

# How **Green** are Trees? – A Carbon Footprint Assessment of Urban Trees and their Care



<http://www.louisdallaraphotography.com>

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# How Green are Trees?

- Started as a conversation with a good friend
- Question: How long does a tree need to live to gain **carbon neutrality**



amerinurseries.com



Treehugger.com

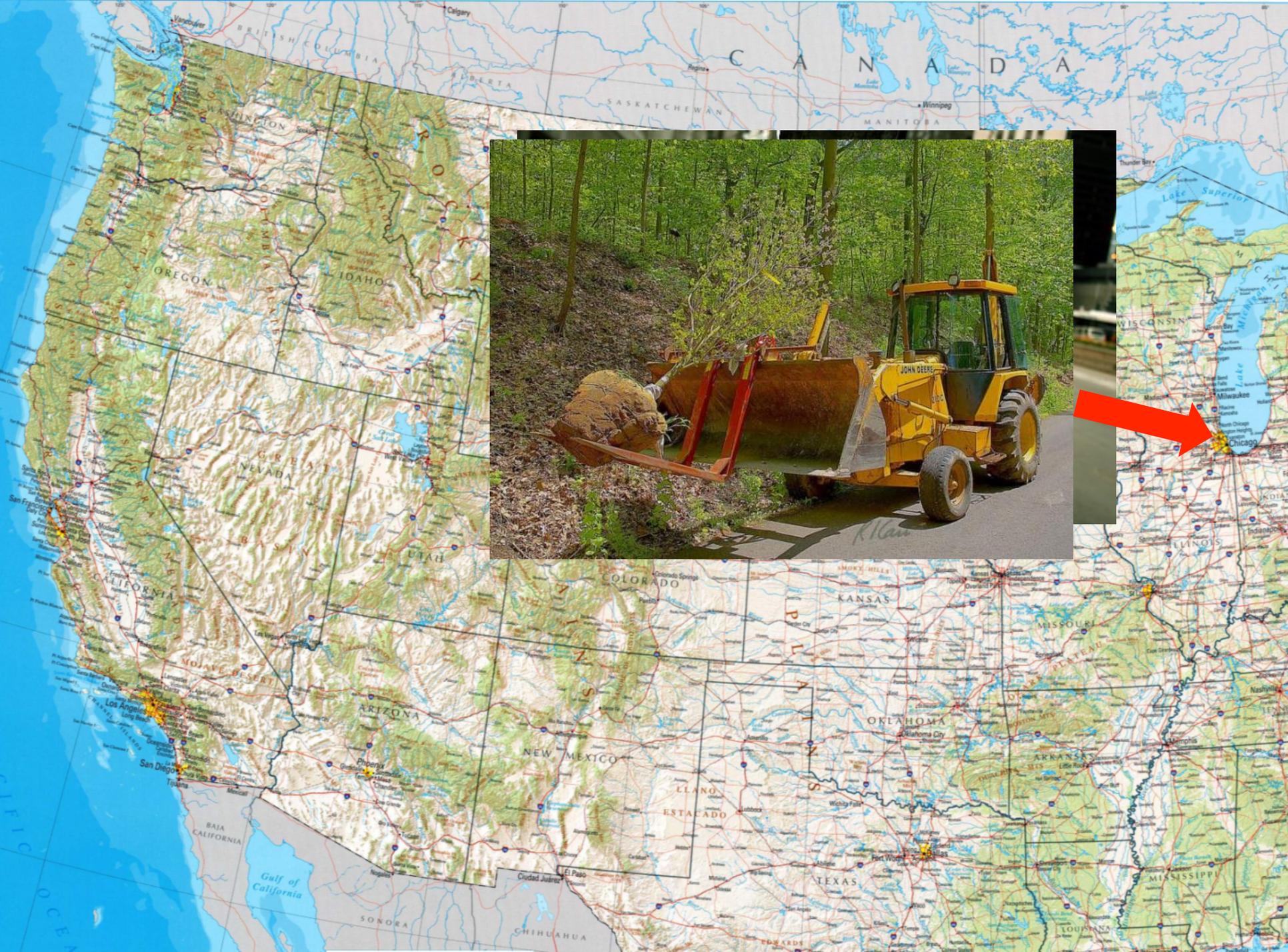


This tree gives back  
**\$1,781**  
worth of environmental benefits  
over the next 15 years.



