

Mixed Species Stands

More things to think about!

ESRM 323

Smith, et al. Chpt. 16

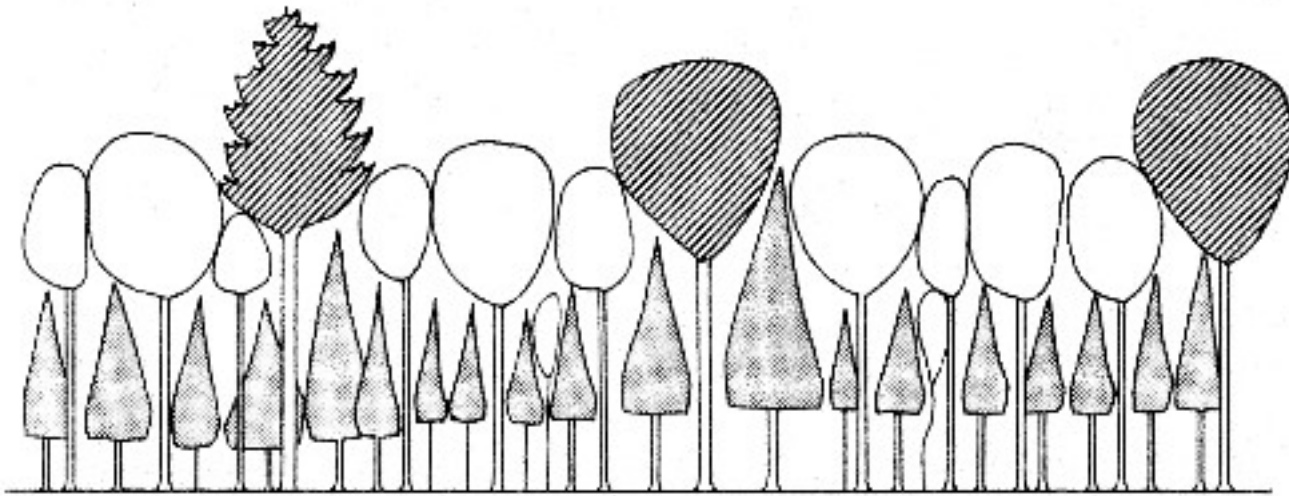
Mixed Species Stands

- Quite common over the landscape
- Key concept: **stratification**
- Common mistake: **larger = older**
- Still, a lot to be learned...

All Silvicultural Systems Apply

- Mixed, single-cohort (even-aged) silviculture system (clean-fell) and grow mixed spp. back
- Multi-cohort (multi-aged) systems have a significant place in mixed species stands
- Double cohort (two-aged) mixed stands are also effective systems (Seed-tree and Shelterwood).

Single-cohort Stratified Mixtures



- More common than we think
- Associated with lethal, stand replacing disturbances

Single-cohort Stratified Mixtures ... 2

- Key: knowledge of species interactions and height growth patterns.
- Early stages: intense and very important in the development
 - Wrong approach: force uneven-aged management
 - Better approach: work **WITH** it !

Single-cohort Stratified Mixtures ... 3

- Stand development and treatment
 - Treat each stratum as individual stand
 - Upper canopy species: no restriction in horizontal expansion
 - Feasibility of all treatments depends on height growth, crown interactions, and logging implementation
 - Stand cleaning may be performed

