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Paulownia: A Stifled Agricultural Resource

by
Thomas Sutton

The Paulownia *tomentosa*, commonly known as the Empress Tree, is a fast growing, deciduous tree that is considered a native species to China, and can be found in many temperate ecosystems throughout North America. The Empress Tree's lumber is very popular in many Asian countries such as China and Japan, and the potential for the tree as an agricultural benefit to the United States is endless. (Invasive Plant Atlas of New England). However, the Paulownia *tomentosa* is currently listed as an invasive species and as a result, the economic profit of the crop is severely stifled. Although considered invasive, the Paulownia *tomentosa* does not meet all required criteria to remain on the invasive species list. Paulownia *tomentosa* should be taken off of the invasive species list and further research should be conducted as to the economic and agricultural benefits of the species. This research paper will give reasons as to why the Paulownia tree should not be listed as an invasive species, compare and contrast the difference between the Empress Tree and Kudzu (a commonly known invasive species in the southeast United States), and then explain who stands to benefit from the Paulownia tree being taken off the invasive species list.

In order to fully understand why the Paulownia tree should not be listed as an invasive species, one must understand why a genus should be put on the invasive species list. An invasive species is defined as any "species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health" (Beck, et al. 414). Furthermore, a species can meet some, but not all of these criteria and still not be considered invasive. For example: In many situations, livestock is not native to the location it is being raised; however, due to their economic benefits, they are not considered invasive. Additionally, livestock is not considered invasive because domestic animals are not considered part of a population. However when a species becomes free from domestication it then can be considered invasive (e.g. feral pigs). Equally, a genus can cause economic or environmental harm and still be native to an ecosystem; therefore, it would not be considered invasive. Non-migratory Canadian Geese, for example, can cause many problems by fouling land throughout the United States, but are not considered invasive because they are native to North America (Beck, et. al. 415-416). The Empress Tree does not meet any of the above criteria.



Paulownia Elongata Specimen
Mizzell

President's Message . . .



Hello to all Paulownia enthusiasts in America and all over the world. We continue to receive emails and phone inquiries at a high rate from other countries as our international interest and membership grows.

In the past, much of our emphasis at the annual conferences has been on selecting and growing Paulownia trees. Now, for many of us, it is time to reap the rewards of our hard labor and look forward to a bountiful harvest. We have many more ways to use the wood that have come into focus in the last few years. This conference will demonstrate some of these new uses. One that we are very excited about is bio-char which utilizes the waste stream of a timber harvest and has many uses, primarily as a soil amendment for gardening and agriculture. We will also look at other markets for Paulownia wood.

So I hope all of you will join us for a beautiful American Paulownia Association Conference on the Eastern Shore of Maryland!

George Newsome

Many common introduced plants in the United States are justifiably considered as invasive species. Kudzu is among these. The first criteria that Kudzu meets, to be considered an invasive species, is that it is not native to North America. Kudzu was brought to North America from Asia in 1876. The plant was brought to the United States to help prevent erosion, and in the 1930s the United States government promoted it as a viable crop to feed livestock (Hettinger 195).

Like Kudzu, the Paulownia tree was once promoted by the United States government, along with numerous universities, as a beneficial crop. Also like Kudzu, many individuals believe that the Paulownia Tree was introduced to the United States in the mid-1800s. Most believe that the tree was introduced by Admiral Samuel Francis DuPont when he was returning from China with jars of tea. DuPont used the tiny Paulownia seeds as padding to prevent the jars from breaking (Carpenter and Graves). By the late 19th century Paulownia was being used as an ornamental and landscaping tree. Today, it is still widely used as an ornamental tree in the United States (Gilman). Although many individuals consider the Empress Tree to be a non-native species, studies have shown that it is actually native to North America.



