The Value of Carbon in Forests

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Woody Biomass and Small Log Workshop: From Feedstock to Product

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Take Home Messages

- Forest carbon is more than carbon sequestration
- Forest carbon benefits include
  - in-forest,
  - in-product and
  - in-renewable energy components
- Poorly implemented regulatory systems can create more potholes than opportunities
- Transparent market prices, low transaction costs, and side benefits will attract participants to provide more forest carbon benefits
- Biomass prices could increase substantially if they include climate and other benefits

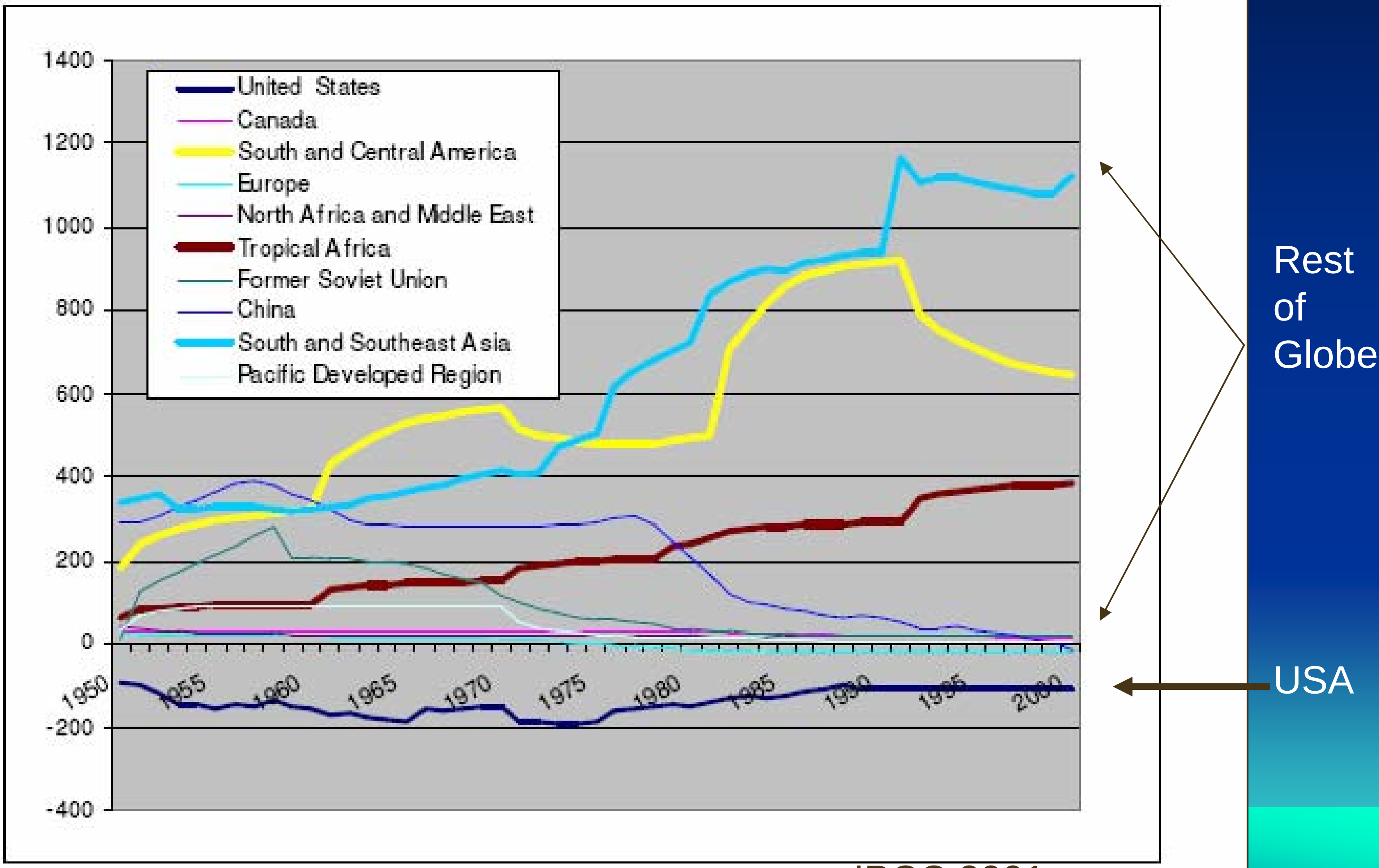
Carbon accounting has been done by foresters for decades

- Pinchot (1900) quote – wood is ½ carbon
- Measurements are tied to end-products (boards, chips, firewood)
- Better recovery rates via better technology are tracked separately
- Forest carbon has bole + other above ground + below ground components
- Increases above baseline trends is the goal of the carbon trackers

Temperate forests*climate benefits are not so simple

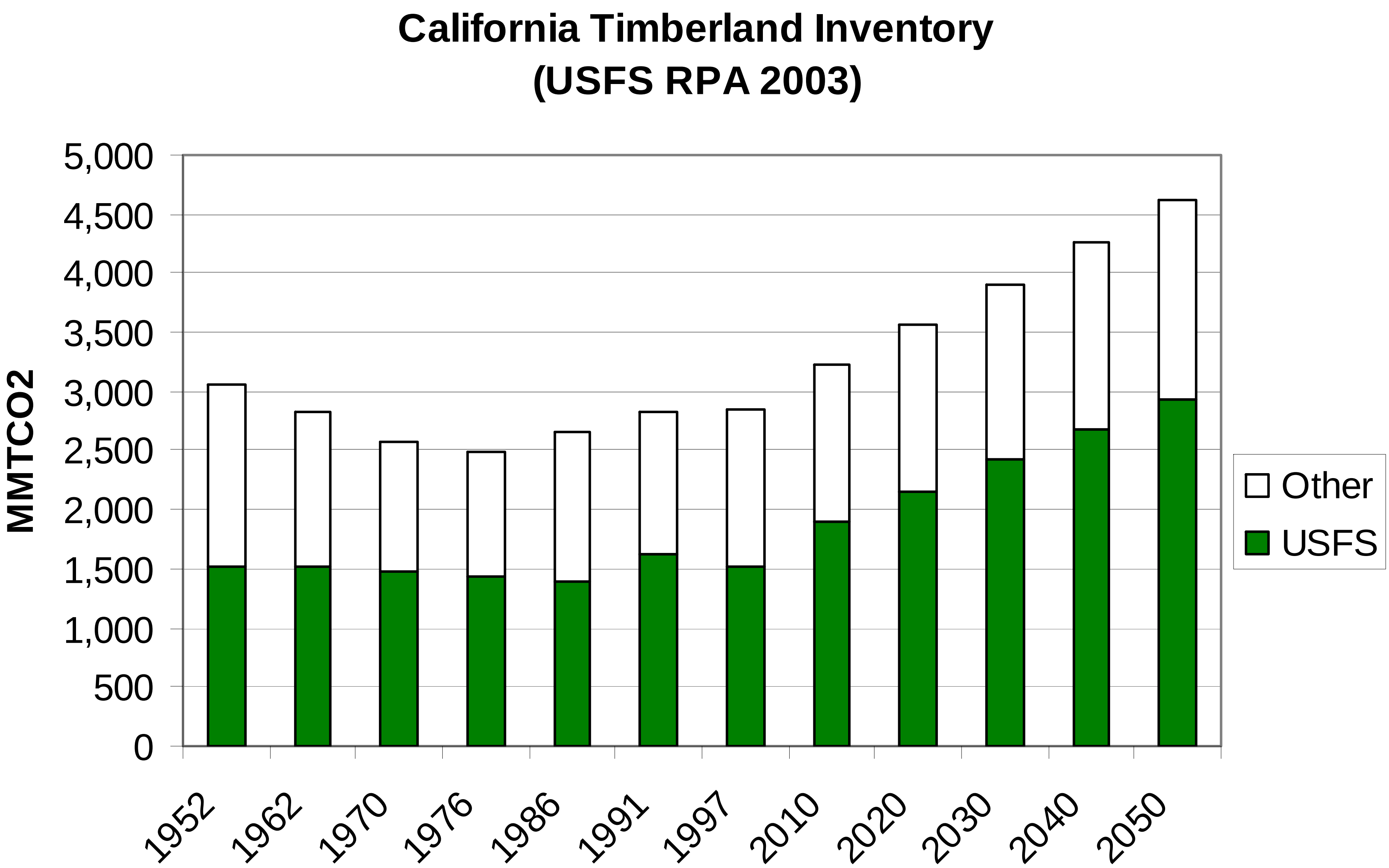
- Other countries do not want to give USA free carbon credits for our expanding forest inventories
- Bala et. al (2007) suggest large negative climate impacts from some temperate and high latitude forests via heat absorption, CH4 emissions, old forest decline
- Overblown claims of <u>current</u> CO2 sequestration from <u>future</u> forest growth are the poster childs of bogus voluntary/guilt-washing projects

