. It is not difficult to do and, even when burning waste wood to provide the carbonizing heat , the process requires less time and attention than barbecuing a rack of ribs in a wood burning smoker.

Introduction

Why would anyone ***want*** to make their own charcoal? For one thing, good hardwood lump burns hotter and cleaner (but faster) than briquettes and is much easier to light. You also know where it came from, what it contains and what was done to it en route. There are endeavors other than barbecue which require high quality natural charcoal: It is still the preferred fuel for forges and blacksmithing. Folks who make their own fireworks and black powder need specialty charcoals with specific burning properties such as that made from willow or grapevine.When grilling or even barbecuing in most pits with charcoal and wood, the quality of the charcoal is really not that critical. There is enough airflow to dilute impurities. Now that I have a Weber Smoky Mountain, though, charcoal quality, impurities and additives become very important. It is a great little cooker and will do everything folks say it will, BUT there is precious little airflow and the meat is bathed in smoke for hours. What you burn, you eat! I have read how briquettes are made by the major manufacturers. That leaves me either burning to coals, which is impractical for the small amount of coals needed by the WSM, or making my own lump, which is just a way to burn to coals and store them for use as needed. Being somewhat of a skinflint, I would rather utilize the resources at hand and make my own lump as opposed to buying it. My objective in this endeavor was to use existing technology to design a simple, cheap, reliable and efficient method for the small scale production of charcoal for home use utilizing readily available materials and minimizing the release of pollutants.

How to make Charcoal:

> *Timing is important. Plan to start your burn on the hottest, muggiest day of the year with a comfort index of at least 105 and air quality just above the minimum to sustain life. These conditions won't affect the charcoal process at all but will ensure that the experience is memorable.*

There are two basic methods of making charcoal: direct and indirect:

- The direct method uses heat from the incomplete combustion of the organic matter which is to become charcoal. The rate of combustion is controlled by regulating the amount of oxygen allowed into the burn and is stopped by excluding oxygen before the charcoal itself begins to burn. This is the ages old method used by colliers to make charcoal in a pit, pile (clamp) or, more recently, in metal or masonry chambers (kilns). See the links below for more information.
- The indirect method uses an external heat source to "cook" organic matter contained in a closed but vented airless chamber (retort). This is usually carried out in a metal or masonry chamber (furnace). The indirect method results in a higher yield of high quality charcoal with less smoke and pollutants and requires less skill and attention than the direct method.

For my first tests, I decided to try the indirect method. There had been some posts on a pyrotechnics newsgroup describing a procedure for making small quantities of willow or grapevine charcoal in a cookie tin or five gallon bucket. For the furnace, I used a 55 gal oil drum with the top cut out and a 12" wide X 10" high hole cut in the lower side for maintaining the fire. I used two iron rods stuck through the sides about 8" from the bottom to support the retort. I also kept the top which had been cut out. After the fire was well established , the top was placed on the drum and supported by rods to help hold the heat in yet allow a good draft. The retort was a 16 gal. steel drum with lid and I cut about six 3/8" holes in the bottom with an acetylene torch. I burned it out well in the furnace to eliminate petroleum residues. These drums are used for lubricants such as transmission fluid and gear grease and are readily available.

After the retort was loaded with air dried hickory the top was sealed and the drum was placed in the furnace or burn barrel. Wood scraps and bark were placed under the retort and around the sides and lit with newspaper assisted by a little burnt motor oil to get things off to a fast start. There was right much smoke for the first hour, but as things heated up and the moisture was driven off, it burned so clean that all you could see were heat waves. With the vent holes located in the bottom of the retort, the vapors and gasses were discharged into the hottest part of the fire and burned.

I stopped the first test too soon and only had about 1/3 charcoal. The rest was charred chunks of wood. The second test burned for about 3 hours, until the gasses had just stopped burning around the holes in the bottom. Results: 56# of wood yielded 17 1/2# charcoal or 32% by wet weight. Assuming an EMC (equilibrium moisture content) of 12%, The yield exceeds 35% on a dry matter basis. This is very good as most direct burns result in 20 to 25% at the best. I got over 2 1/2 five gallon buckets of good lump and only one large (4"X6") chunk showed signs of incomplete conversion with some brown in the center.

