The LAndscape Management Policy Simulator (LAMPS)

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CLAMS

Landscape Planning and Analysis Process

- Existing forest inventories
- Management intentions
- Prices and costs
- Policy guidance
- GIS databases
- Land use pattern
- Stand structure projections
- Tools and data for policy analysis
- Habitat condition for focal species
- Successional stages
- Recreation opportunities
- Aquatic habitat / watershed potential
- Landslide / debris flow
- Employment and income
- Timber volume and value
- Land use change
- Response models
- Synthesis of effects of alternative management scenarios

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**Forest policies influencing land management**

<table>
<thead>
<tr>
<th>Ownership</th>
<th>Policy</th>
<th>Goals</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Service / Bureau of Land Management</td>
<td>Northwest Forest Plan; Individual Forest Plans</td>
<td>Late-successional / old-growth forest conditions; T&amp;E species; aquatic systems; commodity production</td>
<td>Reserves; Matrix; Green tree retention; Adaptive management areas</td>
</tr>
<tr>
<td>State</td>
<td>State Forest Plans</td>
<td>Healthy forests; Commodity production; T&amp;E species</td>
<td>Structure-based management; Habitat Conservation Plan</td>
</tr>
<tr>
<td>Industry / Non-Industrial Private</td>
<td>Organizational Policies; State Forest Practices Act</td>
<td>Commodity production; Protect environment and fish / wildlife habitat</td>
<td>Retain trees in clearcuts; Streamside protection rules</td>
</tr>
</tbody>
</table>
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Spatial units recognized

BSUs  Parcels  Harvest Blocks  Land Allocations

4th Field Watersheds  5th Field Watersheds  Land Ownerships
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Management intentions (what landowners intend to do)

Need to make assumptions for each landowner group:
   Federal, State, Forest Industry, Non-Industrial Private

Key assumptions:
   Timing and intensity of treatments
   Minimum clearcut harvest ages
   Spatial considerations:
      green-up
      blocking of management units for treatment
   Regeneration stand management intensity

How do we arrive at the assumptions?
   Landowner surveys conducted by the Oregon Department of Forestry
   Numerous meetings with landowners and land managers
   Research

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Policy guidance (what landowners have to do)

Need to make assumptions for each landowner group:
Federal, State, Forest Industry, Non-Industrial Private

Key policies:
Riparian management
Leave trees (clumps)
Owl reserves
Interior habitat areas
Structure-based management
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What is it?
Principal Developers
Simulation Notes
Software
Management Options
Spatial Considerations
Riparian Management Choices
Leave Tree Strategies
Transition Probabilities
Stochastic Events
Simulation Results
LAMPS

What is it?

A simulation model that seeks to emulate management behavior of four landowner groups: federal, state, forest industry, non-industrial private.

A model that allows an evaluation of forest policies across a large area, and over a long time frame.

A model that merges strategic and tactical planning considerations so that processes at a variety of spatial and temporal scales can be represented, and to facilitate an analysis of biological effects at a scale appropriate for the species / function being considered.

A Model I formulation of forest management behavior that seeks to represent some “aspiration” of a group of landowners.
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Principal Developers

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Oregon State University
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Marie Lennette
Simulation Notes

Projections are for 100 years, with 5-year time steps. All ownerships must be classified as either federal, state, forest industry, or non-industrial private. Classification of owners and owner policies is flexible. Maximum area simulated: Depends on computer’s RAM.
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Software

User Interface: Visual Basic
LAMPS

Management Options

“Federal” scheduling process
Monte Carlo approach to scheduling clearcuts.

Constraints:
A maximum percentage of “matrix” land area can be clearcut in any one 5-year time period.
A minimum amount of “older forest” within a watershed must be present before any clearcuts can be scheduled in that watershed.
Can set a target (upper bound) number of acres to be clearcut or thinned in each time period.
Can set a target (upper bound) amount of volume to be harvested in each time period.
Management Options

“State” scheduling process
Monte Carlo approach to scheduling clearcuts.
Objective is measured by the achievement of maximum even-flow of timber harvest volume, using binary search.

Constraints:
Achievement of structural conditions by State management District.
Maintain a distribution of sizes of Interior Habitat Area (IHA) patches (essentially older forest conditions spatially connected).
Management Options

“Forest Industry” scheduling process
Value maximization approach to scheduling clearcuts. Objective can be measured by the achievement of maximum even-flow of timber harvest volume, using binary search. Alternatively, target harvest levels can be set by the user as goals to achieve.

Constraints:
Attempt to emulate a historical clearcut size distribution by “blocking” management units together for harvest using a dynamic process (block patterns are not fixed).
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Management Options

“Non-Industrial Private” scheduling process
Harvest probability approach to scheduling clearcuts.
No clear objective function to maximize, although
target harvest levels can be set by the user as goals
to achieve.

Constraints:
Attempt to emulate a historical clearcut size distribution.
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Spatial Considerations

- Adjacency relationships among clearcut harvests
- Clearcut size distributions
- Owl habitat areas
- Interior Habitat Areas
- Federal watershed conditions
- State District forest structure conditions
Riparian Management Choices

1) No harvest within Oregon Forest Practices Act buffers.
2) Allow partial cutting within Oregon Forest Practices Act buffers, to the extent allowed by the Act.
3) Choice #2, yet no harvest of hardwoods within 100 feet of a stream.
4) Choice #1, and no harvest of hardwoods within 100 feet of a stream.
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Leave Tree Strategies

1) Leave Oregon Forest Practices Act minimums (2 small TPA).
2) Leave 2 large TPA.
3) Leave 5 TPA, according to State Forest Plan guidelines.
4) Leave 14 TPA according to State Forest Plan guidelines.
5) Leave clumps of trees (BSUs, as a percentage of land area) uncut.
Transition Probabilities

After clearcutting, each BSU within a clearcut unit has a probability of being regenerated as one of four types: open, hardwood, mixed, or conifer.

Probability = $f$ (previous forest type, owner, ecoregion, distance from stream)
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Stochastic Events

During the scheduling process, we model small gap disturbances by examining each BSU and determining whether or not to “regenerate” it (and not “harvesting” the volume).

Disturbance = \( f \) (BSU size, distance from stream)
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Simulation Results, projection year 2045

- Non-forest
- Woodland
- Water
- Regeneration
- Broadleaf
- Small mixed
- Medium mixed
- Large mixed
- Very large mixed
- Small conifer
- Medium conifer
- Large conifer
- Very large conifer
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Simulation Results, projection year 2070

- Non-forest
- Woodland
- Water
- Regeneration
- Broadleaf
- Small mixed
- Medium mixed
- Large mixed
- Very large mixed
- Small conifer
- Medium conifer
- Large conifer
- Very large conifer

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Simulation Results, projection year 2095

- Non-forest
- Woodland
- Water
- Regeneration
- Broadleaf
- Small mixed
- Medium mixed
- Large mixed
- Very large mixed
- Small conifer
- Medium conifer
- Large conifer
- Very large conifer
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Summary

The LAMPS simulation model is a spatial simulation model of landowner management behavior, and is associated with a quantitative projection of stand structures.

It was designed to help policy makers and land managers “think through” forest policies before implementing them.

It facilitates spatial analysis of biological effects of policies (using wildlife habitat suitability models).
Questions