


# Comparison of Water vs. Land Life in Plants

Requirement or condition	Plants in water	Plants on Land
<b>Water</b>	Absorbed from surroundings	Absorbed by roots
<b>Water conservation</b>	Not necessary	Cuticle prevents water loss
<b>Minerals / nutrients</b>	Absorbed from water	Absorbed by roots
<b>Support</b>	Supported by water	Strong support tissues required
<b>Gamete Transportation</b>	By water	By insects, wind
<b>Seed / spore dispersal</b>	By water	By animals, wind



## Dicots vs. Monocots

	<b>DICOTS</b>	<b>MONOCOTS</b>
<b>Number of flower parts</b>	Multiples of 4 or 5	Multiples of 3
<b>Number of cotyledons</b>	Two	One
<b>Leaf venation</b>	Net veined	Parallel veined
<b>Typical roots</b>	Taproot	Fibrous
<b>Typical stem</b>	Herbaceous and woody	Mainly herbaceous
<b>Vascular bundles in herbaceous stems</b>	Bundles arranged in a circle	Bundles scattered
<b>Examples</b>	Bean, oak, clover, sunflower, geranium	Lily, palm, corn, cattails, grass.

## Comparison of Vascular and Nonvascular Land Plants

Group	Vascular System	Structure	Life Cycle and Reproduction	Habitats
<b>Bryophytes</b>	None	Simple, no true roots, stems or leaves	Need water for reproduction; Gametophyte dominant	Moist Areas
<b>Ferns</b>	Relatively simple	True roots, stems, and leaves	Need water for reproduction; sporophyte dominant	Areas with moisture
<b>Conifers</b>	Complex tracheids main cell type	True roots stems and leaves	Water not required for reproduction; Naked Seeds; Sporophyte dominant and gametophyte greatly reduced	Wide range of land environments
<b>Flowering plants</b>	Complex; Many cell types	True roots, stems and leaves	Water not required for reproduction; covered seeds; sporophyte dominant and gametophyte greatly reduced	Wide range of environments: deserts to freshwater

## Some Evolutionary Trends in the Plant Kingdom

Primitive	Advanced
Unicellular	Multicellular
Little or no tissue differentiation	Much tissue differentiation
Nonvascular	Vascular
Gametophyte generation dominant	Sporophyte dominant
Homospory	Heterospory
Unprotected seeds	Protected seeds
No / little stored food in seeds	Food not stored in seeds

# Trends in Flower Evolution

1. From spiral to whorled arrangement
2. Reduction in flower parts: e.g. many stamens is primitive; few is advanced.  
Loss of petals or both petals and sepals
3. From separate to united parts
4. From superior to inferior ovary
5. From bisexual to unisexual flowers
6. From regular (radial) to irregular (bilateral)



## Arguments for Chlorophyta as Ancestors of Land Plants

Botanists agree that land plants evolved from the **green algae**. The most likely candidate for the ancestor was probably a filamentous chlorophyte that lived near the edge of the water. It is believed that bryophytes and vascular plants evolved independently from green algal lines.

1. Green algae and land plants have the same chlorophylls (*a* and *b*) and also share beta-carotene.
2. The structure of chloroplasts is similar; both have thylakoids stacked into grana.
3. The cell walls of both groups are composed of cellulose.
4. Both store reserves in the form of starch.
5. In some green algae as in land plants the cell wall formed during cell division is produced by Golgi bodies (AKA dictyosomes).

## Highlights of Land Plant Reproduction

Group	Dominant Stage	Transport of Male Gamete
<b>Bryophytes</b>	Gametophyte	Flagellated sperm; swims
<b>Ferns</b>	Sporophyte	Flagellated sperm; swims
<b>Gymnosperms</b>	Sporophyte	Windblown pollen
<b>Angiosperms</b>	Sporophyte	Pollen windblown or transported by insects or other animals