I was going to run a series of trials to compare the indirect method with direct (bottom lit) and direct (top lit). After several burns using the retort, I decided that there were such obvious advantages to the indirect method that I abandoned studies of direct burns. The retort method is easy, reliable, and does not require the skill and attention of direct burns. The equipment and materials which I used are readily available worldwide. As the gasses and volatiles are discharged into a hot bed of coals, I believe that most of the pollutants are burned, adding to the furnace heat. I also suspect that yield and quality are better. From what I have read, 35% by dry weight is excellent; the resulting charcoal burns hot and clean; you can almost light it with a match.

The direct method also appears to be more compatible with heat recovery and waste wood utilization systems. I live on a farm in Virginia and my wife operates a small sawmill. Disposing of slabs and wood waste is a serious problem. I can burn a lot of the hardwood slabs in my indoor masonry heater/cooker. We have not found an economical use for pine slabs (we can't give them away) and have started burning them in a field. This is obviously a wasteful and polluting practice. My ultimate goal is to build a small masonry furnace that would hold several 55 gallon drum retorts and recover heat for domestic space heating during the winter. Charcoal could be a marketable by-product. I would burn pine slabs and waste wood in the furnace and make charcoal from hardwoods in 55 gallon drums. This approach appears to be very energy efficient as the gasses released by destructive distillation are utilized.

For more details and pictures, go to my Charcoal Log and Results Page.

Further information and links

The 'stoves' discussion group deals mostly with small wood, charcoal or biomass burning stoves for developing countries. There have been several interesting discussions about charcoal making stoves but real information is hard to find. Start with Stoves Mailing List Archives for April 1997 The thread starts with a discussion of the World Bank paper (which I have bookmarked below) and resurfaces periodically in the archives up to present.

Finnish research site Nice picture of a metal kiln but not much info.

Step by step direct method of making charcoal in a 55 gal drum. Simpler than MsBelindas (quoted below) in that the barrel is not turned over in the process.

World Bank paper on issues concerning charcoal in developing countries.

Lots of links: the best ones are linked below in this document.

Making Charcoal: A startup business opportunity
for an Interesting 'quasi-scientific' look at charcoal check out "the skinny on..... charcoal"

Fuel for the Fires: Charcoal Making in the Nineteenth Century
Excellent description of the pile or clamp burning method.

Brief description of a small indirect retort.

The old art of charcoal making

Excellent description of charcoal making in England 1000 years ago.

MsBelinda's post to the Azstarnet BBQ list:

Hello fellow smoker/bbq/grillers! Here is the recipe, as requested, to make your own Lump Wood Charcoal (thereby saving yourself tons of cash, and successfully robbing the "Kingsford Mafia"..) To make 30-40 lb of charcoal, you will need:

