

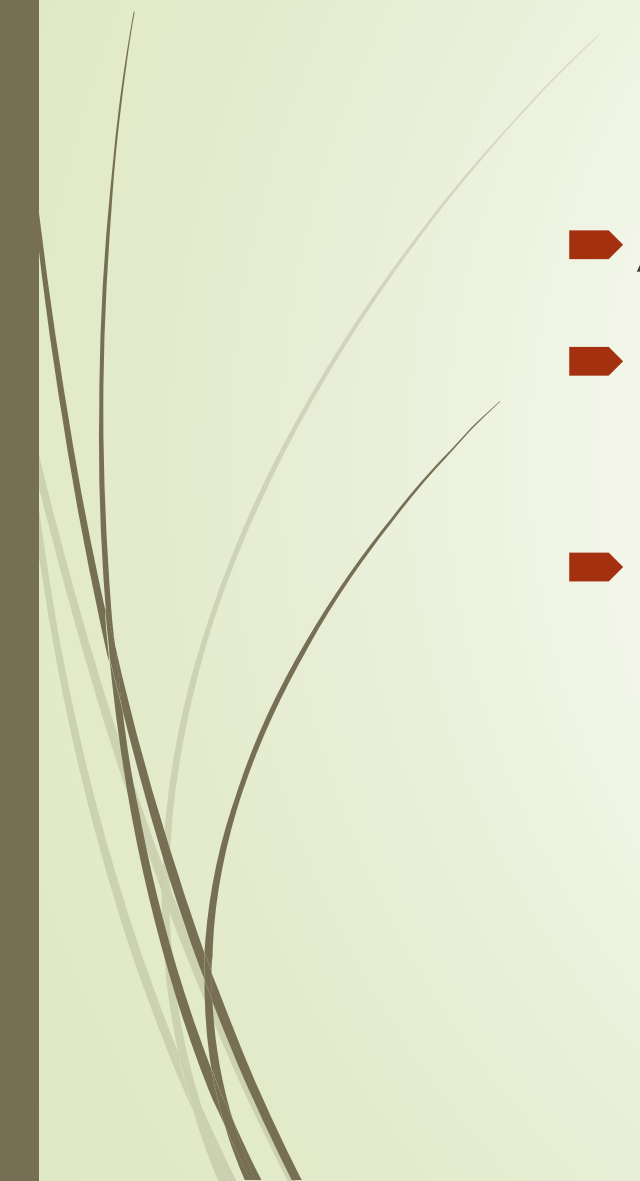
# Nitrogen Management Tools

How Water and Nitrogen Efficiencies are Linked



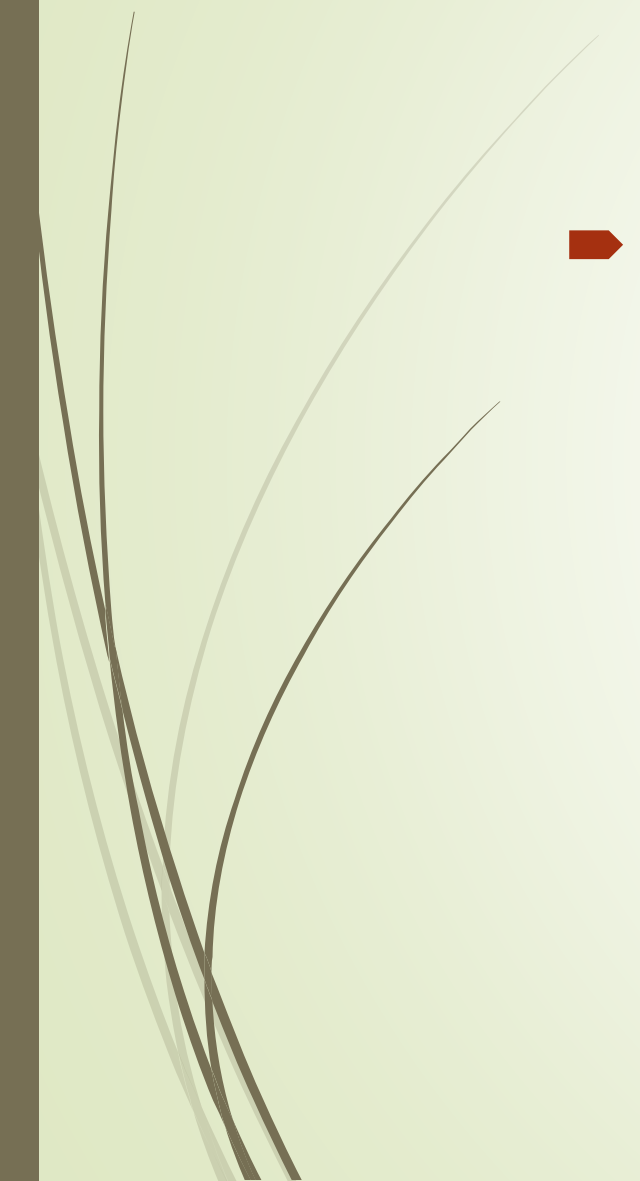


# Roles of Water in Soil and Plants

- All Nutrient Uptake/Movement Involves Water
  - Nutrients Must be Dissolved in Water to Enter Plants
  - Nutrient Movement in Soil is by Diffusion
