Stormwater Series
Turfgrass & Water Management

John Emerson Jr.
Turfgrass Nutrient Management Extension Agent
University of Delaware
06-18-2020

UNIVERSITY OF DELAWARE

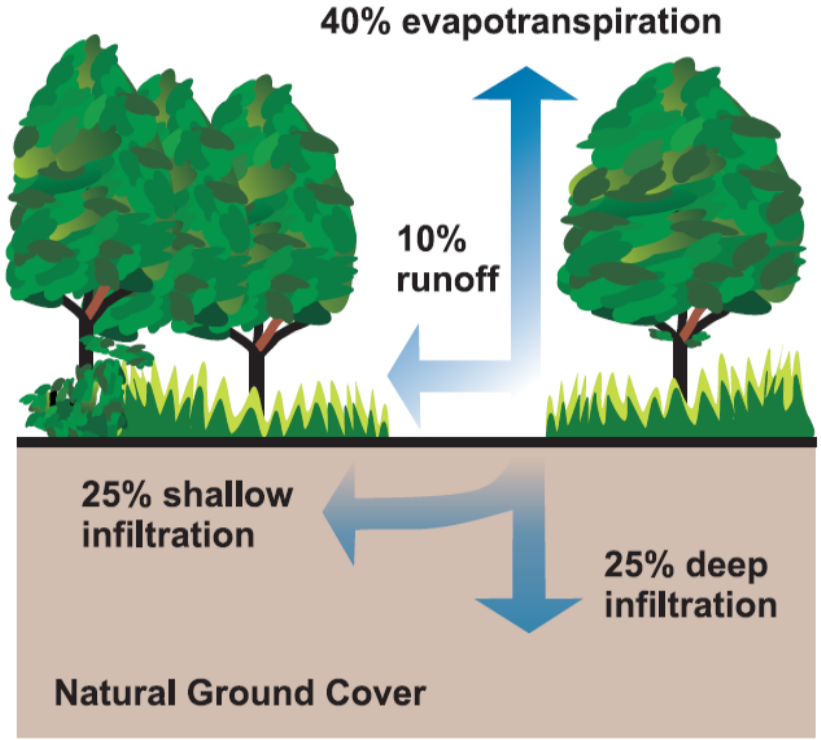
Topics of Discussion

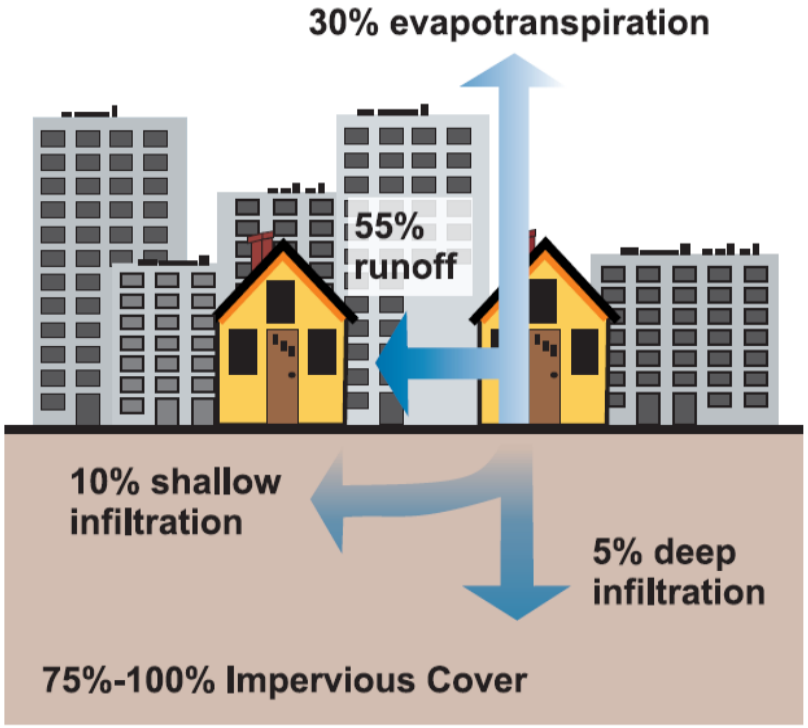
- Potential impacts
- Do’s & Don’t’s
- Agronomy
- Yearly growth cycle
- 5. Water requirements
- 6. Case study
- 7. Induced water stress
- 8. Irrigation auditing

EPA Findings

“A household’s outdoor water use can be as high as 60 percent. In addition, some experts estimate that as much as 50 percent of water used for irrigation is wasted due to evaporation, wind, or runoff caused by inefficient irrigation methods and systems”.

