Today’s lecture: plant morphology

Vegetative morphology
- Growth, development, photosynthesis, support
- Not involved in sexual reproduction

Reproductive morphology
- Sexual reproduction

Vegetative vs. reproductive morphology
**Vegetative morphology: seeds**

*Seed* = a dormant young plant in which development is arrested.

*Cotyledon (seed leaf)* = leaf developed at the first node of the embryonic stem; present in the seed prior to germination.

**Vegetative morphology: roots**

**Water and mineral uptake**

- radicle ➔ primary roots ➔ secondary roots

- taproot
- fibrous roots
- adventitious roots
Vegetative morphology: roots

Modified roots

- Symbiosis/parasitism
- Food storage
- Stem → secondary roots
- Adventitious roots
  - Increase nutrient availability
  - Allow dormancy
  - Facilitate vegetative spread

Vegetative morphology: stems

- Plumule → primary shoot
- Support, vertical elongation
- Apical bud
- Node
- Internode
- Leaf
- Lateral (axillary) bud
- Stipule
- Lateral shoot
Vegetative morphology: stems

Vascular tissue = specialized cells transporting water and nutrients
Secondary growth = vascular cell division, resulting in increased girth

Secondary growth = vascular cell division, resulting in increased girth
Vegetative morphology: stems

Modified stems

Asexual (vegetative) reproduction

**Stolon:**
above ground

**Rhizome:**
below ground

Stems elongating laterally, producing adventitious roots and lateral shoots

Modified stems

Food storage

**Bulb:** leaves are storage organs

**Corm:** stem is storage organ

Stems not elongating, packed with carbohydrates
Vegetative morphology: stems

Rhizomes may also store food

Tuber: fleshy, swollen outgrowth from rhizome

Vegetative morphology: stems

Modified stems

Photosynthesis

Protection

Stems with spines are said to be “armed”

Spines may be derived from shoots, leaves, or stipules
Vegetative morphology: leaves

Photosynthesis

Vegetative morphology: leaves

Leaf veination

- pinnate
- parallel
- palmate

Retinulate (net-veined)

Parallel
Vegetative morphology: leaves

Leaf shape

- linear
- obovate
- ovate
- pinnately lobed
- reniform
- lanceolate
- sagittate

Leaf type (sometimes called leaf arrangement)

- simple
- palmately compound
- pinnately compound
- bipinnately compound
Vegetative morphology: leaves

All basal (basal rosette)

Reproductive morphology: inflorescences

Inflorescence = structural arrangement of flowers

- raceme
- corymb
- umbel
- spike
- head (capitulum)
Reproductive morphology: inflorescences

Inflorescence = structural arrangement of flowers

Reproductive morphology: flowers

Floral morphology

sepals = calyx
petals = corolla

= perianth

male organs = androecium
female organs = gynoecium

receptacle
peduncle (pedicel)

Keith Jones; seasonalwildflowers.com
Reproductive morphology: flowers

Floral morphology

- petals = corolla
- sepals = calyx
- ovary
- peduncle (pedicel)
- receptacle
- style
- stigma
- anther = stamen
- filament
- = pistil

Floral morphology

... encompasses a wide range of variation
Reproductive morphology: flowers

- **complete** = all four whorls present.
- **incomplete** = one or more whorls missing.
- **perfect** = both reproductive whorls present; bisexual.
- **imperfect** = one reproductive whorl missing; unisexual.

**monoeious** = plants with imperfect (unisexual) flowers; both sexes on the same plant.

**dioecious** = plants with imperfect (unisexual) flowers; each sex on a separate plant.

Reproductive morphology: flowers

Floral symmetry

- **radial symmetry**
  - actinomorphic ("regular")

- **bilateral symmetry**
  - zygomorphic ("irregular")
Reproductive morphology: flowers

Fusion

like parts: **connate**; unlike parts: **adnate**

petals free
- polypetalous

petals connate
- gamopetalous

Reproductive morphology: flowers

Ovary position

Ovary superior
- (hypogynous)
- (perigynous)

Ovary inferior
- (epigynous)
- (epigynous or perigynous)
Reproductive morphology: flowers

Pistils are composed of carpels

1 carpel = 1 simple pistil

Multiple free carpels = multiple simple pistils

Multiple fused carpels = 1 compound pistil

Reproductive morphology: flowers

Placentation

Marginal
Parietal
Axile
Free-central
Basal
Reproductive morphology: flowers

fruit = mature ovary; seed = mature ovule

Once the ovules are fertilized, flowers become fruits.

Gymnosperm = naked seed
Angiosperm = clothed seed
Reproductive morphology: fruits

**Fruit summary**

**Simple fruits (from a single flower)**

**Dry fruits**

- **Dehiscent fruits** (splitting open, generally many seeded)
  - **follicle**: from single carpel, splitting along 1 suture
  - **capsule**: from multiple carpels, splitting variously

- **Indehiscent fruits** (not splitting open, generally single seeded)
  - **achene**: from single carpel, single seeded
  - **samara**: winged achene
  - **nut**: from multiple carpels, single seeded, fruit walls are thick, bony
  - **schizocarp**: from multiple carpels, splitting into 1-seeded segments

**Fleshy fruits**

- **drupe**: from single carpel, single seeded
- **berry**: from multiple carpels, many seeded

**Aggregate fruits** (from multiple separate carpels of one flower)

- **e.g.**: strawberry – aggregate of achenes
- **magnolia fruit** – aggregate of follicles
- **blackberry fruit** – aggregate of drupelets

**Multiple fruits** (from multiple separate flowers)

- **e.g.**: pineapple