    - Moving from Source to Sink
    - Transport from Soil Water to Root is Active Process
- 

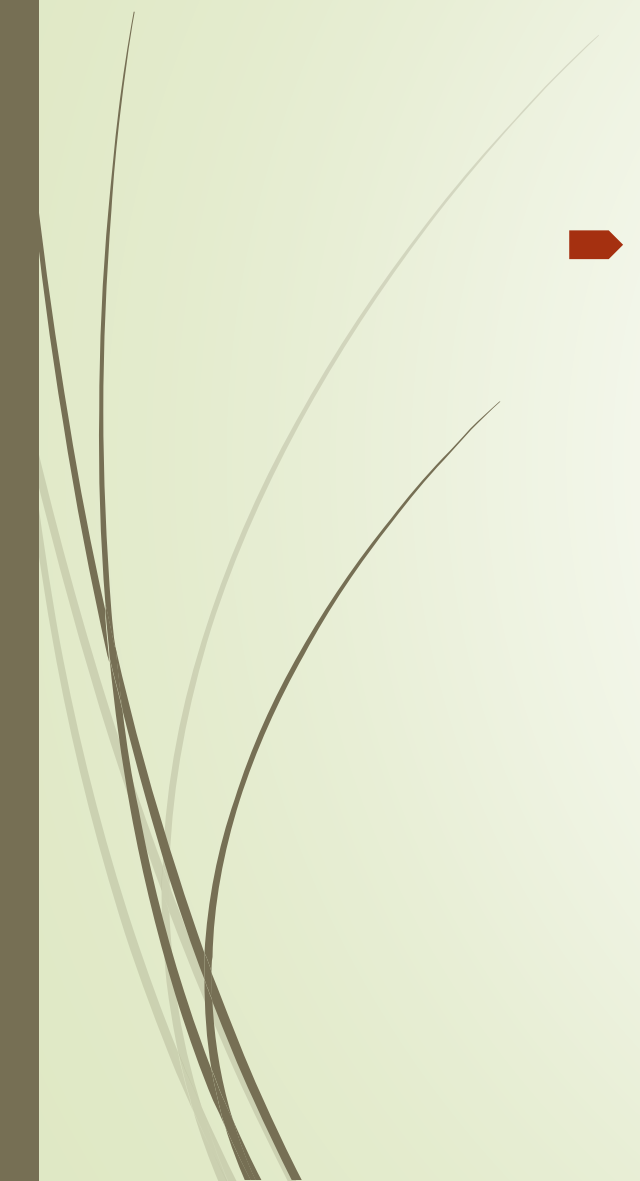


# Roles of Water in Soil and Plants

- ▶ Plants Use Water for
    - ▶ Metabolism
    - ▶ Transport of Nutrients
    - ▶ Physical Support
    - ▶ Cooling
      - ▶ Cooling and Transport are Related Actions
- 