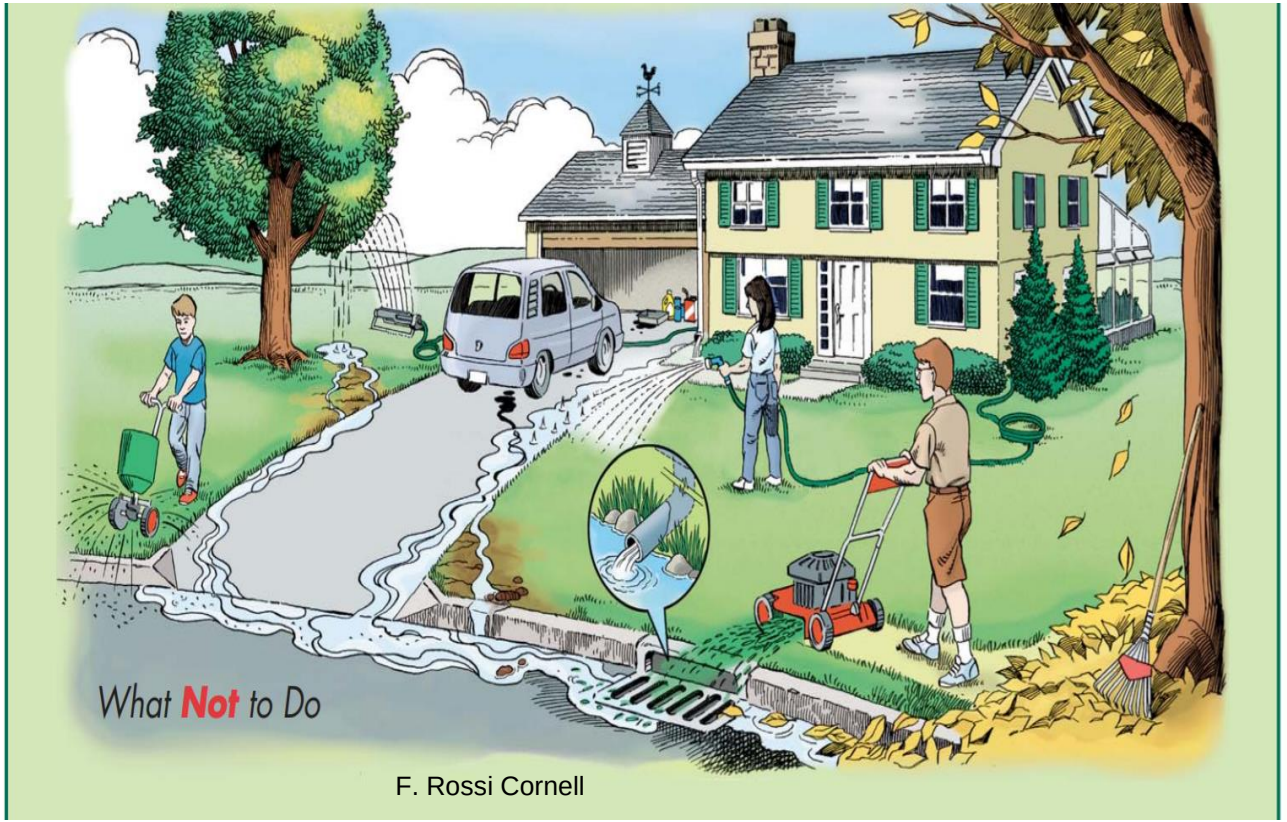
Impacts


40% evapotranspiration
10% runoff
25% shallow infiltration
25% deep infiltration
Natural Ground Cover


30% evapotranspiration
55% runoff
10% shallow infiltration
5% deep infiltration
75%-100% Impervious Cover

Issues With Over Watering

- Excessive leaching
- Excessive runoff
- No acclimation to drought
- Ideal situation for disease
- Waste of water
- Waste of money



F. Rossi Cornell

Evapotransporation (ET)

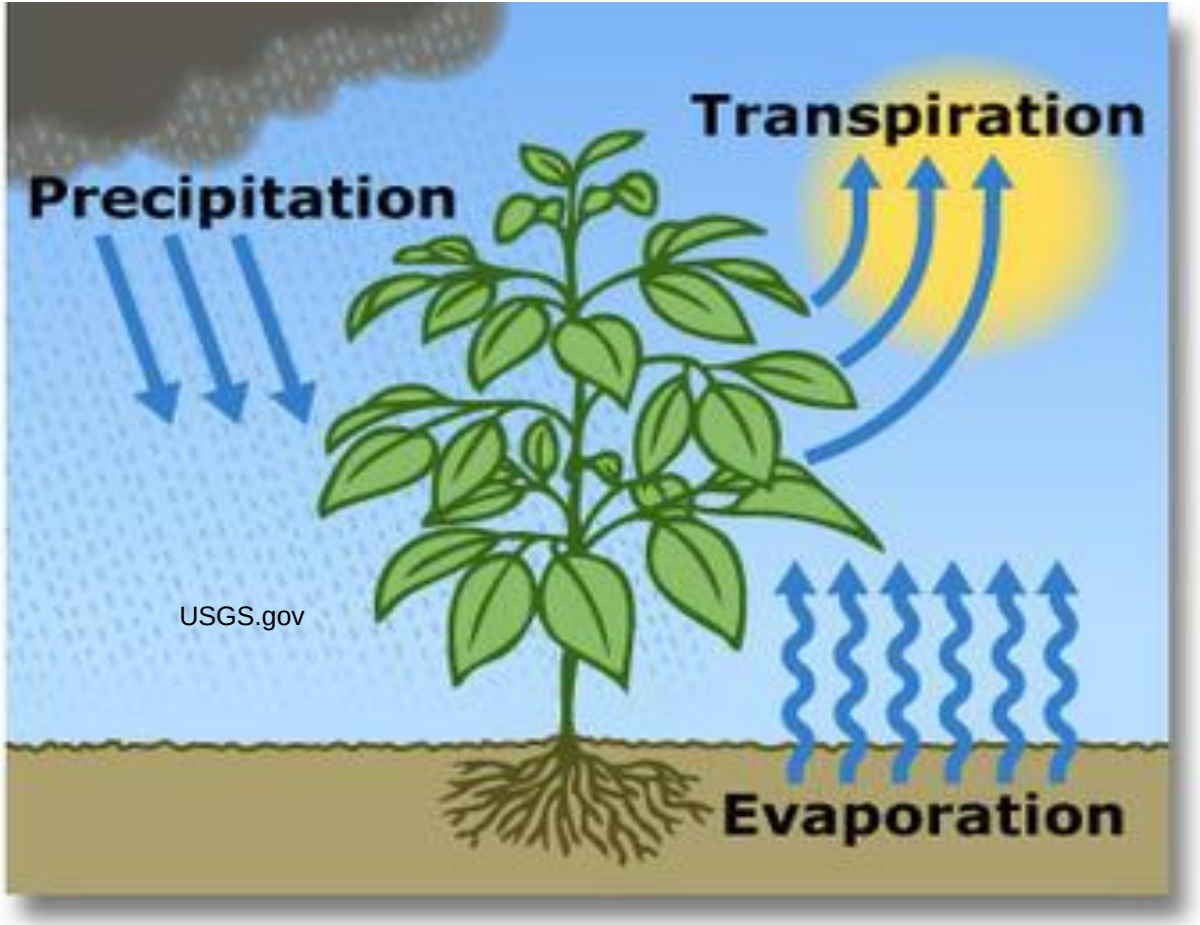
- Evaporation + Transpiration
- As light intensity, temperature, and wind increases so does ET.
- Cloud cover*
- Humidty * (30-50%)

Photosynthesis

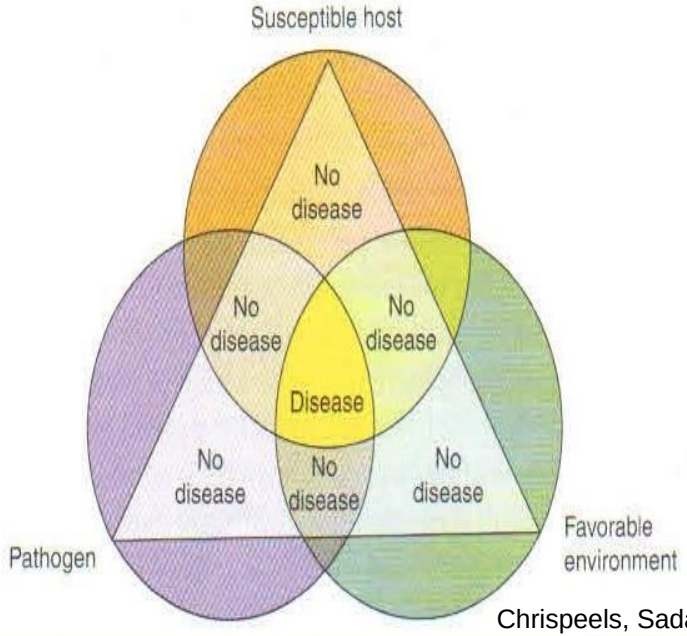
$$6CO_2 + 6H_2O \xrightarrow{\text{light energy}} C_6H_{12}O_6 + 6O_2$$

