Water Conservation: Home, Yard, Farm & Ranch

Alternative Water Sources for Landscape Irrigation

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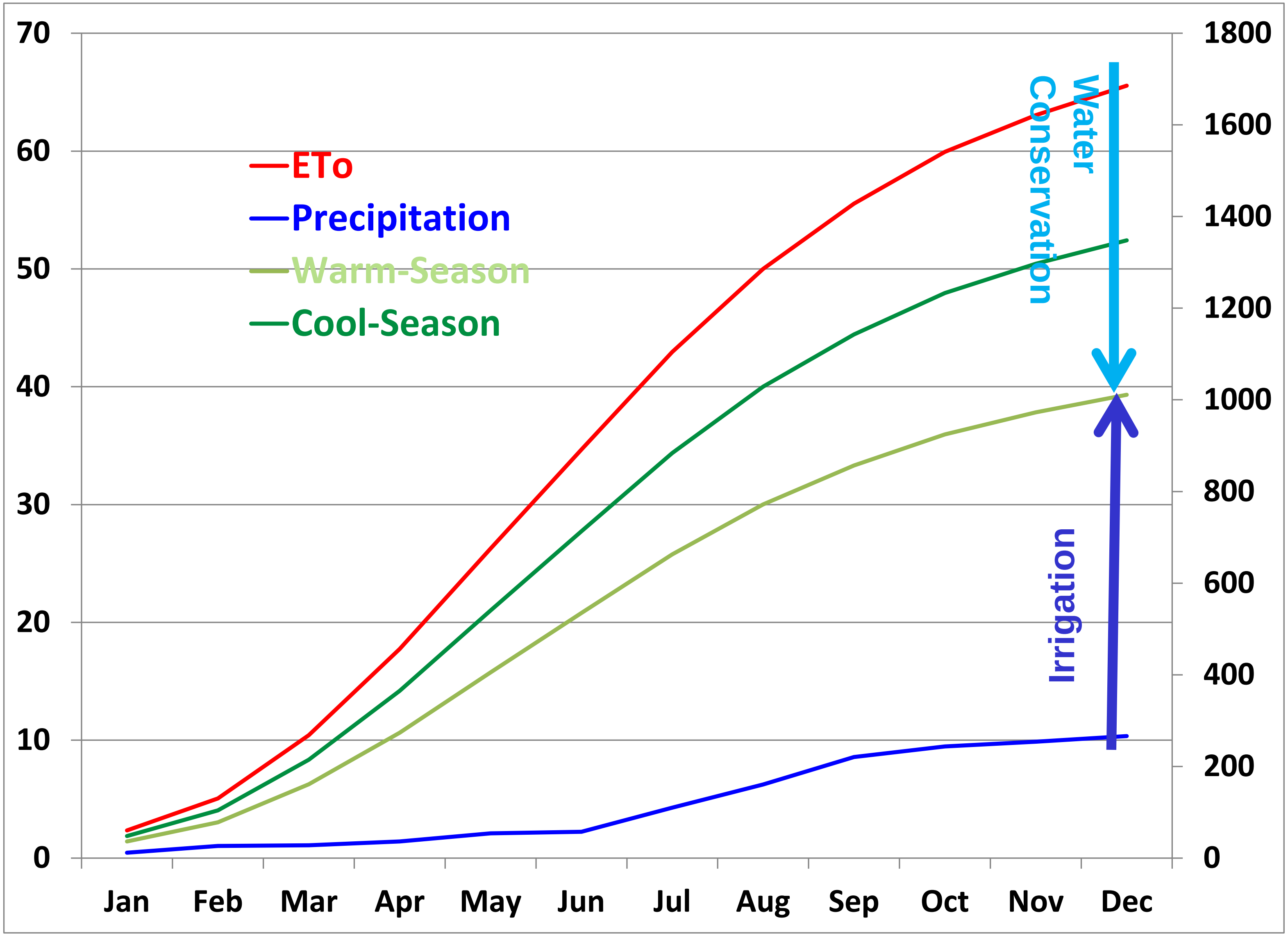
Turfgrass Irrigation

