A Carbon Calculator for Sustainable Forestry Operations
Working Forests Can Outperform Forest Reserves

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Why?

Governor Brown and the Legislature's June 2013 decision to focus on the clean energy goals rather than a myriad of fundable projects from 'Cap-and-Trade' revenues should remind us that reducing fossil fuel emissions from what was once geologic carbon sequestration may be the most transparent way to achieve the goals of the Global Warming Solutions Act of 2006

As all RPFs know, THPs since 2011 have to address the changes to PRC 4513 when it was amended by AB 1504. Carbon sequestration is now one of 9 non high-quality timber product goals.

"It is the intent of the Legislature to create and maintain an effective and comprehensive system of regulation and use of all timberlands so as to ensure both of the following:

(a) Where feasible, the productivity of timberlands is restored, enhanced, and maintained.

(b) The goal of maximum sustained production of high-quality timber products is achieved while giving consideration to values relating to sequestration of carbon dioxide, recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment, and aesthetic enjoyment."

So how should this analysis be done?

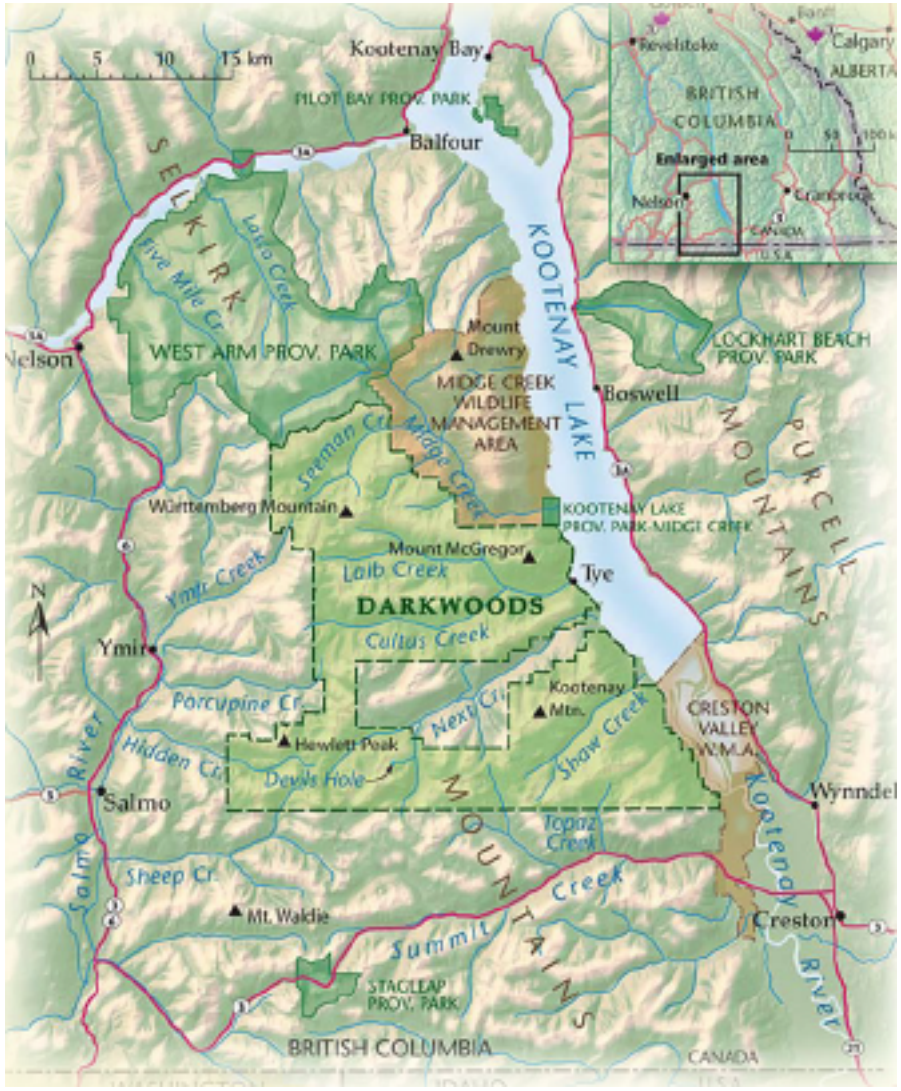
- Focus on emissions solely? Center for Biological Diversity v. EPA (D.C. Cir., No. 11-1101)
- Conduct a full engineering life cycle analysis? - http://www.dovetailinc.org/ has some interesting ideas on buildings
- Use a full global carbon cycle scientific assessment? IPCC reports
- Copy a project promoted in the diverse voluntary offset market?
- http://calfire.ca.gov/resource_mgt/resource_mgt_forestpractice_pubsmemos_memos.php
- THP submitters can propose their own analysis
- http://ucanr.edu/sites/forestry/Carbon/ - integrated look at forests, high-quality timber products, and wood chip energy

The one point I want to make sure I leave you with is that the renewable energy implications of sustainable forestry operations are extremely important – even though wood chips are not very charismatic or all that valuable per ton. Generating energy from wood chips is a great way to foster the geologic sequestration of carbon dioxide. This often gets lost in many of the partial accounting systems that only focus on the trees.

