Biomass Research and Development Technical Advisory Committee Meeting March 27, 2019

Renewable Wood Energy Updates from U.S. Forest Service

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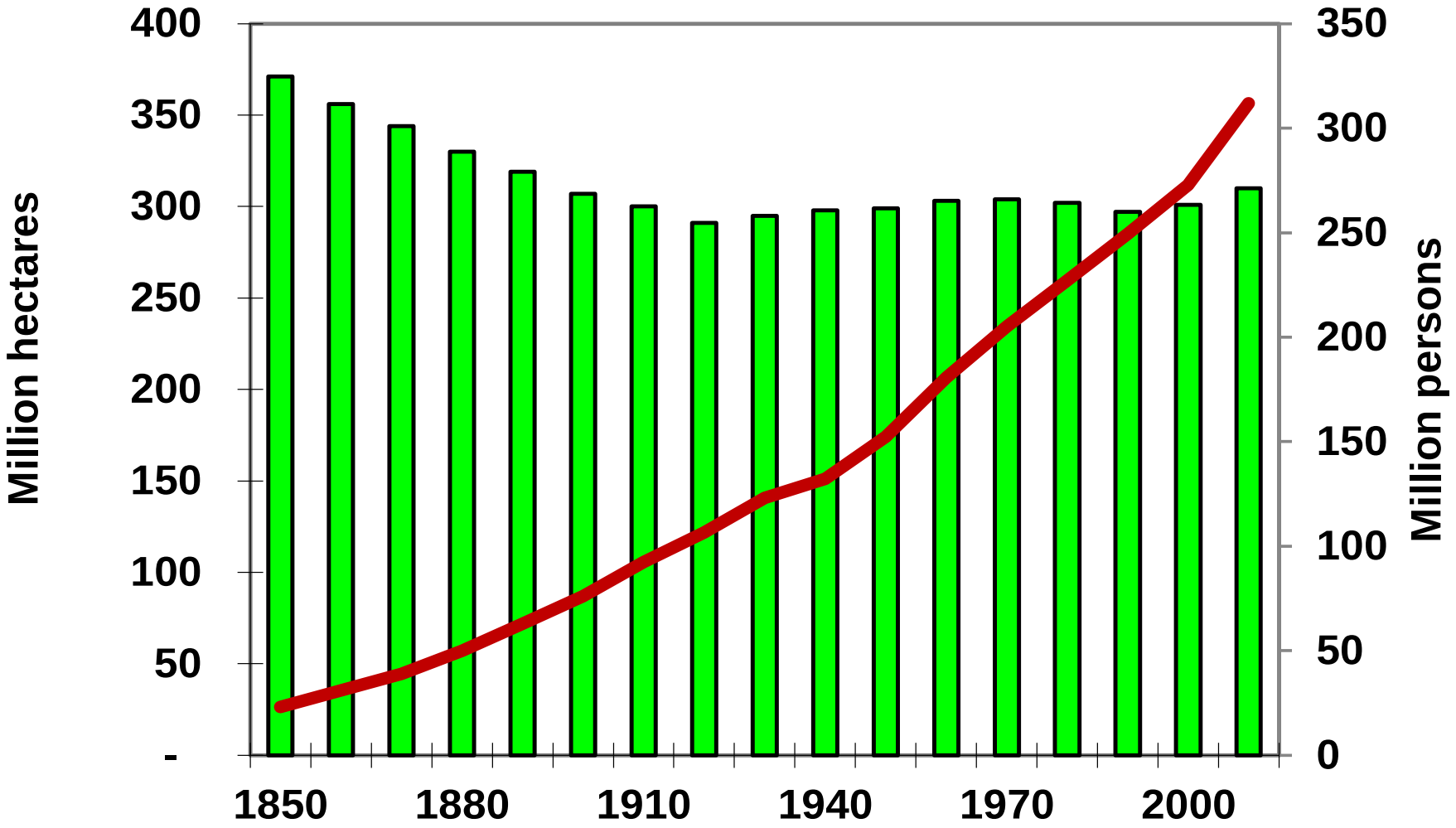
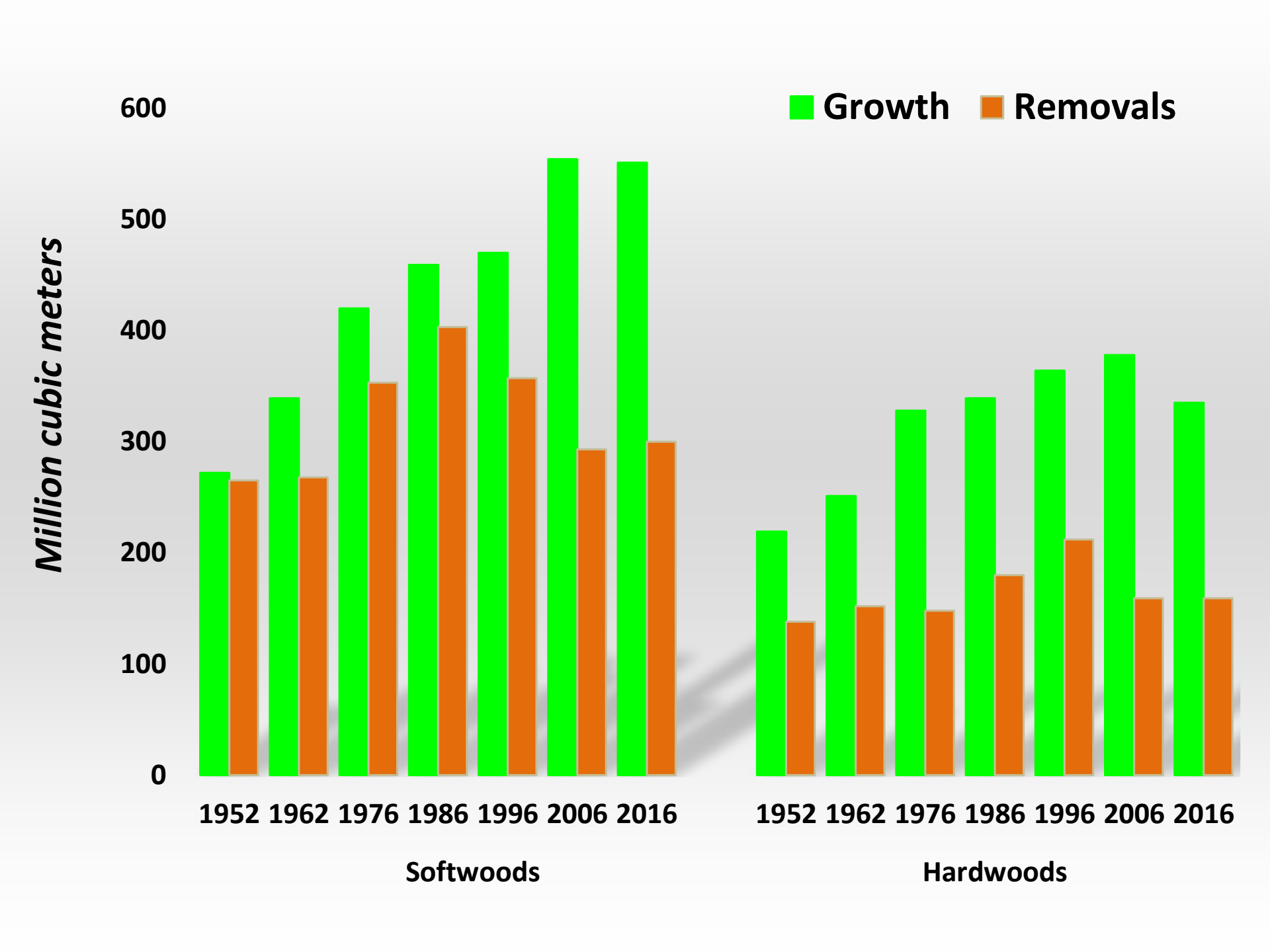
U.S. Forest Service

