Irrigation Evaluation and Maintenance

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Irrigation Efficiency or IE

- Water applied is never 100% beneficially used.
  - There is always some loss
    - Evaporation from soil and leaf surface
      - Evaporation losses can range from 1% to as much as 30%
    - Spray loss from water stream
      - Losses range from 1% to 4%
    - Surface run off
    - Deep percolation (water pushed past the root zone)

*** IE is a measure of the irrigator and the system**

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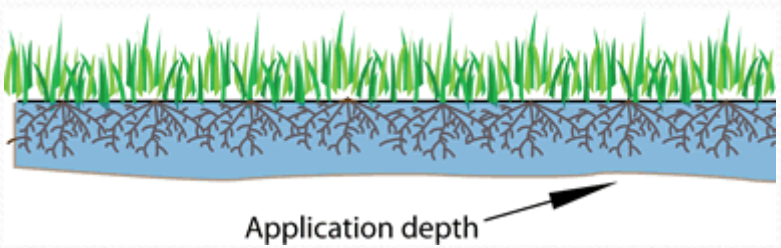
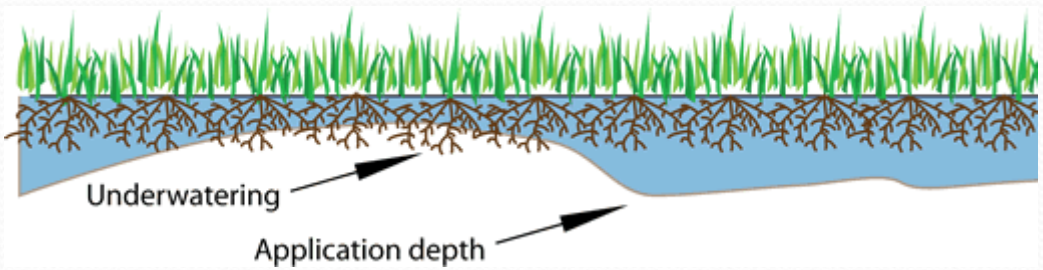
Distribution Uniformity or DU
Emitter Uniformity or EU

- Distribution Uniformity is the measure of how uniformly the water is applied

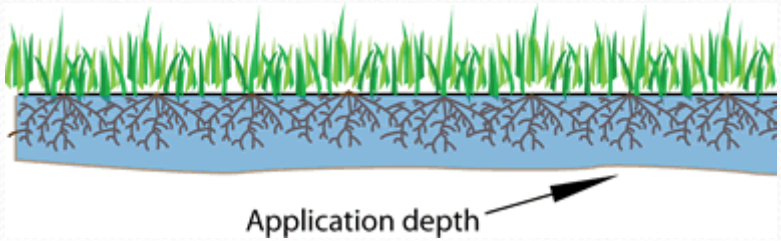
* **DU is a measure of the irrigation system**



Example of a good DU



Example of a poor DU



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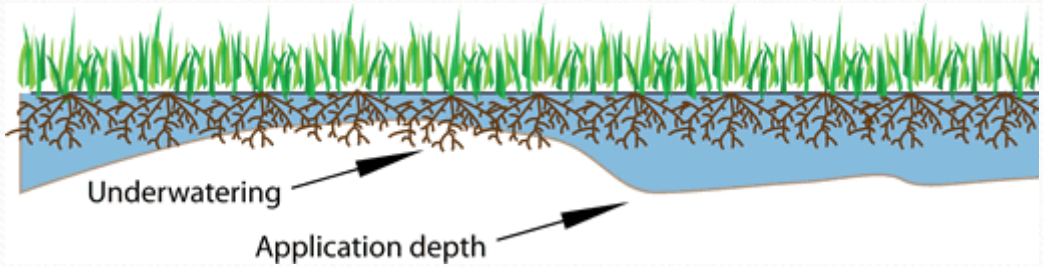
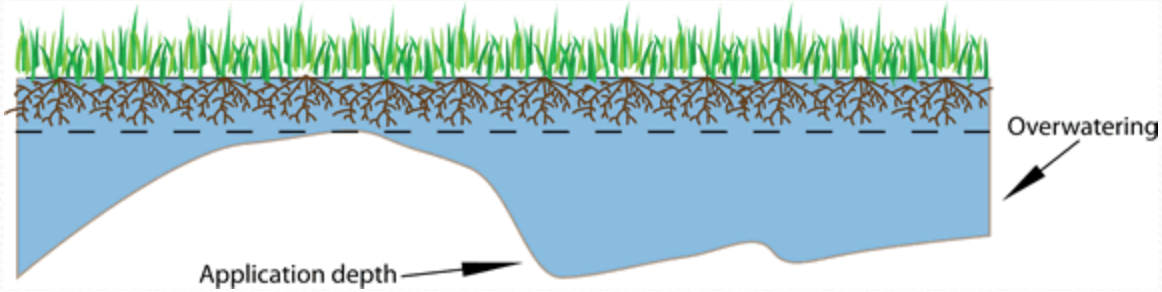


Example of a poor DU

- The problem with a poor DU
  - If enough water is applied to ensure every plant is given adequate water, we overwater other plants.



How Does Poor DU Waste Water

- Example
  - Evapotranspiration rate for almonds is 40 inches
    - Can be found at CIMIS, MJC, or Personal weather station
  - Measured DU is 75%

$$\frac{40\ inches}{.75} = 53 \text{ inches}$$

53 inches are needed to ensure every spot in the field receives 40 inches

Over watering in this example costs 1 acre foot for every acre farmed

Improving system DU even a little bit, can save water

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Potential DU

Orchard Drip	95%
Permanent under tree sprinklers	95%
Linear Move	93%
Sloping Furrow	90%
Border Strip of Flood	85%
Level Furrow	85%
Row Crop Drip	80%
Hand Move Sprinkler	75%

This is potential. Actual DU are usually lower due to poor system design, suitability, system wear, and management.