Single-cohort Stratified Mixtures ... 4

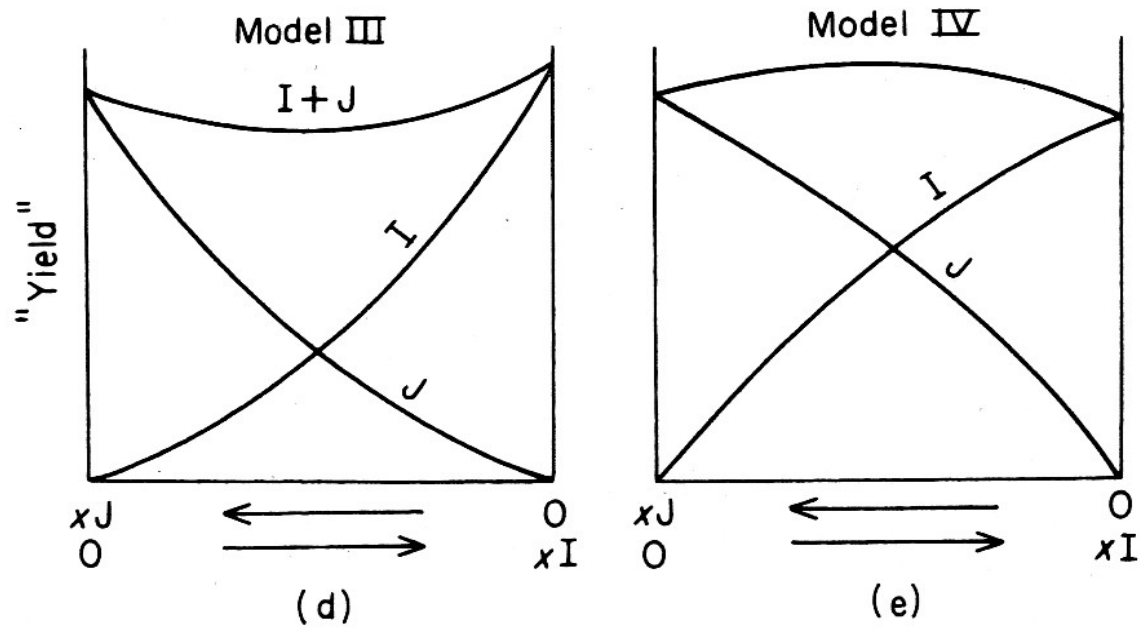
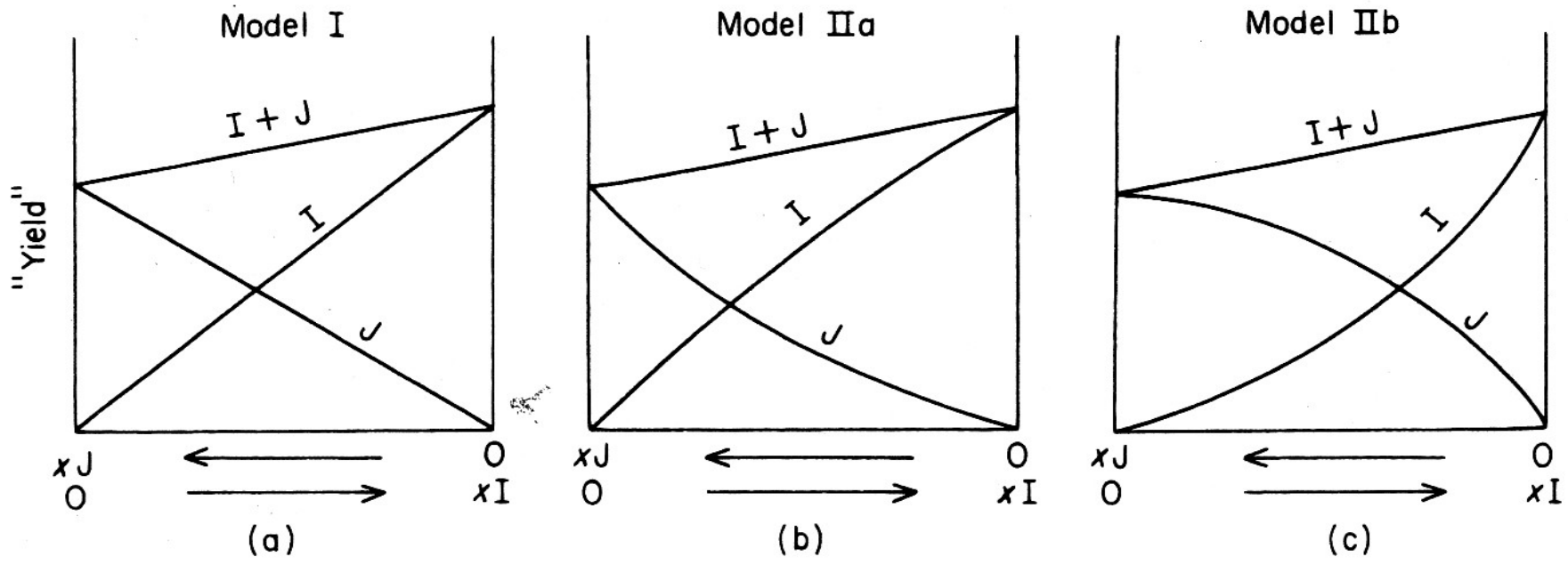
- Stand development & treatment (cont' d)
 - If “A” stratum dependably emerges, can remove during initial regeneration: ensure seed provision
 - Tree spp. do not all grow at the same rate
 - Desirable species may be overtopped when young
 - Planting mixed species can result in a multi-tiered stand that may not match expectations

