Lower Canopy & LOD: Productivity, Structure, Diversity

ESRM 304

Learning Objectives

- Know why we measure lower canopy vegetation & Large Organic Detritus (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

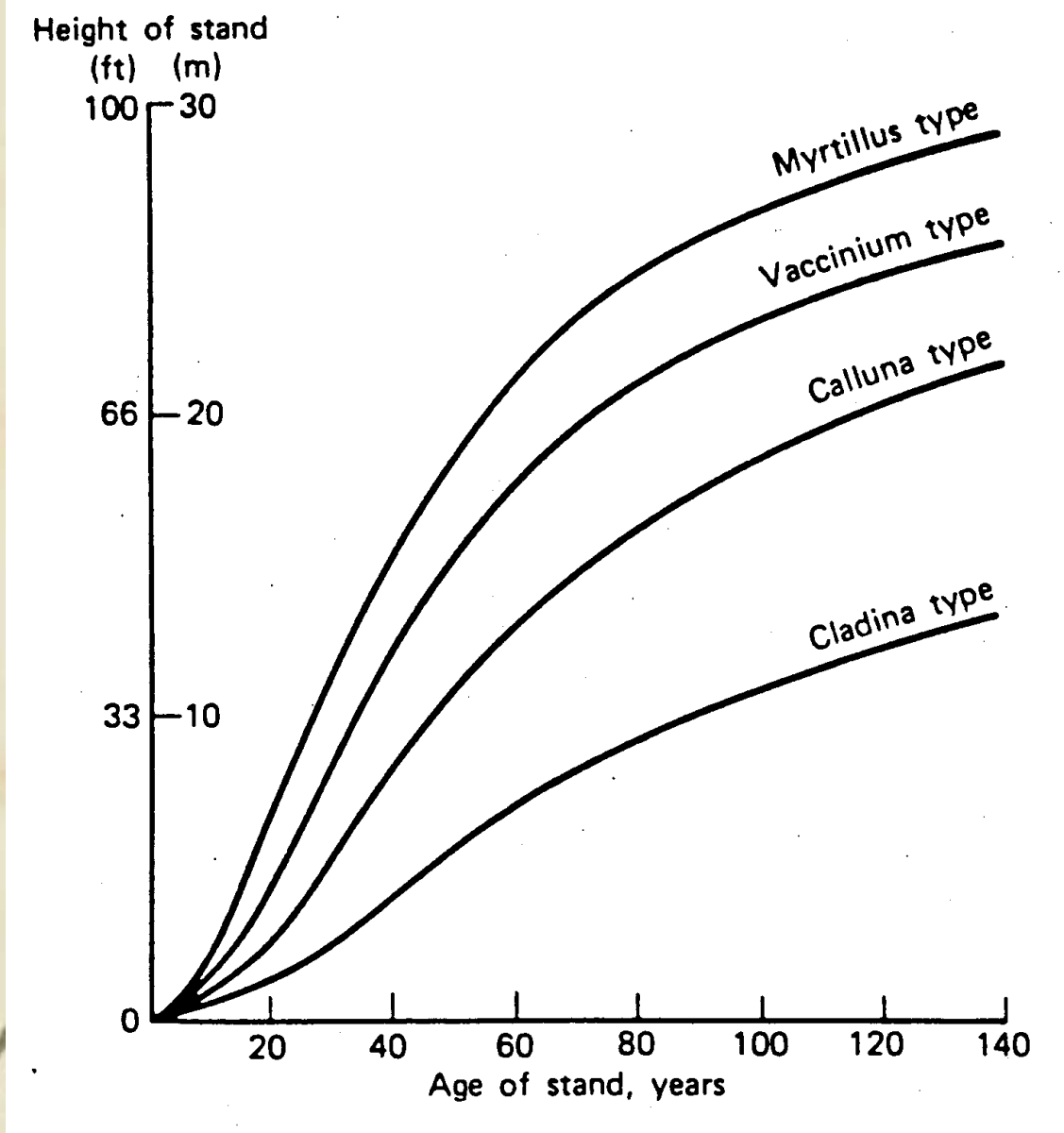
Site Quality

- 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

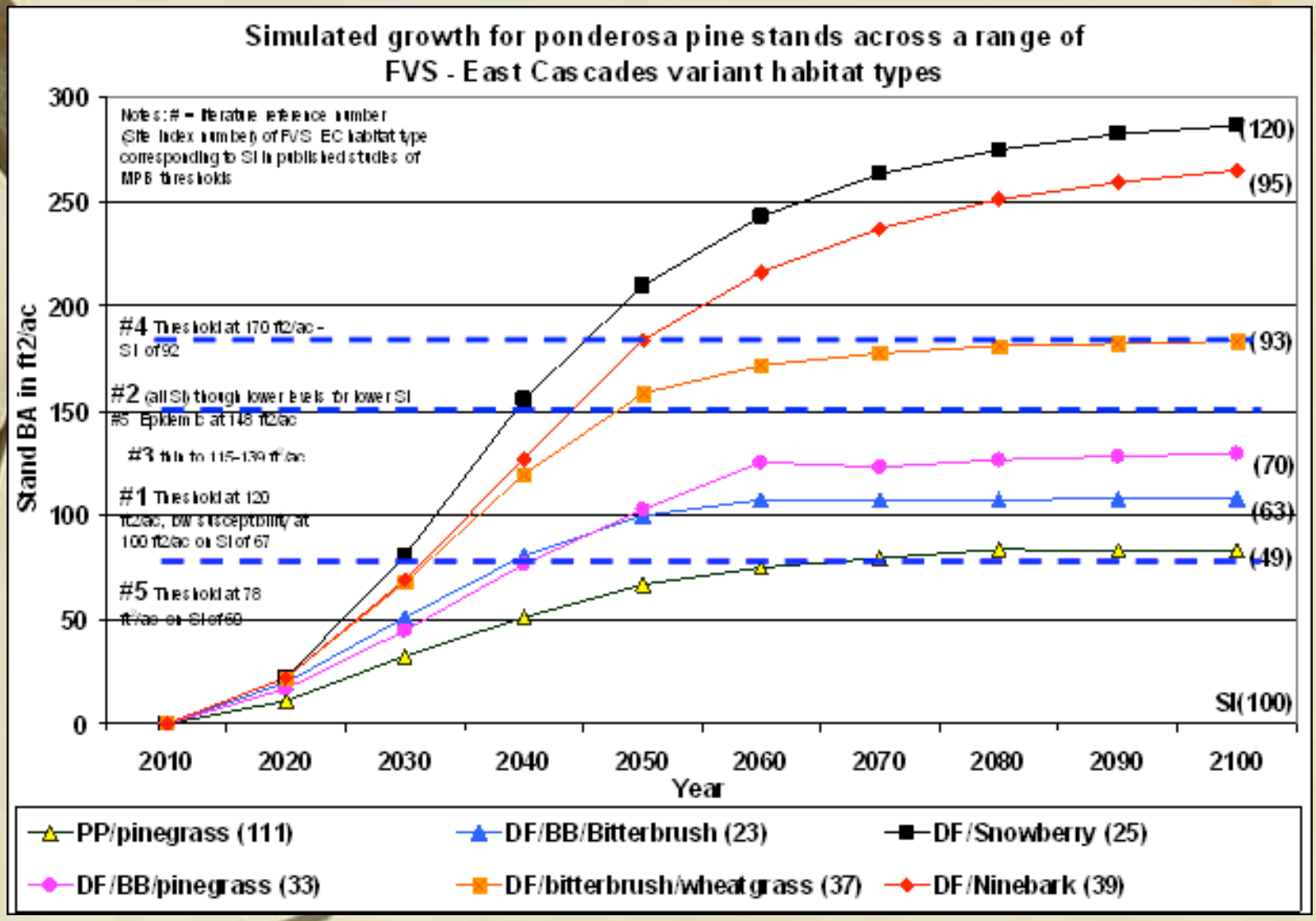
Potential for forest growth can be identified by using assemblages of lower canopy vegetation