The USA is the only consistent forest carbon sink



IPCC 2001

The Baseline – More Forest Carbon



Good Carbon, Bad Carbon

+	Standing Timber Inventory	Offset CO2 emissions
+	Other Biomass	Offset CO2 emissions
+	Wood Products	Offset energy-intensive building products
+	Biomass Energy	Offset fossil fuels
-	Surface and Ladder Fuels	Increase probability of CO2 and CH4 wildfire emissions
-	Crown Fuels	Increase probability of CO2 wildfire emissions
-	Dark Green Surfaces	Increase radiative heating
-	Decomposing snags & logs	Emit CO2
-	Decomposing roots	Emit CO2

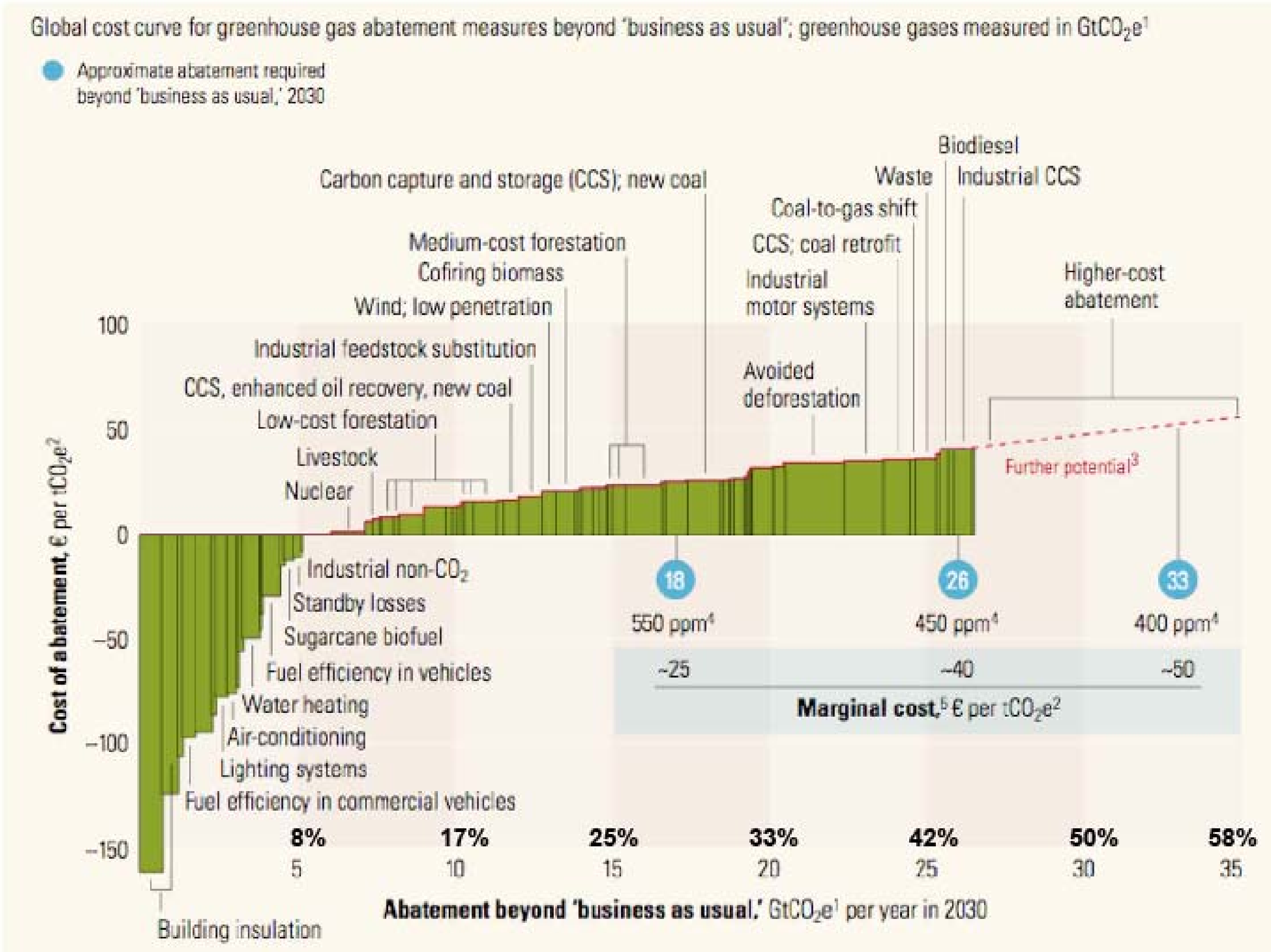
Comparing Global Opportunities

- Look at quantities
- Look at prices
- Whether by market or rules –

  Start with the low hanging fruit and move up the tree

www.ecosystemmarketplace.com for CO_2 prices

Harnessing Farms and Forests in the Low-Carbon Economy for the 'Duke Standard' for CO_2e projects