Single-cohort Stratified Mixtures ... 5

- Stand development & treatment (cont' d)
 - Controlling spp. mix is easier on poorer sites
 - Better sites may get out of control: “jungle”
 - Small to moderate changes in site quality can have a large impact on success of a species
 - Moderate site heterogeneity within the stand may produce patches
 - Patches are a single species rather than an age or diameter cohort
 - May result from or be controlled by patterned mixed species planting

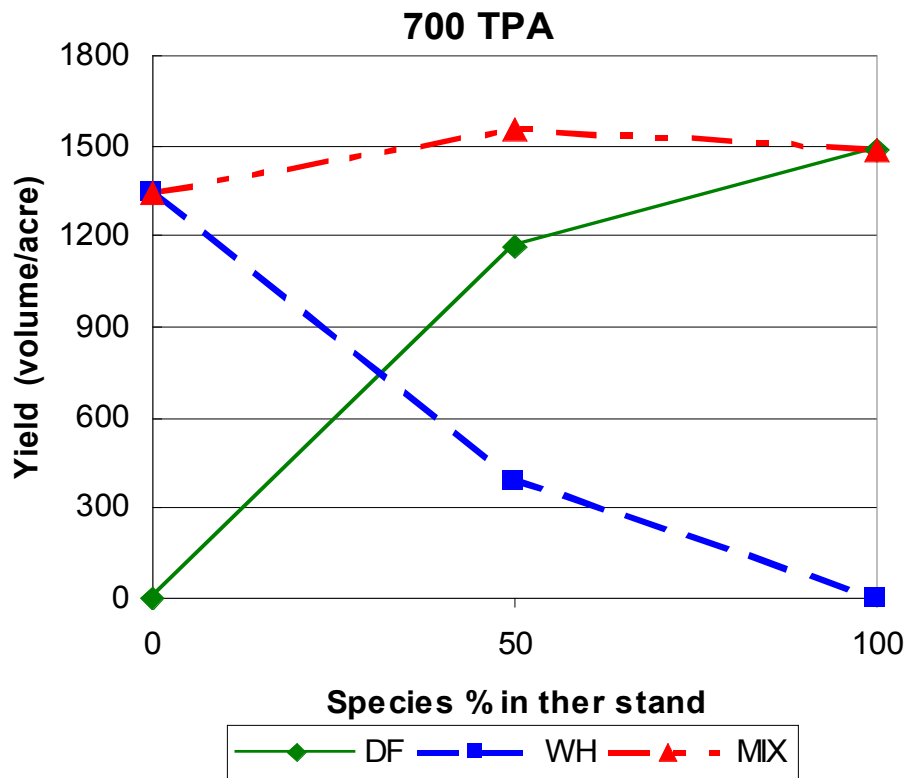
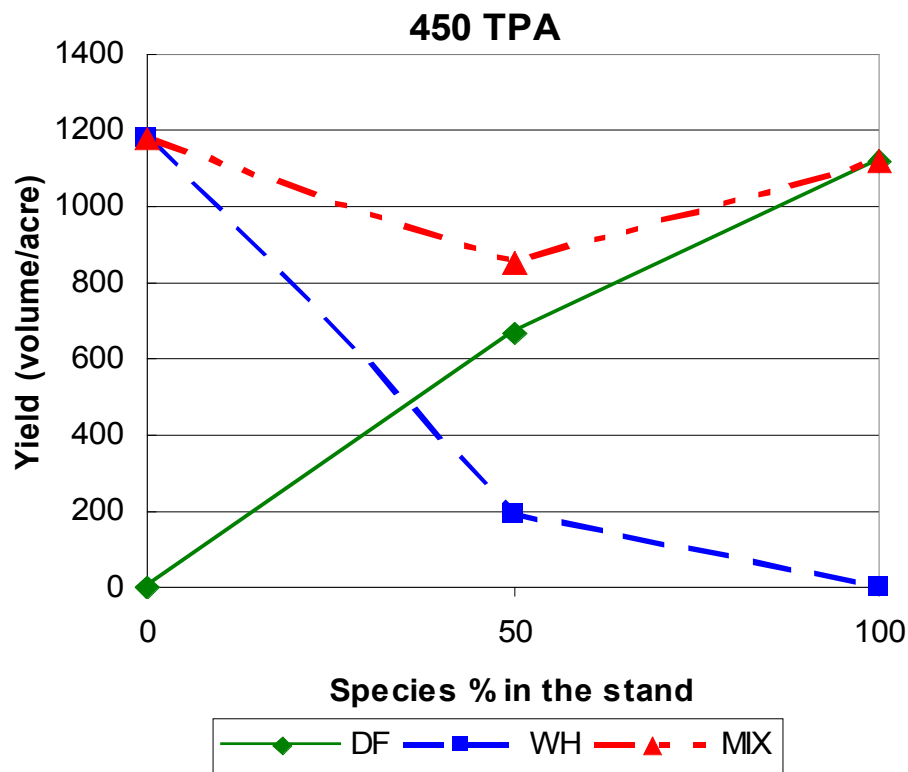
Single-cohort Stratified Mixture Advantages

- Effect of pruning obtained without artificially pruning.
 - Trees of lower strata species can have a training effect on upper strata
 - Keeps bole clear while providing room for crown expansion.
- Natural processes develop good tree form without reducing the crown volume suddenly
 - Allows for maximum growing space utilization
 - Allows for a greater diversity of uses than a pure stand
 - Might be more productive than a pure stand of intolerant species