Forest area stable in U.S. over 100 years

while population has tripled since 1900



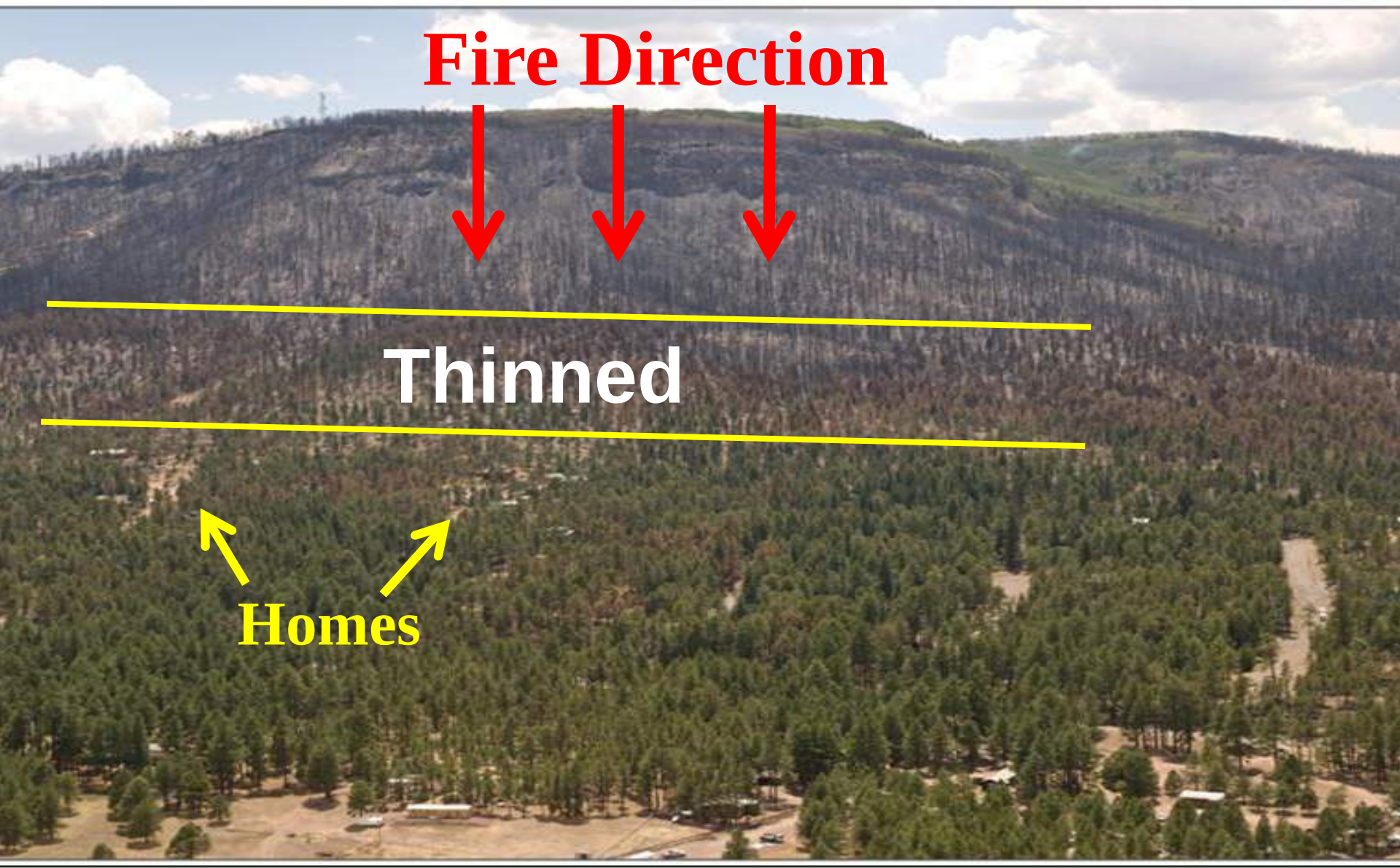

Growth
Removals
Million cubic meters
600
500
400
300
200
100
0
1952 1962 1976 1986 1996 2006 2016
Softwoods