Las Cruces		**GCSAA Survey** (Gelernter et al., 2015)
Cool-season	50”	46.4”
Warm-season	38”	

Grass Type	1500 ft^2	700 ft^2
WS	35,500 gal	16,560 gal
CS	46,700 gal	21,790 gal

Turfgrass Irrigation Requirement
Las Cruces, NM



Canopy die-back (cavitation) of a mature ash tree associated with turfgrass removal and inadequate irrigation
(Courtesy of Devitt and Morris [UNLV], 2008)

Turf removal

- $3/ft^2 Install a new landscape:
  - no live turf or turf looking plants
  - includes plants (no turf)
- synthetic turf may be eligible

http://socalwatersmart.com

Water Conservation

- East Bay Municipal Utility District in NorCal: surveyed 86 sites with water efficient landscapes – water use **nearly double of** budget!
- Cash for grass conservation programs removed 170 million sq ft of turf and resulted in just over 7% savings
  (Michael Hollis, Metropolitan Water District of Southern California)

Strategies to Reduce (Potable) Irrigation Water Consumption

1. Artificial Turf
2. Reduce area under irrigation
3. Irrigation with recycled/impaired water
4. Use of adapted / native (low water use) turfgrass species
5. Accept quality reduction
6. Increase irrigation efficiency
   I. Scheduling
      a) Climate data
      b) Soil water status
   II. Improve Water Distribution

Alternate Water Sources and How They Impact The Landscape

http://www.nrcs.usda.gov/news/archive/2004newsroom.html

ALTERNATIVE IRRIGATION WATER SOURCES

1. Recycled (Effluent) Water
   - discharge from treatment plants
   - grey water
2. Saline Groundwater
3. Surface Water
   - Stormwater
   - Brackish water
   - Sea water
4. Reversed Osmosis Concentrate (Brine)
5. Coalbed Methane Produced Water

Water Quality

Factors:

- biological
- physical
- chemical

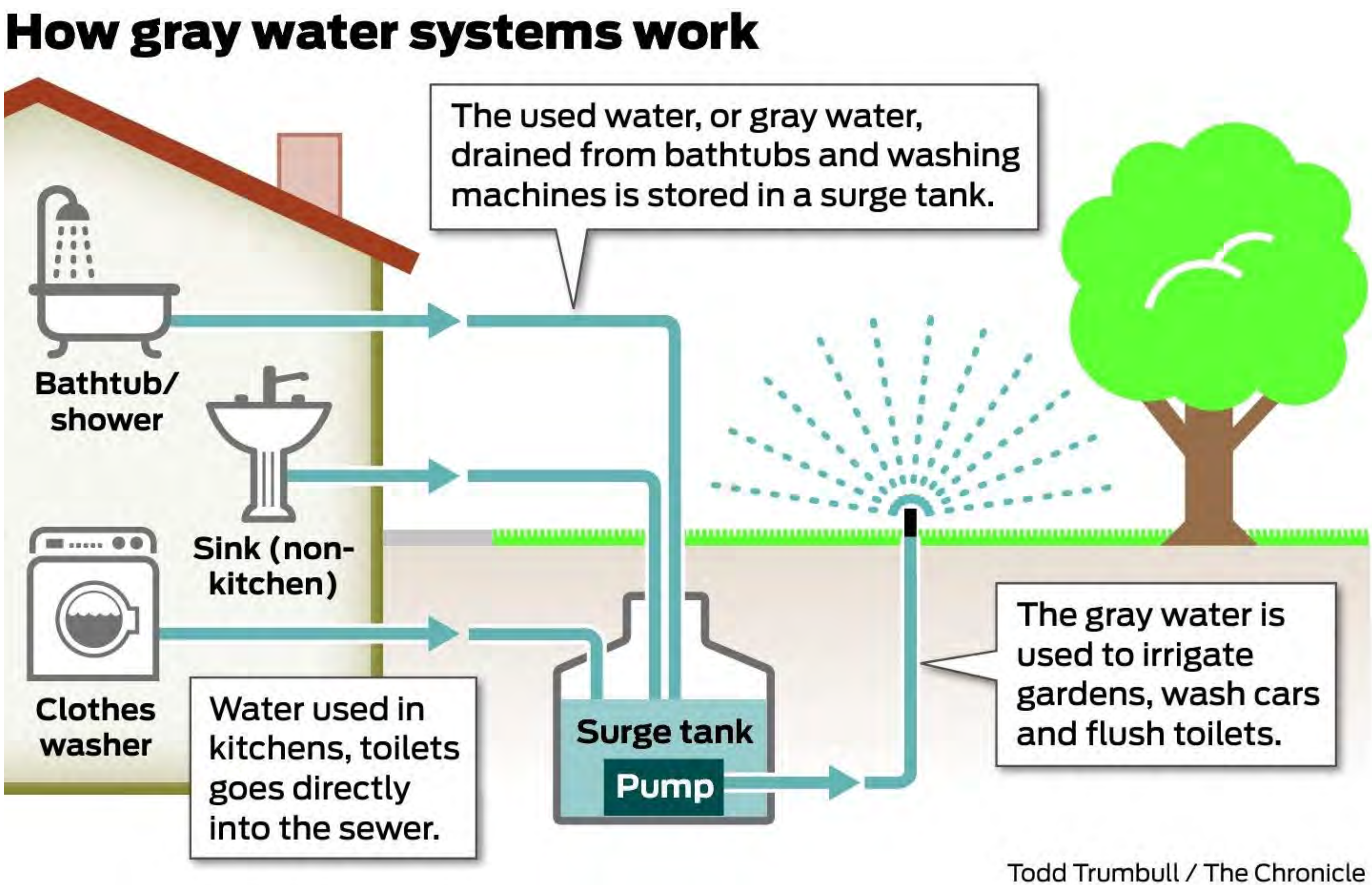
Water Quality

Contaminants of Emerging Concern (CECs):

- Pharmaceuticals and Personal Care Products – PPCPs
- Endocrine Disruptors – Hormones

Irrigation with Recycled Water

Grey Water System



https://images.app.goo.gl/6NX5rnyj8wPuMsLT6

Water Quality

<u>Biological parameters</u>

- Pathogens /
  disease causing organisms
- Algae
- Cyanobacteria
- Iron, Manganese,
  Sulfurbacteria
- Nematodes

Biological Factors

- Bacteria
- Algae
  - Dissolved Oxygen
  - Nutrient content (nitrate, phosphate, ...), eutrophication
  - Clogging of irrigation equipment
  - Algae on turf
  - No published threshold
- Cyanobacteria
- Iron, Manganese, Sulfurbacteria
- Nematodes

Biological Factors

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Physical Factors

- Solids in Suspension
- Turbidity
- Color
- Odor
- Temperature

http://water.usgs.gov/edu/gallery/sediment-lake-tuscaloosa.html


Water Quality Comparisons Chemical Parameters

	Ground Water			Grey Water Recycled Water		Sea Water	CBM Water (47 Wells)	potable
	El Paso	Las Cruces	Carls-bad	CA	Las Cruces			
pH	7.8	7.3	7.7	7.0	7.5		7.6	7.5
EC	2.6	4.0	6.4	2.0	2.3	50	3.0	0.6
TDS	1,644	2,560	3,925	1,266	1,500	34,500	2,010	390
SAR	11.5	10.5	6.4	4.8	7.6	39.8	29	1.4

Data from Assadian, 2006; Asano et al., 1985; Duncan et al., 2009, and Rice et al., 2000

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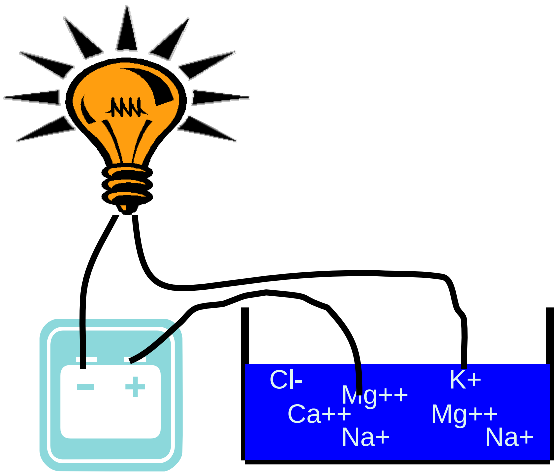
Types of salts