**EVERY TREE COUNTS**



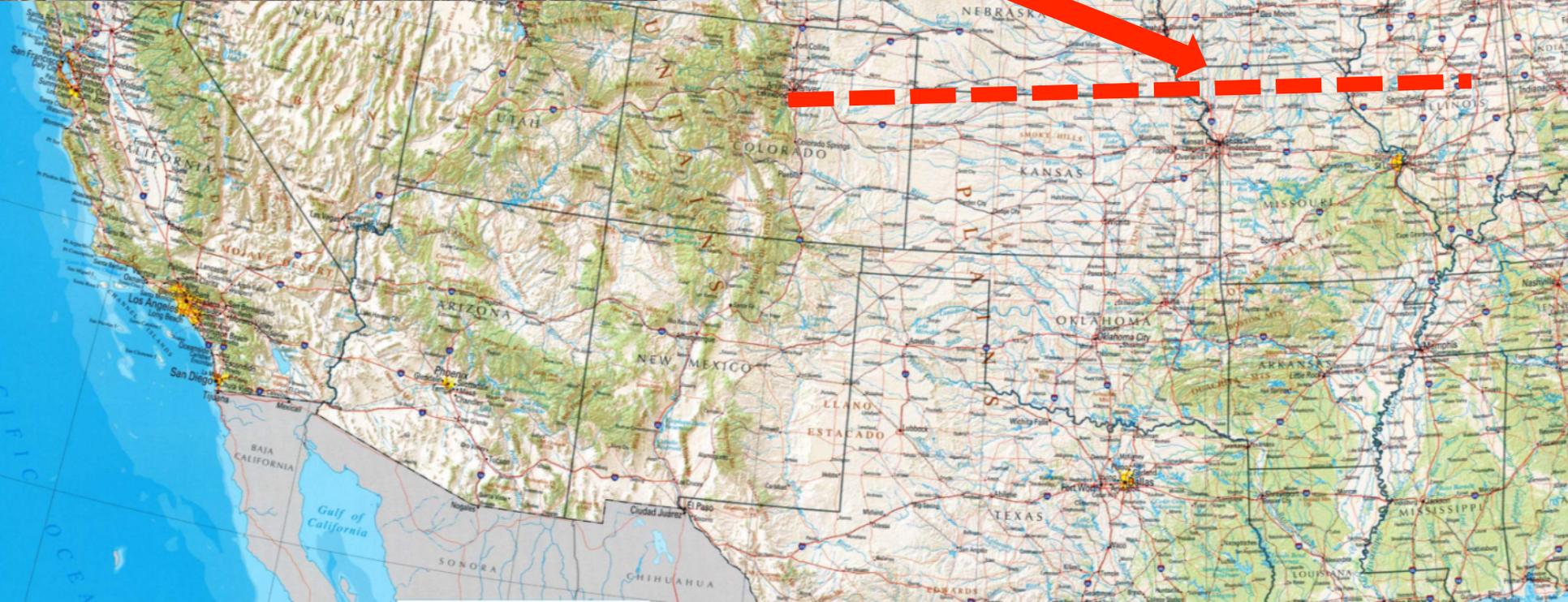
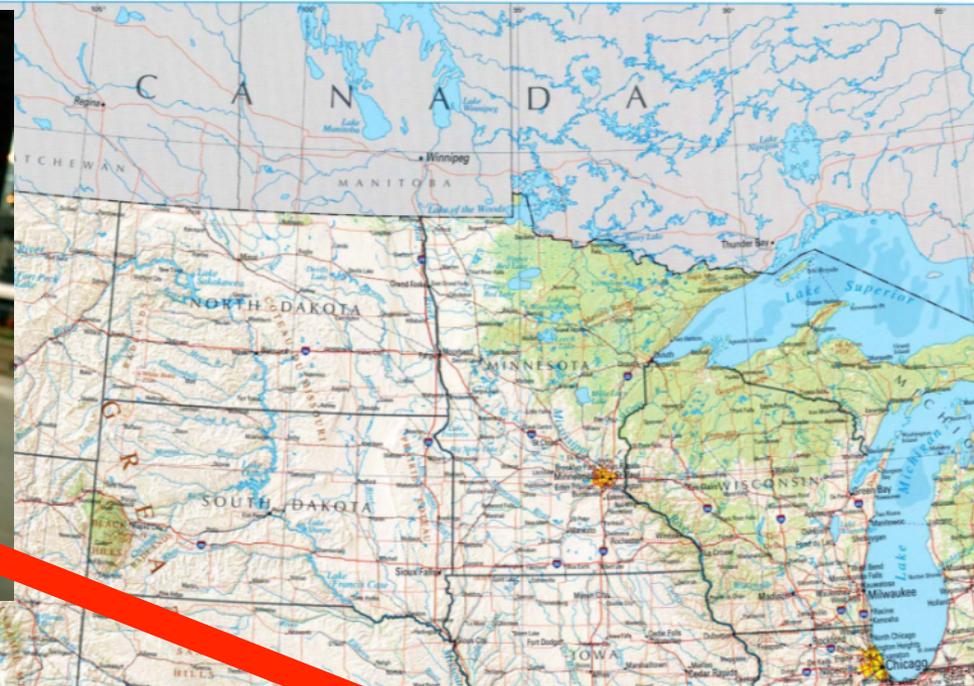












