WATER MANAGEMENT TO IMPROVE TURF PERFORMANCE

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YOU NEED IRRIGATION FOR…

I. Plant health
II. Turf establishment
III. Turf recovery
IV. Pesticide and fertilizer applications
V. Aerification
VI. Other cultural practices

I. PLANT HEALTH

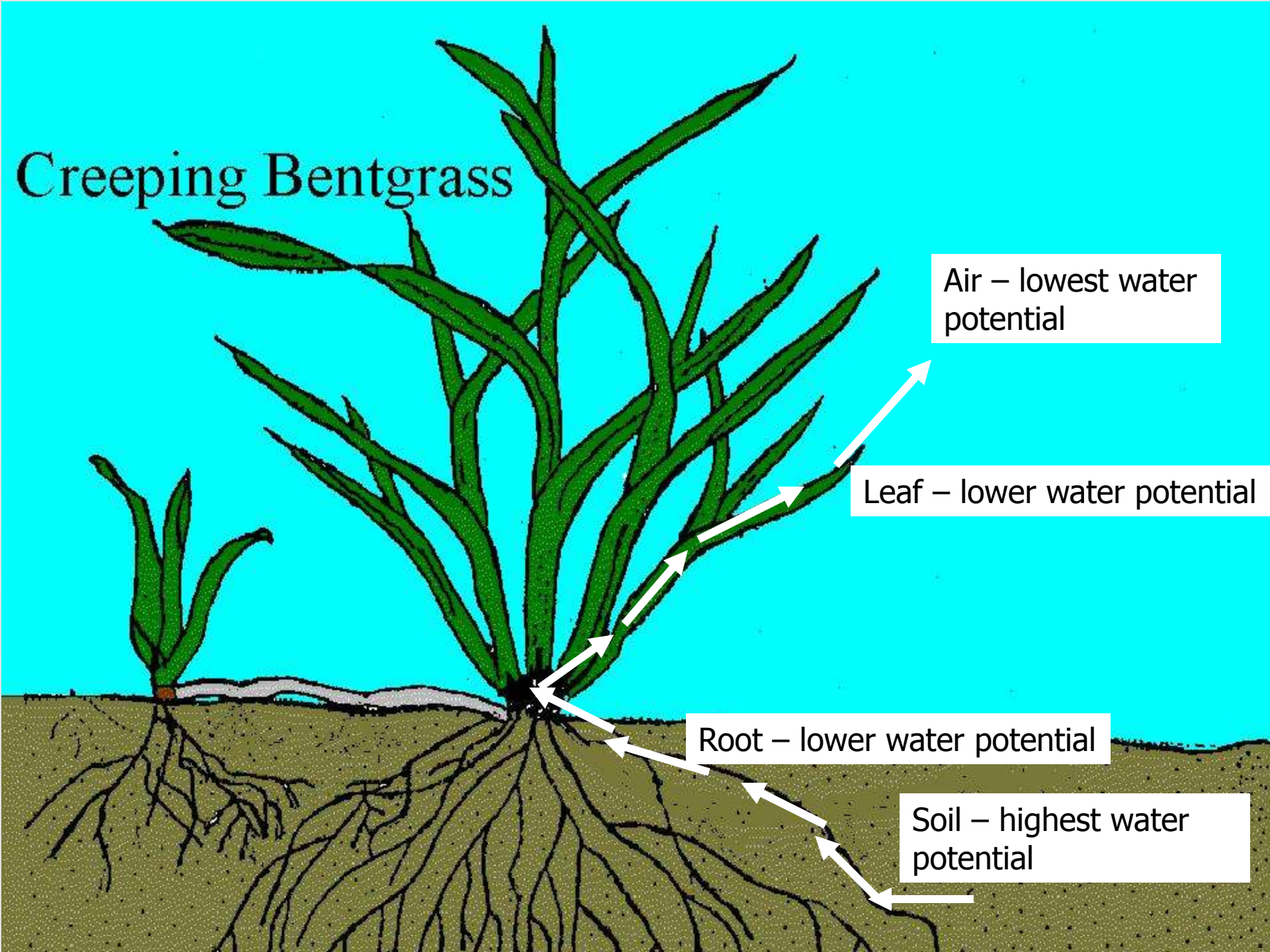
- 90% of the plant is water!

WHAT ARE THE POTENTIAL FATES OF WATER APPLIED TO A STAND OF TURF?

- Absorbed by plant
  - Roots
  - Leaves
  - Transpired through stomates
- Stored in soil (temporarily)
- Runoff or leaching
- Evaporation
  - Before reaching ground
  - From Soil
  - From leaf surface