- Cations:
  - Na^{+}, Ca^{++}, Mg^{++}, K^{+}, NH_4^{+}
- Anions:
  - Cl^{-}, NO_3^{-}, SO_4^{--}, BO_3^{3-}, CO_3^{--}, HCO_3^{-}

Salinity / TDS

<u>Terminology:</u>

- Electrical conductivity (EC) [dS/m]
  - dS/m [deciSiemens m^{-1}] =
  - mmhos/cm [millimhos cm^{-1}] =
  - µmhos [micromhos cm^{-1}] x 1000
- Total dissolved solids/salts (TDS) [ppm]
  - ppm [parts per million] =
  - mg/l [milligrams l^{-1}]
  - 1% = 10,000 ppm
- EC [dS/m] x 640 = TDS [ppm]



Interpreting Water Reports

Salt Hazard		ECw (dS/m)	TDS (ppm)
Low	No detrimental effect on plants or soil build up	<0.75	<500
Med.	Stress for sensitive plants Moderate leaching prevents accumulation	0.75-1.5	500-1000
High	Requires salt tolerant plants Careful irrigation, good drainage and leaching	1.5-3.00	1000-2000
VH	Generally unacceptable Intensive management, excellent drainage and frequent leaching	>3.00	>2000

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Interpreting Water Reports

Na Hazard	SARw	Comments
Low	<10	Can be used for any soil without structure deterioration
Med.	10-18	Ok on coarse textured soils Structure problems on fine textured soils with high CEC
High	18-26	Na accumulation will require intensive management; amendments, leaching
VH	>26	Generally not suitable for irrigation except at very low soil Na levels with intensive management

Interpreting Soil Reports

Salt Hazard	ECe	TDS
	dS/m	ppm
Low	<1.5	<1000
Med.	1.6-3.9	1000-2500
High	4.0-5.0	2500-3200
VH	>5.0	>3200