http://www.mckinseyquarterly.com/Energy_Resources_Materials/

Details, details, details – key points

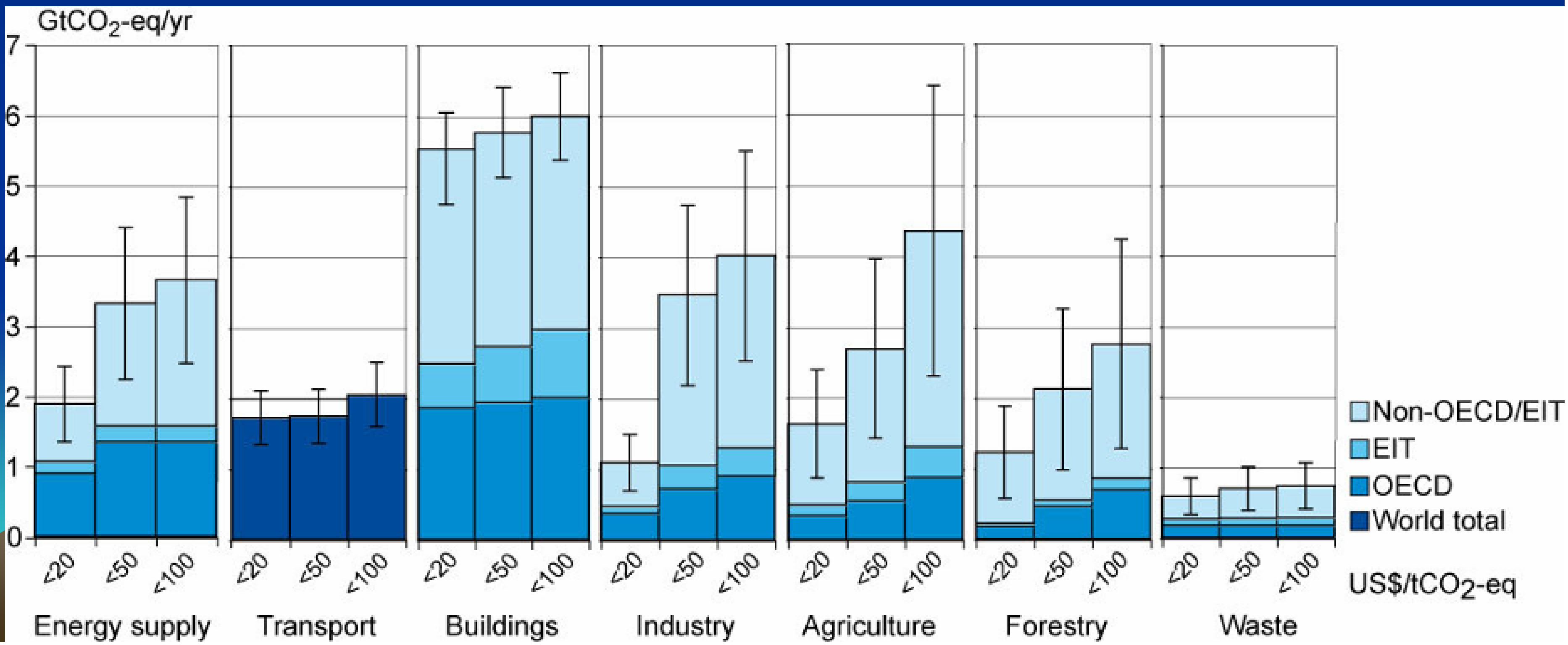
where forestry and forest products matter

