

**PLANTS OF  
THE PACIFIC  
NORTHWEST  
COAST**

*Washington, Oregon,  
British Columbia & Alaska*

POJAR & MACKINNON

Manual of Oregon  
Trees and Shrubs

Ed Jensen et al.

[www.addall.com](http://www.addall.com)

# Survivorship Curves

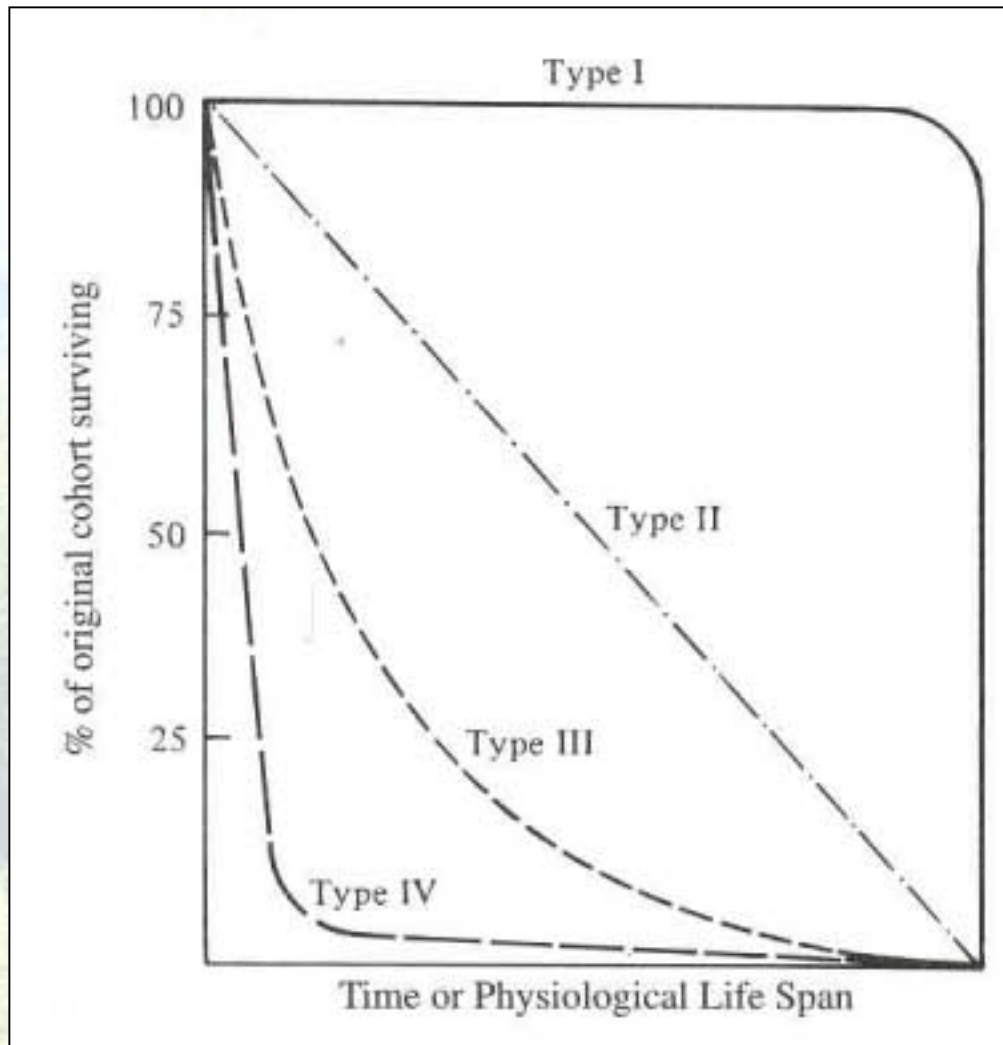


Fig 14.8

# Survival

- Cohort of plant seedlings exhibit a survivorship curve that is characteristic of species
- Compensatory mortality in Douglas-fir
- Light-demanding pioneer species – even-aged distribution
- Shade-tolerant climax species – stable age distribution

