OPTIMIZING IRRIGATION WATER APPLICATION ON GOLF COURSES

A Practical Approach

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OVERVIEW

- Golf Course irrigation is based on science and practical decision-making.
- **Goal:** Efficient water use without compromising turf quality
- **Importance:** Cost, Environmental Impact, turf health.

"Paradigm shifts begin when we start asking new questions about old problems"

-Unknown

BY THE NUMBERS:

- A typical golf course uses 1,500,000 liters of irrigation water per day.
- That's about 150,000,000 liters in 100 watering days.
- For those using commercial water it cost Php 60.00 per cubic meter.
- Pumping Cost of Php 3 pesos per cubic meter.
- 10 percent savings or reduction will save 15 Million liters or 15,000 cubic meters in 100 days - translates to Php 900,000.00 for 100 days

Factors Affecting Irrigation Efficiency

- **Soil Type:** Sand (fast drainage), Clay (slow drainage), Loam (ideal balance).
- **Irrigation System Design:** Uniformity, nozzle types, spacing.
- **Slope:** Impacts runoff potential.

Basic Science of Soil Water

- **Infiltration Rate:** How quickly water enters the soil.
- **Saturation Point:** Soil can’t hold more water.
- **Field Capacity:** Ideal water content post-drainage.
- **Wilting point:** Turf stress begins due to lack of water

What is Soil Water Holding Capacity?

Soil water holding capacity refers to the amount of water that soil can retain and make available for plant use after excess water drains due to gravity

KEY TERMS:

- **Field Capacity** – Maximum water soil holds after drainage; upper limit for plant use.
- **Wilting Point** – Soil moisture level where plants begin to wilt; lower limit.
- **Available Water Holding Capacity** – Difference between field capacity and wilting point; represents usable water for turfgrass.

IMPORTANCE IN GOLF COURSE:

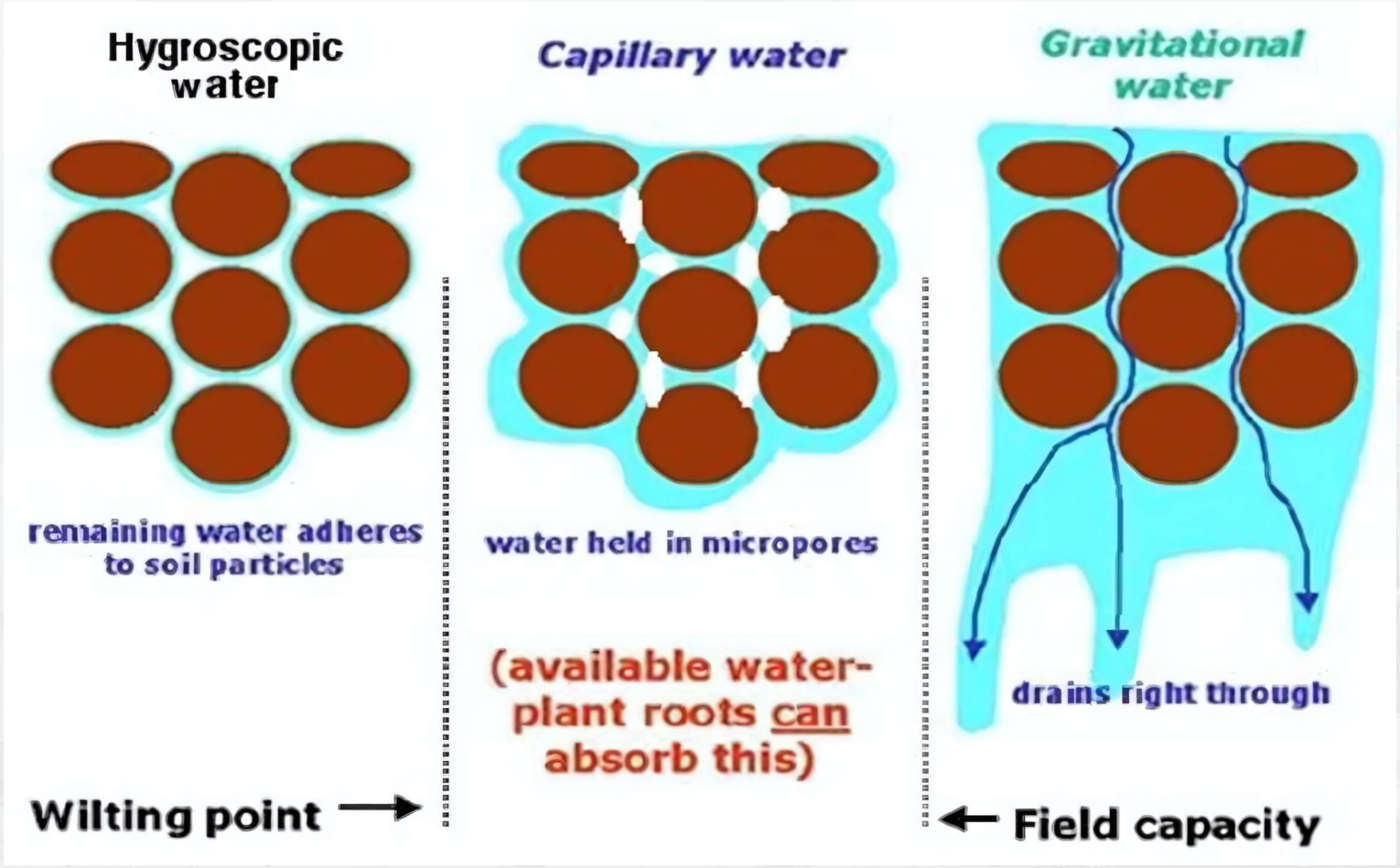
- Helps schedule irrigation efficiently.
- Prevents overwatering and turf diseases.
- Supports drought resistance and sustainable turf management.