# Our Question – How **Green** are Trees?

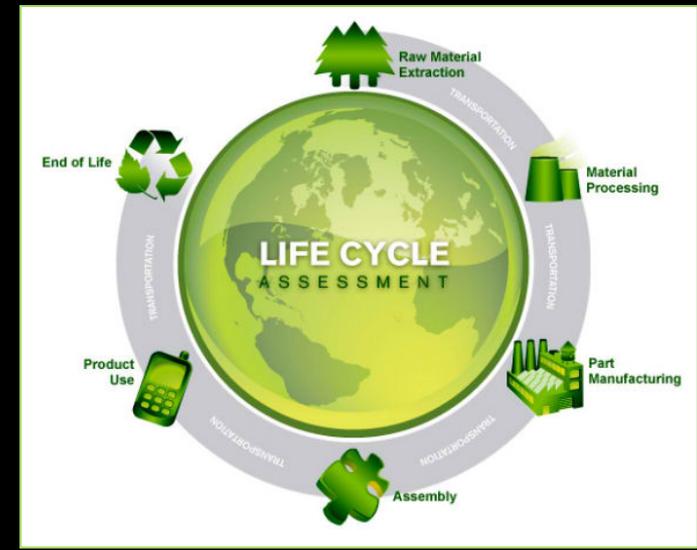
- A lot of research documents real benefits from trees





# What is LCA? - Definitions

**life cycle assessment**  
(*ˈlɪf ˈsaɪ-kəl ə-ˈles-mənt*)  
compilation and  
evaluation of the inputs,  
outputs and the potential  
environmental impacts of  
a product system  
throughout its life cycle  
(ISO-14040)



<http://www.solidworks.com>

# Why do an LCA?

- The public will pay more for, and remain loyal to, **green** producers and businesses
- This motivates some business to assess their production practices and/or apply for third party certifications
- Others just hire creative marketers...



# Creative Marketing (aka **Greenwashing**)

- **Greenwash** /ˈɡriːn  
ˌwɒʃ/ the use of  
green marketing to  
deceptively promote  
the perception that  
an organization's  
aims and policies are  
environmentally  
friendly



# Creative Marketing (aka Greenwashing)



[greenwashingindex.com](http://greenwashingindex.com)

