



# HYDROPHYTES

- Hydrophytes are plants that live in abundance of water or in wet places. They are either partially or wholly sub-merged in water, when they are found in abundance of water. When they are in wet places, their roots or rhizomes are exposed to sufficient water.
- HYDROPHYTES BREATHE THROUGH THEIR BODY SURFACE

# Hydrophytes



- Hydrophytes are plants that require a large supply of water.
- They can grow wholly or partly submerged in water.
- The stems and leaves have little to no cuticle (outer waxy layer of leaf) as they do not need to conserve water

# Classification of hydrophytes

- ▣ Submerged hydrophytes
- ▣ Floating hydrophytes
  - Free floating hydrophytes
  - Floating but rooted hydrophytes
- ▣ Amphibious hydrophytes



**Amphiphytes:** plants that are adapted to live either submerged or on land

**Elodeids:** stem plants that complete their entire lifecycle submerged, or with only their flowers above the waterline

**Isoetids:** rosette plants that complete their entire lifecycle submerged

**Helophytes:** plants rooted in the bottom, but with leaves above the waterline

**Nymphaeids:** plants rooted in the bottom, but with leaves floating on the water surface

**Pleuston:** vascular plants that float freely in the water

## PISTIA- WATER CABBAGE-FREE FLOATING

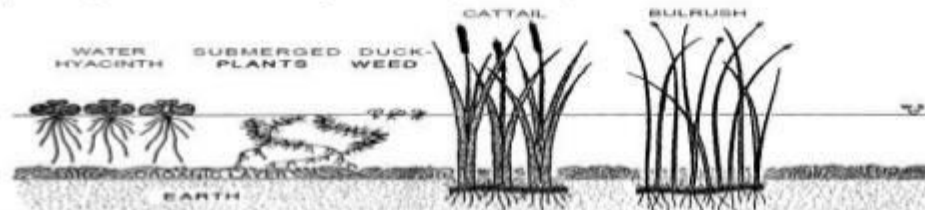


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## Aquatic plants

- Aquatic plants are generally divided into four groups for management purposes. These groups are the Algae, Floating Plants, Submerged Plants, and Emergent Plants.
- **Floating Plants** are not attached to the bottom. Floating plants come in sizes from very small (duckweed) to over a foot in diameter (water hyacinth). Most have roots that hang in the water from the floating green portions.
- **Submerged Plants** are rooted plants with most of their vegetative mass below the water surface, although some portions may stick above the water. One discerning characteristic of submerged plants is their flaccid or soft stems, which is why they do not usually rise above the water's surface.
- **Emergent Plants** are rooted plants often along the shoreline that stand above the surface of the water (cattails). The stems of emergent plants are somewhat stiff or firm.
- Many ponds have more than one type of aquatic plant, and care must be taken to identify all the aquatic plants inhabiting the pond. Some pond plants may be beneficial to local or migratory wildlife, and therefore, may want to be encouraged or at least not eliminated. Click on whichever group of aquatic plants that you feel your specimen may belong to and work through the examples until you find it.

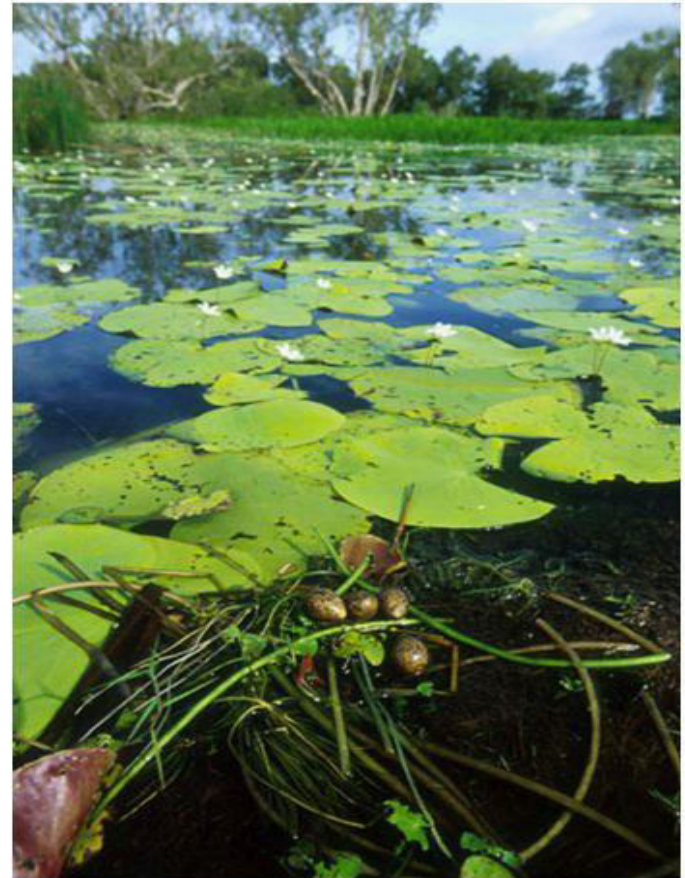


## **Some morphological character of hydrophytes :**

1. Roots may be absent (*Wolffia*, *Utricularia*) or poorly developed (*Hydrilla*).
2. Roots, if present, are mostly concerned with Anchorage (*Ranunculus*).
3. Root caps are replaced by root-pockets (*Eichhornia*, *Pistia*)
4. In some cases floating roots may develop in addition to normal roots (*Jussiaea*).
5. The submerged parts are generally surrounded by mucilage for protection.
6. The stems are weak, slender with long internodes. (*Hydrilla*).
7. The submerged leaves are either ribbon-like (*Vallisneria*) or finely dissected (*Ceratophyllum*). Floating leaves are generally large, broad and thick (*Victoria*).
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9. Heterophylly is common in partially submerged plants (*Ranunculus*).
10. In some hydrophytes, the petioles of leaves are spongy due to the presence of air cavities (*Eichhornia*, *Trapa*).
11. They multiply by means of tubers (*Sagittaria*), Stolons (*Vallisneria*) offsets (*Eichhornia*) of species buds (*Utricularia*).
12. The plants are dull pale green in color, It is an adaptation to absorb the maximum of light falling on them.

# Adaptations of Hydrophytes

- ▶ **Hydrophytes** are plants that have adapted to living either partially or fully submerged in water.
- Typical features of submerged hydrophytes, e.g. the **water lily** (*Nymphaea alba*), include:
  - Large, thin, floating leaves
  - Elongated petioles (leaf stalks)
  - Reduced root system
  - Aerial flowers
  - Little or no waxy cuticle
  - Poorly developed xylem tissue
  - Little or no lignin in vascular tissues
  - Few sclereids or fibers.