Respiration

$$C_6H_{12}O_6 + 6O_2 \rightarrow \text{energy} + 6CO_2 + 6H_2O$$



Disease Triangle



Chrispeels, Sadava 2003

- Monocultures
- Proper cultivar
- Agronomic practices
- Fungicides

Everything Starts and Ends With Your Soils

- Soil quality is USUALLY the culprit for most problems
- Soil quality dictates long term plant health
- Water and nutrient holding capacity
- Natural buffer
- Compacted soils

Cultivar Selection

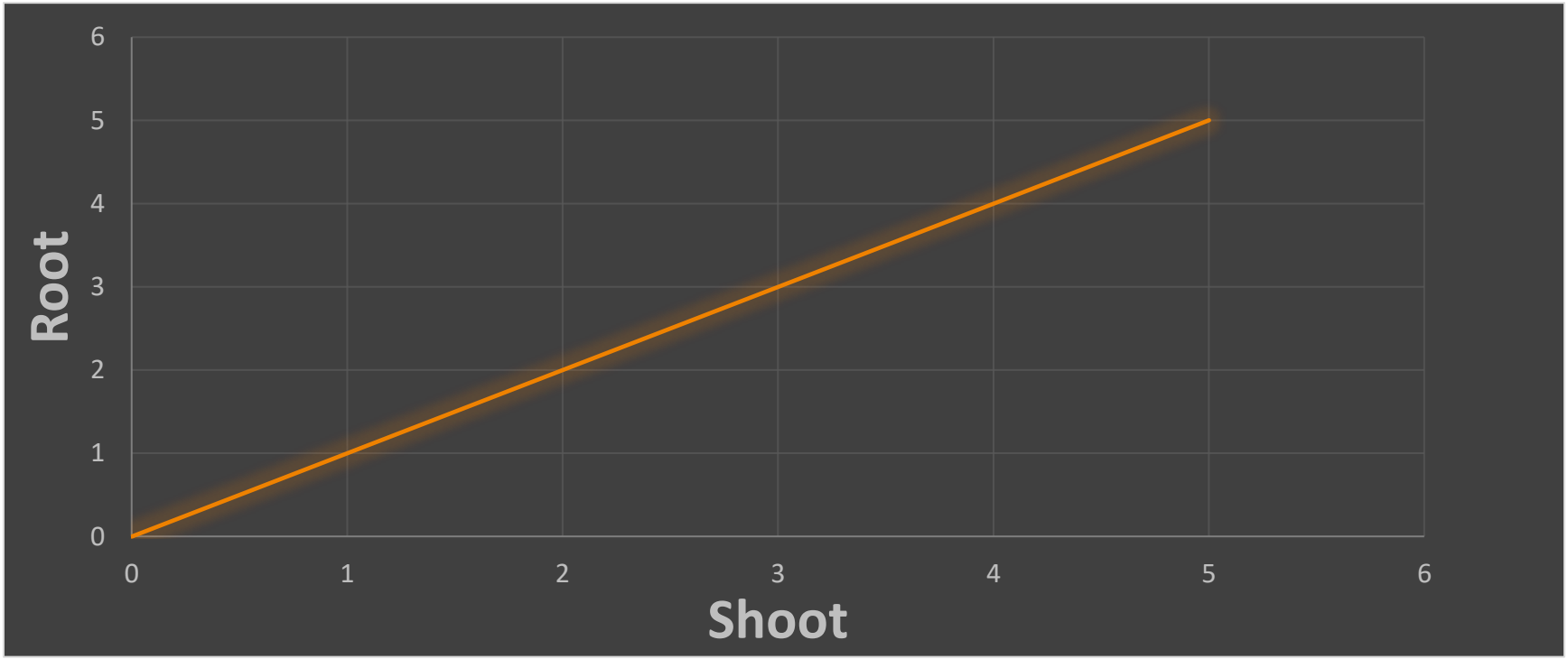
- Expectations
- Warm vs. Cool season
- Drought tolerance
- Disease
- Insect
- Color
- Shaded areas/trees drip lines

Mowing Heights

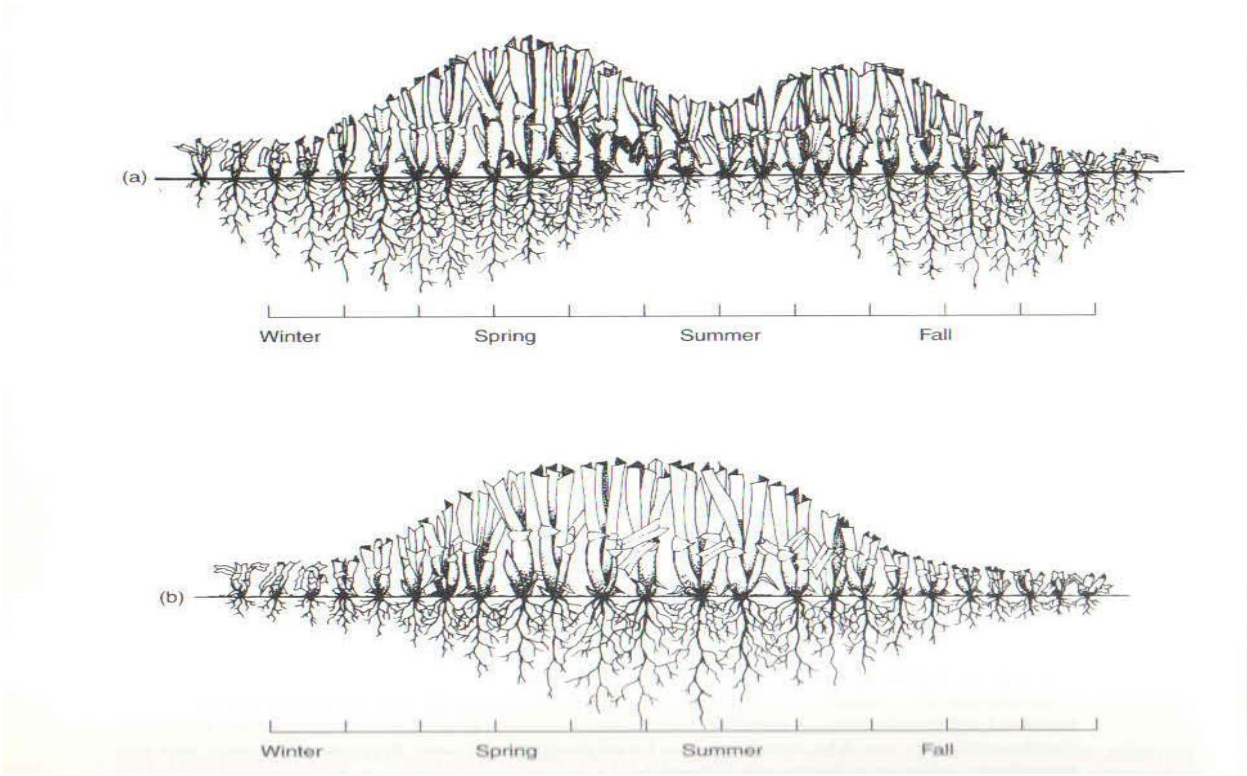
- Mowing is a form of plant stress
- Blade sharpness
- Leave clippings
- 1/3rd rule