#1 buildings

#2 low-carbon energy supply

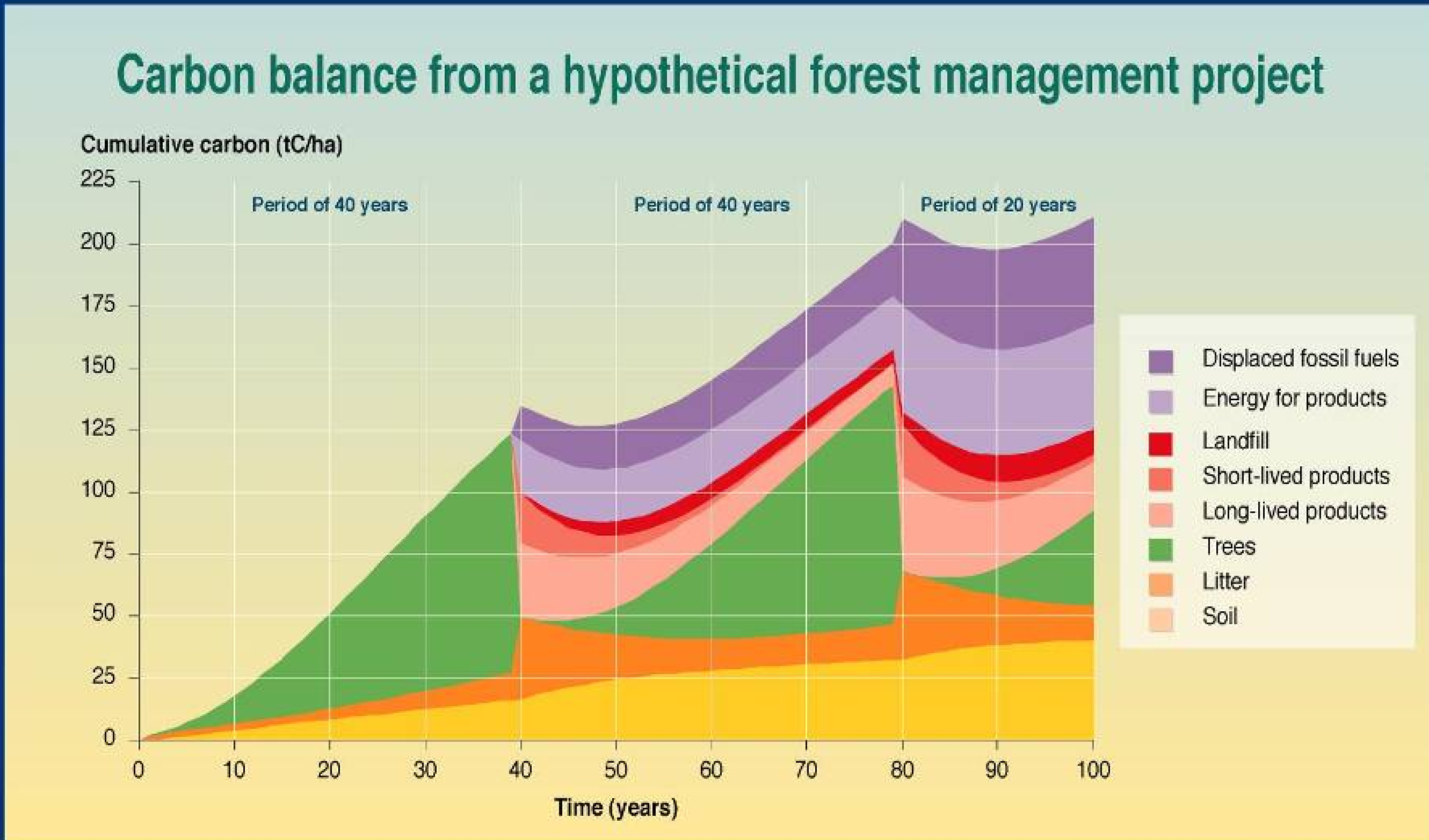
#3 in-forest sequestration

Note comparatively small size of 'OECD Forestry' at $20/CO2e ton www.ipcc.ch



Three Related Opportunities for Forests and Forest Products

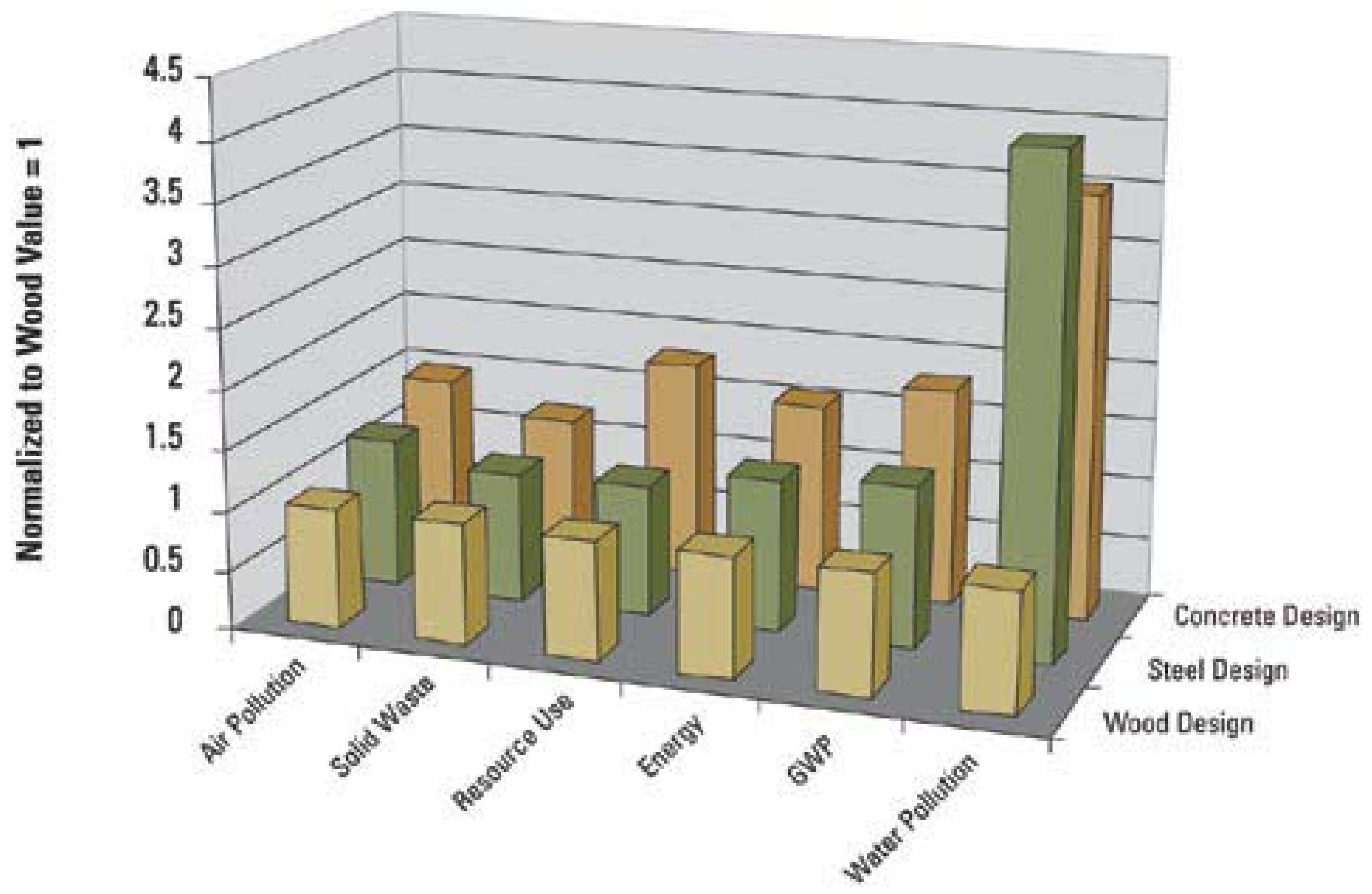
1. In-forest
   – net-new carbon sequestration via faster growth and less loss to fire, insects, wind, etc.
2. In-products
   – increasing the use and lifespan of wood materials in buildings
3. In-renewable energy
   – forest biomass for steam heat and electricity to meet the Renewable Portfolio Standard (RPS)