# Roles of Water in Soil and Plants

- Factors Affecting Water Movement
    - Soil Moisture Content
      - Soil Moisture Between Saturation and Permanent Wilting Point
      - Greatest at Field Capacity
    - Soil Salt Content
      - Interference with Roots
- 



# Roles of Water in Soil and Plants

- ▶ Factors Affecting Water Movement

- ▶ EvapoTranspiration (ET)

- ▶ Evaporation from Soil or Water Surface *Plus*

- ▶ Transpiration from Leaf Surface

- ▶ Both Influenced by Temperature, Wind, and Sunlight Intensity

- ▶ Transpiration is an Estimated Value

- ▶ Must Apply Coefficients to Adjust for Crop, Growth Stage



# Roles of Water in Soil and Plants

- ▶ ET is the Amount of Water Consumed by a Plant
  - ▶ Applied Irrigation Water Does Not Necessarily Equal Water Consumed
    - ▶ Applied Water *Usually Greater than* ET
    - ▶ Includes Rainfall
    - ▶ Deficit Irrigation Utilizes Stored Soil Water



# Roles of Water in Soil and Plants

- Where to Get ET Data

- CIMIS

- Reference ET data Only, Requires Crop Coefficient

- [krcd.org](http://krcd.org)

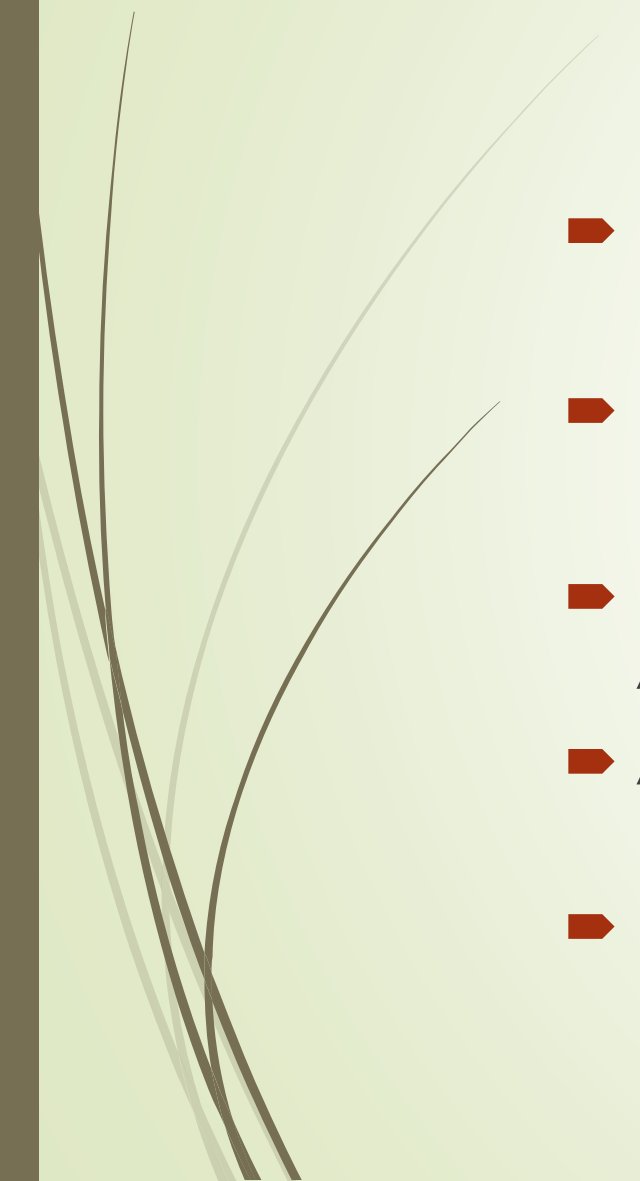
- AgLine Provides ET Data for 31 Crops

- Updated Crop Water Use Weekly (Fridays)

