

Cross Laminated Timber
By John Matel, Virginia Tree Farm Foundation

You will be hearing a lot more about cross laminated timber (CLT). CLT is a building material for the future. This material can be used instead of steel or concrete to construct medium and high-rise buildings. It is the material that will make it possible to build cheaper, faster, and better using an ecologically positive product - wood.

Wood does not get the respect it deserves because it is too familiar. But take a close look at a piece of wood and notice its details, its natural attractiveness in sight, sound, feel, and smell. If we invented wood today, we would call it a high-tech, composite material designed to be environmentally beneficial in production, beautiful in use, and benign in disposal.

What is CLT?

Cross laminated timber is made of wood, a product of our forests, with all the great attributes of wood. It sequesters CO2, is lightweight, and easy to work. CLT is as strong as steel or concrete in many applications. How? Timber is strong in compression, i.e. pushing down, but less in tension, i.e. spanning across. Trees are columns. They carry the heavy weight of the tree above to the ground below.

Cross laminated timber takes advantage of wood's strengths. It is made in panels, each made from three, five or seven, always odd numbered, layers of dimensional timber, with the grains crossed so that they have strength in compression AND in tension. They are cold pressed and glued into panels. It is revolutionary in that it replaces concrete and steel in spanning and structure with lightweight, environmentally friendly wood that can be cut to order in a wood processing plant so that it can be assembled on site in a fraction of the time.

Where is CLT used?

CLT has been used for decades in Europe, Canada, and Australia. The world's tallest wooden building is 18-story Brock Commons in British Columbia, but taller structures are planned in cities like London, Paris, and Montreal. CLT is only now starting to make an impact in the US, where building codes often treat CLT like mass timber and limit building height to six stories.

What about fire?

No building material can withstand hot fire. Steel bends and collapses. Concrete crumbles. Wood burns, but CLT does not burn easily or rapidly. It chars (try starting a campfire with only a match and big logs). Tests indicate that CLT panels will resist fire and collapse as long as concrete and steel, long enough for people to get out and the fire department to arrive. CLT has the additional advantage of being predictable, since CLT chars and burns at uniform rates. Steel and concrete bend or crumble causing structures to collapse more capriciously.



*There are many opportunities for using cross laminated timber, from tall buildings (top) to BBQ grills (bottom).
 Photos by: John Matel, Virginia Tree Farm Foundation.*

Do we have enough wood?

North American forests are growing robustly and have been for the last half century. It would take about six minutes for American forests to replace all the wood used in Brock Commons. In fact, some of our forests are TOO thick. CLT will allow us to clean up the forests and improve their health. I can see cities built of wood, each building holding carbon and improving our environment. Americans forests sequester about 12% of the CO2 produced in the US by industry, cars and homes. Well-managed forests do it better, not only in the wood, but also in soils and underground. Now let's think about keeping that carbon in the wood in the buildings in our cities. Wood is good. CLT will let us use more of it.

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VIRGINIA FOREST LANDOWNER UPDATE

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You can reach the Virginia Water Resources Research Center at 210 Cheatham Hall, Blacksburg, VA 24061-0444; (540) 231-5624; water@vt.edu. We welcome your questions or requests for help in finding water-related information or resources.

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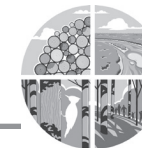
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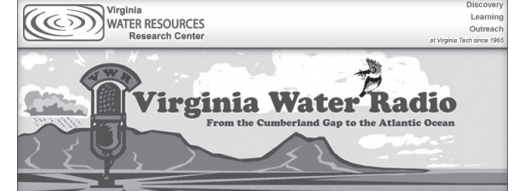
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VIRGINIA FOREST LANDOWNER EDUCATION PROGRAM
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Introducing Virginia Water Radio and the Virginia Water Resources Research Center
By Alan Raflo, Virginia Water Resources Research Center



Logo designed by George Wills, Blacksburg, VA.

