Life Cycle of Woody Plants

- **Seedling**
  - Exponential growth rate, emphasis on root establishment and competition for sunlight
- **Youth**
  - Rapid growth, little flowering, immature morphology, few years to decades; strongly resilient to environmental stresses
- **Maturity**
  - Emphasis on seed production, more spreading habit, slower growth rate, few to thousands of years; recover from damage more slowly
- **Senescence**
  - Dieback, declining vigor, few to many years
- **Death**
  - Ceasing of life functions, collapse and decay

Is Genetic Manipulation in the Landscape Important?
**Genetic Variation**

- **Genotype × environment interaction**
  - Genotype sets potential for traits, environment modifies expression
  - Removing genotype from ecological community
- **Basic sources of genetic variation**
  - Mutations (alteration in the code), genetic segregation (swapping genes), & recombination (rearranging)
  - With environmental selection get evolution
  - Intervention by people results in cultivars
- **Intrinsic variation = within the species**
- **Extrinsic variation = outside the species**

**Types of Intrinsic Variation**

- **Ecphenic or Non-genetic**
  - Phenotypic plasticity
    - Response to environment not under genetic control
    - Sun versus shade leaves
    - Smaller fruit on dry sites
  - Not heritable
- Reciprocal transplant studies
  - Is trait stable in different environments?
  - Ecotype versus Ecophene

**Genetic Variation**

- **Heteroblastic Change**
  - Juvenile to mature phase change
  - Seasonal heteromorphism
- **Mutations**
  - Alterations in genetic code
- **Chromosomal Variations**
  - Haploid, aneuploidy, polyploidy
- **Non-adaptive Variation**
  - Not associated with environmental factor

**Genetic Variation**

- **Ecotypic (adaptive) variation**
  - Ecological Race
    - In response to environment, often discontinuous (Lost Pines)
  - Cline
    - Like ecotypic, but environmental gradient response (Red Maple)
  - Speciation
    - Result of ecotypic variation and/or isolation over time (Escarpment Live Oak)

- Pinus taeda
- Acer rubrum
- Quercus virginiana var. fusiformis or Quercus fusiformis?
Genetic Variation

• Reproductive variation
  – Outcrossing = xenogamy
  • Monoecious versus dioecious
  – Inbreeding = autogamy
  – Apomixis
  • Vegetative apomixis = vegetative reproduction
  – Example: *Populus nigra* ‘Italica’
  • Agamospermy = asexual seed formation

Genetic Variation

• Extrinsic Variation
  – Intergeneric and intrageneric hybrids
    • F₁ generation intermediate
    • F₂ segregates on wide continuum
  – Introgression
    • Repeated back-crossing to parental species
    • Hybrid swarms - gradient of characters
    • Transfers genes among species
  – Gene transfer (genetic engineering)

Questions / Comments?

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