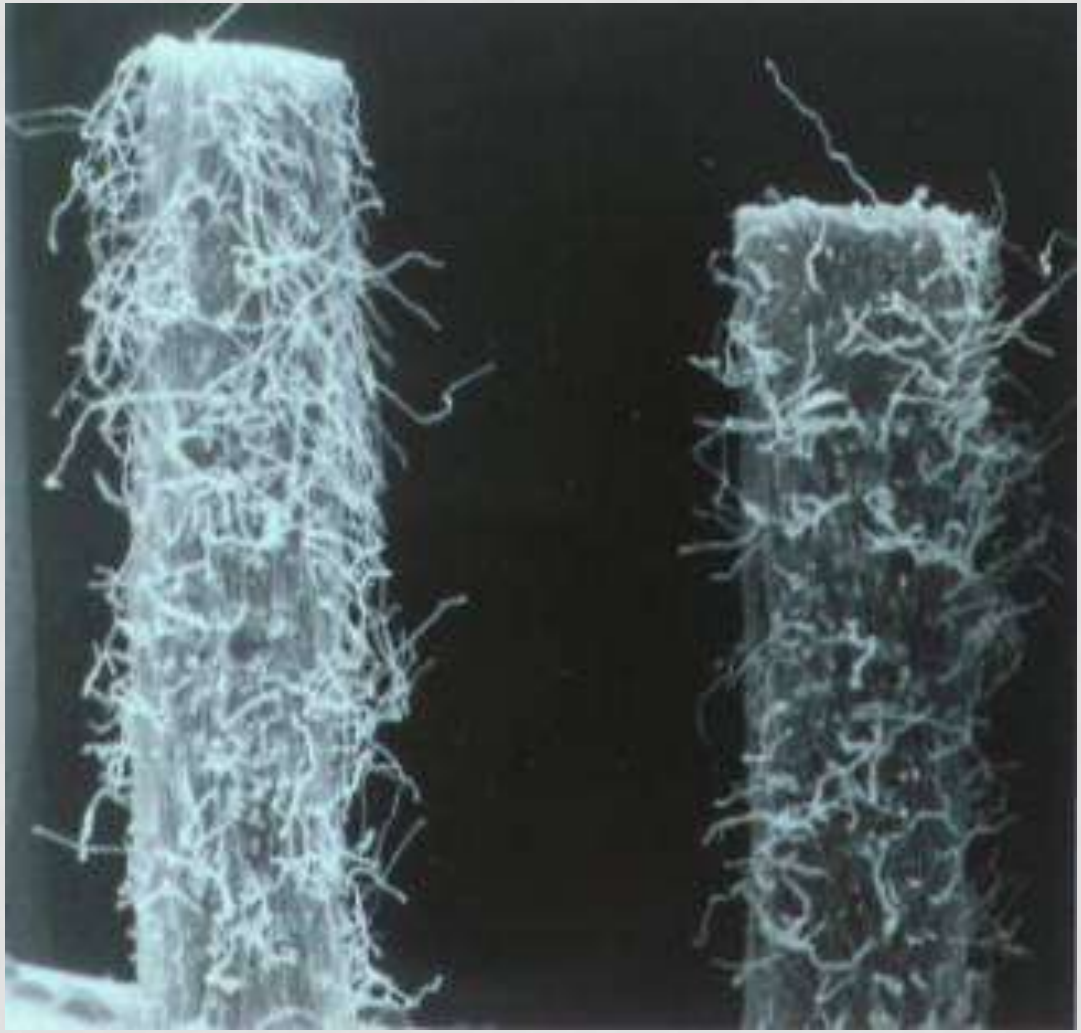
WHAT DOES WATER DO FOR THE PLANT?

FOR WATER MOVEMENT,
A WATER POTENTIAL
GRADIENT IS NEEDED


Creeping Bentgrass
Air – lowest water potential
Leaf – lower water potential
Root – lower water potential
Soil – highest water potential

WATER ABSORPTION IS GOVERNED BY EXTENT OF ROOTING

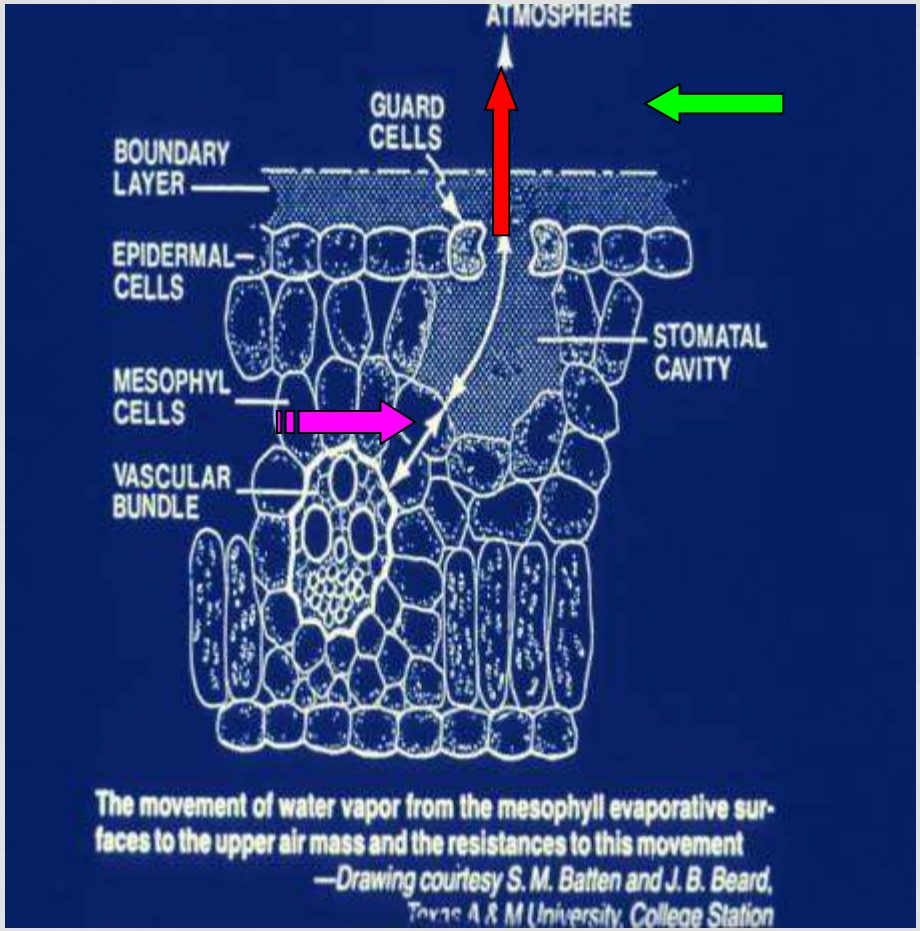
- Affected by:
- Environmental
  - Water content
  - Temperature
  - Soil characteristics
  - Cultural:
    - Fertilization
    - Irrigation
    - Mowing



- Root hairs on tall fescue

TRANSPIRATION

- Transpiration is mainly controlled by three factors:
  - Internal resistance
  - External boundary layer resistance
  - Vapor pressure gradient between the air and leaf



