

Thriving forests. Essential
resources. A strong community.

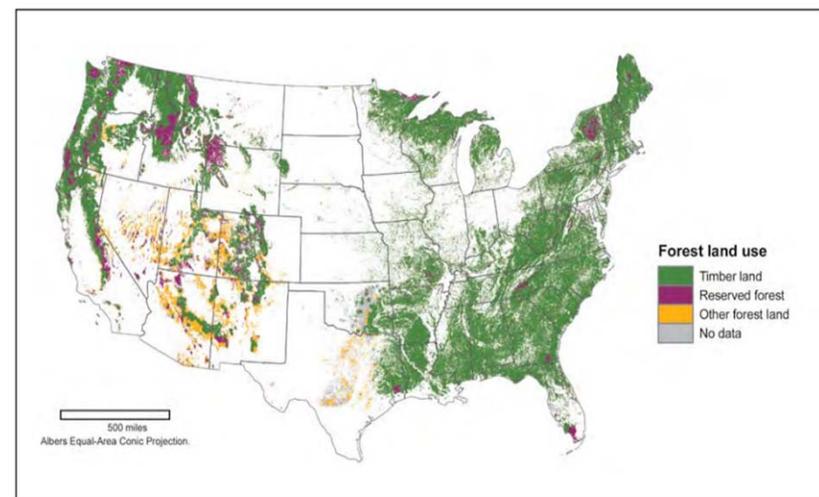
Society of American Foresters
Evolving Forest Management since 1900

Overview

- Forests cover 30% of the world's land area and store 45% of land-based carbon (Malmshheimer et al 2011).
- They make up a 1/3 of the land area in the United States (Smith et al 2009).
- It can take centuries to replace forestland that has been lost due to deforestation (Malmshheimer et al 2011).

Forest land in the US

Plate 8. Timber land, reserved forest and other forest land in the conterminous United States



Forest land use is displayed for forested pixels from the Forest Service map of Forest Type Groups (Rhaefenacht et al. 2008). Timber land was derived from RPA plot data; summarized over a hexagon sampling array developed by the U.S. Environmental Protection Agency, Environmental Monitoring and Assessment Program; constrained to forest site productivity equal to or greater than 20 cubic feet/acre/year. Reserved land was derived from the Conservation Biology Institute, Protected Areas Database, version 4.5; constrained to IUCN classes I-IV.

Source: Geographic base data are provided by the USDA National Agricultural Statistics Service. FIA data and mapping tools are available online at <http://fdatools.fs.fed.us>. Date: March 2009.

Smith 2009

Forest Ownership

- 20% National Forest System lands
- 49% are owned by non-industrial landowners
- 8% by states,
- 13% by other federal agencies
- 10 % by industrial landowners

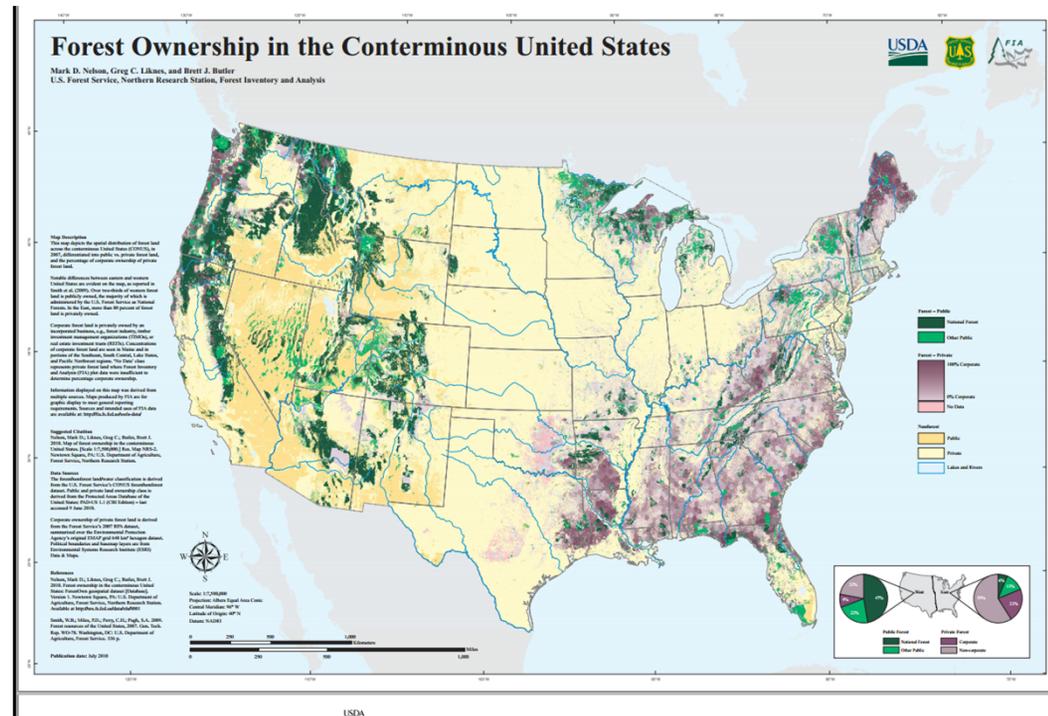
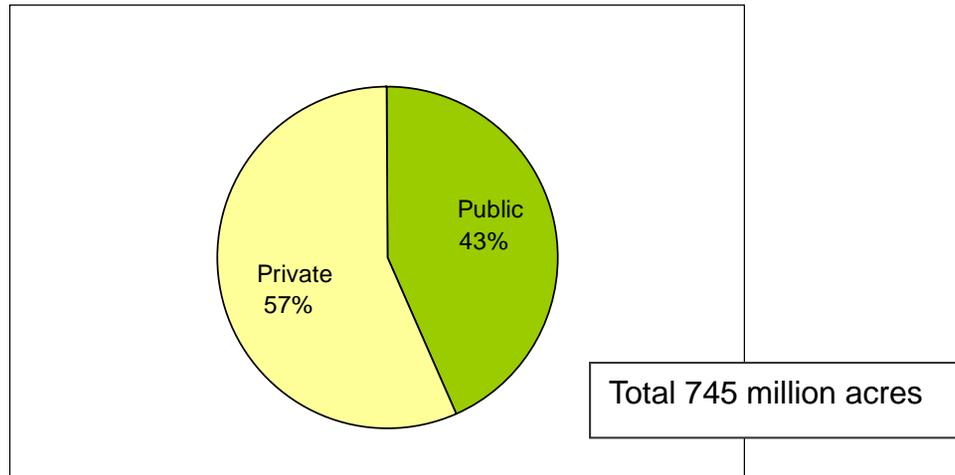


