Forest-based Biomass Energy Projects
Will sustainable forestry, renewable energy, and climate benefits goals overlap this time?

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Fort Bragg, April 24, 2009

What is a biomass project?

- As simple as a wood stove with a catalytic converter, or
- As complex as a large bio-refinery

http://canadaforests.nrcan.gc.ca/rpt#adapting

Why not just use traditional energy? – it is the CO2 emissions

- Coal – 2 tons of CO2 per 1 MWh
- Natural Gas – 1 ton of CO2 per 1 MWh
- Nuclear Power – 0 ton of CO2 per 1 MWh
- Renewable Energy – 0 ton of CO2
  - Big investment costs, need excellent sites
  - Big Hydro
  - Geothermal
  - Wind
  - Solar thermal

Renewable Portfolio Standard (RPS)

- Carbon zero - small hydro, geothermal, wind, solar thermal
- Carbon neutral – agricultural and woody biomass
- Overall - 20% goal by 2010
- 33% goal by 2020
- PGE is at 15% in 2009, other utilities less
- Statewide grid average is 10% - will miss

Renewable Energy in the US

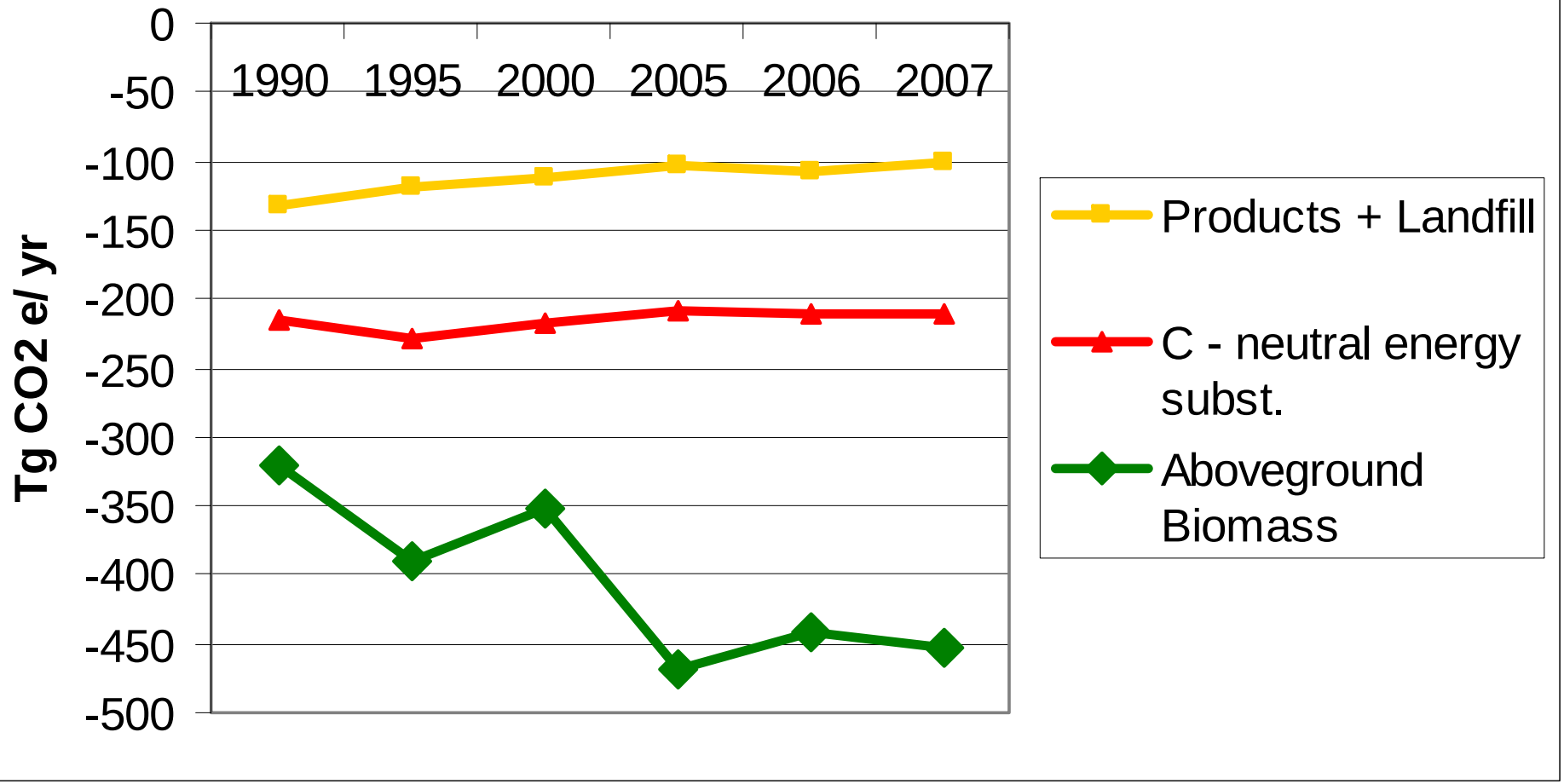
Renewable Energy Source	**2003**	**2004**	**2005**	**2006**	**2007**
Wood Derived Fuels					
Biofuels and Waste					
Hydroelectric Conventional					
Geothermal					
Wind	**1.0**				
Solar/Photovoltaics					

