Late-Successional and Old-Growth Forest Effectiveness Monitoring Plan for the Northwest Forest Plan

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The Bumpy Road to Monitoring LSOG under the Northwest Forest Plan
Three Key Attributes

FEMAT report (1993: 49-52) and FSEIS (USDA and USDI 1994a: 35-40)

**Abundance and Ecological Diversity** – the total acreage and distribution of LSOG by province

**Process and Function** – ecological changes or actions that lead to the development and maintenance of LSOG at all spatial and temporal scales AND the ecological values provided by LSOG. VERY DIFFICULT TO MEASURE

**Connectivity** – extent to which the large landscape pattern of the late-successional and old-growth ecosystem provides for biological and ecological flows that sustain LSOG
Two Views of LSOG

Remotely sensed, from above – upper canopy features, such as canopy cover, the size of tree crowns and inferences about tree diameter, canopy structure (single versus multiple layers), and to some extent, tree species.

Stand-scale from plot data – ground-based measurements of vegetation features (such as species, sizes, canopies, and amount of dead material).
Conceptual Model

Processes
- Disturbance
  Wind, pest, pathogen, fire, logging, roads silviculture
- Vegetation Development
  Regeneration, growth, seed source, site availability
- Other Ecosystem Processes
  Hydrologic, nutrient cycling, carbon storage, primary productivity, etc.
- Regional Processes
  Climate, geology, topography, ownership
- Historical Processes
  Fire history, land use

Function or Process Roles
- Mediate
- Feed Back

LSOG

Large Landscape
- Patch size
- Edge density
- Patch shape
- Juxtaposition
- Patch diversity

Stand
- Tree size and density
- Snags
- Fallen Trees
- Tree crown/platforms
- Forest Floor
- Species Composition

Biological Diversity
- Population/Habitat
  Northern spotted owl
  Marbled murrelet
- Aquatic Habitat
- Species Diversity
  LSOG specialists
  Exotics
  Canopy
  Below ground
- Food Web
Measurable Indicators

Selected LSOG Indicators

What can we reasonably measure?

Potential LSOG Indicators
- Large landscape scale
- Amount and distribution of types
- Patch size, shape, connection
- Changes over time
- Stand scale
- Tree sizes by species
- Canopy structure by species
- Snags
- Down wood

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Processes

Mediate
Feed Back

Biological Diversity

Mediate
Feed Back

Structure and Composition

Measure

Function or Process Roles
Questions

What are the distribution and amount of forest classes, including LSOG, at the large landscape scale? Maps from remote sensing. Acres from plots.

What are the stand-size distribution, stand interior area distribution, and inter-stand distance distribution of LSOG at the large landscape scale? Maps and analyses from remote sensing.

What changes are produced by stressors in distribution and amount of forest classes, starting with the year of the FEMAT analysis (1993), from stand-scale data? Analyses of changes in map and plot data.
It’s Going to Take a Long Time

“The FEMAT report (1993) and the FSEIS (USDA and USDI 1994a: 43) do not project reaching these outcomes for a considerable time, because it takes decades or centuries for young stands to develop into LSOG. Changes in the first several decades should be projected for 100 years or more to evaluate likely outcomes.” (Hemstrom et al. 1998; page 19)
Not easy!
Did we answer the monitoring questions?
What are the distribution and amount of forest classes, including LSOG, at the large landscape scale?

YES…and more….

From: Moeur et al 2005

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**Percent of 5th Field HUC**

<table>
<thead>
<tr>
<th>Forest size class</th>
<th>1994</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Stocked</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>0-9.9&quot;</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>10-19.9&quot;</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>20-29.9&quot;</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>30&quot; +</td>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

From: Moeur et al 2005
What are the stand-size distribution, stand interior area distribution, and inter-stand distance distribution of LSOG at the large landscape scale?

