NORTHWOODS FOREST CONSERVATION:

Celebrating Local Wood and Alternative Forest Products

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CELEBRATING LOCAL WOOD AND ALTERNATIVE FOREST PRODUCTS

In Northwoods Forest Conservation: A Handbook, published in Summer 2020 by Northwoods Alliance and Partners in Forestry, we touched only the surface of the innumerable benefits that northern forests provide. As a follow-up, we are continuing to explore the tangible benefits of natural resources from northern forests, as well as ecological, social and intrinsic benefits. Here, we are pleased to present a new Handbook that celebrates the importance of local wood products, including some less-obvious considerations, and provides tools for using your own sustainably-harvested wood products.

As we mention in the Introduction, a crisis has arisen in the timber industry, with lumber prices reaching unprecedented levels at the very time we have difficulty managing low-value wood harvests because of suppressed demand for pulp and paper. This presents numerous market challenges, and perhaps increases the appeal for forestland owners to sustainably utilize their own wood products. We hope that you will enjoy and learn from this Handbook, which reflects decades of practical experience in the practice of sustainable forestry and local wood use, as well as a true love of all the benefits of the Northwoods forests.

Cover Photo:

A northern forest stand displayed by Hans Schmitt of Schmitt Forestry is above the Kodiak cabin at the Big Bear Hideaway in Boulder Junction. The cabins at the complex are built of local woods, with the exception of the Cedar shake roofs from the Pacific Northwest and treated Southern Yellow Pine in the foundations.

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Introduction

Exacerbated by the Covid-19 pandemic, many different factors have contributed to a crisis of sorts in the forest industry, and this is adversely affecting woodland owners. The headline of an April 23 story on WSAW, Wausau television stated: Lumber Prices More Than Triple in One Year and Continue to Rise! The lumber portion of the forest industry has been unable to meet demands, placing softwood lumber prices at all-time highs with short supply. Conversely, with an overwhelming supply of wood products, driven in part by investment owners putting excess amounts of timber on the market, pulpwood and lower-end raw wood products have little demand. All this is further driven by USA tariffs on lumber from Canada. While the tariffs appear to have benefited corporate lumber production facilities, there has been no benefit to loggers or woodland owners, and increased financial stress to consumers. We as woodland owners are caught in the pinch, with lower stumpage values and ridiculous costs to purchase lumber, if we wish to pursue a project.

The purpose of this report is to explore alternatives to the norm. While it may be viewed as an alternative these days, using local wood has long been used to accent society and the economy. We hope to explore the possibility of re-creating and maintaining an increased level of local wood use. And perhaps this motivation may be promoted by timberland owners and be firmly grounded in some of the decisions we make.

The timber types growing in the Northwoods region are very well suited to a wide range of uses, and thus we hope to advocate, inspire, and assist in developing more vibrant and sustainable markets. Additionally, your use of your own wood resource may go a long way to reinvigorating a trend toward local use of our sustainable, growing forest resource. If so, this trend can assist the greater good in numerous ways, offering economic, social, and environmental benefits to society. And at the very least, using your local wood products can offer you the pleasure of having used what you grow and manage.

The Big Three Benefits of Using Wood Include Renewable, Recyclable, Natural

Timber is one of the few natural, renewable building materials. It is carbon positive (i.e., it sequesters carbon), uses low energy in production, enhances health and well-being, is a natural insulation and is beautiful to the eye. Promoting these features at the local level is, in part, the purpose of this report.

In recent decades, as forest fragmentation has seriously diminished the size of private lands in the region, the forest products industry has gone in the opposite direction with an expansion in the use of massive equipment. These trends contribute to the crisis facing woodland owners. Large-scale forestry equipment has taken over the industry and is often cost-prohibitive to use on smaller woodlots, in part because of the expense of transporting this large equipment. Fewer and fewer small family-owned wood processing operations exist today, often leaving a void in the utilization of forest products at the local level, especially from smaller woodlots.

While it would be naïve to think our suggestions here will alter the local economy in a large manner, we do feel it important to advocate for small producers and processors at the local level. In a niche market in particular, adding value at the local level can have a significant economic benefit. If a small wood processor or crafter can utilize a high-value tree, while adding value along the chain of custody, perhaps real social and environmental benefits can also be achieved. For example, a small-scale value-added processor can go into a woodlot and singly select high value trees at their point of biological maturity, (or damaged or stressed trees), without the often-prohibitive expense of moving large-scale forestry equipment to a typical sale. There are models for this around the region, as traditionally many small-scale operators were successful. Unfortunately, the trend currently continues to move in a reverse direction.

Overcoming Challenges in Local Wood Use

Partners in Forestry Landowner Cooperative (PIF) has firsthand experience in working toward a solution to this type of situation. By 2003 the storm was brewing for some small-scale and family local lumber producers and crafters. Further adoption of the Uniform Dwelling Code (UDC) into the smallest communities in Wisconsin presented a challenge. The code stated that all lumber must be grade stamped, a prohibitive measure for small scale producers. Partners in Forestry was not caught completely by surprise as we had anticipated this possible outcome for some time. We talked to the folks at a major northeastern grading operation, the North Eastern Lumber Manufacturers Association (NELMA), about the possibility of PIF achieving grading authority. In part because rough-sawn wood, including that used for framing or timbers, cannot be grade stamped, this idea was impractical. A very astute comment from NELMA was “you folks do not need to grade--but you do need to work with your state to allow your wood to be used, by creating a local lumber use law”. There had been models for this previously in several northeastern states.

PIF, in short order, connected with then State Senator Roger Breske, who had a passion for assisting common working folks. It took several years spanning two legislative sessions, a number of trips to Madison to testify at hearings, and at the end some political maneuvering by Senator Breske to achieve the goal. Through the process our efforts gained support from WDNR Division of Forestry,

who sent wood utilization specialist Terry Mace to assist. Bob Govett, Ph.D., a Forest Products specialist at the University of Wisconsin-Stevens Point, became involved and eventually was the first to teach training classes as part of a compromise necessary to advance the bill. The training was basic, common sense education on the fundamentals of dimensional lumber grading. The certificate earned from taking the class demanded transparency between the saw miller, lumber buyer and end user. In turn, this allowed the age-old tradition of small sawmillers selling or custom milling lumber for local wood construction to continue. Something truly did seem amiss when the UDC was set to prohibit a landowner from using his or her own timber to build their own residence, and PIF was proud to have been the driving force into correcting the flaw. In 2007, Governor Jim Doyle signed into law Wisconsin Act 208, commonly termed the "Local Lumber Use Law".

While this law has been helpful by maintaining opportunities, the trends continue and are not beneficial to the small operator in the equation. Fewer and fewer small lumber producers exist, small woodland owners often achieve below-par values for their wood, and our concerns

This pile of mix sized members includes potential re-saw beams on lower right. By re-sawing an oversize beam, the oxidation, stains, molds and dust are cleaned off and any warpage is also addressed.

remain over maintaining future equitable opportunities in the overall situation. PIF continues to advocate for local wood use using the phrase “Use Local Wood for Global Good”. We have been researching these factors for years with assistance from the UW Center for Cooperatives, as we advocate for more small-scale economic harmony on the landscape. We believe that many of the small operators are the true crafters in the woodworking arena and hope to support their endeavors as we work to fulfill the expression: Local Wood for Global Good.

Use Local

We widely recognize the specifics and potential of the tree species in the Northwoods region and have promoted them for decades. We also acknowledge any apparent shortcoming in these species, which are easily overcome by the incredible advantage of keeping things local. Local use after harvesting and processing saves valuable transportation costs, assists local economies as well as the crafters, and protects the environment, while supporting the health of our own communities.

While most people are aware that Northwoods forests help to address climate change by absorbing carbon dioxide from the atmosphere, less discussed is the fact that wood products continue to store carbon, thus keeping it out of the atmosphere in the long-term. We advocate for using wood where practical as a substitute for fossil fuel-intensive alternatives, which results in significant amounts of “avoided” greenhouse gas emissions.

The production and processing of wood uses much less energy in production, called embodied energy, than most other building materials, giving wood products a significantly lower carbon footprint. Wood can often be used to substitute for materials that require larger amounts of fossil fuels to be produced. The more local the process is, the more energy-efficient as well.

A trend toward new awareness for the environment means more consumers are looking at how they can use their purchasing power to support sustainability. Local wood purchases can save funds while supporting the local economy, where everyone has a name and a face. This is in contrast to discounted overseas wood purchases, unless they are through a worker evolved cooperative model of sustainability. For example, cite the lack of suitable labor laws in much of Asia, where China pays manufacturing jobs on average $1.75 hour, which is higher than most of Southeast Asia.

If the lumber is locally sourced from the selective and sustainable harvesting of local wood lots, transportation and processing costs are reduced. Unlike a big-box store that may source the majority of its materials from a different state, province or country, we advocate to use local. By buying locally sourced wood, you’ll be able to reduce the distance that raw materials have to travel to get to the sawmill, which in turn reduces pollution.

In addition to reducing your carbon footprint by working with a local producer, you’ll also be able to help preserve the health of our local forests. Selective

timber-producing-lumber harvesting has great benefits for local woodlots. In addition to thinning out older trees so that young ones have opportunities to thrive, selective harvesting significantly reduces the likelihood of wildfires in conifer stands. Purchasing locally sourced items is a great idea, whether you're buying food or lumber or most any craft.

Why Local

The health of a community is largely dependent on the health and well-being of the components comprising the community. The components rely on a central aspect: the people are critically important, but the health of the environment is paramount to the health of the people. The same can be said for the economic health of the community. The community functions best when the members recognize the importance of the resources in the area, the need for and to sustain those resources, and the opportunities to locally produce benefits from those resources.

The high cost of land often leads to abuse of the landscape and its resources, as the greater economy centers around consumption which is often driven by technology. This drive leads to extraction and unsustainable uses, including of the forest resources. Until greater recognition of the importance of working with and not against nature, the woes at the local level cannot be fully addressed. More skilled and carefully considered decisions can go a long way toward establishing and maintaining local economic stability. An individual landowner makes choices which are a critical component in community health.

Closet doors of local White Pine.

Even at the local level, political decisions are often short-sighted and based in satisfying only one part of a constituency. Or the decisions are withered by compromise and not based on the greater good of a community. Simply look through the northern forests at the profligate abuse caused by the exploitation of small acreage land sales and the negative effects of forest fragmentation. At times, the short-term economic reward is the only consideration, but the long-term costs of services often outweigh the short-term gain. This is not beneficial to

the local residents who grew up working the landscape.