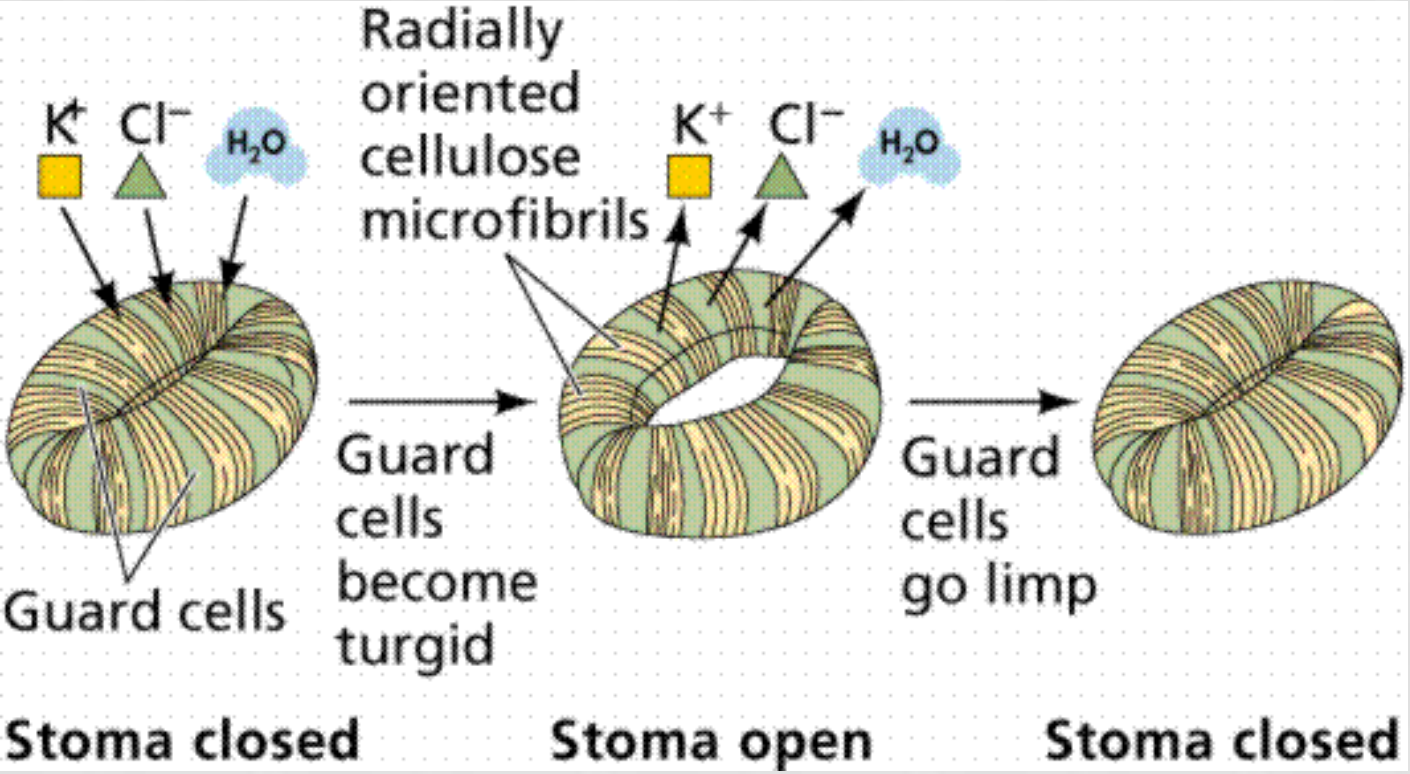
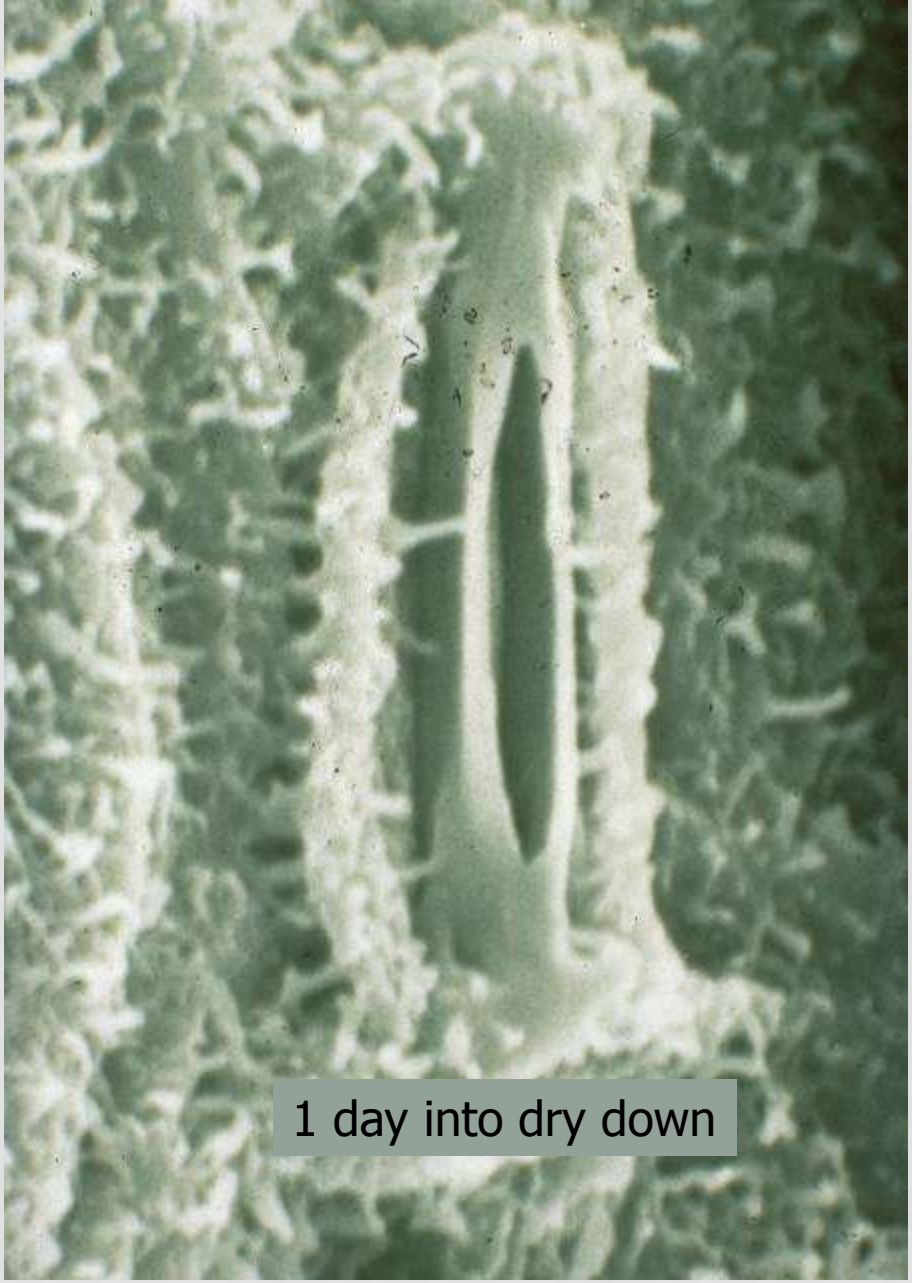