- Independent Consultants



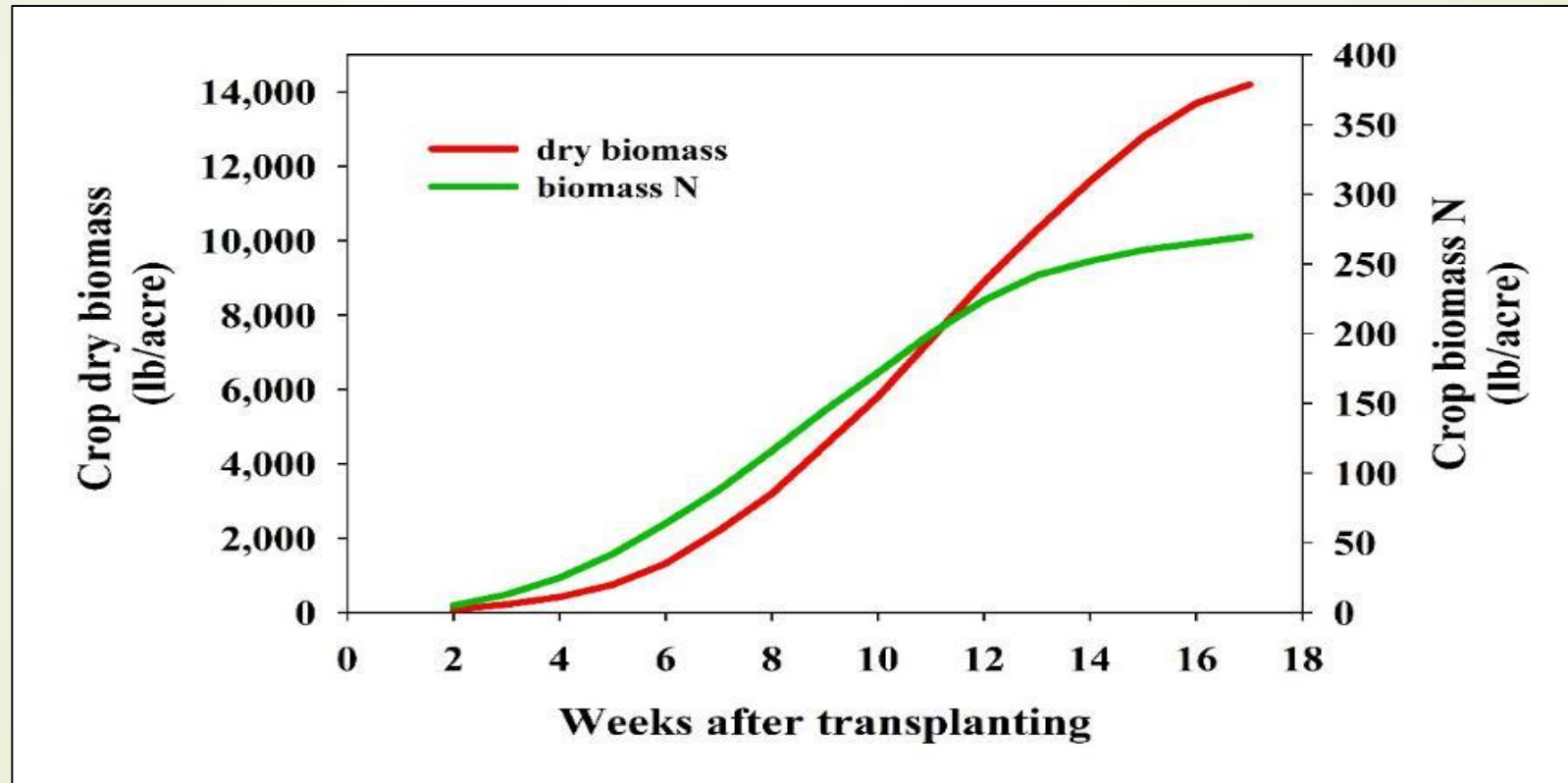
# Roles of Nitrogen in Soil and Plants

- Nitrogen is Required for Protein Synthesis
    - Used by Plants, Soil Microbes, Fungi
  - Nitrogen Moves with Soil Water
    - Same Ionic Charge as Inorganic Soil Components
  - Proper Irrigation Management Keeps Applied N in Active Rootzone
  - Applied Nitrogen Must be in the Soil Profile *Prior* to Plant Need
  - Excess Nitrogen plus Excess Irrigation Equals Leaching
- 