Renewable Energy in the US

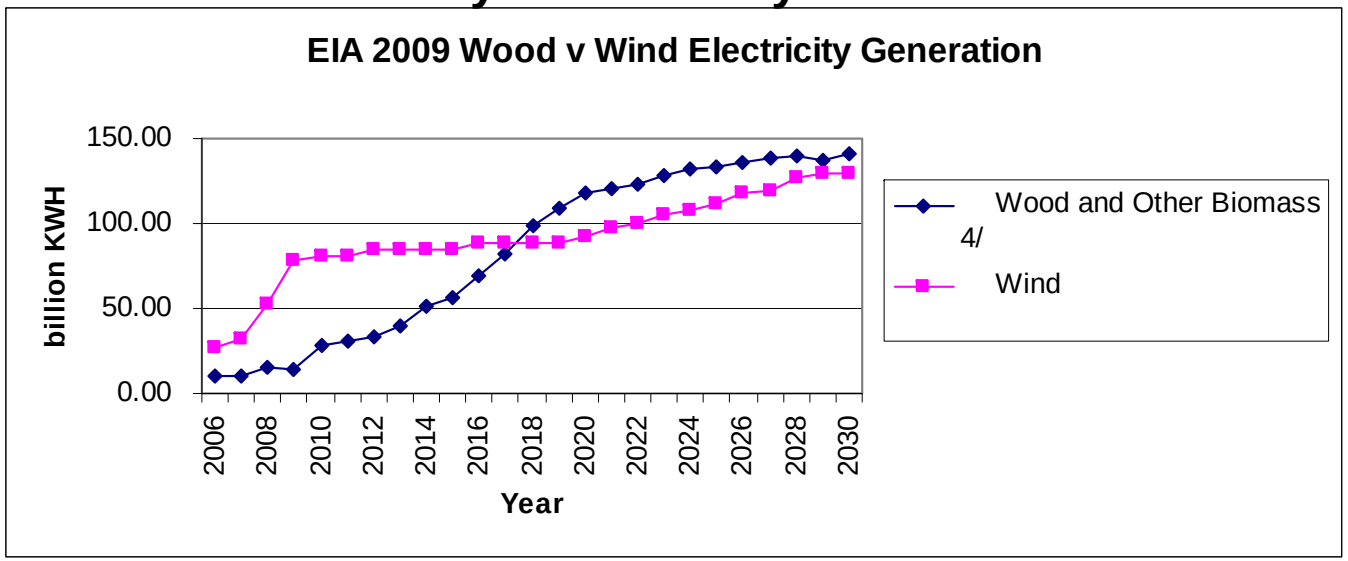
Renewable Energy Source	2003	2004	2005	2006	2007
Wood Derived Fuels	17	18	18	18	18
Biofuels and Waste	7	8	8	10	12
Hydroelectric Conventional	24	23	23	24	21
Geothermal	3	3	3	3	3
Wind	1.0	1	1	2	3
Solar/Photovoltaics	1	1	1	1	1

Climate Sinks of Forests and Forest Products
Cheap Energy Impedes Further Growth of C-neutral bioenergy