1952 1962 1976 1986 1996 2006 2016
Hardwoods

Spruce killed by bark beetles in Colorado.

Loblolly pine killed by southern pine beetles in Georgia.

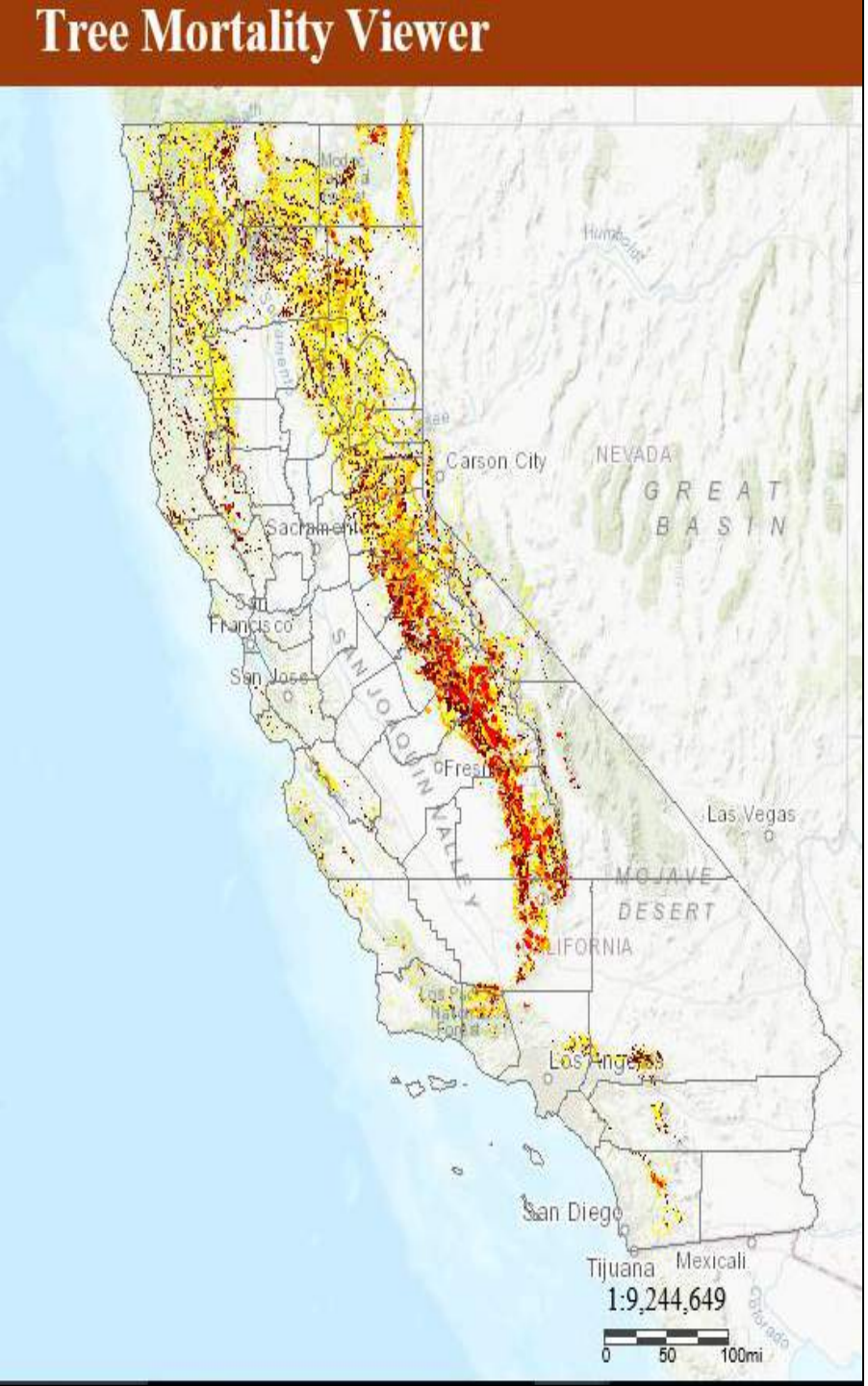
Ponderosa pine killed by mountain pine beetles in SD.