WG3 - FIGURE TS-6

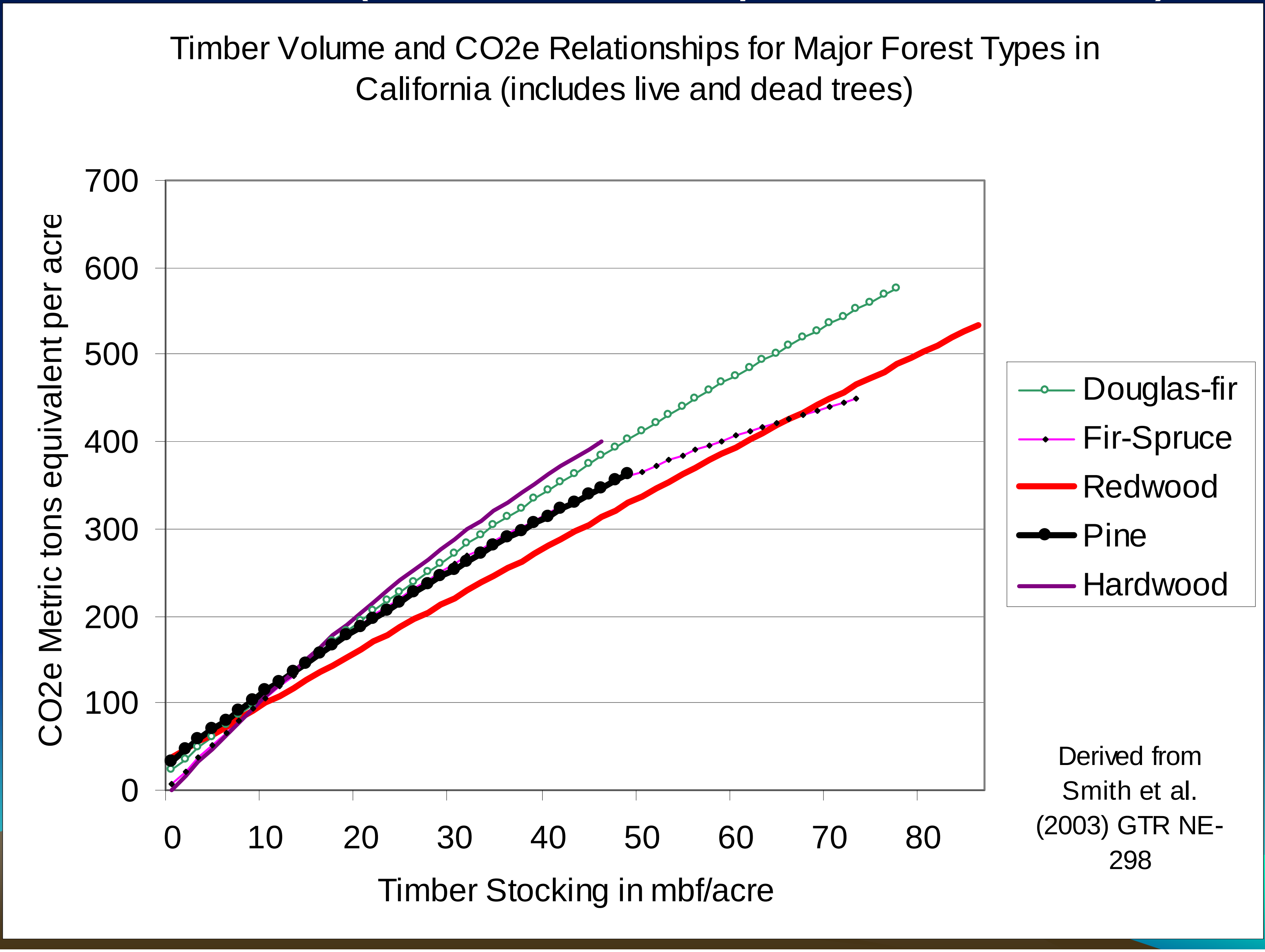
1/3 in-forest, 1/3 in-products, 1/3 in energy conservation

Wood design has many benefits over steel and concrete design in initial energy and lifetime energy use



Embodied Effects Relative to the Wood Design across all Measures

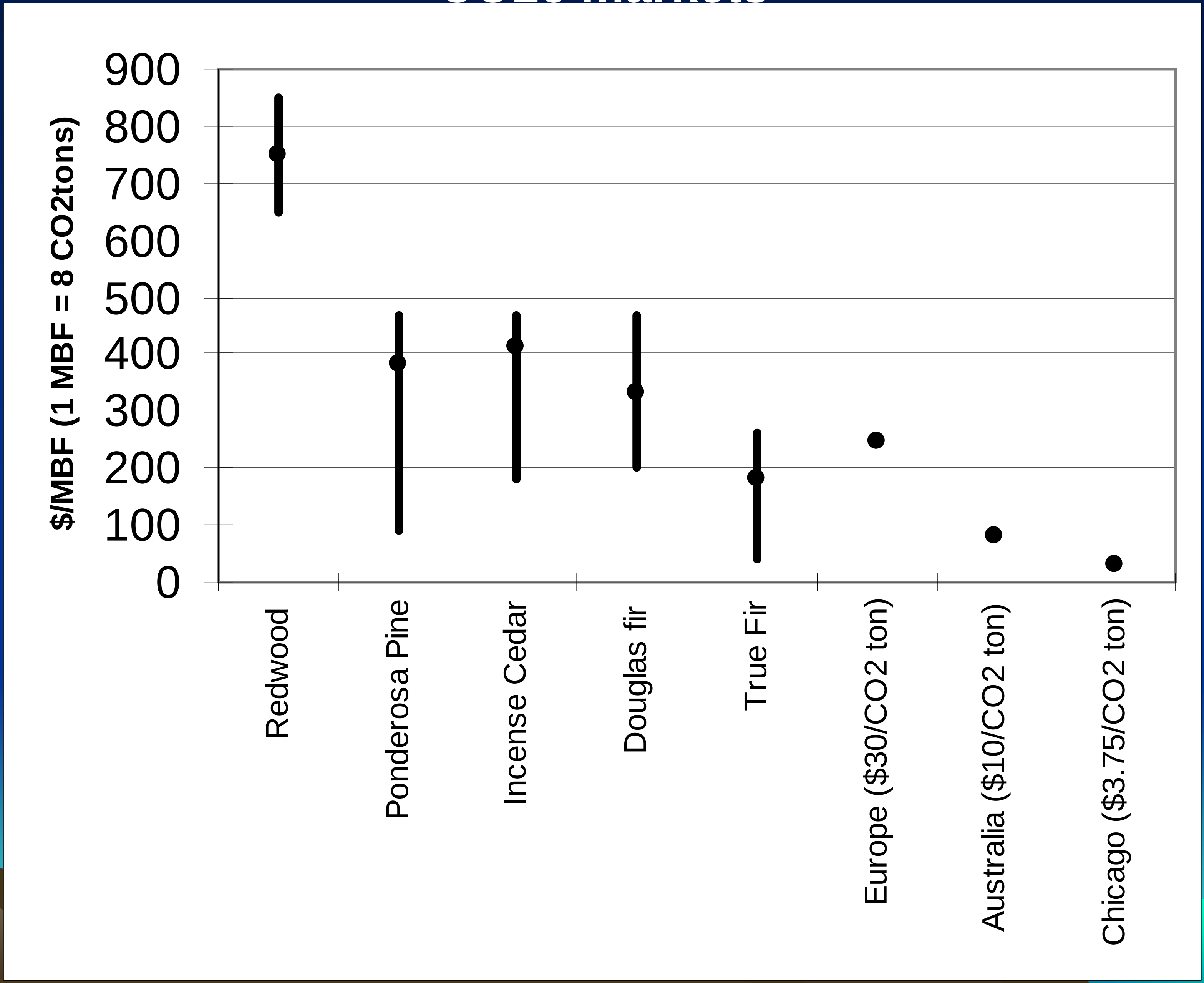
Conversion between forestry measurements (board feet) and metric units (tons of CO2 equivalent – CO2e)