2012 Forest Practice Regulations
897 Implementation of Act Intent (b) (1)
focus on the forest + products

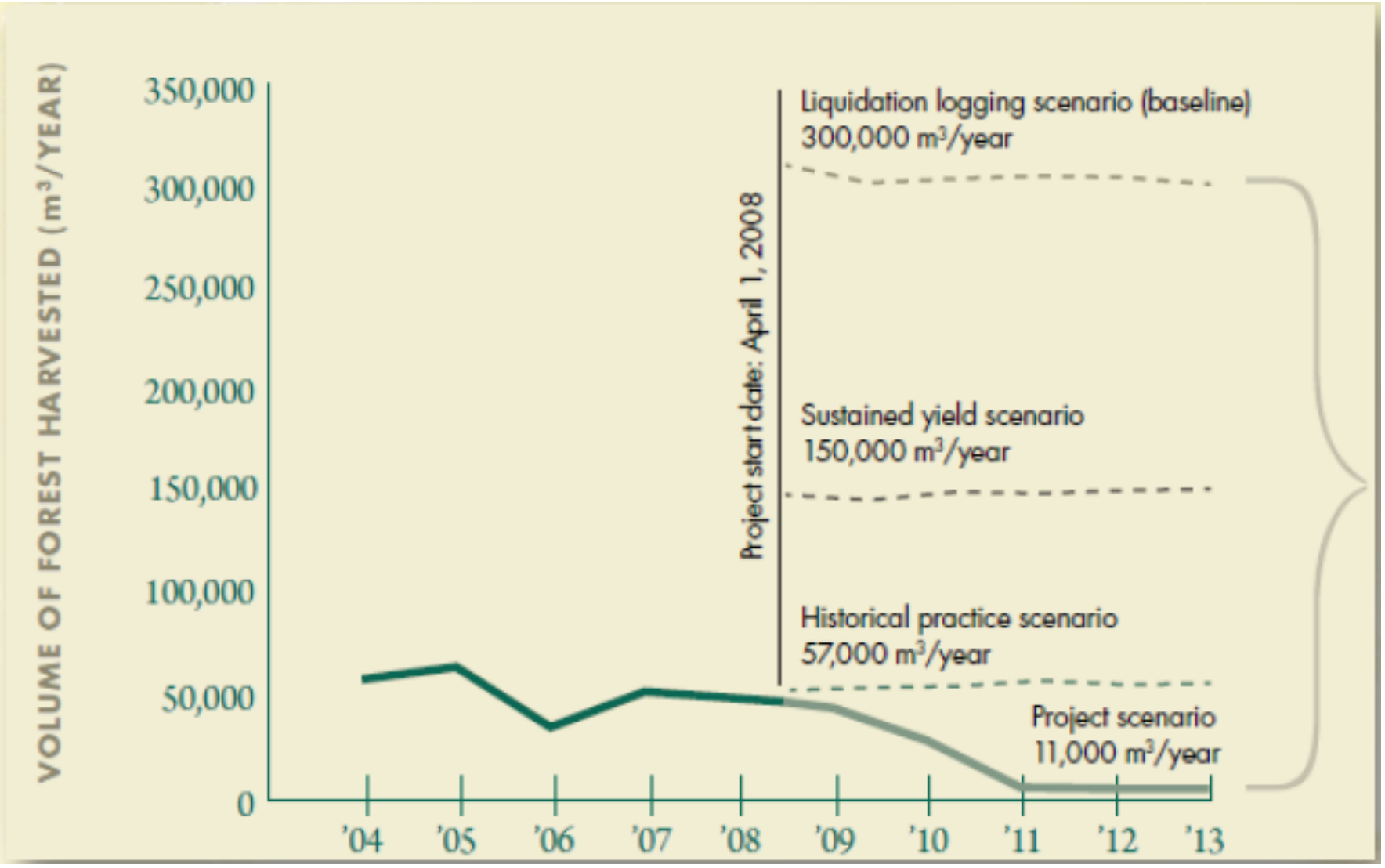
- (A) Achieve a **balance between growth and harvest over time** consistent with the **harvesting methods** within the rules of the Board.
- (B) **Maintain functional wildlife habitat** in sufficient condition for continued use by the existing wildlife community within the planning watershed.
- (C) **Retain or recruit late and diverse seral stage habitat components for wildlife concentrated in the watercourse** and lake zones and as appropriate to provide for functional connectivity between habitats.
- (D) **Maintain growing stock, genetic diversity, and soil productivity.**

Darkwoods: A model for creating forest offsets rather than focusing on products



- Google 'Darkwoods' or check the March 2013 environment and natural resources report at www.bcauditor.com
- 133,000 acres next to Kootenay Lake, 4 Provincial Parks, 2 Wildlife Management Areas
- Bought by Nature Conservancy Canada (NCC) in 2008 from Duke Carl Herzog von Wurtemberg
- $100 million NCC, $25 million Federal Govt grant
- Pacific Carbon Trust (a BC govt entity) buys a ton at $6, sells at $25 to school and hospital districts
- In 2011, started selling ~$ 4 million carbon credits annually to captive schools and hospitals

How Many Carbon Credits Do You Think This Project Was Awarded?



Blodgett Forest Research Station by design is not adding more 'carbon on the stump', but is testing more climate resilient forest operational models

"(c) The scoping plan proposes to maintain the current 5 $MMTCO_2$ annual sequestration rate through 2020 by implementing "sustainable management practices," which include potential changes to existing forest practices and land use regulations." (PRC 4512/ AB 1504)

So, is the Center for Forestry a 'climate criminal'?