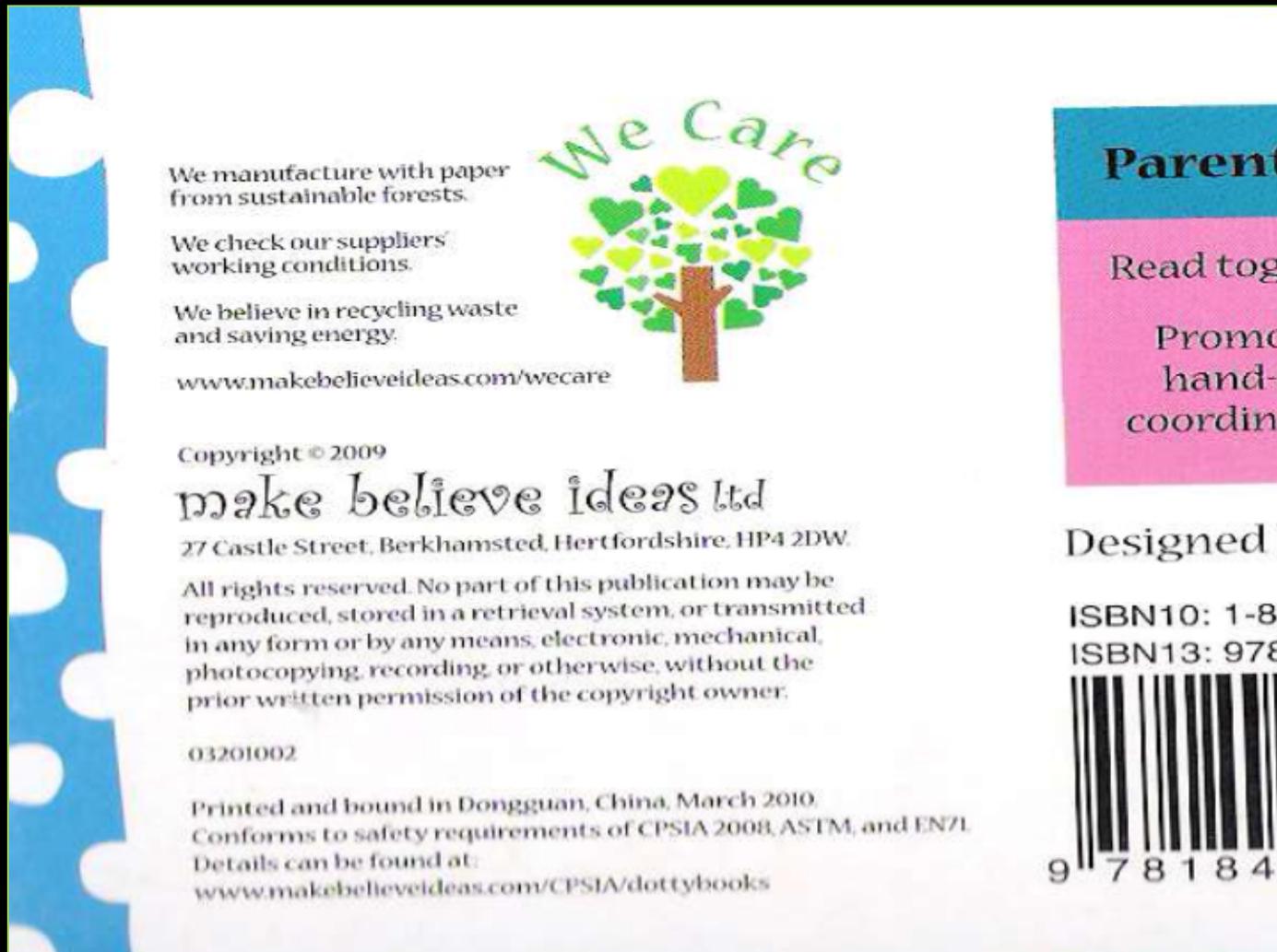


[webecoist.momtastic.com](http://webecoist.momtastic.com)



<http://marketingparks.wordpress.com>

# Creative Marketing (aka Greenwashing)



The image shows the back cover of a baby word book. On the left, there is a blue vertical band with white polka dots. The main white area contains several paragraphs of text and a logo. The logo is a tree with a brown trunk and a canopy of green hearts, with the words 'We Care' written in a green, curved font above it. To the right of the main text is a pink rectangular area with white text, and below that is a blue rectangular area with white text. At the bottom right, there is a barcode with the ISBN numbers 10 and 13, and the number 978184 below it.

We manufacture with paper from sustainable forests.