Species	Recommended Mowing Heights For Turfgrasses
Cool Season	**H.O.C. (in inches)**
Ky Bluegrass	2.0 - 3.0
Tall Fescue	2.5 - 4.0
Perennial Ryegrass	2.0 - 3.0
Fine Fescue(s)	2.0 - 3.0
	*Lower in spring and fall. Higher in summer.
Warm Season	
Bermuda	0.75 - 3.0
Zoysia	0.75 - 3.0
	*Lower in summer. Higher in fall. First mowing in mid-May to early June. Last mowing should be in October.

Root to Shoot Ratio

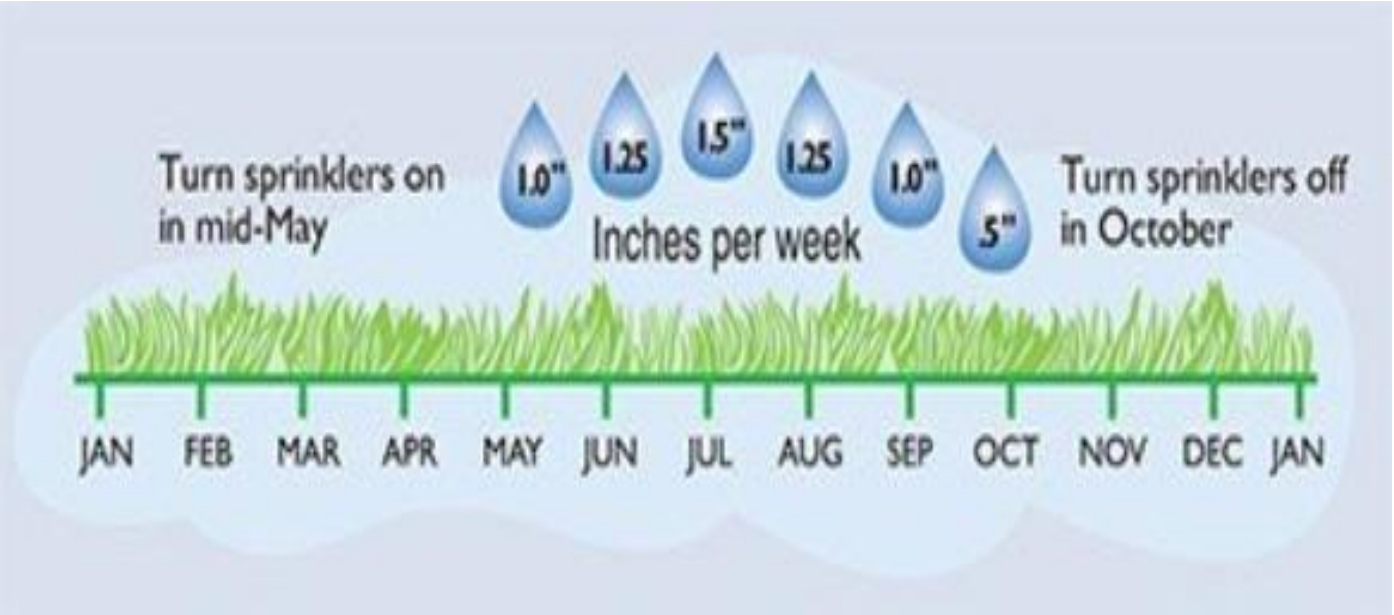


Growth Cycle(s) of Turfgrasses

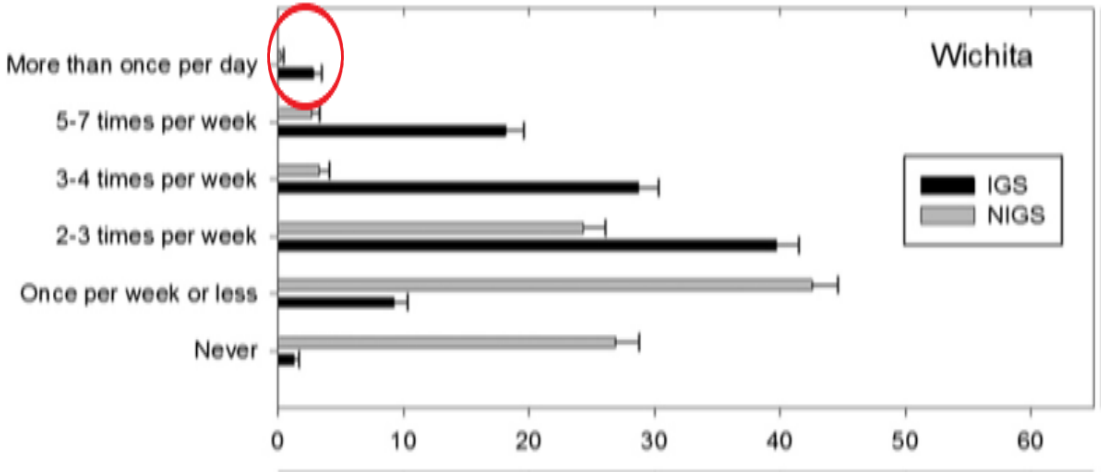


A.J. Turgeon

Average Water Requirements For Turf



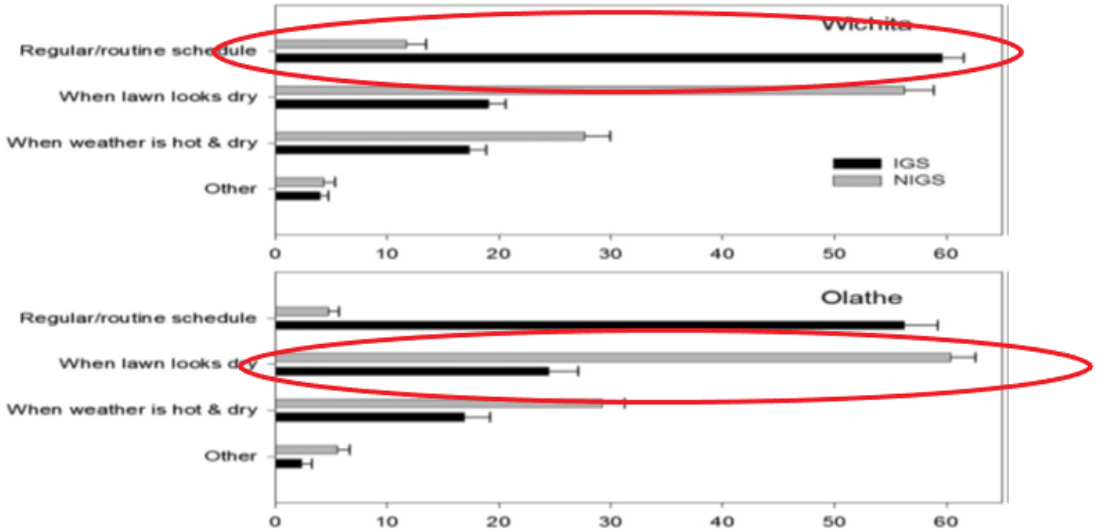
“How often do you water your lawn during dry periods of the summer?”