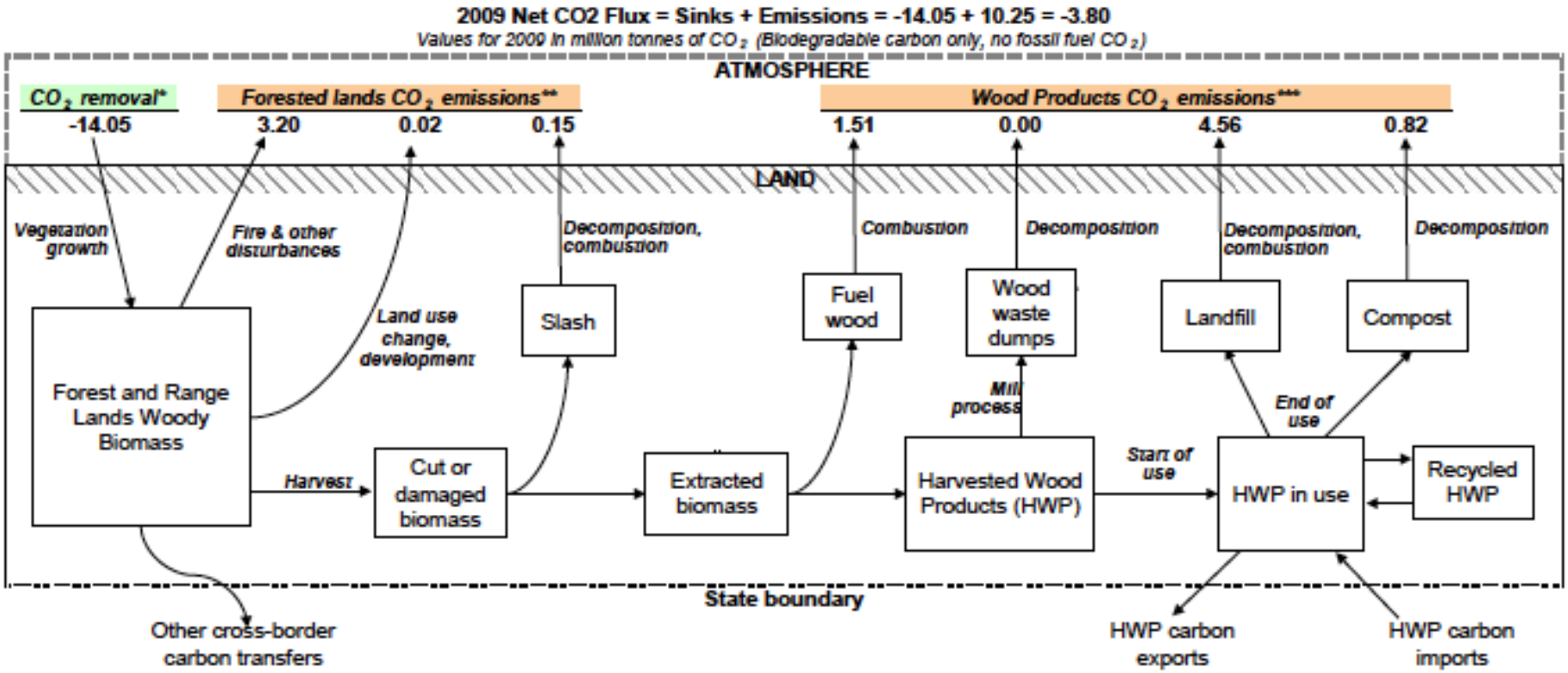
No, because

- Blodgett's managed stands are becoming more resilient to potential climate changes – better seedlings, less drought stress potential, preference for longer lived trees, etc.
- Larger diameter trees have a better lumber/total harvest volume ratio than smaller trees
- Logs go to very efficient sawmills where total product utilization efficiency is >99% rather than the ~84% assumed in CARB forest accounting
- We are working on a partnership with the Placer County Air Pollution Control District to send harvest residues to energy plants to generate yet more climate benefits
- We demonstrate to other forest landowners that there are many ways to manage forest stands for their goals
- We calculate that working forests will outperform full or partial forest reserves in terms of the global carbon balance

A tale of two accounting diagrams

ARB's 2008 forest sector box diagram chose just the 'forest ecosystem' diagram where

1. products and renewable energy are only emissions , and
2. the time dimension does not exist