We are not advocating animosity toward local political leaders; however, these leaders may need to be guided by the needs of the people. Political leaders can be of great assistance to a community, though too often we lack real political leadership, and cannot expect meaningful help from them. Our rural landscapes are faced with big problems, though the solutions can often be solved by a holistically functioning community.

We should not be ashamed of subsistence economies on the rural landscape, as an important counterpoint to corporate profits, reliance on advanced technology, economic competition, and global consumption. If people and their land are to be saved, it will be local people who undertake a thoughtful process of respect for their land and themselves. While a writing by rural author Paul Gilk has advocated to 'get poor now, avoid the rush [from economic disaster]', I refuse to go that far. I think our lands are full of riches if we can recognize their importance while expressing humility and great respect for the environment which sustains the resources and ourselves. If we fail to recognize the importance of sustaining these resources, we will be poor in time.

Local resources have little local value after they are extracted and produced by global industry outside the region. The value, however, can sustain when these same resources are produced, processed, and marketed by and to the local people. In this paradigm the local economy is exposed as being as diverse as are the resources and the people making up the community. If not us, who will care for our communities?

Value-Added Wood Products: Large Companies

The purpose of this handbook is not to discriminate between local wood in general and only that processed by small local producers. Some sizable corporate entities use large volumes of sustainably harvested local wood to manufacture lumber. In the immediate area, both Potlach Corporation, which has a framing-stud processing plant in Michigan's Upper Peninsula and Biewer Lumber, which has a sawmill and treating plant in Prentice Wisconsin, both purchase large quantities of softwood logs to produce framing construction lumber in this region. They contribute greatly to the overall forest products economy, significantly benefiting landowners who have Pine-Spruce harvests or thinning. Perhaps the best and highest value approach for the region's Red Pine is the treated pole market. Red Pine, grown straight and tall, produces excellent poles as the species accepts certain treating chemicals very well and has favorable strength. Currently, there are at least two pole procurement firms in the area which purchase Red Pine, and this perhaps offers the highest and best economic opportunity to a forest owner who has a well-developed Red Pine stand.

Wood markets and demands, and supply are dynamic, in that it seems some things never remain constant for long.

Tigerton lumber collects hardwood logs on Highway 45 in Vilas County through the winter months, to supply their sawmill during the spring break-up season.

A few decades ago, US Stick opened a plant in both Rhinelander and Florence, Wisconsin to capitalize on the mature crop of white birch so prevalent across the region. White Birch was a sought-after favorite for tongue suppressors and popsicle sticks. Today the supply has dwindled, and these processing plants have not been operable for years. And white birch is now far less common on the northern landscape, to the point we are concerned for its viability into the future.

There are also significant hardwood industries throughout Wisconsin and the Upper Peninsula, producing high-value lumber and veneer from the northern forest region. There is likely no higher value raw wood produced from the region's forest than hardwood veneer logs. High-grade hardwood lumber, including hardwood flooring, would be the next highest valued product in the equation, followed by furniture manufacturing. The next step down may be the hardwood tie and pallet lumber industries, and to complete the lineup, pulpwood, and fuelwood. Additionally, wood residue from some of these processing facilities often produces wood pellet fuel.

All of these above-mentioned markets have long been a major component of the local forest products economy and been a great benefit to timber owners. We advocate for and would appreciate further value-added, non-polluting wood processing facilities in the region, to keep a larger share of the value from the process close to home. For example, a standard truckload of hardwood veneer logs likely has a value of about $5000 if it leaves our area. If this same hardwood was manufactured into high-end finished products, the value to the local economy would be many times that. A vibrant large-scale timber industry is critical to our future as woodland owners, and we wish to stress this point. Thus, as we discuss small operators in a complimentary fashion, this conversation is not in an either/or dichotomy, as both scales of operation should be critical components to the local economy.

Value-Added Wood Products: Small Operators

The supply and demand theory, with its ups and downs, has been alive and well in forest products as in most all phases of business. It is valid to question, however, if the supply and demand of the market correlate to proper sustainability in the local forests. Are landowners sometimes pressured to create further supply to satisfy industry demands? While it may be impractical on a large scale, there is something to be said for harvesting when the tree demands, not when industry demands. Such a practice can likely best be successful at the local level when small-scale, skilled producers are engaged. In this scenario, the sequence of events includes harvest trees, produce lumber (or other high-end wood products) and manage the product through its chain of custody. In an ideal situation, the operation might utilize selected suppressed and mature trees and use the wood for a wide range of products, perhaps similar to what described above, from high-grade wood products to fuelwood. The Local Lumber Use Law at least maintained this approach as practical for construction lumber.

As an example, friend and fellow woodworker Jim Birkemeir from Spring Green, Wisconsin was successful with his endeavors in Southern Wisconsin by harvesting, sawing lumber, solar kiln drying and processing high value finished wood products. His venture was called Timbergreen, and he successfully conducted marketing outreach into the population center around Madison. The use of local, especially sustainably selected hardwoods by Timbergreen became well recognized in that part of the state. We applaud the movement they, and others, carried on with success.

I began a similar model of local value-added wood utilization as early as 1973, when starting County Line Wood Products. I centered on a uniquely charming but simple style of log and timber frame homes and cabins, beginning my career in Central Wisconsin and moving north in the mid-eighties. I led a harvesting, sawmilling and finish use operation for several decades. Timing with my physical abilities was excellent in retrospect. The log-timber cabin craze was about to begin in earnest when I was young and eager, and as my body has aged out of the physically demanding work, the craze appears to have faded. Decades of hands-on effort and diverse experience gives me the desire as well as an opportunity to share some of what I have learned and experienced in this writing.

We wish to advocate for, support and inspire younger people of any age who are local crafters, by encouraging them to follow a dream. A subtle but tenacious idea can create success with sufficient motivation, hard work and perhaps a little luck. This may appear insignificant at the small scale, but is central to preserve the vision of the immense value of local wood and crafting.

Do you wish to tackle a project of any scope or scale, or use some of your own timber? We encourage you to consider using your own wood resources, or certainly give thought to purchasing local wood.

Considerations and Technical Notes for Using Wood Products

This section describes some factors for consideration in using local wood products. Further technical terms can be further defined by professional instructors and we are happy to share much of this and discuss in further conversations as well. My advice below was compiled by years of practical experience for the most part. I did, however, make several educational trips to the USDA USFS Forest Products Lab in Madison in the early days of my career, and followed guidebooks on everything from sawing, drying and storing lumber. I also had the opportunity to learn the sawing process in a solid, rural central Wisconsin fashion on a small-scale circular sawmill. Without a doubt, a balanced combination of both technical education and practical experience approaches is certainly the best source of learning.

Drying Lumber

Perhaps you have expanded your horizons and you hire a custom sawmiller to saw some lumber from your own logs; you are hoping to build a cabin, a deck or simply a fence. The mill is gone, you have a pile of sawdust and are excited about the prospects of using your own lumber. Maybe you even have a couple of wide *wavy-edge* planks for that favorite table project you have dreamed about. Or you simply purchase some fresh-sawn lumber. Let us begin by discussing the drying process in simple terms. It is not difficult, but may require some diligence, patience, and of course, hard work.

Green, fresh-cut lumber is very heavy, laden with sap and demonstrates extreme water weight. It more resembles the conditions from a growing tree. There are other reasons as well for drying the lumber, as green lumber is impractical for most applications. The same can be said for burning green wood for fuel; water does not burn. Green lumber will not hold fasteners well, will not accept glue, preservatives, coating, or stain and is very difficult to work within most applications. Lumber increases in strength as it dries, as well as increasing in insulating value and electrical resistance. You certainly best not close in green lumber while framing in areas without ventilation, as you will experience mold, mildew, and likely decay. And a big factor is how green lumber is not the same size as the same product will be when dry. Dry lumber is smaller, but very little of that shrinkage will be in length. There is no substitute for dry lumber. Plan on drying your wood through proper stacking with adequate air circulation. The fresher off the saw the better, especially in warmer months, to avoid mold and stain. Air drying is the most economical method, however there are advantages to a kiln as well.

You can start by picking a spot where there is adequate air flow and lay out some timbers in order for the lumber to be above the ground, thus allowing air flow. Six inches high is minimum, but frankly that is not enough over soil, as even the building codes stress eight inches from soil to untreated wood. Soil produces moisture and has organisms which contribute to decay. A possibility is to lay a piece of six mil plastic under the support timbers. The timbers can be leveled off, with another suggested crossed-perpendicular layer offering support to the lumber at least every other sticker. This second layer of timbers offers more ground clearance and can be shimmed to create a flat surface and begin sticker alignment. You can begin by laying your lumber on the flat supports, each layer of lumber the same thickness.

It is best, whenever practical, to air dry your wood with the dimension in which it will be used, to keep it straight and flat, as the flat supports will maintain the minimal warpage and bowing common in drying. Each layer of lumber will require a layer of stickers of uniform thickness to form the air space (1”x1” wood sticks work well). Spacing of stickers will vary with thickness of lumber, to assure adequate support. Larger timbers may need fewer stickers, but also require air at their sides. A very important factor to consider is to keep one sticker position directly vertically aligned above the sticker below and above a supporting timber. This is especially important at lower portions of the pile and with thinner lumber, such as one-inch-thick boards.

Ideally, your pile maintains good airflow throughout, raises up relatively plumb and at the top a great cover for the pile is panels of roofing steel, creating a temporary roof, with a sufficient overhang. Weight it down with low-grade timbers or even a pallet of blocks.

How dry do you want the lumber? This depends on the application and use of the product. Construction lumber for framing in open areas, normally 19%-20% moisture content (MC) is adequate and is a key number. This MC is relatively easy to accomplish with air drying in a reasonable time frame and may be a desired MC for fuelwood also. Below the 20% threshold, mold will not grow, and stain will not expand. Moving to the drier extreme, perhaps you are looking at a finished indoor project, a wood floor, cabinets, or millwork, where you cannot tolerate shrinkage. In this case, for use in a heated residence, a good target may be 6% MC. You will not achieve this level outdoors, except perhaps occasionally in extreme drought periods with very low relative humidity. Thus, acclimating the wood at the humidity it will be used in is important.

Kiln drying will easily get wood to 6%, but if storing the same product outside or at higher humidity, the MC will increase, and the board will expand. One little trick I used through the years was to sticker the air dried, finished wood indoors, and then place a tarp forming a tent over the pile and include a dehumidifier under the faux tent prior to use. Simply acclimating wood in a well heated home will accomplish this, however in summer months the humidity is likely too high.