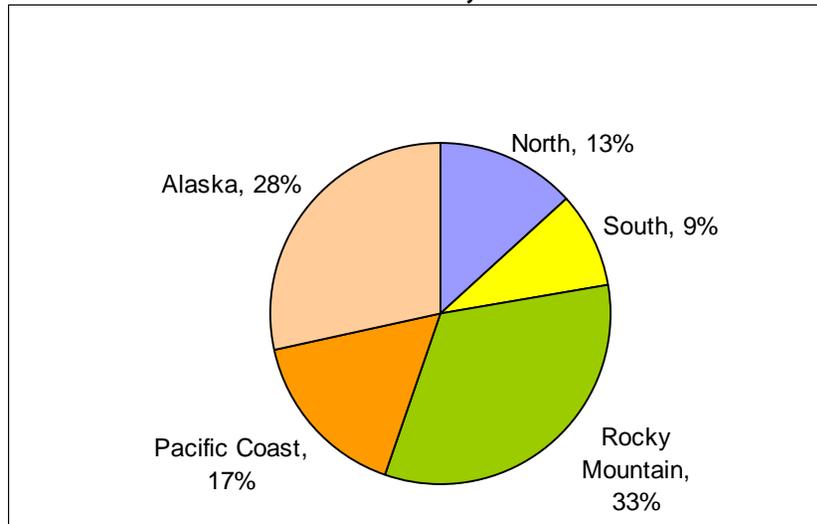
Image: USDA Forest Service

U.S. FORESTLAND

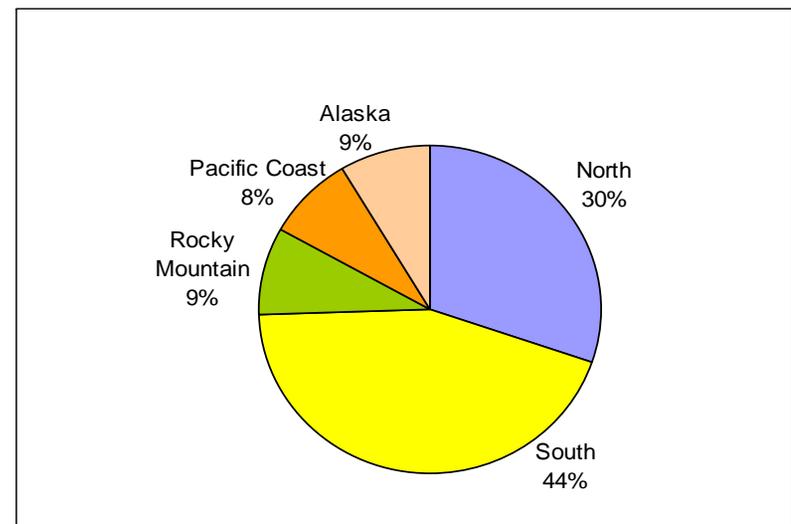
Forest Land Ownership, 2005



Public Forestland Ownership Distribution, 2005



Private Forestland Ownership Distribution in the U.S. 2005

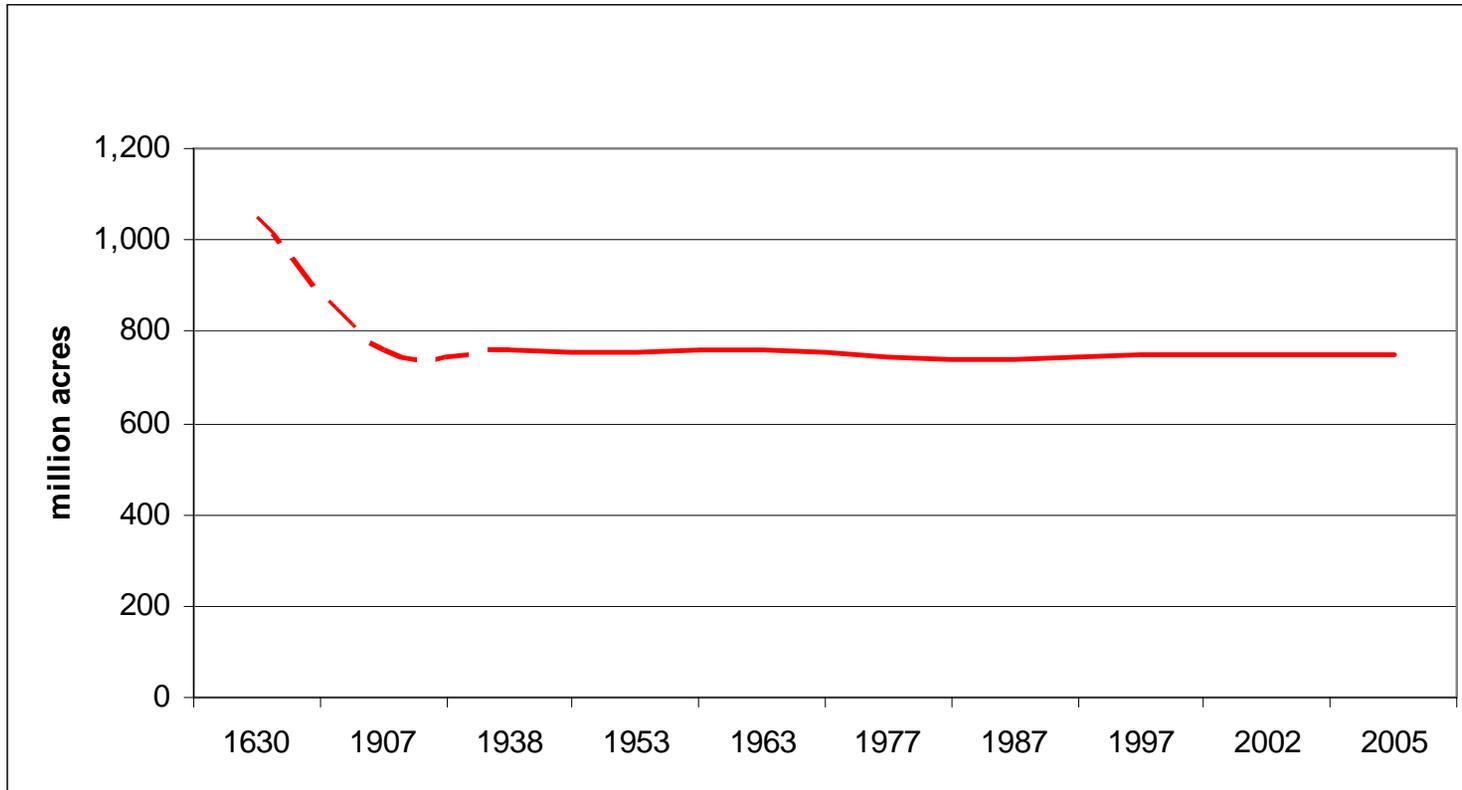


Source: USDA Forest Service data, Forest Inventory Analysis Program. 2006.

U.S. FORESTLAND

