

Canopy Structure

D = dominant

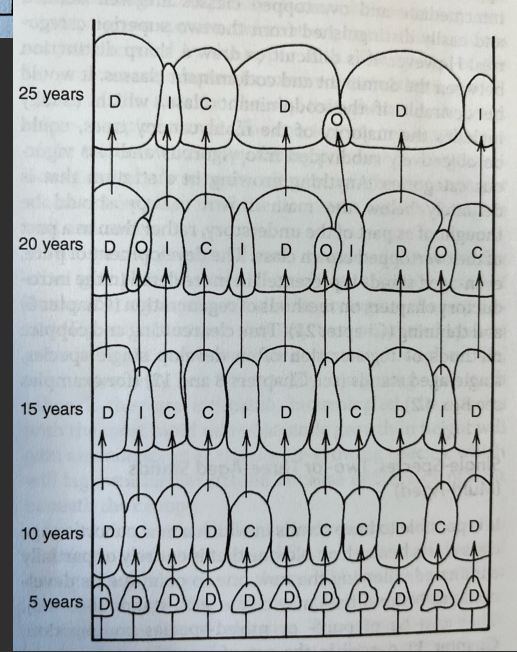
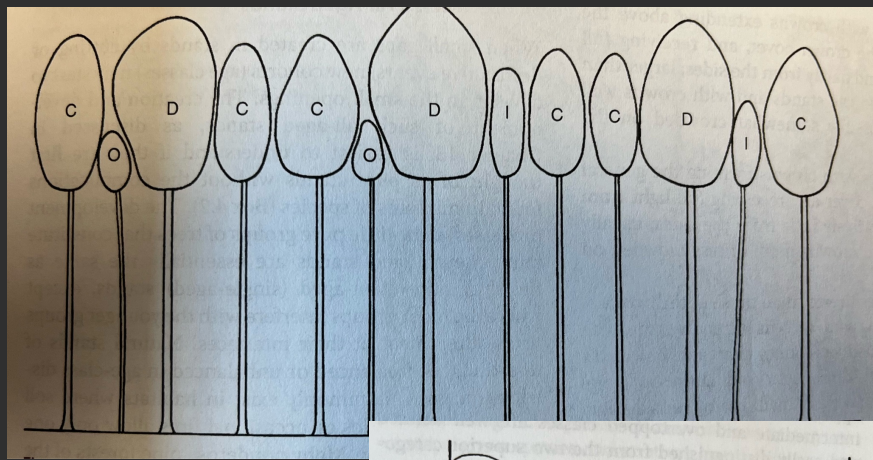
= largest in volume

C = Codominant

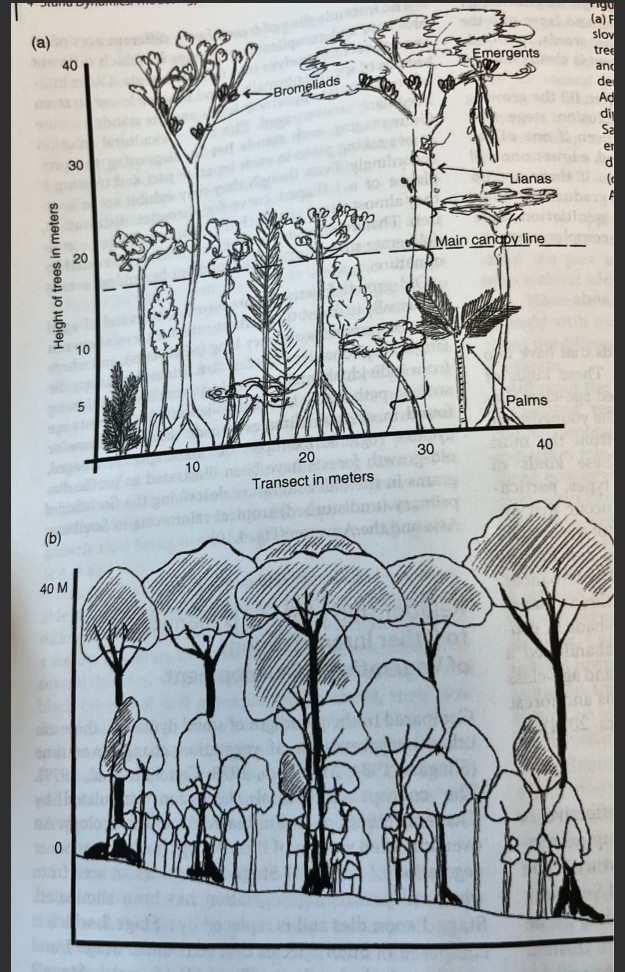
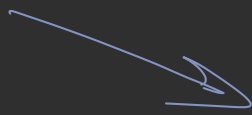
= same canopy layer, but not as large

