Forest Fuels Reductions and Biomass-to-Energy; Parallel Opportunities for Public Benefit

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Forest Fuels Reductions: THIS? Or THIS?
Small Diameter Fuels
Removals are costly; the market value of small logs may be less than the harvest and haul charges.
However!!
There are many values other than net log returns that should be considered...
An obvious example is the public cost of fire fighting.
Fire fighting is expensive and dangerous

Average = $1172/Acre
Non-market Valuations

\[
V_0 = \frac{V_n}{(1+i)^n}
\]

Where:

- \(V_0\) = present value at time 0
- \(V_n\) = future value after \(n\) periods (years)
- \(i\) = interest rate
- \(n\) = number of periods (years)

Parametric Present Value Estimations of Fire Risk Costs with Assumptions of $1000/acre to Fight Fire and 5% as the Discount Rate.

For this Exercise Assume all High Risk acres burn in 30 years (15 year midpoint) and all Moderate Risk acres burn in 60 years (30 year midpoint).

<table>
<thead>
<tr>
<th>Year</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method 1. Present cost/ac of a forest fire at specified future year</td>
<td>$784</td>
<td>$614</td>
<td>$481</td>
<td>$377</td>
<td>$295</td>
<td>$231</td>
<td>$181</td>
<td>$142</td>
<td>$111</td>
<td>$87</td>
<td>$68</td>
<td>$54</td>
</tr>
</tbody>
</table>
Fire Fighter Fatalities = 3-5 Persons /Million Acres /Year

Figure 3. Firefighter Fatalities Related to Wildland Firefighting (1997-2006)
Wildfires result in facility losses. Insurance losses average >$300/burned acre.
Timber losses from fire in high and moderate risk areas on the FNF and ONF average $1605/acre.

Other important values can easily be estimated.
### Treatment Benefits

<table>
<thead>
<tr>
<th></th>
<th>Present Value per acre</th>
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<tbody>
<tr>
<td></td>
<td>High Risk</td>
<td>Moderate Risk</td>
</tr>
<tr>
<td><strong>Fire fighting costs avoided</strong></td>
<td>$481</td>
<td>$231</td>
</tr>
<tr>
<td><strong>Fatalities avoided</strong></td>
<td>$10</td>
<td>$5</td>
</tr>
<tr>
<td><strong>Facility losses avoided</strong></td>
<td>$150</td>
<td>$72</td>
</tr>
<tr>
<td><strong>Timber losses avoided</strong></td>
<td>$772</td>
<td>$371</td>
</tr>
<tr>
<td><strong>Regeneration and rehabilitation costs avoided</strong></td>
<td>$120</td>
<td>$58</td>
</tr>
<tr>
<td><strong>Community value of fire risk reduction</strong></td>
<td>$63</td>
<td>$63</td>
</tr>
<tr>
<td><strong>Regional economic benefits</strong></td>
<td>$386</td>
<td>$386</td>
</tr>
<tr>
<td><strong>Total Benefits</strong></td>
<td>$1,982+</td>
<td>$1,186+</td>
</tr>
</tbody>
</table>

### Treatment costs

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<table>
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<tbody>
<tr>
<td><strong>Operational costs</strong></td>
<td>($374)</td>
</tr>
<tr>
<td><strong>Forest Service contract preparation costs</strong></td>
<td>($206)</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>($580)</td>
</tr>
</tbody>
</table>

### Positive Net Benefits from Fuel Removals

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</thead>
<tbody>
<tr>
<td><strong>Positive Net Benefits from Fuel Removals</strong></td>
<td>$1,402+</td>
</tr>
</tbody>
</table>
FNF & ONF
1,307,667 acres in High and Mod Risk
Total No-Action Liability ($2,071,000,000+)
Net Savings After Treatment Costs $1,312,677,159
How do we value habitats lost to forest fires?
What value should we place on impacts from Erosion? Sediment? and Debris flows?

Source: George Ice and Jeff Amoss
The most precious and irreplaceable resources at risk are the soil and water.
What are the public costs of carbon and other pollutants released to the atmosphere by forest fires?
2006 Forest Fires

Total WA ~ 400,000 acres

Total US > 9.8 million acres

Source: NOAA, EPA, US Census, NIFC, RTI, DNR
Global Warming

The Greenhouse Effect

Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the earth’s surface and the lower atmosphere.

Solar radiation is reflected by the earth and the atmosphere.

Most radiation is absorbed by the earth’s surface and warms it.

Infrared radiation is emitted from the earth’s surface.