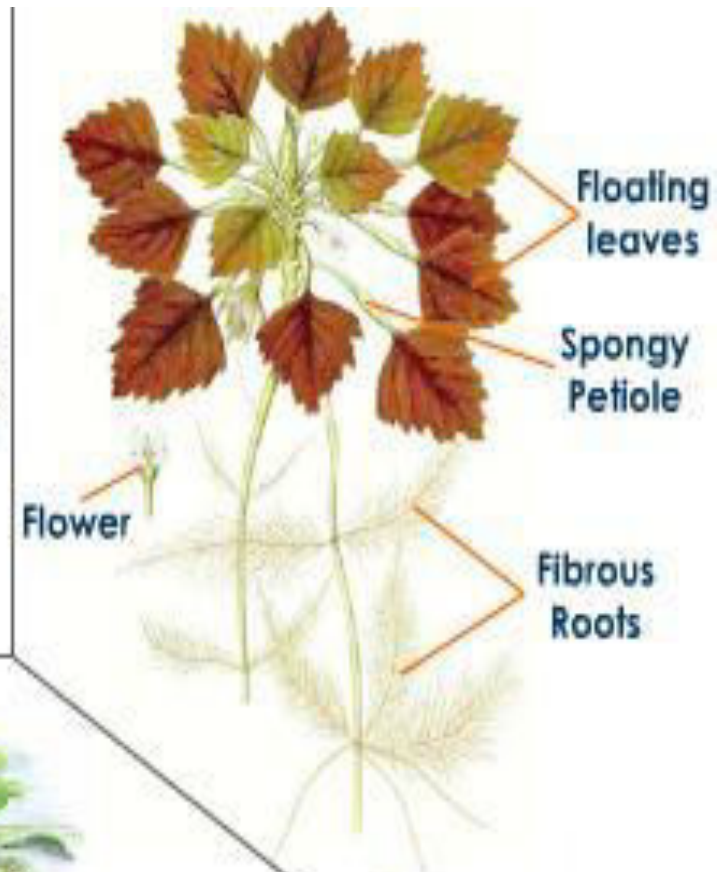
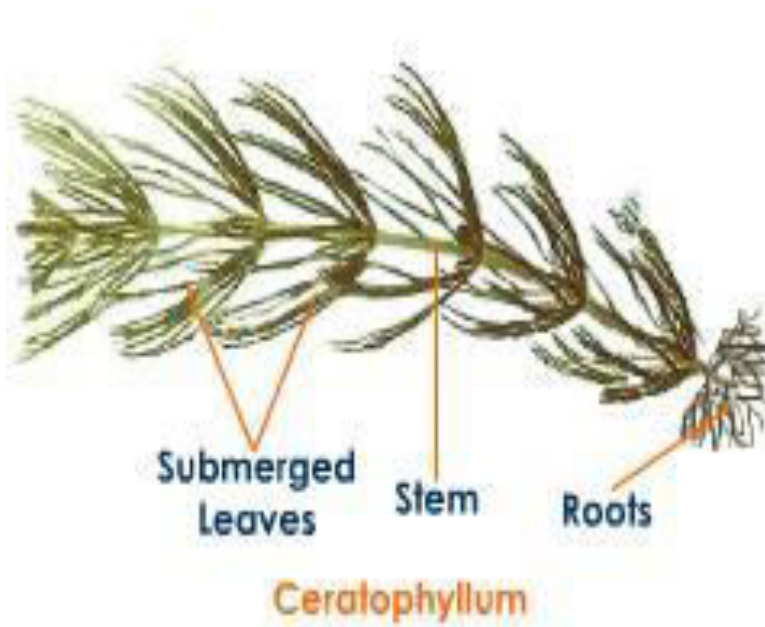
*Dissected under water leaf*