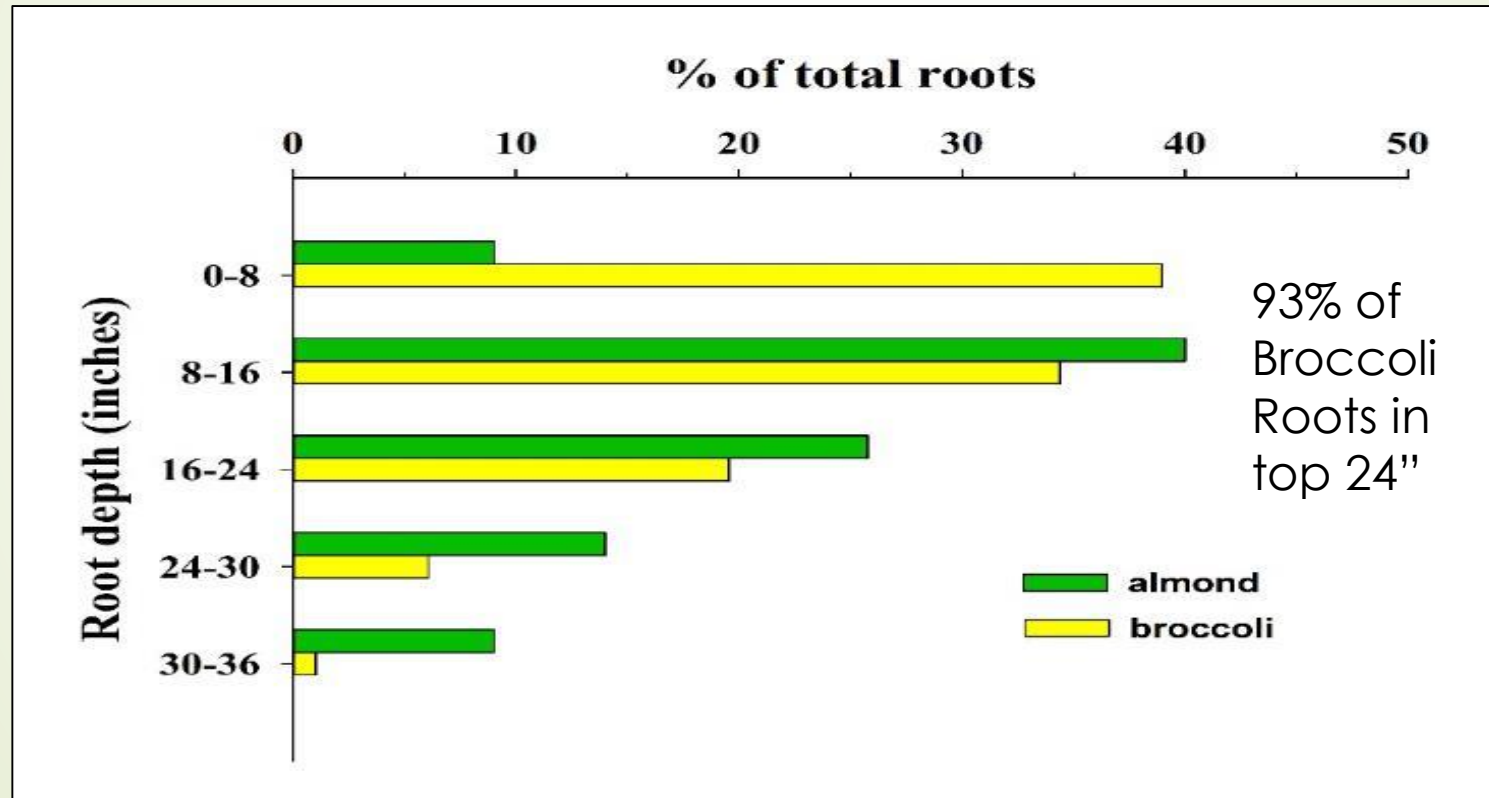
# Roles of Nitrogen in Soil and Plants

Tomatoes