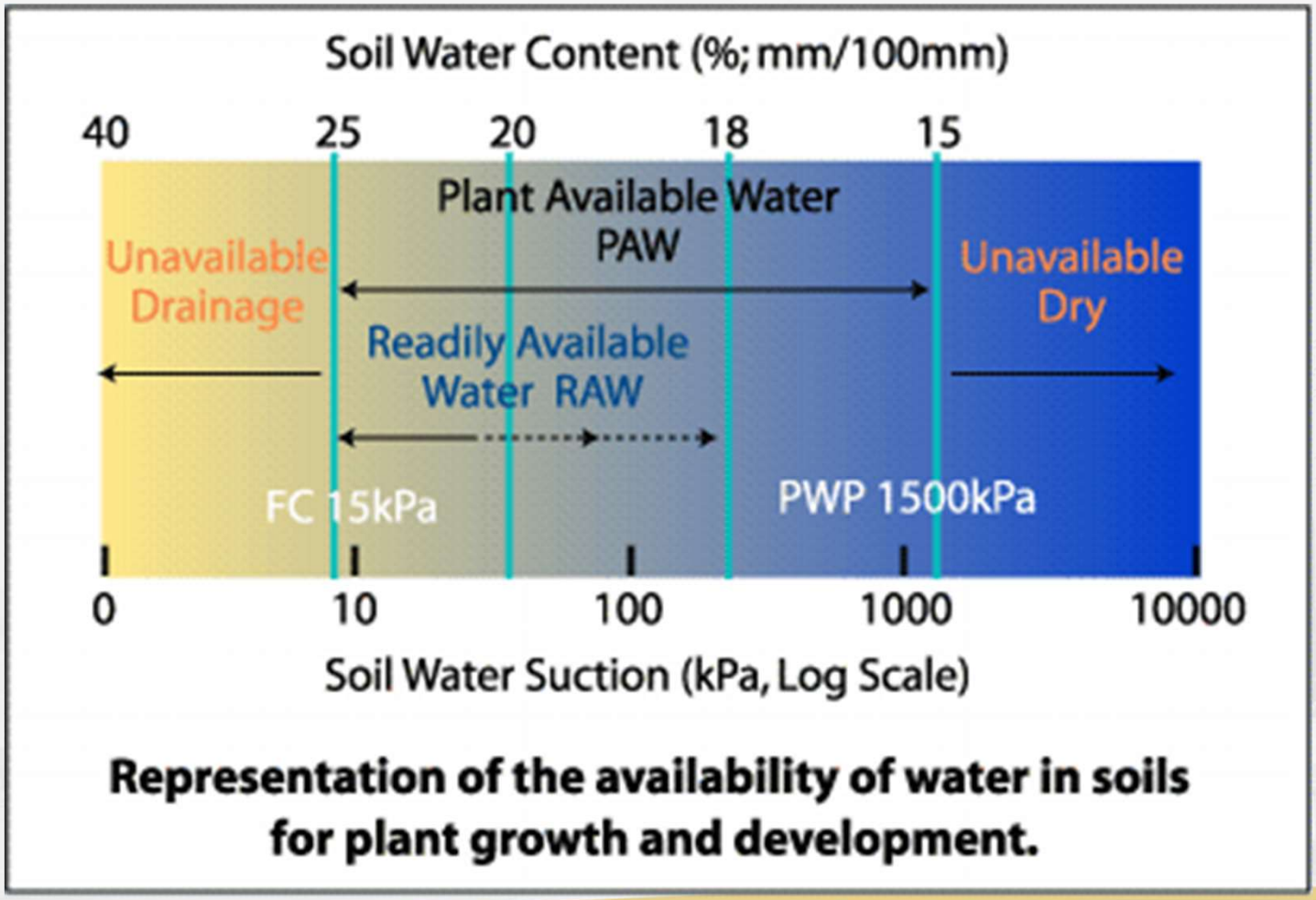
Why It Matters in Golf Course Operations:

- **Prevents Runoff:** If irrigation water is applied faster than the soil can absorb (i.e., precipitation rate > infiltration rate), water will fun off instead of soaking in.
- **Optimizes Water Use:** Knowing the infiltration rate helps schedule irrigation efficiently, conserving water and reducing turf disease risk.
- **Improves Turf Health:** Proper infiltration ensure roots get enough moisture without waterlogging the soil, which can suffocate roots and promote fungal growth.

Factors Affecting Infiltration Rate

- Soil Texture (e.g., sand drains faster than clay)
- Compaction (heavily trafficked areas have lower rates)
- Organic matter content
- Slope and surface cover (e.g., thatch)


Hygroscopic water
Capillary water
Gravitational water
remaining water adheres to soil particles
water held in micropores
drains right through
(available water- plant roots can absorb this)
Wilting point
Field capacity



Representation of the availability of water in soils for plant growth and development.