The time it takes to adequately air-dry lumber is extremely variable by environmental conditions, lumber size and species. Even very similar woods can have significant variability in drying time. For example, Red Pine will dry faster than White Pine, especially in large size timbers. These two species often grow together and at times are hard to distinguish apart viewing the lumber, though they have several very different characteristics and some different uses.

The heavier hardwoods will especially be much slower in drying.

From my experience, one-inch softwood lumber, when spaced well and with good airflow, will dry fairly well through a spring-summer season. A common rule of thumb used by many woodworkers is one year per inch of thickness. Thus, in turn, a 12” x 12” beam may take up to 6 years to dry. An interesting experience is to stand downwind next to a fresh lumber pile on a warm day, and feel the cooling created by the drying process as nature wicks moisture from the lumber surface. On the average, my experience with softwood species has been that air drying will bring your lumber to about 12% MC, variable on recent humidity levels.

There are a number of ways to create makeshift solar kilns, to accomplish faster drying. There is a link to a plan on building a small dehumidification kiln below. A word of caution: drying too fast with high heat can also contribute to excess warpage and dry checking (splitting). Air drying is inexpensive and does contribute to the overall drying process, though kiln drying of freshly sawn lumber may be recommended for certain applications. Temperatures in air drying are not hot enough to kill fungi and insects. The heat in a kiln can also set or firm up the sap pockets in some softwoods. Final drying in a kiln after air drying may, at times, be optimal to equalize and condition the lumber for final use. In this case, remember, lumber will reacclimate to the relative humidity after taken out of a kiln.

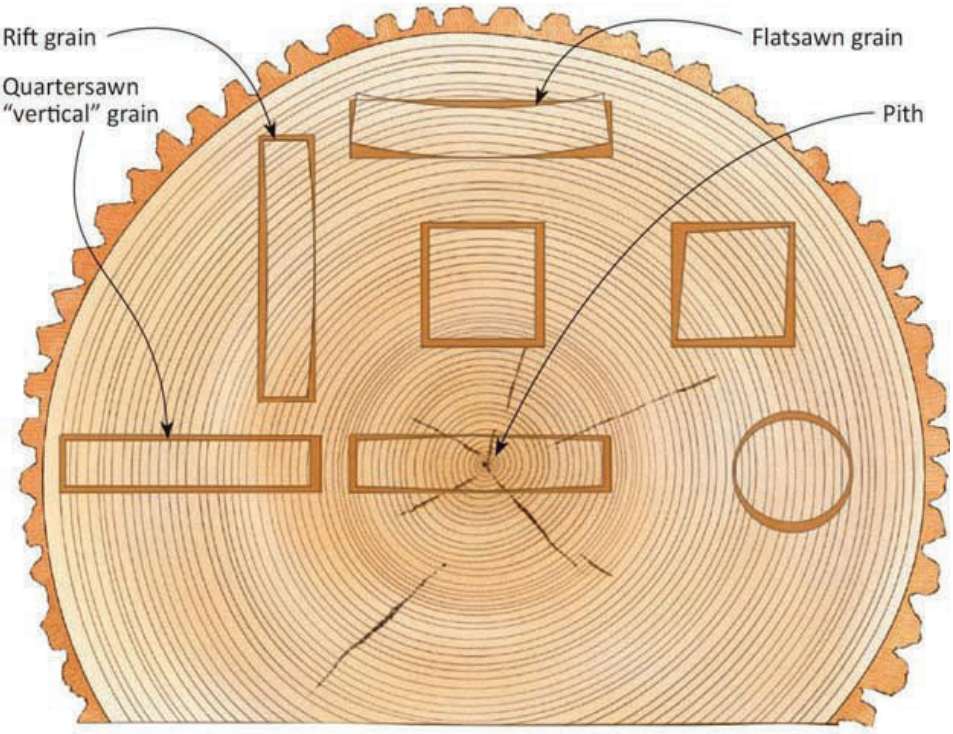
Kiln-dried wood has advantages, but it also drastically expands the embodied energy level in the products and may contribute to climate change. Thus, do think of the solar options, if planning a kiln. My experience has been that slower drying leads to straighter products. Some species, as well as the lumber from certain trees growing with stressed grain can be very prone to warping. This is called reaction wood: compression wood in softwood and tension wood in hardwoods. Cupping, crook, twisting, and bowing are all common warping experiences to be aware of, exacerbated by the shrinking of wood during drying.

The results of drying lumber can be predictable with some foresight and education as the below illustration, sourced from the USDA Forest Products Laboratory, demonstrates. This graphic was in an old lumber drying handbook I used decades ago as well.

As you view the cross-section to understand the drying deformities, you can also envision the parts of a tree as if it was growing, to help one realize the process. Starting from

the outside, the outer bark acts as a protective layer and is dead cells. The inner bark is live cells, is moist and carries nutrients to the living tree. Then the cambium layer transitions the bark and inner wood while forming them. Next in is the sapwood, lighter colored and moisture laden as its job is to transport sap from roots to leaves. Inside of that is the darker, inactive but strength supporting heartwood, which is a gradual change from the sapwood. At the very core is called the pith, which is closely surrounded by the juvenile wood, which at the center seems to contribute to instability and warpage. Also note the wood rays, which are radial cells which contribute to nutrient carrying.

Figure 1: Profiles in Shrinkage



Stock sawn in a variety of shapes from different parts of the log will shrink and distort in unique and predictable ways. Quarter "vertical" grain or quartersawn pieces provide the most stable and truest results.

Graphic sourced from USDA Forest Products Lab

Heartwood is less permeable to liquids than sapwood. Thus, heartwood dries more slowly than sapwood, but also has much less moisture content when green. Even within the annual rings there is early-grown wood with its larger but thinner-walled cell structure, contrasting with the late wood grown later in the growing season. The early wood, (sometimes called spring wood) is lighter colored, softer and less strong than the summer or late wood.

End coating for the drying process is a good foresight, especially with thicker stock, but useful for most deciduous species. Lumber will tend to dry fast from the ends, often causing deep cracks or splits from the end grain. End coating with latex paint, wax or even a water repellent can go a long ways toward preventing the end checking from degrading or shortening your usable stock.

More on the process of air drying can be found at the link below, which was compiled by the WDNR Division of Forestry Wood Utilization team. I have used a print publication from the USFS, titled *Air Drying of Lumber*, since 1973.

https://widnr.widen.net/view/pdf/fdrca8oy8r/Air-Drying-Lumber.pdf

And much more data on local wood, including the kiln plan.

https://dnr.wisconsin.gov/topic/forestbusinesses/resources

Picking a Species for Your Project: Purchasing Local or Regional Lumber or Using Your Own Wood

Biological properties between wood species can vary greatly due to the internal structure of each tree. These include size of cells, thickness of cell walls, and chemical composition. Even trees within the same species can vary widely due to age, growth rate, site conditions, and internal stress within the tree. The lumber from each species of wood has characteristics that will help us realize if it is suitable for various uses. Of these, resistance to decay, ease of working, weight-strength ratio, hardness, color, grain, and resistance to splitting are particularly significant. When selecting lumber for a specific project, consider how the characteristics of the wood species will meet the demands of the job. For example, joists or rafters for a building should use a wood with good stiffness and bending strength. The ability to hold nails-fasteners should also be considered. Once the requirements for the project have been identified, try to select a wood species with appropriate attributes.

Perhaps the job requires a wood that is decay resistant. Keep in mind that the heartwood found in the center of the log contains less moisture and also a higher concentration of decay resistant chemicals than the younger sapwood. This makes heartwood more appropriate for some uses. Young trees have a higher percentage of sapwood than older trees; therefore, small poles and saplings would be almost worthless as posts in the ground, if used untreated. On the other hand, sapwood, because of its light color, greater flexibility, and lighter weight, is preferred to heartwood for items such as hardwood tool handles and siding. Sapwood also accepts preservatives much better than heartwood in the pressure treating process. For example, testing for the All-Weather Wood Foundation systems discards heartwood in the framing.

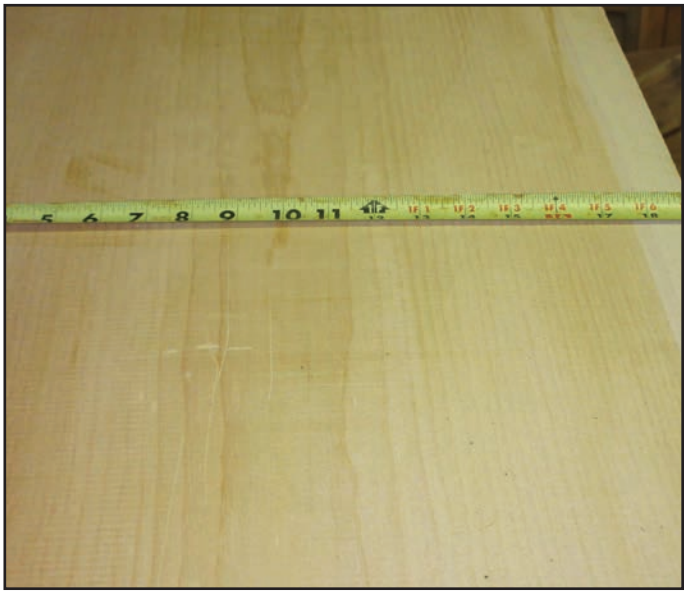
If you are ready to tackle the task of using your own wood, let's consider some of these properties. Ideally, you have multiple species available in order to pick out the most suitable for your project. Here, we offer some comparable insight into actual use properties of some of our common northern softwoods. By no means are we suggesting that only these species can be used for a certain application. For example, if a species or a certain log is not the strongest choice for your application, simply size your component accordingly, or reduce frame spacing. I would often use White Pine beams, fully aware

of its inferior strength to Red Pine or Spruce. The advantages it offered were important to me, but I would greatly oversize the beams for strength and aesthetics. Several species are explored below and are discussed to a degree by wood hardness (soft to hard). Most often we refer to hardwoods as the deciduous, broadleaf species and softwoods as the conifer species with needles or scaly leaf. However, this is not a true reflection on the density or hardness of the wood. For example, Red Oak and Sugar Maple are dense and heavy at 44pounds per cubic foot dry, while Basswood and Aspen are less dense and lighter than Spruce, Hemlock, or Red Pine.