Trend in global average surface temperature

Source: School of environmental sciences, climatic research unit, university of East Anglia, Norwich, United Kingdom, 1999.
Managed Forests store carbon several ways

- Standing forest
- Forest products
- Fossil fuel conservation

Forest Management Can Help Reduce Atmospheric CO2
CO2 emissions from product alternatives

- Treated roundwood: 4 tonnes CO₂ km⁻¹
- Concrete: 17 tonnes CO₂ km⁻¹
- Tubular steel: 38 tonnes CO₂ km⁻¹

International Energy Agency
Clean Energy

Heat, Steam, Electricity, Transportation Fuel
Biomass is renewable and “carbon neutral”
“America is Addicted to Oil”

President George Bush, State of the Union 2006
Clean and Renewable Energy Alternatives Are Needed
Biomass is a uniquely versatile energy source
WA Ambitious Energy Objectives

- I-937 Renewable Portfolio Standard – 15% by 2020
- Renewable fuels standard – 2% ethanol & biodiesel
- Cut emissions to 1990 levels by 2020 and to 50% below 1990 levels by 2050
WA Biomass and Bioenergy Inventory

**Forest Biomass equals all others combined**

Source: WSU, WA DOE
Figure 13: Summary of potentially available forest resources

WA has clean & cheap electricity

Where our energy comes from

In 2004, Washington customers got about 66 percent of their electricity needs from hydro and 33 percent from coal, nuclear and natural gas. The rest came from the renewable resources advocated by I-937 supporters, such as wind, solar and biomass.

Note: Numbers do not add up to 100 percent because of rounding.

Source: Washington State Department of Community, Trade and Economic Development

THE SEATTLE TIMES

Largest non-hydro renewable
Biomass-to-electricity: Especially challenging in the PNW
Fossil Fuel Combustion = 99% of WA CO2

2% Average Increase per Year
Total fossil fuel 2001 = 4.3 billion gallons/year
3rd highest gas price in the nation

http://www.ofm.wa.gov/databook/energy/yt06.xls
$87 Million/year to support research at the National Renewable Energy Laboratory

President’s Biofuels Initiative

The President’s Goals:

Replace the equivalent of more than 75 percent of our oil imports from the Middle East by 2030 – 30% of gasoline pool or 60 billion gallons/year

2012 Goal: Fund additional research in cutting-edge methods of producing ethanol, not just from corn, but from wood chips and stalks, or switchgrass. DOE goal is to make cellulosic ethanol practical and cost-competitive ($1.07/gal) within 6 years
Public ownership dominates West forests

Of the 504 million acres of U.S. timberland, about 29% is publicly owned, 13% is owned by the forest industry, and the remaining 58% is privately owned.

Timberland ownership varies considerably among regions of the country. The East United States tends to be dominated by private ownership and the West by public land ownership.

Source: Alig et al., 2003

Figure 4: Ownership break-up of U.S. forestland by region

### Washington Unreserved Timberlands

*(thousands of acres)*

<table>
<thead>
<tr>
<th>Ownership</th>
<th>Western</th>
<th>Eastern</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>USDA Forest Service</td>
<td>2208</td>
<td>2494</td>
<td>4702</td>
</tr>
<tr>
<td>Forest Industry</td>
<td>3732</td>
<td>878</td>
<td>4610</td>
</tr>
<tr>
<td>Non-Industrial</td>
<td><em>1668</em></td>
<td>1292</td>
<td>2960</td>
</tr>
<tr>
<td>State</td>
<td>1390</td>
<td>647</td>
<td>2037</td>
</tr>
<tr>
<td>Native American</td>
<td><em>310</em></td>
<td>1074</td>
<td>1384</td>
</tr>
<tr>
<td>County and Municipal</td>
<td>194</td>
<td>7</td>
<td>201</td>
</tr>
<tr>
<td>Misc. Federal</td>
<td>78</td>
<td>110</td>
<td>188</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9580</td>
<td>6502</td>
<td>16082</td>
</tr>
</tbody>
</table>

**Washington Farmlands** = ~15,318 thousand acres
WA Ambitious Energy Objectives

✓ I-937 Renewable Portfolio Standard – 15% by 2020
✓ Renewable fuels standard – 2% ethanol & biodiesel
✓ Cut emissions to 1990 levels by 2020 and to 50% below 1990 levels by 2050
From 2001 level to 1990 = (600 million gallons reduction)

Options:

Bio diesel/ethanol:

- Soy = 40 gallons/acre/yr (15 million acres)
- Canola = 100 gallons/acre/yr (6 million acres)
- Palm = 650 gallons/acre/yr (1 million acres)
- Wood = 60 gallons/acre/yr (10 million acres)

with 333,000 acres treated each year

For forest biomass, every acre not burned = ~ 25 tons of CO2 not emitted (2500 gallons gas equivalent emissions @ 20lbs CO2/gal)
Net Energy Balance Comparisons

Source: Carbon-negative biofuels from low-input high-diversity grassland biomass. Tilman et al. 2006
Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels. Hil et al. 2006
Biomass to Energy – Gross is not Net

Fossil Energy Ratio
- Renewable Energy Output/Fossil Energy Input -

Pulp and paper mills are currently struggling
These mills could become forest biorefineries

Figure 6. Same mill converted to a forest biorefinery operation
The Current Trend – Forest Fires

U.S. Annual Acres Consumed by Forest Fires
1960-2006

Million Acres

National Interagency Fire Center
The Current Trend – Energy

Figure 5. Electricity generation by fuel, 1980-2030 (billion kilowatthours)

Energy Information Administration/Annual Energy Outlook 2006
CO2 Emissions increase 37% from 2004 to 2030

Figure 8. Projected U.S. carbon dioxide emissions by sector and fuel, 1990-2030 (million metric tons)

Forest Fires?
THIS? or THIS?

The choice seems remarkably simple...
Questions?

YOU WERE SAYING...

Ban forest management, save our forests.