Relationship of Precipitation Rate, Infiltration Rate & Runoff

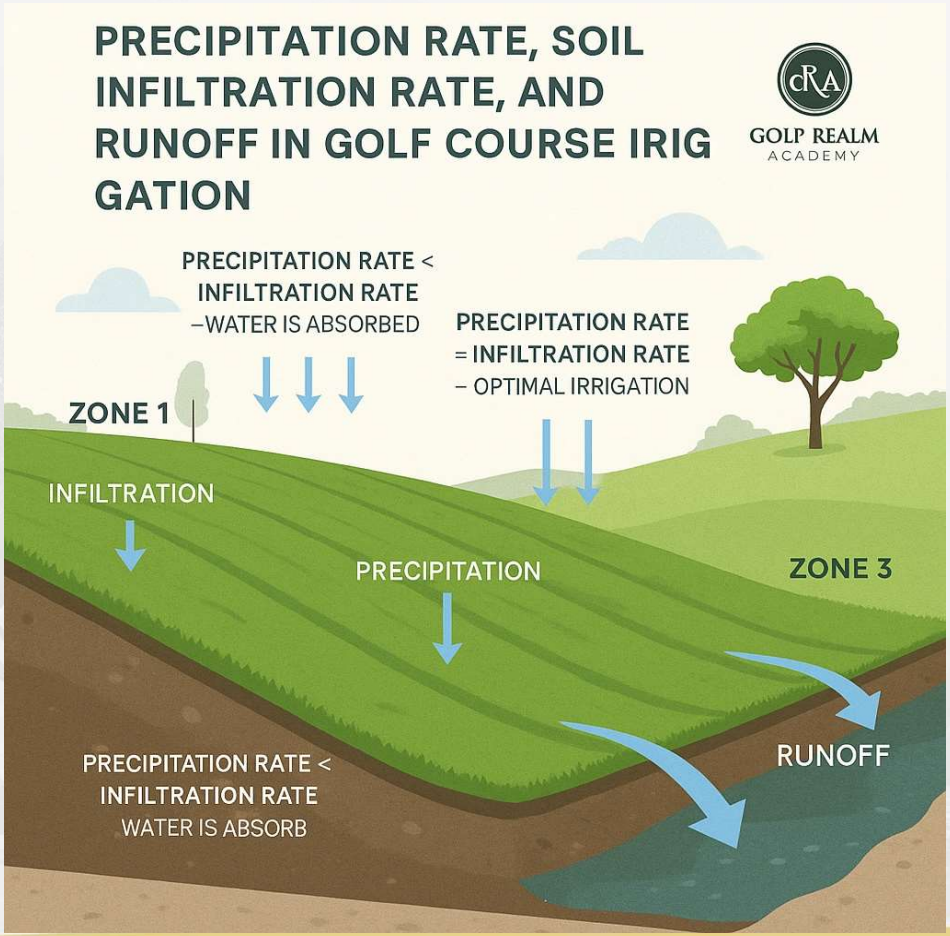
- Runoff occurs when precipitation > infiltration.

Ideal: Match precipitation rate to soil infiltration capacity.

Infiltration, Precipitation & Runoff Principle

- The relationship between soil infiltration rate, irrigation precipitation rate, and runoff is a key principle in golf course irrigation management.
- **Infiltration Rate:** Speed at which water enters the soil (depends on soil texture & compaction).
- **Precipitation Rate:** Speed at which irrigation is applied.

Infiltration, Precipitation & Runoff Principle



CYCLE AND SOAK

💡 How it Works (example):

Total water needed: 15 mm

Instead of: 30 minutes in one go

Use: 3 cycles of 10 minutes each, spaced out by 15-30 minutes

This allows water to percolate into the soil during the soak time, reducing runoff and water waste.

IRRIGATION SYSTEM

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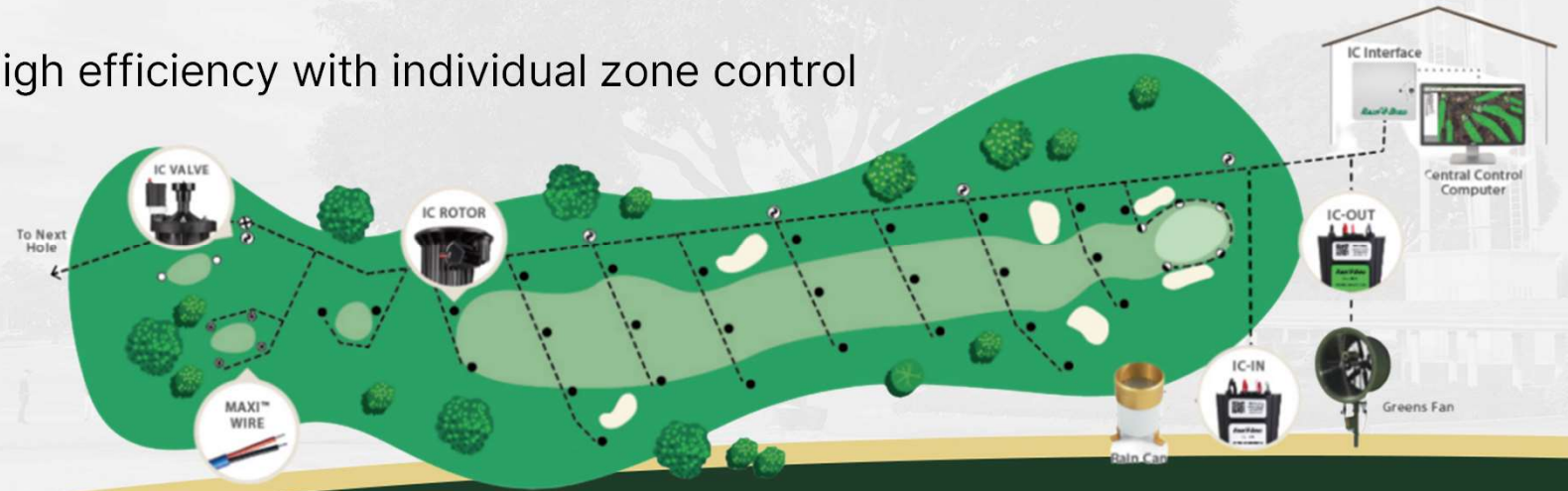
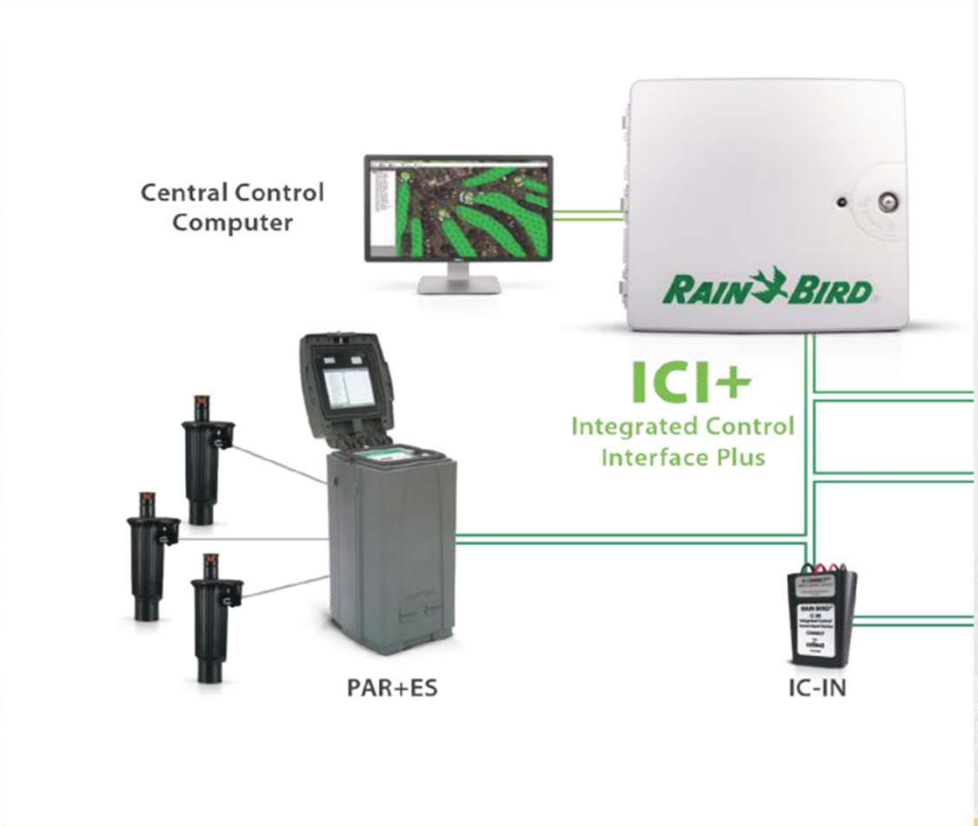
Fully Automated