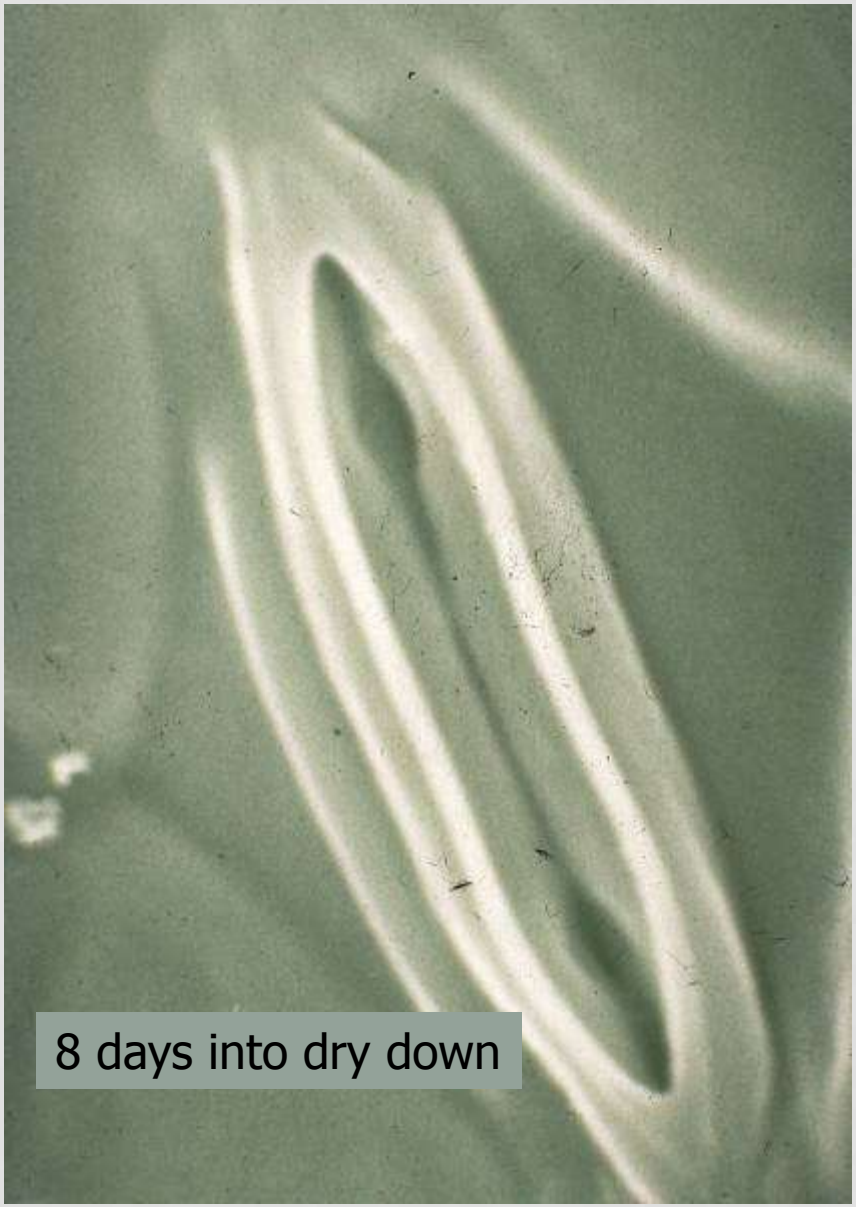
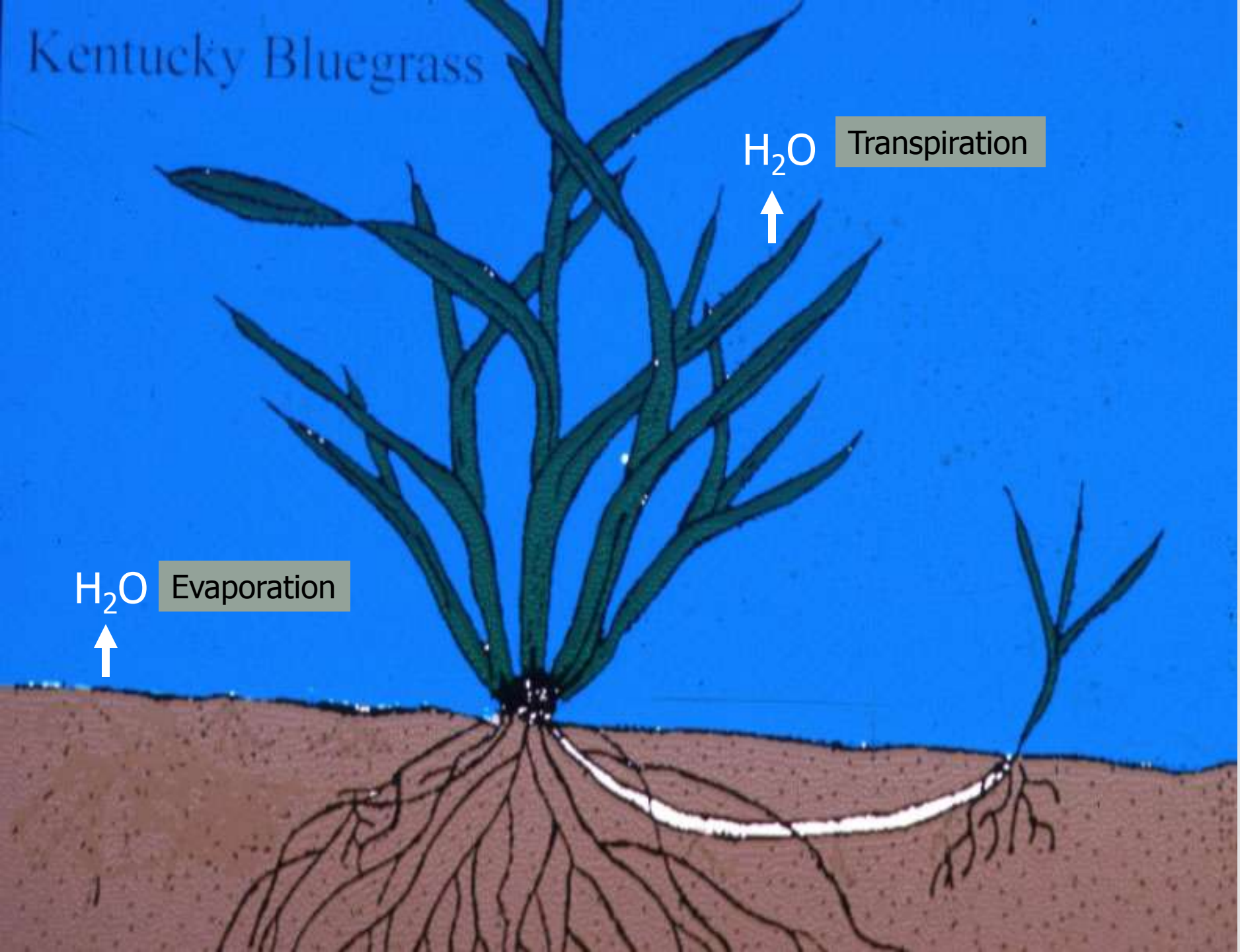


Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com)

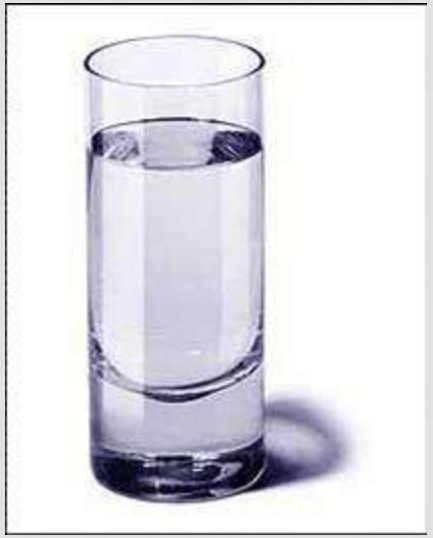




- St. Augustine stoma


Kentucky Bluegrass
H_2O
Transpiration
H_2O
Evaporation

ET IS EXPRESSED AS DEPTH OF WATER LOST OVER TIME



- http://techalive.mtu.edu/meec/module01/Transpiration.htm

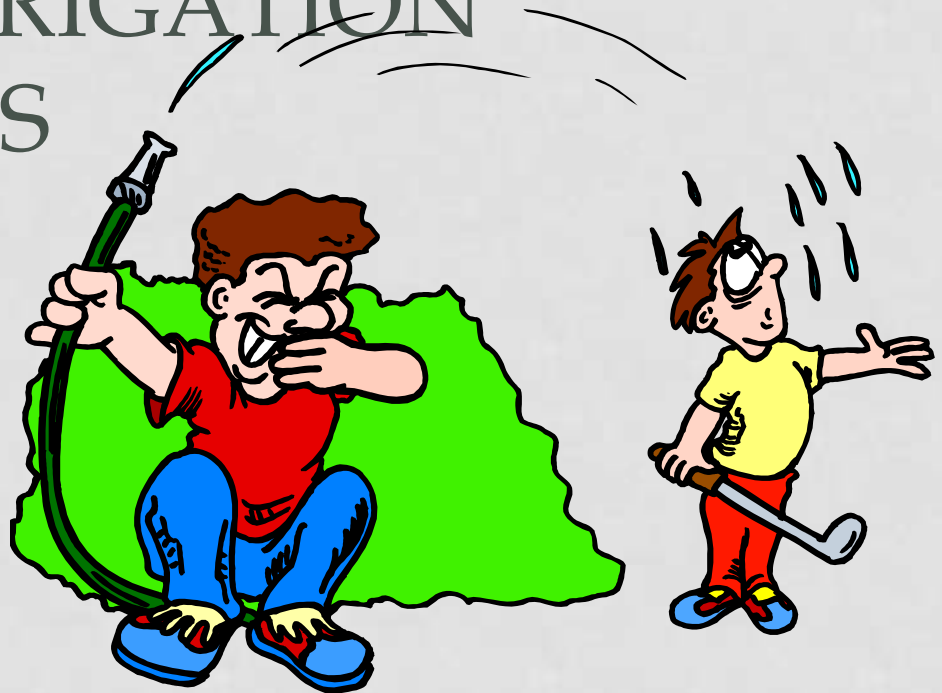
WHAT ENVIRONMENTAL FACTORS INFLUENCE ET?

TYPICAL ET RATES: 1 TO 7 MM PER DAY (0.1 TO 0.3 INCH PER DAY)

