Turfgrass species tolerance to soil salinity

Sensitive (< 3 dS m^{-1})	Moderately sensitive (3-6 dS m^{-1})	Moderately tolerant (6-10 dS m^{-1})	Tolerant (> 10 dS m^{-1})
Annual bluegrass	Annual ryegrass	Perennial ryegrass	Saltgrass
Colonial bentgrass	Creeping bentgrass	Tall fescue	Alkaligrass
Kentucky bluegrass	Fine-leaf fescues	Zoysiagrass	Bermudagrass
Rough bluegrass	Buffalograss		Seashore Paspalum
			St. Augustine

M. A. Harivandi, J. D. Butler, and L. Wu. 1992. Salinity and turfgrass culture. In D. V. Waddington, R. N. Carrow, and R. C. Shearman (eds.) Turfgrass, pp.207–229. Series No. 32. Madison: American Society of Agronomy.

Leaching requirements

LR = Ecw / (5ECe – Ecw)

- ECw = electrical conductivity of irrigation water
- ECe = soil salinity threshold
- Higher EC means more water needs to be applied to leach salts through profile

BMP's For Water Conservation

The Soil System

- Weak grasses and compacted soils will not support this regime.
- Organic matter management is also crucial
- Drainage and increased cultivation may be necessary.

Maintenance

Maintenance

Leveling irrigation heads can improve distribution uniformity by 20%

Background

- PVCC was exceeding their water allotment by 40 AF/ yr. due to an older, inefficient irrigation system (62% uniformity.) Facing fines.
  - *1 acre foot = approx. 1,230,000 liters*
- Set a goal of reducing water use by 76 AF/ yr.
- Collaboration of irrigation designer, manufacturer, university and club.
- Goal: design and install the most efficient irrigation system possible and guarantee performance of at least 80% uniformity.

System design:

- Careful engineering of head layout for optimal spacing.
- Survey grade mapping instruments for sub-centimeter accuracy.
- Triangulation system to protect true location of each sprinkler.
- Audits during and after installation.

Results:

- The efficiency of the new system resulted in saving 79 AF (approx. 100,000,000 liters), exceeding the goal of 76 AF.
- Turf quality and uniformity improved.
- Club has confidence in the design and operation of the system. No longer facing fines.

Sprinkler Name		Base Pressure (PSI)	100.0
Sprinkler Model		Riser Height (IN)	0.0
Nozzle Size	Brown x Red & Teal	Set Screw Setting	
Flow Rate (GPM)	22.90	Degree of Arc	360
Date/Time of Test	12/21/15 14:52	Mins./Revolution	3.20
Testing Facility	C. I. T.	Record Number	
Comment	Nozzle pressure: 50 psi		

Distr. Uniformity	86%	Min (In/Hr)	0.592	Spacing
CU (Christiansen)	91%	Mean(In/Hr)	0.787 0.707 (Theor.)	Equilateral
Sched Coeff (3%)	1.2	Max (In/Hr)	1.395	60.0' x 52.0'

Sprinkler Name		Base Pressure (PSI)	100.0
Sprinkler Model		Riser Height (IN)	0.0
Nozzle Size	Brown x Teal & Teal	Set Screw Setting	
Flow Rate (GPM)	25.30	Degree of Arc	180
Date/Time of Test	12/22/15 09:37	Mins./Revolution	4.00
Testing Facility	C. I. T.	Record Number	
Comment	Nozzle pressure: 50 psi		
Comment	Arc, mins/rev., and appl. rate modified to assume 180° arc		

Distr. Uniformity	78%	Min (In/Hr)	1.005	Spacing
CU (Christiansen)	86%	Mean(In/Hr)	1.528 N/A (Theor.)	Equilateral
Sched Coeff (3%)	1.3	Max (In/Hr)	2.107	60.0' x 52.0'

BMP's for Water Conservation

Reducing Irrigated Acreage

- Eliminating nonessential areas
  - Practice range
  - Rough adjacent to tees
- Installing no-mow areas

Non-irrigated driving range at Laurel Creek

Turf removal

- Save water, not labor
- Weed control challenging
- Local water dept. may subsidize turf removal

Camelback GC

- **220 down to 80 turf acres following redesign**
- **The course has saved 132 acre-ft of water per year (roughly 43 million gallons)**
- **Native areas received 13 inches of irrigation in 2014 (in a year with above average rainfall)**
- **This comprises approximately 1/5 the water needed to yield quality turf for golf**