Here's a history question. What common everyday item owes its origin—in part at least—to the following men, all active from the mid-1800s to the early 1900s: James Maxwell, Heinrich Hertz, Nikola Tesla, Alexander Popov, and Guglielmo Marconi? All of these men, along with other scientists and engineers, contributed to the invention or development of the radio. From Robert Peary's 1909 message upon reaching the North Pole, to the World War II messages from Franklin Roosevelt and Winston Churchill, to the daily talk shows that enliven and influence politics and culture in 2017, radio has been an indispensable part of modern communications.

The Virginia Water Resources Research Center (Water Center) is using this tried-and-true technology—matched with some 21st Century enhancements—to give Virginia citizens another way to stay informed about our state's water resources. Virginia Water Radio, online <http://www.virginiawaterradio.org>, is a weekly broadcast and podcast related to Virginia's water resources. Each episode, running normally between three and five minutes, begins with a "mystery sound" or a musical selection related to water, followed by a short discussion of the water body, issue, event, or organism, connected to the sound or music. As of September 2017, the show is broadcast on WEHC at Emory and Henry College and on WVRU at Radford University, and podcasts of all episodes are online at the program's Web site. Visitors to the site can listen to previous episodes, view show notes for more information, and sign up for notification of future episodes (via RSS feed or podcast download). A subject index helps listeners find episodes of interest, including the following episodes specifically focused on trees:

- Ashes – Episode 376, 7/10/17
- Sycamores – Episode 176, 8/26/13
- Flora of Virginia - Episode 354, 2/6/17
- Tree colors and changes in fall – Episode 285, 10/9/15
- Forestry – Episode 160, 5/6/13
- Tree structures for water movement – Episode 285, 10/9/15
- Maples – Episode 84, 10/17/11
- Trees' human and ecological benefits - Episode 153, 3/18/13
- Rhododendrons - Episode 216, 6/2/14
- Witch Hazel – Episode 238, 10/31/14

Established by the Commonwealth of Virginia in 1965 and housed at Virginia Tech, the Water Center aims to support education, research, and public information and service related to water resources in the Commonwealth. Since 2005, the Water Center has been part of Virginia Tech's College of Natural Resources and Environment.

In a rapidly changing communications landscape, the Water Center's mission challenges it to find affordable, effective, and widely available ways to deliver water-related information to Virginians. Virginia Water Radio is one of the Water Center's efforts to fulfill that mission. Here are several others:

The main Web page is <http://www.vwrrc.vt.edu/>. That page includes links to the Water Center's education, research, and public information activities. Under the Outreach section, at <http://www.vwrrc.vt.edu/subscription-services/>, you can subscribe to various Water Center information services.

Virginia Water Central Newsletter, online at <http://www.vwrrc.vt.edu/water-central-news/>, is published 1-2 times per year with information on water news, policies, science, status of water resources, and stewardship.

Virginia Water Central News Grouper, online at <http://vawatercentralnewsgrouper.wordpress.com/>, provides annotated links to water news articles, events, and resources, all grouped into topics. Regular posts cover upcoming water-related government meetings, other water-related events in and outside of Virginia, and recent data on precipitation, stream flow, and other water-quantity measures.

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Sign up to receive the Virginia Forest Landowner Update at: <http://forestupdate.freec.vt.edu>