I = Intermediate = reduced in size

O = overtopped



Canopy
Structure
in
Tropics
and
hardwoods



Label the stand development stages - and species traits -

Southern Rockies Cold/Wet Mixed Conifer

Populus tremuloides → Pioneer species; full light

Picea pungens

Abies lasiocarpa → Slow growing e. succ.

Picea engelmannii

→ Shade tolerant

Remke et al 2021

→ Late succ. / Slow growing

P. pungens

A. lasiocarpa

P. engelmannii



Stand
Initiation

Stem
exclusion

Understorey
reinitiation

Old-growth?
Mature?

Label the stand development stages - and species traits -

Southern Rockies Warm/dry Mixed Conifer

Pinus Ponderosa

Abies concolor

Pseudotsuga menziesii

Remke et al 2021

→ Modern structure w/ fire

suppression

P. menziesii

P. ponderosa

Frequent Fire

↓

A. concolor

↓



lack of SE

S.I

S.E/UR?

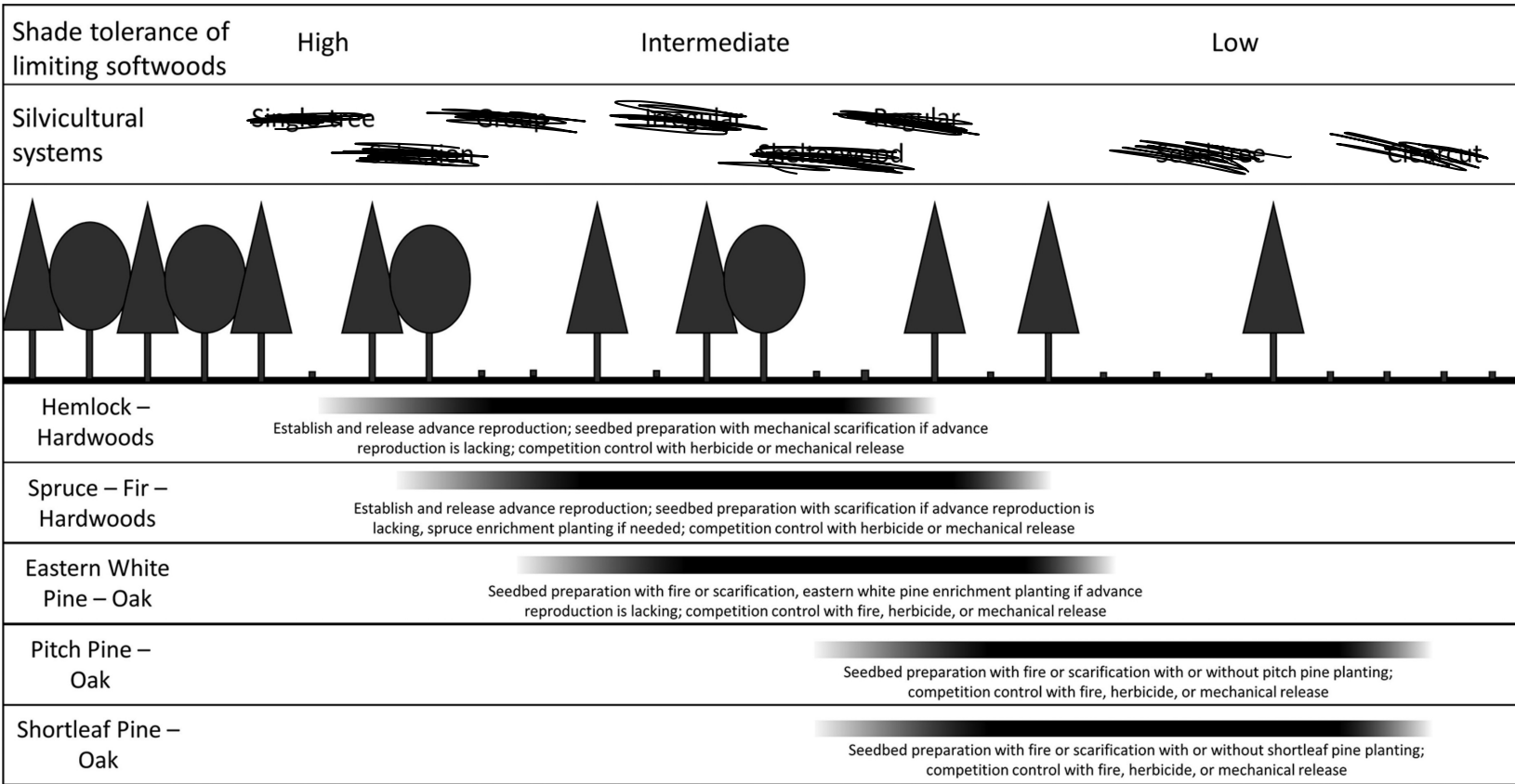
OG?