Another 2007 IPCC diagram that sets a larger goal for forests and net emissions

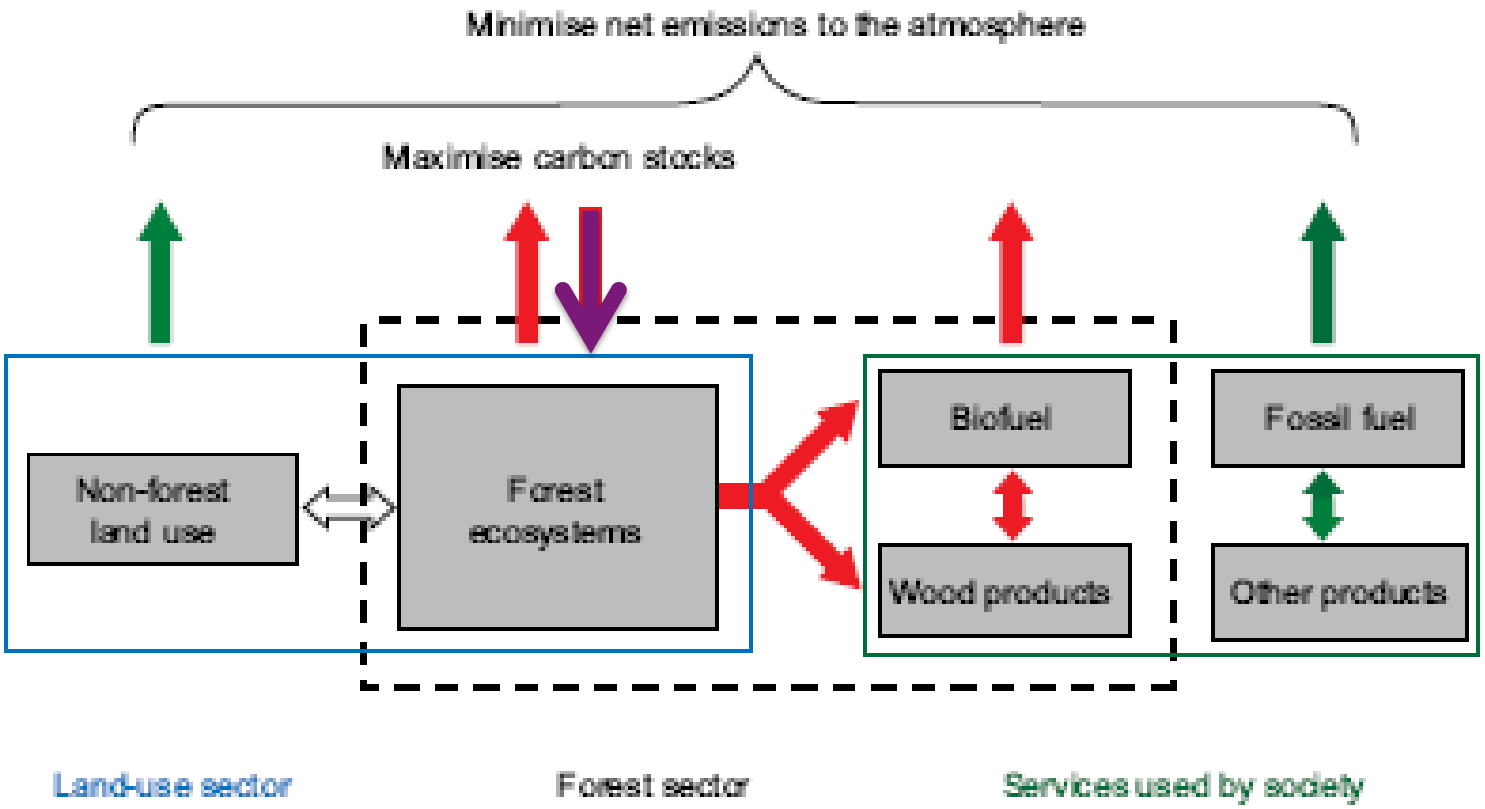
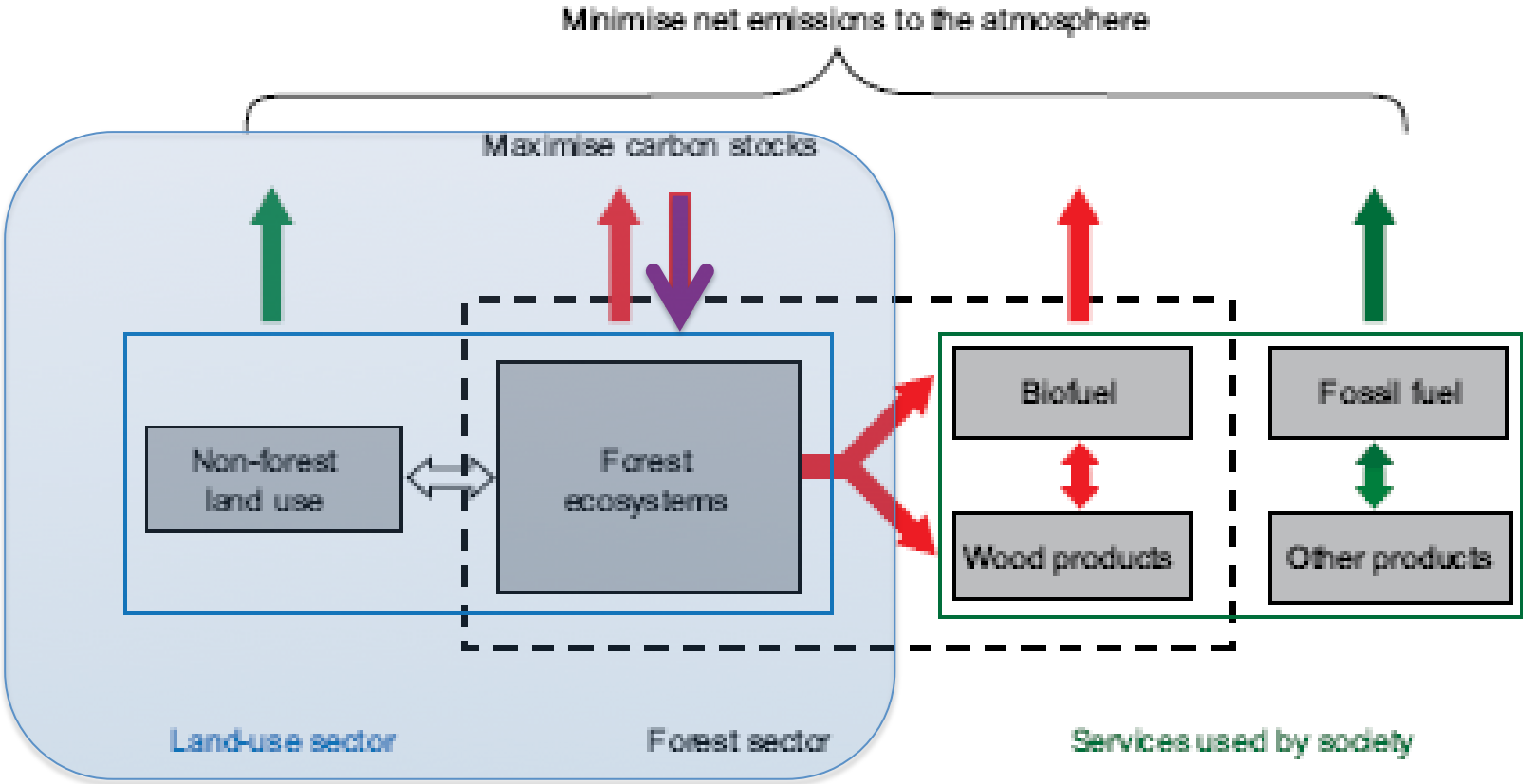


Figure 9.3: *Forest sector mitigation strategies need to be assessed with regard to their impacts on carbon storage in forest ecosystems on sustainable harvest rates and on net GHG emissions across all sectors.*

