Irrigation Management

What is Irrigation?

- Irrigation is a “balancing act” - too much or too little water can both cause problems
- Irrigation can simply be called the replacement of water in the soil used by plants - or maintaining a soil water level or amount.

When to begin irrigation?

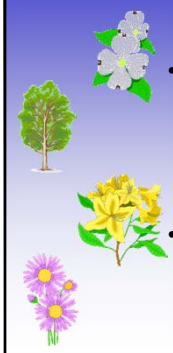
- (1) When a person walking across the lawn can see his/her footprints (easiest)

(Image courtesy Dr. L. B. McCarty)

When to begin irrigation?

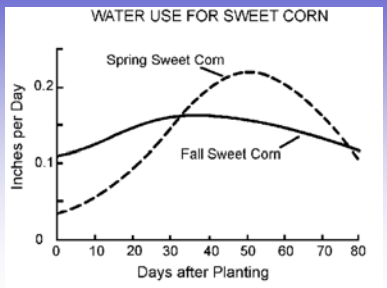
- (1) When a person walking across the lawn can see his/her footprints (easiest)
- (2) When evapotranspiration losses have reached a percentage of the soil’s water holding capacity
- (3) When the soil feels too dry
- (4) When the plants begin to wither?

How much?



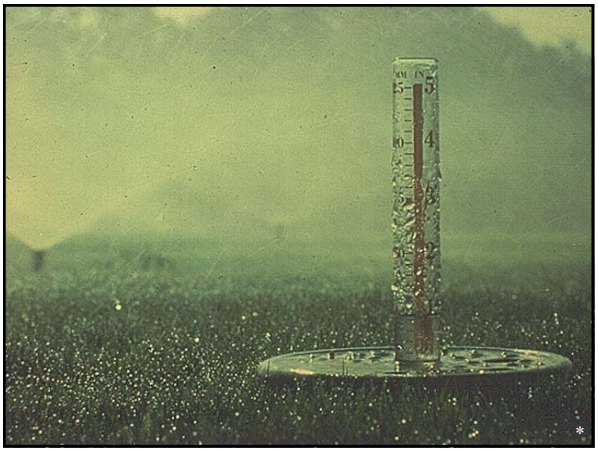
- The amount of water applied is set by the plant water need each week. If this is unknown, **apply 1 inch per week as a starting point** and adjust as necessary
- (SC receives approximately 50 inches of rain each year, but it's not evenly distributed.)

Crop Water Use Curve



When to Water

- Newly planted turf - daily until established (0.2 in/day for 7-10 days)
- Newly planted ornamentals - 1 or 2 times weekly
- High water use zones - 1 or 2 times weekly
- Moderate water use zones - only as needed
- Low water use zones - don't water



1 Inch of water is how much?

- A typical SC household uses 150 gallons of water per day per person
- For a 4 person house average weekly use is 4 x 150 gallons x 7 days = 4,200 gallons per week
- To apply 1 inch of water on 1 acre of land requires 27,154 gallons of water!
- Moral - expect a higher water bill!!

When is the best time to water?

- Common sense has said irrigate during the day to prevent diseases
- Watering during the day exposes the system to much higher evaporative losses - as high as 30% or more of the water pumped can be lost
- Night watering is much more efficient (15% loss generally) - but is it wise?

When is the best time to water?

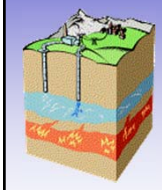
- Prevention of diseases is directly connected to the length of the "leaf wetness" period
- Watering in the evening or early morning - which in effect increases the time the leaves are wet due to the dew fall - can increase disease problems
- Watering during the night after dew fall will generally not escalate problems

Morning Irrigation and Reservoirs

- Some water systems depend on water tank storage to meet early morning water demands
- Irrigating during the 5:00 a.m. time period may deplete the storage of a water system - just in time for the "morning rush."
- Timing the irrigation system so that irrigation is completed earlier can prevent water and pressure shortages.

Irrigation and Soils

Soils hold water!



- Coarse soils (sands) hold little water - and drain quickly
- Fine soils (clays) hold a great deal of water - and drain slowly
- Irrigation scheduling should consider soil type and soil water holding capacity to maximize the benefit of the system

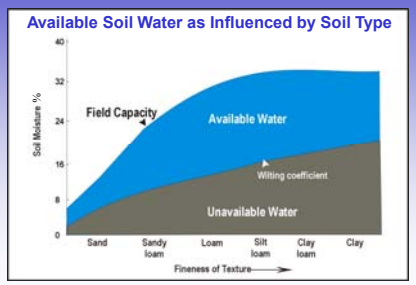
What does this mean?