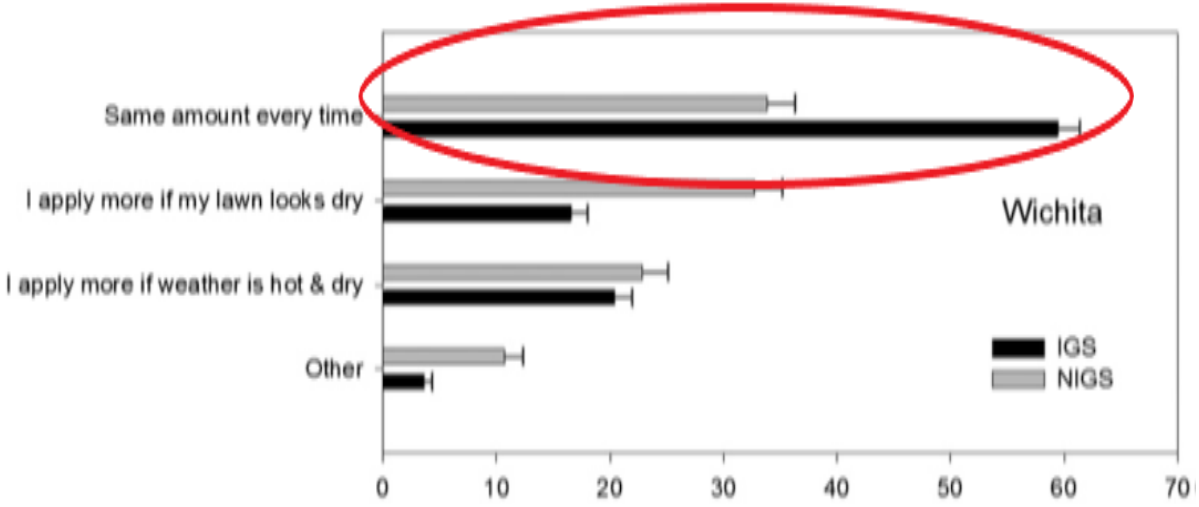
In-ground Irrigation Systems Affect Lawn-watering Behaviors of Residential Homeowners

D. Bremer, S. Keeley, A. Jager, J. Fry, C. Lavis 2012

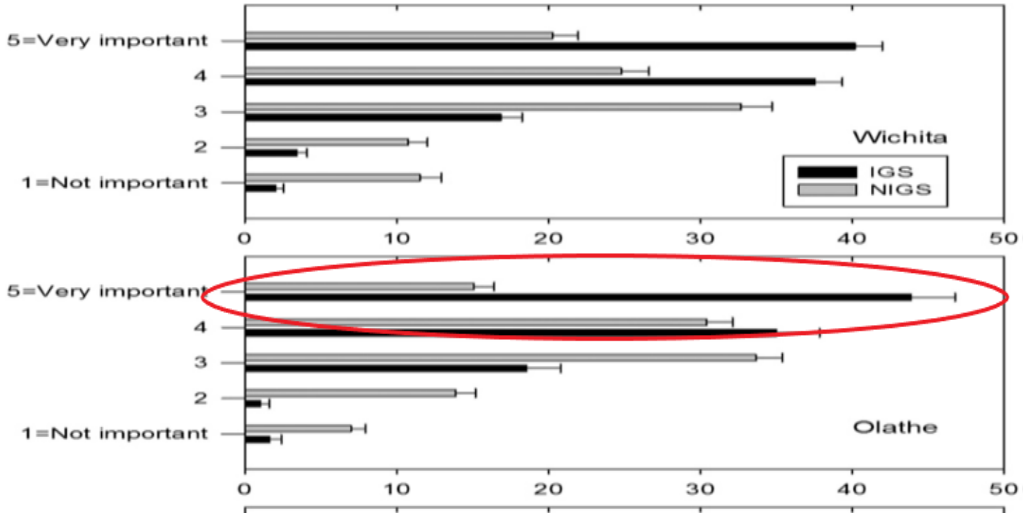
“When do you decide when it is time to water your lawn?”



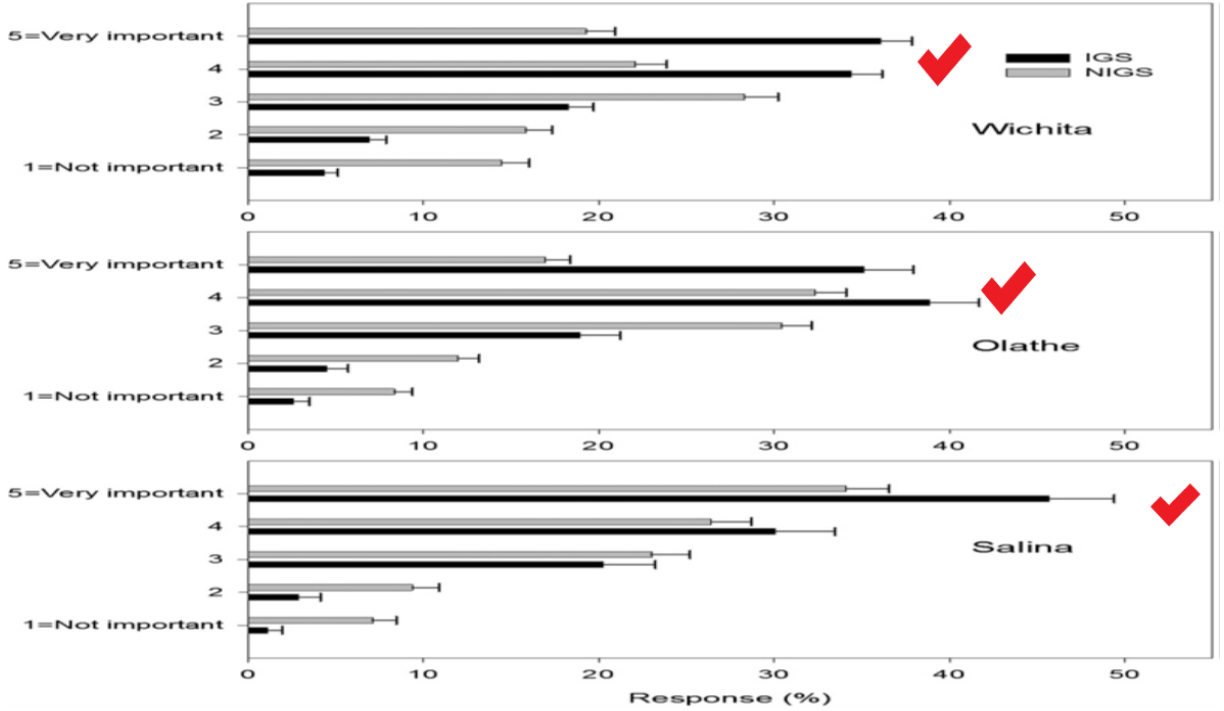
“How do you decide how much to water your lawn?”