Scots pine growing in Finland …

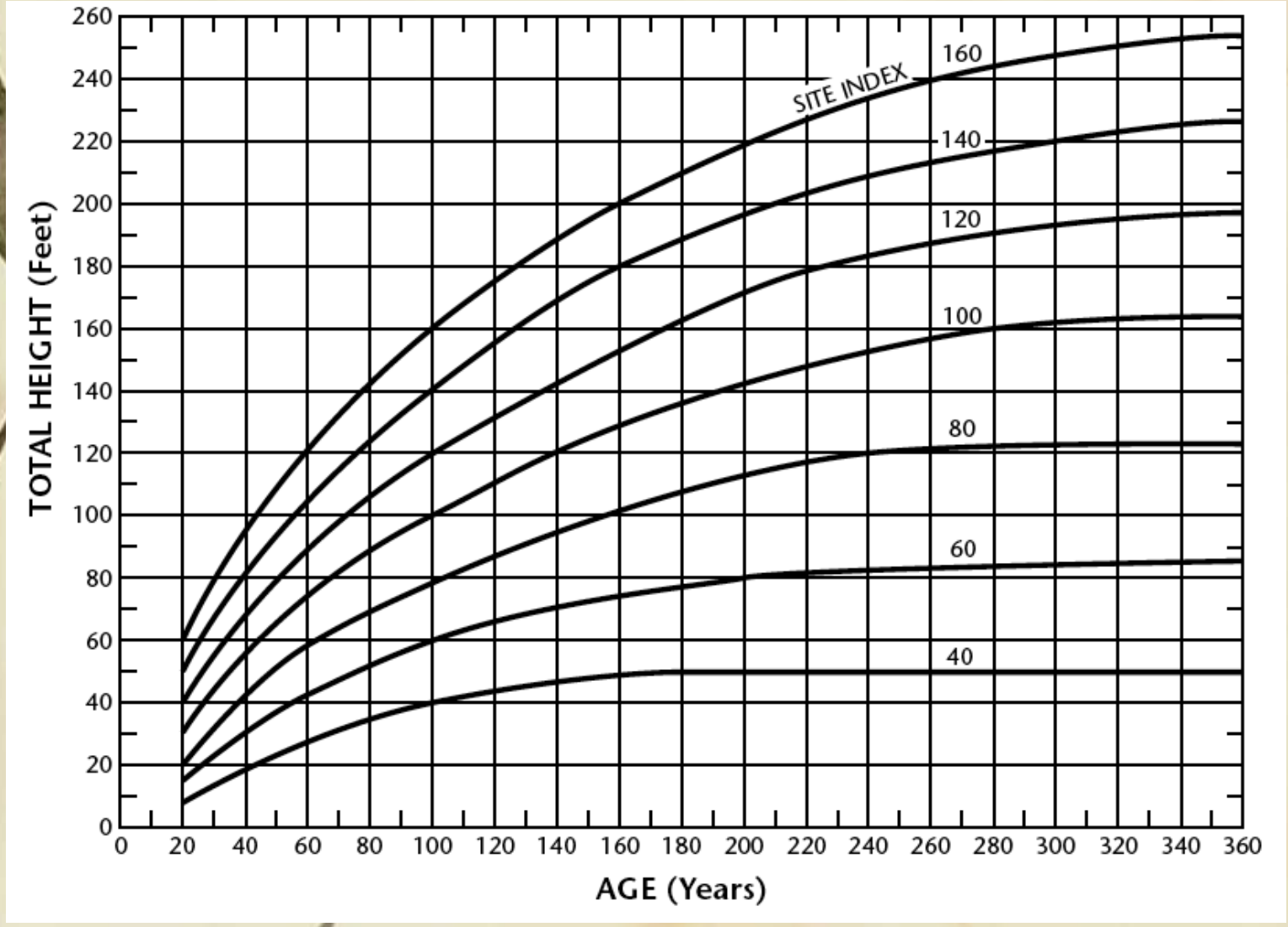


Assessing Site Quality

Closer to home …



Assessing Site Quality