Bark beetle devastation in California: 100+ million dead trees



Managing forests with high wildfire risk

There has got to be a better way….



TREE MORTALITY • TASK FORCE

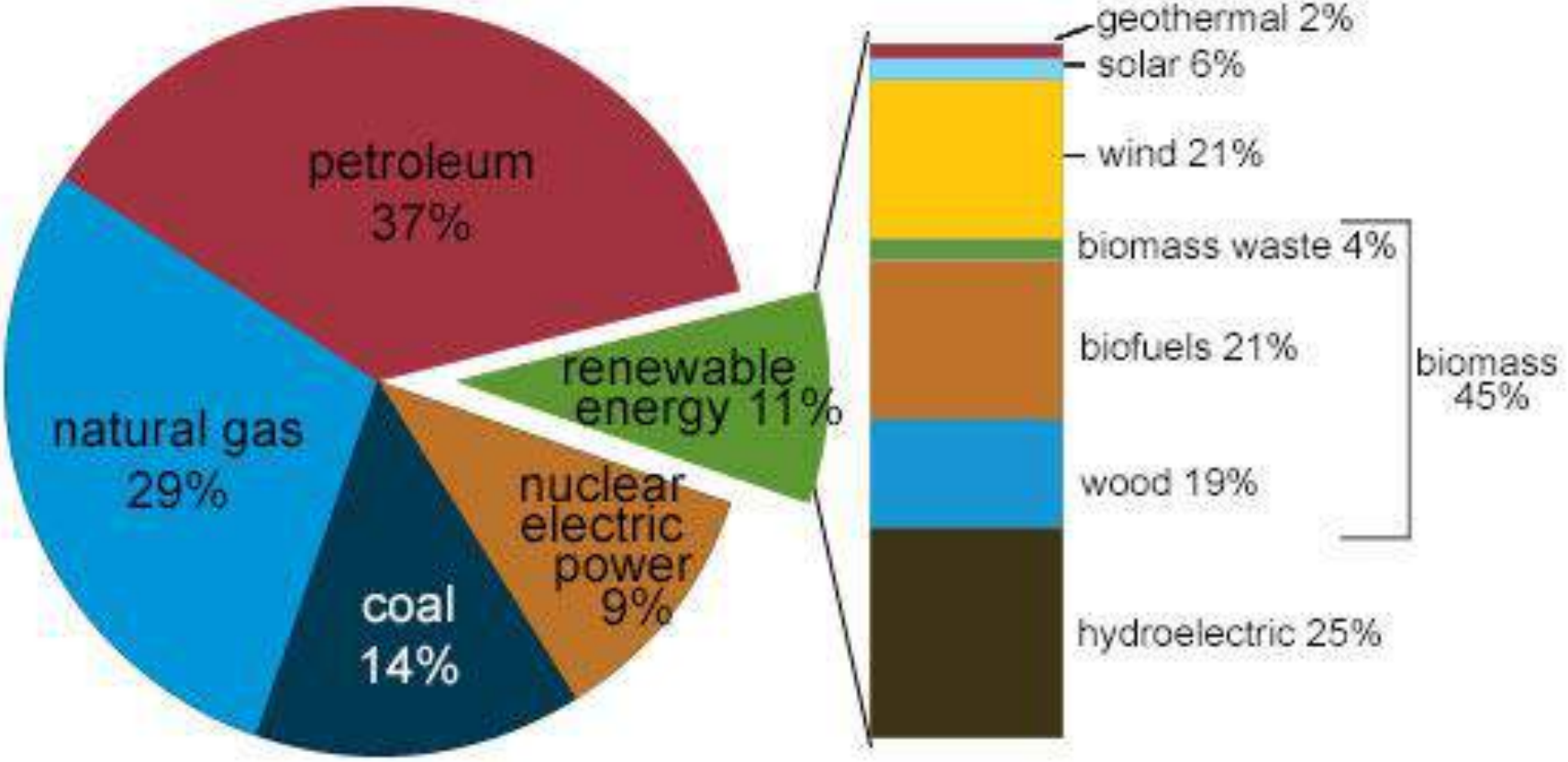
- **Over 100 million dead trees.**
- **2015 emergency proclamation & Tree Mortality Task Force.**
- **2017 Executive Order**