- Fully automated with central software control
- Weather- and sensor-based adjustments
- Real-time monitoring and diagnostics
- High efficiency with individual zone control



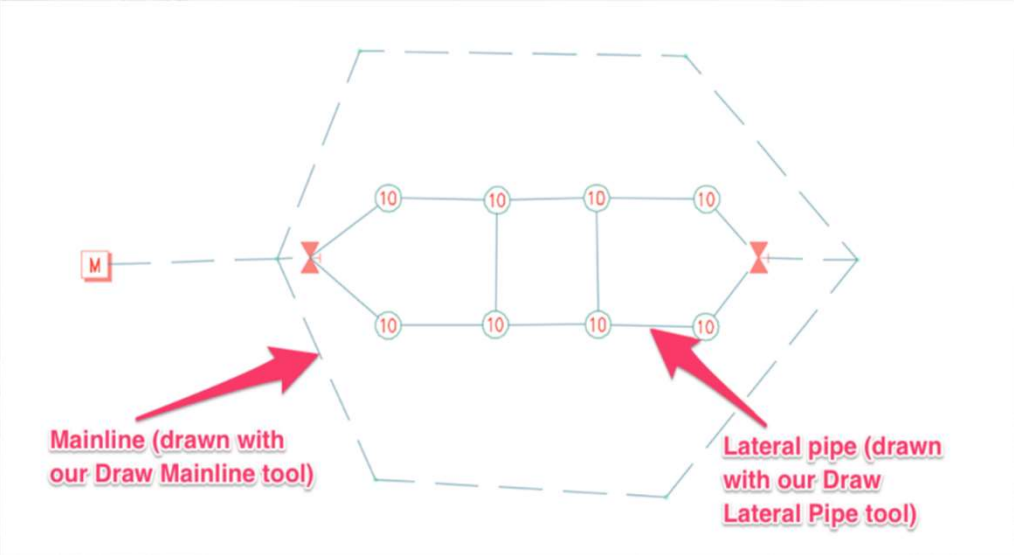
SATELLITE IRRIGATION SYSTEM

- Distributed local controllers communicate with central or act independently
- Allows zonal programming and backup functionality



BLOCK IRRIGATION SYSTEM

- Multiple sprinklers controlled by a single valve
- Cost-effective setup
- Less flexible – entire block runs simultaneously
- Suitable for small courses or limited budgets



MANUAL IRRIGATION SYSTEM

- Requires manual opening/closing of valves
- Labor-intensive and time-consuming
- No automation or precise control

HAND WATERING

- Manual application using hoses
- Most precise water delivery
- Used for spot-treating dry or stressed turf
- Essential on greens and sensitive areas

CUSTOMIZED IRRIGATION SCHEDULING

- Use ET (evapotranspiration) data.
- Soil moisture sensors.
- Time of day (early morning best).
- Adjust for microclimates and shaded areas.

DEFICIT IRRIGATION IN GOLF

- Applying less than full ET to encourage deeper roots.
- Promotes turf resilience.

Source: Beard, J.B. 'Turfgrass: Science and Culture'; GCSAA publications on water conservation.

DEFICIT IRRIGATION OF BERMUDAGRASS AND SEASHORE PASPALUM FOR GOLF COURSE TURF

By

Jaime Bañuelos

A Thesis Submitted to the Faculty of the

DEPARTMENT OF SOIL, WATER AND ENVIRONMENTAL SCIENCE

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

In the Graduate College

THE UNIVERSITY OF ARIZONA

2010

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Figure B 1. Bermudagrass, June 24, 2010