Elongata Clones B.Brown

In his article, paleontologist Charles Smiley describes his findings of ancient leaves while digging fossils in southern Washington and northern Oregon. Smiley found that the leaves were almost identical to the leaves of the modern day Paulownia *tomentosa* (176). These findings completely discount the currently held notion that the Empress Tree is an exotic species to North America. Although this proof that the Paulownia tree is native to North America should be enough to take it off the invasive species list, it also does not meet the other required criteria to remain an invasive species.

Another criteria for a species to be selected for the invasive species list is that it must cause environmental harm to the ecosystem it resides in. Environmental harm can be the product of numerous instances. Examples of environmental harm can include, but are not limited to, a deterioration of wildlife

habitat, a reduction in topsoil stabilization, variations in flora and fauna rate, or a land's diminished carrying ability for livestock or wildlife. Some species may commit one, some, or many of these examples to be considered an invasive species (Beck et al. 417-418).

Kudzu, again, is a perfect example of what an invasive is. The plant embodies the meaning of environmental harm. Kudzu is a vine plant that is considered to be in the legume family. One of the plant's vines has the potential to reach 100 feet and it will grow over virtually anything in its path. Kudzu eventually kills the plants that it covers because it blocks almost all of the sunlight the plant needs to survive, and because kudzu can grow up to one foot per day, it can break branches and even uproot trees due to the crippling amounts of biomass it produces (Langland et al.). Even worse, in their study, Jonathan Hickman and others found that Kudzu increases nitric oxide emissions into the atmosphere (10117). Furthermore, due to the alarming rate that Kudzu grows, it is estimated that it covers about 2 million acres in the United States alone (Langland et. al.). Paulownia does not begin to compare with Kudzu in the amount of environmental damage caused.

One of the main reasons some individuals consider the Empress Tree as an invasive species is because of the numerous amounts of seed the tree produces and the fast growth rate of the tree after the seeds have germinated. There is no arguing that a mature Paulownia *tomentosa* tree can produce 20 million seeds in one season (Innes). But, that is because it is so difficult for one Paulownia seed to germinate. The trees are extremely sensitive, need bare ground, and need plenty of sunlight. Of those 20 million seeds, only a few trees will become fully mature Paulownia Trees (Sutton). It is also factual that the Empress Tree can grow up to two meters in its first growing season (Innes). However, the tree would only grow at that rate in perfect conditions. If the tree needs to compete in any way with other trees, its growth would be significantly stifled (Sutton).

The Empress Tree does not cause any amount of environmental harm. The tree does not deteriorate wildlife habitat, reduce soil stabilization, change flora and fauna rates, or diminish a land's ability to carry wildlife or livestock. Furthermore, the tree is unable to compete with plant species that are considered native to North America. In a study to find ways to eradicate the Paulownia *tomentosa*, James E. Moore and Elizabeth P. Lacey found that "broadcasting seeds of native tree species, such as *Platanus* [American Sycamore] and *Liquidambar* [American Sweet-gum] onto bare disturbed sites may help slow the establishment of ... Paulownia" (392). Even though these individuals view the Paulownia tree as invasive, their findings indicate that Paulownia does not cause environmental harm. This is evident because the Paulownia tree was unable to compete with the native species. If a genus that cannot compete with native species in their habitat then it cannot be environmentally harmful to the ecosystem in question. Not only is their proof that the Paulownia *tomentosa* is native to North America and does not cause environmental harm, but it also does not cause harm to human health.



Paulownia NC - G. Pace



Lab Cultured Plants - FVSU



Didgeridoo New Borns - Quattrone

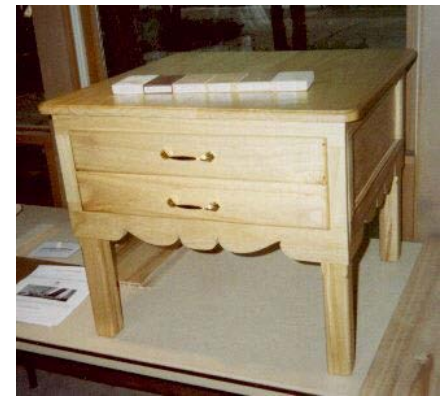
Again, causing harm to human health is another criteria for a genus to be listed as an invasive species. An example of a plant causing harm to human health includes, but is not limited to, plants that are poisonous or plants that could cause a disease or infection of any sort. While Kudzu is not harmful to human health, there are many other invasive plants that are. For example: exposure to the Tree of Heaven's (native to china) sap can cause inflammation of the heart muscle when it comes in contact with broken skin. Workers who cleared out infested areas, and were exposed, have "experienced fever/chills, chest pain radiating down both arms, and shortness of breath." (Beck, et al. 418)

