OUTLINE:

- Definitions of silvics, silvicultural systems and regeneration cutting methods
- Even-aged systems: clearcutting, seed tree, shelterwood
- Uneven-aged systems: single-tree selection, group selection, patch cut systems
- Hybrid systems: variable retention silviculture

Excellent web-based resource and illustrations: http://www.for.gov.bc.ca/hfp/training/00014/index.htm

What is “silvics”?  
- ecological study of forest trees  
- life history and general characteristics of forest trees and stands  
- environment + genetics  
- basis for the practice of silviculture  
  - theory and practice of controlling the establishment, composition, growth and structure of forests

Role of Silvics in Forest Management  
Management and restoration of forests, and maintaining/promoting desired attributes:  
- tree species choice, methods of regeneration and cultivation, effects on productivity and site quality  
Requires knowledge of  
  - ecological characteristics of trees species and environmental effects on tree behaviour and growth

Silvicultural Systems  
- program of treatments for a whole “rotation” determined by management objectives + site features  
- multiple steps:  
  1. Pre-harvest prescription  
  2. Regeneration cutting method – harvest system, site preparation, regeneration  
  3. Post-regeneration treatments brushing, spacing, pruning, fertilization, thinning, pre-commercial thinning

Regeneration Cutting Methods  
- silvicultural systems are named by method of regeneration cutting used to replace a forest stand  
  - systems that create even-aged stands: clearcutting, seed tree, shelterwood  
  - systems that create uneven-aged stands: group selection, single-tree selection, patch cuts  
  - hybrid systems: variable retention silviculture

A Brief History of Forest Management and Silvicultural Practices Since 1960s  
- clearcutting has dominated, with rare use of other traditional silvicultural systems  
- in recent decades, greater social constraints led to greater governance, high-level plans and regulations  
- compelling ecological evidence has shown the benefits of green-tree retention + structurally diverse stands  
- in the last 15-20 years, movement away from traditional clearcutting toward variable retention systems  
  - managing for more complex structure and mixed-species stands  
  - increasing diversity and resilience to climate change  
  - understanding of silvics = even more critical
Silvicultural Systems – creating even-aged stands

1. Clearcut System
Harvest an entire stand of trees in a single harvest
- area >1 hectare and >2 tree heights in width
- >50% open area climate (not influenced by edge)

Regeneration
- even-aged stand by planting, natural or advance regeneration, direct seeding
- shade-intolerant or exposure-tolerant species
- species that grow on a range of substrates with fast initial growth rates

Reserves
- trees retained for objectives other than regeneration

2. Seed Tree System
Selected trees or tree groups left during harvest
- provide seed source for natural regeneration
- even-aged system, creates single or double cohort
- after natural regeneration, seed trees may be cut

Regeneration
- shade-intolerant or exposure-tolerant species
- important factors: spatial configuration, timing of cut and site preparation

Criteria for leave-trees
- large, dominant trees
- windfirm – topographic position, exposure within patch or along edges
- tree roots, stem and crown
- “good” seed source

3. Shelterwood Systems
Mature trees removed in a series of cuts over 20-30yrs
- Prepatory cut - leave windfirm trees, ↑ growth + cone production
- Seed cut - create gaps for regeneration, provide protection + seed
  - a new cohort(s) regenerated under the shelter of remaining trees
  - regeneration may be planted, natural or advance
- Removal cut - after regeneration achieved, shelter no longer needed

Regeneration
- shade-tolerant or protection-requiring species
- provide seeds for natural regeneration
- retained mature trees release = generate volume increments for subsequent harvest

Types of shelterwood systems (to be discussed later in term):
Uniform shelterwood – individual residual trees are uniformly dispersed
Group shelterwood – residual trees are clustered
Nurse-tree shelterwood – mixed species, protects regeneration
Silvicultural Systems creating uneven-aged stands
- harvest at specified repeated intervals
- harvest single scattered individuals or small groups of trees
- encourage relatively frequent establishment of regeneration in canopy gaps
- encourage and maintain an uneven canopy and an uneven-aged stand structure

1. Single Tree Selection
   - remove 1+ trees of a range of sizes = small gaps, cutting cycle 1-10+ years
   - regenerate very shade-tolerant species to create multi-cohort stands

2. Group Selection
   - cut trees in defined groups, openings <2 tree heights wide
   - shade-intolerant trees can regenerate with shade-tolerant species
   - creates multi-cohort stands

3. Patch Cut System
   - openings < 1 hectare in size
   - creates small even-aged stands (fine scales), uneven-aged at coarser scales
   - does not depend on shelter incidentally provided by the surrounding uncut stand

Hybrid Silvicultural Systems - Variable Retention
- Fundamental objective
  - reduce ecological impact by retaining biological legacies (structural diversity)
- Components of even-aged and uneven-aged regeneration silvicultural systems
  - ≥50% of opening <1 tree length from an edge
  - irregular boundaries and retention of trees provides ‘forest influence’
  - regeneration usually even-aged, natural or planted