CASE

Curriculum for Agricultural Science Education

Principles of Agricultural Science – Plant

Degrees of Growth

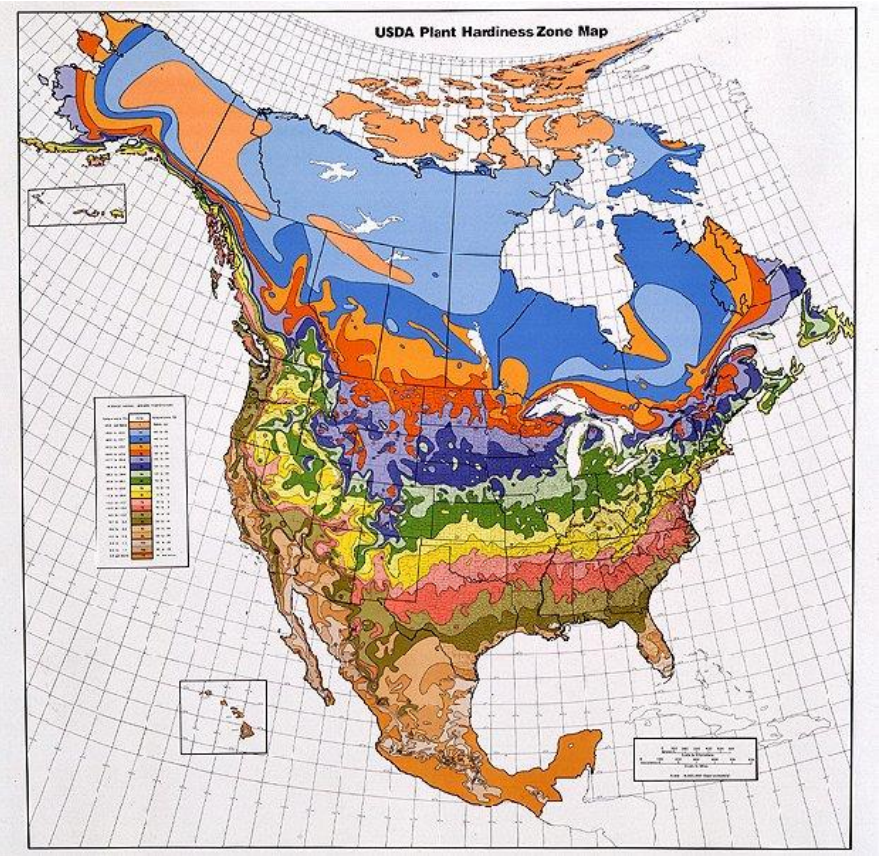
Unit 6 – The Growing Environment
Lesson 6.4 Chilly Lilies

Environmental Temperature Variations

The climate, specifically temperature, for a geographic location is influenced by:

- Latitude
- Elevation
- Microclimate zones, such as coastal areas

Hardiness Zones



USDA, 2003

A hardiness zone map

- Provides temperature characteristics of geographic regions
- Used to determine the species and varieties of plants best suited for an area

Temperature Classifications

Two general categories based on temperature requirements:

- **Cool-season plants**
  - survive mild frost
  - tolerate cool spring and fall temperatures
- **Warm-season plants**
  - typically killed by frost
  - require warm temperatures

Temperature Sensitive

Specific temperatures trigger:

- Vegetative growth
- Physiological development
  - Maturity based on the length of time exposed to temperatures
  - Reproductive stages
- Dormancy
  - Cold-induced
  - Heat-induced

Temperature vs. Growth

Plant growth and temperature have a direct relationship:

As temperature increases…  **Plant growth increases** 

As temperature decreases…  **Plant growth decreases** 

Why is plant growth influenced by temperature?

Temperature influences three main metabolic functions of plants:

- Transpiration
- Photosynthesis
- Respiration

Maturity Requirements

Plants require a specific amount of time exposed to a specific threshold of temperature in order to initiate flowering.

The requirement is met by accumulating Growing Degree Units (GDU).

More on Growing Degree Units

Growing Degree Units (GDU) are units of exposure to adequate temperatures required for plant growth.

To calculate GDU use the following formula:

$$\frac{\text{Daily High Temperature} + \text{Daily Low Temperature}}{2} - \text{Base Temperature Requirement} = \text{GDU}$$

Dormancy Requirements

Temperature is also used to initiate and break dormancy of seeds and vegetative growth for perennial and biennial plants.

Plants sense natural seasonal changes in temperature to initiate growth responses.

Terms Related to Dormancy Associated with Temperature

- **Forcing:** controlling temperature to promote vegetative growth and flowering outside of natural seasonal patterns in plants
- **Stratification**: the duration of exposure to cold temperatures to promote germination of some seed types
- **Vernalization**: the cold treatment applied to plants to initiate flowering

References

United States National Arboretum. (2003). *"Web version" of the USDA plant hardiness zone map*. Retrieved December 12, 2008 from http://www.usna.usda.gov/Hardzone/ushzmap.html?

Parker, R. (2010). *Plant and soil science: Fundamentals and applications*. Clifton Park, NY: Delmar.