Nabuurs, G.J.,IPCC 2007

1. In the Land-use sector: demonstrate that forestry can ‘pay the bills’ , so less need to sell to the ‘friendly developer’



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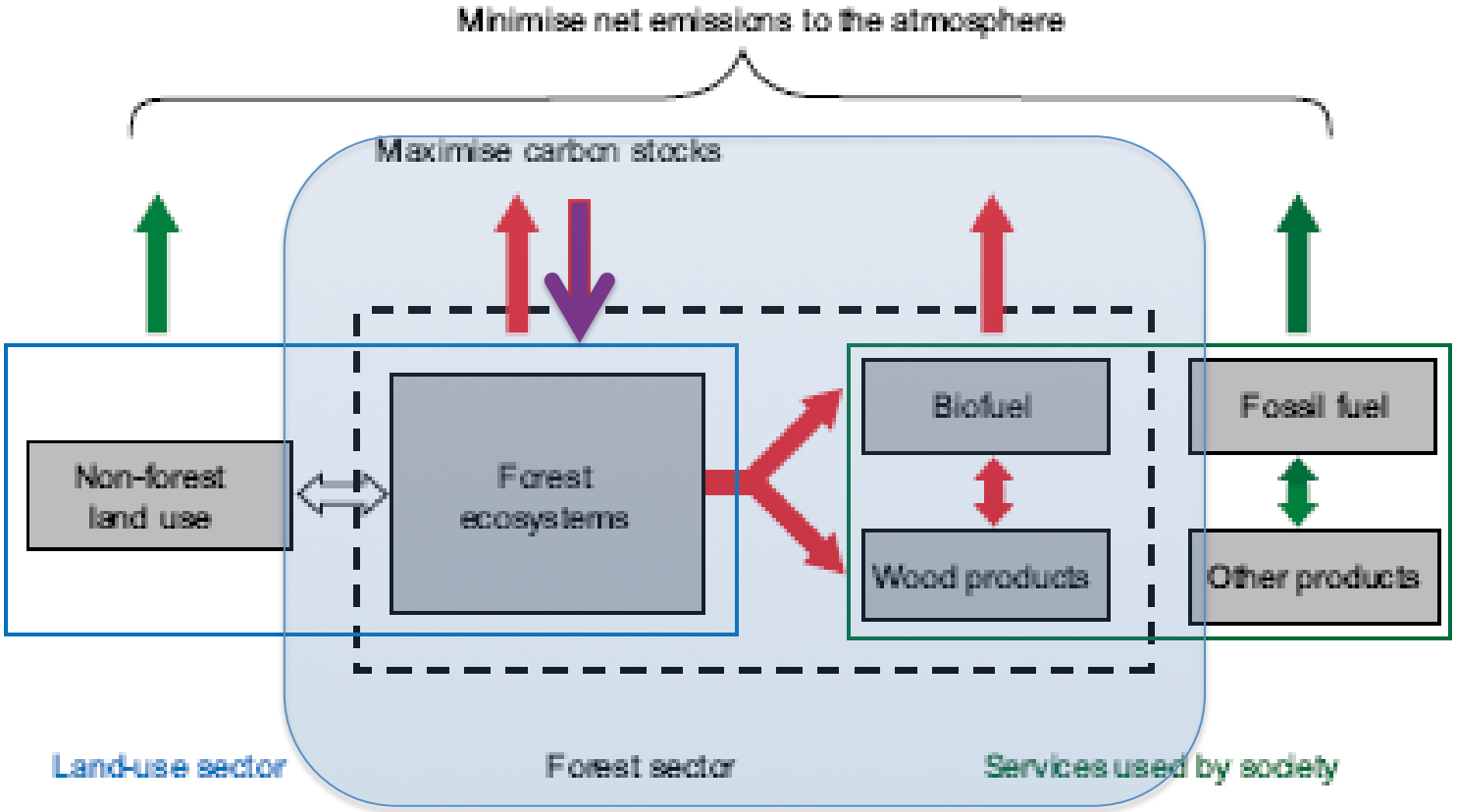
2. In the Forest Sector, minimize density dependent conifer mortality, maximize utilization of growing space with healthy trees, and ship out biomass on log trucks and chip vans