Again, the *Paulownia tomentosa* does not cause any harm to human health. In fact, the opposite has been found to be true. The plant has been used for centuries in Chinese medicine (Sutton). Additionally, studies have shown that the Empress Tree may be effective in the removing pollutants from tainted soil. In their study, Elissa Azzarello and others found that *Paulownia tomentosa* was very effective at removing dangerously high amounts of zinc from soil that had been polluted as a result of mining. While low levels of zinc are necessary to provide nutrients to plant life, extremely high levels of zinc have a negative effect on the ability for most plants to grow. Also, very high levels of zinc can have detrimental effects to the human body (14-17). One can now deduce that the *Paulownia* tree does not cause environmental harm, the tree may be native to North America, and does not cause harm to human health. *Paulownia* also has no negative effect on the United States economy.

Economic harm is another reason for a genus to be listed as an invasive species. Invasive species can cause many long lasting and negative effects on the economies they reside in. This includes, but is not limited to, exacerbating business opportunities, diminishing sport fishing opportunities, decreasing agricultural tourism, or reducing agricultural growth. Each of these above conditions could adversely affect the local economies they are in. In short, any species that is not native and cost the population or the local or federal government revenue could justifiably be listed as an invasive species (Beck et al. 418-419). Kudzu is a perfect example of a genus' ability to cause economic harm.

Kudzu is very damaging to numerous economies throughout the southeast United States. This exotic species will take over any other plants that get in their path, and this has been very taxing on government spending. The total estimated losses to agricultural businesses are calculated at 500 million dollars a year, and it is estimated that the government spends about 1.5 million dollars a year to remove Kudzu from wires and poles. Furthermore, Kudzu carries a disease called "soybean rust" which is a very detrimental disease that affects soybean crops (The Growing Problem of Kudzu). The Empress Tree does not compare to Kudzu in the amount of economic harm caused on a daily basis.

Unlike Kudzu, the *Paulownia tomentosa* does not cause any amount of economic harm. Any revenue spent by a government to eradicate the species is a wasted use of economic assets. The tree causes no environmental harm, therefore no crops are being negatively affected by it. It is resistant to most pests so it will not help other invasive species migrate (Sutton). Furthermore, it in no way decreases returns from



Paulownia Furniture - Davis

agricultural tourism or stifle agricultural growth. Oppositely, the Empress Tree could help to improve the economies it is grown in.

Paulownia tree farming could have positive and lasting effects to numerous economies throughout the United States. According to the Tennessee Forest Products Bulletin, Paulownia logs are selling for about 85 cents per board foot. To put that in perspective, Hickory logs sell for 40 cents per board foot, White Pine sells for 22.5 cents per board foot, and Oak and Cedar logs are both selling for 30 cents per board foot. Paulownia lumber is selling for more than double its' (more commonly grown) competitors. Also, David Sutton, a Paulownia tree farmer for over 25 years, is selling his lumber, already processed, for up to 10 dollars per board foot. Not only does Paulownia lumber cost more than other logs, it also has a much faster turnaround. A mature Paulownia tree, with established root systems, can be processed as often as every 15 years. This is not possible with most other species of trees (Sutton). Additionally, Paulownia is ideal for countless markets.