RED PINE: Strong, not too heavy and an appropriate choice to use for most framing applications, timbers and much more. It also holds fasteners well. Red Pine dries relatively quickly but tends to warp more than White Pine. I sometimes would dry very oversize Red Pine beams and resaw them to size after drying, wasting a bit of wood but cleaning up and straightening the member. Red Pine also tends to retain some sap pockets, especially near knots. I used many board feet of Red and White Pine for exposed (from below) roof sheathing as well. Additionally, Red Pine displays a beautiful wood grain for paneling or furniture. It is denser than White Pine and reflects a bit lower R-value in a log wall. If custom wood preserving is an option, Red Pine fits the bill better than other regional species for outdoor projects such as decks, posts and so forth as it accepts many of the treating chemicals well.

Red Pine saw timber, cruise stick displays 26" DBH (direction of eye). At 3 1/2 16' foot logs this tree could yield about 800 BF.

WHITE PINE: Often used with Red Pine locally, White Pine has less strength and weight, is softer and dries a bit slower with less warpage. It also has a better R-value, making it a preferred species in full-log homes. White Pine is an iconic northern lumber, and forest tree



A surfaced knot-free 1x20 White Pine board.

species. In higher grades it is the most preferential species in window, door, cabinet, and millwork use. The lower grades make charming paneling, though often not as deep-grained as Red Pine. In large operations, White Pine is commonly graded by appearance. It is a very cooperative wood to work with as it is dimensionally stable, planes and sands very well, glues easily, stains and finishes with ease and accepts fasteners well. Also used by some carvers, it was traditionally a species used in ship masts, match sticks, and the needles were used in tea to prevent scurvy. White Pine is truly a preferred species.

BALSAM FIR: Likely our strongest northern softwood, surpassing even Red Pine. Often, however, Balsam is bypassed for lumber as it is sap-laden, dries slower, and can be uncooperative by twisting and warping. Perhaps a better reason is that it is shorter lived and needs a more nutrient rich site to achieve saw timber size, thus some northern areas do not have an abundance of fir in saw log categories. When growing with more light it can be an extremely limby tree; in the days of hand cutting, one old Northwoods logger commented that Balsam was an appropriate name, as you cut down the tree then you ball-some wading through the limbs. Fir also makes a great Christmas tree with its pyramidal shape, is very aromatic and is used to make essential oils.

Craig Quimby hand crafted two special paddles of local woods. Cedar bench and railings with treated Red Pine deck display further functional local lumber.

This White Spruce demonstrates the quintessential pyramidal form displayed in Spruce and Fir.

SPRUCE *(White, with occasional Black or Norway Spruce)***:** Is a beautiful light-toned wood, displaying good strength characteristics with favorable light weight (28 pounds per cubic foot dry). It has very hard knots, enough that I often broke carbide bits out of the circle sawmill. Often used with our Pines, it is an attractive and worthy choice for a wide variety of uses. Clear Spruce is often sought out by music instrument makers, and in specialty paddles. Spruce is an excellent choice for many building and crafting projects as it is strong, holds nails well and is beautiful. Used with Red or White Pine it offers great diversity in aesthetics with its random knot structure.

JACK PINE: This species is dense, strong and dries fast. The deep colorful grain and random knot pattern offers exceptional beauty in paneling. A bit heavy and dense, and it is often more poorly formed, and this makes it less favorable than the other local softwoods for log construction. Its strength makes it favorable to the stud-framing producers. It holds nails very well. In large-scale operations, the structural grading combines these species in the category "SPF" for Spruce-Pine-Fir, but this generally does not include White Pine.

TAMARACK *(larch)***:** Perhaps most comparable to Jack Pine visually for paneling, Tamarack is a strong, dense, tough, and heavy softwood. Often used for strength in poles such as in the old tobacco sheds, it likely has a slightly better rot resistance than Pine-Spruce-Fir. Tamarack timbers develop deep

A stand of mixed Cedar and Hemlock on the Wildcat Falls Community Forest. This part of the community forest will not allow timber harvests to protect Hemlock, Cedar and riparian features.

fissures and dry cracks in their side grain during the drying process. It is not the most cooperative conifer to work with, but it does exhibit some worthy benefits and should be considered if you have it available. This is the one conifer that does lose its needles in fall following a display of yellow.

HEMLOCK: This species has a very favorable strength to weight ratio (the weight is identical to Spruce and

between Red and White Pine) and is a mild appearing but beautiful wood for a variety of uses. The most serious drawback (other than environmental) to using Hemlock as a local lumber, is the ring shake (separation of annual rings) which is so often prevalent. Many a local sawyer and user has been disappointed to experience Hemlock boards separating at the grain. Deep frost cracks are also common in Hemlock. Mainly for environmental reasons, we do not recommend cutting a healthy Hemlock for lumber, but if cleaning up storm damage, by all means do utilize your resource. It is an iconic Northwoods species with immense value other than economics.

WHITE CEDAR: At only 22 pounds per cubic foot dry weight, White Cedar is our lightest northern species. Fittingly, it has the best R-value as well, though its taper may degrade it in log construction. Best known for its rot resistance in the heartwood, it is an extremely versatile wood. Sauna paneling, posts, the iconic traditional Cedar canoe, you name it.

This rough-cut timber displays the marks of a sawmill blade.

Because of Cedar's diminishing stature on the landscape, we normally do not advocate cutting, but encourage your proper use for specialty products. A rather weird anomaly with White Cedar is how often one sees a live, healthy appearing Cedar with rotten hearts, even though the same heartwood is the most rot resistant of our native softwoods in lumber.

SOME SOFTER DECIDUOUS SPECIES: Basswood, at only 26 pounds cubic foot dry, is similar to White Pine (25 pounds per cubic foot) in weight. Basswood exhibits a rather mundane appearance, lacking the grain and knot beauty of our native Pines. There is, however, no better wood for your carving project. We strongly encourage you to use your Basswood accordingly for a variety of home projects. High-grade Basswood is sought after for wood blinds and specialty products. It makes excellent lumber as well.

Aspen (and Cottonwood) are similar in weight to Hemlock with a much simpler appearance, similar to Basswood; however, it is a bit heavier and less cooperative than Basswood. It has a favorable weight-to-strength ratio, rendering it a practical choice for numerous uses. I have used Aspen for a variety of construction uses, most often hidden within a structure, but also have used it in wood floors and exposed ceiling planks. It is fast-growing and short-lived, and we strongly encourage you to utilize your Aspen resource when possible. It is favored as a popular choice in food and cheese boxes,

as dry Aspen has no odor. Aspen and Basswood both have little rot resistance. The good grade Aspen logs are often procured for making plywood.

HARDWOODS: The scope of hardwoods, even including only our local species, is extremely variable in characteristics, appearance and uses. Here, we will lump these as one in a brief explanation. They are most all much heavier woods. For example, Sugar Maple and Red Oak are 44 pounds per cubic foot when dry, White Oak and Locust are 48 pounds per cubic foot and White Birch 39 pounds per cubic foot. Hardwoods have a much more complex structure than the softwoods. They have distinct wood rays, while softwoods have resin ducts. Hardwoods generally will dry slower, check more (especially Oak) and require more supporting timbers and stickers while drying. End coating is strongly recommended. While hardwoods require extra effort, the beauty they display is exceptional, thus we highly encourage your use of your hardwoods, especially for important projects. Hardwoods display an incredible diversity of color variety, with White Birch, White Ash and Maple especially being mostly light appearing, while Oak starts moving you toward some of the darker color choices. Fastener application in hardwoods can be a serious challenge, most often drilling a hole slightly undersized to the fastener is required.

See PIF website for a thorough file on Bob Simeone's 'tree to rocker' where he mixes local woods with responsibly sourced tropical woods.

There is great satisfaction with crafting a project, and hardwoods increase the satisfaction level and using your own wood truly makes the experience wholesome. The link to the USDA USFS Timber Management Field Book is provided here. A Weight Table is on page 2.10. Partners in Forestry members should have this book in print copy as well.

https://www.fs.usda.gov/naspf/sites/default/files/publications/timber_mgmt_lr.pdf

Estimating Your Lumber Volume

If you have a plan for a project, you will want to determine an estimate of how much wood you may need. In the US and Canada, the Board Foot (BF) is the common measurement used for volume of lumber. In larger quantities we use MBF to represent a thousand board feet. For lumber, any multiple of 12 by using width and thickness will equate to a board foot. For one-inch lumber, one could consider a board foot and square foot as equal. Looking at a one-foot-long piece of wood that is one inch thick and twelve inches wide, commonly called 1x12, or pieces of wood that are a 2x6 or a 3x4 will all equal one board foot per foot of length. Also, for any lumber in 12-foot length, the board feet will be the simple multiplication of the thickness and width. See the board foot chart below for your sizes in calculating the quantity for your project.

Using this approach, one can calculate your board footage, though you must keep in mind a reduction in square footage of lumber ready to use will

Diameter (inches)	Length of Log (feet) 8	10	12	14	16	18	20
	Contents- Board Feet (BF) in Tens (add 0)						
10	3	3	3	4	5	6	7
12	4	5	6	7	8	9	8
13	5	6	7	8	10	110	12
14	6	7	9	10	11	13	14
15	7	9	11	12	14	16	18
16	8	10	12	14	16	18	20
17	9	12	14	16	18	21	23
18	11	13	16	19	21	24	27
19	12	15	18	21	24	27	30
20	14	17	21	24	28	31	35
21	15	19	23	27	30	34	38
22	17	21	25	29	33	38	42
23	19	23	28	33	38	42	47
24	21	25	30	35	40	45	50
26	25	31	37	44	50	56	62
28	29	36	44	51	58	65	73
30	33	41	49	57	66	74	82
32	37	46	55	64	74	83	92
34	40	50	60	70	80	90	100
36	46	58	69	81	92	104	115
38	54	67	80	97	107	120	132
40	60	75	90	105	120	135	150

Table 1: Scribner Decimal C Log Scale Volume Chart: Measure small end diameter of log inside bark.

As one studies this chart, note how the smaller diameter logs grow so little in scale per 2 feet increments, however with a large diameter log at 34", each 2' increment adds 100 BF.

An expanded chart can be found in the Timber Management Field Book at 2.6 with a defect deduction chart for the same at 2.5.

Scribner Decimal C is a widely accepted log scale measure in this region. Other areas may use the International ¼ kerf rule, or the Doyle rule. The Doyle is said to significantly under scale small and medium size logs. The non-Scribner tables can also be found in the Field Book, with a comparison table at 2.9.