- A clean 55 gallon metal drum with the lid cut off roughly (you will be able to reuse this drum many, many times)
- Enough seasoned wood to fill said drum, chopped into big fist-size pieces (ok..say 5"x5", and the wood just needs to be a couple months seasoned, although the dryer the wood, the faster the process..)
- A bag of sand
- 3 or 4 bricks
- A case of beer(optional)
- Time and patience
- Start by punching/cutting 5 holes in the bottom of the drum which are each 2" square. Try to keep them towards the center. Put the drum down on the bricks, placed so it is off the ground and fill it with the wood. Start a fire in the drum. When it is going well, put the top back on to reflect back the heat. Since it was cut off roughly, there will be slight gaps to allow the a draft.
- Now, turn the whole thing over, placing it back onto the bricks. (This is where you might need the case of beer to convince several men to help you lift the sucker. It will be heavy. And mind the lid doesn't fall off!) Wait, consuming the beer as necessary. The smoke will start out white. This is the water vapor burning off. Next the smoke will go blue/grey which is the alcohols and phenols burning off. Then the smoke appears yellow, which is the tar burning off. Finally the smoke will clear and you will just see waves of heat. When this happens, Carefully remove the bricks out from underneith. Take the sand and make a pile around the bottom lid, plugging up the bottom draft. Also, cover the top with either a piece of turf or a large piece of metal. Use the sand to seal around the turf/metal so no air can get into the drum. We are trying for a closed system here. If air/oxygen/fire-fuel DOES get into the drum, the charcoal will just burn up. Not what we want. Also, try not to let the sand fall down into the drum through the holes. Allow the drum to cool (2-3 hours). Then turn back over, pry off the top and remove your charcoal. If there is a spark, the charcoal may "catch", but just douse it with some water. The charcoal will still be hot enough to dry out. Repeat above process as necessary.
- Thanks to my Bodger brother-in-law, Don Whiting, who taught me how to do this.
  (P.S. A "bodger" is a pole-lathe wood turner. He makes nifty beesoms as well...)
  Best of luck to you all with the above process.
  Hogs and quiches from Cheshire (by way of Palm Desert!)
  Belinda

Note: I found two discussions about making charcoal by indirect methods. Both were on pyro newsgroups and this is most informative:

After reading a note, I can see that this was the weekend to make charcoal. A couple of weeks ago I went to a local winery and picked up a load of fresh grape vine prunings which I converted to charcoal on Sat. I used a very simple, yet effective, method to make the charcoal which consisted of a 32 gal steel drum with removable lid (furnace), a 5 gal steel bucket/lid (retort can) and a welded steel grate.

I cut a 5x8 hole in the bottom-side of the large drum which allows me to feed scrap wood into the fire burning in the bottom of this drum. The grate sits in the bottom of the large drum and allows the 5 gal can a solid resting spot with enough room for a fire underneath (about 8"). The 5 gal can was first burned in the furnace to remove any paint, asphalt roofing cement, plating or other undesirable contaminants. Of course, the gasket in the lid also is burned up in the process. A couple of 1/4" holes were drilled in the bottom of the can and it was then loaded with grape vine. The lid was held in place by using about 6 of the securing tabs.

The 5 gal can was placed on the grate and the 32 gal lid was used as a damper and to help hold the heat in. More wood was loaded into the fire. After about 45 min the grape starts breaking down, in the absense of oxygen, and the steam and flammable gases began to escape from the vent holes in the bottom of the can. This gas jet is directed at the hot coals/flames and really adds to the intensity of the fire with a very noticeable blow-torch sound which lasts about 10 min. Flames are also present around the lid. After the escaping gases/flames stop, I continued the cooking for another 5 min, just to be sure all the wood was converted to charcoal.

The 5 gal can was removed, cooled down and then opened. Perfect, black, hard grapevine sticks. These crush much easier than mesquite. I weighed 3632 g of grapevine which yielded 709 g of charcoal in one 5 gal bucket. The volume in the bucket decreased by about 30%. After 5 loads I ended up with a 5 gal can of moderately crushed grapevine charcoal. There were no traces of ash or uncarbonized wood in any of the 5 batches.

I should mention that this is a joint venture that X and I are working on. X supplied the drums, I did the cutting/welding. We have a fellow pyro who is going to supply us with some willow that we will convert that into charcoal soon. For most of my pyro needs I am quite happy with the coconut shell charcoal supplied through KSI, but it will be fun to experiment with grapevine, willow, pine and any others that seem interesting. We already have mesquite airfloat.

I suppose that some of you will think that its a little whacky to be making your own charcoal, but I think that charcoal is a larger variable in most pyro compositions than most people think and that there is an uncertainty about what is the "real" makeup in a bag of commercial charcoal. Its only after experimenting with different charcoals that one notices that there really is a difference in charcoals. This new "tool" will allow us a way to easily make inexpensive charcoal from various types of wood. A smaller version could be easily made by using 1 and 5 gal cans.

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