Interpreting Soil Reports

- Sodium

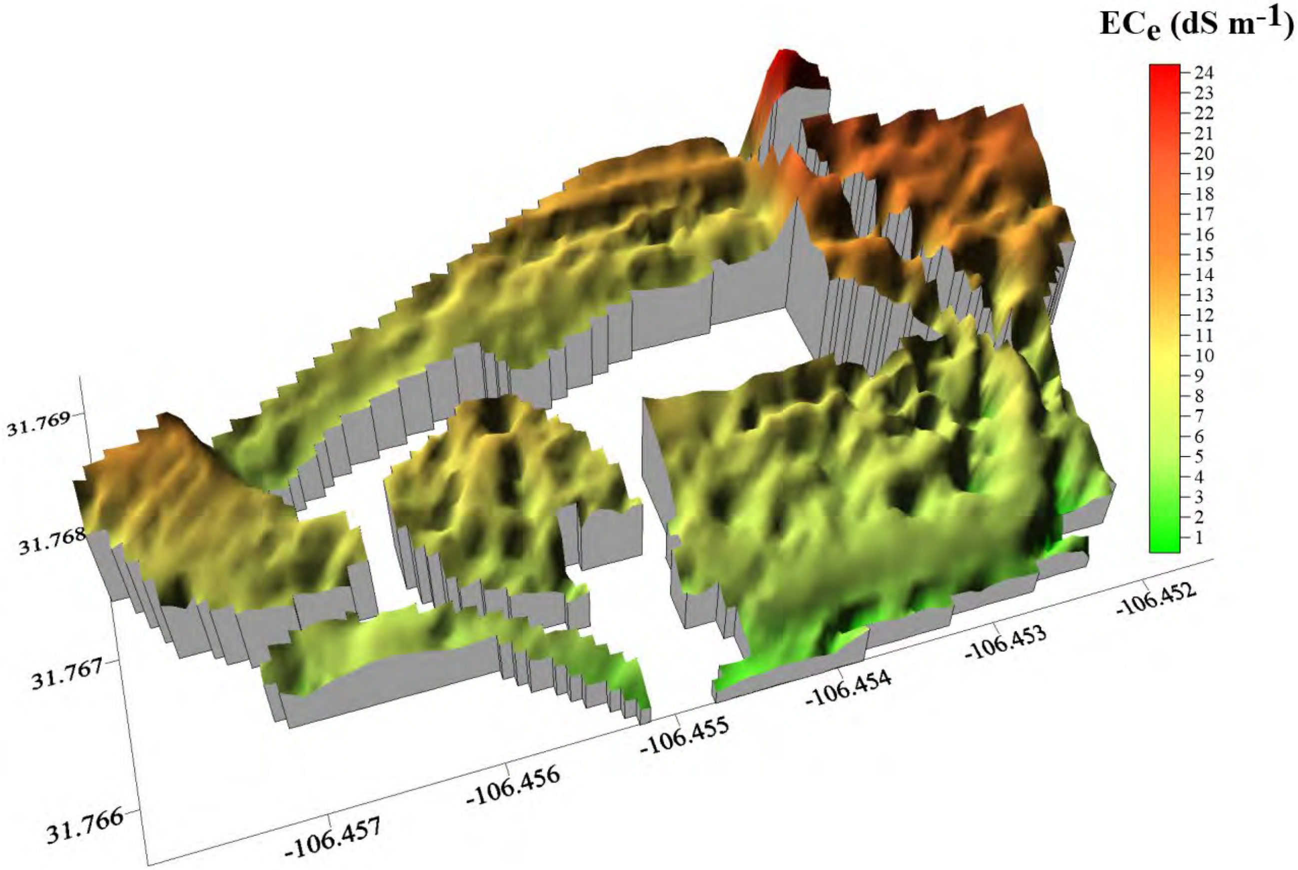
Soil Parameter	Degree of Permeability Problem: None	Increasing	Severe
ESP	<3.0	3.0-15	>15
SAR	<2.1	2.1-12	>12