# Conifer Survivorship Curves

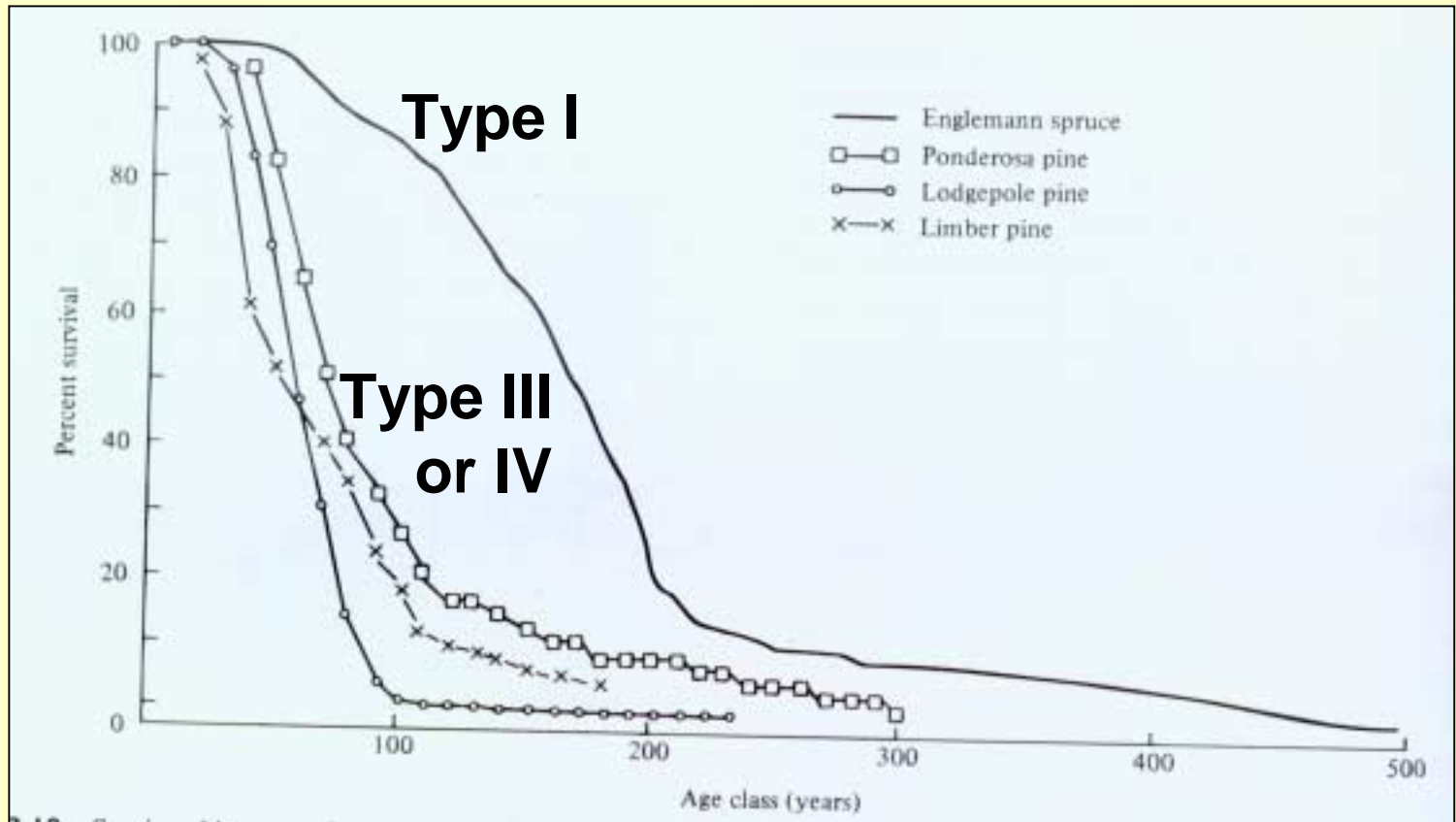


Fig. 14.18

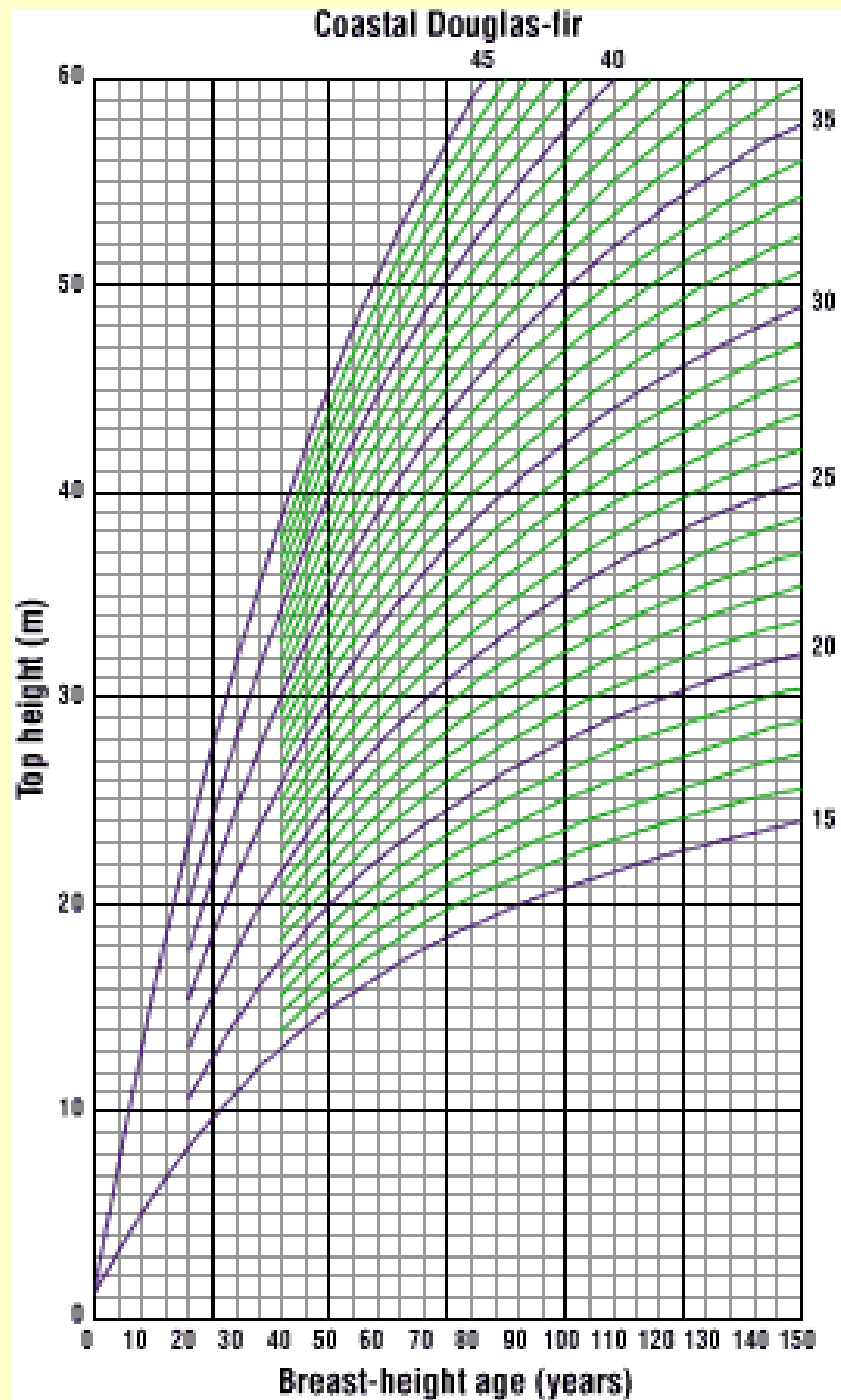
# Density-Independent Regulation

- Physical Resources Available
- Site Index

site index = f (temp, soil moisture, and soil nutrients)

- Classification of the productive potential of a site for tree growth by height
- Fairly constant for a particular species over a wide range of stand densities
- Mortality: wind, fire, snow, pathogens (may operate in a density dependent manner)

# Site Index Curves – Coastal Douglas-fir



# Density-Dependent Regulation

- Competition for limited resources
- Determinant of plant size and number
- Competition-induced mortality
- Self-thinning rule
  - Log mean plant mass vs. log stand density, slope =  $-3/2$