EVENTS CALENDAR			For the most complete listing of natural resource education events, visit the on-line events calendar at http://forestupdate.frec.vt.edu		
Contact	Date	Location	Event	Time	Fee
DCR	Oct., Nov., & Dec.	Virginia's State Parks	A variety of events and activities For a complete list, visit: www.dcr.virginia.gov/parks	Varies	Varies
MP	Year-round	State-wide	Virginia Master Naturalist Volunteer basic training www.virginiamasternaturalist.org/chapters.html	Varies	Varies
BW	Oct. 5 - RE-SCHEDULED FOR NOV. 2	Pulaski County	Pulaski County Fall Forestry & Wildlife Field Tour On this tour we'll see how active logging can create habitat for golden-winged warblers and pollinators, tour an active sawmill, and learn how to protect our homes and woods from wildfires.	8 - 5:00	\$35*/person; \$60*/couple
JF	Oct. 10	Buckingham County	Buckingham County Fall Forestry & Wildlife Field Tour Here in the geographical center of Virginia, forestry is alive and well. We'll see good pine and hardwood forest management practices that are essential for protecting water quality.	8 - 5:00	\$35*/person; \$60*/couple
JF NC JG	Oct. 17 & 24 Nov. 2 & 9 Nov. 9 & 16	Chatham New Kent Radford	Preparing for Generation NEXT Are you prepared to pass the environmental and heirloom values rooted in your forest to the next generation? By researching and planning ahead of time, you can ensure your wishes are met and minimize the financial costs and emotional challenges while securing your woodland legacy.	12:30 - 7 12:30 - 7 9 - 4:00	\$50* for up to 2 family members; \$25* each additional (Chatham only). \$70* for up to 2 family members; \$35* each additional (New Kent/Radford)
AD	Oct. 20	Augusta County	Augusta County Fall Forestry & Wildlife Field Tour Join us for a varied day in the fields and forests of beautiful Augusta County. From the mountains in the George Washington National Forest to the South River, we will explore a variety of management tools for landowners to improve forest productivity, diversity, and habitat value.	8 - 5:00	\$45*/person; \$80*/couple
NC	Oct. 25	Emporia	Emporia Fall Forestry & Wildlife Field Tour Bottomland hardwoods and associated wetlands are tremendously important when it comes to buffering storm water runoff, filtering out pollutants, providing excellent habitat for wildlife, and offering recreation. They can even generate some income for the landowner. Learn about the options on this tour.	8 - 5:00	\$45*/person; \$80*/couple
JG	Oct. 26	Goldvein	Tree Farm Dinner & Tour Join Tree Farmers and other landowners interested in practicing good forestry on their lands. Tour an active Tree Farm and learn about the Virginia Tree Farm Foundation. All woodland owners are welcome and encouraged to bring a friend or family member. Dinner will be provided.	3:30 - 6:30	\$10*/person; \$5* each additional family member
If you are a real estate professional or Commissioner of the Revenue, please visit the Landowner Update website in early 2018 for a schedule of our NEW continuing education classes, Real Forestry for Real Estate. (http://forestupdate.frec.vt.edu).					
*meals included					

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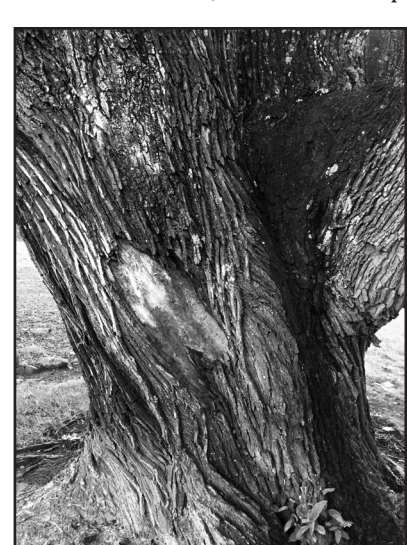
You Ain't From Around Here! Exotic Invasive of the Quarter: Norway Maple (*Acer platanoides*) By Jennifer Gagnon, Virginia Tech