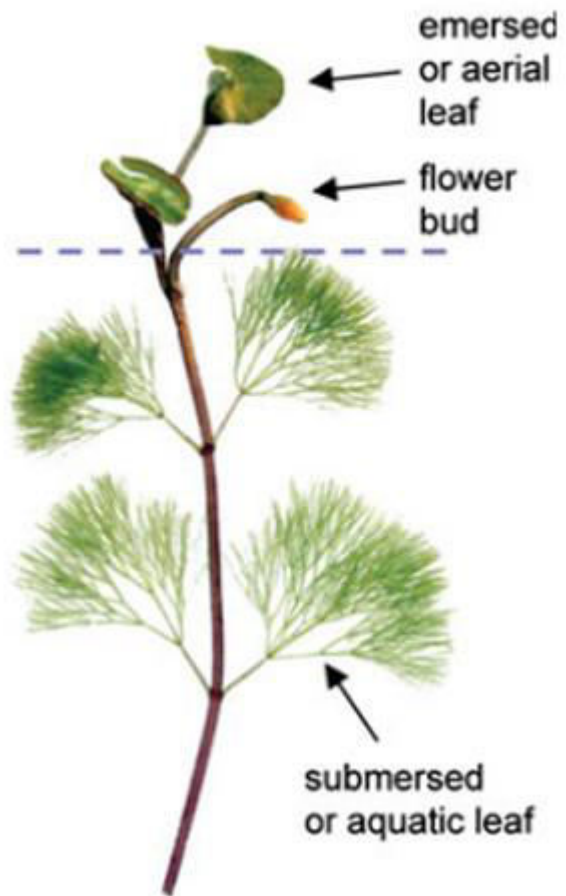


*Normal aerial leaf*

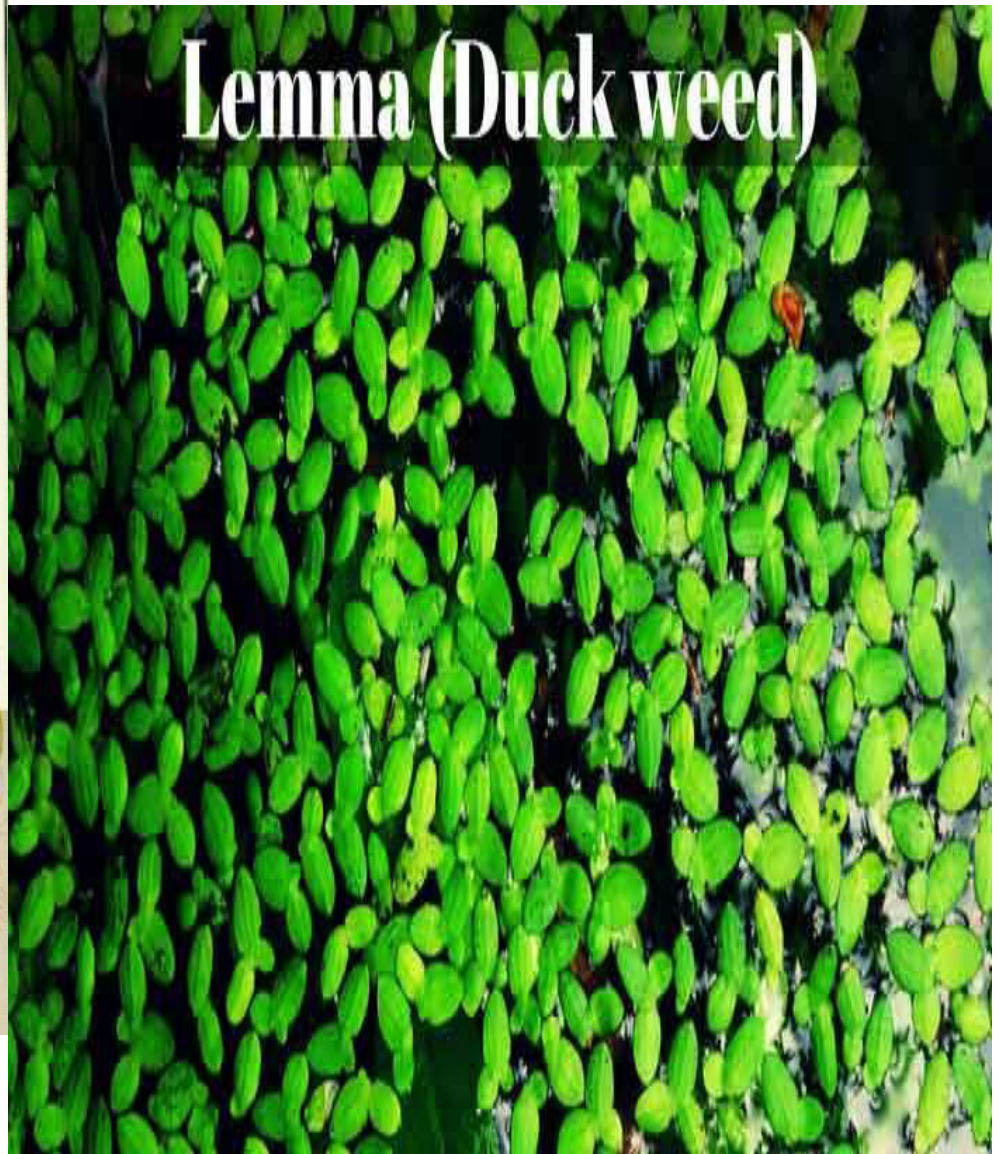


***Limnophila: Heterophylly***











# Free Floating Hydrophytes



*Lemna*



*Salvinia*