For the past 100 years, the amount of forestland in the United States has remained relatively stable at around 755 million acres thanks to improvements in markets for forest products and reforestation efforts accomplished through several government-sponsored programs that offset the loss of large tracts of forestland early in the 20th Century.

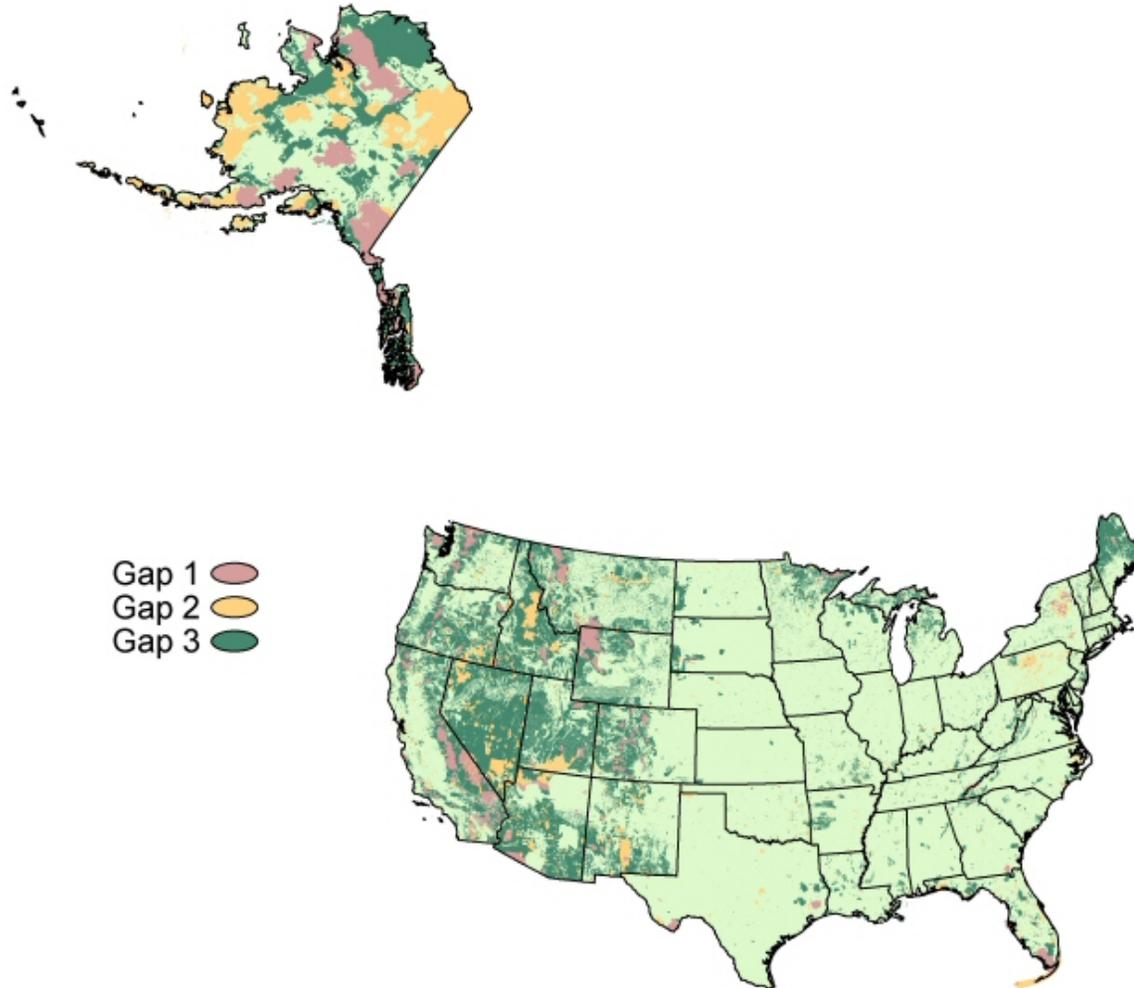
Trend in the acreage of forestland in the U.S. from 1700s to present