I've decided to feature Norway maple as the exotic invasive of the quarter as an ode to the lovely, albeit invasive, individual that dominates my front yard. You can see a photo of it here: <http://bigtree.cnre.vt.edu/detail.cfm?AutofieldforPrimaryKey=1903> because it is the fourth-largest Norway maple in Virginia. Being a nerdy forester, this is something that brings me great pride. I'm not ashamed of it being an exotic invasive as I was not the one to plant it over 100 years ago. This article is a tribute to it, because it is not long for this world. In the past year, I've seen significant decline – a thinning crown, sloughing bark, fungal bodies at the base, and a large crack along one of the main stems. The wind is wicked out at my place and the tree hangs over my roof. Not a safe combination for a tree in this condition. As such, my husband and I have regretfully come to the decision to take it down this fall. This will completely change the character of the yard, reduce shading of the house, and make me very sad. On the upside, it will reduce seed production from an exotic invasive species.

Native to Europe (from Norway south) and western Asia, Norway maple was first introduced to the United States by John Bartram in 1746. The dense, rounded crown, ease of transplanting, rapid growth rate, resistance to damage from wind and ice, and tolerance of a wide range of soils, pollution, and temperatures quickly made it popular as a street tree in urban areas.

You may be asking yourself, if it's such a tough, lovely tree, what's the problem? Norway maple produces copious amounts of seeds, forms dense canopies, shades out native species such as sugar maple, and reduces wildflower diversity. Additionally, the surface roots are shallow, leading to damage to lawns and pavement.

Norway maple long ago escaped its urban plantings and now has become a component of eastern forests. In fact, it can be found as a component of early and late successional forests, forested wetlands, open disturbed areas, roadsides, vacant lots, yards, and gardens. In Virginia however, Norway maple isn't the worst of the worst when it comes to invasive species. Virginia's Department of Conservation and Recreation's Division of Natural Heritage only has it ranked as a medium invasive threat. But in northern states, such as New York, it can be more problematic.



Sloughing bark on its own may not be a sign of decline, but if there are other symptoms, such as a thinning crown and fungal growth at the base, yard trees should be examined by a qualified arborist. Photo by: Jennifer Gagnon, Virginia Tech.

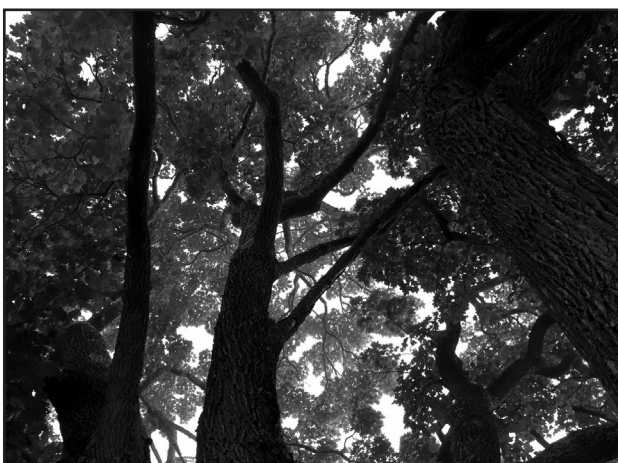
How to control Norway maple:

Mechanical: Pull small seedlings when soil is moist. Dig out root systems of larger seedlings/saplings. Cut down large trees and apply herbicide to stump to prevent sprouting or girdle trees.

Chemical: Cut stump treatment with glyphosate; or cut stump or basal bark treatment with triclopyr.

Soon my woodland shade garden will be no more. The male hummingbird will no longer have a perch from which to guard the feeders on our porch from the female who is unrelenting in her attempts to feed from them. On the plus side, there will be enough firewood to heat our home for the next several winters. The Norway maple will be replaced with a white oak seedling grown from an acorn collected from Virginia Tech's Stadium woods. Hopefully this native tree will one day grow up to be a state champion contender. And I am perfectly comfortable letting the owners 300 years from now deal with its imminent decline.

Jennifer Gagnon is an Extension Associate, 540-231-6391, jgagnon@vt.edu.



A thinning crown may be a sign of decline. Photo by: Jennifer Gagnon, Virginia Tech.

