WATER WISELY: Lawns, gardens, trees and shrubs

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Learning objectives
1. Be able to explain the effect of soil texture on water movement and availability to plants
2. Implement best watering practices that will reduce the need for water while still providing a beautiful, productive yard & garden.

Plants & Water
• Healthy plants are adaptable
• Healthy plants can tolerate drought, moisture
• The same site can have varying growing conditions
Drought tolerant plants: adapted to low moisture, heat stress, deep roots

Moisture tolerant plants: adaptable to short-term submersion, low O₂
Why water

- Water is a critical component of photosynthesis
  
  \[
  \text{Light + CO}_2 + \text{water} = \text{carbohydrates.}
  \]

- Important for plant growth, flowering, seed production, and defense mechanisms.

- Transports nutrient minerals and other plant solutes.

- Turgor

  - Controls opening and closing of stomata and transpiration.

Credit: NASA/Goddard Space Flight Center Conceptual Image Lab
https://www.youtube.com/watch?v=TeR_fLRDrZg
Evapotranspiration (ET)

*Loss of water through evaporation and plant transpiration (stomata)*

- Influenced by
  - Weather - temperature, wind, humidity, solar radiation, rainfall
  - Site conditions - vegetation, soil, water, management practices.

- ET data:
  - Irrigation strategies
  - Water and groundwater management
  - Balance ecosystems (wetlands, reservoirs)

Soil & water

- Holds water & nutrients for plants to absorb (water-holding capacity)
- Drains excess water
  - Aeration reduces compaction / runoff
- Organic matter:
  - Improves drainage
  - Increases pore space (O₂)
  - Increases water-holding capacity
  - Add to clay soil – increases air space, lessens compaction
  - Add to sandy soil – increases water-holding capacity
Soil characteristics

<table>
<thead>
<tr>
<th>Soil Trait</th>
<th>Sandy Soils</th>
<th>Loam Soils</th>
<th>Clay Soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texture</td>
<td>Coarse</td>
<td>Medium</td>
<td>Fine</td>
</tr>
<tr>
<td>Density</td>
<td>Low</td>
<td>Intermediate</td>
<td>High</td>
</tr>
<tr>
<td>Nutrient holding capacity</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Moisture holding capacity</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Drainage</td>
<td>Excessive</td>
<td>Good</td>
<td>Slow</td>
</tr>
<tr>
<td>Oxygen level</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

Considered the “ideal” soil

Effects of soil texture on water movement

- **Sand** (Coarse texture)
- **Loam** (Medium texture)
- **Clay (Compacted)** (Fine texture)
Soil characteristics – oxygen, density, compaction

- Quantity, size of pore spaces
- Space for root growth
- Lower percolation rate
- Higher run off rate

**How can I tell what kind of soil I have?**
Adding organic matter will have a positive effect on water movement drainage, water-holding capacity, air space.
Soil texture by feel
http://www.ext.colostate.edu/mg/gardennotes/214.html

Percolation test: measures drainage

1. Dig a hole 12” deep
2. Fill it with water.
3. Time the rate (on an hourly basis) of water drainage out of the hole:
   - 1” per hour = desirable, well-drained soil
   - >1” per hour = sandy, excessive drainage
   - <1” per hour = clay, compacted, slow drainage

Poor drainage after 24 hours
What do I do with my soil info?

- Change how you water based on your soil type
  - Clay soil – apply less frequently at lower rates due to lower infiltration rate
  - Sandy soil - apply more frequently at higher rates due to higher infiltration rate
    - Water that moves past the root zone is wasted water.

- Add organic matter to:
  - Improve drainage in clay soil
  - Increase pore space \((O_2)\) in clay soil
  - Increases water-holding capacity in sandy soil

Summary

1. Soil texture affects water movement and the availability of water to plants.
2. Use the ribbon test to determine your soil texture.
3. Organic matter:
   a. Improves drainage
   b. Increases pore space \((O_2)\)
   c. Increases water-holding capacity
Healthy plants
healthy planet
healthy people

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