Note: data prior to 1938 is based on historical evidence, not field sampling.
Source: USDA Forest Service data, Forest Inventory Analysis Program. 2006

CONSERVATION EFFORTS

More than 753 million acres of both forested and non-forestland land benefit from some kind of protection.



Source: Conservation Biology Institute. 2006. Protected Areas Database, version 4.
<http://www.consbio.org/cbi/projects/PAD/>. Accessed November 2006.

The Role of Forests

Forests affect climate in 3 main ways:

1. photosynthesis/respiration
 2. Evapotranspiration
 3. Albedo affects
- Carbon sinks decrease with increased disturbance events, which have been going up
 - Forests are being affected by a number of different factors causing change . These include
 - Fire
 - Wind Events
 - Insects
 - Invasive Species
 - Temperature

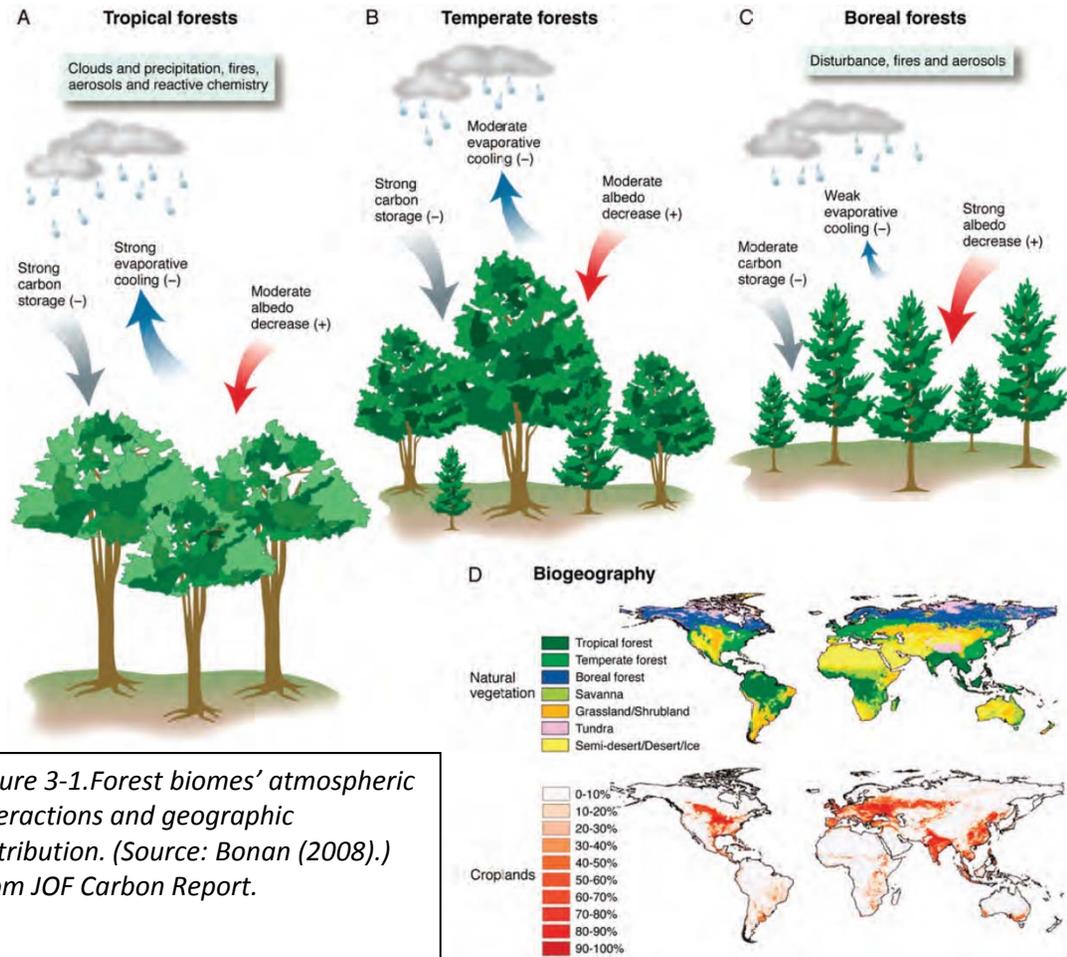


Figure 3-1. Forest biomes' atmospheric interactions and geographic distribution. (Source: Bonan (2008).) From JOF Carbon Report.