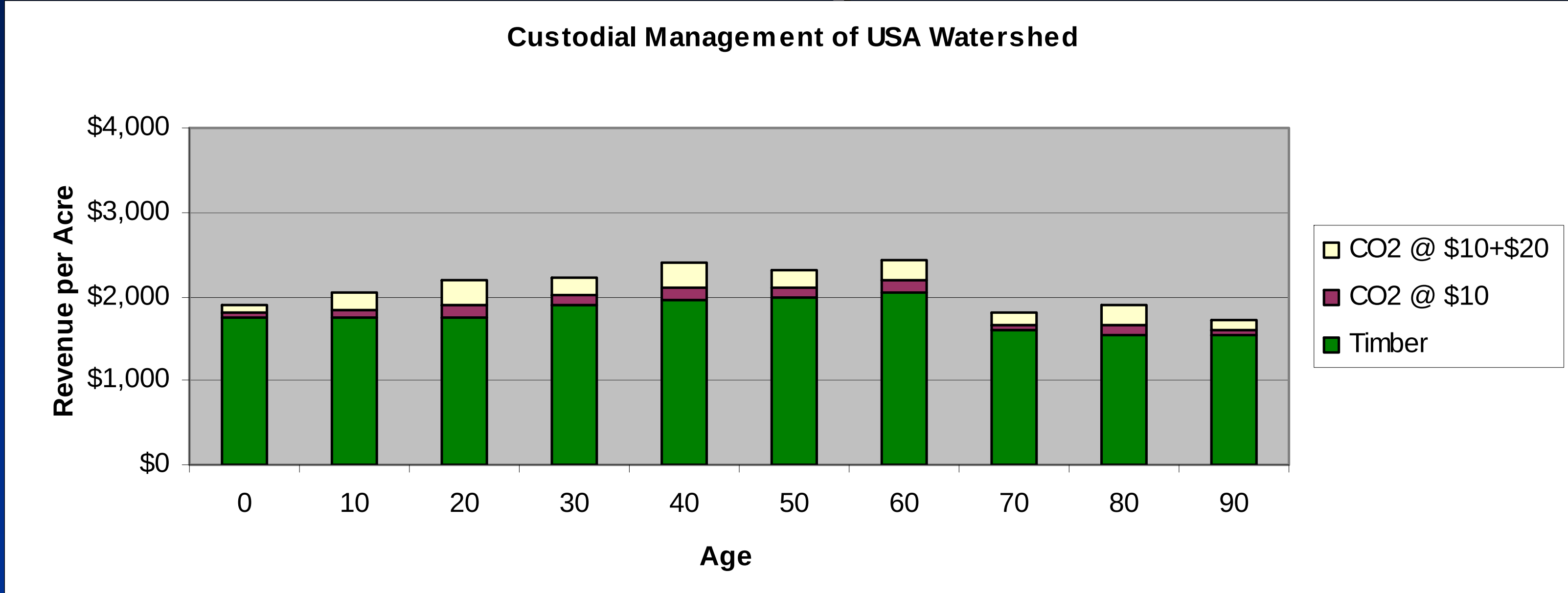
Comparing Timber and CO_2 Stumpage

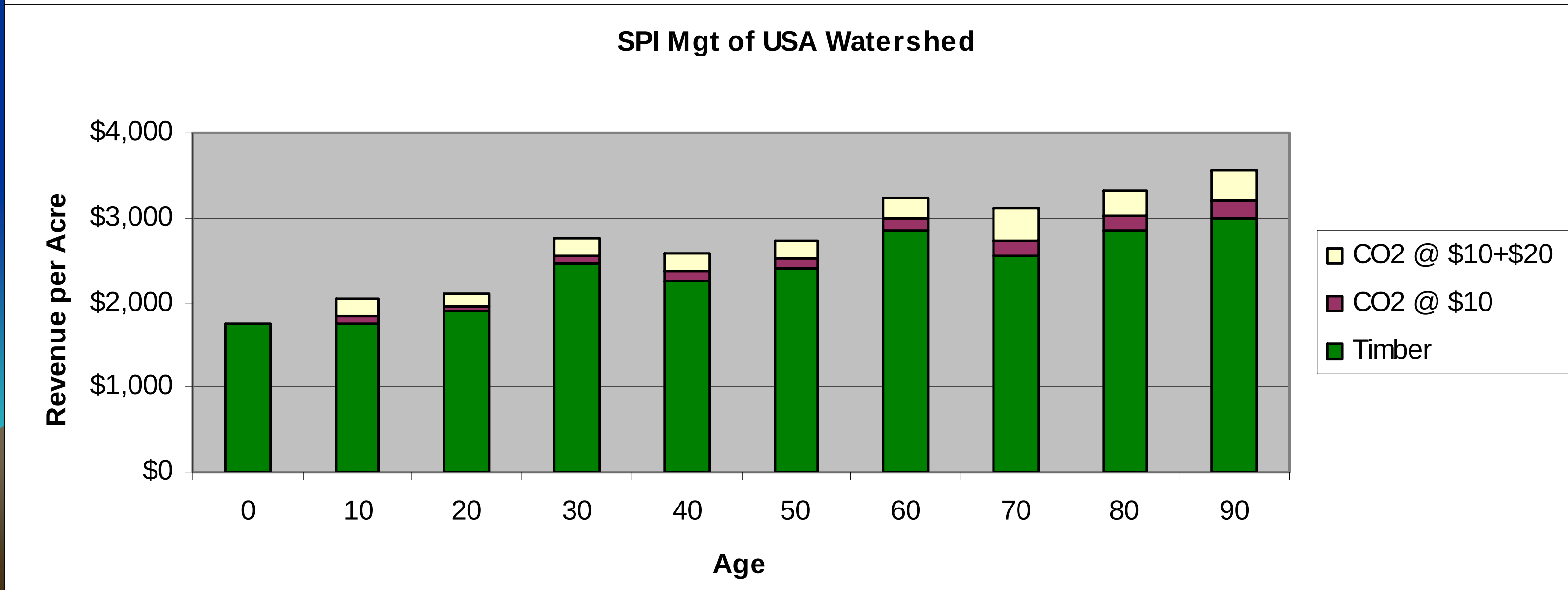
CA	Southeast USA	\$/ mbf	\$/ CO_2 ton	Similar CO2/ton prices
	Pulpwood	**50**	**6**	Lowest cost US voluntary offers (unverified)
Firewood	Hardwood	**100**	**13**	PGE Climate Smart Pgm request at $10/ton
Fir - Coast	Pine – chip n saw	**150**	**19**	Low cost investments (IPCC 2007)
Fir - Sierra	Pine - sawtimber	**200**	**25**	Current CO2 Price in Europe for future sales
Pine-Coast		**250**	**31**	European Union – penalty
Doug. Fir - Coast		**300**	**38**	
Doug. Fir, Pine - Sierra		**400**	**50**	Higher cost investments to achieve CO2 reductions
Redwood		**850**	**106**	Equal to the most expensive options