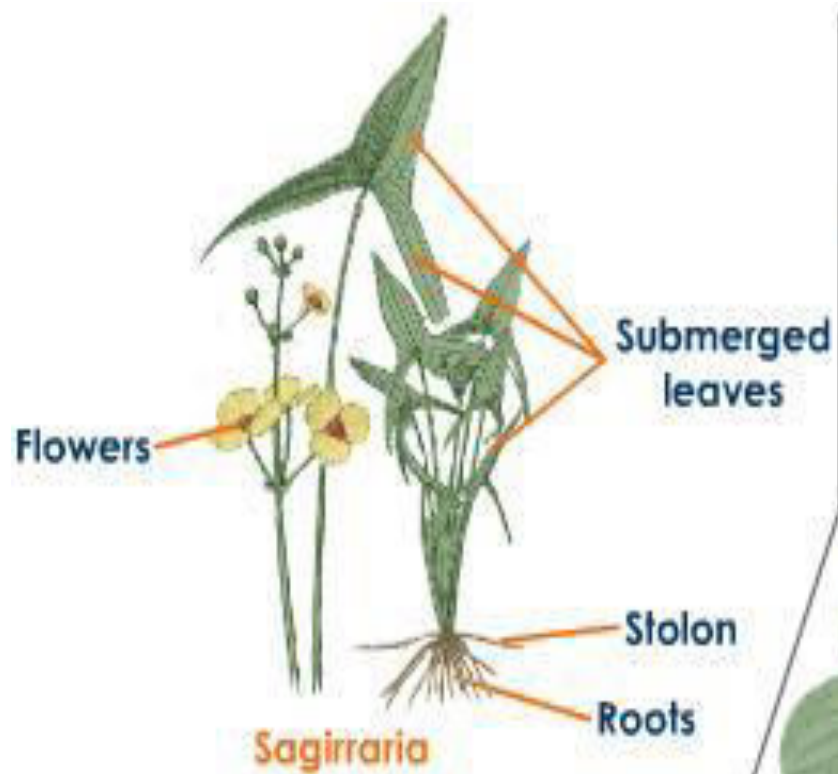
*Azolla*



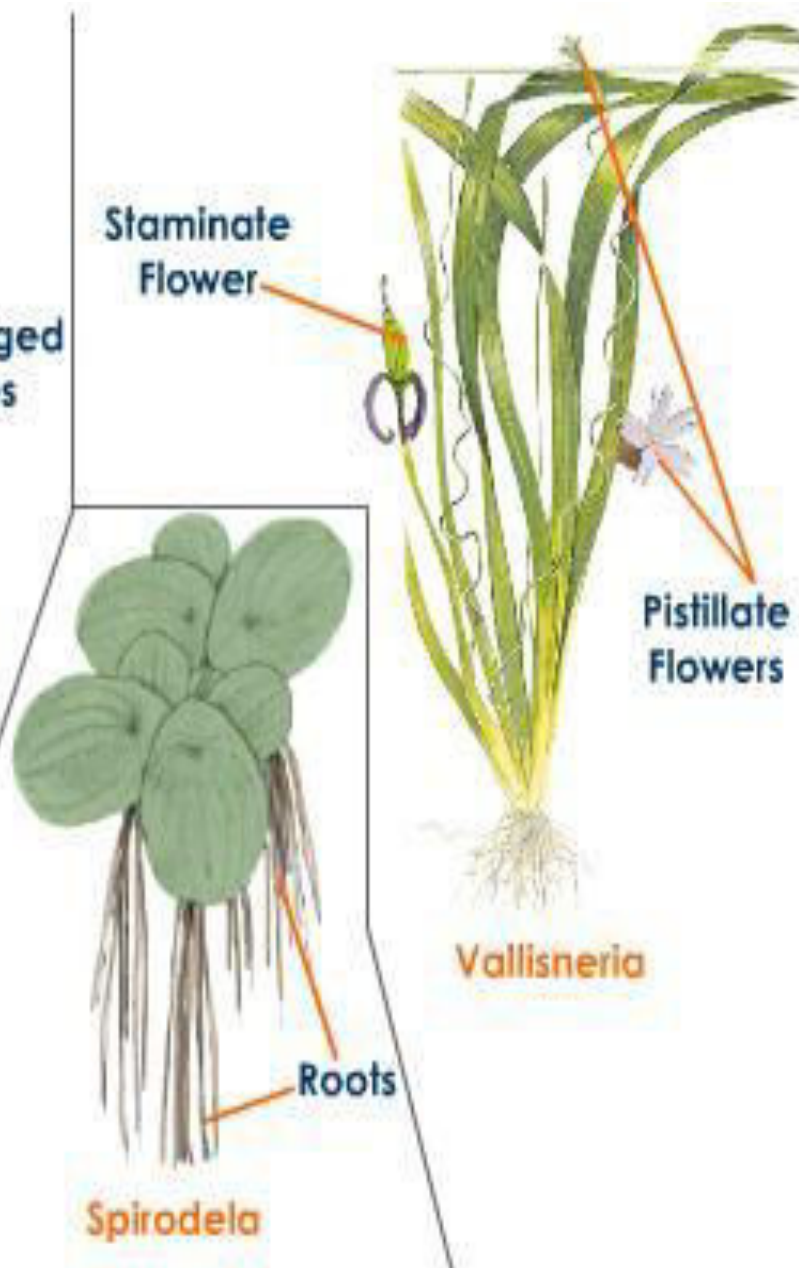
*Pistia*



*Wolffia*



**Nelumbo**



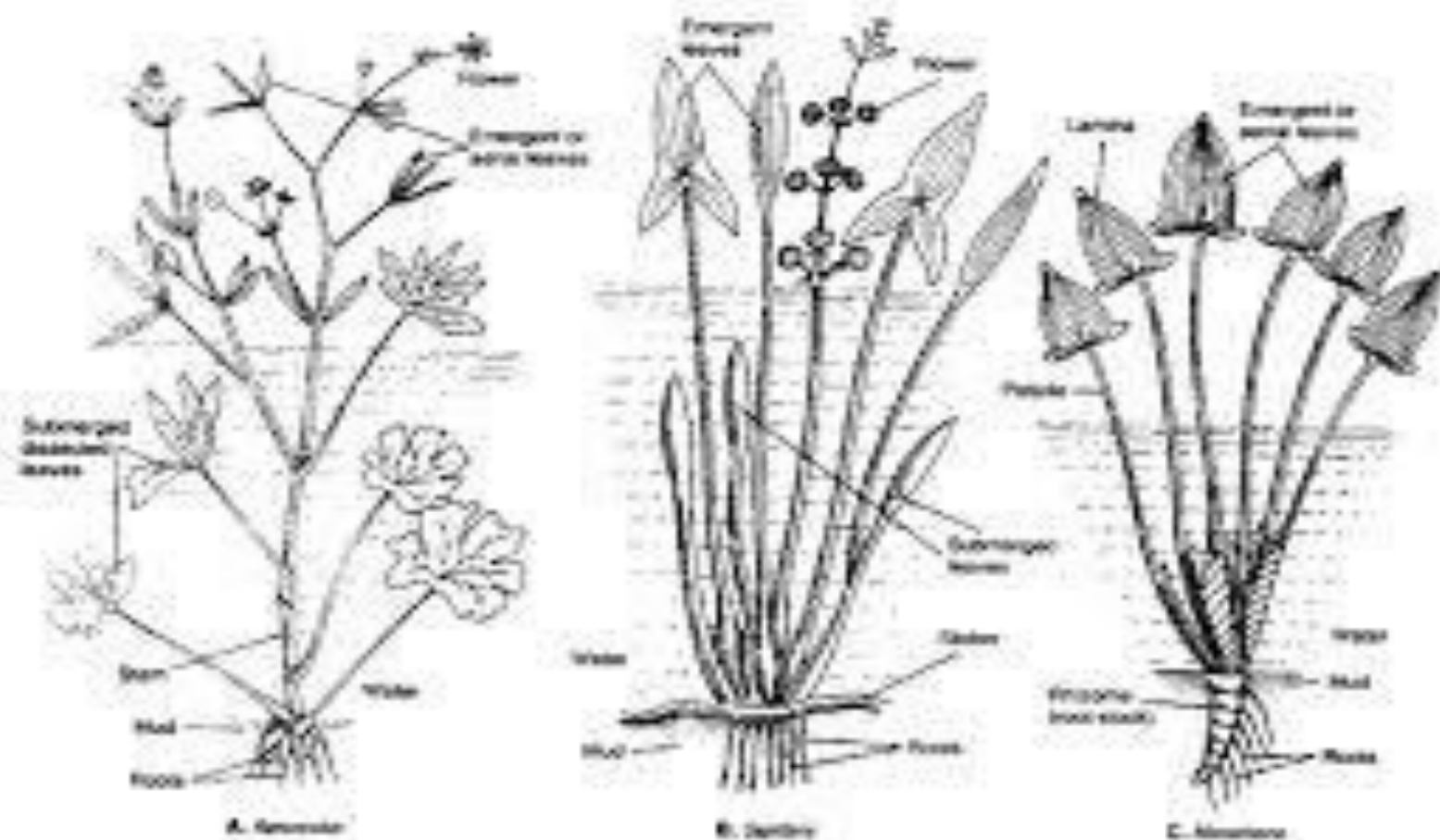
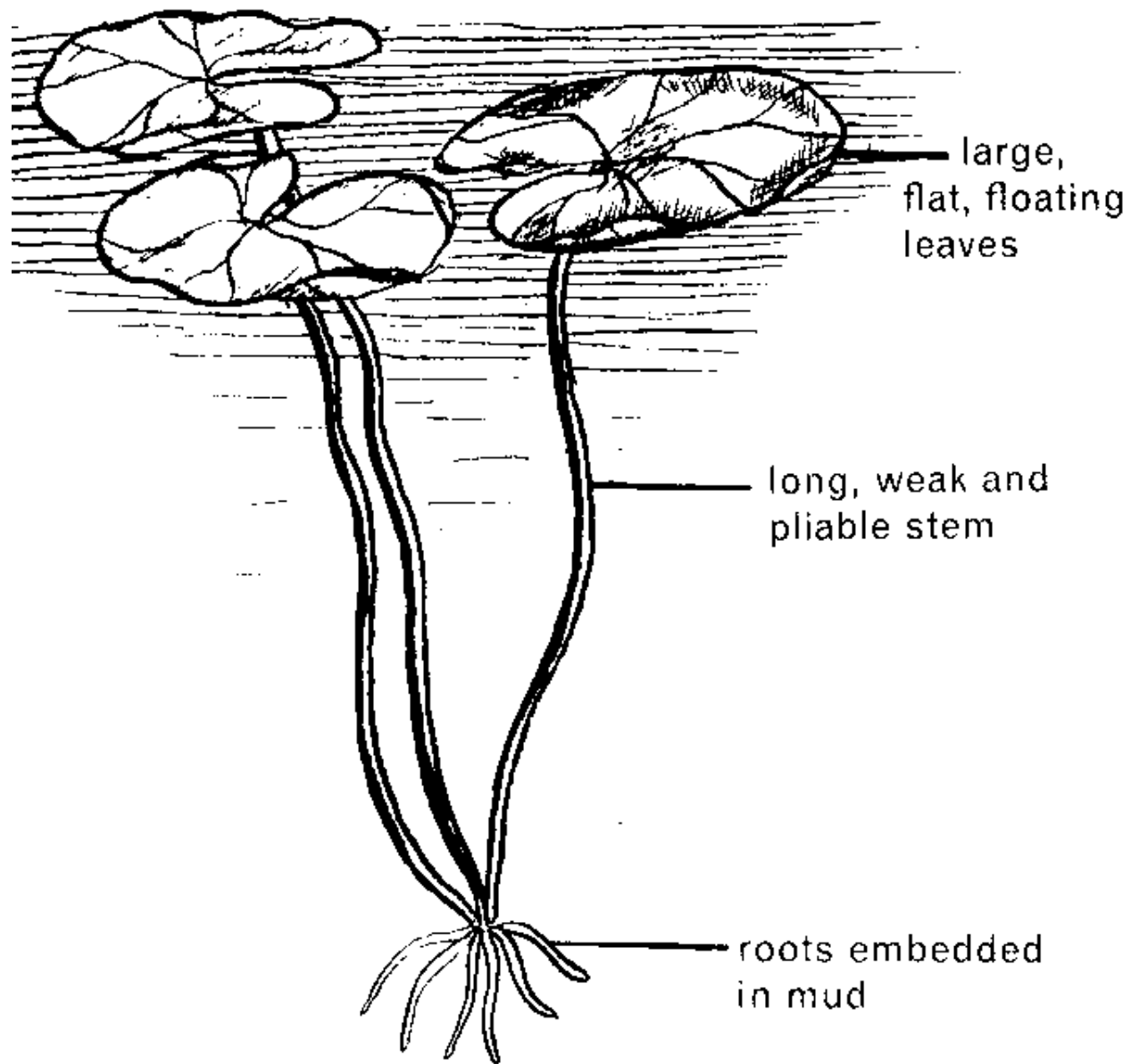