Fire

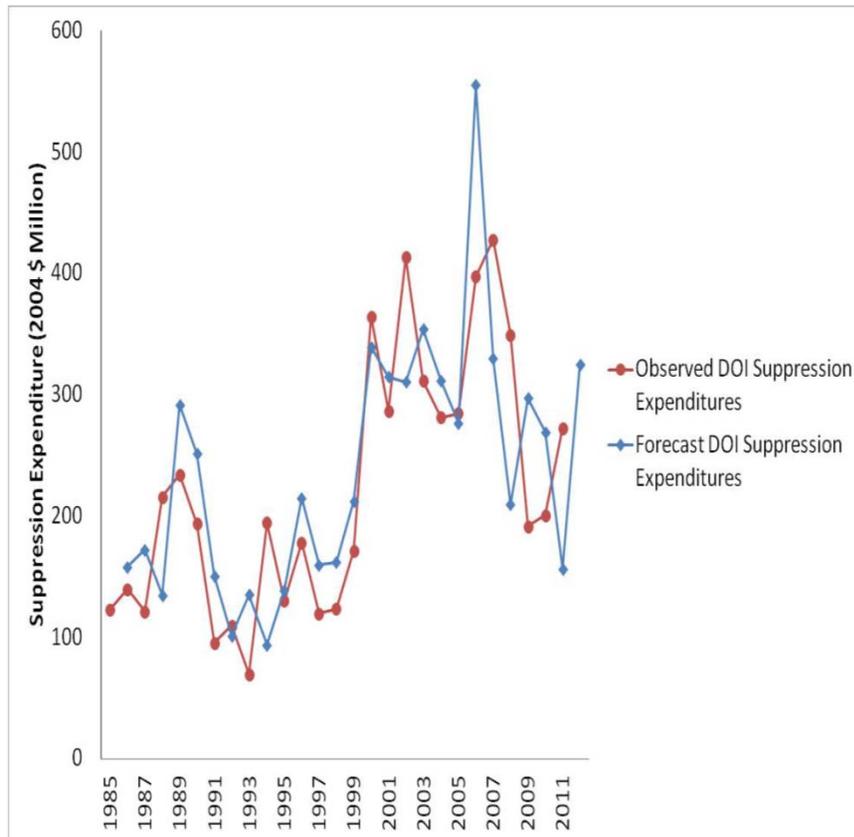
- Large wildfire events have increased in the past decades.
 - Wildfire frequency increased by four times the 1976-1984 average in the following period
(Westerling et al 2013)
- Fire frequency has been found to correlate with increasing temperature.
 - Studies have found longer wet periods and longer dry periods means fine fuel accumulation during wet periods and worse fires during dry periods
(Calkin 2005)

Total Wildland Fires and Acres (1960-2009)*Figures prior to 1983 may be revised as NIOCC verifies historical data.*

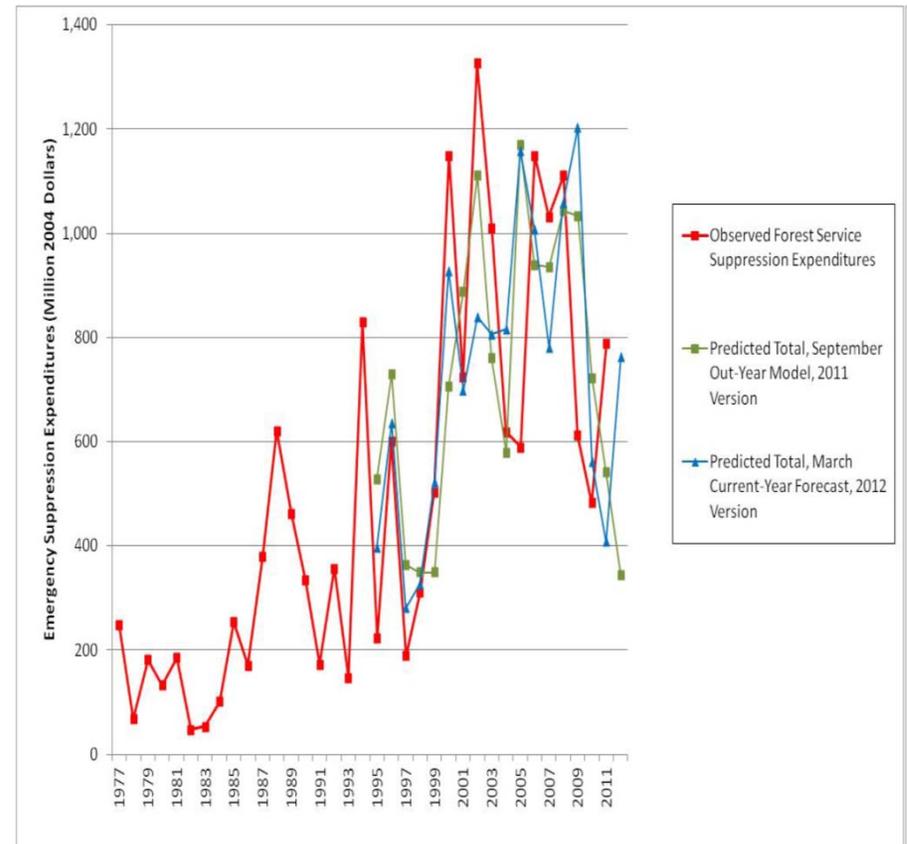
Year	Fires	Acres
2011	74,126	8,711,367
2010	71,971	3,422,724
2009	78,792	5,921,786
2008	78,979	5,292,468
2007	85,705	9,328,045
2006	96,385	9,873,745
2005	66,753	8,689,389
2004	65,461	*8,097,880
2003	63,629	3,960,842
2002	73,457	7,184,712
2001	84,079	3,570,911
2000	92,250	7,393,493
1999	92,487	5,626,093
1998	81,043	1,329,704
1997	66,196	2,856,959
1996	96,363	6,065,998
1995	82,234	1,840,546
1994	79,107	4,073,579
1993	58,810	1,797,574
1992	87,394	2,069,929
1991	75,754	2,953,578
1990	66,481	4,621,621
1989	48,949	1,827,310
1988	72,750	5,009,290
1987	71,300	2,447,296
1986	85,907	2,719,162
1985	82,591	2,896,147
1984	20,493	1,148,409