A 16' White Pine log at 22" diameter small end, scales 330 BF with Scribner Decimal C.

occur through the drying and processing of the lumber. For example, you may wish to put a roof on using one-inch-thick lumber. Any one-inch (or thinner) board stock does calculate to a square foot being equal to a board foot. However, after drying and surfacing the piece will be closer to that of a store-bought piece.

Nominal lumber (industry standard) thicknesses for one inch stock after drying and surfacing is 25/32". For thickness or width: with two inch the nominal size is 1 ½". Four inch is 3 1/2", six inch is 5 1/2", both a ½" deduction, and with eight inch and wider/thicker there is a ¾" deduction.

If you use your lumber in rough form, the drying process often deducts less than the surfacing, thus a rough structural member should be well over the nominal size. This of course is an opportunity to gain a bit in strength as well in certain construction applications.

LUMBER SCALE-Board Foot (BF) calculator chart

Size in inches	Length of board, plank or timber in Feet 6	8	10	12	14	16
1x4	2 BF	2.6	3.3	4	4.6	5.3
1x6	3	4	5	6	7	8
1x8	4	5.3	6.6	8	9.3	10.6
1x10	5	6.6	8.3	10	11.6	13.3
1x12	6	8	10	12	14	16
2x4	4	5.3	6.6	8	9.3	10.6
2x6	6	8	10	12	14	16
2x8	8	10.6	13.3	16	18.6	21.3
2x10	10	13.3	16.6	20	23.3	26.6
2x12	12	16	20	24	28	32
2x14	14	18.6	23.3	28	32.6	37.3
3x6	9	12	15	18	21	24
3x8	12	16	20	24	28	32
3x10	15	20	25	30	35	40
3x12	18	24	30	36	42	48
4x4	8	10.6	13.3	16	18.6	21.3
4x6	12	16	20	24	28	32
6x6	18	24	30	36	42	48 BF

This table can be used to indicate the board foot volume of lumber of different dimensions.

Two board foot tables are included in this section. Table 1 demonstrates the approximate volume of lumber you can achieve out of a given log, by simply measuring the small end, correlating to the log length. These are estimates, based on average saw kerf and other averages. More BF will be achieved by sawing larger sized timbers as less kerf (loss from sawdust) is involved. There are several different log scale rules used in the USA and beyond. Most often this region centers on the Scribner Decimal C log scale, while other regions may use the International ¼ inch Decimal rule, or the Doyle scale.

Table 2 shows the BF per cord and includes approximates for cordage of logs to relate to BF content. On average, it takes just over two cords of nice eight-foot

logs, (also termed bolts) to achieve one MBF. Larger, straighter logs and sawing larger size lumber will increase the BF per cord. Officially a range of 2.25 to 2.45 is common for hardwood and softwood -conversion of cords to BF is often used. I could often achieve more than one MBF from 2 cords of White and Red Pine, if logs were well-shaped in larger diameters, and especially while sawing thicker stock. To stress the log size ratio, one can look at the number of eight-foot logs making up a cord. In six-inch bolts (small end) 42-47 is a range, up to 20" diameter the number drops to five or less bolts per cord.

There are also extensive tables on board feet content and much more in the USFS Timber Management Field Book with link provided above. See 2.3 (bolts per cord) 2.6 (log Scribner C) and 2.11 (lumber) specifically.

Grading Lumber

In the forest industry, grading standards are promoted and enforced by rules widely approved by engineers and industry specialists. As we discussed with the Local Lumber Law, this grading process is impractical for the typical woodland owner or small operator. By no means does that reflect negatively on the grading standards themselves. In fact, earlier on in my home building career, I devised several tables to guide us in choosing the proper components for structural softwood lumber applications. Originally, I hand drew these tables from NELMA standards, and they were laid into digital form some years later.

While we share these grading tables for your review, we also stress these do not replace official lumber grading, nor are they specific to the Wisconsin Act 208. They did, however, serve my career very well. And they can act as a valuable educational tool to guide your lumber use, and also to demonstrate the quality standards in the lumber grading process. If you plan to use local wood in Wisconsin for residential construction, we highly recommend working with a sawyer who has the local lumber certification.

The grading book, designed by Bob Govett, for Wisconsin Local Lumber use can be found here. The booklet is specific to the law, but has more extensive information as well, including more tables on volumes and strength properties of our area wood.

https://dnr.wisconsin.gov/sites/default/files/topic/ForestBusinesses/LmbrGrdngHndbk.pdf

To participate in the Wisconsin local use grading course, you can find a schedule of classes here.

https://dnr.wisconsin.gov/topic/forestbusinesses/events

While the Wisconsin law is centered around 2" to 4" thick dimensional lumber, in my career I used significant amounts of thicker timbers as well. In these grading tables, there is one table relevant to 2"-4" lumber and another for 5" and thicker members. Obviously, grading beams is a bit of a challenge as there is a lot of wood that

cannot be seen by the eye. These tables demonstrate only the structural use

GRADING TABLES

consideration, however grading also steps into appearance as well. For example, White Pine is often graded as an appearance standard, as White Pine

Northern Softwood 2"-4" Structural Joist, Plank, Rafter

	Select	Grade 1	Grade 2	Grade 3
Splits	Length(L) less than width(W)	L equal to W	L is 1.5 of W	18% of L
Skips	Hit and miss 10% maximum	Light, 10% maximum	5% can have 2 foot skips	Heavy 10%
Slope	1 in 12	1 in 10	1 in 8	1 in 4
Stain	10% max red heart	Firm heart stain	No limit	No limit
Wane	Avg. 25% thickness and 25% width	Avg. 25% T, 25% W	Avg. 33% T, 33% W	Avg. 50% T, 50% W
Warp	50% of medium—very light	Very light	Light	Medium

Allowable knot size per grade

	Edge/wide face *see diagram 1				**Center/wide face** *see diagram 2				**Holes and loose or unsound knots**			
	Select	*Grade 1*	*Grade 2*	*Grade 3*	*Select*	*Grade 1*	*Grade 2*	*Grade 3*	*Select*	*Grade 1*	*Grade 2*	*Grade 3*
6"	1 1/8	1 1/2	1 7/8	2 3/4	1 7/8	2 1/4	2 3/8	3 3/4	7/8	1 1/4	1 3/8	2
8"	1 1/2	2	2 1/2	3 1/2	2 1/4	2 3/4	3 1/2	4 1/2	1 1/4	1 1/2	2	2 1/2
10"	1 7/8	2 1/2	3 1/4	4 1/2	2 5/8	3 1/4	4 1/4	5 1/2	1 1/4	1 1/2	2 1/2	3
12"	2 1/4	3	3 3/4	5 1/2	3	3 3/4	4 1/2	6 1/2	1 1/4	1 1/2	3	3 1/2

Diagram 1

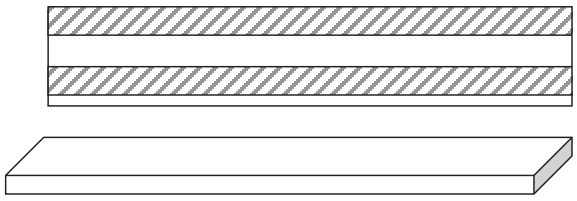
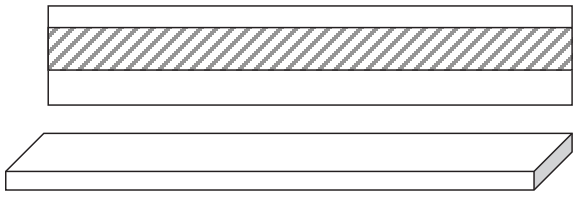


Diagram 2



DEFINITIONS FOR TERMS USED ABOVE IN GRADING CHARTS:

- Knots: pin less than ½", small ½ to ¾", medium ¾" to 1 ½", large over 1 ½"
- Pitch is an accumulation of resin
- Pith is center core of log, mentioned in drying section also, is weaker, larger celled and prone to warp
- Pin Holes are very small holes, less than 1/16" *
- Pockets are defined areas between grain with pitch and or bark present
- Shake is separation of annual rings occurring in length
- Slope is the path of grain, and is expressed as a ratio of rise to run
- Splits are length wise separations which often go through the thickness, can be caused by drying process
- Stains are any variation of the normal coloring in the wood
- Wane is either bark or bark free log edges on the lumber
- Warp is either bow, cup, twist or mis shape from flat surface, or any combination of

**holes up to ¼" are small, up to 1" are large, over 1" are very large.*

For more information on soft wood grading, grading terms from NELMA Library https://schmeling.com/file_library/nelma_lumber_terms.pdf

FOR HISTORY BUFFS

Standards and specifications from US Govt. Dept of Commerce 1927 for wood using industries in including lumber grading terms and definitions. https://www.govinfo.gov/content/pkg/GOVPUB-C13-1f1e-03de6a4483e30d85c3ef3400ed18/pdf/GOVPUB-C13-1f1e-03de6a4483e30d85c3ef3400ed18.pdf

GRADING TABLES

BEAMS 5” and Up Northern Softwood Structural Beams and Stringers

	Select	Grade 1	Grade 2	Grade 3
Checks	25% of thickness	25%	Seasoning checks	Seasoning checks
Pinhole	Limited	Limited	Loose knots half size of chart	Three quarters of knot
Pitch streaks	Ok	Ok	Ok	Ok
Pockets	Medium	Medium, plus	Pitch and bark pockets ok	Pitch and bark pockets ok
Shake	1/6 of thickness on end	1/6 of thickness on end	Half length, half thickness	Full length not continued
Slope	1 in 15 at middle 1 in 12 at ends	1 in 11 at middle 1 in 8 at ends	1 in 6, full length	--
Splits	Up to half of width	Equal to half of width	Medium	25% of length
Stain	10% or less	Sapwood ok, with firm heart	Ok	Ok
Wane	1/8 of face (more for short distance)	1/4 of face (more for short distance)	1/3 of face	1/3 of face

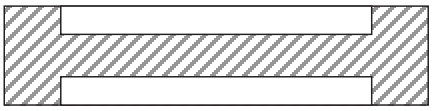
Allowable Knot Sizes

	Edge/wide face *see diagram 1				**Center/wide face** *see diagram 2			
	Select	Grade 1	Grade 2	Grade 3	Select	Grade 1	Grade 2	Grade 3
5”	1 1/4	1 7/8	2 5/8	X	1 1/2	2	2 1/2	X
6”	1 1/2	2 1/4	3 1/4	X	1 3/4	2 1/2	3	X
8”	1 7/8	2 5/8	4 1/2	X	2	3	4 1/2	X
10”	2	2 7/8	5 5/8	X	2 5/8	3 3/4	5 5/8	X
12”	2 1/8	3 1/4	6 7/8	X	3 1/8	4 1/2	6 7/8	X
14”	2 3/8	3 1/2	8 1/8	X	3 3/8	4 7/8	7 5/8	X
16”	2 1/2	3 3/4	9 1/8	X	3 5/8	5 1/4	8 1/8	X

X= for Grade3 beams, sound knots are 3/4 of surface

Diagram 1

Diagram 2



is not widely recognized as a structural component using nominal lumber sizes in the industry. I used many White Pine structural components, by safely oversizing the members, which also greatly accented the aesthetics of heavy timber construction. For the most part, in the larger industry, hardwoods are appearance graded as well, as hardwoods were not widely used in structural considerations, though many a local barn or home were built in rural Wisconsin using hardwoods. An appearance grade popular in this area is termed ‘Select Cut’ from Biewer Lumber. The Select Cut reference is centered around the appearance, as this lumber is number two and better by the standards of the lumber bureau.