Major Sectors Using Woody Biomass

- **Residential** – *heating*
- **Commercial/institutional/industrial** – *heating, cooling, electricity*
- **Biomass power plants** – *electricity*
- **Export products** – *pellets, wood chips*
- **Emerging technologies** – ***torrefied wood, biocrude, and biodiesel***

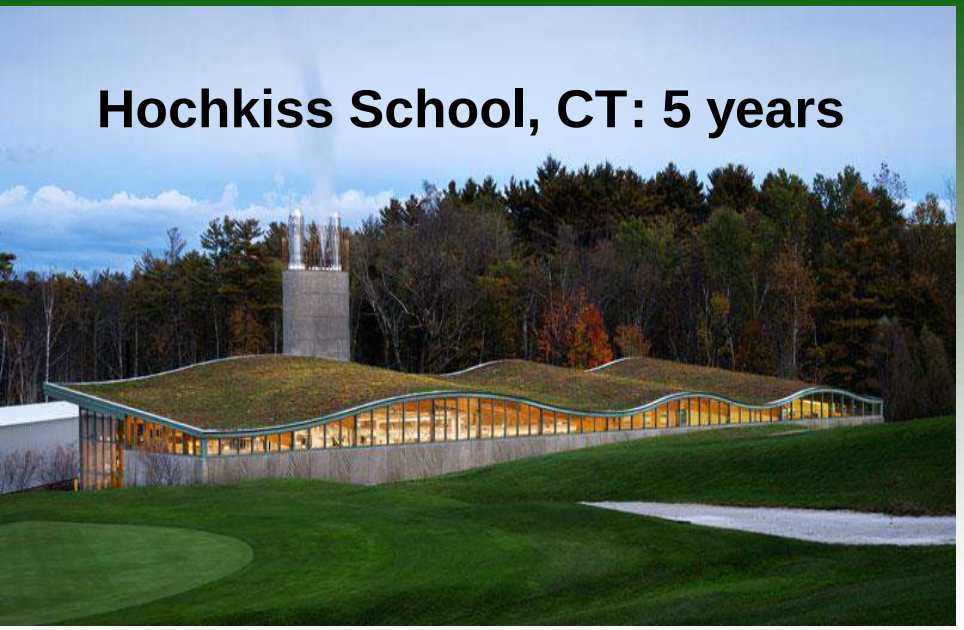
U.S. energy consumption by energy source, 2017

Total = 97.7 quadrillion British thermal units (Btu)

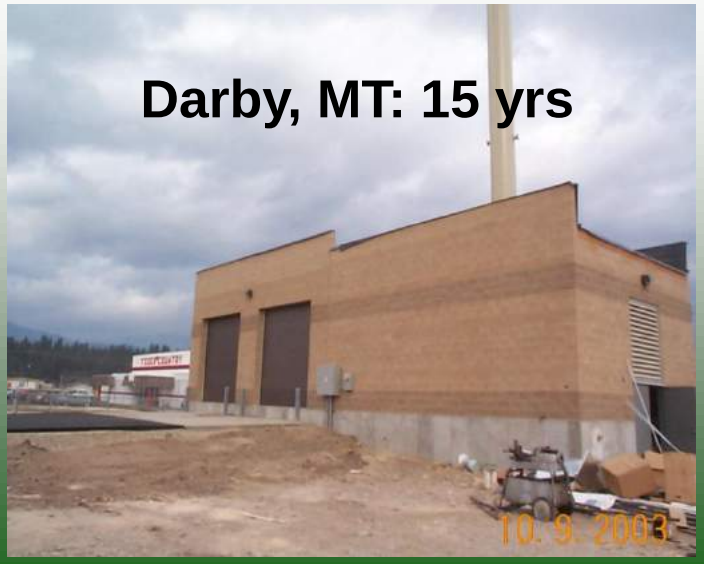


Note: Sum of components may not equal 100% because of independent rounding.
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1, April 2018, preliminary data

eia



Institutional Facilities



Gundersen Health System (Wisconsin)

- **Generates more energy than it uses.**
- **Wood offsets natural gas to heat & power over 1 million sq. ft.**
- **15,000 green tons/year of locally sourced wood chips.**
- **Wind turbines, biogas digesters, landfill gas, and geothermal.**

Rio Bravo Fresno Biomass Power Plant


BioRam facility
250,000+ green tons ag & forestry

Challenges

- Transportation costs – 50-75 miles
- Low fossil fuel prices
- Smaller scale successes, but need large scale solutions
- No federal incentives, with minor exceptions

Education

- National Bioenergy Day
- Wood Education and Resource Center

Technical Assistance

- Regional Coordinators
- Forest Products Lab
- National Tech Assistance

Research

- Forest Products Lab
- Partnerships with universities and other organizations

Agency Initiatives

- Wood Innovations Grants
- Strategic cooperative agreements (torrefaction, ASHRAE standards, etc)

Agency Priorities

- Hazardous fuels
- National Forest System lands
- High thermal demand and CHP
- Existing biomass power plants

2019 Sector Priorities

- **BTU Act**
- **$25 M/yr for Community Wood Energy & Wood Innovations**
- **Renewable Fuel Standard – electric pathway and fair implementation**
- **U.S. Wood Energy Sector report**

Renewable Fuel Standard

Only facility to generate RINs from wood.