http://epa.gov/climatechange/emissions/usinventoryreport.html

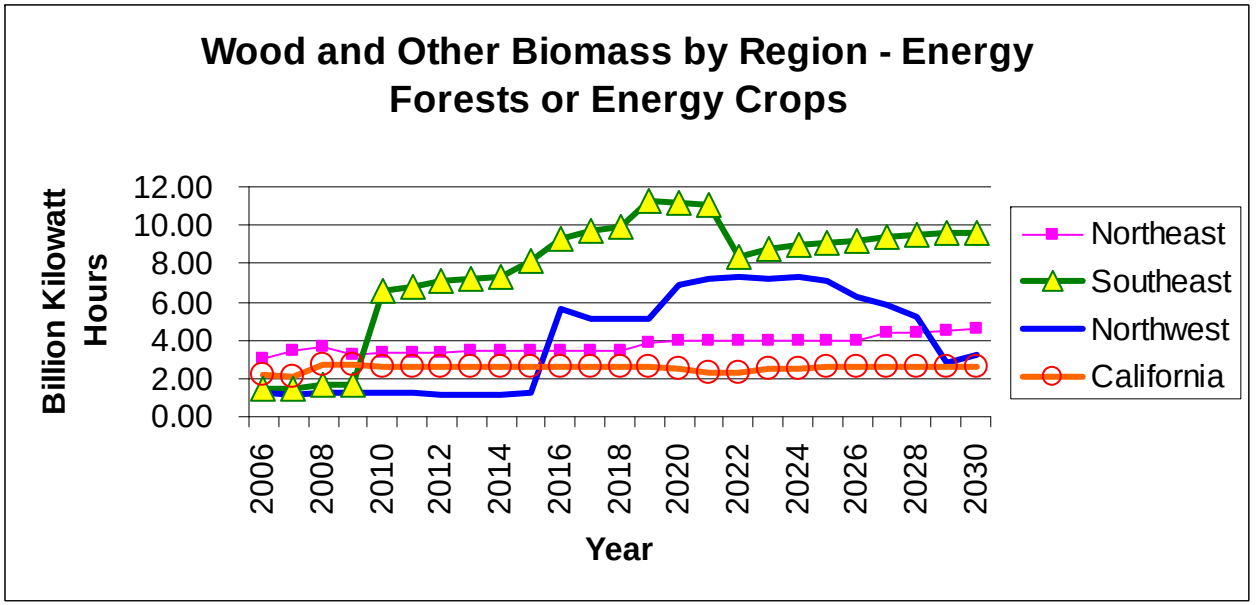


Biomass to Electricity is projected to be the #2 renewable electricity in 2030, after conventional hydroelectricity



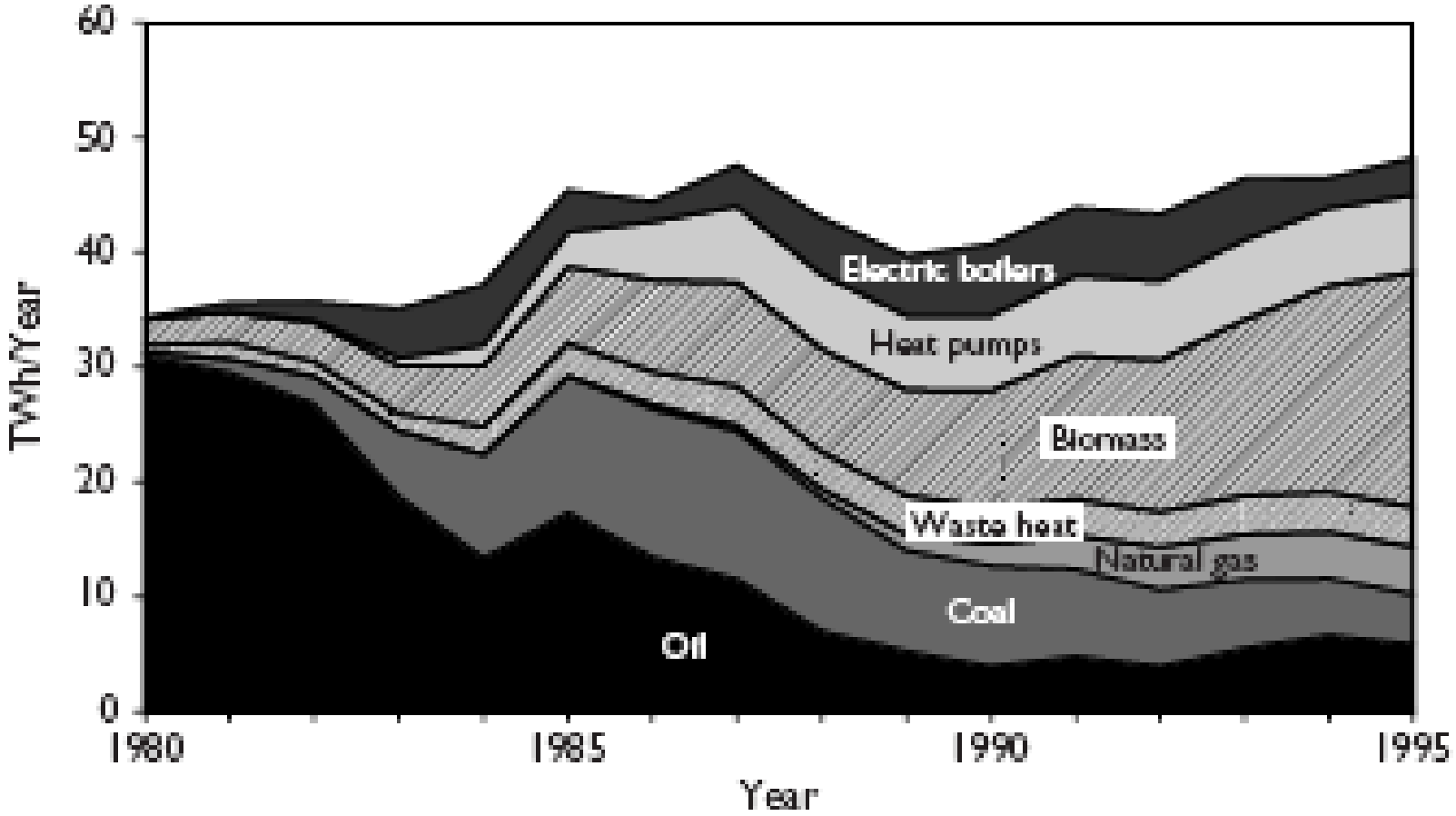
With most of the new capacity from energy farms