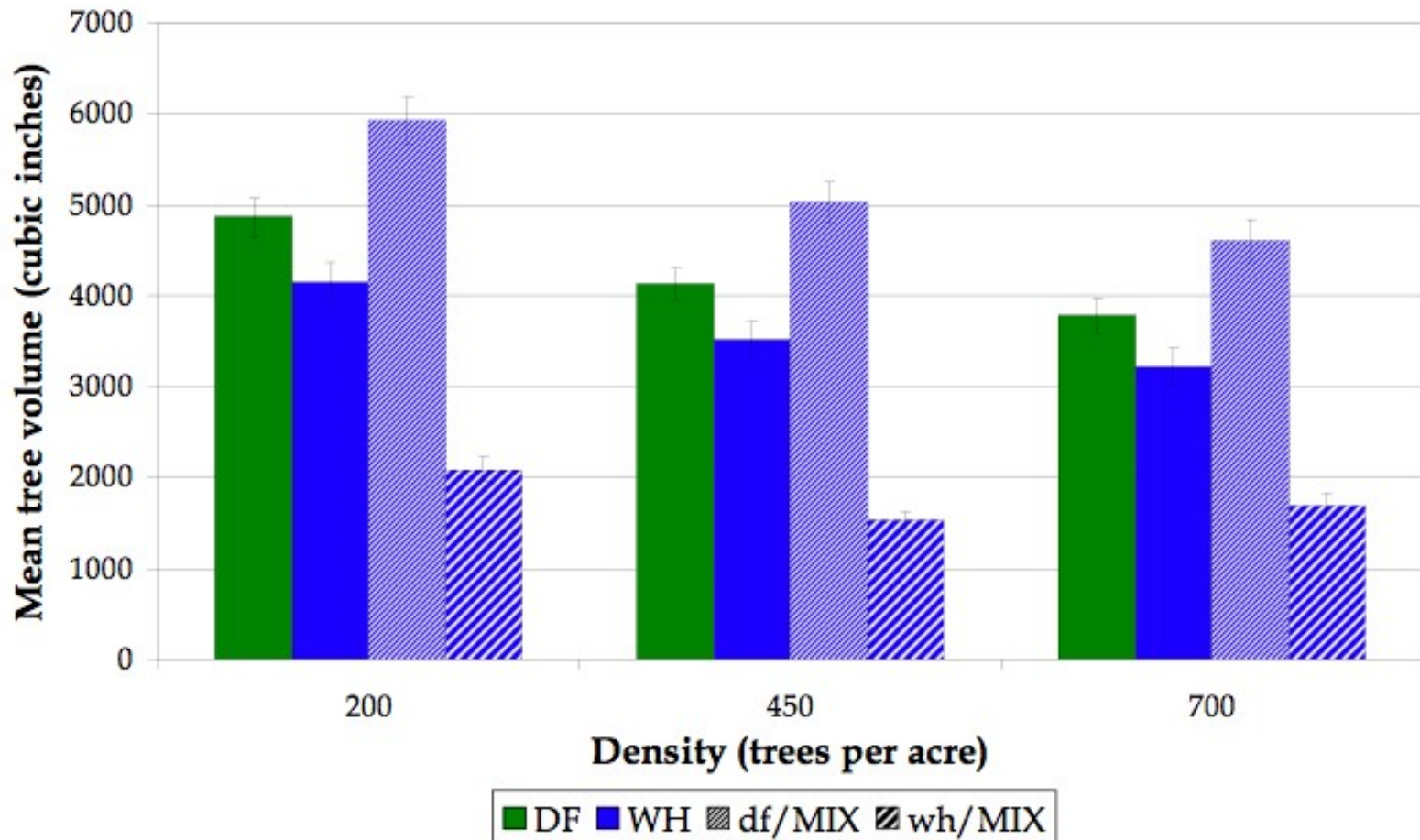
(Harper 1977)