Online next year. Needs RINs for economics to work.

EPA inaction has serious implications for biomass power plant sector.

Renewable Fuel Oil for heating

- Memorial Hospital, New Hampshire
  - >95% of heating using RFO for ~ 4 years
- Youngstown Thermal, Ohio, District Heating
  - >2.5 million gallons consumed since mid-2016
- Bates College, Maine
  - >80% of heating ops using RFO for ~2 years
- Duluth District Energy, MN
  - Permitting underway
- Leading generator of D-7 RINs

Significant market – Total District Energy fuel use in the US equivalent to >5 billion gallons/year or over 260 RTP20 plants

ENSYN

EPA regulation: Renewable biomass:

2. **Planted trees and tree residue from a tree plantation located on <u>non-federal land</u>…**

4. **Slash and pre-commercial thinnings from <u>non-federal forestland</u>…**

5. **“Biomass (organic matter that is available on a renewable or recurring basis) obtained from within 200 feet of buildings and other areas regularly occupied by people, or of public infrastructure, in an area at risk of wildfire.”**

7. **Separated yard waste….**

For wildfire areas, EPA refers to: 2010 Wildland Urban Interface Map

Wildfire Hazard Potential

Version 2018

The wildfire hazard potential (WHP) map is a raster geospatial product produced by the USDA Forest Service, Fire Modeling Institute that can help to inform evaluations of wildfire risk or prioritization of fuels management needs across very large spatial scales (millions of acres). ***Our specific objective with the WHP map is to depict the relative potential for wildfire that would be difficult for suppression resources to contain.*** To create the 2018 version we built upon spatial datasets of wildfire likelihood and intensity generated for the conterminous U.S. in 2016 with the Large Fire Simulator (FSim), as well as spatial fuels and vegetation data from LANDFIRE 2012 and point locations of past fire occurrence (ca. 1992 – 2013). ***Areas mapped with higher WHP values, therefore, represent fuels with a higher probability of experiencing torching, crowning, and other forms of extreme fire behavior under conducive weather conditions, based primarily on landscape conditions at the end of 2012.***

On its own, WHP is not an explicit map of wildfire threat or risk, but when paired with spatial data depicting highly valued resources and assets such as communities, structures, or powerlines, it can approximate relative wildfire risk to those resources and assets. WHP is also not a forecast or wildfire outlook for any particular season, as it does not include any information on current or forecasted weather or fuel moisture conditions. It is instead intended for long-term strategic planning and fuels management.

Versions of this product prior to 2014 were known as the Wildland Fire Potential (WFP) map.

For more information and links to download GIS data, visit:
http://www.firelab.org/project/wildfire-hazard-potential

Legend

- National Forest Administrative Boundaries

Wildfire Hazard Potential

- Very Low
- Low
- Moderate
- High
- Very High
- Developed Lands
- Non-burnable Lands*
- Water

N W E S

0 100 200 400 600 800 Miles

0 100 200 400 600 800 Kilometers

Wildfire Hazard Potential	Non-NFS Lands		NFS Lands		All Lands	
	Acres†	Percent	Acres†	Percent	Acres†	Percent
Very Low	642,340,000	37%	32,100,000	19%	674,440,000	35%
Low	302,140,000	17%	28,500,000	17%	330,640,000	17%
Moderate	209,080,000	12%	38,110,000	22%	247,190,000	13%
High	123,480,000	7%	37,200,000	22%	160,680,000	8%
Very High	47,720,000	3%	25,870,000	15%	73,590,000	4%
SUM of High and Very High	171,200,000	10%	63,070,000	37%	234,270,000	12%
Non-burnable Lands	393,451,185	22%	8,050,000	5%	401,501,185	21%
Water	35,931,625	2%	909,167	1%	36,840,792	2%
Grand Total	1,754,142,810		170,739,167		1,924,881,977	

†Acreage totals are rounded to the nearest 10,000 acres, and based on counts of 270-m pixels (each approx. 18 acres).

USDA

FOREST SERVICE

*Non-burnable lands include non-burnable agricultural fields, perennial snow/ice, and bare ground.

Map projection: CONUS Albers Conical Equal Area, NAD 1983

Greg Dillon, USDA Forest Service, Fire Modeling Institute, July 6, 2018

Research Needs

1. U.S. Wood Energy Sector Report
2. Communication Products, esp visuals:
   - Environmental, forest health, and economic benefits vs. alternate fates.
   - Slash pile burning vs. renewable energy.
   - Carbon and GHG benefits.
   - Feedstock sourcing trends.