Price Ranges for Different Species by Region and Different CO2e markets



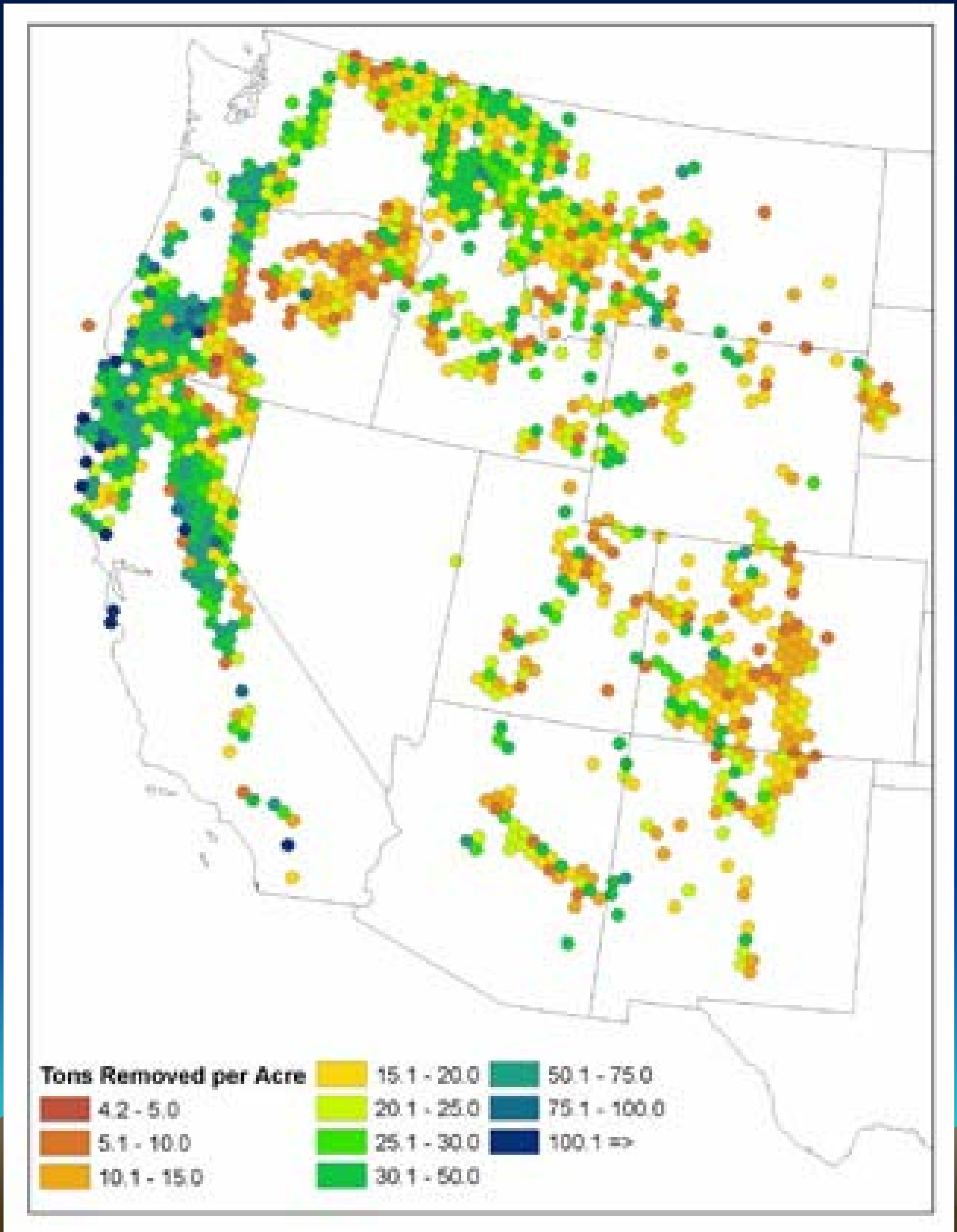
CO_2 icing on the sustainable forestry cake





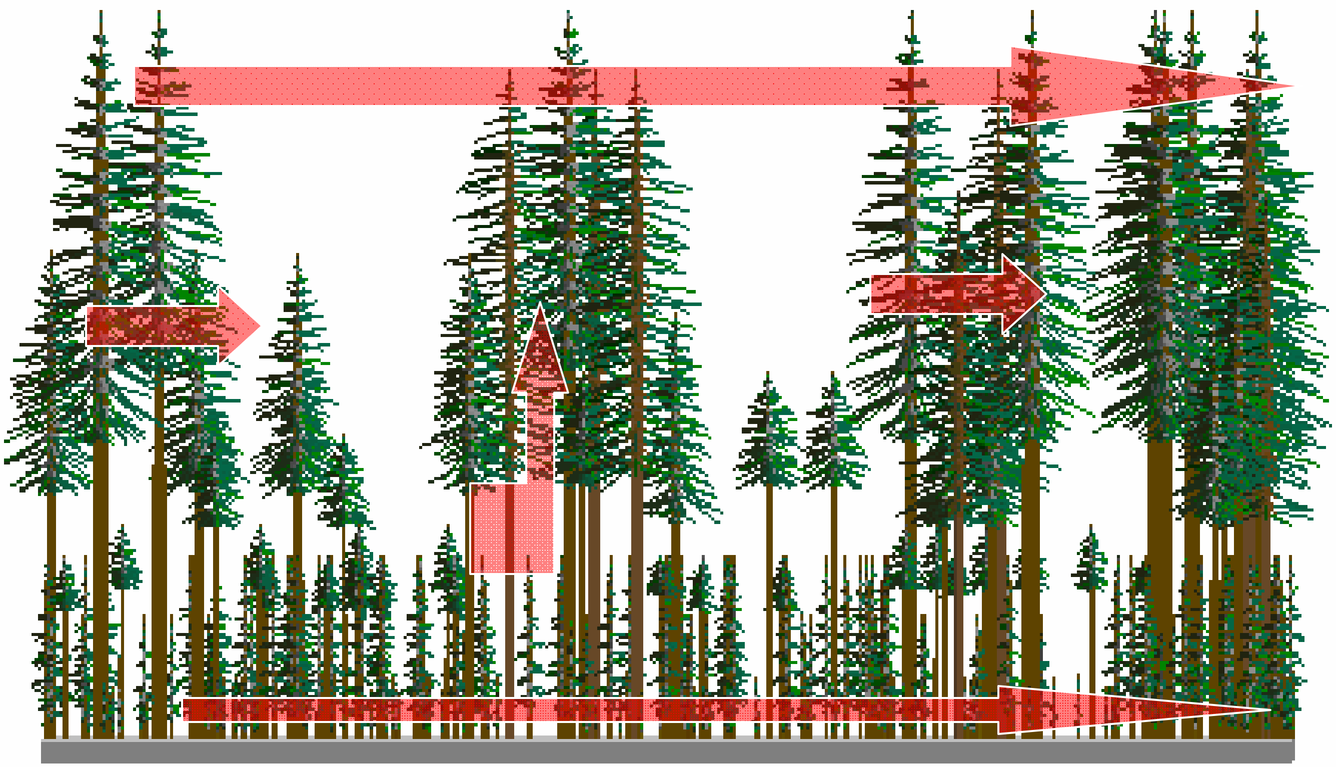
Go back to the good carbon, bad carbon slide

