SILVICULTURE OF PURE, SINGLE-COHORT STANDS

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PURE SINGLE-COHORT STANDS

- Naturally occur after severe, stand replacing events
  - Persist naturally where conditions are intolerable (hot/dry, cold/wet) for other species to claim growing space

- Artificial occurrence through clear-cutting
  - Complete removal of previous stand (full growing space available)
  - No restrictions for future treatments
  - Choose over partial-cutting when residual trees won't:
    - Be a good seed source
    - Protect new crop
    - Provide wildlife habitat
    - Increase in value
    - Provide amenity values

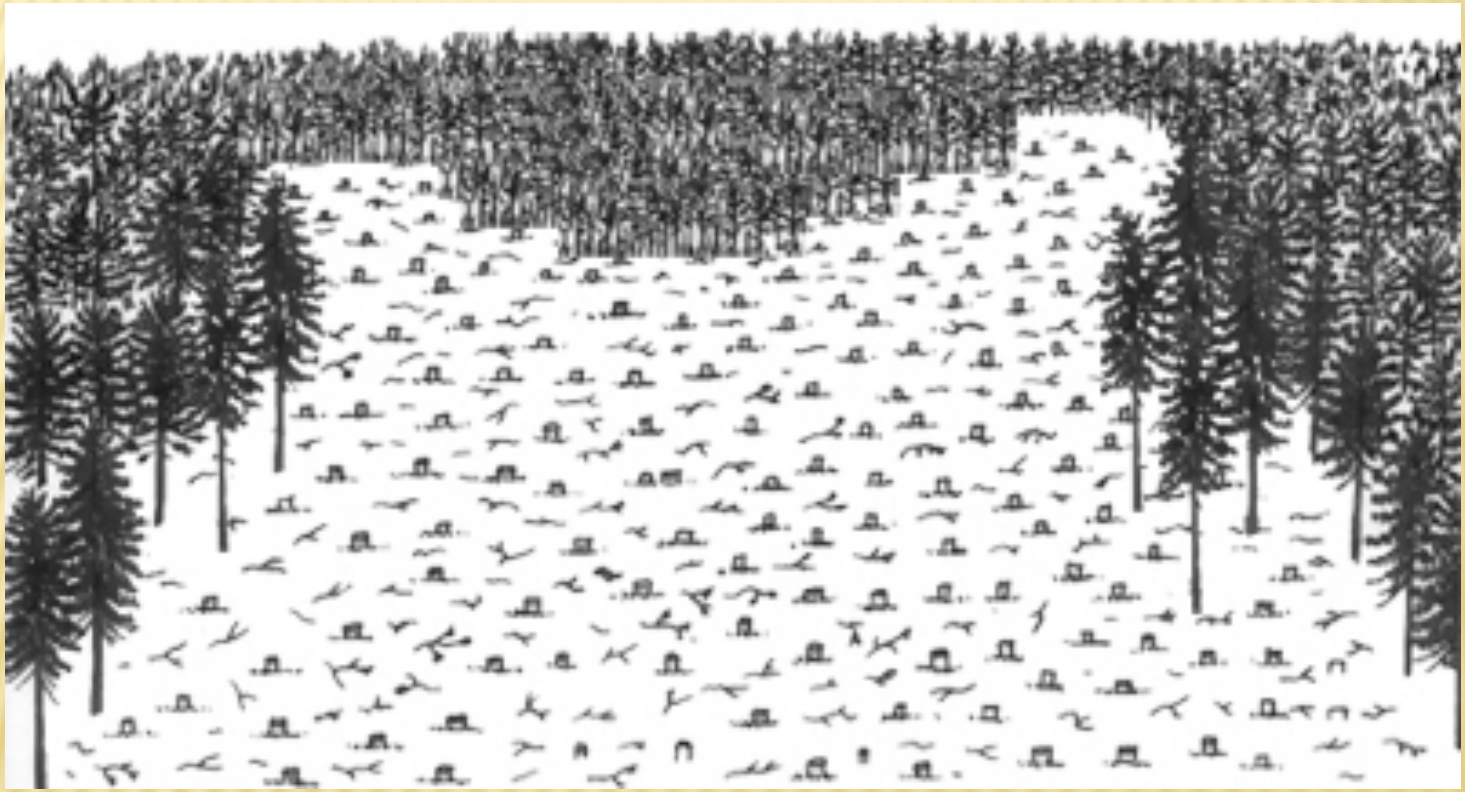
- Least complicated system

PURE SINGLE-COHORT STANDS

- Two chief silvicultural systems
  - High forest
  - Coppice (low forest)

PURE SINGLE-COHORT STANDS

- Artificial occurrence through clear-cutting



REGENERATION - Seeding

- Regeneration from seeding is possible; typically used only under special circumstances
- Associated with extensive, low-investment silviculture
- Clear-cutting with seeding from adjacent stands:
  - Agencies of dispersal (wind, water, birds and wildlife) and seed adaptations are very important.
  - Size and shape of the clearings (long and narrow)
  - Direction of prevailing winds during dispersal season
    - (1 - 6 times the height of source trees)

REGENERATION - Seeding

- Clear-cutting with seeding from adjacent stands:

REGENERATION - Seeding (cont'd)

- Clear-cutting with regen from seed on site:
  - No restrictions by seed-dispersal distances, reliance on seed stored on the trees or soil.
  - The only useful seed is that produced in the current year (most species).
  - Long-term storage of seeds is characteristic of undesirable species
    - Exceptions
      - Atlantic white cedar – remains viable many years in duff
      - Yellow poplar – requires high temps and exposure to light
      - Ash species – requires 1 yr. in forest floor to stratify

REGENERATION - Planting

- :-) Uniform and fuller stocking than other methods
- :-) Faster establishment
- :-) Excellent control of:
  - Density
  - Spatial arrangements
  - Species
- :-(Stands may become crowded with individuals of equal vigor/size/condition
  - "stagnation"

REGENERATION – Planting (cont.)