# Self-Thinning Rule

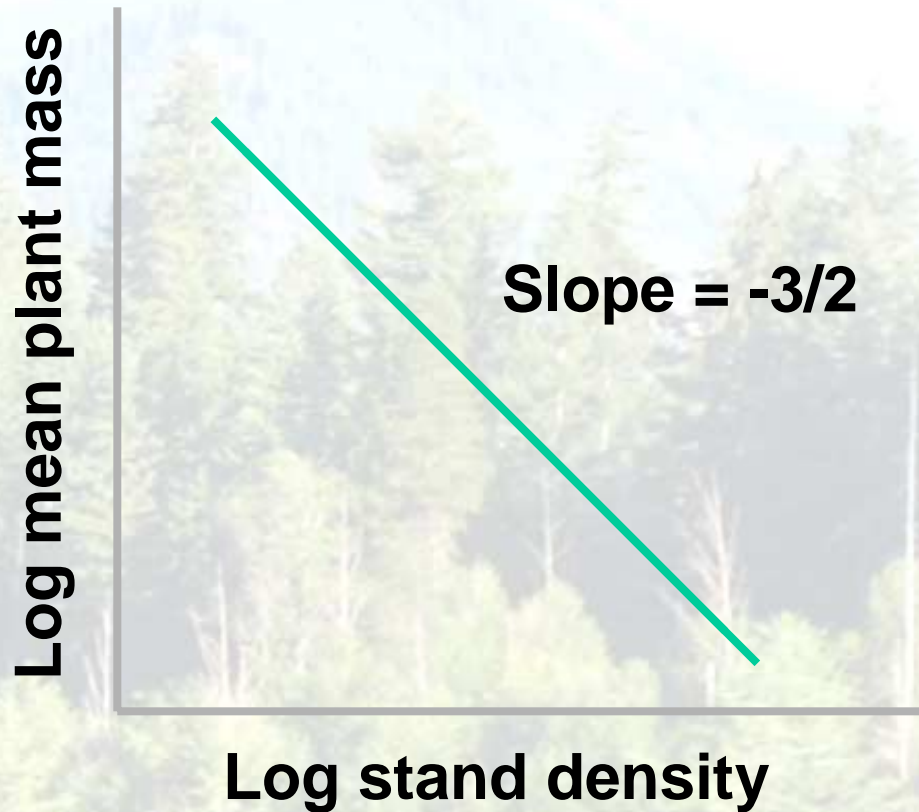
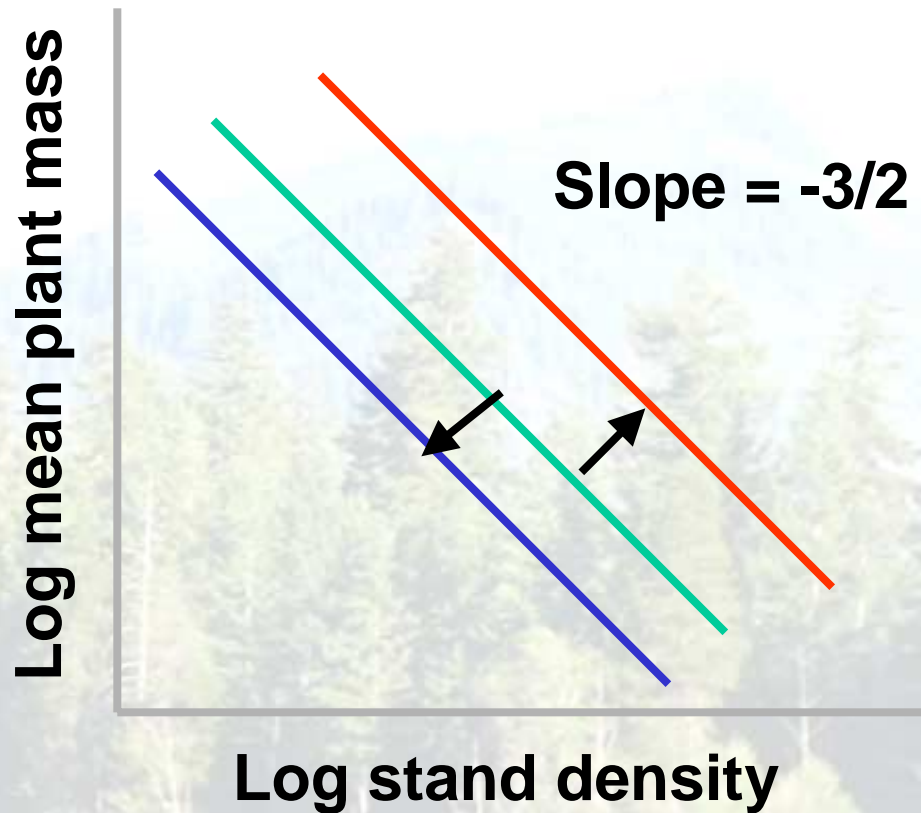