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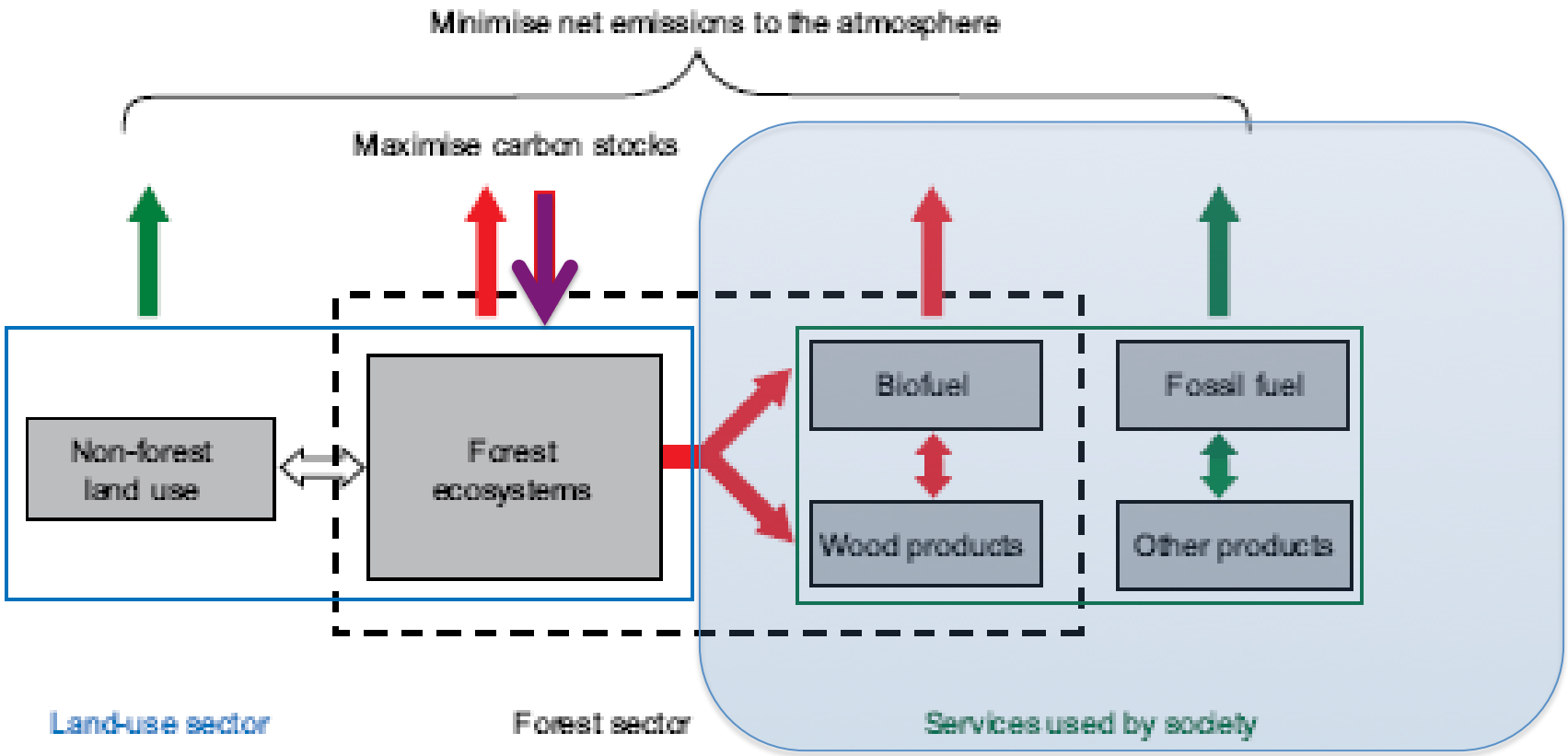
3. In the Services used by society sector, deliver logs and chips that REPLACE emission-intensive alternative products



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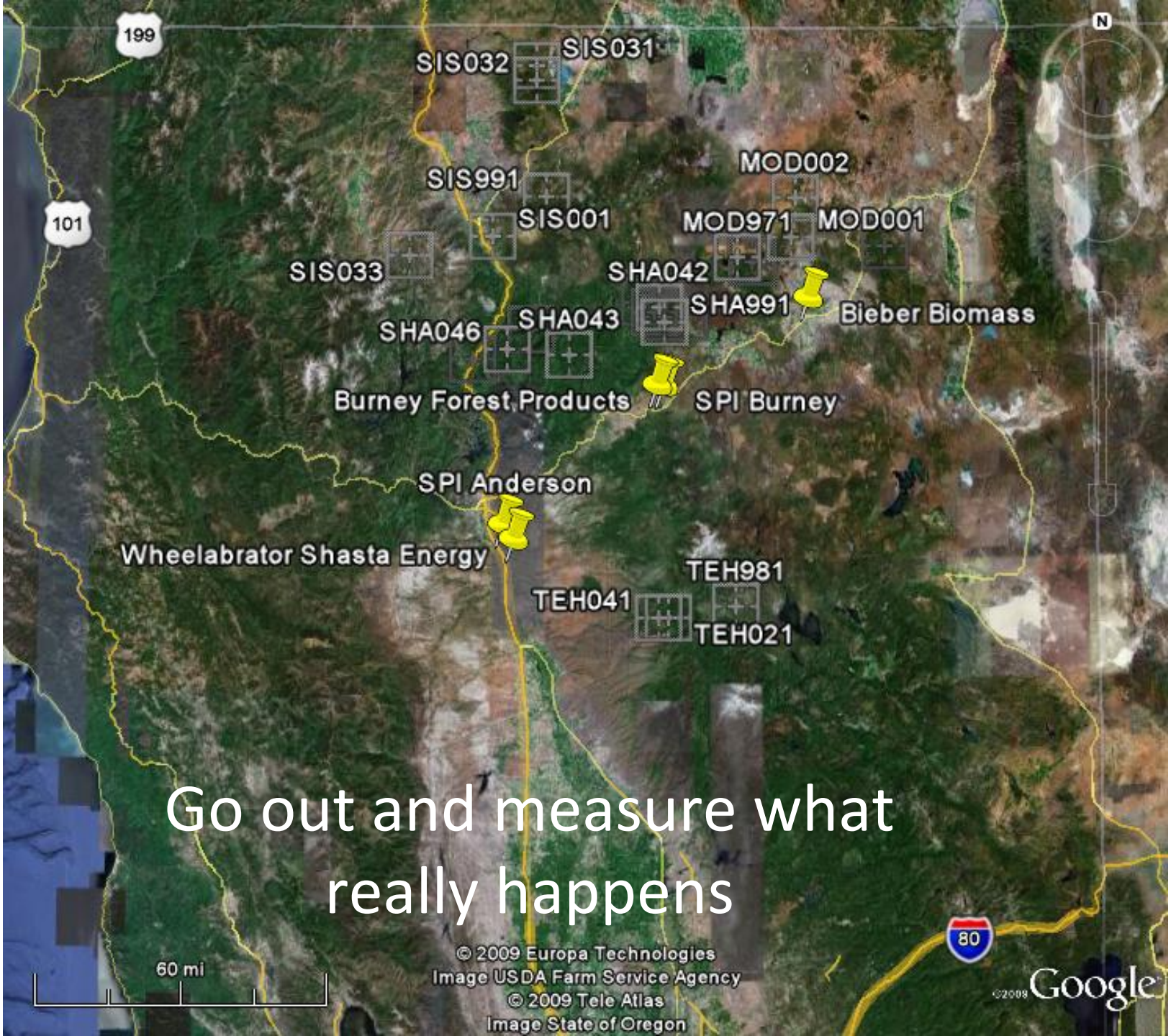