Figure B 3. Bermudagrass, July 16, 2010

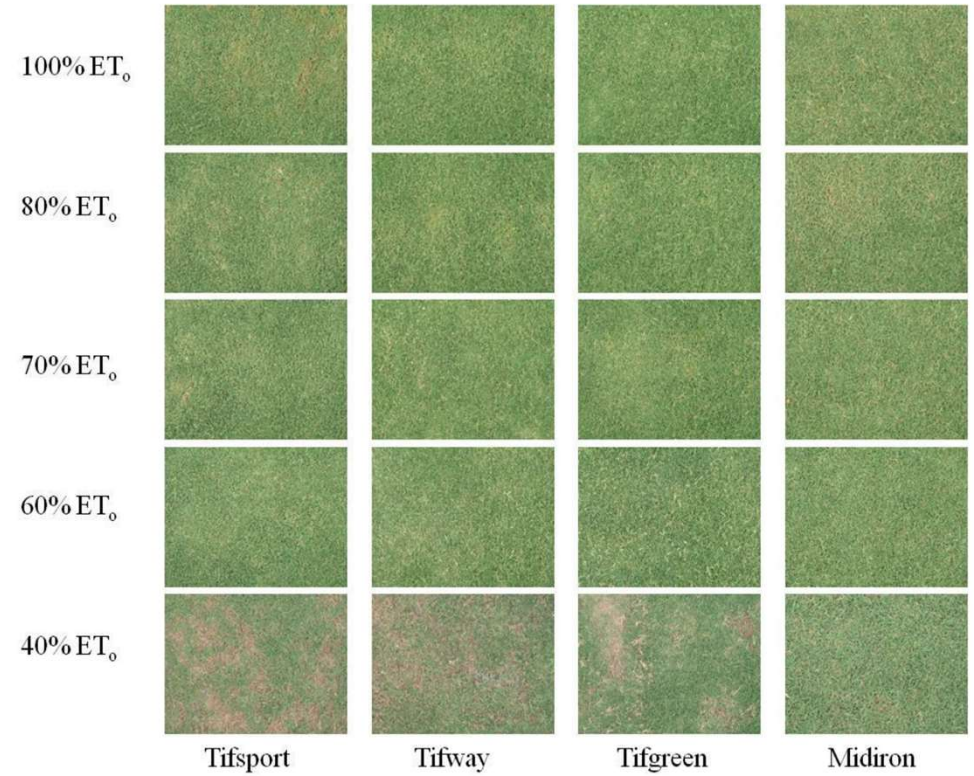

Figure B 5. Bermudagrass, August 16, 2010

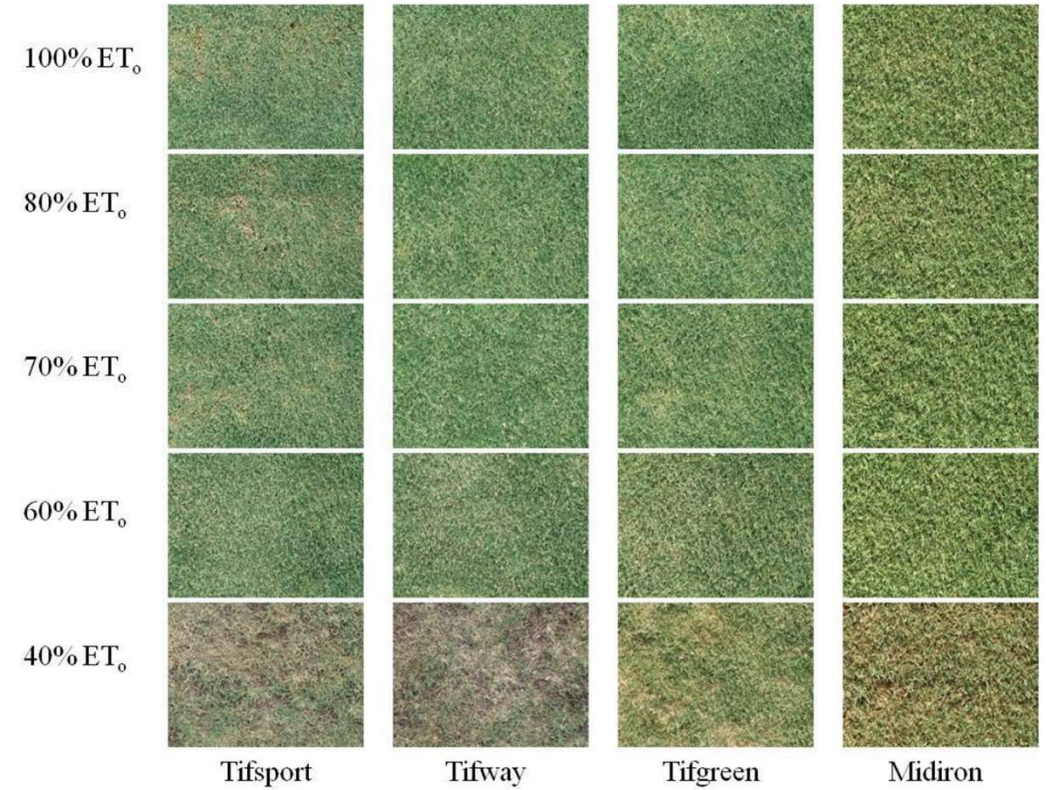

Figure B 7. Bermudagrass, September 13, 2010

RISKS OF OVERWATERING

- Shallow roots.
- Disease development (e.g., Pythium, dollar spot).
- Nutrient leaching.
- Increased maintenance costs.

DISCUSSIONS ON PRACTICAL APPROACH

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USE OF TECHNOLOGY

- Central Control - Automated Irrigation System
- Weather Stations
- TDR’s
- Use of Wetting Agent

CENTRAL CONTROLS

TDR'S

FIELDSCOUT

TDR 350 SOIL MOISTURE METER

IF YOU DON'T MEASURE IT, YOU CAN'T MANAGE IT EFFECTIVELY

TDR350

Backed with proven time-domain measurement technology, the TDR 350 accurately measures soil moisture across a full range of soil conditions. An ergonomic design and built-in display provides quick and easy measurements for water management.

What Does it Measure?

Soil Moisture (Volumetric Water Content %), salts (electrical conductivity) and surface temperature, plus optional Infrared Temperature sensor

Features & Benefits

- Backlit Display - Easy to see on early mornings and bright sunny days
- Easy to Read Layout & Large Digits – clearly view readings, settings and icons
- Integrated Bluetooth & GPS greater accuracy with onboard components
- Internal Data Logger - records approximately 50,000 measurements with GPS coordinates
- Optional TDR 300 Mode

Common Applications

- Reliable, portable meter for instant, accurate and actionable root zone moisture and soil EC readings average of the rod length
- Irrigation scheduling, syringing practices and soil flushes
- Track and trend data from day to day, month to month and season to season to optimize turf health and conditioning

How Do You Access The Data?