In grading dimensional lumber for construction, the grade 2 is generally the lower category designed for structural use. Official grading often has levels above number 2, with structural select and number 1. If buying graded lumber, the category number 2 and better reflects the fact that the higher grades were not removed from that sorting process. Thus, this may be an opportunity to have some better grade members in those batches termed No. 2 and better.

The Local Lumber Law is designed around that very principle, that the better wood is not selected out for higher grades, but instead will improve the overall grading balance in the selected framing. In using local woods, all parties involved have a deeply vested interest in maintaining the best possible lumber for a given use. For residential construction, the building inspector will have the final say under the UDC, but the law gives them the holistic opportunity to look at local woods as an appropriate and wise choice.

More Tips for Using Your Own Lumber or Purchasing Local Wood

When surfacing your lumber using a planer, surfacing following the drying process has demonstrated better results than planing green lumber. Many drying deformities are removed by the planer process, as well as surface dust, mildew, molds and stain. Rough sawn wood even seems to dry better with the saw-textured surfaces, which have more surface area, and in turn wick away moisture more efficiently.

In my building career, I highly preferred using rough sawn lumber for many structural components, as it offered increased size and strength, and especially for outdoor uses for the advantages of the drying considerations. Even on a deck surface, rough lumber offers great slip resistance. Surfacing the poor and unexposed side only will assure thickness. Planers are much more precise than a sawmill. There are great advantages to using rough sawn lumber, however we must realize and acknowledge any drawbacks.

While drying lumber, especially over long periods of time, there is an accumulation of outdoor environmental factors to consider. The surface molds, mildew, pollen, dust, dirt and the oxidative greying which often occur can be problematic for the aesthetics and to finishing. Washing is an effective and practical method to clean off these adverse and ill appearing factors from the wood surfaces. In washing, please do not use a household or commercial form of chlorine bleach on raw or any unfinished wood. Chlorine bleach, while highly

This functional outdoor area celebrates local woods; treated Red Pine on deck, Cedar on table legs and rails and Aspen planks for table and benches.

effective in destroying molds, is extremely damaging to bare wood surfaces, seals pores from accepting finish and destroys wood fibers. It is highly recommended to use an oxygen bleach or a mild acidic solution, to loosen dirt and mildew for washing. These products can also be effective in removing planer glaze from new wood, and open pores to accept stain, finishes or preservatives, thus they are called 'wood cleaner and coating prep'. They often are very effective in brightening wood as well. Some of these are not the best choice for routine maintenance cleaning as they can dull coating surfaces, however they can be effective if prepping for another coat of finish. Following washing and rinsing, the water will dry from the wood much faster than the sap originally laden in the wood. Some water-based products can be applied in short hours. When using oil base finishes, the wood needs a day with good drying conditions, so a 24-hour minimum is a more reasonable time frame to plan.

If you should do an outdoor project with pressure treated wood, consider that new treated wood will not stain well or hold sealers for a long time. But with that said, it is important to seal the

1880s era lumber surfacer and more modern surfacer-planer with 36'' table.

Garden building.

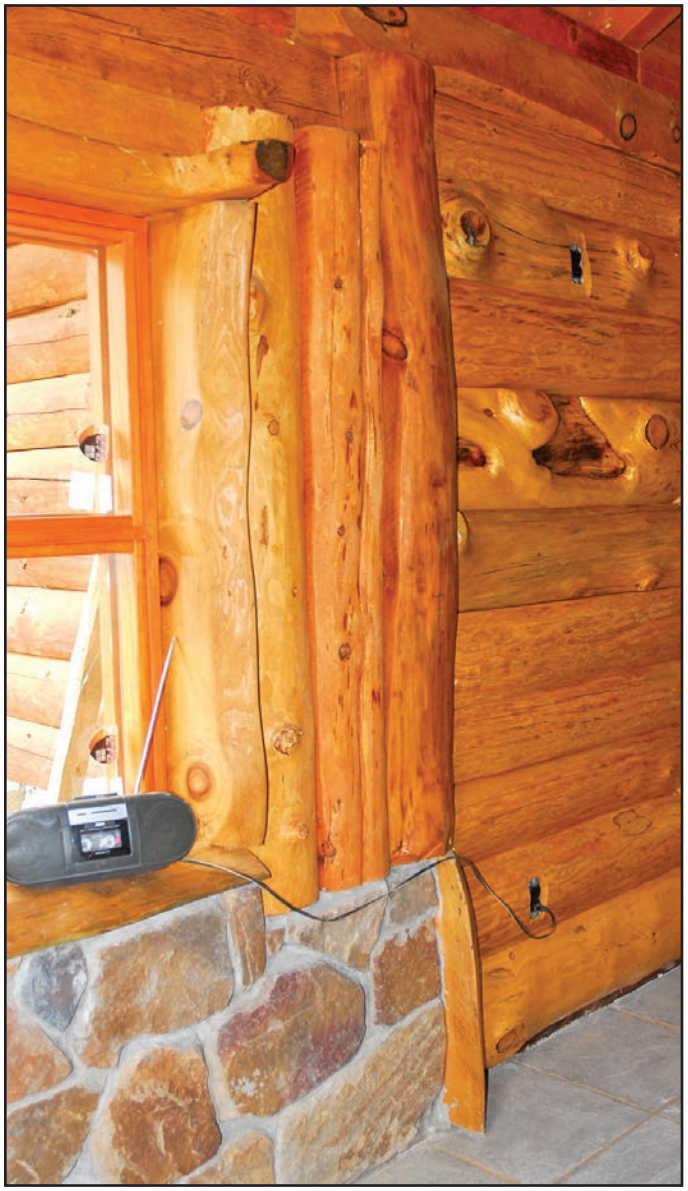
wood to prevent checking and serious UV drying, and water damage. New pressure treated wood may take a few months to dry, more reminiscent of the lumber drying process. The oxygen bleach or mild acid solutions can also be used on new or old treated wood to prep for finishes or sealers.

For indoor projects with surfaced wood, normally sanding is the most effective method of removing planer glaze. This glaze is caused in the surfacing process by the tremendous pressure from the platen on the planer, it closes pores and prevents finishes from adhering properly. Sanding will remove this barrier, as will the cleaning agents we have mentioned above. Do NOT sand treated wood, as the dust can be toxic to you and the environment.

Prepared, local logs and timbers to be used in Lee & Margo's new home

Building Construction

Log Style Buildings have been a significant component of construction within the local rural landscape for the past several decades. I use "log style" very loosely, as the reference to log homes is often poorly defined. Many buildings are referred to as log, however, they are framed and sided with a partial log, or in some instances a plank is mechanically coved to a rounded shape to assist the imagination in envisioning a log. In other words, these are log faced or log sided buildings. The craze toward log buildings was so extreme for some time that I recall an old lumber sales rep attempting to convince me to use the foam backed, composite faced logs (simply siding) which they were distributing. My gosh, I was such a purist I would not use cultured stone, referring to that as "lick and stick". When he said, "lightweight and insulated", I envisioned cheap and polluting. His attempt was in vain.



Interior log wall accents Northwoods living.

Logs can make an incredibly beautiful and functional building. If one understands all the factors around the use of logs, the conversation is more fulfilling. As we have learned above, large-size timbers are slow drying. We also see that sapwood shrinks more than heartwood when drying. Yet many log homes are constructed using large, full logs often in a way (think scribe or chinked) where the bearing surfaces are sapwood. If one uses a 16" diameter log, requiring eight years of drying, it is not practical to air dry these large full-length logs. Thus, other considerations must be made. Scribe builders needed to make a slide over windows, doors and even around chimney flashing and interior walls. The slide would compensate for the several inches of shrinkage which is certain to occur over a several year period. They often required a post jack system so a vertical support timber for an interior beam was compatible with the log walls. The concern around drying could also be raised, in that if a log wall is green, will it dry before it invites internal decay? This possibility could be more apparent on shaded sides, under wide (but necessary) overhangs and especially in deep forest cover. Damp rooms, such

Lee & Margo had a new Northwoods home built of local woods, using logs and large timbers and celebrated by placing a conservation easement on their 60 acres surrounding their new home.

as bath or laundry, could also possibly contribute to this concern.

I chose a very different use of full type logs, which served my career well. Admittedly, this system did require additional processing and handling, but also allowed for quiet and thorough drying of the individual logs. As I utilized large amounts of native stone in my technique, I found it vital to control the shrinkage and settling occurring in many log building methods. I also often used logs in a vertical fashion, thus with almost no shrinkage in the length.

We would remove much of the sapwood by flattening the tops, bottoms and sometimes the third side (usually inside) on the sawmill. We would then stack the logs with adequate air space, as we would for large timbers, to air dry. Once I achieved adequate inventory, the several years of drying in our White Pine logs was not a big problem. The removal of sapwood, along with the air drying achieved the goal of a more stable log wall with a much thicker contact surface which offered more overall insulating capacity. Thus, this style was a pleasure to look beyond the shrinkage issues and worked well with our use of stone, vertical posts and logs and even the use of vertical board on board paneling on interior walls.

In order to keep brevity in this log building discussion, it is not our wish to promote one technique over another. If you can use local wood, follow the best path forward and accent the advantages of whichever style you prefer. There are, however, several very important factors to consider if designing, considering or building a log home; and many relate to any construction.

