Some Plant Basics

Introduction to plant physiology and reproduction
Plant Kingdom

Plant Ecology

- **The forest floor** is often blanketed with decaying leaves, twigs, fallen trees, animal scat, moss, and other detritus. The forest floor is where recycling occurs, fungi, insects, bacteria, and earthworms are among the many organisms that break down waste materials and ready them for reuse and recycling throughout the forest system.

- **The herb layer** of the forest is dominated by herbaceous (or soft-stemmed) plants such as grasses, ferns, wildflowers, and other ground cover. Vegetation in the herb layer often gets little light and in forests with thick canopies, shade tolerant species are predominant in the herb layer.

- **The shrub layer** is characterized by woody vegetation that grows relatively close to the ground. Bushes and brambles grown where enough light passes through the canopy to support shrub growth.

- **The understory** of a forest consists of immature trees and small trees that are shorter than the main canopy level of the tree. Understory trees provide shelter for a wide range of animals. When gaps form in the canopy, often times understory trees take advantage of the opening and grow to fill in the canopy.

- **The canopy** is the layer where the crowns of most of the forest's trees meet and form a thick layer.

- **Emergents** are trees whose crowns emerge above the rest of the canopy.

Source
Plant Kingdom
Plant Ecology
Plant Kingdom

Phylogenetic Tree of Life
Plant Kingdom

©1996 Encyclopaedia Britannica, Inc.
Milestones in Plant Evolution
Plant Kingdom

- **Ancestral Green Alga**
  - Mosses, liverworts, hornworts
  - First vascular plants

- **Nonvascular plants**
  - Ferns

- **Vascular plants**
  - Seed plants
    - Conifers
    - Flowering plants
  - First seed plants
  - First vascular plants
Plant Kingdom

THE PLANT KINGDOM
(not to scale)

BRYATA

Whisk Ferns
Club Mosses
Horsetails
Ferms

TRACHEATA

Cycads
Gingko
Pines
Gnetophytes
Flowering Plants
Plant Kingdom
Non-Tracheophytes

• Bacteria
• Fungus
• Lichens
• Bryophytes (Moss, *Liverworts)
  – “Leaves”, spores, no vascular system, gametophyte stage
  – *Hepatikophyta (Liverworts)
Plant Kingdom

Tracheophytes

- Vascular Plants
  - Lycophytes
    - Club Moss, Lepidodendrales, Zosterophylls
    - Vascular, microphyll *leaves, roots, wood*, spores, gametophyte
  - Pteridophytes
    - Ferns, Sphenopsids, Psilotopsids
    - Vascular, *leaves*, roots, spores, gametophyte
  - Spermatophytes (seeds)
    - Gymnosperms (Pino- Ginkgo- Cycado- Gneto- phytes)
      - Vascular, leaves, roots, *seeds*, wood
    - Angiosperms
      - Vascular, leaves, roots, seeds, wood, flowers
Plant Kingdom

Algae

- Algae
  - Marine
Plant Kingdom

Algae

• Algae
  – Freshwater
Plant Kingdom

[Diagram of Ulothrix Life Cycle]
Plant Kingdom

• Fungus- **not** the plant Kingdom!
• Heterotrophic
  – Mycelium
  – Hyphae
  – Spores
    • Sexual
    • Asexual
Plant Kingdom
Algae, Fungi, Lichens

• Lichens
  – Fungus and Algae
Bryophytes

- Mosses
- Liverworts
- Hornworts
  - No vascular system
  - Lack any vascular tissue
  - Leaf-like structures are present
  - Spores (not seeds)
  - Gametophyte is free-living
  - Photosynthetic
Plant Kingdom

• Reproductive Terms
  • Sporophyte
  • Gametophyte
  • Antheridium
  • Archegonium
  • Zygote
  • Haploid
  • Diploid
Plant Kingdom
Pteridophytes

• Psilophyta (whisk ferns)
  – Simple Branching
  – No leaves
  – Spores
  – Rhizomes
  – Small and low
Plant Kingdom
Pteridophytes

- **Lycopsida (club moss and spike moss)**
  - Most ancient trees with living relatives
  - Leaves and roots differentiate
  - Megaphylls branching in one plane
  - Photosynthetic webbing
  - Vertical growth limited (weak)
  - Lateral (secondary) growth (wood)
- **Spores**
  - Homosporous
  - Heterosporous
Plant Kingdom
Pteridophytes

• Class Lycopsida
Plant Kingdom
Spenopsida

- Spenopsida
  - Horsetails
  - Scour Rushes
  - Spores
  - Cone-like *Strobilus*
Plant Kingdom
Spenopsida

• Spenopsida (horsetails)
Plant Kingdom
Pteridophytes

• Filicopsida
  – Ferns and Tree Ferns
  – Homosporous spores
  – Sporophyte and Gametophyte generations
  – Require water for fertilization
Plant Kingdom
Pteridophytes

© 2001 Janet Novak

1 mm
The gametophyte generation of ferns are small, heart-shaped, plants called prothallia (singular: prothallium). They are less than an inch (1 - 2 cm) in diameter and look very much like thalloid liverworts or hornworts. Male and female sex organs are located on the underside of the prothallium and, when conditions are right, the sperm swims from the male antheridium to fertilize the egg in the archegonium.

Source
Plant Kingdom
Pteridophytes
Plant Kingdom
Gymnosperms

- Conifers, Ginkgos, Cycads
  - Roots, Wood (lignin)
  - Small leaves, Cones
  - Homosporous, Heterosporous
  - Male and female trees
  - Wind dispersal
  - Fertilization on the tree
Plant Kingdom
Gymnosperms

• Class Pinales/Coniferales
Plant Kingdom
Gymnosperms
Plant Kingdom
Gymnosperms

• Class Ginkgoales
  – Male Trees
  – Female Trees
Plant Kingdom
Gymnosperms

• Class Ginkgoales
• Ginkgos
  – Male and Female Flowers
Plant Kingdom
Gymnosperms

• Class Cycadales
• Cycads
Plant Kingdom
Angiosperms

• Flowering Plants
Plant Kingdom
Angiosperms

• Flowering Plants
• Trees (upper story)
• Shrubs (Middle story)
• Ground layer (lower story)
• Perennials (>2 growing seasons)
• Annuals
• Herbaceous (die back to ground level)
• Deciduous trees
Plant Kingdom

Angiosperms

- Flowering Plants
  - Monocots
    - Grasses
    - Some shrubs
  - Dicots
    - Shrubs
    - Flowering trees
<table>
<thead>
<tr>
<th>MONOCOTS</th>
<th>DICOTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotyledons</td>
<td>Two cotyledons</td>
</tr>
<tr>
<td>Veins in leaves</td>
<td>Usually netlike</td>
</tr>
<tr>
<td>Flower parts</td>
<td>Usually in fours or fives</td>
</tr>
<tr>
<td>Arrangement of primary vascular bundles in stem</td>
<td>In a ring</td>
</tr>
</tbody>
</table>

- **MONOCOTS**
  - Cotyledons: One cotyledon
  - Veins in leaves: Usually parallel
  - Flower parts: Usually in multiples of three
  - Arrangement of primary vascular bundles in stem: Scattered

- **DICOTS**
  - Cotyledons: Two cotyledons
  - Veins in leaves: Usually netlike
  - Flower parts: Usually in fours or fives
  - Arrangement of primary vascular bundles in stem: In a ring
Plant Kingdom

Angiosperms

- Stamen
  - Anther
  - Filament
- Carpel
  - Stigma
  - Style
  - Ovule
  - Sepal
  - Petal
Grasslands