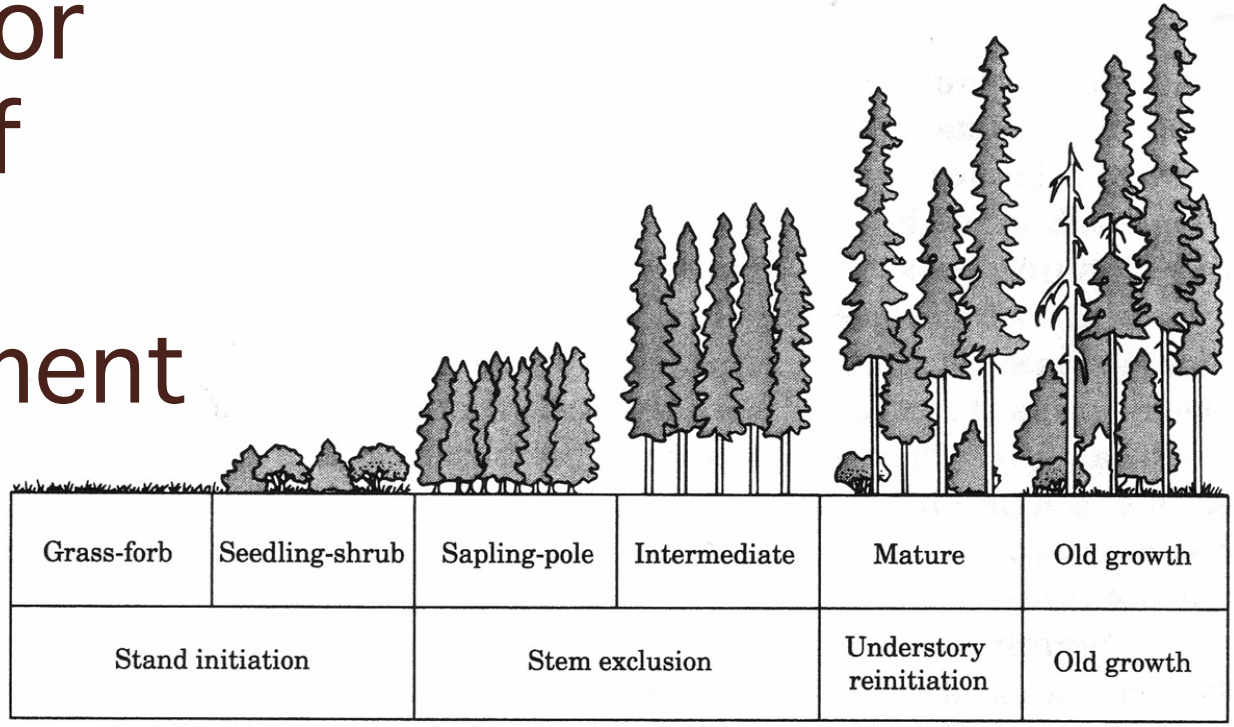


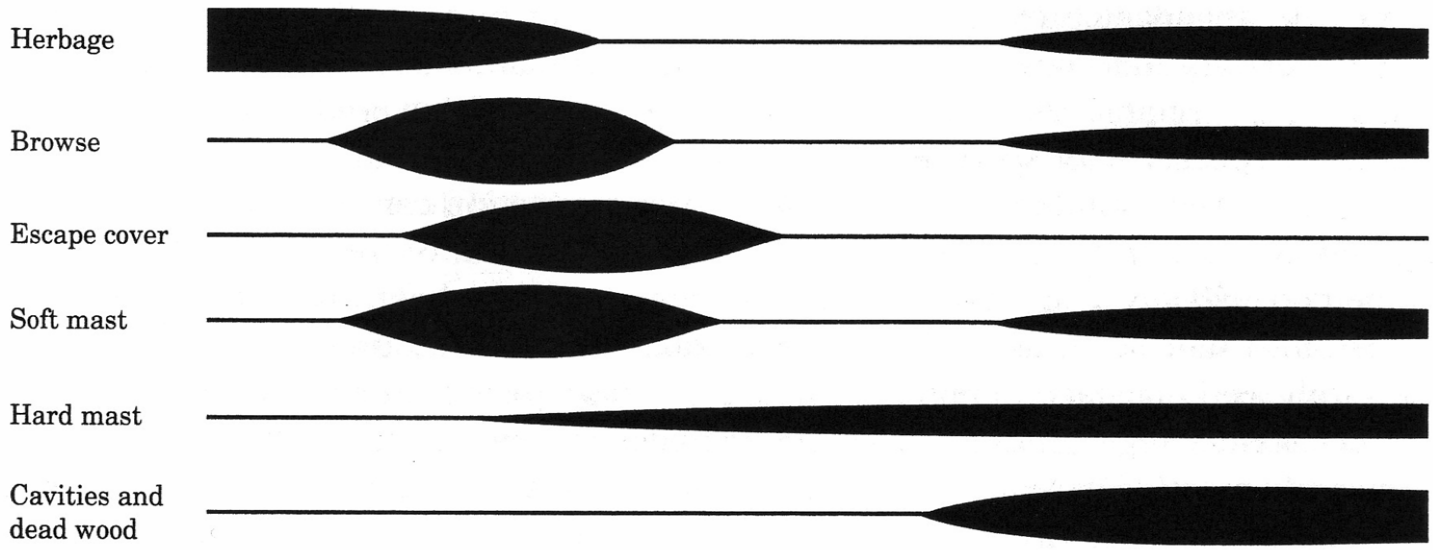
Site Index for Ponderosa Pine, 100-yr basis