Soil type	ph	EC (mmhos/cm)	SAR	Problem
Silty Loam	7.7	17.3	13.6	Very likely

Water Quality

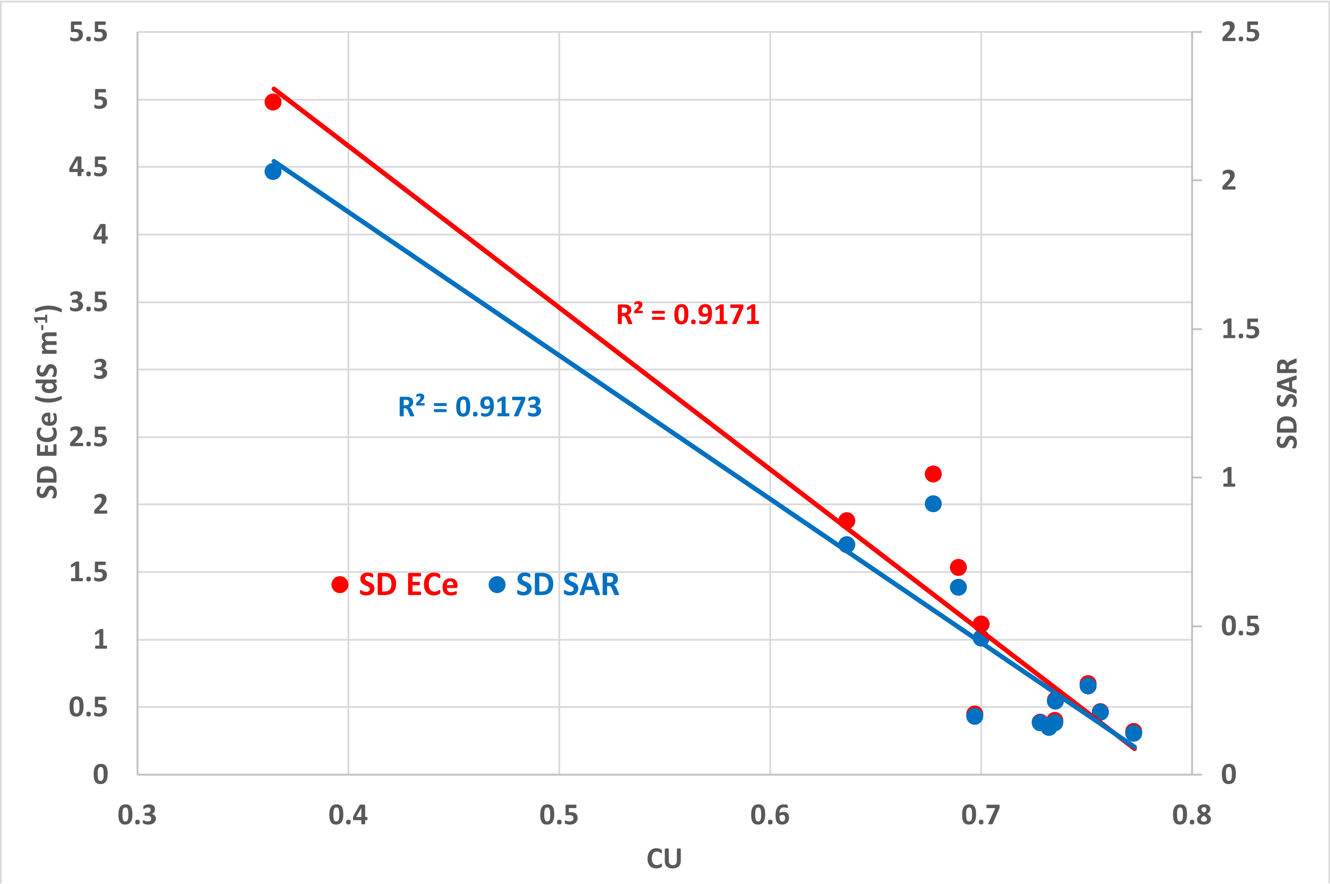
- TDS (salt content)
- Na content
- Mn, B toxicity

- Chamizal National Memorial
- 350 acre irrigated turf area, El Paso, TX
- 46 years irrigated with saline groundwater
- EC = 1.1 dS m^{-1}; SAR = 5.2



ECe (dS m-1)
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
31.769
31.768
31.767
31.766
-106.457
-106.456
-106.455
-106.454
-106.453
-106.452

Relationship between irrigation system uniformity and soil salinity



Monitoring

- Frequent soil and water tests

Alternate Water Sources and How They Impact the Landscape

In a desert environment, alternate water sources generally have a higher salinity and sodicity than traditional sources:

1. Select salt tolerant plants
2. Correcting salinity problems
   a) Reduce salt inputs
   b) Remediate saline/sodic soils:
      Control calcium and sodium to avoid structural problems
   c) Salt tolerant grasses
   d) Avoid soil amendments that increase moisture retention

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Estimated Relative Salinity Tolerances 1 (Marcum, 1999)

Species	Grass type	EC_e (dS/m) for 50% growth reduction
Disticlis sp. var. *stricta* *Sporobolos virginicus*	Warm	>35
Paspalum vaginatum *Zoysia matrella, tenuifolia* *Puccinella* spp.	Warm Cool	25
Stenotaphrum secundat.	Warm	18
Cynodon spp.	Warm	15
Zoysia japonica	Warm	12
Agrostis stolonifera	Cool	9
Festuca arundinacea	Cool	7

Estimated Relative Salinity Tolerances 2 (Marcum, 1999)

Common name	Grass type	EC_e (dS/m) for 50% growth reduction
Lolium perenne	Cool	5
Buchloe dactyloides	Warm	
Bouteloua spp.	Warm	
Poa pratensis	Cool	3
Poa trivialis	Cool	
Festuca longifolia /elatior /ovina	Cool	
Lolium multiflorum	Cool	
Axonopus spp.	Warm	
Eremochloa ophiuroides	Warm	
Agrostis tenuis/canina	Cool	2
Paspalum notatum	Warm	