We check our suppliers' working conditions.

We believe in recycling waste and saving energy.

[www.makebelieveideas.com/wecare](http://www.makebelieveideas.com/wecare)

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**make believe ideas ltd**

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03201002

Printed and bound in Dongguan, China, March 2010.  
Conforms to safety requirements of CPSIA 2008, ASTM, and EN71.  
Details can be found at:  
[www.makebelieveideas.com/CPSIA/dottybooks](http://www.makebelieveideas.com/CPSIA/dottybooks)

**Parent**

Read tog

Promo  
hand-c  
coordin

Designed l

ISBN10: 1-84  
ISBN13: 978

9 78184

(Back of my daughters' baby word book)

# LCA: A Tool to Put Meaning Behind Green Claims

- LCA accounts for all of a product's inputs and outflows



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- You can also change one part of production to see what it means for the big picture (i.e., switching to smaller stock).



<http://locallygrownnorthfield.org>

# LCA: A Tool to Put Meaning Behind Green Claims

- LCA counts for all of a product's inputs and out flows
- This account sheet is used estimate environmental impacts (e.g., global warming)
- You can also change one part of production to see what it means for the big picture (i.e., switching to smaller stock).
- LCA results can be peer reviewed and publicly available



[blog.engglib2.upd.edu.ph](http://blog.engglib2.upd.edu.ph)

# The Functional Unit: Making Apples to Oranges Comparisons



[mrhsgg.weebly.com](http://mrhsgg.weebly.com)

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mrhsgg.weebly.com



# How do we compare these two?



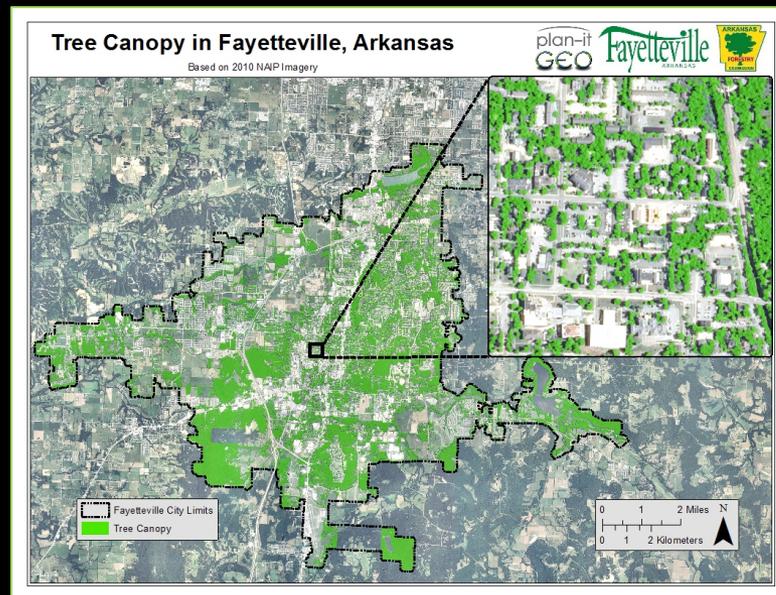
# What about trees?



# How do We Compare These?



# What about trees?





# Impact Assessment

- Select impact categories of concern
  - i.e., Global Warming



<http://studentmedia.uab.edu>



[ypte.org.uk](http://ypte.org.uk)



[beaverlakeboaters.net](http://beaverlakeboaters.net)

# Impact Assessment

- Select impact categories of concern
  - i.e., Global Warming
- Identify inventory items that will affect you impact category
  - CO<sub>2</sub>
  - Methane
  - CFCs...etc. etc.