Log walls or log siding is a very poor choice in any situation where water can drive against or splash on the logs. An adequate overhang is vital to the life of a log wall, especially logs in a horizontal position. Consider not only wind driven rain but also the splash which is caused by roof runoff on a deck. Not only are the seams between logs potential water catchers, but also the dry checks running randomly with the length of the log.

Over a decade ago I was called as an expert witness in a legal dispute. An owner-builder-seller in the Kickapoo Valley built a charming appearing log home on the side of a bluff, in very open conditions. The house caught more than the eye, as it also caught all the driving rains, laying doom to the log walls within short years following the sale. High, horizontal log walls, inadequate overhangs and the surrounding environment invited fungi and decay doing extensive damage to the logs. The result was appalling and a serious black eye to log homes. I learned an extensive knowledge on wood decay from doing my research, and shared some of that in Partners News July 2011, through an interview with a mycologist from Michigan Tech.

Keeping any untreated wood (and logs) well removed from soil or constant moisture is an important factor. A proper rule of thumb is to design log walls (and untreated wood) up off the ground and protected by overhangs. The building codes require eight inches from soil to untreated wood. More is better and can be aesthetically accented by the use of stone below the logs. Proper overhang design should consider any potential passive solar benefits on the south and west sides primarily. Overhangs which protect from summer sun (and rains) but allow for winter solar benefits are a good consideration. On higher log walls such as gable ends, I would often create an eyebrow overhang at a mid-point, protecting the lower logs and windows from rain and summer sun. Or I would use vertical logs on the lower wall. While a quality wood finish is great on log walls offering protection and aesthetics, a properly designed and constructed log building should not require the finish as a decay prevention. A well-built log building should be an heirloom, not a maintenance burden.

We strongly advocate for and encourage you to use local woods in your projects, especially your lumber and timbers from your own woodlots in as many practical methods as possible, be it structural as in joists, rafters and beams, practical as in roof or floor sheathing, appearance for paneling, flooring, cabinets or in a piece of furniture. We widely recognize the efforts and extensive work involved and are happy to assist in your learning process.

When considering a project at this time of unprecedented lumber prices, attempt to keep it local, as crafting with local wood offers global benefits!

For further reading, see a press statement concerning Local Lumber Law from Senator Roger Breske at this link.

https://partnersinforestry.com/Documents/Breske%20Statement%20on%20SB28%20(2).pdf

The Big Bear Hideaway in Boulder junction Wisconsin is a showcase of local woods and sustainability. While western Red Cedar shakes are on the roofs, and Southern Yellow Pine is buried in treated wood foundations, everything else in constructing the complex was sustainably sourced from public and private forest lands in the region. Accenting not only the local economy, but celebrating creativity, the local use is a testimony to our northern forests.

Additionally, consider the effort of a small-scale entrepreneur beginning a sawmill at this link.

https://dnr.wisconsin.gov/sites/default/files/topic/ForestBusinesses/Sawmill.pdf

For more on Balsam Fir in Wisconsin see this link.

https://dnr.wisconsin.gov/sites/default/files/topic/ForestBusinesses/BalsamFirReport.pdf

For Bob Simeone's journey using local hardwoods with accents of responsibly sourced tropical woods see this link.

https://partnersinforestry.com/forest_habitat.htm

The Oak and Cherry floor support a heavy plank table, using character woods for table and bench legs.

NON-TRADITIONAL FOREST PRODUCTS AND THEIR USES

In addition to construction materials, there is a vast array of other practical components which can be harvested or utilized from the forest. If done is a sustainable fashion, these considerations may offer economic, social and environmental benefits as well. We do stress sustainable however, as often these gathering practices can deplete a resource, which in turn can seriously jeopardize the environment. As a guide, recall Indigenous Elders' Wisdom: Take only what is needed. Pay your respects. Leave the rest.

CHARACTER WOOD: Well-known across the region is the use of character wood, burls, crotches and unique shaped log products. Used for everything from limb furniture to structural posts, these unique products can offer tremendous diversity and character to a project, and may offer a source of income to a landowner who has a crop of odd shaped trees. Even picking up curly shaped limbs after logging, or selecting a special odd shaped component from a stand may fit the purpose. Consider the use

value to the natural and aesthetic value as you contemplate harvest. I used many oddly formed logs for posts and support members. They offer a tremendous natural beauty and level of diversity to a project.

CHRISTMAS DECORATION: Other than the array of traditional Christmas trees so well known in the region, there are also viable opportunities to harvest boughs. Balsam Fir is very abundant across the north in small sizes as it readily fills in gaps, being shade tolerant, and is sought as boughs for wreaths and seasonal decorations. Spruce, Pine and Cedar are also used accordingly for Christmas trees and decorations. When harvesting Balsam boughs, consider the sustainability of the growing tree. Balsam Fir has a myriad of other benefits, including wildlife habitat, essential oils and more. Some guidelines include: Harvest boughs after at least two hard frosts as that helps the longevity, harvest from the bottom half of the tree, always leave a part of the branch for growth and regeneration (bough limbs are generally no larger than a pencil), do leave at least 50% of the tree in growing limbs, harvest from trees seven feet tall or larger, and retain aesthetics by not heavily harvesting near public roads as balsam offer tremendous cover.

BIRCH AND ITS BARK, STICKS, CHAGA: This is a category I hesitate to mention as our Paper Birch is in serious decline in this region. The species is heavily browsed by deer, and needs a disturbed soil to germinate from seed, thus we advocate for great care concerning White Birch. A long-time traditional bark industry has utilized Birch bark across the northern regions for decades. Removing bark from dead or down Birch is not a big concern, however this bark will likely be more fragile than bark from a live tree. Harvesting bark can kill a tree or degrade its lumber quality. We offer these simple suggestions: Harvest only from trees slated to be cut in

One of at least two common Lycopodium species in the northern forest.

the near future, harvest carefully by removing only the outer bark which is about 1/3 the thickness of the bark overall, harvest at optimal time (normally late June to early July), and roll your harvested bark at a right angle to the way it wants to roll back as it grew on the tree. Bark that curls back to its desired shape will be hard to undo after it dries. Laying flat with weight is also an option. Normally bark is harvested from trees of six-inch diameter or larger. Be careful by respecting our declining Birch resource. White Birch can also be utilized for its twigs and decorative poles, which can likely be done sustainably only after logging, by cleaning up tops. One can also consider Chaga from Birch, the medicinal fungi. For details on Chaga please see Partners News May 2018 (see link below).

Still Mill Leeks

PRINCESS PINE:

Lycopodium comes from Greek words luko (wolf) and Podos (foot) is sometimes called wolf's paw or wolf foot. Lycopodium species are not moss, though are commonly called a club moss. It is a tiny evergreen, possibly related to ferns, not moss. Two varieties are common in northern forests. *Lycopodium denroideum* is round branch ground Pine while *Lycopodium obscurum* is flat leaved ground Pine. Both are commonly called Princess Pine. A less common *Lycopodium complanatum* is related and called ground Cedar. Princess Pine is gathered for holiday green

This functional sawmill has a 52" circle saw in style F and has 50 teeth made of carbide cutting tips which are held in place with individual shanks. This mill saws primarily Pine and uses a 120 horse power air cooled diesel power unit.

Scribner rule, handmade cruise stick, and manuals all assist in achieving sustainability in the process of log to finish product, and are displayed on top of a heavy White Pine table.

decorations as well as medicinal herbal remedies but can be threatened by over harvesting. Historically it was also used as flash powder in pyrotechnics. Often many plants are genetically identical and make up a clone. The plants reproduce by spores and they have rhizome roots. An aerial stem can take six years to mature, after which they produce strobili or cones, which form the spores necessary for reproduction.

Harvest carefully by plucking the mature stem at the base near the ground, without disturbing the portion below. Only the mature stems which have produced spores are economically valuable. Harvesting mature stems in the fall may help the plant expand as the commotion may release the viable spores from the strobili, and on mildly disturbed soil begin reproduction. Harvest only mature stems, and never disturb the same area two consecutive years. Skipping a couple of years in between harvests can help assist in the plant's future. More on Lycopodium can be found in Partners News, April 2021 (See link below).

There are numerous other possibilities for a woodland owner to consider within the realm of Non-Traditional Forest Products (NTFP). Also, under the terms of agro-forestry or forest farming one can consider or possibly create markets for nuts, berries, leeks, and of course the northern favorite, Maple syrup. One can also explore medicinals and herbals, essential oils or extracts and cones for market possibilities. Further consideration of green products by transplants, trees, stems, or herbaceous plants. Do realize also, that clean water is a forest product. And a landowner can also consider recreation, allowing some use by others. Hunting leases or selling access for recreation may fall into this category.

We remain hopeful, also, that possible carbon markets may become viable for family forest owners. There is ongoing activity on the carbon issue in relation to climate concerns, but few concrete steps have developed at this stage to allow most landowners to achieve this goal.

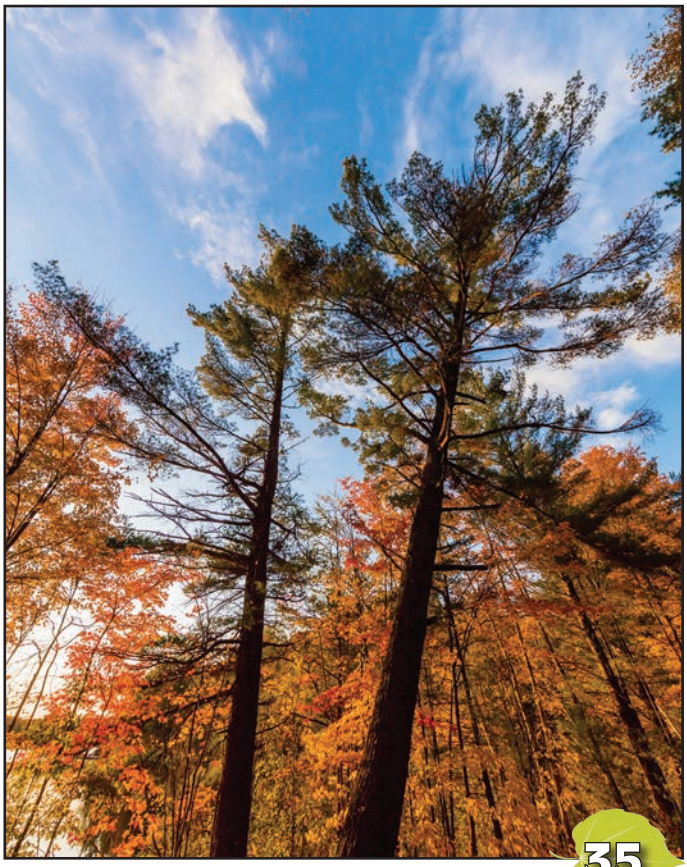
A charming Northwoods bathroom with a wooden tub and sink. Numerous species of local woods are involved with Juniper accents. The tub and sink are encased in marine epoxy.

