Lower Canopy & LOD: Productivity, Structure, Diversity

ESRM 304
Learning Objectives …

- Know why we measure lower canopy vegetation & Large Organic Debris (LOD)
- Know what basic lower canopy & groundstory attributes are important and how to measure them
- Introduce field methods for labs this week
Lower Canopy Information: Importance

- Site Quality
- Forest Structural Patterns
- Wildlife-Habitat relationships
- Biological Diversity
- Biomass of secondary forest products
Site Quality

- Productive capacity of forest land
- Useful for ...
  - Determining what species are suitable
  - Predicting growth potential
  - Evaluating ecosystem resiliency
  - Determining management priorities
  - Land valuation
Assessing Site Quality

Potential for forest growth can be identified by using assemblages of lower canopy vegetation Scots pine growing in Finland …
Assessing Site Quality

Closer to home …
Assessing Site Quality

Site Index for Ponderosa Pine, 100-yr basis
Examining Structural Patterns

- Northwest ecosystems contain many different vegetation patterns.
- Types, amounts, and distribution of vegetation patterns define water quantity and quality, wildlife habitat, timber resources.
- Vegetation patterns impact forest processes such as stream flow, erosion, and succession.
- Forest landscapes are created and maintained through a balance of disturbance and recovery processes.
Four major stages of stand development

<table>
<thead>
<tr>
<th>Grass-forb</th>
<th>Seedling-shrub</th>
<th>Sapling-pole</th>
<th>Intermediate</th>
<th>Mature</th>
<th>Old growth</th>
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<tbody>
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<td>Stand initiation</td>
<td>Stem exclusion</td>
<td>Understory reinitiation</td>
<td>Old growth</td>
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</tbody>
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- Herbage
- Browse
- Escape cover
- Soft mast
- Hard mast
- Cavities and dead wood
Wildlife Habitat Relationships

Vagrant shrew
Townsend’s mole
Meadow voles
Jumping mice
Deer mouse
Gophers
Ground squirrels
Chipmunks

Marsh and Trowbridge’s shrews
Southern red-backed vole
Tree and flying squirrels
Keen’s mouse
Shrew-mole
Coast mole

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Herbage
Browse
Escape cover
Soft mast
Hard mast
Cavities and dead wood
Biological Diversity Quantification

- Indexes attempt to combine abundance, composition, dominance into single no.
- Diversity at different scales
  - Landscape level
  - Community-Ecosystem level
  - Population-species level
  - Genetic level
Diversity at Different Scales

Community-ecosystem Level
- How have natural disturbances and/or management activities affected species diversity?
- What is the function of a species in the community?
- Where are the areas of high species richness, endemism, or rarity and how well are they protected?

Community Metrics
- Richness, composition, Shannon, Simpson
Lower Canopy Structure & Diversity

- **Horizontal structure / diversity**

  **OSpecies Richness**
  - Number of species present, $n_i$

  **OSpecies Composition**
  - $p_i = \text{amt. of species } i \div \text{amt. all spp.}$

  **OShannon Index ($H'$)**
  - $H' = -\sum p_i \cdot \ln(p_i)$

  **OSimpson’s Index ($D$)**
  - $D = \sum [n_i(n_i-1)] / [N(N-1)]$
  - usually expressed as $1/D$
Lower Canopy Structure & Diversity

- Vertical structure / diversity
- BSD is directly related to FSD
Biomass of secondary forest products

- Secondary Forest Products
  - Floral arrangements (salal, ferns)
  - Mushrooms
  - Fiddle heads (Ferns)
  - Others …
Biomass of secondary forest products

Some Biomass Equation examples:

**Shrubs**
- RUUR (trailing blackberry): $\text{TAB} = -1.214 + 0.8392 \times \text{(COV)}$
- VACCI (*Vaccinium* species): $\text{TAB} = 0.0 + 1.644 \times \text{(COV)}$

**Ferns**
- ATFI (lady fern): $\text{TAB} = 0.0 + 1.235 \times \text{(COV)}$
- PTAQ (bracken fern): $\text{TAB} = 0.0 + 3.1057 \times \text{(COV)}$
LOD (DWD, CWD) Information: Importance

- Contributes organic matter to soil
- Component of habitat for many species
- Plays a role in temporary carbon storage (slow release through decay)
Vegetation & LOD Survey
Field Methods

Assessing Lower Canopy, LOD Attributes

Objectives:
1) To gain experience in application of two transect sampling techniques:
   a. Point transect sampling for lower canopy vegetation; and,
   b. Line intersect sampling for volume or biomass of dead / down material;
2) To gain experience in application of fixed-area plot sampling for these same attributes;
3) To gain familiarity with variability / reliability of lower canopy assessment data and the magnitude of possible measurement errors.

