### O Level Elective Geography
### Chap 3: Types of Natural Vegetation

#### Tropical Rainforests
- **Distribution in the world**
  - Between 10° N & S of the Equator
  - Tropical equatorial climate: high temp (27°C) & high rainfall (1500mm)
- **Structure**
  - 5 vertical layers: Emergent, Canopy, Understorey, Shrub, Undergrowth
  - 3 horizontal layers: Coastal zone, Middle zone, Inland zone
- **Diversity of plant species**
  - Largest biodiversity of all biomes: year-round high temp & rainfall enables itself to support large variety of plants
- **Density**
  - Extremely dense: tropical equatorial climate encourages dense, abundant vegetation growth.

#### Tropical Monsoon Forests
- **Distribution in the world**
  - Between 10° to 25° N & S of the Equator
  - Tropical monsoon climate: high temp (26°C) & high rainfall (1500mm), with distinct wet & dry seasons
- **Structure**
  - 3 vertical layers: Canopy, Understorey, Undergrowth
  - 3m to 40m
  - 3 horizontal layers: Coastal zone, Middle zone, Inland zone
- **Diversity of plant species**
  - High biodiversity, but lower than TR due to inconsistent rainfall (lack of water in dry seasons)
- **Density**
  - Dense plant growth (but less than TR): Dense during wet season - Slightly sparse during dry season

#### Mangrove Forests (Mangroves)
- **Distribution in the world**
  - Between 23.5°N & S of the Equator
  - Tropical climate, especially along sheltered coastal regions & places where rivers constantly deposit clay & silt.
- **Structure**
  - No distinct layers: trees grow uniformly in height (20m to 30m) in pure stands
- **Diversity of plant species**
  - 4 main halophytes (salt-tolerant plants)
  - A...
  - S...
  - R...
  - B...
- **Density**
  - Dense canopy: continuous canopy formed to compete for sunlight
  - Sparse undergrowth: canopy blocks sunlight from

#### Coniferous Forests
- **Distribution in the world**
  - Between 60° & 70° N of the Equator
  - Cool continental climate experiencing the 4 seasons, low temp (-40°C to 21°C) and low precipitation (300mm to 635mm)
- **Structure**
  - No distinct layers: trees grow uniformly in height (20m to 30m) in pure stands
- **Diversity of plant species**
  - Low biodiversity - pure stands of single species: few plants can adapt to climate/ the low temp & precipitation climate does not support growth & survival of most plant species
- **Density**
  - Not dense: low temp/rainfall does not support dense/abundant vegetation growth

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<table>
<thead>
<tr>
<th>Characteristics and adaptations</th>
<th>Leaves</th>
<th>Flowers &amp; fruits</th>
<th>Bark and branches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Evergreen: high rainfall throughout the year</td>
<td>• Flowering &amp; fruiting during dry season</td>
<td>• Thin, smooth bark (no protection needed)</td>
</tr>
<tr>
<td></td>
<td>Large and broad leaves for maximum SA for photosynthesis</td>
<td>• Colourful to attract insects for pollination</td>
<td>• Branches found on uppermost ⅓ portion of trunks for maximum sunlight</td>
</tr>
<tr>
<td></td>
<td>Waxy, drip tips to allow rainwater to drain off, preventing bacteria growth</td>
<td>• Buoyant fruits elongated with sharp tips to anchor itself in soft muddy soil</td>
<td>• Thick coarse barks to protect trees from heat &amp; dryness, to withstand extreme heat from forest fires</td>
</tr>
<tr>
<td></td>
<td>Deciduous: shed leaves during dry season to minimize water loss through transpiration</td>
<td>• Salt secretors</td>
<td>• Branches located around middle of trunks</td>
</tr>
<tr>
<td></td>
<td>Waxy drip tips to allow rainwater to drain off, preventing bacteria growth</td>
<td>• Thin leathery surfaces to reduce water loss through transpiration</td>
<td>No adaptation</td>
</tr>
<tr>
<td></td>
<td>Evergreen: no seasonal changes</td>
<td>Male cones produce pollen</td>
<td>• Thick barks to protect against long cold winters</td>
</tr>
<tr>
<td></td>
<td>Broad leaves with drip tips</td>
<td>Female cones produce seeds</td>
<td>• Downward sloping flexible branches to allow snow to slide off</td>
</tr>
<tr>
<td></td>
<td>Waxy drip tips</td>
<td>Ultrafiltrators</td>
<td></td>
</tr>
</tbody>
</table>
### Roots

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow roots</td>
<td>which spread widely</td>
</tr>
<tr>
<td>Buttress roots</td>
<td>to support the incredibly tall trees which compete for sunlight</td>
</tr>
<tr>
<td>Deep tap roots</td>
<td>for tapping underground water during dry season, due to inconsistent rainfall</td>
</tr>
<tr>
<td>Aerial roots</td>
<td>exposed to take in oxygen, an adaptation to the O₂ deprived soil caused by waterlogged conditions</td>
</tr>
<tr>
<td>Prop &amp; kneed roots</td>
<td>provide firm support in muddy soil</td>
</tr>
<tr>
<td>Shallow, spreading roots</td>
<td>to absorb water from soil surface when snow melts</td>
</tr>
</tbody>
</table>

### Structure of the TR and TMR

<table>
<thead>
<tr>
<th>Layer</th>
<th>Tropical Rainforest</th>
<th>Tropical Monsoon Forest</th>
</tr>
</thead>
</table>
| Emergent 30-50m    | • Emergents reach a height of up to 50m and their crowns appear above the canopy  
• They have tall, straight trunks as they compete for sunlight |                                                                                               |
| Canopy 15-30m      | • The wide crowns of tall trees interlock to form a continuous canopy  
• It prevents sunlight from penetrating into the lower layers  
• Presence of plants, epiphytes and other parasitic plants | • Crowns of trees do not interlock to form a continuous canopy as they do not grow as closely as TRs  
• More sunlight is able to pass through gaps of canopy  
• Presence of plants, epiphytes and other parasitic plants |
| Understorey 6-15m  | • Trees have narrower, oval-shaped crowns and grow under gaps of the canopy where sunlight can pass through  
• Presence of shrubs, ferns and plants which require less sunlight | • Trees in the understorey are about 15m in height |
| Shrub 5-6m         | • Tree saplings & woody plants growing up to 6m are found  
• Presence of shrubs, ferns and plants which require less sunlight |                                                                                               |
| Undergrowth 0-5m   | • Dark and damp as very little sunlight reaches this layer  
• Plant growth is sparse due to lack of sunlight in the undergrowth  
• Mainly grasses, fungi and leaf litter which decomposes quickly to release nutrients into soil | • Bamboo thickets and grasses grow densely during the wet season  
• The undergrowth is less dense during the dry season when rainfall is insufficient |