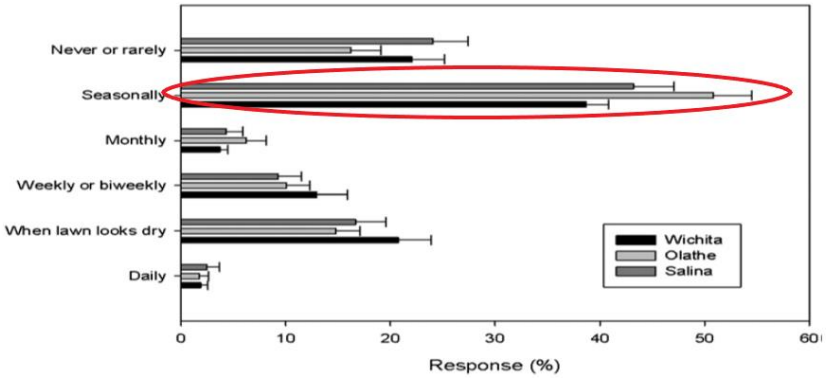
“I like my lawn to look green all the time.”



“I try to follow current lawn-care guidelines and recommendations.”



“How actively do you adjust your sprinkler timer?”



Induced Water Stress

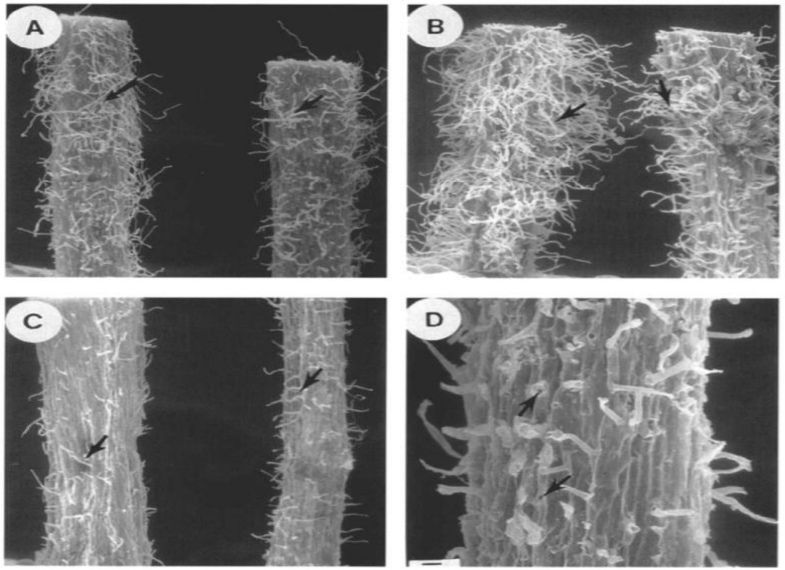
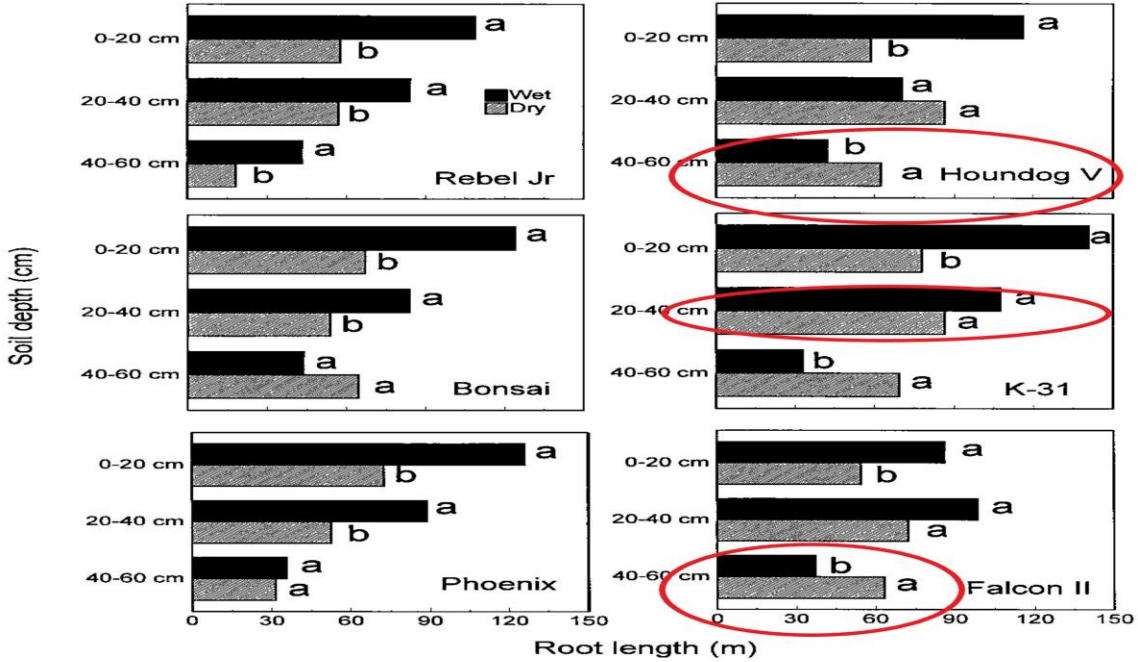


Fig. 4. Root hair development of Kentucky-31 under well-watered conditions (A), after 14 d of dry down (B), and after 28 d of dry down (C) and (D). Arrows indicate root hairs. The horizontal bar in D represents 100 μm.