Environmentally Friendly Homes By Adam Downing, Virginia Cooperative Extension

If the three little pigs were environmentally conscious and building houses today, what materials would they choose to build with? What constitutes an environmentally friendly home that will stand the test of time? Some would say it is a home designed to use natural systems such as sun in the winter and shade in the summer or perhaps even geothermal energy, to limit reliance on electricity and fossil fuels. Indeed, these and other factors such as energy-efficient appliances are part of a design that limits a home's impact on the environment. But, builders of truly environmentally friendly homes need also consider what the structure is made of. What's holding it all together?

Home building materials used today fall into roughly three categories: wood, concrete, and steel. Each of these has certain benefits, drawbacks, and environmental costs. Consideration must be given to what it takes to produce a load of 2x4's, concrete, or steel framing and deliver it to a building site. Where do these raw materials come from? What is their availability? What does it take to extract and process them to make usable building materials?

Wood, concrete, and steel are end products, processed from various natural resources. Wood, of course, comes from trees. Concrete is a mixture of sand, gravel, and cement (made of burned lime and clay). Like concrete, steel also comes primarily from below the earth with the mining of iron ore that is alloyed with other materials to achieve certain properties. While each of these materials is extracted and processed differently, the environmental friendliness of each can be measured by keeping track of the total energy inputs for the product, from cradle to grave. The amount of energy required is a quantifiable tool to measure environmental impact.

One study was conducted in a part of the world where a typical house has a steel frame, corrugated iron roof, a concrete floor, brick veneer wall cladding, and aluminum window frames. The fraction of this house in steel is only 6% by weight but consumes up to 31% of the total energy! A house such as this requires approximately 525 units of energy measured in billions of joules (GJ). A typical concrete house ranks second, totaling almost 400 GJ. The concrete in this type of house accounts for approximately 26% of the total energy consumed.

The energy used to produce the wood used in a typical wood house totals less than 20% of the total energy required for the materials in that house. Overall, a wood house requires just over 300GJ to produce. This is greater than 10% savings in total energy in production when compared to a concrete house and savings of almost 40% when compared to a steel house! This means that wood is the most environmentally friendly building material considering how much energy it takes to obtain and process various materials.

Not only does wood require the least amount of energy to process, but it also comes from a natural resource that is renewable. As mentioned earlier, all three products originate from natural resources. Natural resources fall into one of two broad categories, renewable and non-renewable. Renewable resources, as the name suggests, are renewable. That is, within a reasonable time frame (a generation or two), the resources we harvest can be replenished. The best example of a renewable natural resource is a forest. On the other hand, non-renewable natural resources cannot be replenished within a reasonable time frame. Materials such as iron and concrete are examples of products that come from primarily non-renewable resources. When sand and gravel are mined from an area, they will only be replenished by natural systems over thousands and millions of years. The same is true for iron ore, the primary ingredient in steel.

Trees, as natural resources, grow very fast. Trees can be harvested for use in our homes and offices and more trees will grow during our lifetimes. With a little bit of management, we can even encourage faster and better growth. Depending on the type of trees, a new stand ready for harvest can grow from the ground up in as little as 15 years to as great as 100+ years. Even at this upper end, wood is a very renewable resource!

Wood, concrete, and steel are all acceptable building materials in terms of strength and durability. But, they are not created equal in terms of the impact to the environment. If the environmentally conscious three little pigs were building houses today, what material do you think they WOOD choose?

Adam Downing is the Northern District Forestry & Natural Resources Agent, 540-948-6881, adowning@vt.edu.

The data regarding different building material was taken from the following source: Glover, J., D. White, and T. Langrish. 2002. Wood versus Concrete and Steel in House Construction: A Life Cycle Assessment. *Journal of Forestry*. 100(8):34-41.



Homes built with wood, a renewable natural resource, are 40% more energy-efficient to produce than steel homes. Photo by: Adam Downing, VCE.