Go out and measure what really happens

Initial Disposition of Harvested Trees

(Stewart and Nakamura, 2012 @ http://ucanr.edu/sites/forestry/Carbon/)

Silvics	Wood Products	Sawmill Energy	Sawmill Waste	Forest chips for energy	Un-collected residues	Total
Partial Cut	6.8	2.3	0.2	23.0	1.6	33.8
Clear Cut	68.1	21.7	0.9	13.7	4.3	108.4
One thin + One final harvest	74.8	23.9	1.0	36.7	5.9	142.2
Pct of total	52%	17%	1%	26%	4%	100%

In bone dry tons/acre. The 50/50 split between lumber and wood chips is also what the USFS measured in both California and Oregon in 2006. Wood chips really matter.

It also matters which reports you use when tracking those wood chips

Where	USFS	Pre 2008		USFS	Post 2008	
Utilization	Product	Energy	Waste	Product	Energy	Waste
Harvest	0.60	0.00	0.40	0.70	0.26	0.04
Sawmill	0.67	0.17	0.16	0.75	0.24	0.01
Post-consumer	0.43	0.22	0.35	0.65	0.25	0.10

CARB's protocols use the undocumented pre-2008 USFS efficiency estimates with low efficiencies at harvest, sawmill and post- consumer stages.

(Smith, Heath, Skog, and Birdsey. 2006. Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States GTR-NE-343)

Current efficiencies are actually high

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If there is a market for wood chips, current harvesting technology can collect the harvest residues at a break even cost and meet fire risk reduction (slash) requirements

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We only have modern, efficient sawmills left in California. Mills that toss 16% of incoming sawlog volume out back as sawdust are illegal in California.

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When wood was cheap and waste disposal was unregulated, maybe 35% of wood products were simply left to rot in the sunshine. We assume that that CalRecycle has better plans these days.

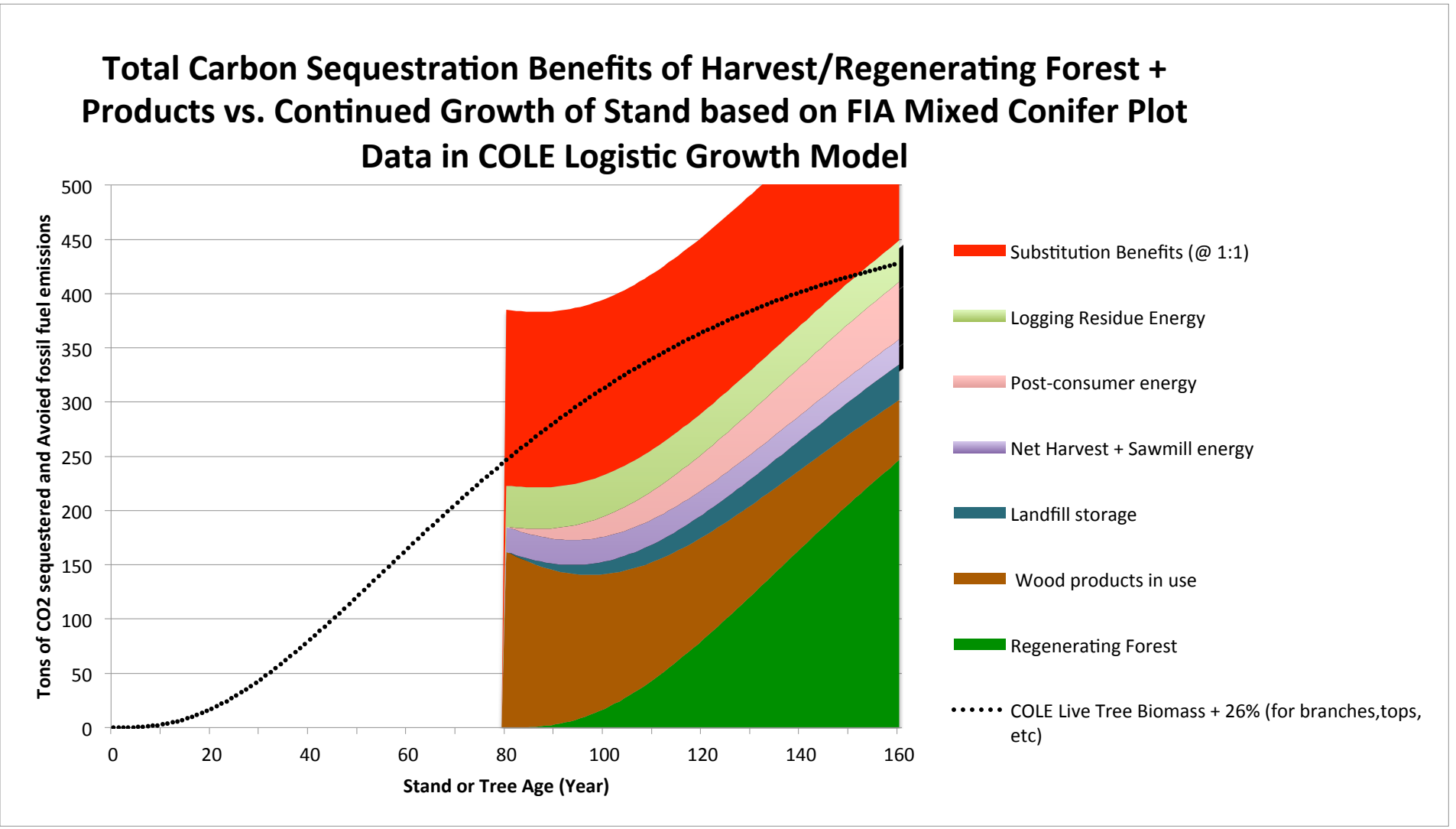
Estimated climate benefits from harvesting 100 tons of carbon from California Forests