Cost of Fighting Fires

DOI



USFS



Source: USFS Federal Land Assistance, Management and Enhancement (FLAME) Act Suppression Expenditures for Interior and Agriculture Agencies: March 2012 Forecasts for Fiscal Year 2012

Wind

- A single wind event (like a hurricane) can lead to a conversion of trees holding 10% of annually sequestered carbon from live to dead and down biomass (McCarthy et al 2006, McNulty 2002).
 - 85% of this dead biomass will decompose in 25 years
 - Forests require 15-20 years to recover, so a lot of carbon will be returned to the atmosphere from the storm

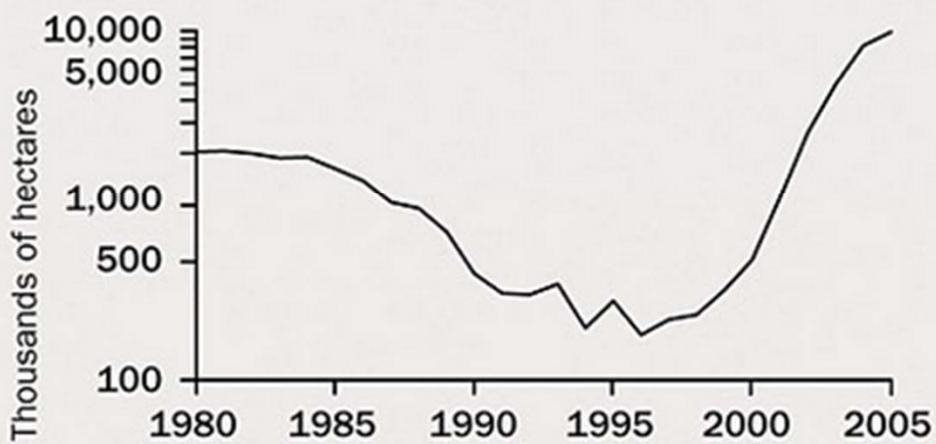
Insects

- Forest pests have evolved with some ecosystems, but warming temperatures are expanding their range into areas they have not previously been, resulting in massive outbreaks and large-scale mortality in trees that haven't evolved defense mechanisms.
- Insect outbreaks can alter nutrient cycles and change stand structure, and could affect fire severity.
 - Recent research has found that insects are not so much causal to fire as that both are symptoms of a warming planet (Tinker et al 2011).