Fig. 8.1. Rooted emergent hydrophytes with heterophylly.



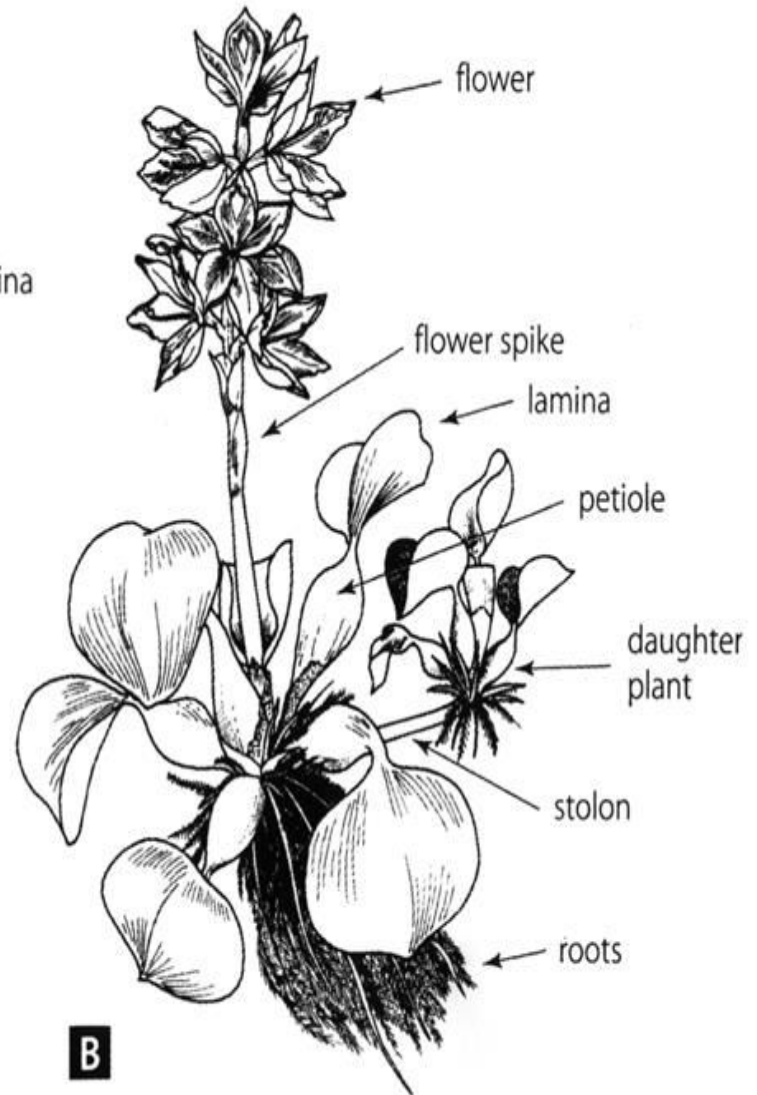
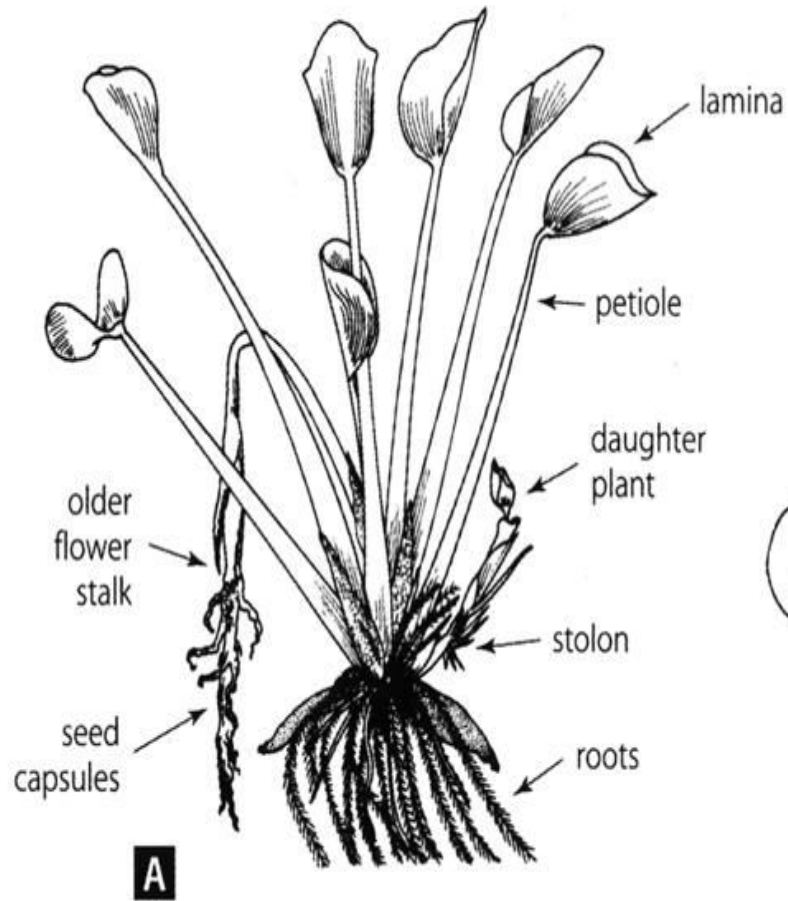
FLOATING LEAVES OF WATER-LILY