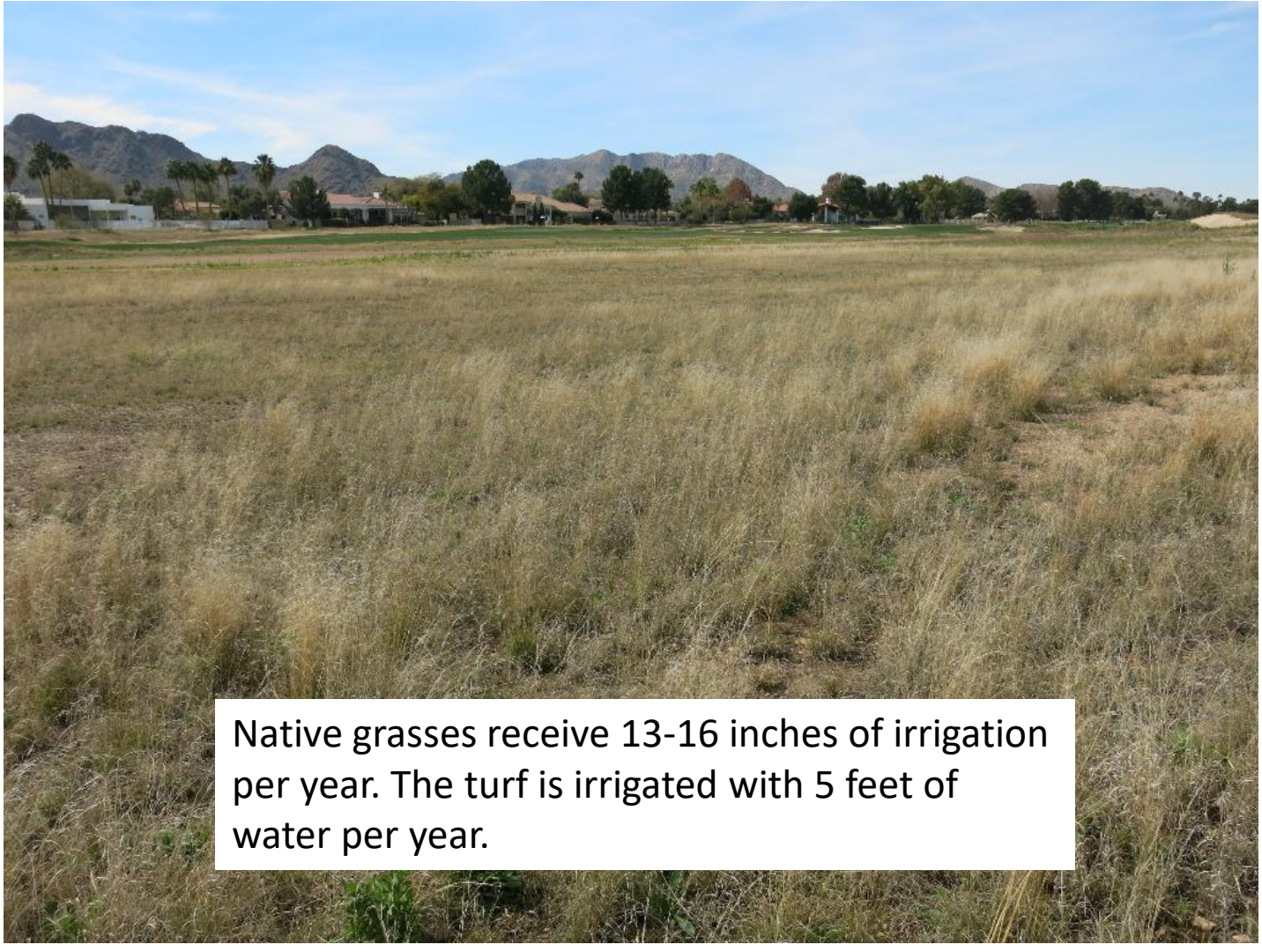
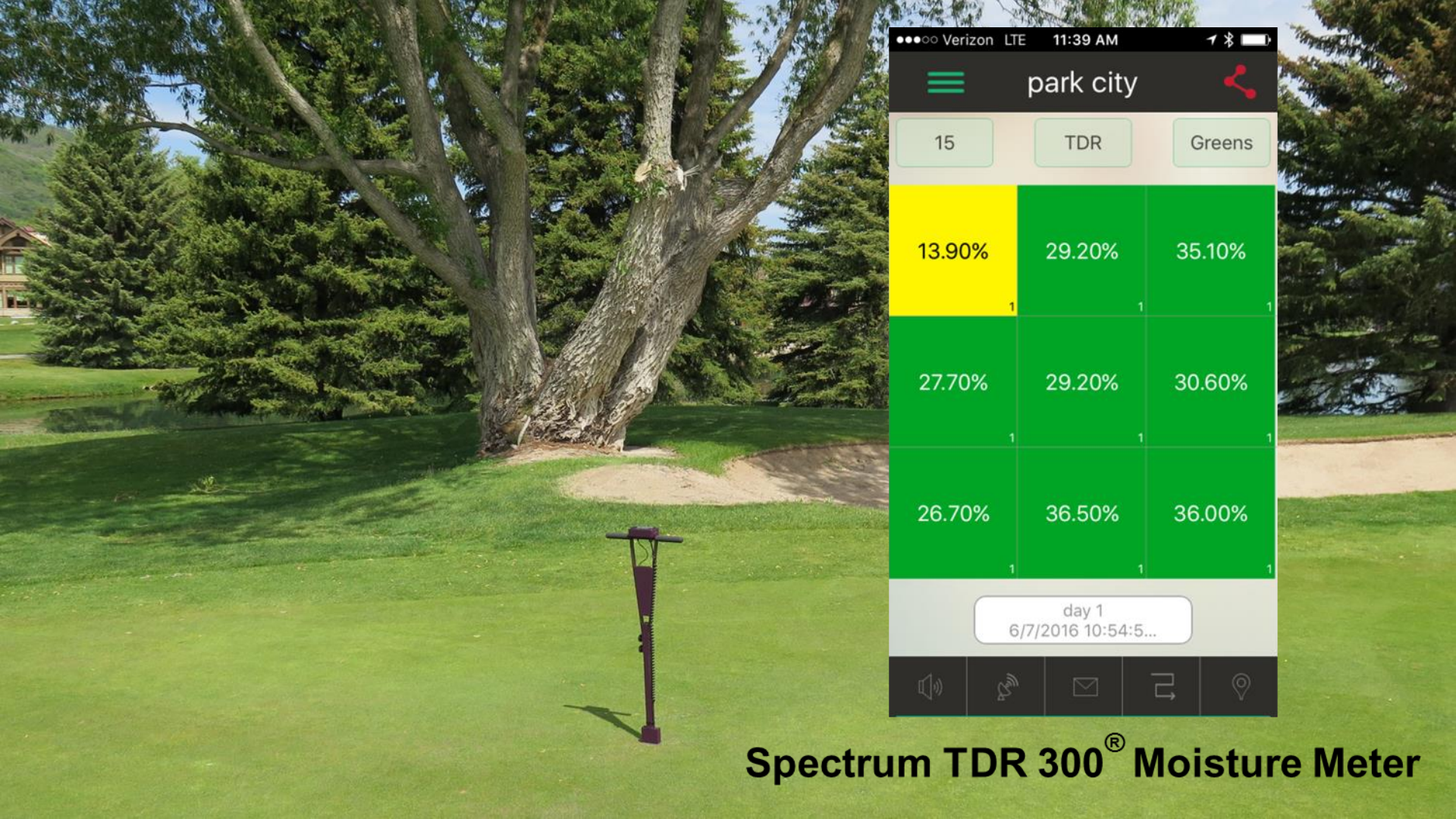

Native grasses receive 13-16 inches of irrigation per year. The turf is irrigated with 5 feet of water per year.

Table 1. Native “Short” mix up to 3 feet tall	
Common Name	Genus and species
Purple three-awn	Aristida purpurea var. purpurea
Sideoats grama	Bouteloua curtipendula
Blue grama	Bouteloua gracilis
Sand dropseed	(Sporobolus cryptandrus
Alkali sacaton	Sporobolus airoides
Indian ricegrass	Achnatherum hymenoides
Galleta grass	Pleuraphis jamesii
Sand sage	Artemisia filifolia
Triangle-leaf bursage	Ambrosia deltoidea
Brittlebush	Encelia farinose

Portable moisture meter



Spectrum TDR 300® Moisture Meter

Supplementing potable water

- Wells (bore holes) and water storage
- Bel-Air CC well development & tank storage
  - Low-yield well (20 GPM)
  - Inadequate storage

Well water is stored in large tanks and pumped into the irrigation system. Using well water decreases the golf course's reliance on expensive potable water.

Questions?

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