2009 Energy Outlook by EIA



Wood Chips Displaced Oil, then Coal in Sweden, will be #1 energy fuel in Sweden and Finland soon

Figure 1.6. District Heating in Sweden, 1980-1995

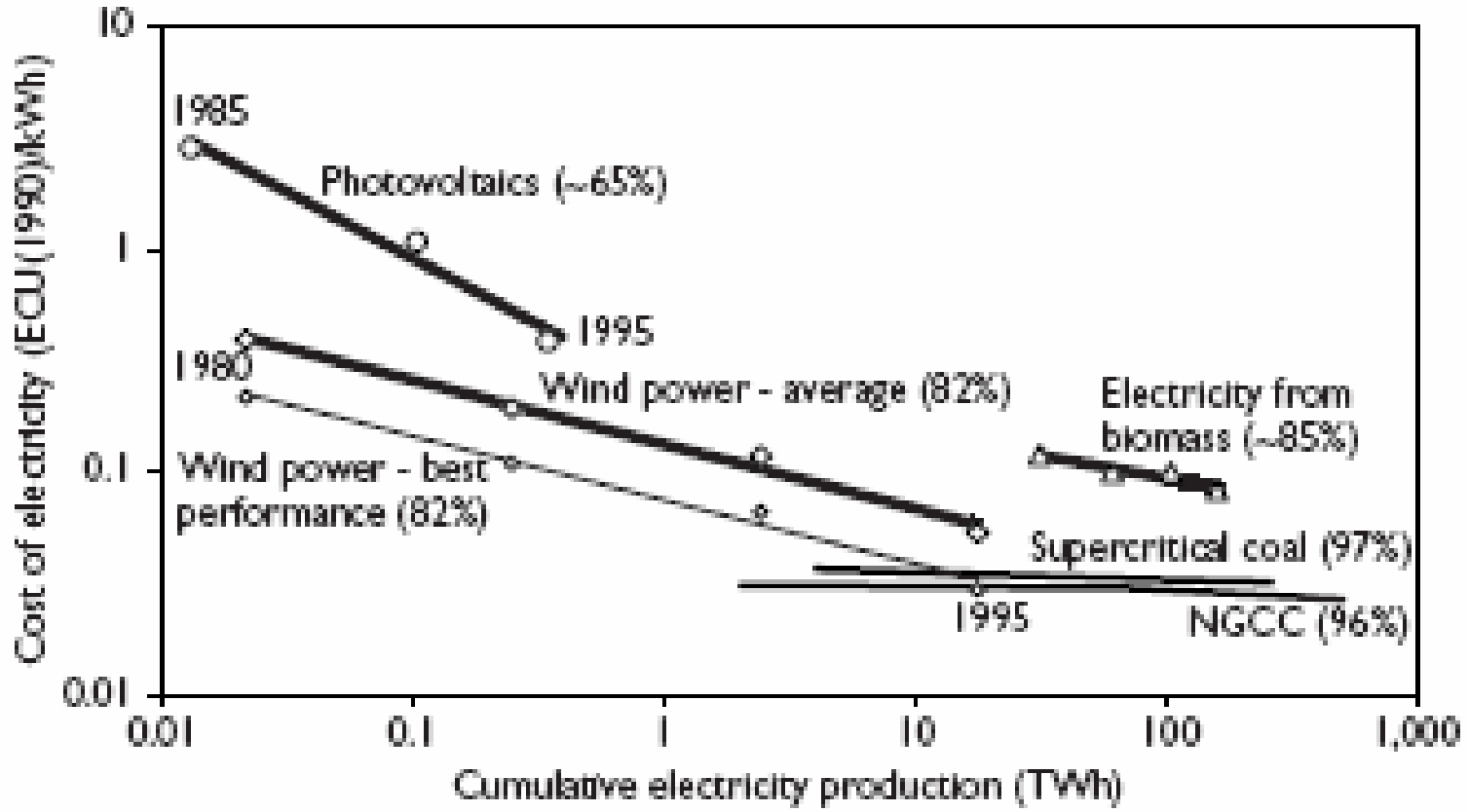


Continental Europe

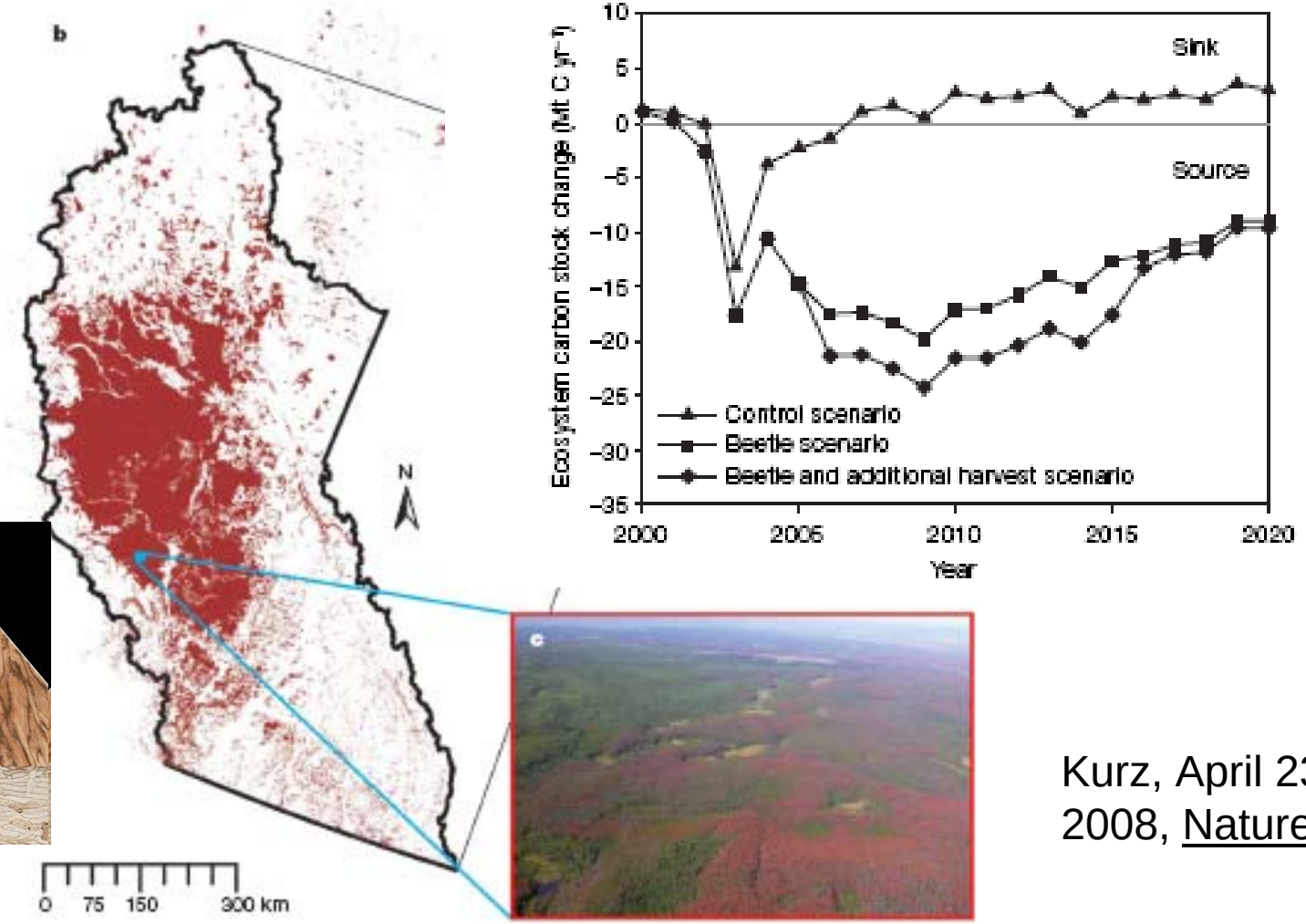
- High volume, uneven aged management
- Silviculture to ensure regeneration, get large harvestable trees, and allow public access
- Long rotations (> 100 years) with ½ the harvested volume as sanitation salvage
- Using both forest slash and energy plantations – huge increase in bioenergy

Learning By Doing: Biomass is 10x as big and the same price (cents/kwh) as Wind Power in Europe