Fig. 14.19

# Self-Thinning Rule



**Douglas – fir**

SDI=600 – 10” trees  
per acre (tpa)  
(1500 - 25.5 cm  
trees per ha (tph))

Stand Density Index (SDI) – Maximum number of trees of a given size for a species that can grow within a certain area.

Fig. 14.19

# Maximum SDI

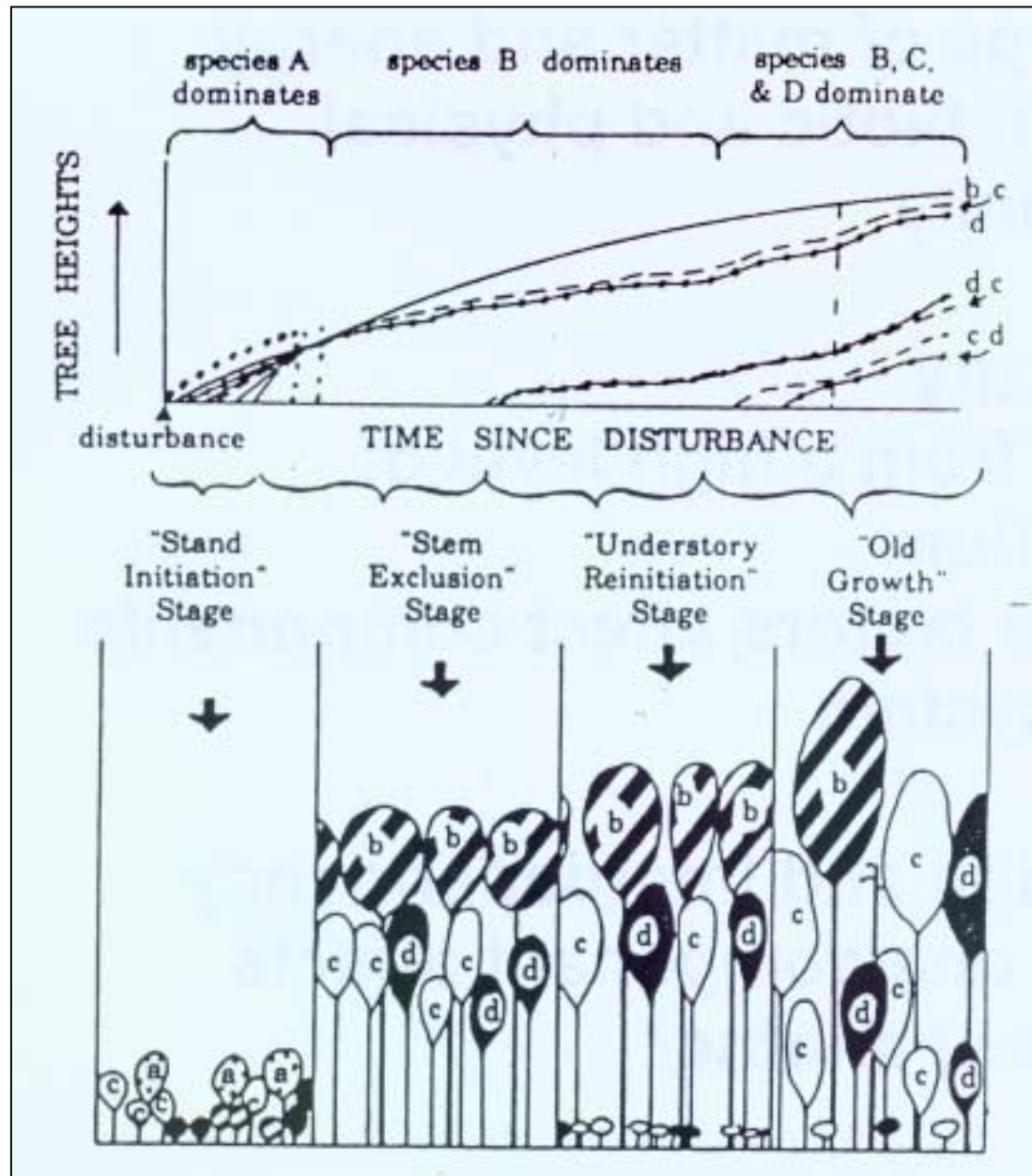
Species	(English)	(metric)	Source
Redwood	1000	2470	Reineke 1933
Ponderosa pine	800	1980	Reineke 1933
Upland oak	230	570	Schnurr 1937
Ponderosa pine	830	2050	Long, 1985
Lodgepole pine	690	1700	Long, 1985
Douglas-fir	587	1450	Long, 1985
Western hemlock	790	1950	Long, 1985