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

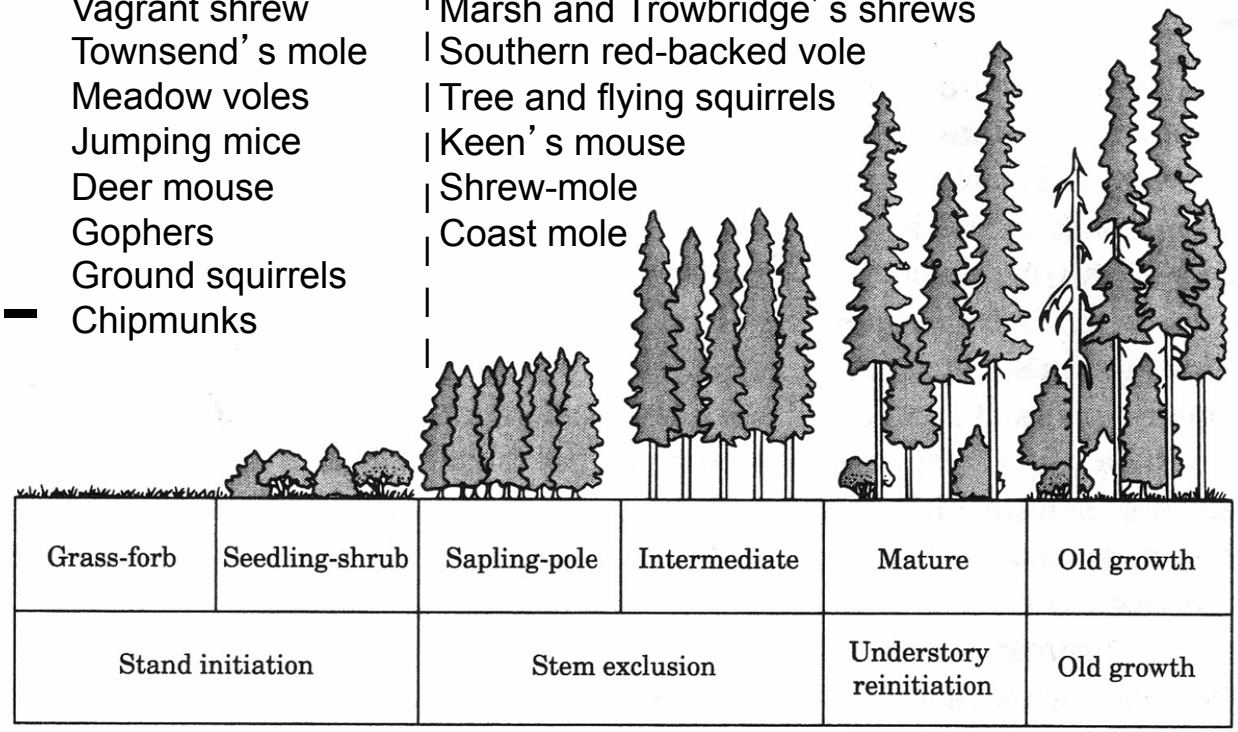


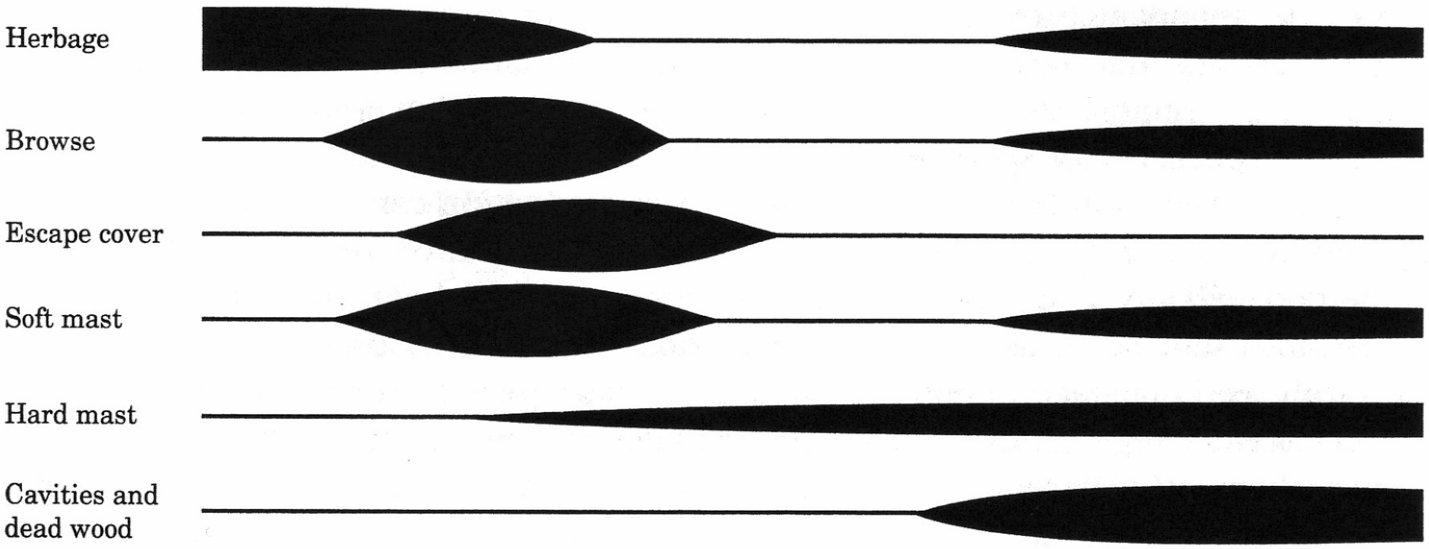


Wildlife Habitat Relation-ships

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





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

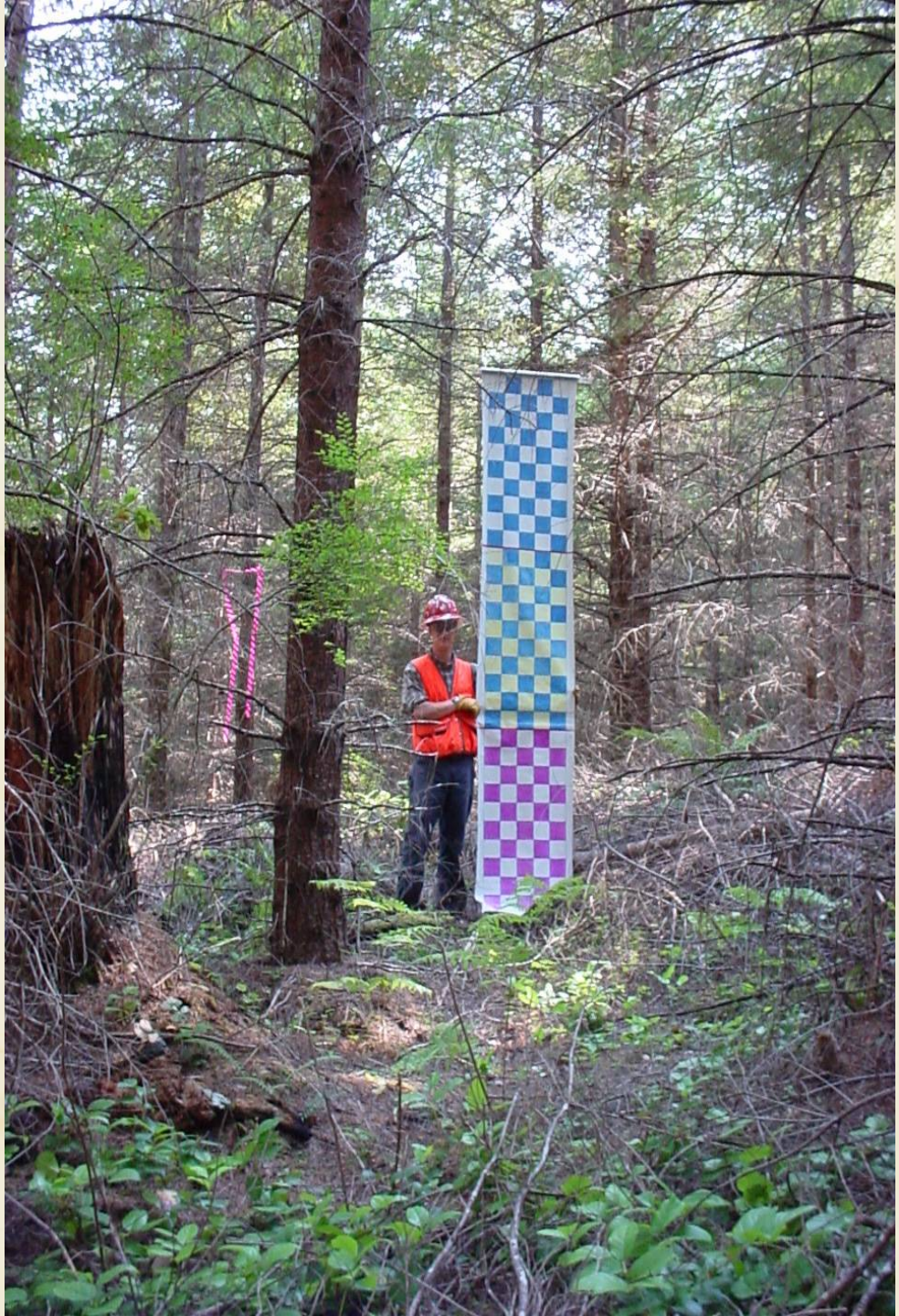
Lower Canopy Structure & Diversity

- Horizontal structure / diversity
  - Species Richness
    - Number of species present, n_i
  - Species Composition
    - p_i = amt. of species i / amt. all spp.
  - Shannon Index (H')
    - $H' = -\sum p_i \cdot \ln(p_i)$
  - Simpson'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:

<u>Shrubs</u>

RUUR (trailing blackberry):	TAB = –1.214 + 0.8392 (COV)
VACCI (*Vaccinium* species):	TAB = 0.0 + 1.644 (COV)

<u>Ferns</u>

ATFI (lady fern):	TAB = 0.0 + 1.235 (COV)
PTAQ (bracken fern):	TAB = 0.0 + 3.1057 (COV)

LOD (DWD, CWD) Information: Importance

- Slows travel of surface water
- Critical habitat for some species