Figure 1.5. Electric Technologies in EU, 1980-1995



A Very Large Forest Disturbance: Mountain Pine Beetle in BC and Beyond



Kurz, April 23 2008, Nature

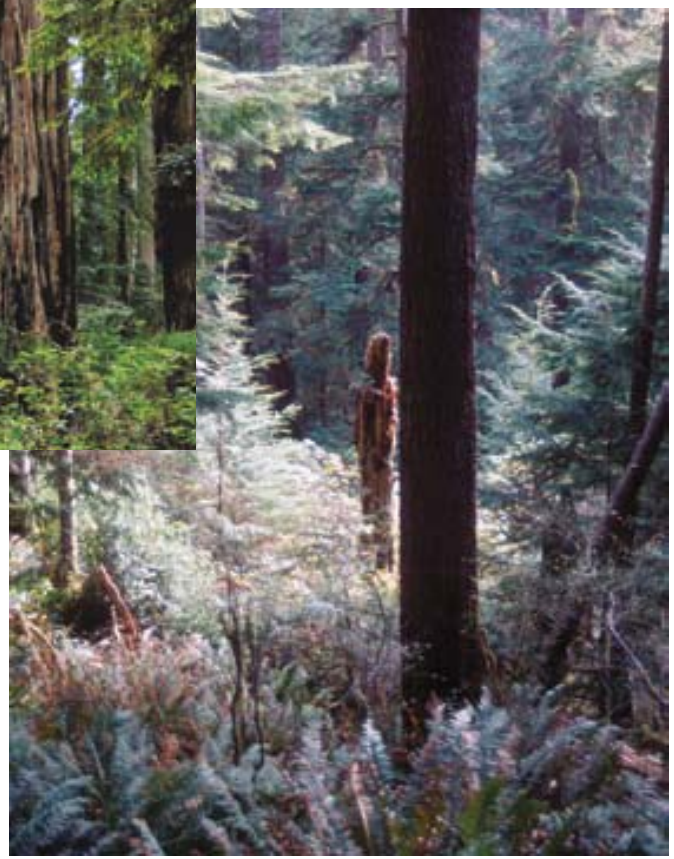
Figure 1 | Geographic extent of mountain pine beetle outbreak in North America. a, Extent (dark red) of mountain pine beetle. b, The study area includes 98% of the current outbreak area. c, A photograph taken in 2006 showing an example of recent mortality: pine trees turn red in the first year after beetle kill, and grey in subsequent years. Photo credit: Joan Westfall, Entopath Management Ltd.