Balsam chips/trees/boughs, bark from birch or other species, berries, birch branches/twigs, cedar products such as boughs or posts, character wood, cones, essential oils/extracts, herbals, medicinals, moss, cane and basket supplies, dried grapevine, wild plants, pine needles and boughs all contribute to markets for Aromatherapy supplies, arrangements/displays, basket supplies, carvings, essential oils, herbal products, mushrooms, canning, weaving, clothing, furniture of logs and sticks, instruments, special projects, restoration, swags, poles, plants, wreaths and more.

And of course, use the sweet favorite from trees. The table demonstrating Maple tapping, holes per acre per diameter of trees can be found at 8.1 of the USFS Eastern Region https://www.fs.usda.gov/r9

While we promote your use of these resources as benefits to the area's economy and your land stewardship, we continue to caution about the sustainability of the resource. As a greater widespread concern, please consider the following points as we look past our locale for education on the topic, from an environmental coalition promoting Indigenous rights across the world:

The harvest of wild non-timber forest products (NTFP) represents an important source of income to millions of people worldwide. Despite growing concern over the conservation of these species, as well as their potential to foster forest conservation, information on the

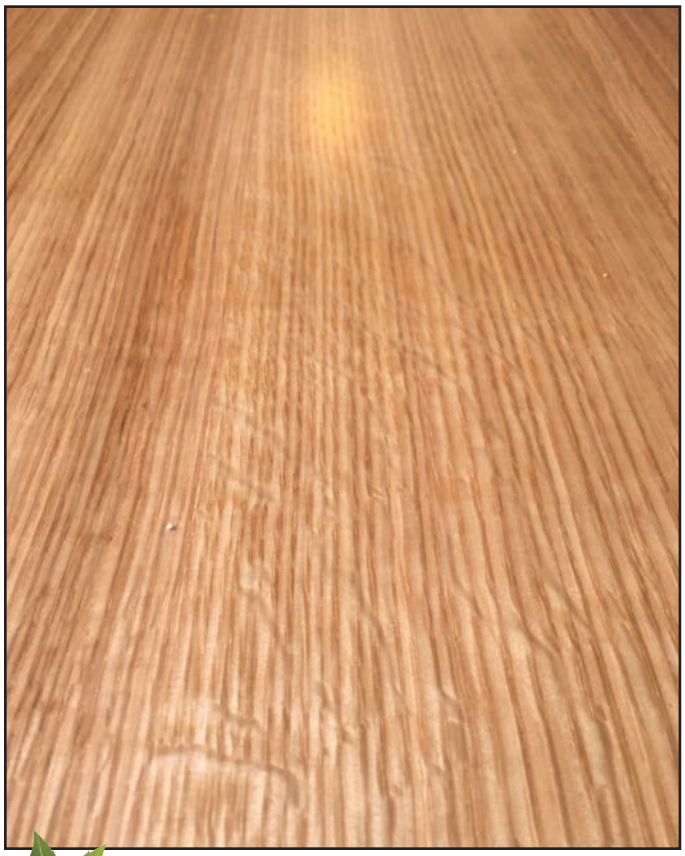


White Pine tree towers above surrounding colorful hardwoods.

ecological implications of harvest is available only in limited case studies.

Seventy studies that quantify the ecological effects of harvesting NTFP from plant species were found, with the aims of assessing the current state of knowledge and drawing lessons that can provide guidelines for management as well as better directing future ecological research in this area. The case studies illustrated that NTFP harvest can affect ecological processes at many levels, from individual and population to community and ecosystem. However, the majority of research was focused at a population level and on a limited subset of plant parts that are harvested.

Tolerance to harvest varies according to life history and the part of the plant that is harvested. Moreover, the effects of harvest for any one species are mediated by variation in environmental conditions over space and time, and by human management practices. In order to withstand heavy harvest, specific management practices in addition to gathering are necessary for many NTFP species. Management practices can be carried out at different spatial scales and some are highly effective in fostering population persistence.



A table top reveals grain pattern in quarter sawn Red Oak.

One could summarize this by stating, let's harvest with care and be aware of the many things we do not know. Once again, the Indigenous Elders' advice is critical to consider: Take what you need. Pay your respects. Leave the rest.

We should also be aware of the vast environmental benefits of the forest. For example, clean water and air are truly forest products. Our choices will impact our own well-being.

Partners in Forestry has attempted to stay abreast of local wood happenings and non-traditional forest market activities as well. Past issues of many previous Partners News can be found at www.partnersinforestry.com/newsletters where we have covered Maple syruping, leeks, mushrooms, gathering Chaga and much more. See Partners News November 2020 for a forest farmer's account of growing cultivated mushrooms. And most importantly, we can not do this alone, so please share your experiences with local woods, local crafting and non-traditional products from the woods.

Thanks to Renewable Resource Solutions LLC, and the USFS for assistance on the Nontraditional Forest Products report.

Additional credit paid to the University of Wisconsin Center for Cooperatives for their ongoing support, as we continue to explore the arena of alternative forest products, uses and marketing approaches. The following links offer further insight into alternative forest products

http://cels.uri.edu/docslink/safewaterPDF/FACTSHE9_2.pdf

https://www.fs.fed.us/forestmanagement/products/sfp/index.shtml

FUEL: Any discussion on the values of local wood use should also at least credit the use of wood for fuel. Many of us have used wood to heat our homes and more, for a very long time, and it is a historical source of heat in most any forested region. In recent years, the aging process perhaps, drove me to begin converting some of our heat needs to gas. I stress begin, as in short order I experienced a revival of conscience, long before any gas was installed, accepting and appreciating the innumerable benefits of wood heat.

Which woods to choose may be a question. If one measures by volume (cord), the dense hardwoods certainly top the list in BTU value. However, if one measures by weight of dry wood for example, things get much closer, as 1 pound of dry wood will yield approximately 6,000-8,000 BTUs. Pellets are generally promoted as 8,100 BTU per pound. Some sources show wood as high as 8,500 BTU per pound. Comparatively, coal has 12,000 BTU and fuel oil 18,000 BTU per pound. One full cord of dry hardwood should yield the BTUs of one ton of coal or 200 gallons of fuel oil.

Certainly, some of the discrepancies in BTU per pound of wood are based on the dryness (oven dry vs. typical dry). Dry wood is essential for efficient burning. If a wood burner does burn green wood, it is an inefficient and polluting process, additionally hampering the stove and the chimney. Certainly, wood at or below 20% MC is preferred. Dense hardwoods may take two years to dry thoroughly, depending to a degree on the location stacks are in, and the available air flow. Shorter lengths and splitting certainly does assist the drying process, as wood dries significantly from the end grain and very little through the bark.

Hardwoods take more heat to ignite, however they burn much longer. Not all deciduous woods are higher in BTU by volume than are all conifers. For some common area woods from southern Wisconsin up through the western UP, the below list is descending from close to 30 million BTUs per cord, down to less than 13 million BTUs per cord.

Hickory, Black Locust, Ironwood, Apple, Oaks, Sugar Maple, White Ash and Yellow Birch are excellent to very good choices in BTU per cord.

Mid-level BTU per cord include White Birch, Tamarack (but it throws sparks), Cherry, Green Ash, Elm, Black Ash and Red Maple.

Lower-level choices in BTU per cord are Jack and Red Pine, Aspen, Hemlock, Spruce, White Pine, Fir, Basswood and White Cedar.

Do consider which woods you have in abundance and that all wood does burn and gives heat. Ideally the woodshed will have the denser hardwoods available for the coldest days, however it is doubtful that will always play out in practice. In milder weather, igniting a short burn with a couple sticks of a softwood may be just what is needed.

In the end, having a mix of hardwoods and softwoods on your woodpile can help you to control your burn. While hardwoods take longer to catch fire and will burn longer, softwoods ignite quickly and burn fast. That makes softwoods ideal for getting your fires going, or for short burns. In cold weather, once your fire is burning well, you can add hardwood to keep your fire burning for long periods.

We close by stressing several factors. Please burn dry wood. Keep your chimney clean. Do not transport fuelwood over great distances, as you never know what critter or disease is active in fresh cut wood and may be hitchhiking. The exception to the transportation guidance would be wood that has been heat treated or thoroughly dried. And do enjoy the warmth and ambiance of a fire, with local wood.

There is more on wood burning in the USFS Timber Management Field Book, link provided above. See 8.2 as well as the weight table at 2.1. The weight table is very informative for more than fuel, as it covers weights per cord, per 1 MBF lumber green, per cubic foot green and cubic foot dry. This guidance can benefit our uses and transportation of local woods.

Conclusion

Humans have had an intimate relationship with wood for centuries, and forests have enriched our lives in numerous ways. Looking to the future, the forests likely will be essential to our very survival as a means of mitigating climate disruptions. At the same time, humanity has exploited vast areas of forest land in startling and unsustainable ways, which may paint a bleak future. As woodland owners, respecting our own lands for their economic, social, environmental and intrinsic values offered to us is paramount. What better way than to utilize our own forest resources in a sustainable way?

We hope you can enjoy, utilize, and be enriched by a better relationship with your woodlands. Everything around the growth and careful use of wood has the potential to benefit humans, and perhaps technology will expand on these facts. Let us not forget that wood is much more than another industrial product. It simply feels right to live in a wood home, to experience the warmth of a wood fire, to take a walk in the woods; it even felt good to me to work with wood through my career.

Care for your woods, use the resources with respect, experience the benefits and become holistic in your land ethic. Use local wood to benefit the greater good.

THANK YOU!

CREDITS:

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This document was drafted by Joe Hovel and edited by Rachel Hovel.

Partners in Forestry Coop and Northwoods Alliance Inc. strive for economic, social and environmental justice on the landscape of Northern Wisconsin and the Western Upper Peninsula. We partner with other groups to promote sustainable forest management and forest land conservation.

See ***Northwoods Forest Conservation: A Handbook*** for many references.

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A stand of mixed Cedar and Hemlock on the Wildcat Falls Community Forest. This part of the community forest will not allow timber harvests to protect Hemlock, Cedar and riparian features.

A forester selects appropriate trees and they go to the sawmill for processing into lumber.