**Mostly.** Stand sizes – YES. Interior stand area distribution – NO. Inter-stand distances – YES.

<table>
<thead>
<tr>
<th>Province</th>
<th>Medium and Large Distance (miles)</th>
<th>Size indexed to Veg. Zone Distance (miles)</th>
<th>Large multi-storied Distance (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All blocks mean (s.d.)</td>
<td>Blocks &gt; 1,000 ac mean (s.d.)</td>
<td>All blocks mean (s.d.)</td>
</tr>
<tr>
<td>California Cascades</td>
<td>0.2 (0.2) 1.0 (1.5)</td>
<td>0.2 (0.2) 1.0 (1.3)</td>
<td>0.4 (0.4) --</td>
</tr>
<tr>
<td>California Coast Range</td>
<td>0.3 (0.5) 16.7 (24.8)</td>
<td>0.3 (0.5) 12.5 (22.3)</td>
<td>0.3 (0.4) 33.1 (66.2)</td>
</tr>
<tr>
<td>California Klamath</td>
<td>0.2 (0.1) 0.5 (0.8)</td>
<td>0.2 (0.1) 0.5 (0.8)</td>
<td>0.4 (1.1) 10.8 (10.8)</td>
</tr>
<tr>
<td>Oregon Coast Range</td>
<td>0.2 (0.3) 2.1 (3.8)</td>
<td>0.2 (0.2) 2.7 (2.4)</td>
<td>0.2 (0.3) 3.7 (4.2)</td>
</tr>
<tr>
<td>Oregon Eastern Cascades</td>
<td>0.2 (0.1) 3.1 (5.1)</td>
<td>0.2 (0.1) 1.2 (1.9)</td>
<td>0.3 (0.5) --</td>
</tr>
<tr>
<td>Oregon Klamath</td>
<td>0.2 (0.1) 1.3 (2.6)</td>
<td>0.2 (0.1) 1.3 (1.8)</td>
<td>0.2 (0.1) 3.6 (7.4)</td>
</tr>
<tr>
<td>Oregon Western Cascades</td>
<td>0.2 (0.1) 0.6 (1.8)</td>
<td>0.2 (0.1) 0.4 (0.7)</td>
<td>0.2 (0.1) 3.6 (2.8)</td>
</tr>
<tr>
<td>Oregon Willamette Valley</td>
<td>0.5 (1.1) --</td>
<td>--</td>
<td>0.8 (1.9) --</td>
</tr>
<tr>
<td>Washington Eastern Cascades</td>
<td>0.4 (0.5) --</td>
<td>--</td>
<td>0.2 (0.2) 1.9 (4.2)</td>
</tr>
<tr>
<td>Washington Olympic Peninsula</td>
<td>0.2 (0.2) 0.4 (0.6)</td>
<td>0.2 (0.1) 0.4 (0.4)</td>
<td>0.2 (0.2) 1.4 (3.3)</td>
</tr>
<tr>
<td>Washington Western Cascades</td>
<td>0.2 (0.1) 0.8 (1.8)</td>
<td>0.2 (0.1) 0.7 (1.0)</td>
<td>0.2 (0.1) 3.7 (4.9)</td>
</tr>
<tr>
<td>Washington Western Lowlands</td>
<td>0.3 (2.1) 2.0 (3.7)</td>
<td>0.4 (0.5) --</td>
<td>0.8 (0.7) --</td>
</tr>
<tr>
<td>Northwest Forest Plan</td>
<td>0.2 (0.2) 1.0 (3.9)</td>
<td>0.2 (0.2) 0.9 (3.7)</td>
<td>0.2 (0.2) 4.9 (17.2)</td>
</tr>
</tbody>
</table>
What changes are produced by stressors in distribution and amount of forest classes, starting with the year of the FEMAT analysis (1993), from stand-scale data?

**YES.** Fire and timber harvest stressors examined. LSOG increased at about 600,000 acres for the first decade overall. Varies by province. Generally in line with NWFP expectations.