Eastern United States

- New England – already have lots of little biomass energy projects and are scaling up. Plan to use biomass harvesting to finance what were money losing stand improvement activities
- Southeast – Biomass for energy has lower quality standards than pulp for paper (can use forest slash) and will have 2x CO2 benefit

Everywhere the concern is to ensure forest sustainability

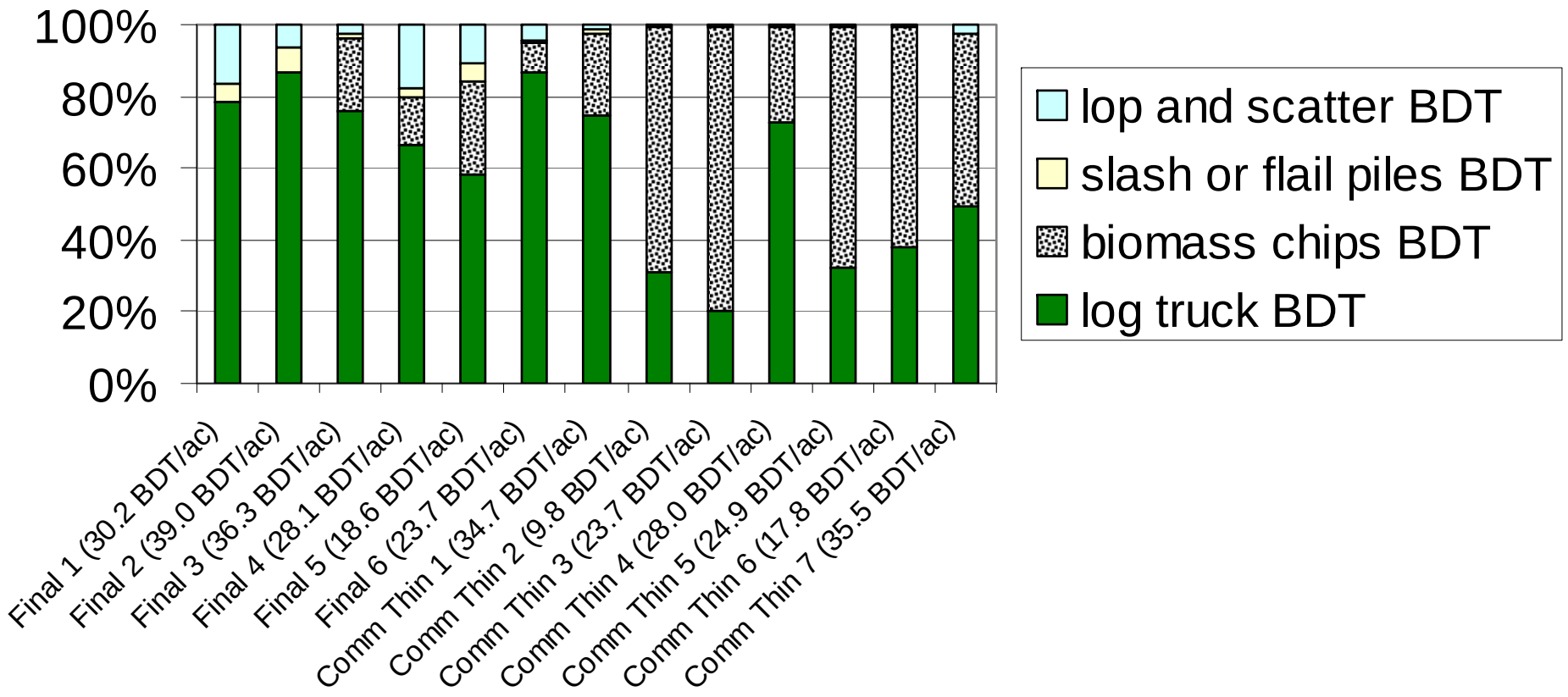
- Water quality
- Nutrient cycling
- Wildlife habitat
- Soil fertility