- Manual – download the data with a USB flash drive, no special software or cable required
- Hands free – instantly view data on your smartphone or tablet via FieldScout Mobile App
- Cloud – SpecConnect FieldScout Pro subscription automatically uploads data to your personal web portal to view enhanced mapping and reporting features

6435 TDR350 Soil Moisture Meter with Carrying Case *(Rods required, but sold separately)*

SpecConnect Compatible

SMARTIRRIGATION:
Maximize Irrigation Audits with TDR

16 www.specmeters.com

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CENTRAL CONTROLS

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Types of Wetting Agents

- Penetrants
- Retainers
- Blended or Combination

Why Hand Water?

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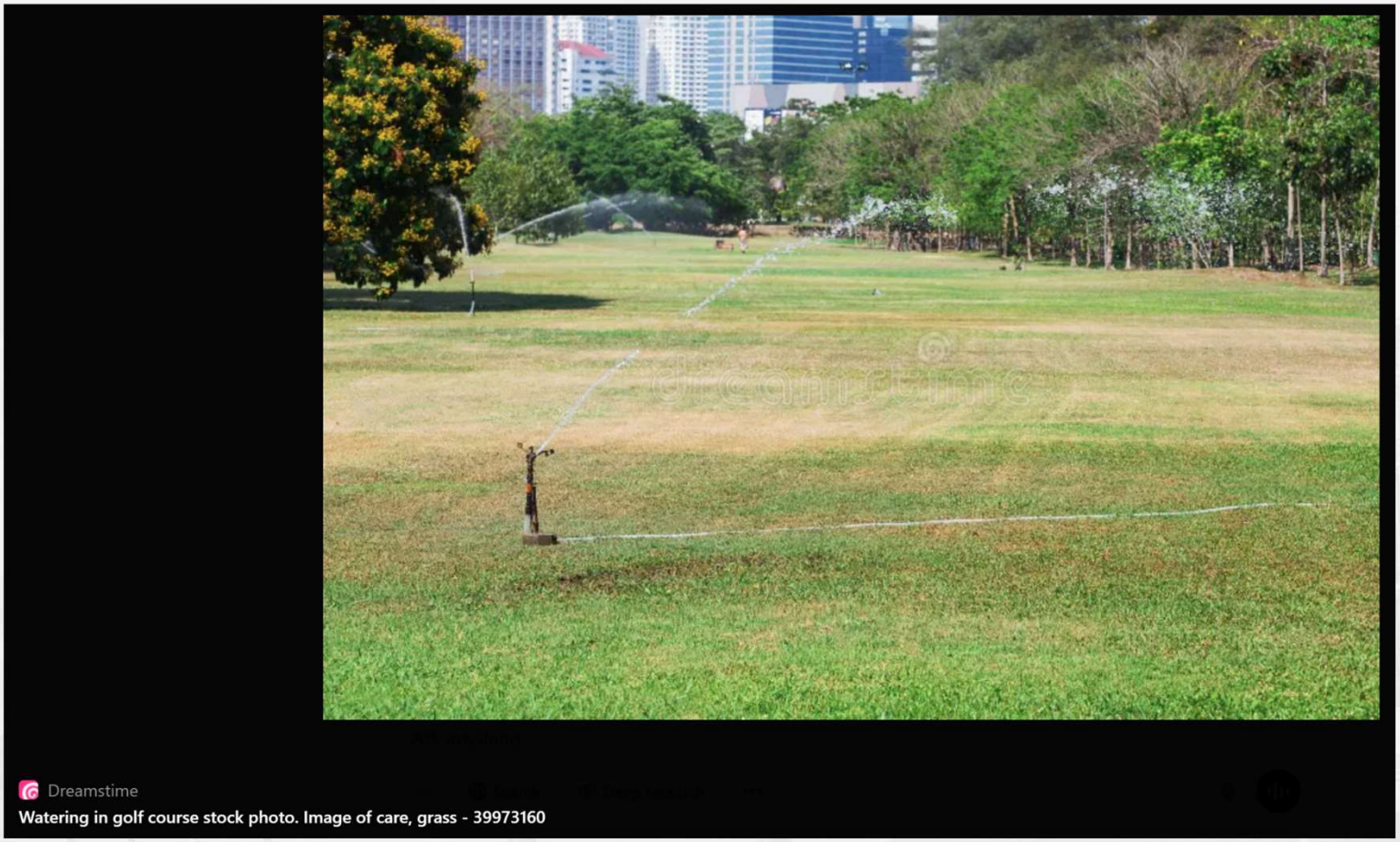
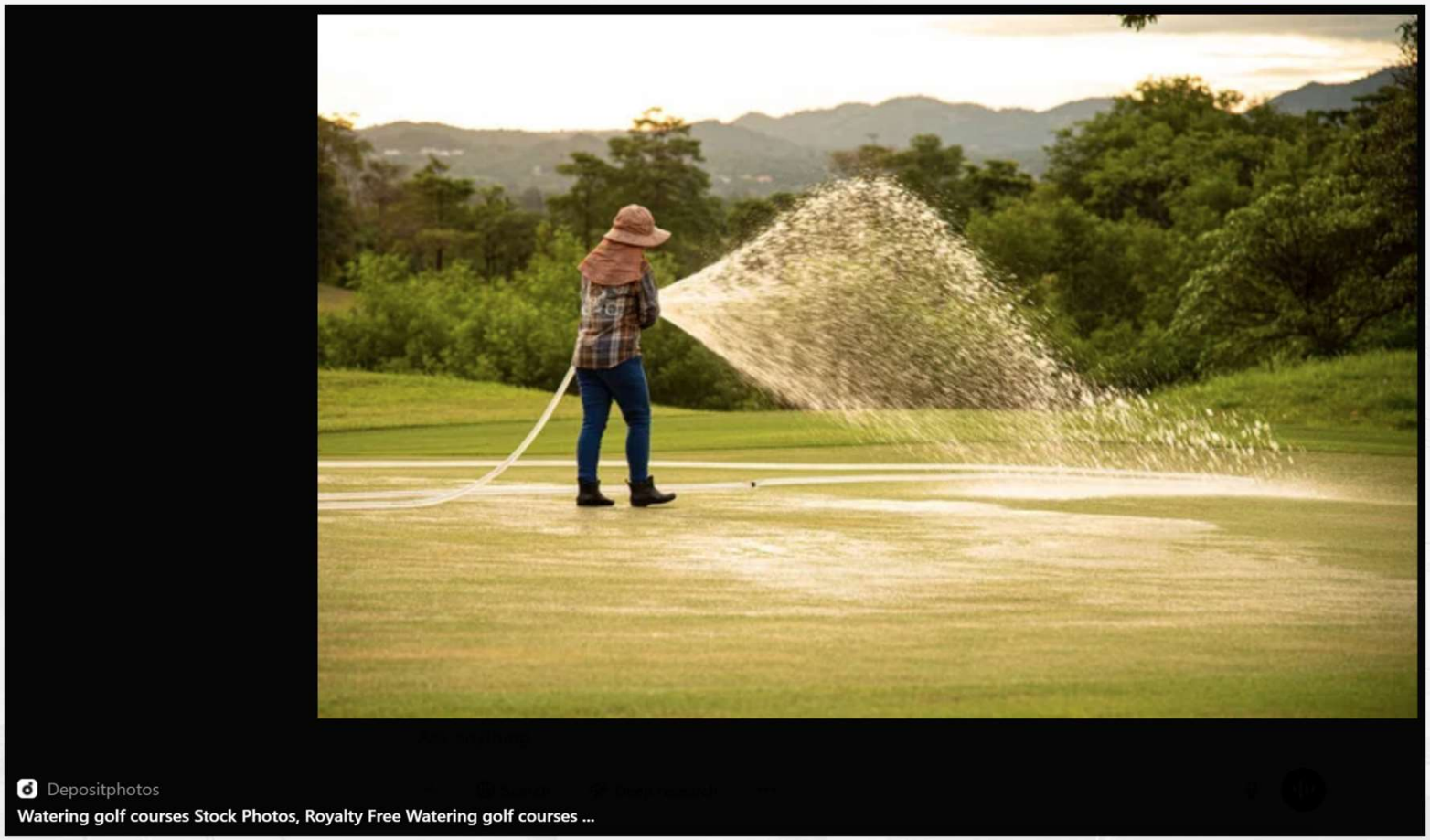
Dry Spot In Need of Hand Watering
Dry Spot In Need of Hand Watering
Low Area Not In Need of Water
Aqua Turf International
The Advantages Of Hand Watering Golf Greens | Aqua Turf International