lack of SE



Table 1. Composition, limiting softwood species, natural disturbance regime, and regeneration ecology of selected temperate mixedwoods in two overarching categories based on shade tolerance of limiting softwoods.

	Mixedwoods with softwoods of high shade tolerance	Mixedwoods with softwoods of low to intermediate shade tolerance
Species composition	<ul style="list-style-type: none"> • Hemlock–hardwoods • Spruce–fir–hardwoods 	<ul style="list-style-type: none"> • Eastern white pine – oak • Pitch pine – oak • Shortleaf pine – oak
Limiting softwood species	<ul style="list-style-type: none"> • Eastern hemlock • Red spruce • Northern white-cedar 	<ul style="list-style-type: none"> • Eastern white pine • Pitch pine • Shortleaf pine
Disturbance regime in natural conditions	<ul style="list-style-type: none"> • Frequent small-scale and periodic moderate canopy disturbances 	<ul style="list-style-type: none"> • Frequent surface fire or moderate to severe canopy disturbances
Regeneration	<ul style="list-style-type: none"> • Continuous to episodic 	<ul style="list-style-type: none"> • Episodic
Competitive disadvantages of limiting species	<ul style="list-style-type: none"> • Reproduction primarily from seed (vs. vegetative) (though northern white-cedar frequently layers) • Small seeds require receptive seedbeds for germination and initial survival (e.g. decayed deadwood, mineral soil) • Slow growth relative to hardwoods (particularly sprouts) and balsam fir 	<ul style="list-style-type: none"> • Reproduction primarily from seed (vs. vegetative) (though shortleaf and pitch pine can produce sprouts) • Small seeds require receptive seedbeds for germination and initial survival (e.g., mineral soil) • Slow growth relative to sprouts of hardwoods • Lower shade tolerance than competing hardwood species
Competitive advantages of limiting species	<ul style="list-style-type: none"> • Long-lived • High shade tolerance; can survive decades in the understory and respond to canopy disturbance 	<ul style="list-style-type: none"> • Long-lived • Bark thickness insulates cambium during fire • Shortleaf pine and pitch pine sprout after fire



Which Silv. Principals are relevant to maintaining mixed wood stands?

— Be specific about how each principal matters (i.e. how is control of stand process utilized?)

For this exercise, do not articulate silvicultural terms, rather, in your own words describe how you will achieve a goal of maintaining mixed wood systems