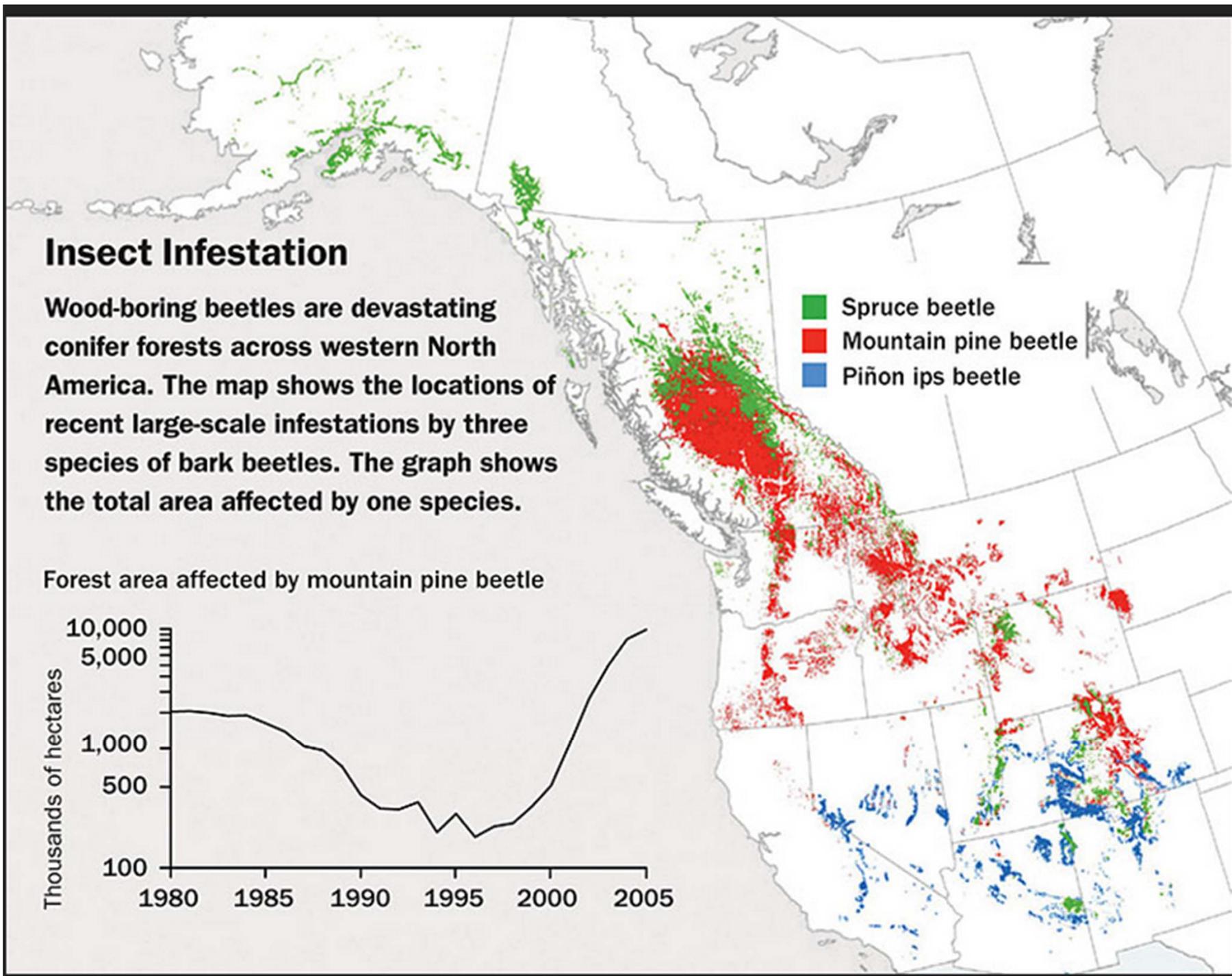
Insect Infestation

Wood-boring beetles are devastating conifer forests across western North America. The map shows the locations of recent large-scale infestations by three species of bark beetles. The graph shows the total area affected by one species.

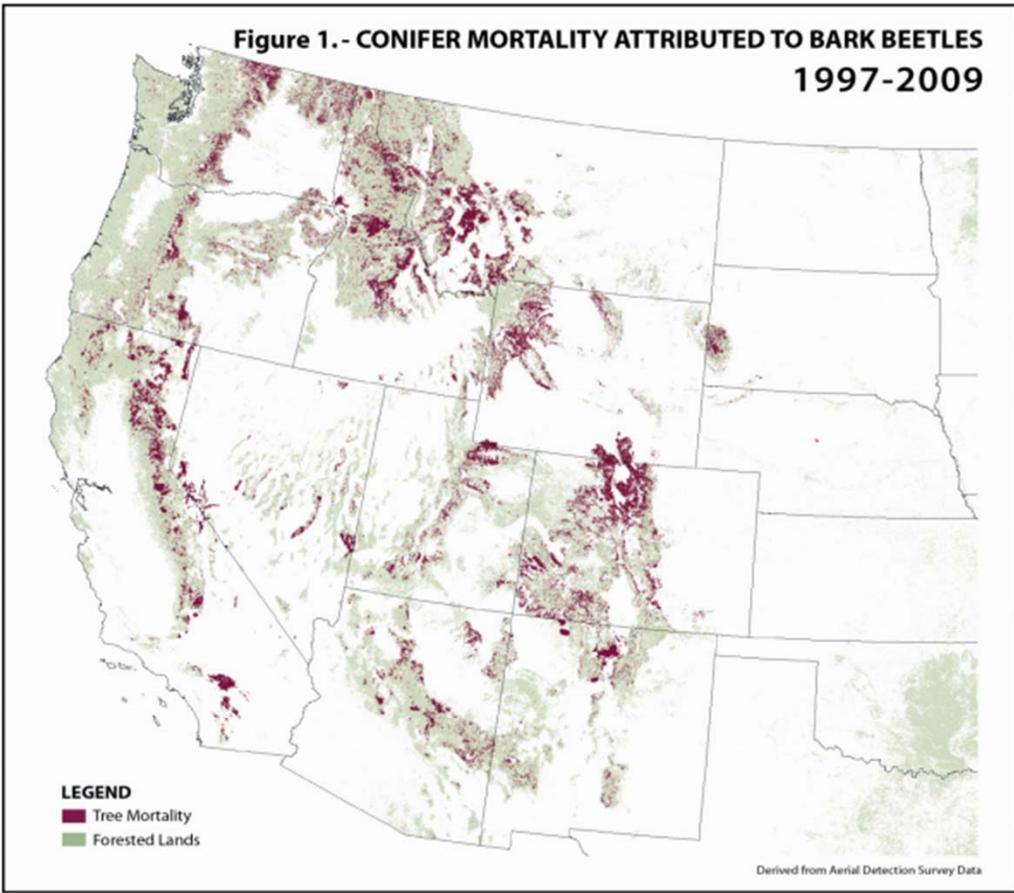
Forest area affected by mountain pine beetle



-  Spruce beetle
-  Mountain pine beetle
-  Piñon ips beetle



**Figure 1.- CONIFER MORTALITY ATTRIBUTED TO BARK BEETLES
1997-2009**



ACRES BY STATE	
Arizona	2,343,000
California	5,528,000
Colorado	6,637,000
Idaho	5,177,000
Montana	6,166,000
Nebraska	30,000
Nevada	1,302,000
New Mexico	1,830,000
Oregon	3,000,000
South Dakota	473,000
Utah	1,960,000
Washington	3,622,000
Wyoming	3,654,000

BARK BEETLES INCLUDED	
California fivespined ips	Pine engraver
Douglas-fir beetle	Pinyon ips
Douglas-fir engraver	Red turpentine beetle
Douglas-fir pole beetle	Roundheaded pine beetle
Fir engraver	Silver fir beetle
Ips pilifrons	Southern pine beetle
Ips spp.	Spruce beetle
Jeffrey pine beetle	Western balsam bark beetle
Lodgepole pine beetle	Western cedar bark beetle
Mountain pine beetle	Western pine beetle

Invasive Species

- Nonnative trees may outcompete and prevent establishment of native trees (Malmsheimer 2011).
- Nonnative pests can result in massive mortality.
 - For example, the Chestnut Blight basically eliminated native Chestnut (USDA-FS Chestnut Blight Fact Sheet) and the emerald ash borer is causing large-scale mortality in ash trees (USDA-APHIS), which has been a problem in urban areas where dead trees can fall and injure or kill people.