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- Convert to a standard factor that has a known relationship to your selected Impact category(ies)
  - i.e., convert methane and CFCs to CO<sub>2</sub>

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<http://phys.org>

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[sierraclubgreenhome.com](http://sierraclubgreenhome.com)

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- Convert to a standard factor that has a known relationship to your selected Impact category(ies)
  - i.e., convert methane and CFCs to CO<sub>2</sub>
- Determine overall impact
  - i.e., global warming potential

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[sierraclubgreenhome.com](http://sierraclubgreenhome.com)

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21



<http://studentmedia.uab.edu>

# Interpretation

- Findings are summarized into a formal conclusion
  - What are the strengths/ weakness of given product or urban forestry practice
  - What is the better of multiple alternative management strategies



<http://www.stylebubble.co.uk>

# Ingram, 2012

- B&B tree production in KY



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- B&B tree production in KY
- Looked at production from propagation to shipping off (+removal)



<http://pics.davesgarden.com>

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- Looked at production from propagation to shipping off (+removal)
- Functional unit: one 2-inch red maple



Jeff Dean

# Ingram, 2012

- Two biggest sources of CO<sub>2</sub> – Digging (2.83 kg) and Hauling/Loading (2.95 kg)



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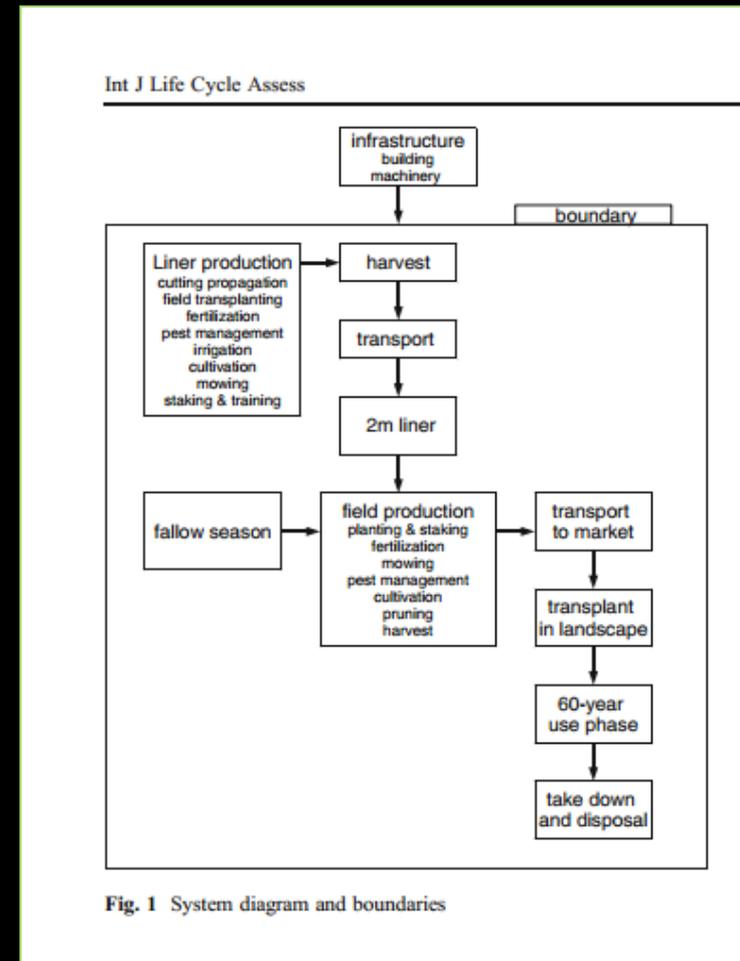
- Two biggest sources of CO<sub>2</sub> – Digging (2.83 kg) and Hauling/Loading (2.95 kg)
- Total CO<sub>2</sub> emitted to produce a tree (11.9 kg)
- Broad assumptions made with regard to destination and care



<http://www.southernbotanical.com>

# Moving into the City

- Identified potential inputs for:
  - production,
  - **maintenance,**
  - **removal and disposal**



# Replacing Assumption with **Data**

- Identified potential inputs for:
  - production,
  - maintenance,
  - removal and disposal
- Surveyed NEMF Members to determine actual equipment, runtimes, labor, and other inputs for planting, pruning, PHC, etc.



# Initial Survey Findings

- Completed in full by 31 urban forestry programs



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- Completed in full by 31 urban forestry programs
- Reliance on mechanization varied.
- Dominant trees expected to live an average of 38 years in the landscape (varying by species)



# Initial Survey Findings

- 87% had current inventories (78% of all street trees)



# Initial Survey Findings

- 87% had current inventories (78% of all street trees)
- Pruning cycles ranged from 3 to 15 years (~6 average)



# Creating the Inventory

- A highly mechanized planting, maintenance, and disposal scenario was used as the **baseline**



# Creating the Inventory

- A highly mechanized planting, maintenance, and disposal scenario was used as the baseline
- Compared three less intensive scenarios (including one with **mostly hand labor**).