Kiln Frame Loaded - Zither Instrument Wood

The Empress Tree is a very valuable wood in quite a few markets. Due to the tree's strength, relative to its weight, it is ideal for furniture production (Hardie et al. 2). Also the wood is ideal for many water sports. David Sutton has a high percentage of his sales go to individuals that build surf boards, paddle boards, kayaks, and hand planes (devices used to aid an individual in body surfing). With such economic and agricultural potential, why is this tree not a commonly accepted source for lumber?

According to Executive Order Number 13112, the United States Government has the duty to not only execute ways to eradicate an invasive species, but also to demote cultivation of said species. Because of this, until Paulownia *tomentosa* is taken off the invasive species list, many large scale companies will not conduct business with its' lumber (Sutton). For that reason, Paulownia is currently destined to smaller markets, unable to reach its' full economic potential. Thus, the Paulownia tree must be taken off the invasive species list.

If Paulownia *tomentosa* were taken off the invasive species list and promoted as an agricultural resource, it would benefit countless organizations, as well as current and prospective farmers. Additionally, it would be backed by countless universities providing information on raising the trees. If the Empress Tree was properly listed as non-invasive, then it would be beneficial to the numerous Paulownia tree farmers who are unable to fully reap the benefits of their harvest. Furthermore, before the Empress Tree was classified as invasive, numerous universities, including; The Universities of Kentucky, Georgia, Tennessee, Maryland, Virginia, and others, conducted research and promoted the cultivation of the Paulownia tree as a valuable, agricultural resource.

As one can see, the Empress Tree is a fast growing tree that is currently listed as an invasive, exotic species, that can be found in many temperate ecosystems throughout the United States. It is easy to conclude that when compared to other invasive species, like Kudzu, the Paulownia tree does not meet all necessary criteria to remain on the invasive species list. It does not cause any economic harm, and actually has enormous economic potential. It does not cause any environmental harm or damage to human health, and documented research has confirmed that it is indeed a prehistoric native of North America. Additionally, the market for Paulownia lumber is very promising in industries such as water craft manufacturing and furniture production. Paulownia *tomentosa* should be taken off of the invasive species list, and further research should be conducted as to the economic and agricultural benefits of the species. The results of this research would be beneficial to the numerous farmers who currently grow Paulownia trees, and if removed from the invasive species list would be backed by countless universities and organizations.

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Paulownia Guitar - Fender

AMERICAN PAULOWNIA ASSOCIATION 25th ANNUAL CONFERENCE - 2016

University of Maryland Extension, Wye Research & Education Center
124 Wye Narrows Drive, Queenstown, MD 21658

“MID-ATLANTIC PAULOWNIA TIMBER, PRODUCTION AND ALTERNATIVE USES”

Thursday, April 21, 2016

7:00 – 9:00 PM Board of Directors Meeting; Location TBD.

Friday, April 22, 2016

8:00 – 8:30 AM **Registration and Vendor Setup:** UMD Extension, Wye Research & Education Center, 124 Wye Narrows Drive, MD.

8:30 – 8:45 **Conference Welcome and Introduction:** Mr. George Newsome, President; and, Dr. David Sutton, Vice President, American Paulownia Association, Inc.

8:45 – 9:15 **“State of Forestry in Maryland and the Mid Atlantic Region”:** Mr. Donald VanHassent, Acting Director/State Forester, Maryland Forest Service.

9:15 – 10:15 **“Paulownia and Its Role in Agriculture & Renewable Energy – Bio-char Concepts, Commercialization & Utilization”:** Mr. Dale Hendricks, Representative, International Biochar Initiative (IBI) & Green Light Plants, LLC, PA.

10:15 – 10:30 **“A Small Bio-char Production Facility”:** Dr. David Sutton, President, Kisdan, LLC & Early Bird Nursery, TN.

10:30 – 11:00 **Break:** Visit with Members, Vendors and Guests.

11:00 – 11:30 **“A Brief Review of Regional Paulownia Species, Availability, and Utilization”:** Mr. George Newsome, President, AL; and, Mr. Dan Blickenstaff, Editor & Publicist, MD State Director.