The Economics of Biomass Power

LOW-VALUE BIOMASS, $15-35/ton:

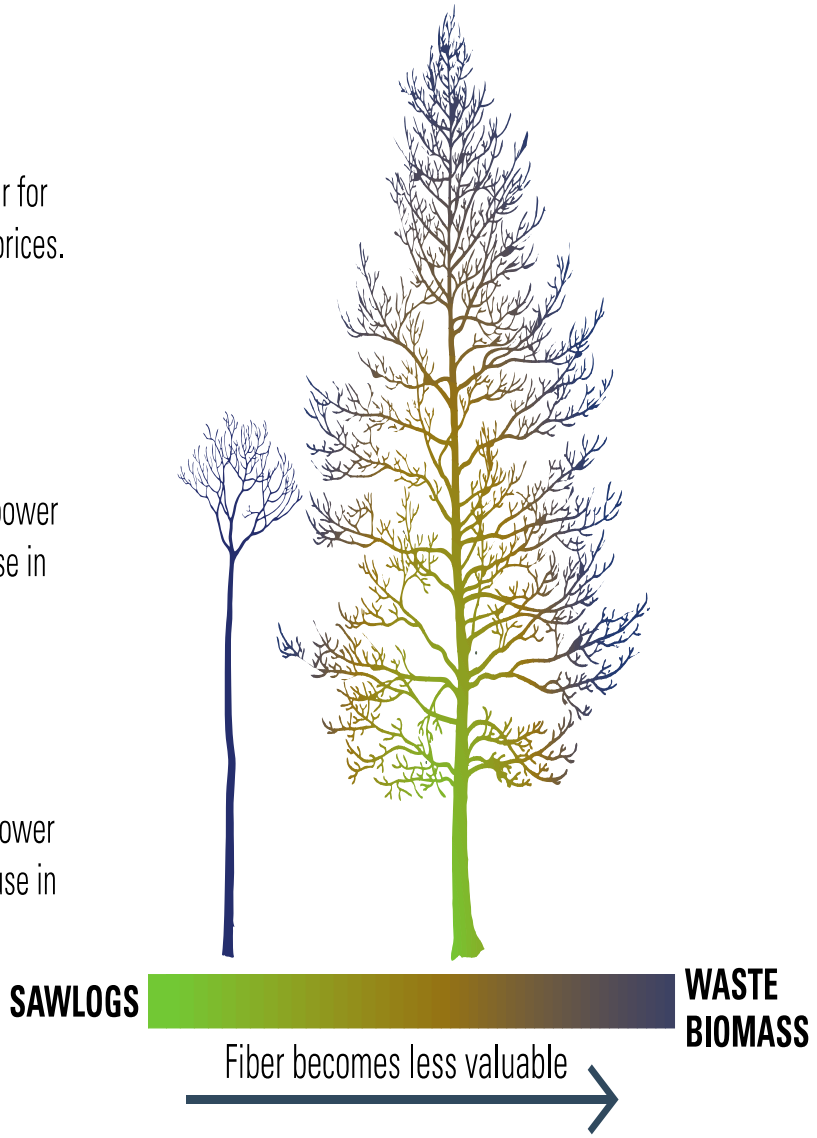
Using this material as fuel for energy, power producers are able to sell power for $0.08 - 0.15 per kilowatt hour (Kwh), which is realistic given current energy prices.

MERCHANTABLE PULPWOOD, $35-55/ton:

To use this material as fuel for energy, power producers would need to sell power for $0.10 - 0.15 per kilowatt hour (Kwh). This type of fiber is unrealistic for use in energy production.

SAWLOGS, $55-80/ton:

To use this material as fuel for energy, power producers would need to sell power for $0.13 - 0.165 per kilowatt hour (Kwh). This type of fiber is unrealistic for use in energy production.



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Bonus slides for Q&A

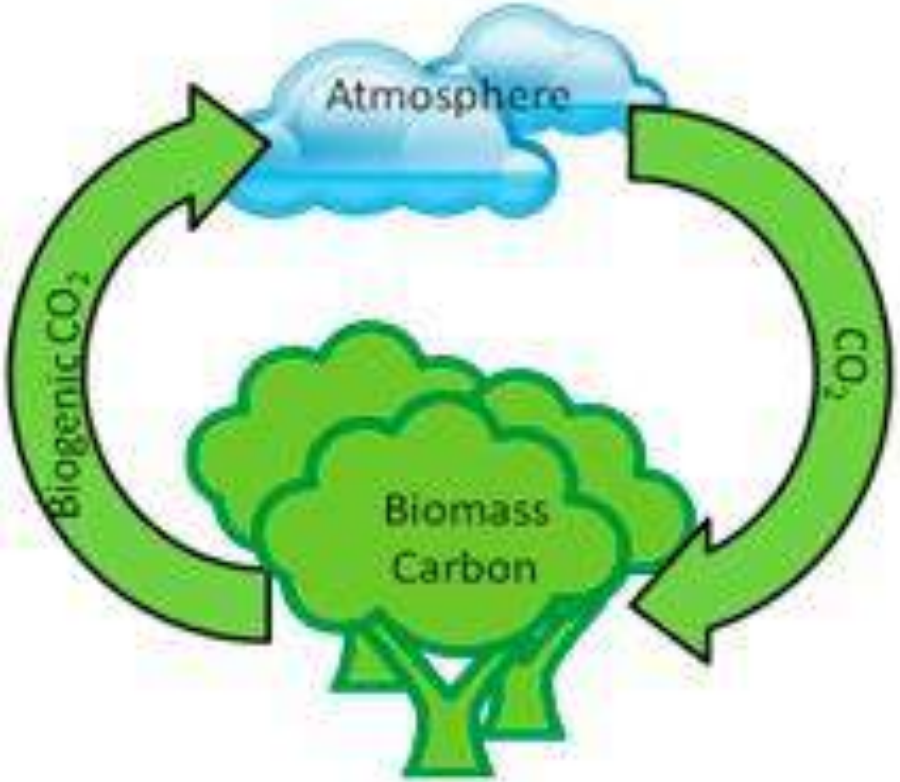
Energy Independence & Security Act of 2007