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Measuring Our Current DU

- Drip or Micro Sprinklers
  - Emitter Uniformity

Measuring Our Current DU

- Drip or Micro Sprinklers
  - Emitter Uniformity
    - Measure the water from the emitter during a given time
    - Record amount of water collected from each emitter
    - Record a minimum of 24 samples (more samples = better accuracy)
    - Calculate emitter uniformity using the Low quarter calculations.

$$EU = \frac{Average\ of\ the\ lowest\ 1/4}{Average\ of\ all} X\ 100$$

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Place all of the numbers in order from highest to lowest

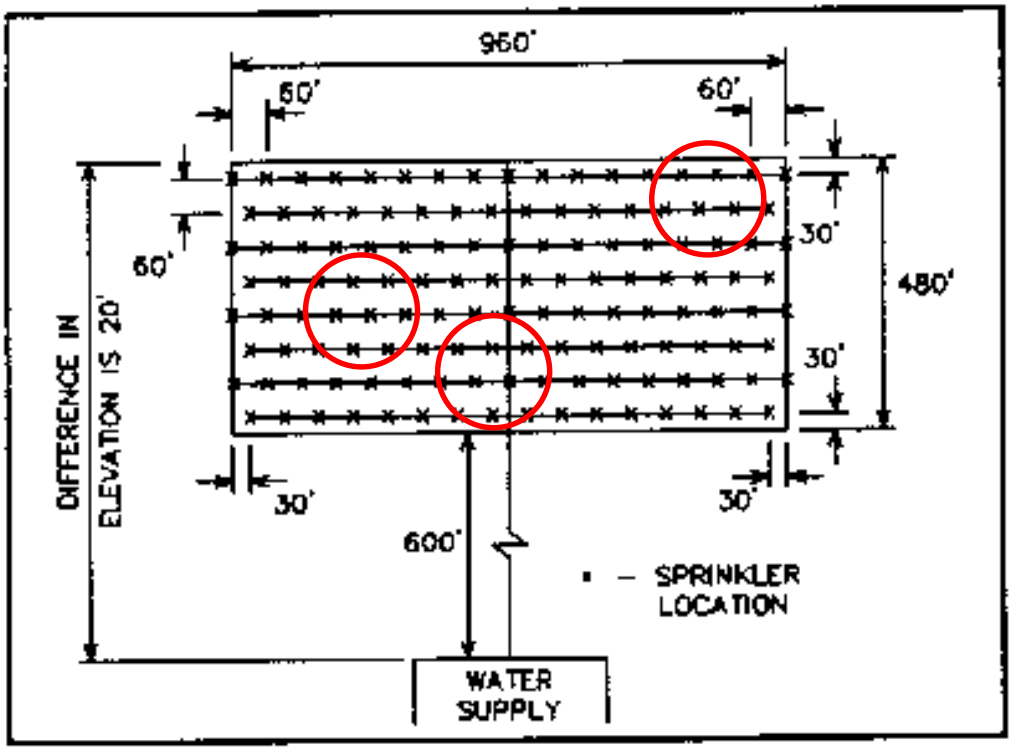
122 ml
119 ml
118 ml
118 ml
115 ml
110 ml
108 ml
105 ml
105 ml
104 ml
100 ml
99 ml
99 ml
97 ml
96 ml
96 ml
96 ml
92 ml
91 ml
90 ml
90 ml
88 ml
88 ml
87 ml

Lowest ¼ of the values

- Average the lower ¼ of the collected values
  - 89
- Average all the collected values
  - 101
  - $DU = \frac{Average\ of\ the\ lowest\ \frac{1}{4}}{Average\ of\ all} \times 100$
  - $DU = \frac{89\ ml}{101\ ml} \times 100 = 88\%$

Test Locations

- Multiple tests give more accurate results
  - Near where the main line branches into laterals
  - In the middle of the field
  - At the ends of the laterals



Measuring Our Current DU

- Sprinklers
  - Catch can evaluation
    - Place catch cans (minimum of 24) in an equal grid spacing
    - Run sprinklers to gain a representative sample
    - Measure and record amount of water collected in each catch can
    - Calculate DU using the same low quarter method

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Gathering and Using Information

- Test brand new systems
  - New system evaluation sets a baseline
  - Allows feedback to designers and manufactures
- Test system 3 times a year
- Troubleshoot drops in performance (5% drop = Problems)
  - Look for emitter plugging
  - Water source changes
  - System wear
- Develop optimum operating parameters

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Maintenance

- **<u>Keep system the way it was designed!</u>**
- Clean and maintain filtration systems
  - Check and replace sand as needed
  - Inspect screen filters regularly
- Flush lines every 2 weeks (depends on system)
  - Watch for contaminates when flushing and adjust
- Check pressure regulating devices
- Use flow meters and record data
- Check systems regularly for leaks and repair as needed

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Emitter Plugging

- 3 types of plugging
  - Biological (often from surface water sources)
    - Filtration
    - Biocide
      - Chlorination, Acid treatments, There are many products on the market
  - Particulate
    - Improve filtration
    - Flush lines regularly
  - Chemical precipitates (calcium carbonate and iron)
    - PH control, acid treatments, fertigation choices

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Questions

- Contact Information

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