- Sandy soils cannot hold much water and are well-drained. They should probably be irrigated twice per week.
- Clay soils hold water quite well and hold quite a bit. Irrigating once per week should suffice
- **Do not irrigate every day!** Deep, infrequent watering promotes deeper roots - and healthier plants

Exceptions to Daily Watering

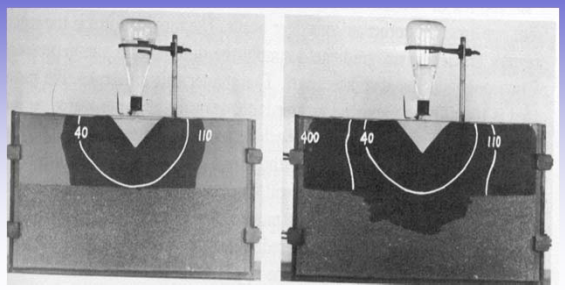
- Newly planted sod
- Potted plants
- Street trees in containers
- Commercial vegetables
- Golf course greens

Available Soil Water

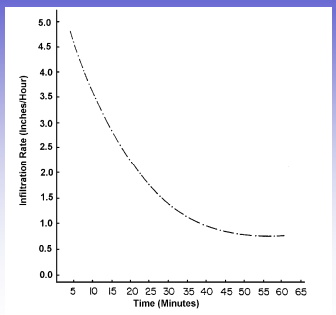


Source: Brady and Weil soils book

Stratified Soils and Water Movement (110 and 400 minutes)



Soil Infiltration Rates



Irrigation Equipment

Impact Sprinklers

(image courtesy Rainbird Mfg.)

(image courtesy Nelson Turf)

(image courtesy Rainbird Mfg.)

Gear-drive and Rotor Sprinklers

(Image courtesy Nelson Turf)

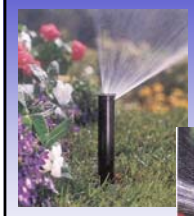
(Image courtesy Hunter Industries)

(Image courtesy Rainbird Mfg.)

Stream Rotors

(courtesy Hunter Mfg.)

Pop-up Spray Heads



(image courtesy Hunter Mfg.)

(images courtesy Rainbird Mfg.)

Spray Head .vs. Sprinkler

Spray Heads - full pattern wetted at once - no stream rotation

Sprinklers - single or multiple rotating streams

Timers and Controllers

(Images courtesy Rainbird Mfg.)

Valves

Gate Valve

(courtesy Hammond Valve)

Ball Valve

(courtesy Spears Mfg.)

Electric Valve

(courtesy Rainbird Mfg.)

Valve Box

(courtesy Tony Tyson, University of Georgia)

- Used when burying valves in the yard for easy identification and access
- Available in various sizes

(courtesy Corey Tanner, Clemson Extension)

Piping

PVC

Black Roll Pipe

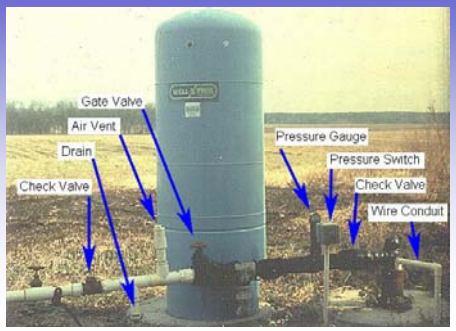
(courtesy Newberry Hardware)

"Swing" Pipe and Joints

(courtesy Rainbird Mfg.)

(courtesy Hunter Industries, Inc.)

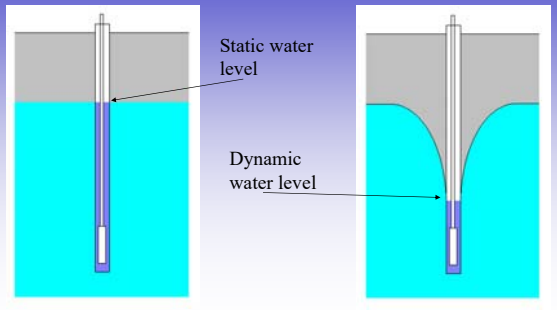
Water Sources



Pump Cycling

- Electric motors *love* to run. Operating a pump 24 hours a day, 7 days a week will not harm it.
- Electric motors *hate* to start. The start windings in the motor heat each time they are used.
- A single-phase motor should not start more often than once every 5 minutes. This allows the star windings to cool between uses.

Wells



Water Meter

(courtesy Tony Tyson, University of Georgia)

- Used on municipal water systems
- available in 5/8", 3/4", 1", and larger sizes
- Adding an "Irrigation meter" may save money in the long run - no sewer charges

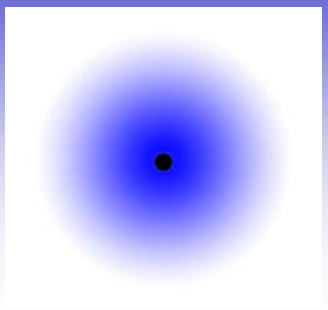
Backflow Preventer

(courtesy Zurn/Wilkins Company)

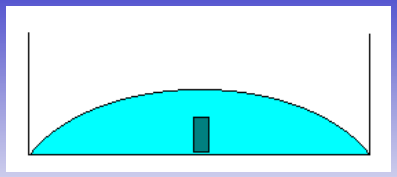
- Available in many different types - need is determined by local water authority
- Prevents "backflow" and contamination of municipal water supply
- Not required for a well system