“(v) Biomass obtained from the immediate vicinity of buildings and other areas regularly occupied by people, or of public infrastructure, at risk from wildfire.”

The "neutral" biomass carbon cycle

vs

Carbon transfers from geological reserves

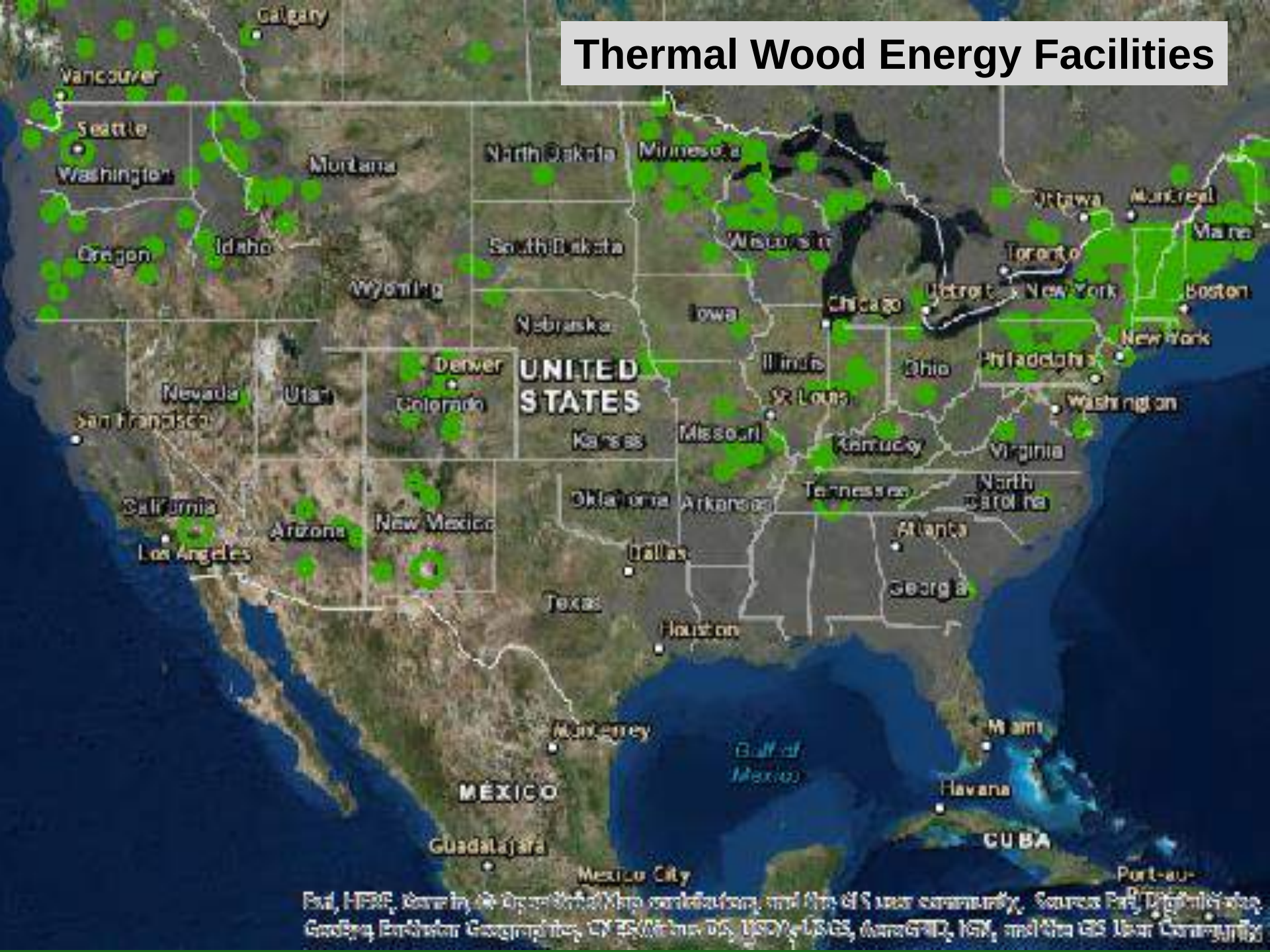


Biogenic carbon is part of a relatively rapid natural cycle that impacts atmospheric CO_2 only if the cycle is out of balance

Fossil fuel combustion transfers geologic carbon into the atmosphere. It is a one-way process

Source: National Council on Air and Stream Improvements

Thermal Wood Energy Facilities



Wood CHP Facilities