Single-cohort Stratified Mixture - DF & wh



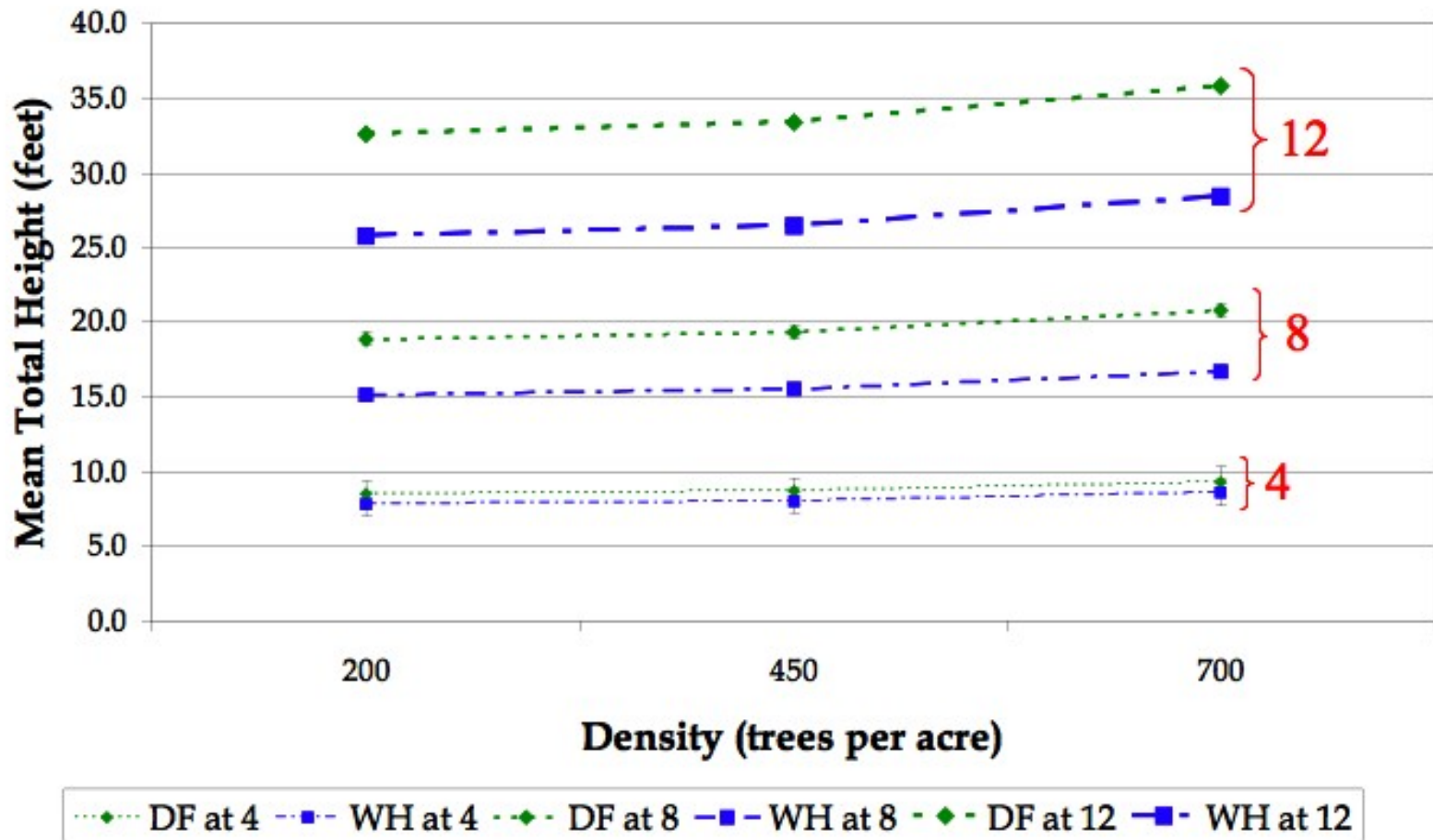
Pure and mixed Douglas-fir and western hemlock plantations - Age 12
(Amoroso and Turnbull 2006)

