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

- Key: knowledge of species interactions and height growth patterns.
- Early stages: intense and very important in the development
  - Wrong approach: uneven-aged management
  - Best action: let them be!

Stand development and treatment

- Stand cleaning may be performed
- 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 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

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 space utilization.
  - Allows for a greater diversity of uses than a pure stand.
  - Can be more productive than a pure stand of intolerant species.

Pure and mixed Douglas-fir and western hemlock plantations - Age 12
(Anoroso and Turnbull 2006)
Single-cohort Stratified Mixture - DF & wh

Height development in Mixed Douglas-fir and western hemlock plantations

(Amoroso and Turnblom 2006)

Single-cohort Stratified Mixture - DF & wh

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
  - Heavy removal cuttings in stands with advance regeneration started by natural disturbances, i.e., without deliberate effort (gaps)
  - Poor control of the regeneration (pure stands and low productivity)
  - Useful tool for rehabilitating degenerate (senescing) old-growth or high-graded stands
  - Most applicable in stands just coming under sound silviculture
  - Blunders: failure to recognize advance regeneration for what it is, killing it
**Single-cohort Stratified Mixtures**

- Irregular Shelterwood Method
  - Regeneration period is longer, new stand is treated as one cohort; may not be even-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
  - Good control of the regeneration
    - Can realistically regenerate intolerant species, too

**Multi-cohort Mixtures**

- Associated with incomplete or frequent low-intensity disturbances: creation of age classes.
- How to distinguish these stands?
  - Species with different shade tolerance, growth rate appear in all strata
  - Easy approach: If advance regeneration is present, convert to single-cohort stand
  - Best approach: Better to live with the complexity and take advantage of it!

**Multi-cohort Mixtures**

- 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 winds and sun come

**Multi-cohort Mixtures**

- 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

- 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 Management 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 Forest

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

- Oak-Hickory type on the Georgia Piedmont (in late autumn)
  - 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 Management 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, 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