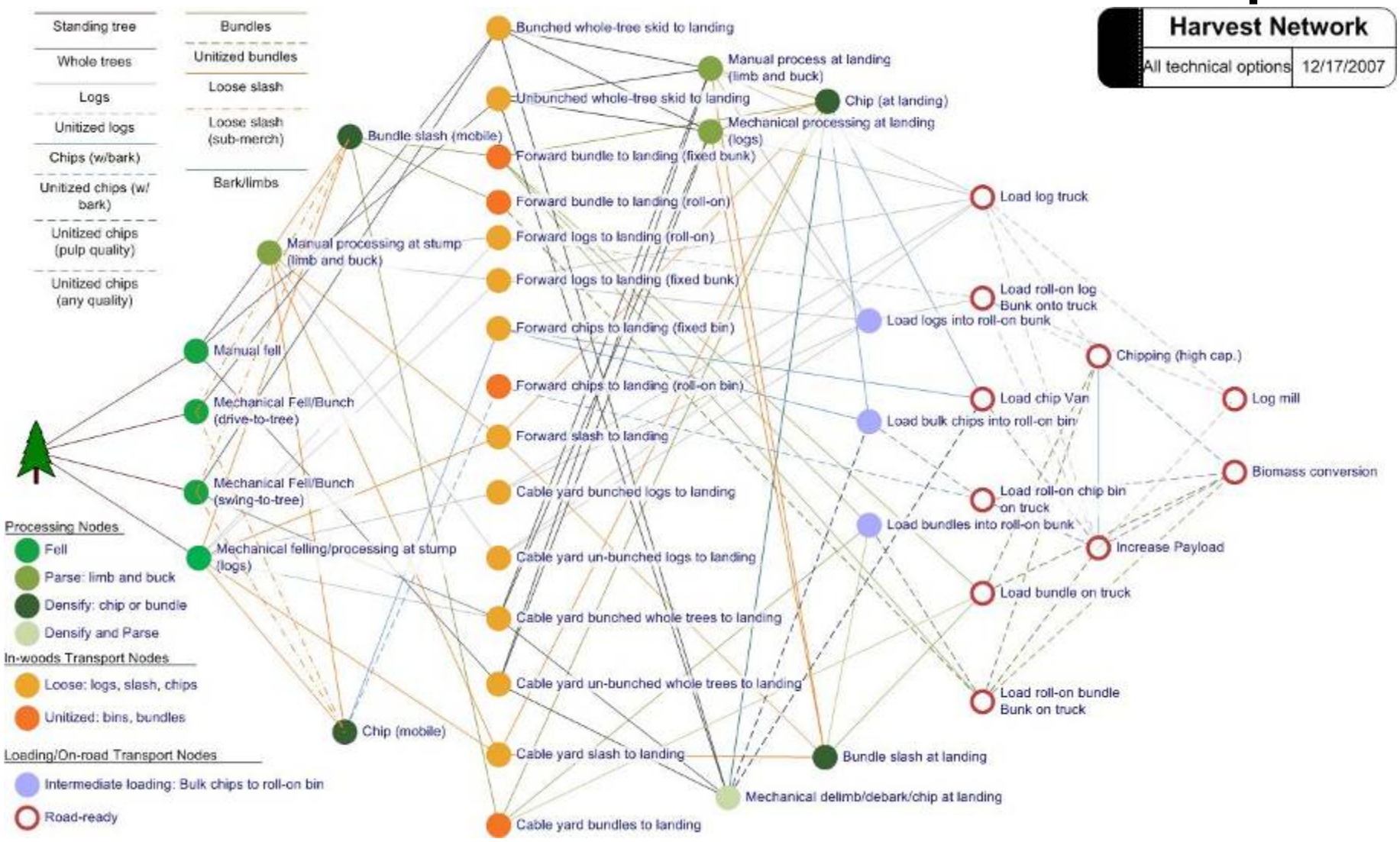
An Assessment of Biomass Guidelines, Evans and Perchel, Forest Guild, January 2009

- Base on sound science and include wide stakeholder input
- Recognize local ecological traits
- Address what biomass to leave and nutrient cycling
- Guidelines should be practical and easy to follow and promote long term forest health