Eichhonia  
petiole t.s







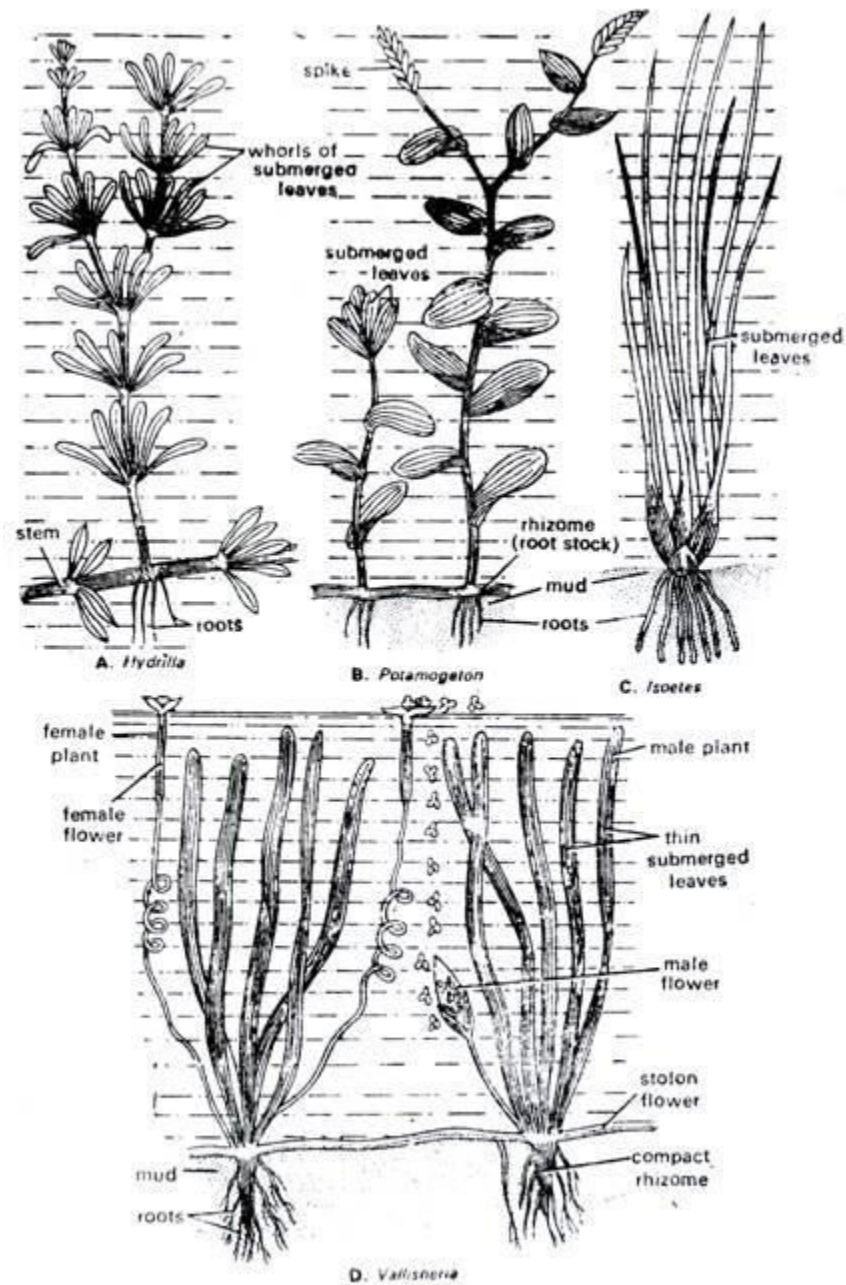


Fig. 10.9. Rooted submerged hydrophytes



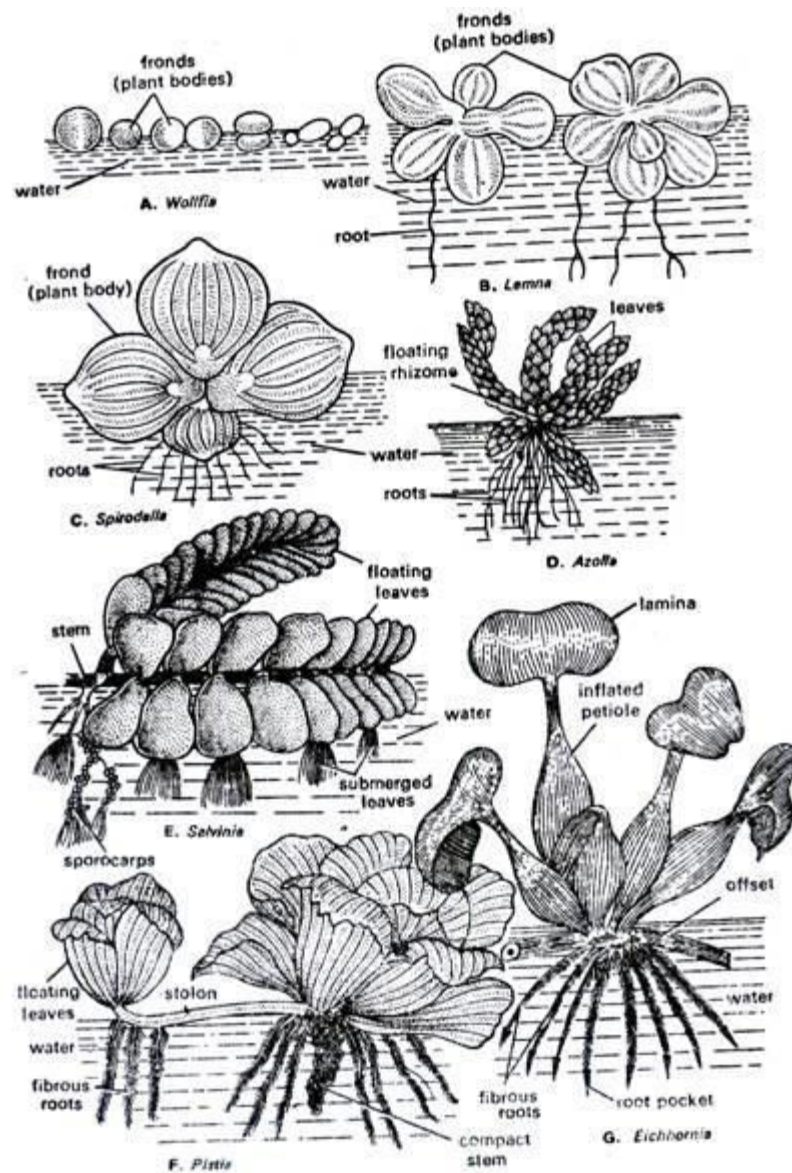
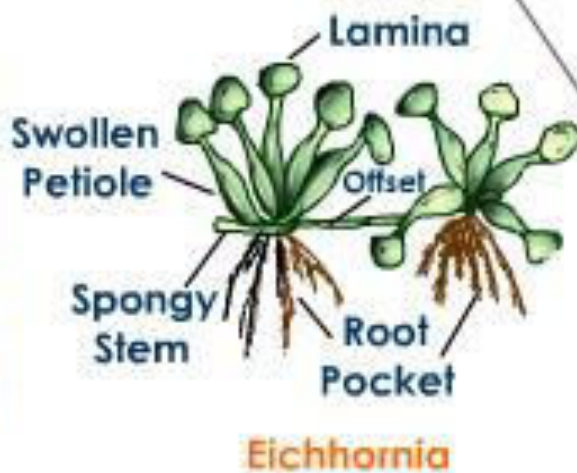
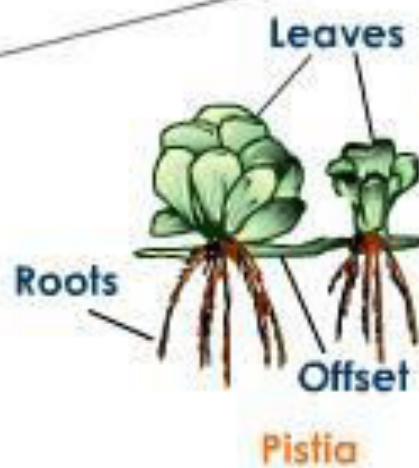
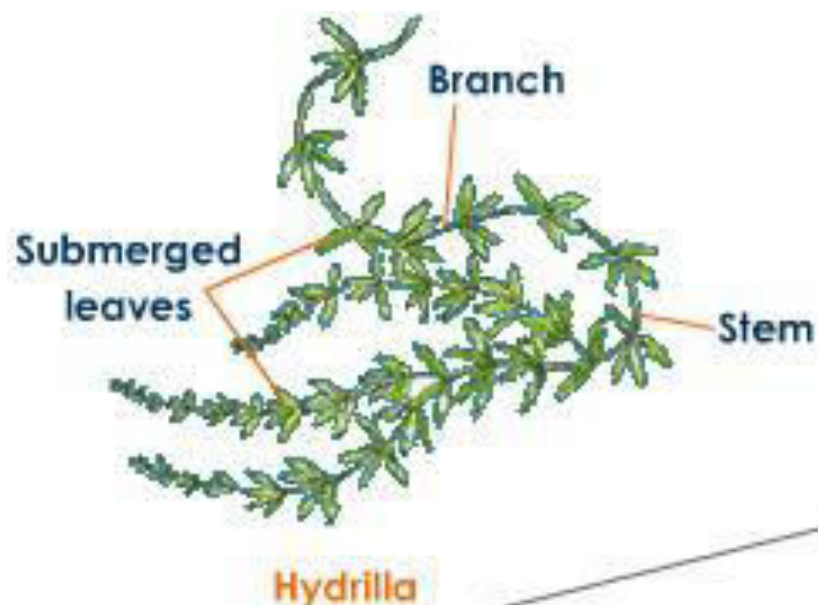