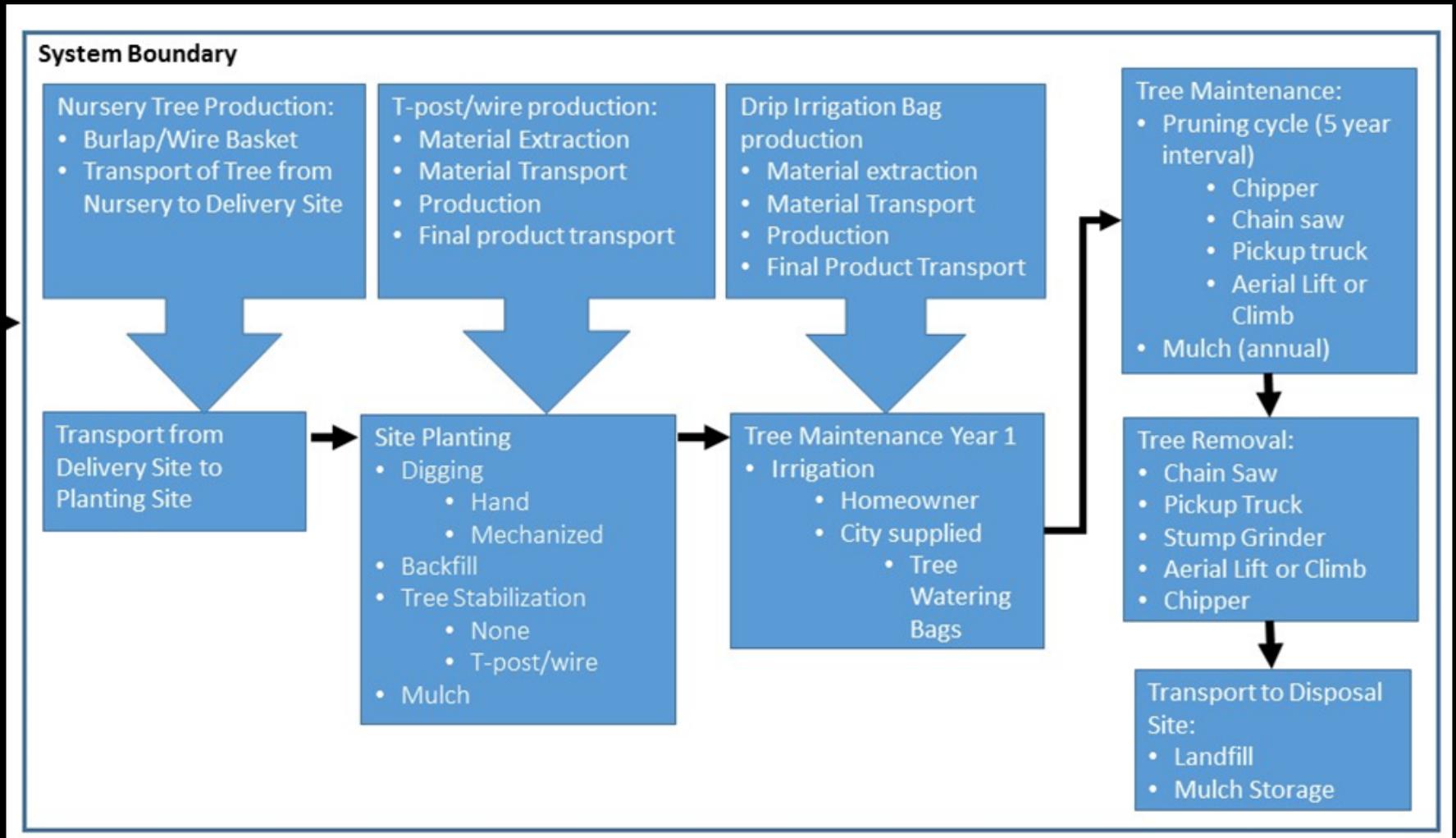


# Functional Unit

A 48 year-old red maple (*Acer rubrum* L) sourced from a balled-and-burlapped nursery (from seed to wood chips)