Dreamstime

Watering in golf course stock photo. Image of care, grass - 39973160


Depositphotos
Watering golf courses Stock Photos, Royalty Free Watering golf courses ...

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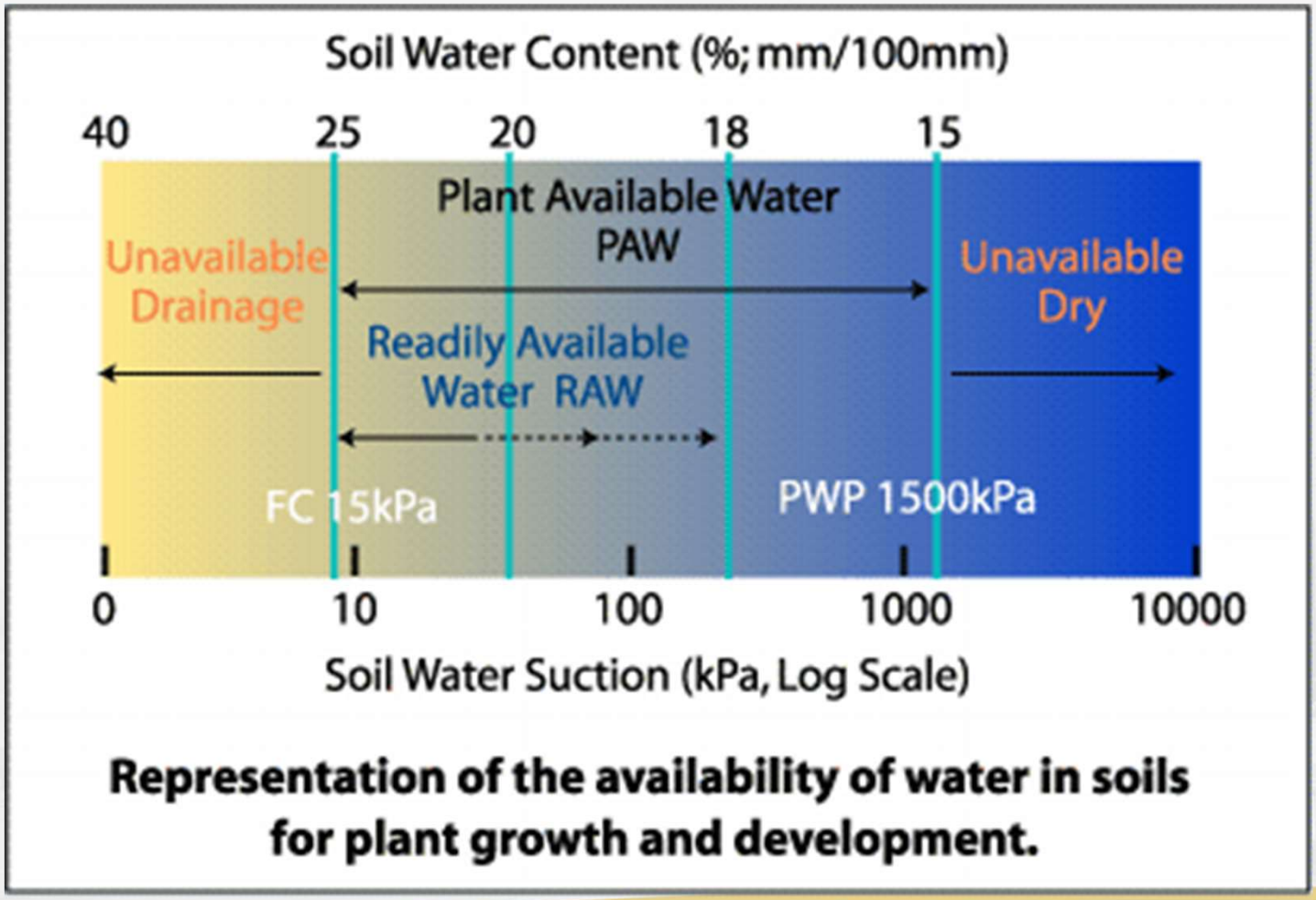

