BioSum: A Model for Evaluating Forest Management Alternatives

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BioSum: Bioregional Inventory Originated Simulation Under Management
BioSum: A Brief History

- BioSum 4 – New Capabilities (2011)
- BioSum 5 – BioSum as we know it (2012-2013)
- BioSum 6 – Extended time horizons (2016-2018)
- Further optimization? (2019)
Workflow

Choose Best - Summarize

1. Acres treated
2. Resilience score change
3. Treatment longevity
4. Treatment cost and revenue
5. Cost effectiveness
6. Co-benefits such as wood production, climate benefits, forest health
<table>
<thead>
<tr>
<th>Input Data</th>
<th>User Variables</th>
<th>Models</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest-specific stand and fuels data</td>
<td>Forest habitat to maintain components</td>
<td>FVS (forest growth)</td>
<td>Change in fire risk metrics by area</td>
</tr>
<tr>
<td>Harvest system production and cost data</td>
<td>Forest treatment packages</td>
<td>FVS FFE (fire model)</td>
<td>Post-treatment stand conditions</td>
</tr>
<tr>
<td>Road system</td>
<td>Fuels treatment packages</td>
<td>Operation Cost Model</td>
<td>Harvest outputs</td>
</tr>
<tr>
<td>Processing facilities</td>
<td>Subsidy and cost share rules</td>
<td>Optimal transportation network</td>
<td>Gross and net revenue</td>
</tr>
<tr>
<td>Commodity prices</td>
<td></td>
<td>Core analysis – optimization</td>
<td>Carbon sequestration balance</td>
</tr>
</tbody>
</table>
Average Mortality Under Severe Fire Weather by Forest Type

<table>
<thead>
<tr>
<th>Year</th>
<th>Mortality Volume Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Douglas-fir</td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>40</td>
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</tbody>
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Grow-only
- Douglas-fir
- Mixed Conifer
- Pine
- True fir

Optimal Treatment
- Douglas-fir
- Mixed Conifer
- Pine
- True fir
Activity fuels $= f(\text{harvest system})$

- Whole tree leaves mainly very small (sub 5””) trees
  - Supplemental surface fuel treatments are much less
  - But purchased chip volume is declining
- Cut To Length (CTL) also leaves tops and limbs from larger trees plus boles of non-commercial species and cull trees
  - Harvest cost lower but leave more surface fuels
- BioSum will choose WTL where operationally feasible (not too steep)
Outputs

Net growth (gross growth – mortality) FIA Sites 3&4, Uneven age stands

Corporate Timberlands

USFS Timberlands

\[ \frac{1}{2} \text{ plots } > 3 \text{ MgC/ha/yr} \]

Initial basal area/acre

0-59  60-119  120-179  180-239  240-299  300+

Less than \( \frac{1}{4} \) plots > 3MgC/ha/yr

Initial basal area/acre

0-59  60-119  120-179  180-239  240-299  300+
Outputs

Results for Optimal system where BioSum identified the best sequence for each plot – with lots of actions to improve fire resistance

![Graphs showing merchantable volume (billion cubic feet) over decades for different types of trees. The graphs display data for Douglas-fir, Mixed conifer, Pine, and True fir, with owners categorized as NFS and Private.](image-url)
The Context in Which We Operate

Fire is top of mind for forest managers

- Burn area across all forest types are steadily increasing
- We are seeing more large-scale high severity patches than ever before
- Suppression costs are also increasing

Vegetation management is not on pace with wildfire risk and mortality

- We know vegetation management has been proven to be a cost effective way to reduce wildfire risk, but state policy cannot be based on small set of anecdotes

We need to scale up

- There is a $7.5 billion backlog of forest restoration to be conducted in California
- Agencies are shifting towards collaboration in theory, but what about in practice?
- Without a better handle on limiting “mega” wildfire events, our forests will start being net carbon sinks AND we will to increase fossil-fuel based substitutes or imports to meet consumers’ needs for building materials, packaging and energy
There are dozens, if not hundreds, of models to simulate forest growth, fuels treatments and other silvicultural activities. Many are agency based, while others are created by researchers for their own use. So, why BioSum?

• BioSum is a constantly evolving tool that links together a number of massive databases in an system to provide statistically robust estimates for different scenarios based on input conditions and goals

• We have detailed information on forest stands, forest & fire risk growth models, forest & fuels management costs, harvest and transportation costs, commodity values (sawlogs, chips, carbon offset contracts)

• The BioSum model can be used across numerous forest ownership types, taking into account the numerous and varying constraints faced by each agency

• There is no one “correct” way to use BioSum

• It’s free, as is support in learning how to use it
The Future of BioSum

- Proposed updates to the BioSum tool include FIA plot growth calibration, better fire probability calibration, more fire risk metrics and new cost data

- Stakeholder meetings designed to solicit needs and wants from land managers throughout the state, across agencies

- Training sessions for agency staff to help familiarize them with the BioSum model and how to run it

- A ubiquitous, systematic decision support tool for decision-makers to evaluate different strategies appropriate for different goals and budget levels
Thank You

Presentation photos courtesy of Ariel Thompson at Berkeley Forests
BioSum journal articles