- Cool-season grasses have higher ET rates than warm-season grasses

Rainbird.com

YOU SHOULD BE USING SOME METHOD TO DETERMINE IRRIGATION NEEDS



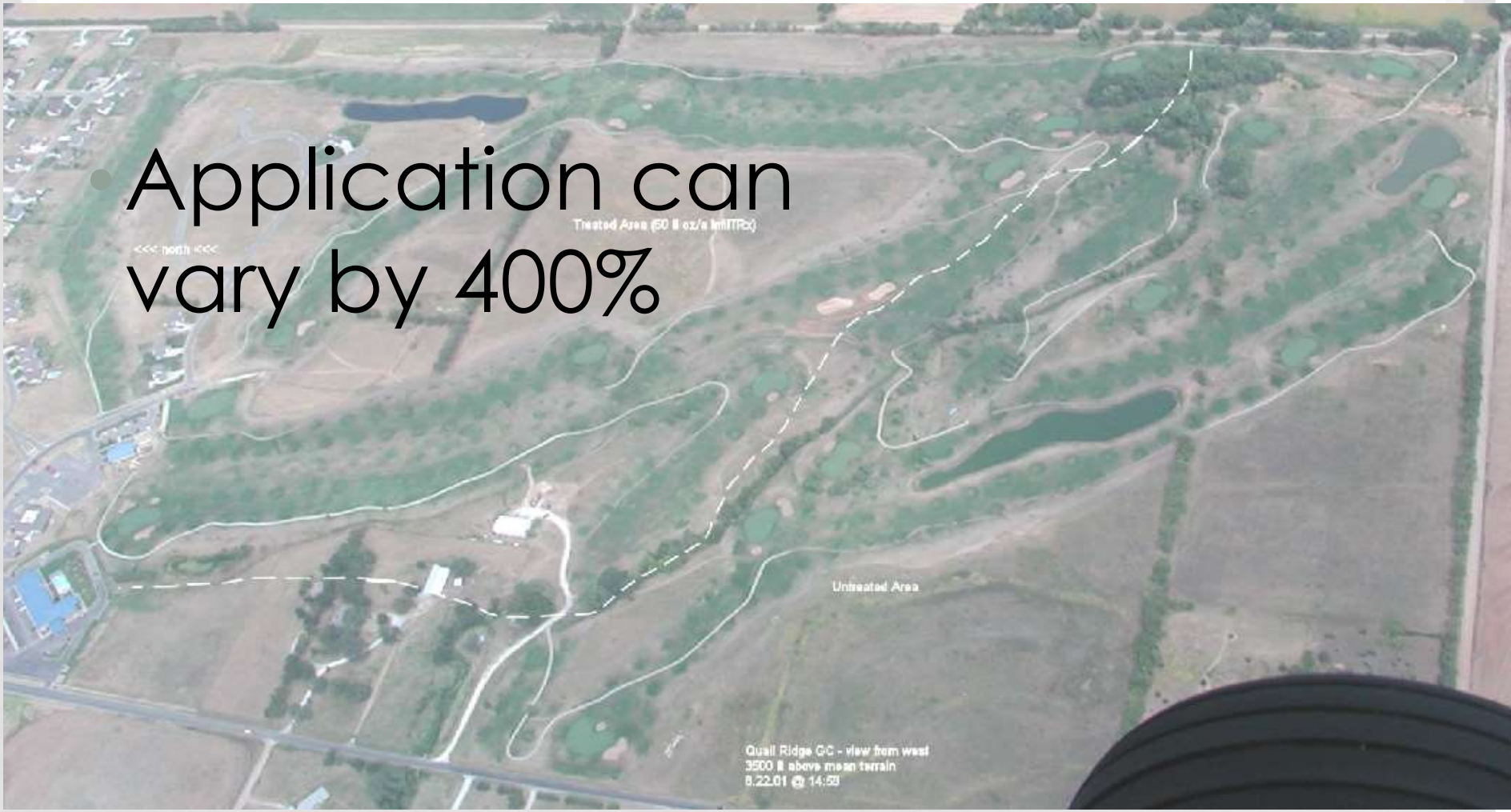
MONITOR ET

- A lot more water is applied to turf on which need is not monitored using ET estimates or soil moisture sensors.

Myth:

- Automatic irrigation systems apply water uniformly.

- Application can vary by 400%



- Do an irrigation audit and make adjustments to improve uniformity.

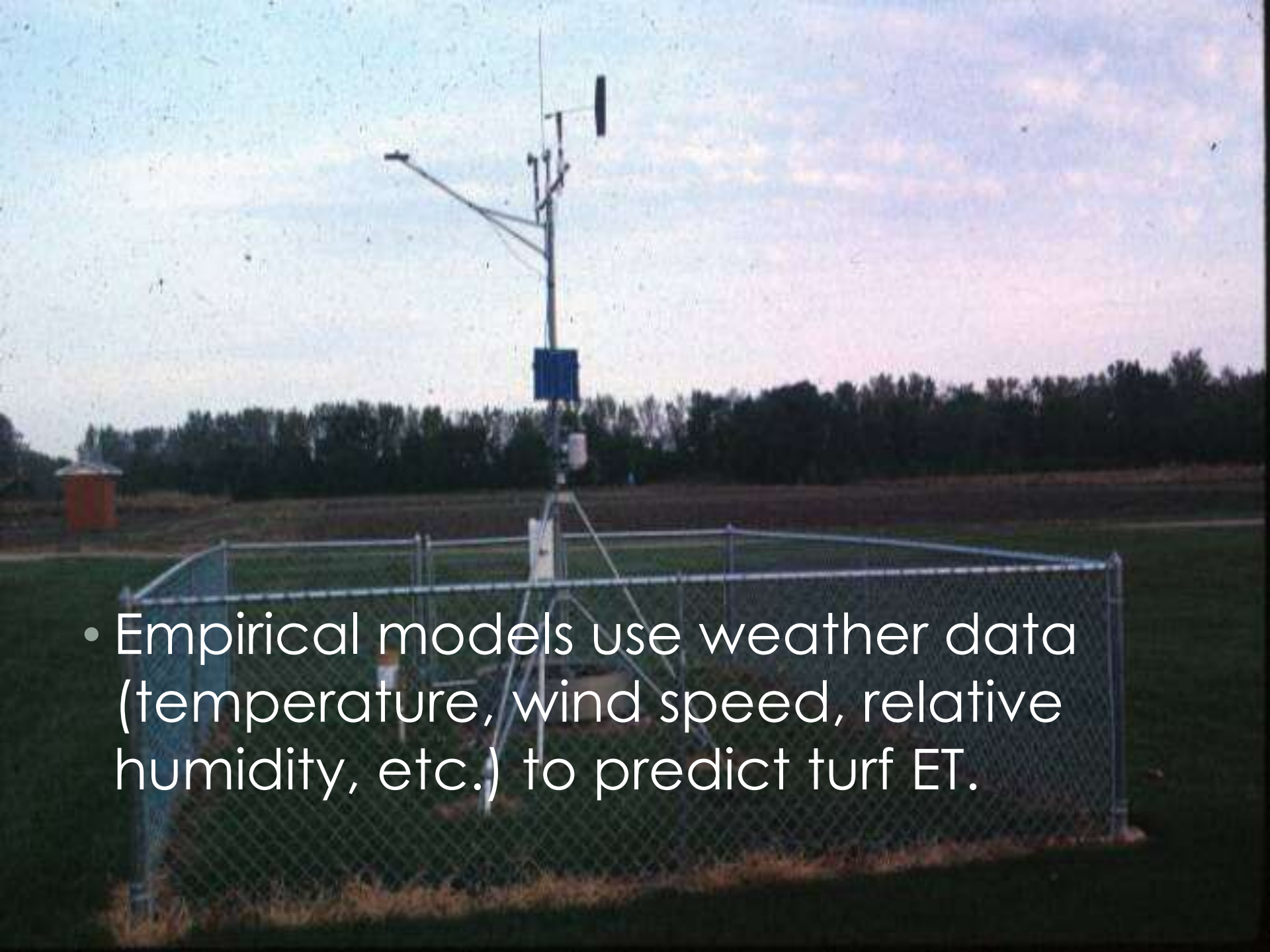
- Estimates are of little use if the system can't deliver the water efficiently.