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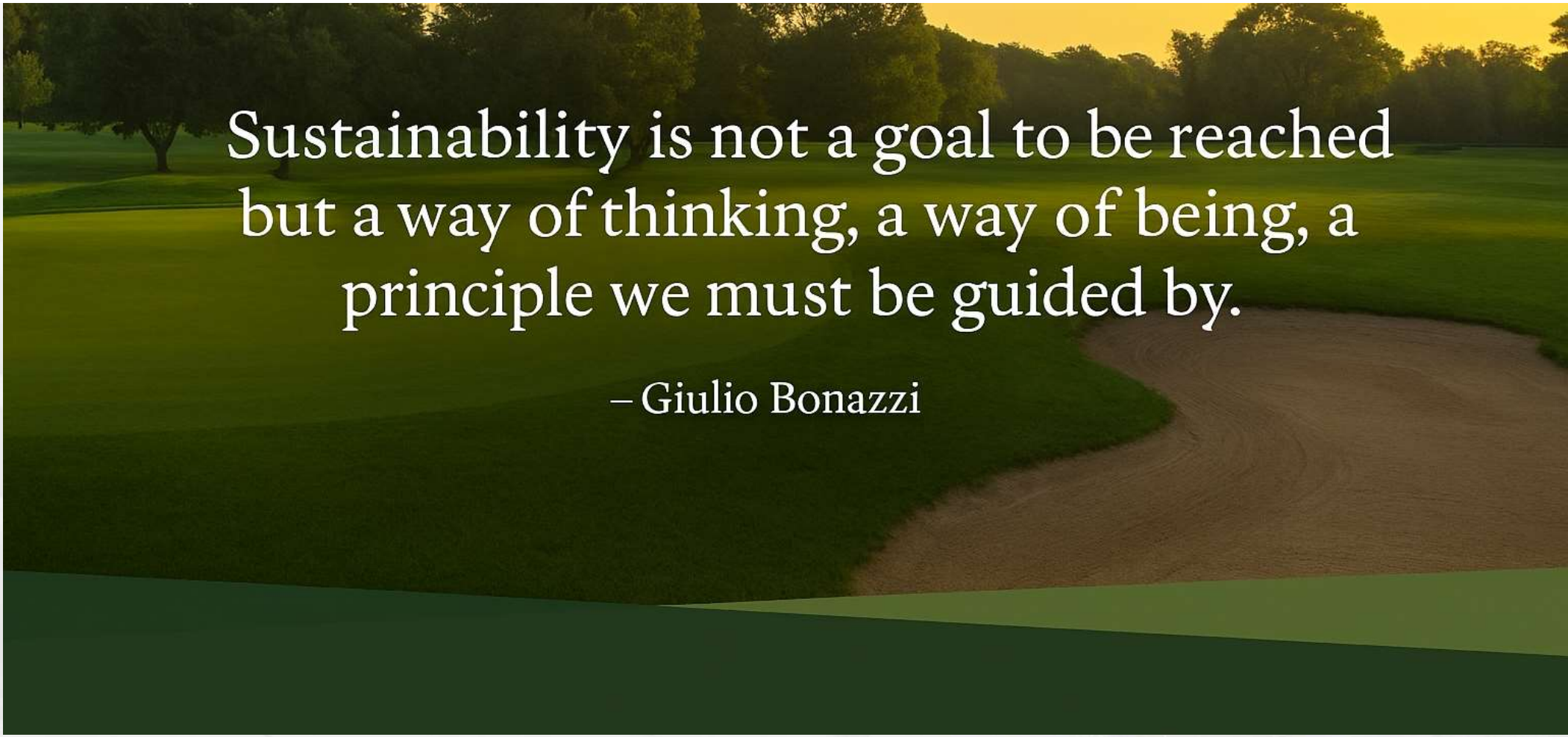
Best Practices for Golf Course Irrigation

- Regular system audits.
- Calibrate sprinkler heads.
- Monitor for dry and wet spots.
- Use weather-based irrigation controllers.

Summary and Recommendations

- Understand soil and water dynamics.
- Match irrigation inputs with plant needs and soil capacity.
- Avoid overwatering and monitor system performance.

CALL TO ACTION


Sustainability is not a goal to be reached but a way of thinking, a way of being, a principle we must be guided by.
– Giulio Bonazzi

References

- Beard, J.B. Turfgrass Science and Culture
- GCSAA Irrigation Management Tools
- University of California Cooperative Extension – Turfgrass Irrigation
- USGA Green Section Record
  - Penetrants vs. Retainers: Understanding Wetting Agent Claims and the Science Behind Them .June 02, 2023
  - Factors to Consider When Developing a Wetting Agent Program
- Bañuelos, Jaime. 2010, Univertisty of Arizona Deficit Irrigation of Bermudagrass and Seashore Paspalum for Golf Course Turf

Thank You!

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Infiltration, Precipitation & Runoff Principle

- **Runoff:** Occurs when precipitation rate exceeds infiltration rate, especially on slopes.

  ✅ **Ideal:** Precipitation Rate ≤ Infiltration Rate → Minimal runoff, better turf health.

  ⚠️ **Risk:** Precipitation Rate > Infiltration Rate → Runoff, water waste, erosion, and turf stress.


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