



## Botany 3: Adaptation to Environment

### *Biome Exercise*

#### **Proposal for a New Garden at The Huntington**

Your class has been hired as consultants to propose a garden for the Huntington. Each garden is based on one of the following biomes:

- |                                 |                              |
|---------------------------------|------------------------------|
| 1. Tundra                       | 6. Mediterranean woodland    |
| 2. Taiga                        | 7. Savanna                   |
| 3. Midlatitude deciduous forest | 8. Tropical deciduous forest |
| 4. Grassland                    | 9. Tropical rain forest      |
| 5. Desert                       |                              |

#### **PROCEDURES**

1. Your group has been assigned a biome to research and present to the garden board. Make a presentation on why your biome should be included in the garden and what it might look like.
2. In order to make your presentation, you will need to make a board with your research on the biome. Address the following in your display:
  - a. Location where your biome occurs in nature (include a map)
  - b. Abiotic factors:
    - i. Climate type
      - (a) precipitation seasonality and amount
      - (b) temperature levels and seasonality
    - ii. Soil type(s) and qualities
  - c. Biotic factors:
    - i. Overall vegetative structure
    - ii. Level of biotic diversity
    - iii. Dominant vegetation
    - iv. Dominant adaptations to abiotic factors
  - d. Primary limiting factor
  - e. Net productivity
3. Each group will present their biome to the garden's board and should make the case as to why their biome design should be selected for an exhibit at the garden.



**Biome Clues** (with tundra and tropical deciduous forests completed as examples)

**1. Tundra**

- a. High latitudes and high altitudes; covers 1/5 of the earth's land surface
- b. Abiotic factors
  - i. Climate: tundra (ET), subarctic (Dw & Dfd)
    - (a) Precipitation low
    - (b) Temperatures cold (slow photosynthesis, frozen water)
  - ii. Soils: gelisols (young soil, permafrost) in arctic tundra, but not alpine
- c. Biotic factors
  - i. Treeless marshy plain
  - ii. Low species diversity
  - iii. Dominated by grasses, mosses, lichens
  - iv. Vegetation undergoes photosynthesis at low temperatures and light levels; low lying plants gain protection from cold winter temperatures by snow cover
- d. Primary limiting factor: cold temperatures year-round
- e. Net primary productivity low

**2. Taiga**

Cold and wet (most of the precipitation falls in the summer)  
Coniferous forests thrive  
Winters are long

**3. Midlatitude deciduous forest**

Mild climate with plenty of rain  
Deciduous trees shed their leaves in the fall  
Warm summers with cool winters

**4. Grassland**

Rich growth of prairies  
Often highly productive land when converted to agriculture  
Moderate climates half-way between the equator and the poles

**5. Mediterranean woodland (chaparral)**

Seasonal precipitation  
Drought deciduous vegetation  
Limiting factor: lack of moisture



**6. Savanna**

Grass is the predominant vegetation  
Wide temperature variation throughout year  
Seasonal drought  
Open landscape with widely spaced trees

**7. Desert**

Sparse vegetation often with thorns  
Drought is a limiting factor  
Can be warm or cold  
As a biome is most represented in the interiors of the continents

**8. Tropical deciduous forest**

- a. North and south of tropical rain forests, generally between 10° and 20° N or S of the equator
- b. Abiotic factors
  - i. Climate: tropical wet and dry (Aw)
    - (c) Precipitation less than tropical rain forest and periodic; seasonal droughts
    - (d) Temperatures generally warm year 'round
  - ii. Soils: oxisols (red, highly weathered and leached, low fertility), ultisols (red, clayey, low fertility), alfisols (light-colored, clay layer, fertile)
- c. Biotic factors
  - i. More open than tropical rainforest; grades into savanna; denser understory than tropical rainforest
  - ii. High level of diversity although not as diverse as tropical rainforest
  - iii. Mix of broadleaf evergreen and broadleaf deciduous trees
  - iv. Drought deciduous
- d. Primary limiting factor: dry winter
- e. Net primary productivity relatively high

**9. Tropical rain forest**

Plenty of rain and heat  
No winter  
Not very fertile soil