- Plays a role in temporary carbon storage (slow release through decay)
- Contributes organic matter to soil

Vegetation & LOD Transect Surveys Field Methods

Assessing Lower Canopy, LOD Attributes

Objectives:

1) To gain experience in application of two transect sampling techniques:
   a. Point transect sampling for under- and ground-story 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:

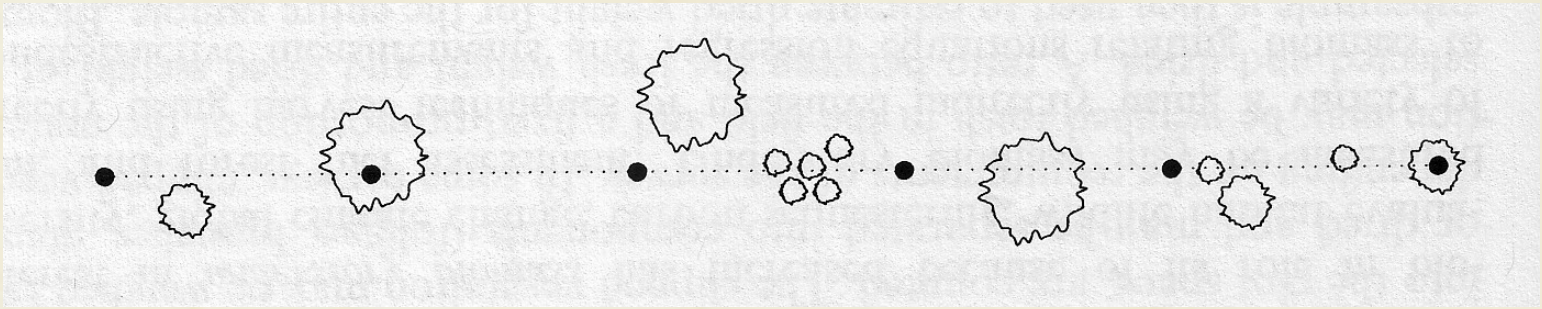
Hand compass, 100-ft cloth tape, calculator, DBH-tape, write-in-the-rain plot measurement cards, dichotomous plant ID key & other handout materials

Procedure:

Each measurement team is assigned two 100-ft transects that will be used to perform one each of the *point transect* sampling technique for lower canopy vegetation and the *line intersect* technique for large organic detritus (LOD). The same transect will be used to locate a single sample point (plot center) at which two concentric, fixed-area, circular plots will be set up to assess the same two stand characteristics (understory vegetation and LOD).