English = 10" tpa

Metric=25 cm tph

# Stages of Stand Development Succession

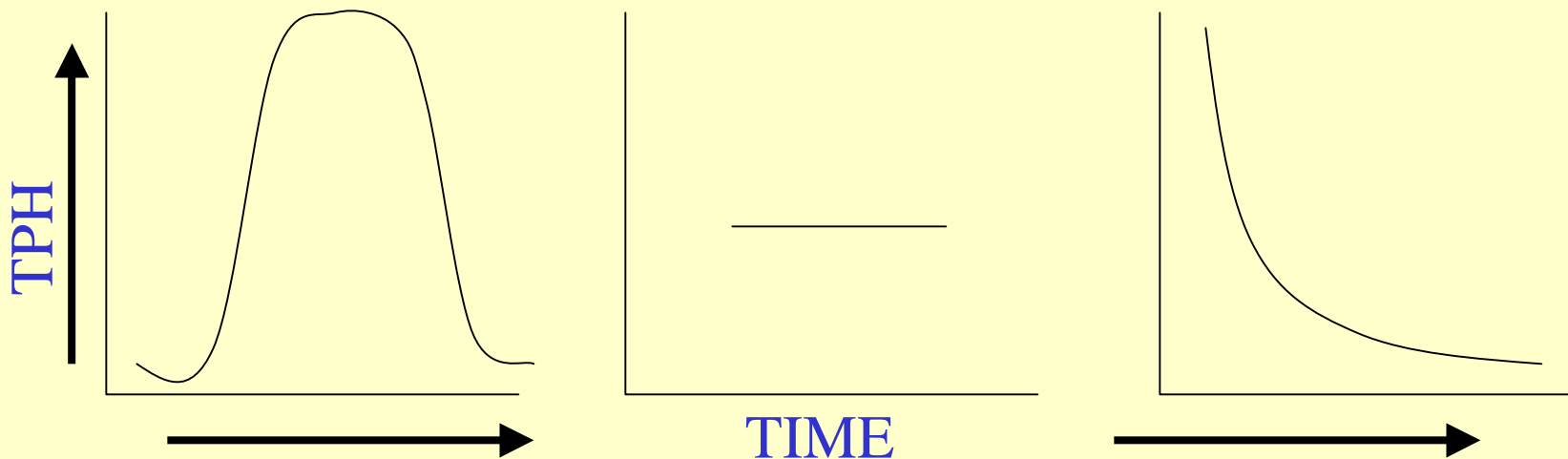
- Resulting from competition and self-thinning in an even-aged cohort
  - Stand Initiation - prior to canopy closure
  - Stem Exclusion - after canopy closure
  - Understory Reinitiation - formation of gaps
  - Old growth - multi-layered, multiple age & size classes



From: Oliver, C. and D. Larson. (1990) Stand Dynamics

# Tree Size Distribution / Time

- Bell-Shaped: Pioneer, shade intolerant
  - Flat: Mid-seral, moderate shade tolerance
  - Reverse-J: Mid/Late Seral, shade tolerant
- (see Fig. 14.17 in text)



# Application

- Much of timber management is applied population ecology
- Forests are managed for:
  - Age class
  - Size class
  - Species mixtures
  - Predict maturation rates
  - Protection of wildlife and fish habitat
  - Control of insects and disease - \*invasives

Next:

Community Ecology