Climate and Water

- Increasing rate of disturbance events effect climate
 - Forest fires have been found to release carbon. For example, 293 Tg of C was released in 2005-2006. The total carbon stored in forests in 2008 was 792 Tg of C
- Changing land use affects water flow and flood events
- 1 in 5 Americans get their drinking water directly from forests.
- 53% of all drinking water touches a forest

Economics

Maintaining resilient forests is important environmentally and economically:

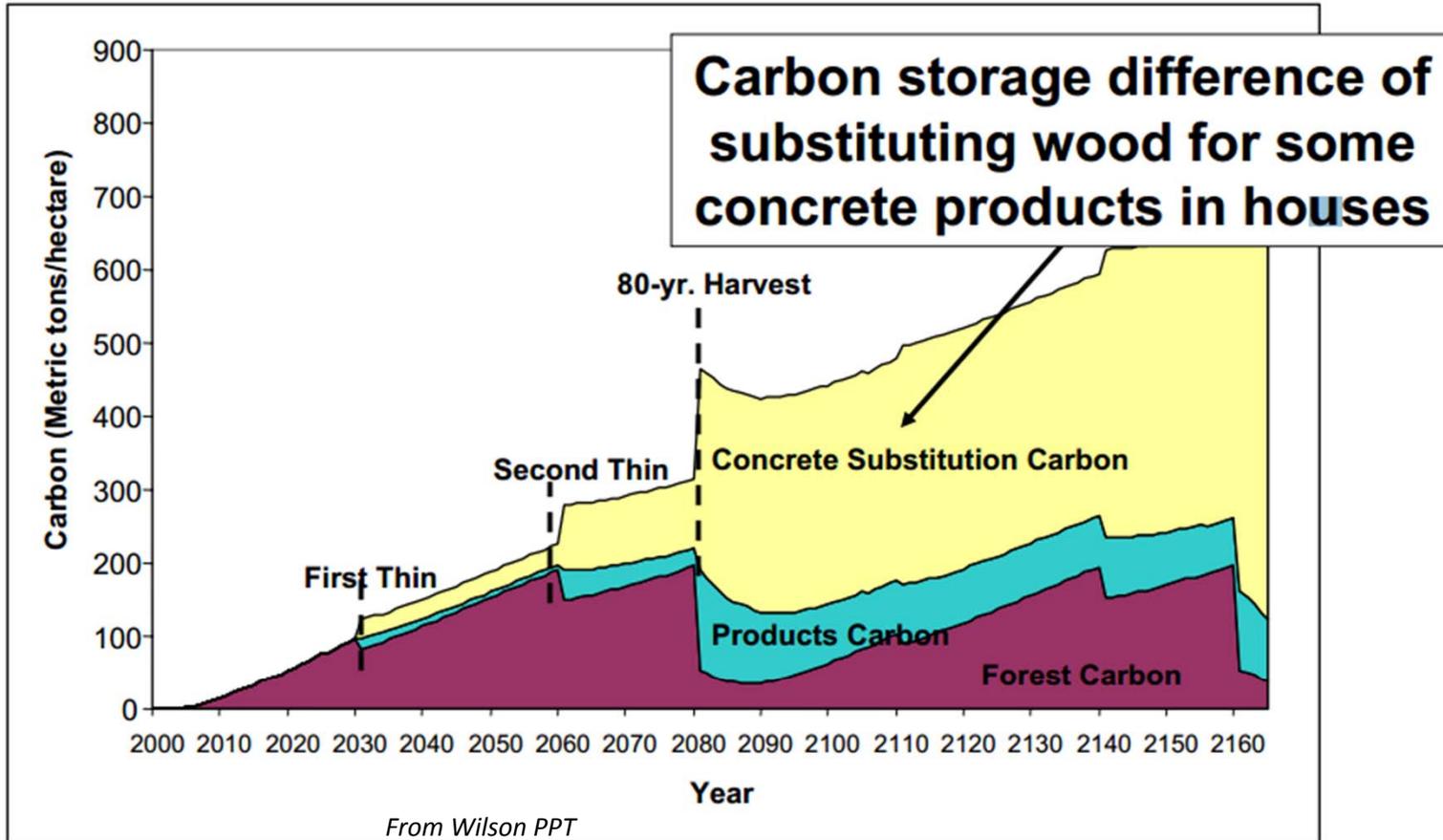
- Forest products store carbon, can contribute to carbon sequestration and are especially important in reducing carbon emissions by substitution for materials like concrete.
- The Forest Service has been allocated \$1.7 billion, and the DOI \$566 million to fight fires this year.

Healthy forests produce jobs in the forest industry and beyond:

- Forests contribute \$190 billion to the nation's economy
- Employ 900,000 (but lost 322,805 since 2005)
- Every million dollars spent on activities like stream restoration or road decommissioning generates from 12 to 28 jobs.
- 170 million visitors to National Forests every year.



Forest, Products, and Substitution Carbon -- if wood is used for some concrete



Reference: Perez-Garcia, J., B. Lipke, J. Cornnick, and C. Manriquez. 2005. An assessment of carbon pools, storage, and wood products market substitution using life-cycle analysis results. *Wood and Fiber Sci.* 37(Special Issue):140-148.

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Thriving forests. Essential resources. A strong community.

We challenge land-owners, decision-makers and society at large to make choices about our forests based on professional knowledge, leading-edge thinking and a century of practical experience.

We seek viable pathways forward, balancing diverse demands on our natural resources.

We set the standard in forest management, bringing science, best practice and the best people together to actively shape the future of the profession.

‘For the greatest good. For the greatest number. For the long run.’

Society of American Foresters

Evolving Forest Management since 1900

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