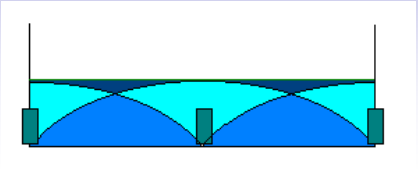
Sprinkler Head Placement

Sprinkler Application Pattern

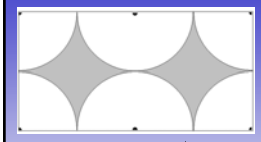


Sprinkler Water Distribution Pattern

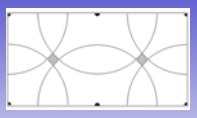




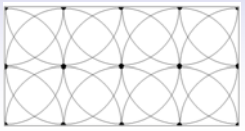
Sprinkler Spacings



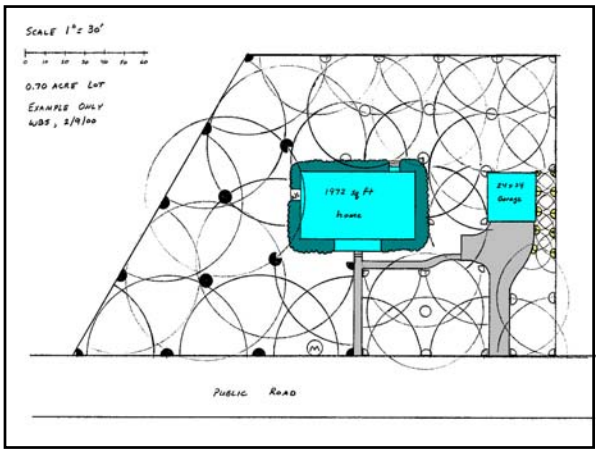
Sprinklers spaced at 100% of wetted diameter

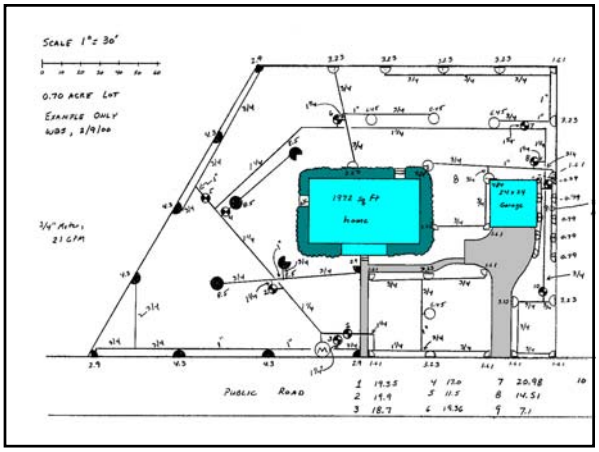


Sprinklers spaced at 75% of wetted diameter

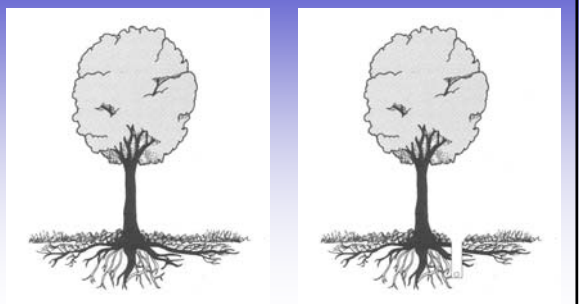


Correct spacing - 50% of wetted diameter



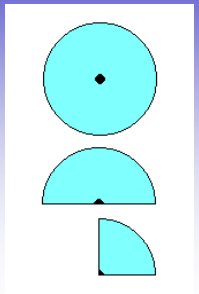


A Word on Trenching, Trees and Tree Roots



(image from "Trees and Turf, Int. Society of Arborculture, 1991)

Sprinkler Areas and Flows



- Full-circles cover 100% of the circle
- Half-circles cover 50% of the circle, so need 50% of the flow of a full circle
- Quarter-circles cover 25% of the circle, so need 25% of the flow of a full circle

Pressure and Elevation

Pressure Losses

- There are two main types of pressure loss in a residential sprinkler system:

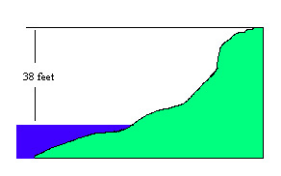
(1) Friction loss - pressure loss due to friction through pipe, valves and fittings. The amount of loss depends on flow rate and pipe size.

(2) Elevation loss - pressure lost (or gained) due to elevation. The amount of loss is <u>not</u> dependant on flow rate or pipe size.

Elevation and Water Pressure

- To pump water up a hill 1 foot high requires 0.433 psi, regardless of pipe size or flow rate
- When pumping water down a 1 foot high hill, the weight of the water *adds* 0.433 psi to the line pressure

Elevation Example - Up Hill



- The vertical elevation difference is 38 feet
- Pressure required to reach hilltop: 38 feet x 0.433 psi/ft = 16.4 psi
- If the pump supplies 50 psi, then there will be 50 - 16.4 = 33.6 psi at the hilltop

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- Images marked with a "*" are courtesy of Tony Tyson, University of Georgia Cooperative Extension Service

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