CO_2 And THE TRUTH ABOUT TREES

Summary: There is broad consensus that trees can and will play an important role in helping reduce CO_2 loading of the atmosphere. Trees are phenomenally good at removing CO_2 and sequestering it as wood. The difficult truth is that, in order for trees to be a long-term effective CO_2 sequestration method, ***a certain quantity of trees must be harvested***. The wood must then be utilized such that it does not rot for centuries. This will, in turn sequester significant amounts of CO_2 … for centuries. The more mass of wood that is used in furniture or construction, etc … the more CO_2 that is sequestered for the long term.

HOW DO TREES SEQUESTER CO_2:

Trees are extremely effective at removing CO_2 from the air; they are extraordinarily good at it. CO_2 is basically their food. They take CO_2 from the air and obtain water from their roots and through the almost magical process called photosynthesis, they create the wood they need to grow. (and produce an incredible amount of useful chemicals and food in the process!). Trees are the very best device that exists or ever will exist to remove CO_2 from the air.

So, why do we need to harvest them? Trees are a very temporary repository of CO_2. Like all things, they die. Within a short time after they die, natural processes (decay) release all that CO_2 back into the atmosphere. That's the problem.

However… if the wood is utilized and kept dry, the CO_2 is sequestered… potentially, forever – that's the solution.

Attachment #1 sets forth the calculations required to quantify the amount of CO_2 sequestered by wood that is utilized and kept dry. The result is that for EVERY POUND of wood kept dry (for example) and used as "bulk" furniture:

*1.33 lbs of CO_2 are **PERMANENTLY** sequestered!*

CAN THIS BE SIGNIFICANT?

Definitely, Yes.

There are approximately 130 million households in the US. If they each only added 100 lbs. of the "Bulk is Best" (see below) slab or stump or disk furniture to their home, there would be 130,000,000 x 100 x 1.33 = 17.3 billion lbs of CO_2 permanently sequestered. That amount is equivalent to removing one million cars off the roads in the US for one year. One thousand lbs/household could easily be reached over the years with a corresponding 10-fold amount of CO_2 sequestered.

"Bulk is Best"

The following types of furniture are best for CO_2 sequestration:

SLABS:

- To be most effective the wood used for sequestration should be wood obtained from Dead, Dying or Downed trees*. Such trees are no longer removing CO_2 from the air and, in fact, are beginning to release it. Such trees are found all over the world in massive quantities. It turns out that such trees are also the best raw material to utilize for custom, beautiful, slab furniture. In addition, slabs are quite massive and heavy. The more weight, the more CO_2 is sequestered. Finally, slabs require the least amount of milling (less CO_2 emissions) and are usually air dried. Therefore, because of weight, and less energy required to mill and dry the wood…: "Bulk is Best".

Stumps & Trunks

- Utilizing the whole trunk is even better. Here there is no 25% reduction factor and almost zero milling. "Stumps" conjure up a not so eye pleasing mental image. But the truth is that they make extraordinarily beautiful and unique end-tables and coffee tables:

DISKS:

- Disks are essentially thin sections of trunks and, other than a small amount of extra milling, they are just as good at CO_2 sequestration.

By simply buying and enjoying beautiful and unique furniture made from trees as set forth above, ordinary Americans can do their part to reduce CO_2 in the atmosphere.

* Other types of trees, such as fast-growing species that readily regenerate (like poplars) can be effectively utilized before they become Dead, Dying or Downed.

ATTACHMENT #1

The Numbers:

Although the density of wood varies quite a bit from species to species, the amount of Carbon contained in all wood is about 0.5 lbs per dry pound of wood.

The amount of CO_2 effectively sequestered by a dry pound of wood is determined by molecular weight of CO_2 vs. Carbon = 44/12 = 3.67

The probable average amount of water contained in a thick piece. of wood stored indoors is about 20%.

Therefore, if a piece of wood weighs 100 lbs:

$$\frac{100 \times 0.5 \times 3.67}{1.2} = 153 \text{ lbs of } CO_2$$

153 lbs of CO_2 can be effectively and indefinitely permanently sequestered in each 100 lbs. of wood kept dry.

What about CO_2 emissions to obtain, process and transport the wood??

("NET" CO_2 Concepts)

The 147 lbs of CO_2 per 100 lbs of wood DOES need to be reduced by the emissions required to produce it. This is rather complicated to get exact, but it can be readily estimated within a reasonable margin for error.

Example: A 30 inch diameter dying maple tree with 20 feet usable trunk for slabs:

Weight (at 20% Moisture Content) = $(30"/12"/ft)^2 \times \pi/4 \times 20$

= 98 cubic ft

98 cubic feet of 20% moisture content maple weighs:

$98 \times 44 \text{ lbs/ft}^3 = 4300$ lbs.

Approximately 75% of that total remains after cutting the trunk into wood or slabs with the "off cuts" left to decay for future trees to grow. (*1)

So, $4300 \times .75 = 3225$ lbs. of wood to be used to sequester CO_2.

3225 lbs. of wood x 1.53 (CO2 to C factor) sequesters 4,934 lbs of CO_2.

In order to determine the actual amount of CO_2 sequestered, the amount of CO_2 emitted by harvesting, milling, processing and transporting needs to be calculated:

In our 30" maple tree example, here are the estimates to get that wood from tree to home:

Harvesting - Chainsaws: +/- 2 gallons of gasoline = 40 lbs/ CO_2

Diesel fuel for heavy equipment: 8 gallons = 179 lbs/ CO_2

Milling: 2 gallons (or electricity equivalent) = 45 lbs/ CO_2

Drying: 0 (large slabs are air dried – the best type of wood for sequestering is the bulkiest. "Bulk is Best")

TRANSPORTATION: Conservatively assuming our 30" maple tree must be trucked to a processing facility and the wood from it again transported a long way (to homes); 500 miles is utilized.

An average freight truck emits .081 gms CO_2 /lb of freight/mile. (*2)

So for our **tree** we have

- 500 miles x 4300 lbs x .081 x 1/454 = 383 lbs CO_2.

The overall CO_2 "cost" for our tree is 40 + 176 + 45 + 383 = 644 lbs CO_2

Therefore: (4,934-644)/4,934 = 87% CO_2 sequestration efficiency!

The "all-in" determination of CO_2 sequestered per pound of wood permanently kept dry is

$$\frac{(1 \times 0.5) \times (44/12)}{} \times .87 =$$

1.2

1.33 lbs *of CO_2 are sequestered for every pound of wood kept dry!*

*1 The branches, comprising a very significant biomass can also be left to decay for future trees.

*2 Published figures