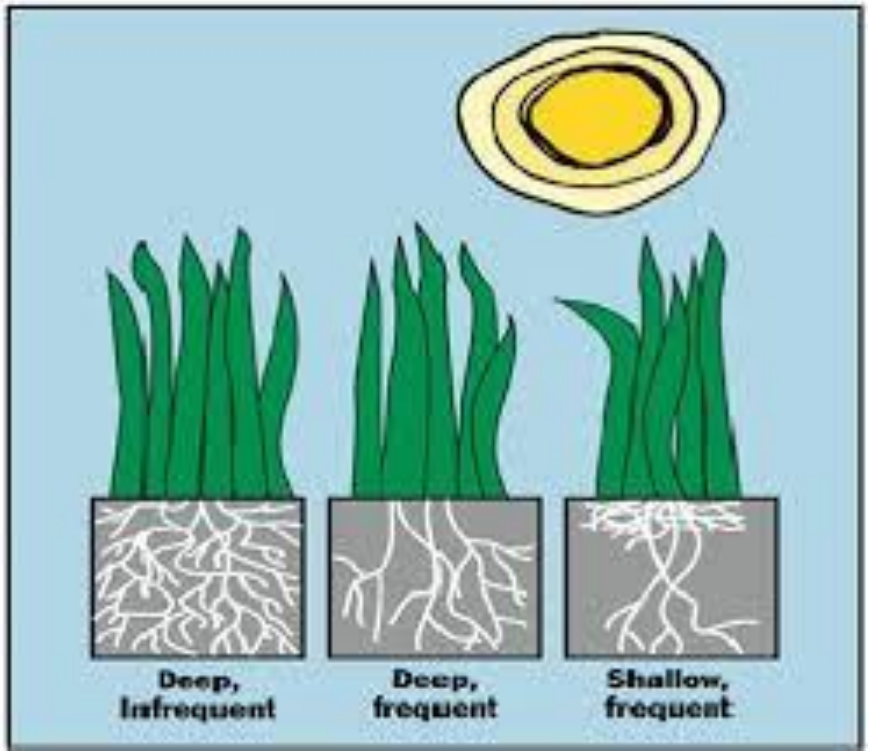
Huang & Fry 1998

Root Response To Drying Of Soils



Roots and Water

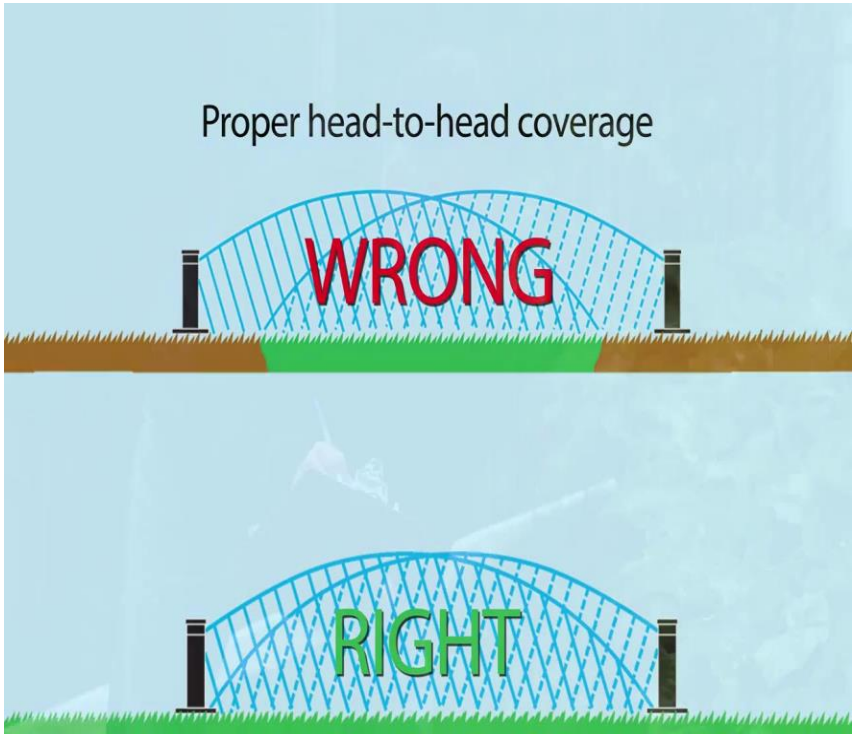
- Irrigation Cycles
- Frequency
- Weather



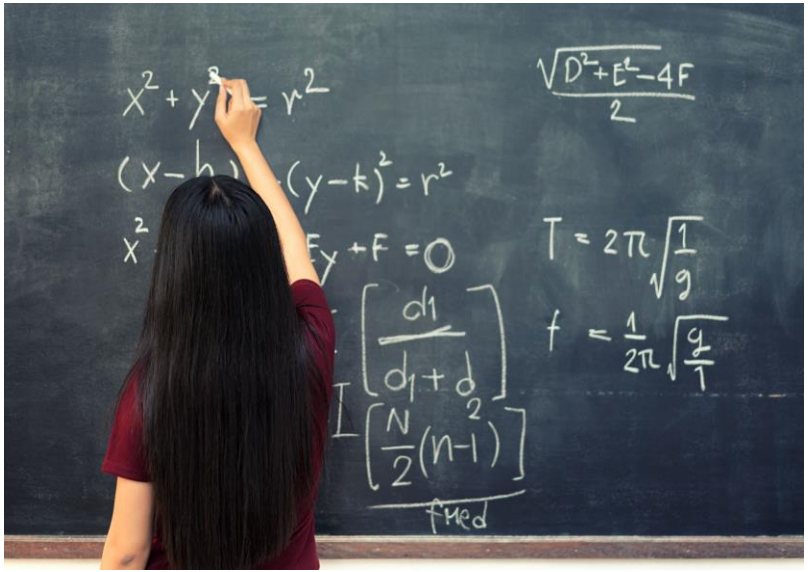
Irrigation Audit

- Manual vs. Automatic Programs
- No leaks
- Proper coverage
  - Pressure
  - Arc & Radius
  - Nozzles
- Catch Pan Test
- Rain gauge

Catch Can Test



Art or Science?