# Scope of Inventory and Assessment



# Results

- In our more mechanized baseline scenario 2,919 kg CO<sub>2</sub>e were released during production, maintenance, and removal/disposal.
- By switching to a less mechanized scenario, this could be reduced to 1,725kg CO<sub>2</sub>e to 1,340kg CO<sub>2</sub>e.

# Results

- What does 2,919 kg CO<sub>2</sub>e (Baseline) mean?



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  - It is equivalent to the CO<sub>2</sub>e released when cooking up 340 cheese burgers (The Florida Times-Union, 2007)



GOOD. THEN GONE.

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# Results

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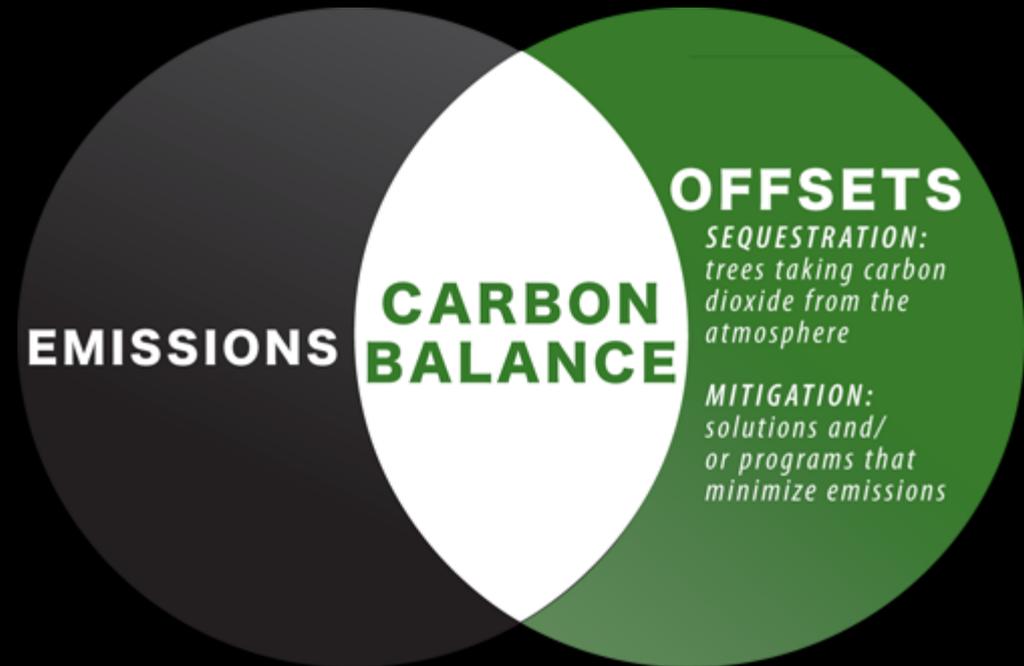
# Results

- Unlike most other products tested with LCA – trees provide environmental services (CO<sub>2</sub> sequestration) to counteract their inputs/energy demands....



# Results

- In our baseline scenario, a red maple in Chicago (US) will reach carbon neutrality after 33 years.
- This could be shorted to 26 years if more hand labor used.



# Results

- For our mechanized baseline scenario, trees serve as carbon sinks for an average of 15 years (48-year average lifespan).
- Until they break even, trees are essentially sources of carbon....



# Conclusions

Trees are good, if...

- Properly cared for to survive transplanting



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Trees are good, if...

- Properly cared for to survive transplanting
- Provided to growing space and protection needed to reach maturity
- Retained as long as feasible given potential risk posed to nearby targets.



# Conclusion

Knowing the true environmental costs of trees does not diminish their value, rather it highlights the importance of our work to increase tree growth and longevity in a responsible manner.

We cannot manage urban trees haphazardly... every year after the break even point counts!

# Any Questions?



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