Fig. 10-6. Free-floating hydrophytes.

## AZOLLA



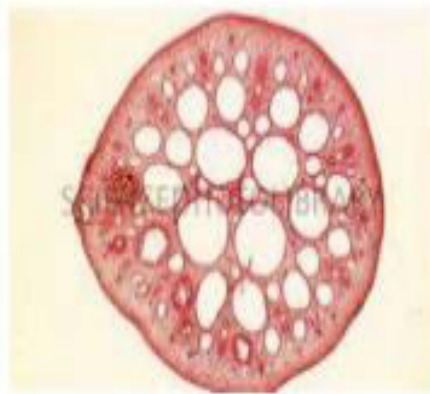




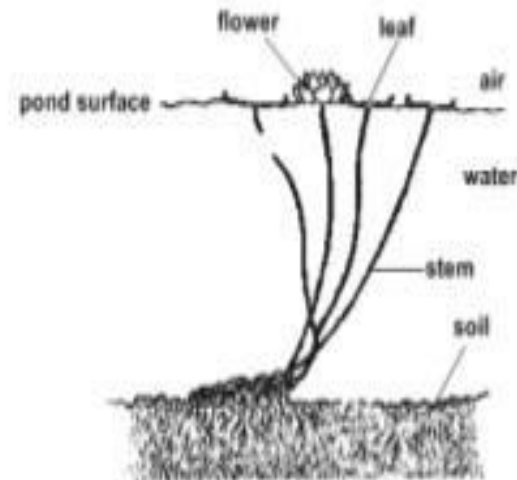


# Adaptations

- **Very thin or no waxy cuticle-** They do not need to conserve water so water loss by transpiration is not an issue
- **Many always-open stomata on the upper surface-** Unlike other plants there is no risk to the plant of loss of turgor as there is always water available, so they are always open for gaseous exchange and the guard cells are inactive. With water lilies the stomata need to be on the upper surface of the leaf so they are in contact with the air.
- **Reduced structure to the plant-** the water supports the leaves and the flowers so there is no need for strong supporting structures.
- **Wide, flat leaves-** Water lilies have wide, flat leaves that spread across the surface of the water to capture as much sun light as possible.
- **Small roots-** Water can diffuse directly into stem and leaf tissue so there is less need for uptake by roots.



- **Large surface area of stems and roots under water**- This maximises the area for photosynthesis and for oxygen to diffuse into submerged plants.
- **Air sacs**- Some have air sacs to enable the leaves and flowers to float to the surface of the water.
- **Aerenchyma**- Specialised parenchyma tissue forms in the leaves, stems and roots of the plants. It has many large air spaces, which seem to be formed at least in part by apoptosis ( programmed death) in normal parenchyma. It has several different functions within the plants, making the leaves and stems more buoyant and forming a low-resistance internal pathway for the movement of substances such as oxygen to tissues below the water. This helps the plant to cope with extreme low oxygen conditions in mud, by transporting oxygen to the tissues these are normally found in crop species.