Signs Of Drought Stress

- Foot printing
- Severe wilting
- Blue-gray-silver discoloration
- Leaf roll/folding
- Overall plant vigor decline

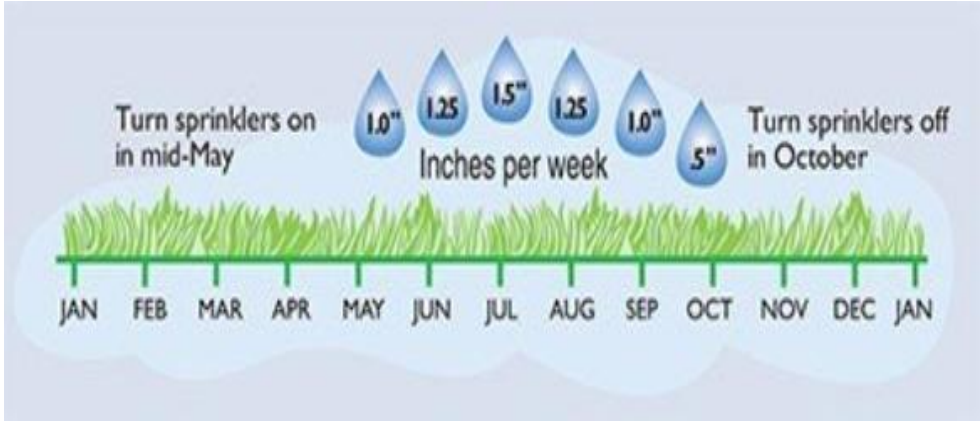
Signs of Drought Stress

- Foot Printing

- Wilting

Checking Soil Moisture

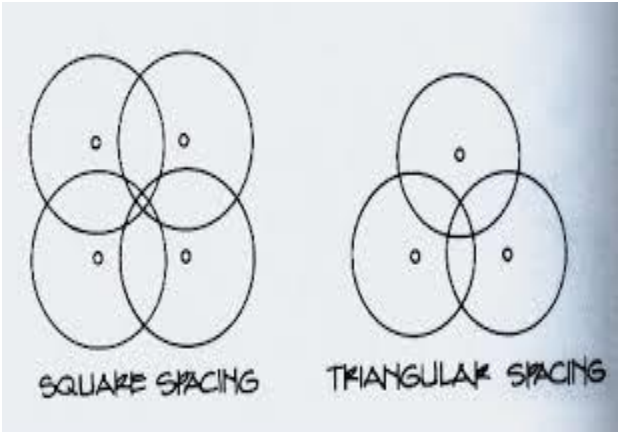
Rain Gauge



How Much Water Are You Putting Out?

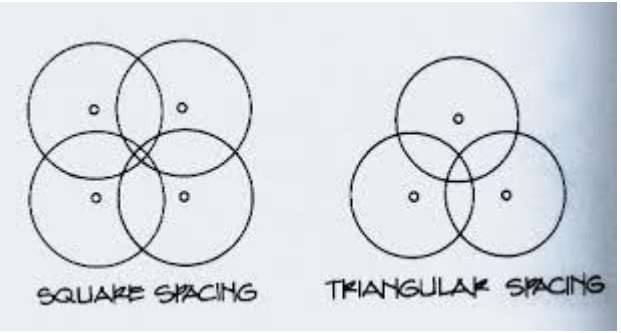
Falcon® 6504 Nozzle Performance

Pressure psi	Nozzle	Radius ft.	Flow gpm	Precip In/h ■	Precip In/h ▲
30	4	39	2.9	0.37	0.42
	6	43	4.2	0.44	0.50
40	4	41	3.3	0.38	0.44
	6	45	4.9	0.47	0.54
	8	49	6.6	0.53	0.61
	10	51	8.1	0.60	0.69
	12	53	9.7	0.66	0.77
	14	55	11.3	0.72	0.83
	16	55	12.6	0.80	0.93
	18	59	13.7	0.76	0.87
50	4	41	3.7	0.42	0.49
	6	49	5.5	0.44	0.51
	8	51	7.4	0.55	0.63

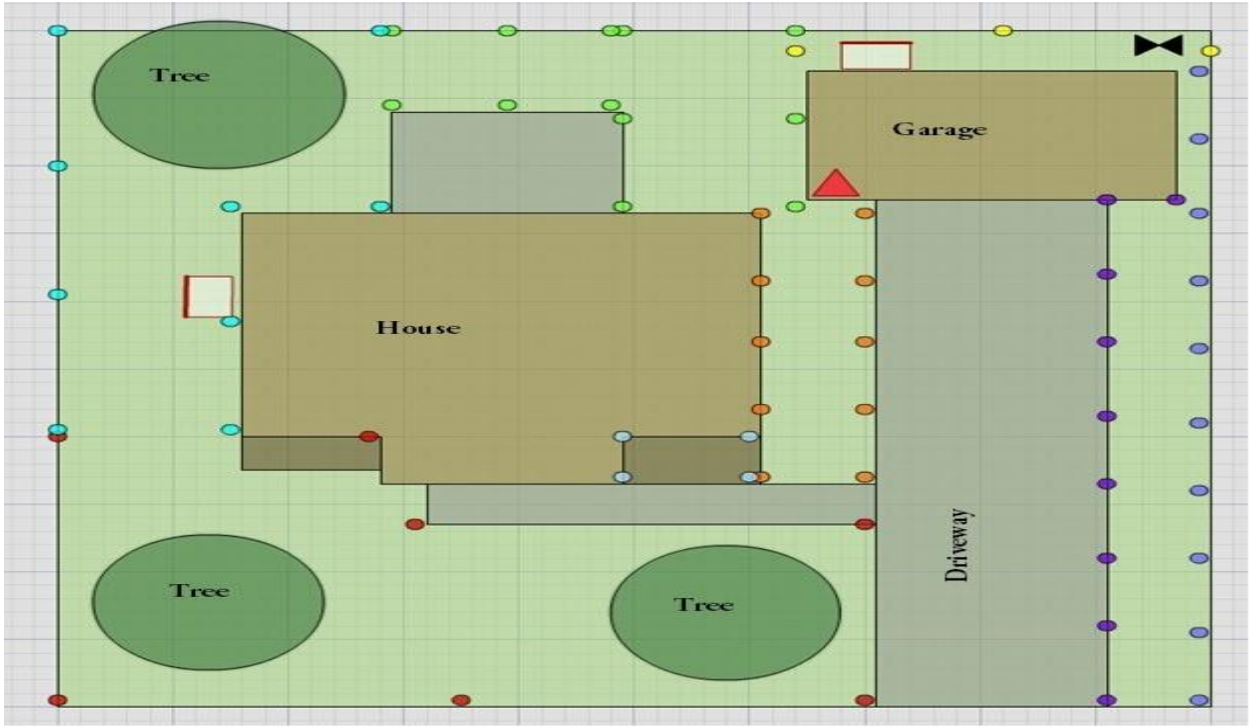


Rainbird.com

Square & Triangle Spacing



Irrigation Map



Take Control

- Smart controllers

- Moisture meters

Best Management Practices

- Take control of your irrigation system
- Apply water only when needed
- Your turf needs some form of drought stress
- Too much water can be detrimental to turf health & environment
- Monitor and track weather conditions
- Audit at the start-up & shut-down
- No more “set it, and forget it”

Landowner Environmental Footprint

- YOU CAN MAKE A DIFFERENCE!!!!
  - Judicious watering practices
  - Proper cultivar selection
  - Nutrient management
  - Set the example, be an agent of change

Delaware Liveable Lawns

- https://www.delawarelivablelawns.org/
- Homeowner tab
- Certified businesses