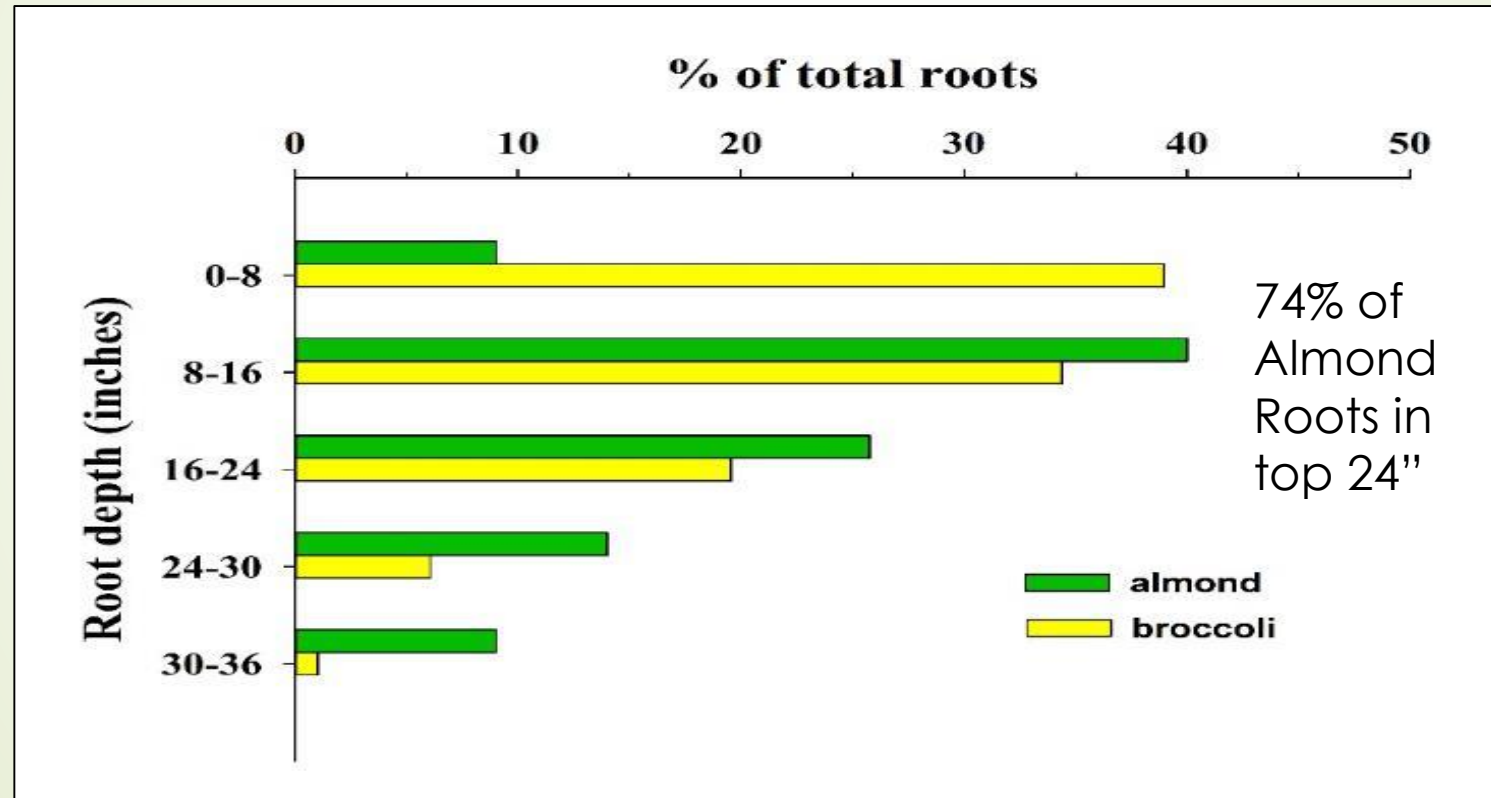
Source: Tim Hartz, UCCE (ret)