Forest Product-related Climate Benefits	Pre-2008 USFS wood utilization coefficients	Post-2008 USFS wood utilization coefficients
C stored in products	15	27
C stored in landfills	11	7
Energy from logging residues	0	26
Energy from sawmill residues	17	23
Energy from post-consumer residues	7	11
Energy benefits of product substitution	16	30
Total	66	123

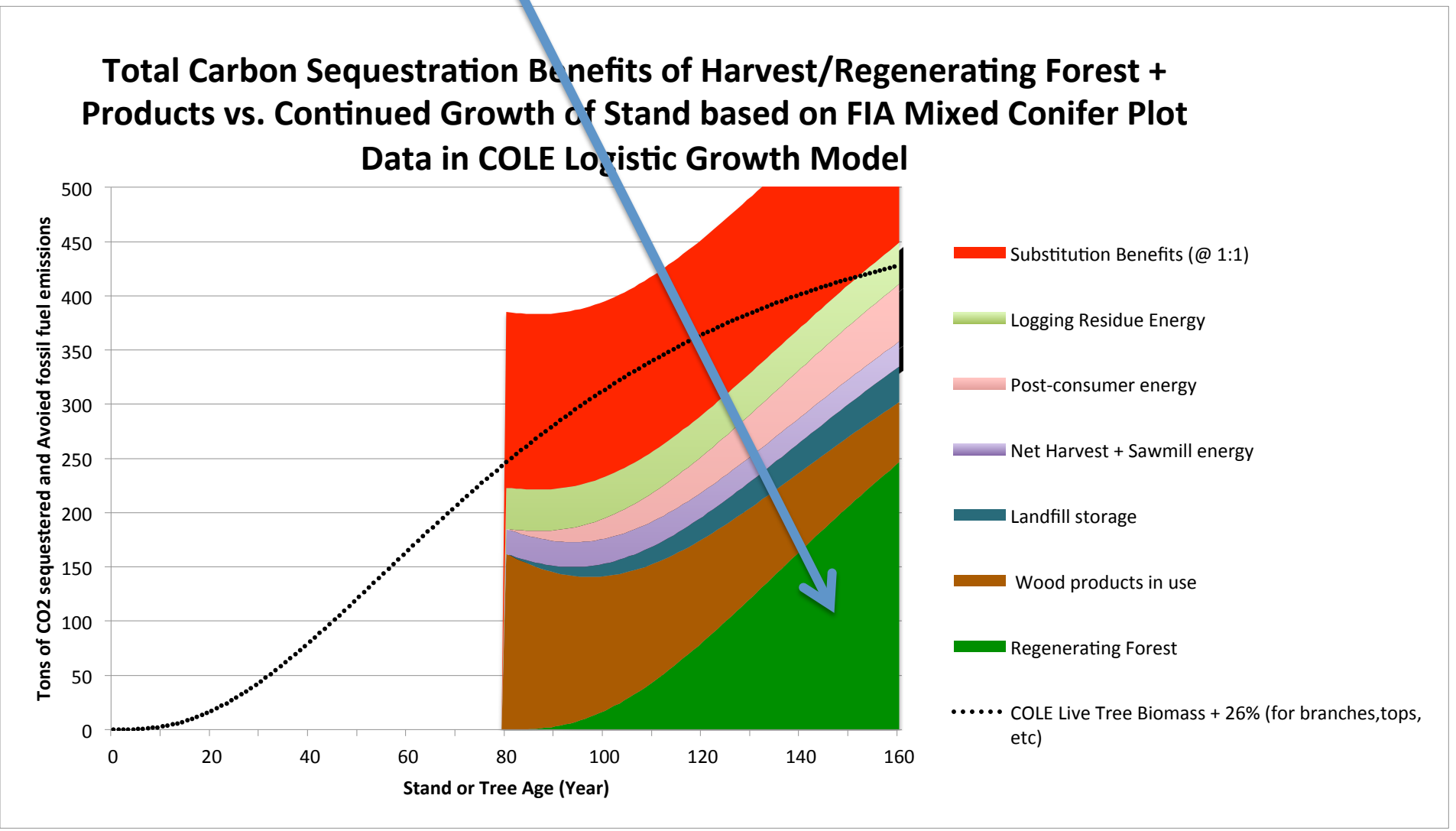
Stewart and Nakamura. 2012 @ UCCE website – 'forest research and outreach' under 'carbon sequestration' page

California's forestry BMPs are very climate-efficient when the energy benefits are counted.

Good forest managers can probably outproduce forest managers of 80 years ago
Good wood products 'managers' should be less wasteful as well



Forest Landowners hope to control this, everything else is estimated



Beyond *de minimus* environmental impact – sustainable forestry operations deliver:

- Valuable wood products that displace fossil-fuel based alternatives and,
- Increased resiliency of the managed forests to withstand future potential climate driven stressors and,
- A business model that can integrate technological efficiencies

A Carbon Calculator for Sustainable Forestry Operations: Is it the Holy Grail?

- We are still not sure who will be the independent arbiter of model quality
- It is still in a state of flux at state, national and global levels
- Given that, the best use of professional forester's time is to increase productivity and resiliency of their forests – rather than engage in 'spreadsheet' scenarios driven by assumptions about what happens after the log trucks and chip vans leave.