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 (Malmsheimer 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 (Malmsheimer et al. 2011).
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

Total 745 million acres

Private 57%
Public 43%

Public Forestland Ownership Distribution, 2005

North, 13%
South, 9%
Alaska, 28%
Pacific Coast, 17%
Rocky Mountain, 33%

Private Forestland Ownership Distribution in the U.S. 2005

North 30%
South 44%
Alaska 9%
Pacific Coast 8%
Rocky Mountain 9%

Source: USDA Forest Service data, Forest Inventory Analysis Program. 2006.
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
More than 753 million acres of both forested and non-forestland land benefit from some kind of protection.
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)
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<th>Year</th>
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<th>Acres</th>
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Cost of Fighting Fires

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

Graph shows thousands of hectares affected from 1980 to 2005.
Figure 1. - CONIFER MORTALITY ATTRIBUTED TO BARK BEETLES
1997-2009

LEGEND
- Tree Mortality
- Forested Lands

ACRES BY STATE

<table>
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<tr>
<th>State</th>
<th>Acres</th>
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<tr>
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<td>California</td>
<td>5,528,000</td>
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<tr>
<td>Colorado</td>
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<td>Idaho</td>
<td>5,177,000</td>
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<td>Montana</td>
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<td>Nebraska</td>
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<tr>
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<td>1,830,000</td>
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<td>Oregon</td>
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<tr>
<td>South Dakota</td>
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<tr>
<td>Utah</td>
<td>1,960,000</td>
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<tr>
<td>Washington</td>
<td>3,622,000</td>
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<td>Wyoming</td>
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BARK BEETLES INCLUDED

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<tr>
<th>Bark Beetle</th>
<th>Species Name</th>
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<td>California fivespined ips</td>
<td>Pine engraver</td>
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<tr>
<td>Douglas-fir beetle</td>
<td>Pinyon ips</td>
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<tr>
<td>Douglas-fir engraver</td>
<td>Red turpentine beetle</td>
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<tr>
<td>Douglas-fir pole beetle</td>
<td>Roundheaded pine beetle</td>
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<tr>
<td>Fir engraver</td>
<td>Silver fir beetle</td>
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<tr>
<td>Ips piliifrons</td>
<td>Southern pine beetle</td>
</tr>
<tr>
<td>Ips spp.</td>
<td>Spruce beetle</td>
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<tr>
<td>Jeffrey pine beetle</td>
<td>Western balsam bark beetle</td>
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<tr>
<td>Lodgepole pine beetle</td>
<td>Western cedar bark beetle</td>
</tr>
<tr>
<td>Mountain pine beetle</td>
<td>Western pine beetle</td>
</tr>
</tbody>
</table>

Derived from Aerial Detection Survey Data.
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

Carbon storage difference of substituting wood for some concrete products in houses

Literature Cited

- Consolidated Appropriations Act 2012.
- Westerling. http://www.sciencemag.org/content/early/2006/07/06/science.1128834?explicitversion=true
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.’

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