- Higher inventories in second growth forests have benefits and risks
- (+) Full use of growing space in uneven stands
- (-) Excessive fuels and fire risk
- (-) Too many trees for droughts
- (-) Less shaded snow, water runoff



USFS (Skog et al. 2006) report on fire risk reduction harvest potential – California has greatest risk, greatest fuel buildup, and greatest potential biomass yields/ac – key area to reduce risk and produce renewable energy

Wildfire: All burnt acres are not the same in terms of carbon losses



Types of Fires

Active – 10% acres crown

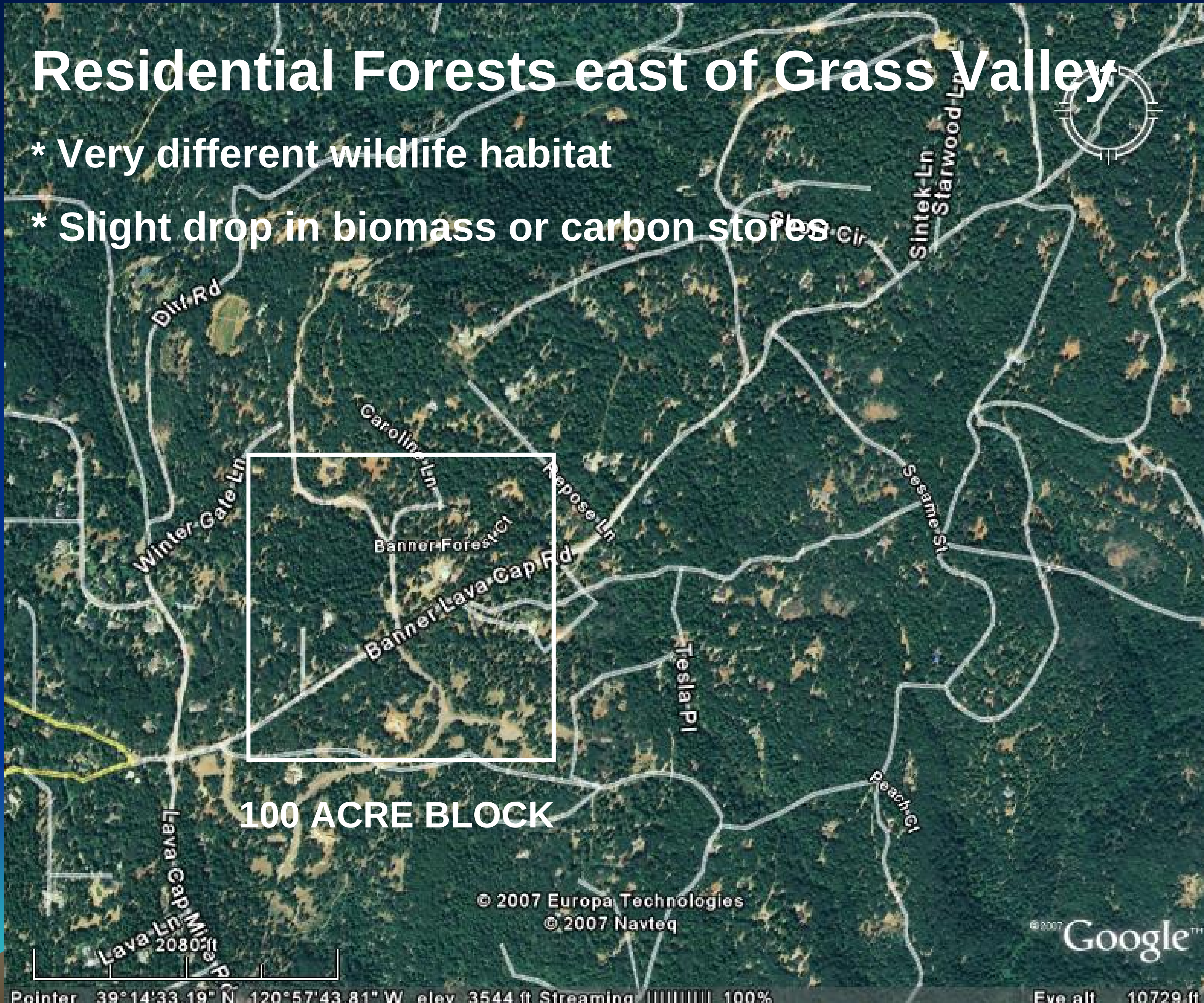
Mixed – 30% acres

Surface – 60% acres

Residential Forests east of Grass Valley

* Very different wildlife habitat

* Slight drop in biomass or carbon stores



In-renewable energy benefits

- Renewable Portfolio Standard quota – 20% soon and will increase over time
- offset fossil fuel GHG emissions – 1 BDT = 1 CO_2 ton of emissions avoided
- reduce landscape-level wildfire emission risks (CO_2, CH_4, NO_x)
- Increase near residential areas fire resiliency (highest value assets in wildlands – but who pays?)

Forest climate benefits that the atmosphere will see (excluding co-benefits to owners or others)

'Net new', or above baseline, forest carbon via

1. New planting of areas that will support forests
2. Faster growth of existing forests
   - Low – 0.25 mbf/ac/yr or 2 CO_2e ton/ac/yr
   - Medium – 0.5 mbf/ac/yr or 4 CO_2e ton/ac/yr
   - High – 1.0 mbf/ac/yr or 8 CO_2e ton/ac/yr
3. Reduced probability of climate-related risks
   - Fire (not all carbon is lost on every burned acre)
   - Insect and disease infestation and loss
   - Windthrow
4. Reduced regional conversion losses of trees
5. Bundle true climate benefits and don't mix in non-climate land preservation or open space benefits

Climate change resiliency should be more than forest carbon sequestration projects

- Permanent carbon storage projects on Acre ‘X’ or ‘Y’ are expensive to track and guarantee
- Resilient forest stands for a hotter and drier future climate will require thinning (hence lower inventories) but will be dinged if fire risk is ignored in thinned and unthinnned projects
- Biomass has multiple climate benefits – RPS quota, offset fossil fuels, reduce wildfire emission risks, etc.
- Successful programs will resemble the Drought Water Bank
  - **Simple to understand (annual fallow for $)**
  - **Cheap to implement (2% transaction costs)**
  - **Fixed term contracts, not land sales or permanent easements**

Take Home Messages

- Forest carbon is more than carbon sequestration
- Forest carbon benefits include in-forest, in-product, and in-renewable energy components
- Biomass has multiple climate benefits but transaction costs could overwhelm revenue streams
- Poorly implemented regulatory systems can create more potholes than opportunities
- Transparent market prices, low transaction costs, and side benefits will attract participants
- Biomass prices could increase substantially if they include climate and other benefits