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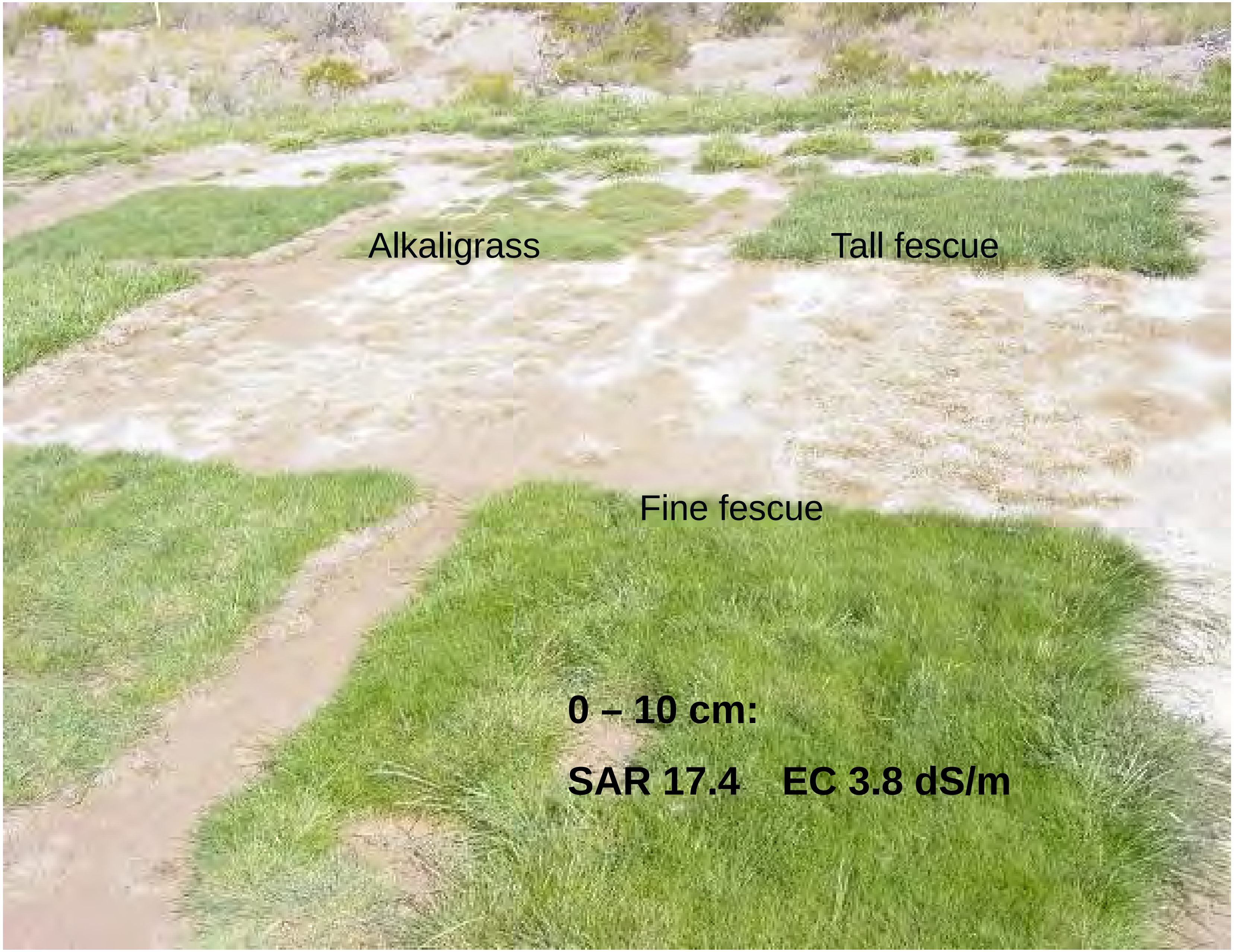
Alkaligrass
Tall fescue
Fine fescue
0 – 10 cm:
SAR 17.4 EC 3.8 dS/m

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