Vegetation Survey – Transects

Point Transect Sampling for vegetation cover, composition



Record what is observed at a set of points at pre-determined 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 Survey – Transects

Point Transect Sampling for vegetation cover, composition

Vegetation Point Transect Card Page_____ of _____

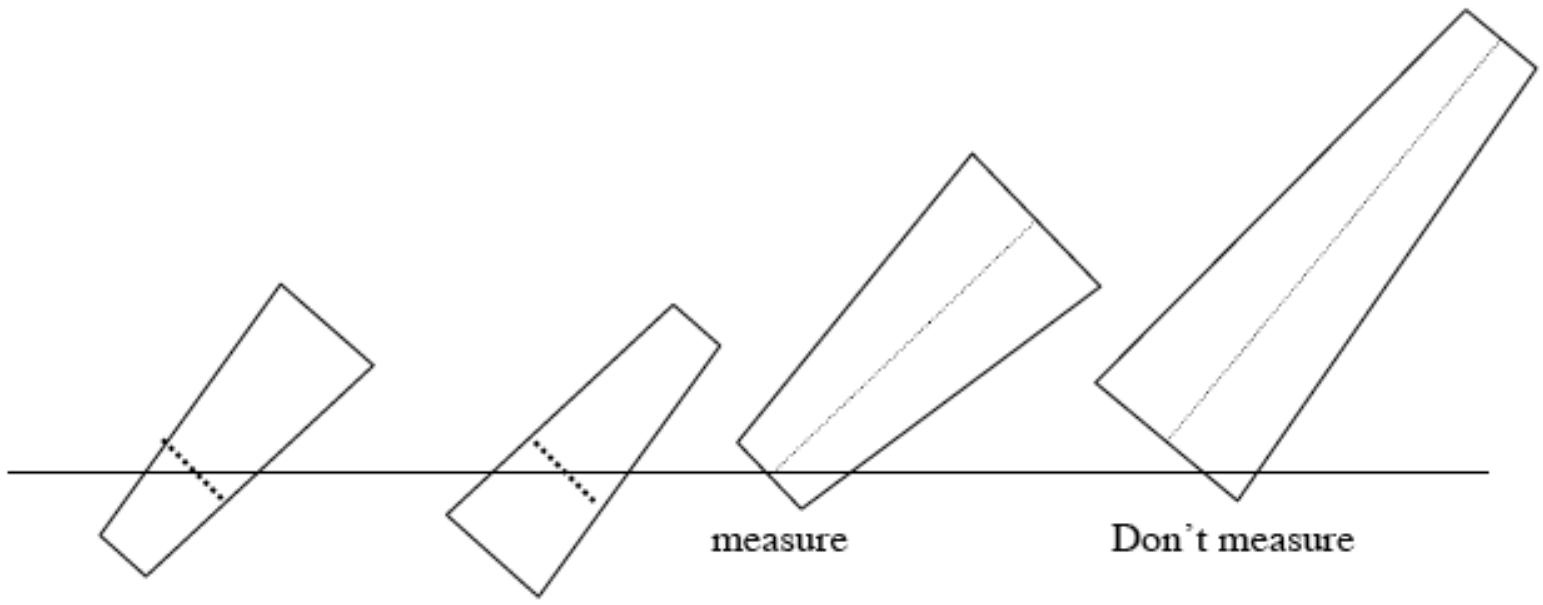
Date_____ Team_____ Forest _____

Comp. _____ Stand_____ Transect ___length (ft) _____

Point #	Spp. 1	Spp. 2	Other spp.	Comment(s)

LOD Survey by Transect

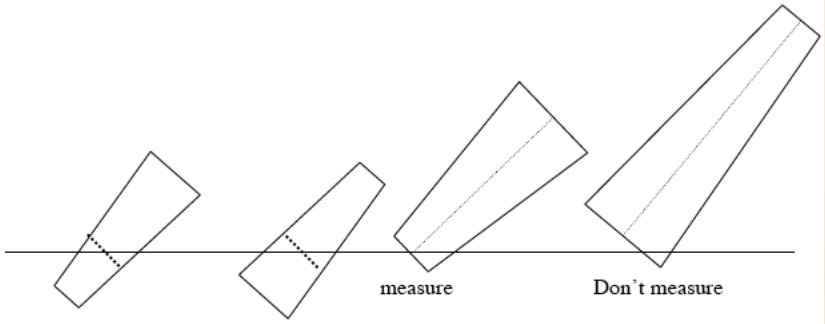
Line Intersect Sampling for Large Organic Detritus



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.