11:30 – 12:00 Subject Matter Follow-Up **“Utilization of Paulownia in Composite Bioplastics”;** and, **“Bio-char as an Organic Soil Amendment”**, Dr. Brent Tisserat, Plant Physiologist, U.S. Dept. of Agriculture, Agricultural Research Service, National Center for Functional Food Research Unit, Peoria, IL.

12:00 PM – 12:30 **Membership Meeting:** Committee, Officers & Director Reports

12:30 – 2:00 **Lunch:** Visit with Guests, Vendors and Members

2:00 – 2:45 **Fort Valley State University Research Presentations: “Tissue Culture & Wood Forming Genes”;** Dr. Nirmal Joshee, Professor Plant Science & Biotechnology, Fort Valley State University, GA.

2:45-3:15 **“The Medicinal Properties of Paulownia”;** Dr. Prahlad Parajuli, Wayne State University School of Medicine, Detroit, MI.

3:15-3:30 **“Marketing Report; FARMMoST, LLC Formation; Harvesting and Production Updates”;** Mr. Dan Blickenstaff, Editor & Publicist, MD State Director.

3:30-4:00 **Open Discussion: “Ask the Experts Q & A”**

4:00 PM **Adjorn**

Saturday, April 23, 2016

Two field trips are planned for Saturday beginning at 9:00am.

1) Tour of member Mr. Harold Fink’s Paulownia plantings and nursery located at: 124 Price Station Road #44, Church Hill, Maryland 21623. This Paulownia grove consists of 20 plus year old timber in addition to various stages of additional plantings utilizing; land reclamation, irrigation and intensive cultural practices. This stop will provide a wealth of information on both the successes and not-so-successful approaches to Paulownia culture.

2) Tour of member Mr. Donald Bates’ Paulownia plantation located at: 2409 Gibson Road, Forest Hill, Maryland 21050. This 10 acre plantation of Paulownia “tomentosa” was visited approximately 10 years ago by our Association on an annual “Spring Fling” stop, and since was partially harvested in 2012. We will have an opportunity to enlighten ourselves on some of the following: experienced harvest issues; timber recovery rates; re-growth control; and subsequent timber growth quality factors. This is a “must visit” opportunity for those growers near harvest and those investors wishing to maximize returns!

“Why I Love The Paulownia “kiri” Tree”

The Paulownia tree is a tree of historical significance. First written about in Chinese literature over 2600 years ago, the Paulownia tree and its unique attributes secured a place of reverence in the mythology, tradition and life of its people then and now. Oriental mythology states that when the Phoenix returned it rested in a Paulownia tree, bringing blessings and prosperity to that family. Tradition is entrenched by such uses of the Paulownia wood to construct a prospective bride’s hope chest, called a “tansu”, that ensured protection for their most cherished possessions. Everyday uses include; construction of monastery pillars in antiquity, numerous household furnishings, shoes called “getta”, musical instruments, the tree’s silhouette to adorn the official Japanese “yen” coin, abundant nutritional and medicinal applications, and as an over-story tree for inter-crop farming to name a few.

Fast forward approximately 2540 years from the first written account, and the Paulownia tree was discovered in the United States by Japanese timber buyers. To the best of our knowledge, Paulownia “tomentosa” was reintroduced to the Americas by the likes of Thomas Jefferson through his agrarian interests at his Monticello Virginia estate, and perhaps even by accident when the seed pods were used as packaging material for far-east pottery and porcelain shipments to this country. Hence, a limited natural supply generated intense interest when the Japanese offered prices and purchased wild slow-growth Paulownia “tomentosa” for large sums of dollars through the 1990’s. Foresters and university extension offices recommended planting Paulownia; farmers, land owners and investors took the challenge and created small Paulownia plantations scattered throughout the Southeast and Mid-Atlantic states; a non-profit American Paulownia Association (APA) was formed in 1991 to enhance research into the Paulownia saga, assist the growers and users of Paulownia, and act as a clearing house for information.