- Applications of Pure-stand Silviculture
  - West Coast Douglas-fir region:
    - Douglas-fir typically regenerates naturally, densely after stand replacing fires caused by lightning strikes
      (seed source = trees in swales, other unburned areas)
    - Douglas-fir dominates for 100s of years
    - "Selective" logging was attempted; size ≠ age
    - If cuttings are <100 acres, wind born seeds come in
    - Direct seeding attempted after broadcast burn
    - Conservation movement changed attitudes about regeneration – planting of seedlings now standard

REGENERATION – Planting (cont.)

- Applications: West coast Douglas-fir

REGENERATION – Planting (cont.)

- Applications of Pure-stand Silviculture
  - Southern region:
    - Silviculture for many southern pines evolved along similar lines as Douglas-fir
    - Partial cutting first attempted
      (seed-tree method)
    - Direct aerial seeding was then attempted
    - Planting seedlings is regeneration method of choice
    - Works with loblolly (*Pinus taeda*), short-leaf (*P. echinata*), slash pines (*P. elliottii*), and long-leaf (*P. palustris*)

REGENERATION – Planting (cont.)

- Southern Region: Planted Loblolly pine

COPPICED SINGLE-COHORT PURE STANDS

- Silviculture that depends on vegetative sprouting or layered branches is remarkably simple & successful
  - Most common and ancient form of deliberate forest regeneration
  - All standing trees are harvested (cut) at the end of each rotation; perfectly even-aged stand sprouts up nearly immediately
  - Most vigorous sprouts occur when trees are cut in dormant season

COPPICING

- Reproducing vegetatively has great survival value for many species of perennial plants
  - Frequent mode of regen for most shrubs, grasses, and many herbs w/ perennial roots & annual shoots
    - Sexual (from seed) reproduction maintains capacity for genetic change & adaptation
  - Angiosperms possess ability to sprout vegetatively as an added mode of regen
  - Conifers cannot reproduce this way, with a few exceptions, though it happens infrequently

COPPICING

- Reproducing vegetatively is a natural adaptation to hot fires that kill above-ground parts too frequently for seed-bearing aged individuals to develop (with any regularity)
- Growth of young sprouts is much more rapid than seedlings of comparable age; extensive root system already exists
- Full advantage is gained by cutting all individuals of the species to be regenerated in a single operation

VEGETATIVE REGENERATION

- Stump-sprouts
  - Arise from dormant buds at root collar
    - Develop from lateral buds present on leading shoot of seedling; grew outward with cambium to maintain position just under bark
    - Remain connected to pith; if severed, cannot become new shoot
    - Bark may become too thick for it to develop
  - Stump-sprouting capacity decreases with age
  - Usually cluster in rings around the stump; competition is fierce

VEGETATIVE REGENERATION

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- Stump-sprouts
  - Sweet chestnut, Surrey

VEGETATIVE REGENERATION

- Stump-sprouts (cont'd)
  - Risk of heart-rot from old stump varies with species
    - Not a problem in maples, but is in yellow-poplar
    - Not a problem for most oaks, as long as sprout originates low down on stump
    - Coast redwood stump sprouts have no problems
  - American conifers that can be usefully regenerated by stump-sprouting
    - Coast redwood
    - Bald cypress
    - Pines: pitch, pond, shortleaf

VEGETATIVE REGENERATION

- Seedling-sprouts
  - Much the same as stump-sprouts, but come from stumps less than 2” in diameter
  - Generally means stump is mostly sapwood, callusing over quickly, reducing threat of heart-rot spread
  - Stems tend to be straighter than those sprouting from larger stumps
    - Oaks, hickories, chestnuts often rely on this as an adaptation to survive through drought, etc.; a kind of long-term advance regeneration storage – though more important for high-forest methods than coppice

VEGETATIVE REGENERATION

- Adventitious bud-sprouts
  - Most important source of regeneration from this source is root-suckers or root-sprouts forming along roots of killed or damaged trees
    - Very common among aspen poplars
    - Common in sweet-gum, black-gum, American beech, black locust and sasafras
  - Tend to be straighter, more evenly spaced, and free of rot compared to stump-sprouts

VEGETATIVE REGENERATION

- Adventitious bud-sprouts – pollarding

STUMP-SPROUT STANDS

- Most common vegetatively regenerated stands arising from simple coppice cutting of all trees
- Rotation length is restricted due to high competition among sprout clumps (< 35 yr)
  - Risk, incidence, and extent of decay spread increases with age, though varies greatly with species and climate
  - Cut low and slant stump faces to assist water run-off
    - Use saws to avoid loosening bark
    - Burn slash to kill stump sides, restricting sprouting buds to at or below ground surface

ROOT-SPROUT STANDS

- Easier than managing stump-sprouts
  - Spacing is not a problem; regen usually too abundant
  - Risk, incidence, extent & spread of heart-rot decay virtually non-existant
  - No restrictions on rotation age
- Most important species still regenerated this way are quaking and bigtooth aspens in Great Lakes Region

COPPICE METHOD

- Chief role is growing fuelwood, pulpwood, and other small tree products from angiosperms
  - Practiced for hundreds of years on the Atlantic seaboard
- Sure regeneration method for sprouting species
- Growing space
  - Soil remains completely occupied by the crop trees
  - Above ground growing space is quickly reoccupied
- Thoroughly preserves genetic make-up of trees