FIELD WORK

Equipment:
Hand compass, 100-ft cloth tape, calculator, DBH-tape, write-in-the-rain plot measurement cards & handout materials

Procedure:
Each measurement team will collect data from two 100-ft transects that will be used to implement the point transect sampling technique for lower canopy vegetation and execute the line intersect technique for large organic detritus (LOD). Each team will collect data from two sample points (plot centers) along each transect. At each plot center, two fixed-area, circular plots will be set up to assess the same two stand characteristics (understory vegetation and LOD). Each team should share their relevant data with every other team and turn in all equipment used before leaving.
Point Transect Sampling for vegetation cover, composition

Record what is observed at a set of points at predetermined distances along a transect (bare ground, species, etc.). Make other comments, as applicable. The transect pictured would produce an estimate of 2/6, or 33% cover.
Vegetation & LOD Survey

Point Transect Sampling for vegetation cover, composition

<table>
<thead>
<tr>
<th>Vegetation Point Transect Card</th>
<th>Page_____ of ________</th>
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</thead>
<tbody>
<tr>
<td>Date_________</td>
<td>Team__________________</td>
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<tr>
<td>Comp._________</td>
<td>Stand_____________</td>
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<thead>
<tr>
<th>Point #</th>
<th>Spp. 1</th>
<th>Spp. 2</th>
<th>Other spp.</th>
<th>Comment(s)</th>
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Vegetation & LOD Survey

Line Intersect Sampling for Large Organic Debris

Measure and record the diameter at the point of crossing, perpendicular to central axis of piece. Measure and record the length of the piece, also.
Vegetation & LOD Survey

Line Intersect Sampling for Large Organic Debris

Measure and record the diameter at the point of crossing, perpendicular to central axis of piece. Measure and record the length of the piece, also.
Vegetation & LOD Survey

Line Intersect Sampling for Large Organic Debris

<table>
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<td>Comp._____________</td>
<td>Stand__________________</td>
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<tr>
<td>Piece #</td>
<td>Diam (in.)</td>
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Vegetation & LOD Survey

Fixed-area plots for vegetation & LOD

Small Plot – vegetation measurement
- same plot center as large plot
- 0.01 acre plot ➞ 11.8-ft radius

Large Plot – LOD measurement
- Shares plot center with small plot
- 0.10 acre plot ➞ 37.2-ft radius
Vegetation & LOD Survey

Fixed-area plots for vegetation & LOD

**Vegetation Plot Card**

- **Date**: 
- **Team**: 
- **Comp.**: 
- **Stand**: 
- **Plot**: 
- **Size (ac.)**: 

<table>
<thead>
<tr>
<th>Species</th>
<th>Cover(%)</th>
<th>Avg. Ht. (ft)</th>
<th>Comment(s)</th>
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**LOD Plot Card**

- **Date**: 
- **Team**: 
- **Comp.**: 
- **Stand**: 
- **Plot**: 
- **Size (ac.)**: 

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<tr>
<th>Piece #</th>
<th>$D_b$ (in.)</th>
<th>$D_u$ (in.)</th>
<th>length (ft.)</th>
<th>Stump?</th>
<th>Comment(s)</th>
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Summary Remarks

- Need info on structure, variability, processes for:
  - Grouping of stands into productivity classes
  - Building inventory on critical habitat conditions
  - Identifying wildlife-habitat relationships
  - Enhancement of grouping stands into risk classes
  - Development of management targets for
    - Silvicultural manipulations
    - Managing potential fire hazard
    - Biological diversity maintenance
Summary Remarks

- Diversity at different scales
  - Landscape
  - Community
    - Community – Lower Canopy Structure & Diversity
    - Horizontal / Vertical Structure
  - Population - Species
  - Genetic
Vegetation & LOD Surveys

- Field Trip to St. Edward State Park
- Bring your PNW Plant ID Key
- Bring sturdy, closed-toe footwear pref. w/ ankle support
- Tue 20, Wed 21 Oct. 2015
- Depart from behind Bloedel Hall (C-10 parking lot) promptly at 12:30 P.M.