This movement went along well for approximately 8 years, until there was a realization that plantation grown Paulownia does not have the same wood botany characteristics as “wild” Paulownia. Plantation grown timber is; not as dense, not as uniform in growth patterns, may not have the same wood characteristics if a different cultivar “sub-species” of Paulownia was planted (there are nine true cultivars known), is difficult to establish and maintain to achieve the required marketable lumber standards, and demanded extensive and dedicated effort until the crop is harvested and marketed. The APA realized these issues and regrouped, focusing on the use of Paulownia wood domestically. At about this same time, the National Forest Service was under pressure from interested environmentalists, several National and State Parks, and the Department of Agriculture to declare the tree as a “non-native-invasive”. This was finally achieved by the signing of a presidential executive order (might I add without due diligence or requested input from the APA) and the here-to-for collegiate, forestry service and public support dried up over night. Since that time, the APA has located documented

evidence that the Paulownia “tomentosa” is a prehistoric native tree to North America, and such facts are supported by both official written publications and close to 500 fossil records (“A Record of Paulownia in the Tertiary of North America”; *American Journal of Botany* 48(2); 175-179 Illus. 1961; Charles J. Smiley; Macalester College; St. Paul, Minnesota). Enough history about a wonderful tree that has received a bad rap, let us move on to my love of the Paulownia tree and how its products are used in the United States today.

There are those among us who love “old” things, especially if an interesting and unique story accompanies that “old” thing. What better “old” thing than the Paulownia tree, a 40 million year old wonder of nature, perhaps even a “primordial” tree, able to

WALNUT COUNCIL

We are an association of over 1,000 members representing foresters, researchers, and growers of walnut and other fine hardwoods in 45 states and 4 foreign countries. One of our objectives is to transfer forestry research and other useful information from the laboratory to the timber grower.

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survive and even flourish in harsh environments eons ago as well as now, in an environment that was very unkind to most other plants and trees evolving and struggling to survive. Recent research has validated the Paulownia tree's ability and propensity to sequester large amounts of carbon in its woody mass, cleaning the air we breathe while at the same time providing micro-climate moderation and preventing soil erosion. And that is not all folks; this amazing tree has the ability to regenerate from seed, roots and other tree parts that classify it as one of the best renewable woody tree species in existence. It has been shown to be a spectacular soil remediation tree used to; detoxify landfills, coal mine residuals and agricultural wastes. And, while providing these benefits, the Paulownia tree also generates wildlife habitat with both cover and food resources. In fact, one ranch in the Midwest uses the Paulownia tree for their deer hunting preserve, while several wildlife and nature parks incorporate the tree into the shade and browse needs of their parks. If I wish to secure a wild turkey for our Thanksgiving meal, all I need do is head for the Paulownia tree grove and wait, soon the flock arrives scratching for those delicious Paulownia seeds deposited from last year's proliferate crop. And with all of the benefits previously mentioned the Paulownia tree remains a "fringe" tree, one that does not compete well with grasses and other established native tree species; but, grows on the outskirts of forests, along water ways, land/rock slide prone sites and other locations disturbed by nature or man. In other words, where nature or man has created an environment (a garden) suited for this amazing tree; and, there is adequate moisture, sunlight and temperatures not too cold, the Paulownia will sprout and grow blessing us with its numerous benefits.

In addition to the growing Paulownia tree's benefits above, its wood has characteristics unlike many others. For example, the Paulownia is officially classified as a hardwood tree, but its density is less than many soft woods, often competing in light weight with cedar and even balsa wood. Paulownia wood has a high strength-to-weight ratio and the lumber is resistant to shrinking, cracking and cupping. The wood accepts and holds paint and stains well, but is resistant to deep penetration of moisture and other topical applications; hence, its wide acceptance for use in water and winter sports products. Surfboards, kite boards, paddle boards, canoes, kayaks, skis and snow boards top the long list of current uses.