LOD Surveys

Line Intersect Sampling for Large Organic Detritus



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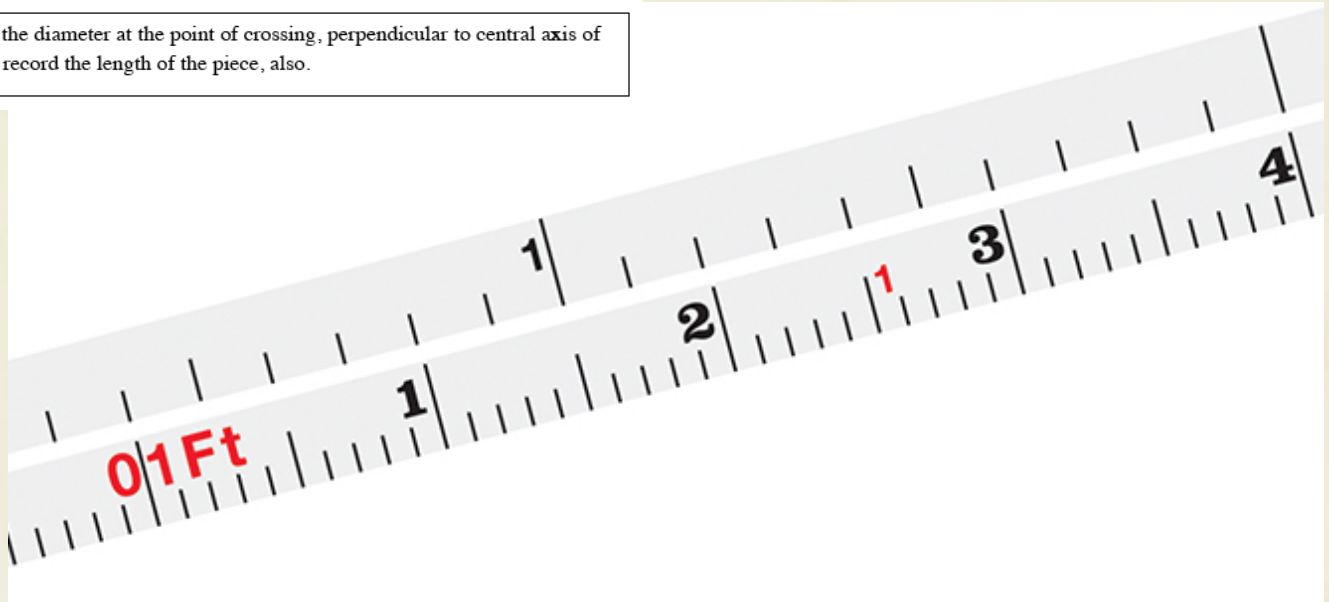


LOD Survey – Transects

Line Intersect Sampling for Large Organic Detritus

LOD Line Intersect Card Page_____ of _____

Date_____ Team_____ Forest _____

Comp. _____ Stand_____ Transect #_____, length (ft) _____

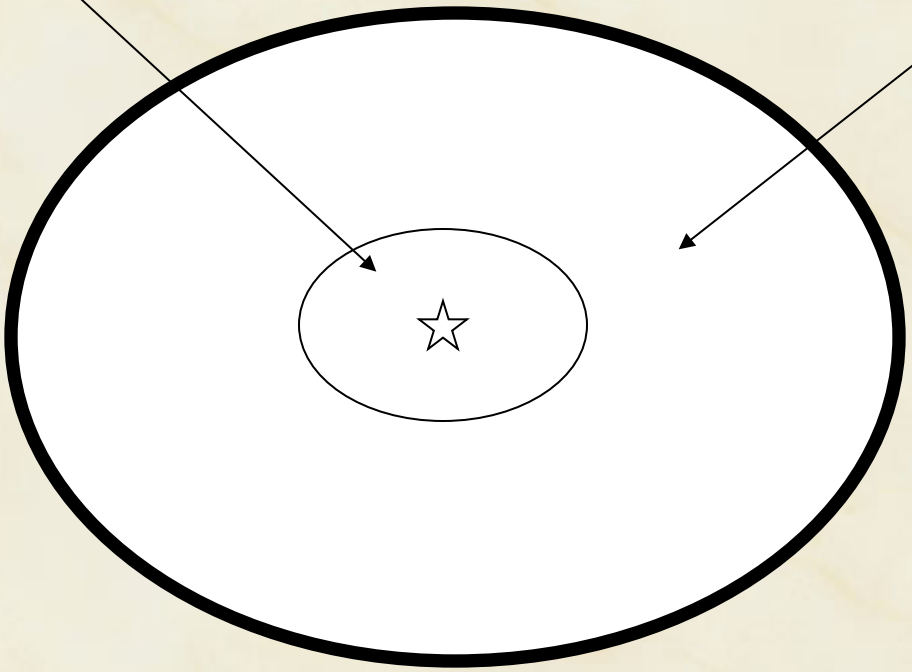
Piece #	Diam (in.)	length (ft.)	Stump?	Comment(s)

Vegetation & LOD Plot Surveys Field Methods

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 – Plots

Fixed-area plots for vegetation & LOD

Vegetation Plot Card Page_____ of _____

Date_____ Team_____ Forest _____

Comp. _____ Stand_____ Plot _____Size (ac.) _____

Species	Cover(%)	Avg. Ht. (ft)	Comment(s)

LOD Plot Card Page_____ of _____

Date_____ Team_____ Forest _____

Comp. _____ Stand_____ Plot _____Size (ac.) _____

Piece #	D_b (in.)	D_u (in.)	length (ft.)	Stump?	Comment(s)

Summary Remarks

- Need info on structure, variability, processes for:
  - Grouping of stands into productivity classes
  - Building inventory on critical habitat conditions
  - I.D.-ing 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

- Read Chpt. 10 in Husch, et al. 2003. Forest Mensuration. John Wiley & Sons, Inc. New York.

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 17th, Wed 18th Oct. 2017
- Depart from behind Bloedel Hall (C-10 parking lot) *promptly* at 12:30 P.M.