What Happens to the Harvest? Northern Interior of California



Possible Harvest Process Steps



Cable Yarding Whole Trees

- Skyline Yarders

Changes to Cable Yarding

- Steep-Terrain Feller-Buncher

Hartsough, UC Davis

Changes to Cable Yarding

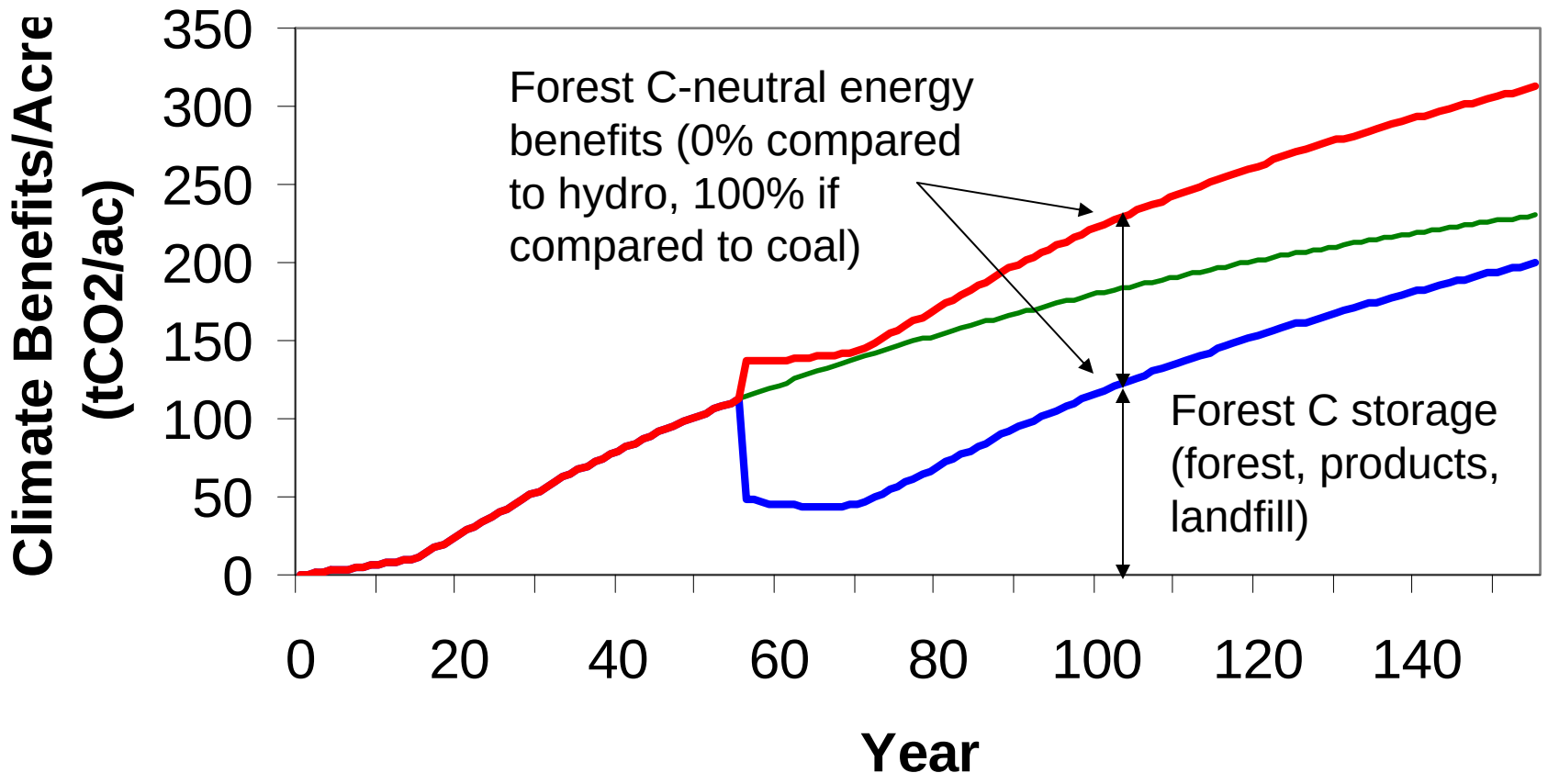
- Gondola Endless-Loop Yarder

Few hands touch chips once delivered to the biomass plant

International Perspectives on Biomass Energy

- European countries, UNFCC compliance - #1 goal is to reduce coal consumption
  - Forest bioenergy > Forest C storage (increasing)
- Canada – Kyoto signatory
  - Forest C storage then beetles forced a reevaluation
- US Federal Policies – still evolving
  - Forest C storage > Forest energy crops but…
- California
  - Forest + products only in CARB, bioenergy currently not part of policy solution mix, but it will be soon
- Tropical Forests – Voluntary Carbon Std (VCS)
  - Improve forest management and plant new forests
  - Focus where sustainable forestry is rare

Forest C Storage and C-neutral Energy Climate Benefits of Long and Very Long Rotation Douglas-fir stands



American Clean Energy and Security Act of 2009 (3/09 draft)

Renewable electricity standard

Biomass definition (p7-8) – for price premium

- Existing cropland
- Existing forest plantations (weak signal for grass->trees)
- Forest slash and thinnings not from
  - 'mature forests' (mixed message for uneven aged mgt)
  - Federal lands (let fires and bugs drive 'ecological restoration')

  Seems to prefer annual energy crops to tree based biomass - soil fertility, CH_4 and and N_2O emissions, and water quality issues?

  No incentives to increase conversion rate of crop/grassland-forests

  Would penalize forest thinnings of many FSC certified properties

  http://energycommerce.house.gov/Press_111/20090331/acesa_discussion draft.pdf

The US, California, local governments can promote or inhibit the replacement of fossil fuel emissions with carbon neutral bio-energy