The wood has a beautiful grain pattern, often compared to swamp ash and some oaks; but, is soft and silky if finished properly. And my favorite, the acoustical qualities of musical instruments and sound emitting products fabricated from Paulownia rival the best-of-the-best on the market. Numerous stringed instruments including; guitars, violins, harps, dulcimers and zithers top the list. Even didgeridoos and turkey call boxes have come to be recognized as superior products when fabricated from Paulownia wood. If in doubt, use your favorite web browser and type in the word "paulownia" plus the article's name you wish to search. You will be amazed at the number of hits you receive and at some of the values associated with the best and oldest of these articles.

If you do not own or have in your home an article made of Paulownia wood, I highly recommend that you procure a superiorly made one and see for yourself the attributes discussed above. And if you are a believer, perhaps even some of the associated mythical blessings will find their way into your life.

Dan Blickenstaff
Past President, American Paulownia Association
MD State Director & Publicist,
Owner, Mount Hope Farms, Maryland
Partner, FARMMoST, LLC



Therapeutic Wooden Pillows - Clements



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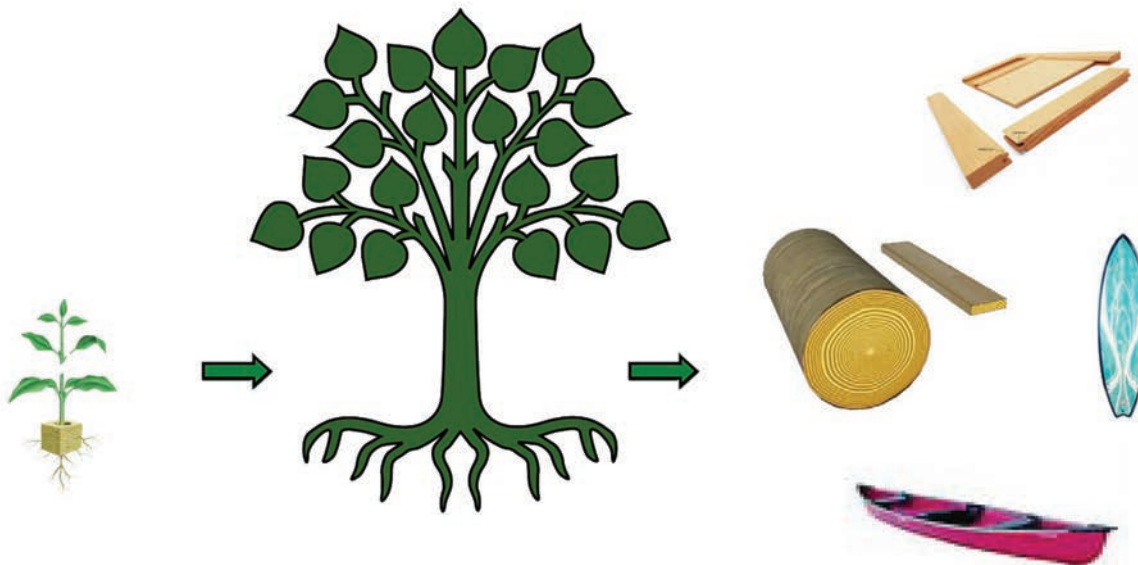
Plan now to attend and register for our conference April 22-23, 2016; see the enclosure for a copy of the entire program. Below are highlights of the scheduled biochar presentation to be presented by Dale Hendricks, International Biochar Initiative (IBI):

The Rest of the Story: Soil, Carbon, Gardening and Agriculture

- *What is biochar and can it be a part of a suite of solutions and carbon friendly opportunities?
- *Can we have diverse, regenerative and productive forests, gardens and farms while moving excess atmospheric carbon into the most productive place—the soil?
- *Where is a lot of the “Carbon Action,” and how can we as humans, gardeners and farmers most productively engage in replenishing soil carbon?
- *What roles do water, symbiotic relationships and diverse plant and animal systems play in soil carbon capture?
- *How well does the Paulownia tree fit into this sequestering and remediation process?

FARMMoST, LLC

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