# Roles of Nitrogen in Soil and Plants



Source: Tim Hartz, UCCE (ret)

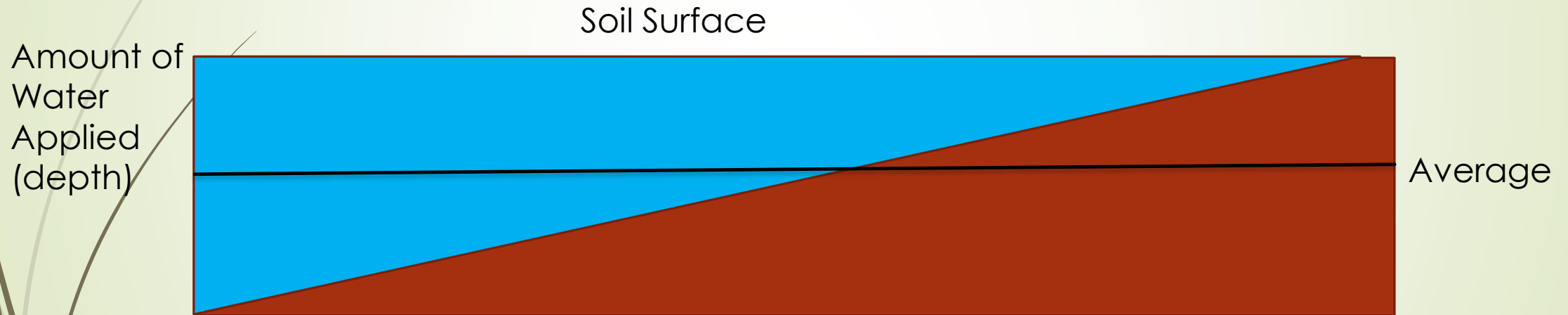
# Roles of Nitrogen in Soil and Plants



Source: Tim Hartz, UCCE (ret)

# Roles of Nitrogen in Soil and Plants

Proper Irrigation Volume Does Not Equal Uniform Application





# Roles of Nitrogen in Soil and Plants

- Nitrogen Sources

- Irrigation Water

- Kings River Water: Zero Practical Nitrogen Content
    - Pumped Groundwater: Highly Variable, Testing Recommended
    - Testing is Required IF Parcels Located in a High Vulnerability Area
      - Provision of Regional Board Approved Management Plan

# Roles of Nitrogen in Soil and Plants

## ► Key Formulas

$$\text{Applied Water (in)} = \frac{\text{Flow (GPM)}}{449} \times \frac{\text{Irrigation Time (hrs)}}{\text{acres}}$$

$$\text{N Applied (lbs/ac)} = \text{Nitrate-N (ppm)} \times \text{Inches Applied} \times 0.23$$

$$1 \text{ cfs} = 2 \text{ AF/day} = 453 \text{ GPM}$$

Other Calculators Available at [agmpep.com](http://agmpep.com)



# Guaranteed Analysis

- ▶ Legally Binding Nutrient Content
  - ▶ Minimum Content +/- 1%
  - ▶ Rarely Above (Cost is Based on Content, not Analysis)
- ▶ Numbers are N-P-K-other
  - ▶ 15-15-15 represents 15 % Nitrogen, 15 % P<sub>2</sub>O<sub>5</sub>, 15 % Potassium
  - ▶ Other can be Anything, Usually Identified (Sulfur (S), Calcium (Ca), etc.)
  - ▶ Values Based on Weight
    - ▶ Must Convert Liquid Gallons to Weight



Questions?