<table>
<thead>
<tr>
<th>Province</th>
<th>Percent</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>California</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascades</td>
<td>12.7</td>
<td>49,500</td>
</tr>
<tr>
<td>Coast Range</td>
<td>5.1</td>
<td>9,300</td>
</tr>
<tr>
<td>Klamath</td>
<td>9.7</td>
<td>193,700</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>252,500</strong></td>
</tr>
<tr>
<td><strong>Oregon</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coast Range</td>
<td>5.6</td>
<td>32,200</td>
</tr>
<tr>
<td>Eastern Cascades</td>
<td>1.9</td>
<td>4,700</td>
</tr>
<tr>
<td>Klamath</td>
<td>9.7</td>
<td>76,100</td>
</tr>
<tr>
<td>Western Cascades</td>
<td>3.6</td>
<td>74,900</td>
</tr>
<tr>
<td>Willamette Valley</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>187,900</strong></td>
</tr>
<tr>
<td><strong>Washington</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern Cascades</td>
<td>2.7</td>
<td>4,900</td>
</tr>
<tr>
<td>Olympic Peninsula</td>
<td>-4.6</td>
<td>-30,600</td>
</tr>
<tr>
<td>Western Cascades</td>
<td>12.9</td>
<td>191,000</td>
</tr>
<tr>
<td>Western Lowlands</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>165,300</strong></td>
</tr>
<tr>
<td><strong>Northwest Forest Plan</strong></td>
<td>7.7</td>
<td><strong>605,700</strong></td>
</tr>
</tbody>
</table>
Excellent Job!
Key Issues

- Different kinds of old forest in different environments
- Different old forest dependent species
- Reactions to disturbance and management?
- Propensity to produce old forests?
- Effects of climate change?
Conceptual Model

• How do growth, succession, disturbance, management, climate change interact to produce old forests?
• How does this vary by province?
• How can we reinforce landscape
  – Propensity to produce old forest?
  – Given disturbances?
• Integrative, understandable, shared
Solution?

Vegetation Type A
Cover type: Ponderosa Pine
Structure: Old single-story forest

Vegetation Type B
Cover type: Ponderosa Pine
Structure: Non-Stocked, Post disturbance

- Simple conceptual models
- Integrate on-going research
- Work for planning and monitoring

Regeneration
Growth
Underburning
State and Transition Models

Vegetation Development Dynamics Tool (VDDT). www.essa.com

Tool for Exploratory Landscape Scenario Analysis (TELSA)
www.essa.com
Summarize VDDT results to HUC6, ownership, potential vegetation group

Database
- Vegetation cover type, structure
- Disturbances
- Associated characteristics (e.g. wildlife habitat, products, etc.)

VDDT
- Vegetation Type A
- Vegetation Type B
- Vegetation Type C
Example Old Forest Habitat

VDDT
- Vegetation cover type, structure
- Disturbances
- Associated characteristics (e.g. wildlife habitat, products, etc.)

% highly suitable
- 0-10%
- 11-20%
- 21-30%
- 31-40%
- 41-50%
- 51-60%
- 61-70%
- 71-80%
- 81-90%
- 91-100%

HUC6  Acres of highly suitable habitat
- 1  10,000
- 2  2,000
- 3  500
- ... xxxxx
Trends and Desired Future Condition

Plan

DFC & Trends

Monitor

Adapt

Input

Different?
BUT......

• Existing vegetation mapping was more difficult, time-consuming, and expensive than estimated.

• Coordination and data standardization across the NWFP area was difficult.

• Budgets are shrinking

• Expertise is spread thinner

• The next monitoring report will have to be done quicker, cheaper, and still answer difficult questions.
Solution?  Partnership

- A partnership between State, Federal agencies, Research, and others
- Leverage scarce resources
- Develop common vegetation data and models
- Mesh with NF plan revisions
- Assist in BLM plan revisions and sage grouse habitat analyses
- Accomplish Oregon Department of Forestry assessment objectives
Challenges

• Limited and declining funds
• Very busy people
• No desire for conflicting answers to broad questions
• Need integrated answers – single resource perspectives not suitable
• “Black box” models
• Direct tie between planning, adaptation, and monitoring
Cooperation and Partners

• A consistent approach for assessment, analysis, planning, and monitoring.

• Leverage available resources with partners who need the same kinds of information.

• Regional or mid-scale approach that integrates finer scales and relates to coarser scales.