ET ESTIMATORS

- Lysimeters

H_2O

ET Gauge



- Empirical models use weather data (temperature, wind speed, relative humidity, etc.) to predict turf ET.

MEASURE SOIL WATER CONTENT

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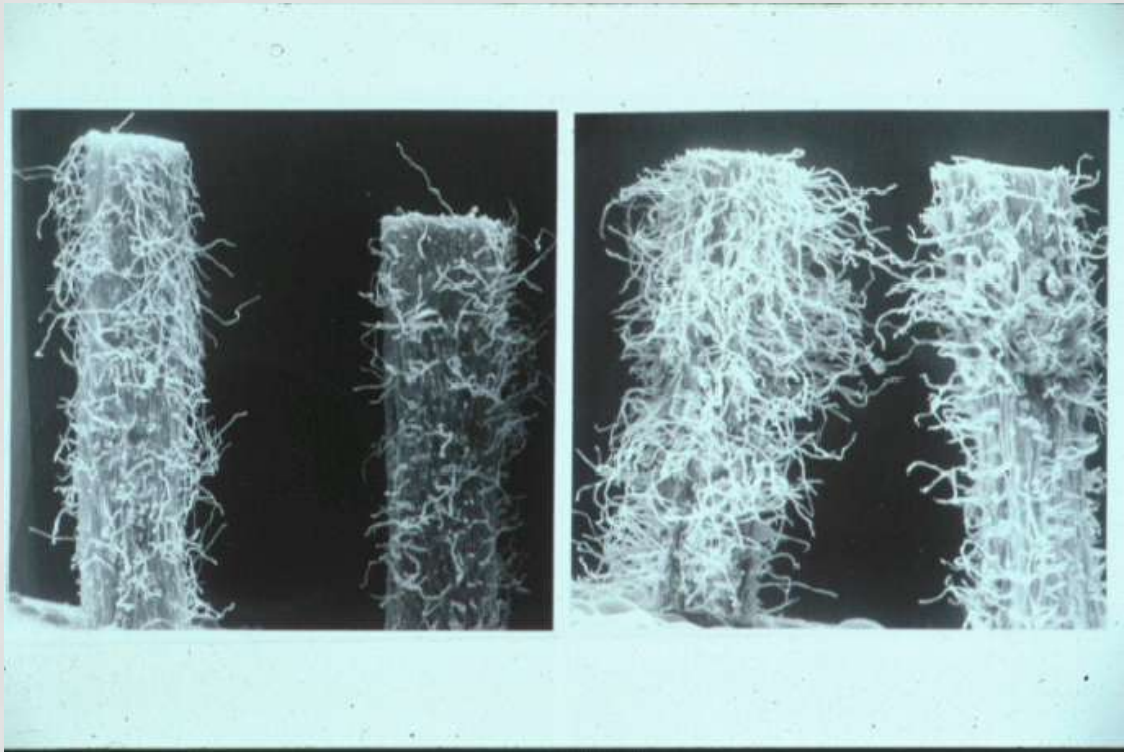
FREQUENCY

- Don’t irrigate by routine; rather, use wilt-based irrigation

- Allowing surface soil to dry between irrigations promotes deep rooting.

WILT-BASED IRRIGATION

- Greater total root production, and development of more and longer root hairs.



WHY DOES PERIODIC DRYING CAUSE ROOT ENHANCEMENT?

ANOTHER POTENTIAL BENEFIT

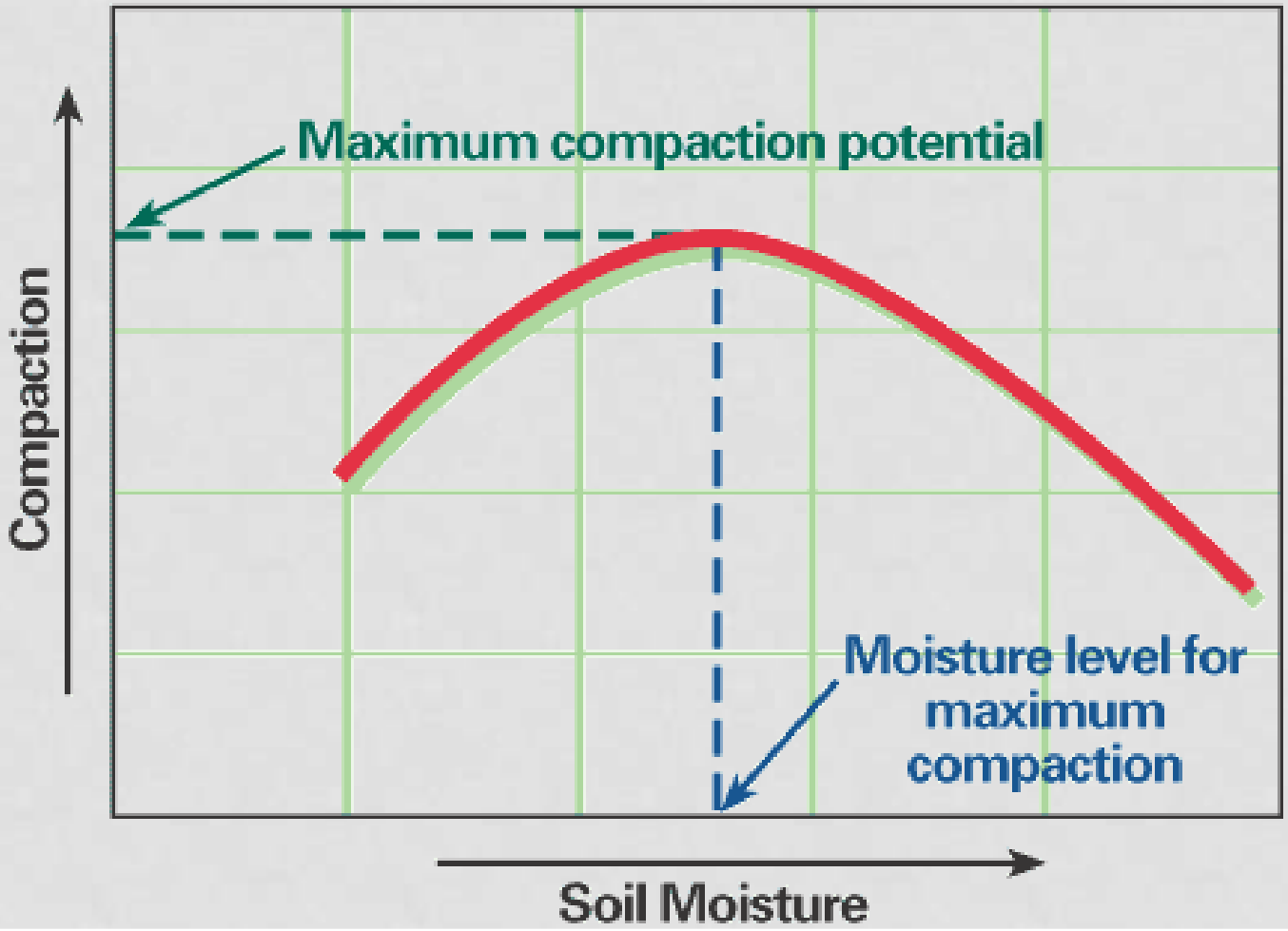
- Reduced soil compaction.