Single-cohort Stratified Mix - DF & wh ... 2



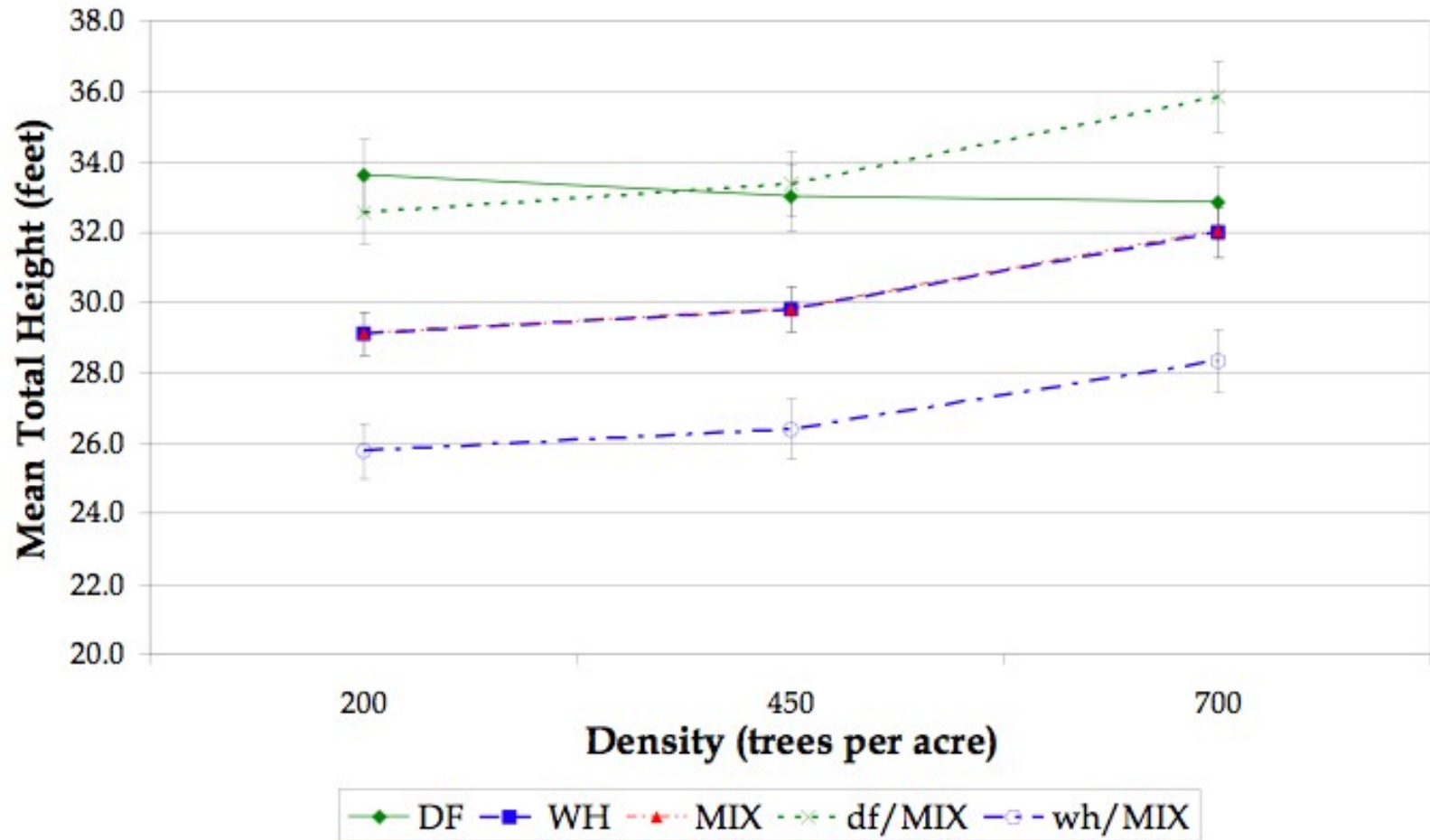
Pure and mixed Douglas-fir and western hemlock plantations - Age 12
(Amoroso and Turnblom 2006)

Single-cohort Stratified Mix - DF & wh ... 3



Height development in Mixed Douglas-fir and western hemlock plantations
(Amoroso and Turnbull 2006)

Single-cohort Stratified Mix - DF & wh ... 4



Pure and mixed Douglas-fir and western hemlock plantations - Age 12
(Amoroso and Turnblom 2006)

Single-cohort Stratified Mixture Advantages

- Generally more productive than single stratum (canopy) mixture
- Possible to create sustained harvest by releasing species in sequence
 - Least tolerant harvested 1st, most tolerant last
 - Ensure provision for seed / regeneration of all strata