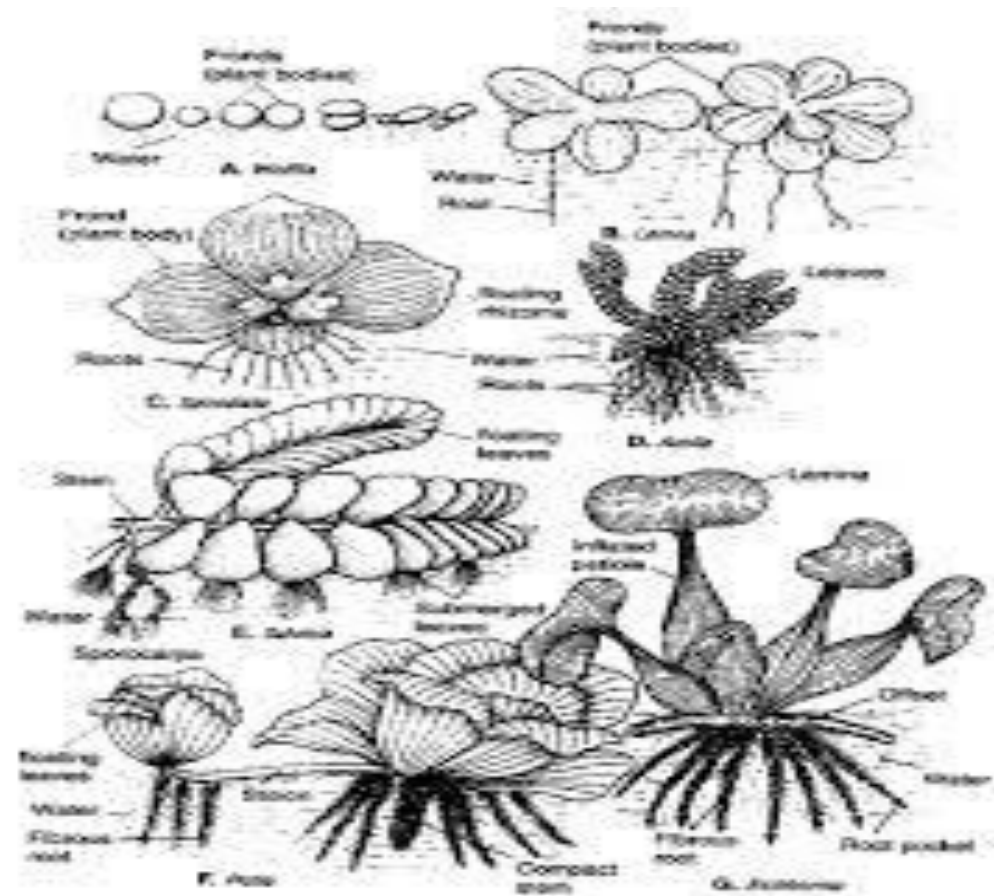
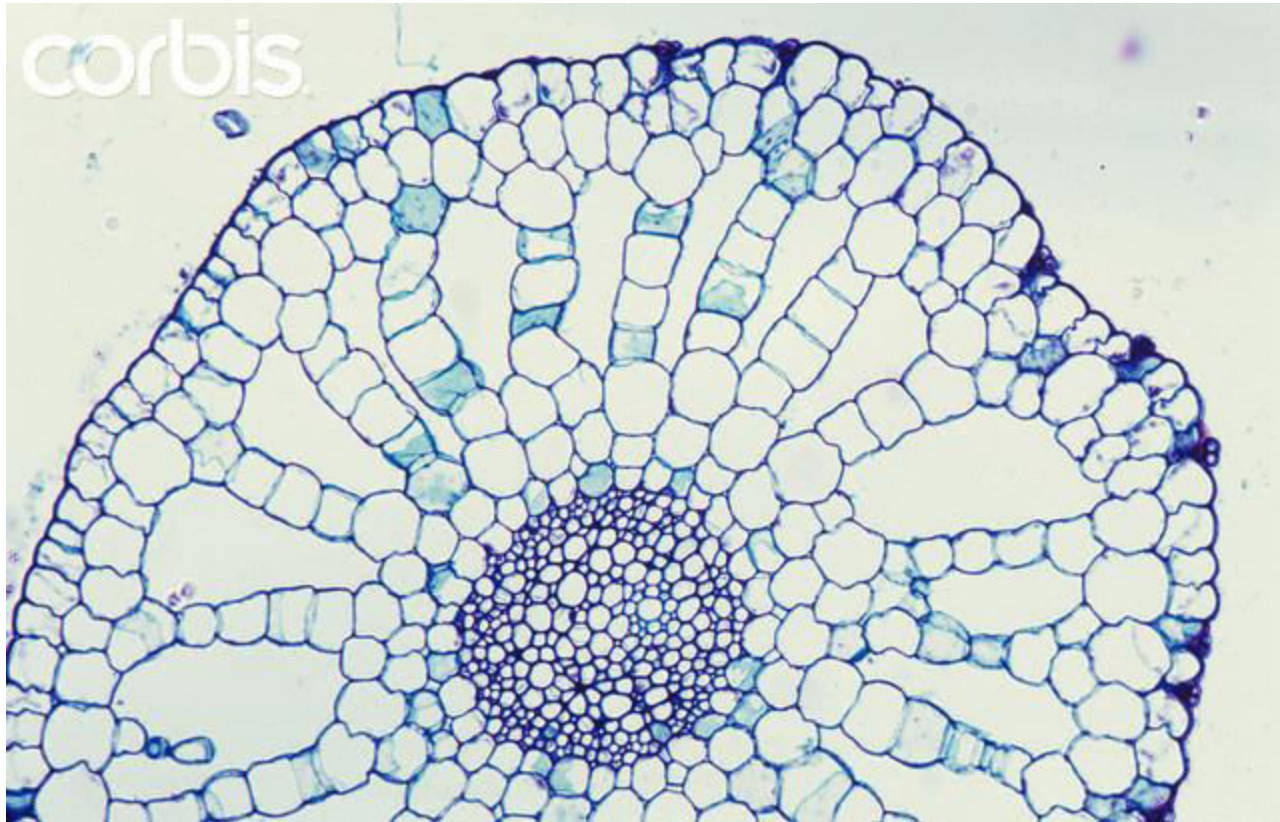


Fig. 34. Free floating hydrophytes.



*Jussiaea repens*





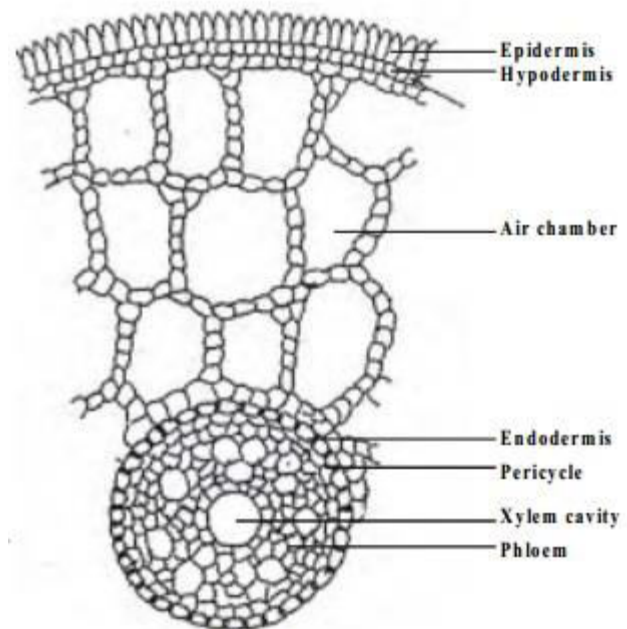


Fig : T.S. Hydrilla Stem