WILT-BASED IRRIGATION

- Better turf quality during dry down if turf was previously water infrequently.

- During midsummer, wilt-based irrigation frequency may increase.

BE AWARE OF SOIL WATER CONTENT AND SOIL COMPACTION



ipm.iastate.edu

II. WATER IS NEEDED FOR TURF ESTABLISHMENT


Land Pride

- During play, keep a viable seed bank present.
- Drill seed in to maximize seed-to-soil contact

IF OVERSEEDING IS LOCALIZED, USE FREQUENT HAND WATERING

III. WATER IS NEEDED FOR RECOVERY

- 1. WATER

- 2. Nitrogen

IV. IRRIGATION IS NEEDED TO WATER IN FERTILIZERS AND PESTICIDES

V. WATER IS NEEDED TO INSURE ADEQUATE SOIL MOISTURE WHEN AERIFYING

sportsfields.ca

IOWA STATE

- General – twice per year; 10 holes/sq. ft.
- High traffic: some form of coring, slicing, spiking 6 to 8 times per year.
- Renovation with overseeding: 36 holes per square foot

PURDUE

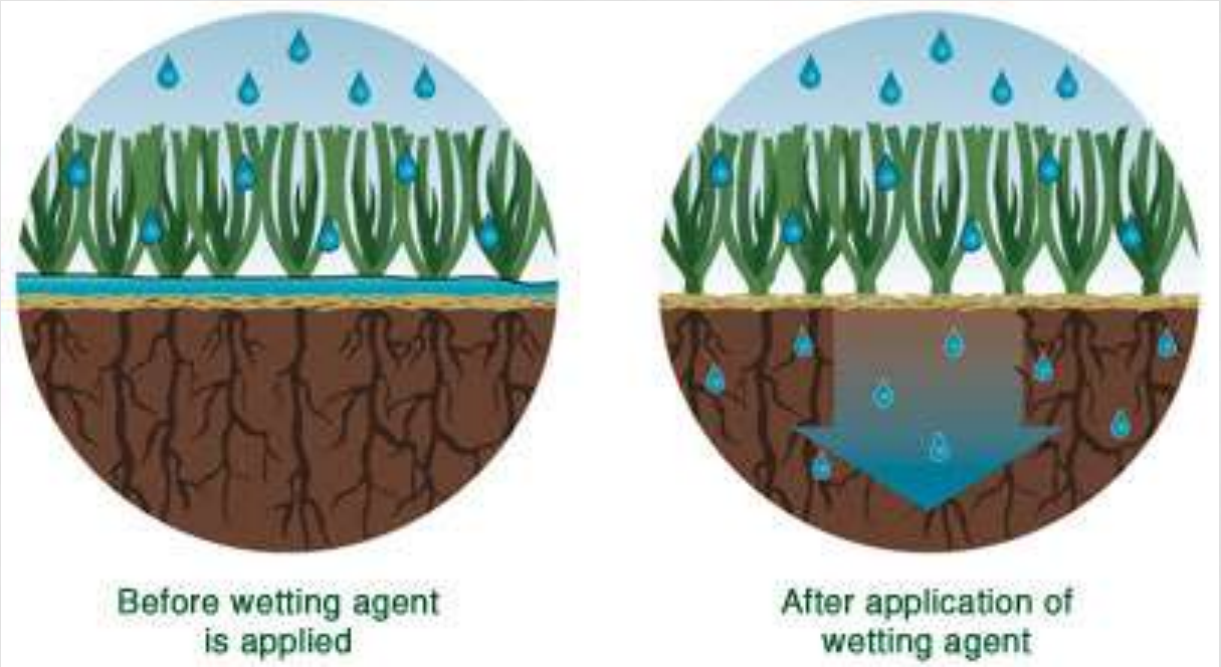
- Most aerifying machines available at rental agencies may not punch enough holes per square foot on a single pass, thus multiple passes will be needed to achieve the 20 to 40 holes/ft^2
- The purchase of a large reciprocating arm aerifier should be included in the budget because aerification will be needed often.

- http://www.youtube.com/watch?v=Ug65H-rbKr4

AND, DON'T FORGET THE DIRT

VI. OTHER CULTURAL PRACTICES

- e.g., wetting agent application



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BOTTOM LINE: TO MAINTAIN A QUALITY FIELD, THE MANAGER NEEDS TO HAVE A RELIABLE WAY TO DELIVER WATER.

- Plant health
- Turf establishment and recovery
- Pesticide and fertilizer applications
- Aerification
- Other cultural practices

VII. COMMUNICATION