Single-cohort Stratified Mixtures

- One-cut Shelterwood Method – most useful when ...
 - Stand had heavy removal cuttings in past with advance regeneration started by natural disturbances, i.e., without deliberate effort (gaps)
 - Regeneration was poorly controlled
 - Goal is to rehabilitate degraded (senesced / severely damaged) old-growth or high-graded stands
 - First entry in stands just coming under sound silviculture

Single-cohort Stratified Mixtures

- Irregular Shelterwood Method
 - Regeneration period is longer, though new stand is treated as one cohort (though uneven-aged?)
 - Different height growth patterns (irregular)
 - Stands are treated such that seed-producing trees of desired (but rare) species are kept scattered within the stands
 - Can realistically regenerate intolerant species

Multi-cohort Mixtures

- Associated with incomplete / frequent low-intensity disturbances: age classes created
- How to differentiate from single-cohort ?
 - Species with different shade tolerance / growth rates appear in all strata
- Silviculture
 - Easy approach: If advance regeneration is present, convert to single-cohort stand using one-cut shelterwood method
 - Better approach: live with the complexity, try to take advantage of it

Multi-cohort Mixtures ... 2

- Strip arrangements
 - Combines the attributes of Selection System Silviculture with regeneration from the Shelterwood Method in spatial patterns achieved by cuttings in successive strips
 - Cuttings progress towards the same direction from which winds and sun come

Multi-cohort Mixtures ... 3

- Group arrangements
 - Each small sub-unit within the stand is regenerated from seed produced by adjacent groups
 - May be useful, but more logical to advance the cuttings in one direction (turn patches to strips)

Two-aged Mixed Stands ... 4

- Many reasons for reserving scattered trees: additional future growth, wildlife management purposes, aesthetics, etc.
- Key point: Trees must remain standing long enough to accomplish the objective

Mixed Stand Silviculture Opportunities

- North American stratified mixtures
 - PNW coastal forest – Conifer mixtures
 - High elevations in Cascades
 - Noble & grand fir, white pine, w. hemlock, m. hemlock, Douglas-fir, alpine & silver fir
 - Eastern deciduous forest with admixtures of conifers
 - Most complex in world outside humid tropics
 - Southern bottomland hardwoods

PNW Coastal Forests

- West of Cascades
 - Douglas-fir
 - Western hemlock
 - Red cedar
 - Sitka spruce becoming larger component near coast



Eastern Deciduous Mixed-wood Forest

- Appalachians on mesic sites
 - Yellow poplar
 - Red oak
 - Red maple
 - Cherry
 - Some eastern hemlock at lower elevations



Eastern Deciduous Mixed Forest

- Georgia Piedmont Oak-Hickory type on dry sites
 - Oaks
 - White
 - Red
 - Black
 - Hickories
 - Bitternut
 - Mockernut
 - Pignut



Southern Bottomland Mixed Forest

- Southern Coastal Plain, southeast Texas to Maryland and up the Mississippi Valley to southern Illinois
 - Baldcypress
 - Water tupelo
 - Red maple
 - Black willow
 - Carolina ash



Mixed Stand Silviculture Opportunities

- Moist tropical forests
 - Origin of stratified mixture concept
 - Complicated by lack of growth rings
 - Interpretation not universally satisfactory to develop silvicultural system
 - Lack markets for secondary species

Mixed Stands – Pros / Cons

- :-(Takes more skill to treat & manage mixed stands
- :-(Yields and development patterns are less predictable
- :-| May be less costly to maintain
- :-) Better utilization of soil resources
- :-) Decomposition of conifer litter by an admixture of hardwood

Mixed Stands – Pros / Cons

- :-) May be safer (i.e., lower risk), more productive, more attractive
 - Single-canopied mixtures often less productive; stratified mixtures often more productive (diameter / volume growth)
 - Physical separation of susceptible species may retard disease spread (though not likely for spore dispersed fungi)
 - Heteroecious conifer stem rusts (and organisms with alternate **tree** hosts) couldn't exist in a pure stand
 - Whole stands are unlikely to be lost all at once