This presentation premiered at WaterSmart Innovations

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How Much Water Does A Landscape Really Need?

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Goals

- Understand landscape plant water needs research
- Compare field data to WUCOLS
- Show how to use research data effectively

Importance of Landscape Water

- Function
- Aesthetics
- Recreation
- Mental Well-being

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Landscapes require irrigation when.....

performance expectations exceed plant adaptation

Demand for Climate-based Plant Water Needs Data

- State & local conservation ordinances
- Days of week restrictions
- Water budgets
- Smart irrig'n. controllers
- 'Green' building & development codes
- U.S. EPA 'Water Sense'

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Limitations in Using Climate-based Plant Water Needs Data

- Limited amount of reliable PF & Kc data
- ETo x PF has limited accuracy and application
- ETo data not readily available everywhere

How Much Water Do Plants Need?

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Estimating Plant Water Needs

- Define a reference for plant water use that is a function of climate
- Compare water needed to maintain given plant with reference amount
- Express plant water need as % of reference
  - Plant Factor (PF)
  - Crop Coefficient (Kc)

Evapotranspiration (ET)

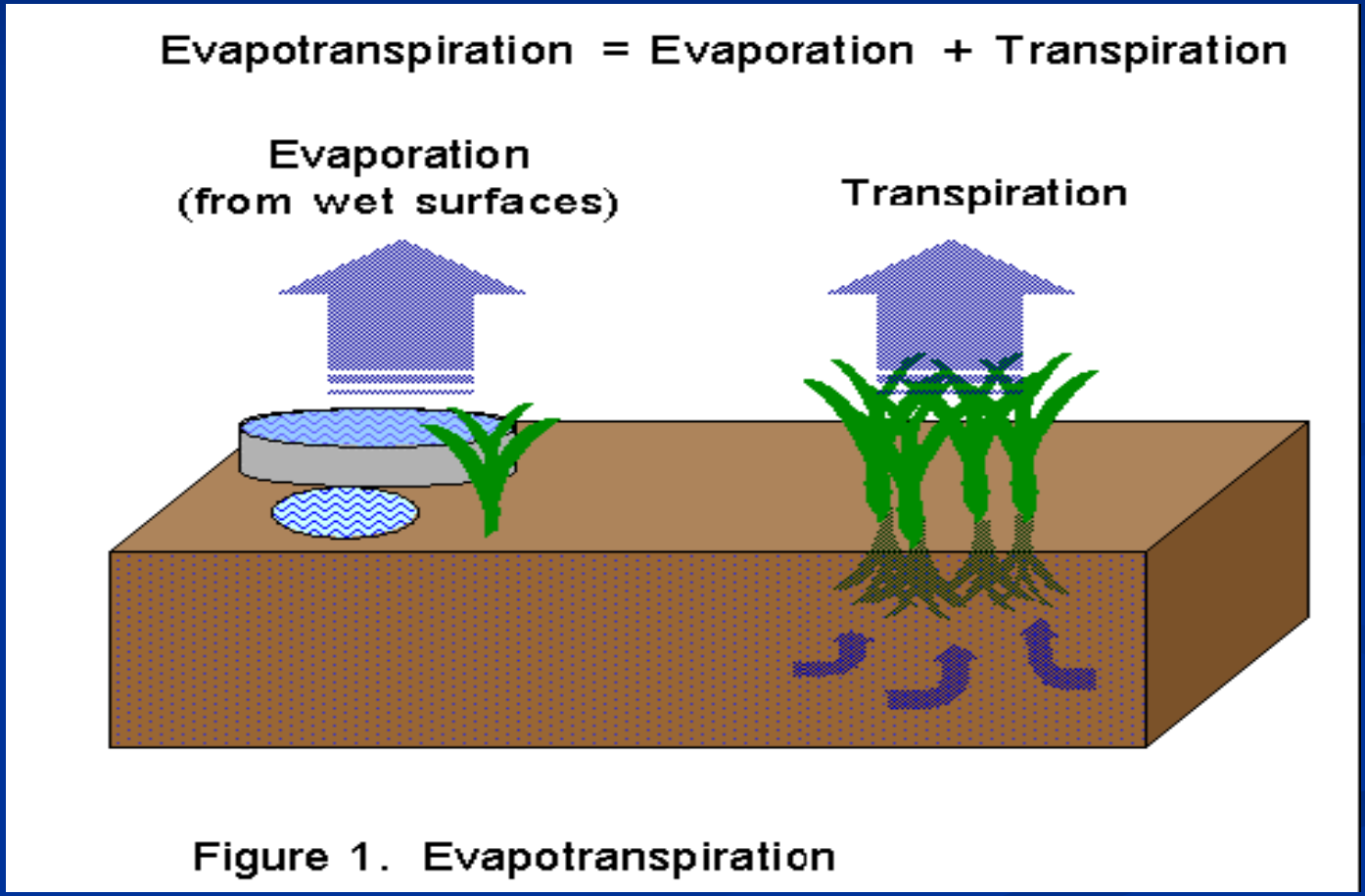


Figure 1. Evapotranspiration

Reference Water Need/Use = Reference ET (ETo)

- ETo = water use of well-watered cool-season turf
- Calculated by formula using weather data

Reference Evapotranspiration (ETo)

An estimate of environmental demand on plant materials for water.

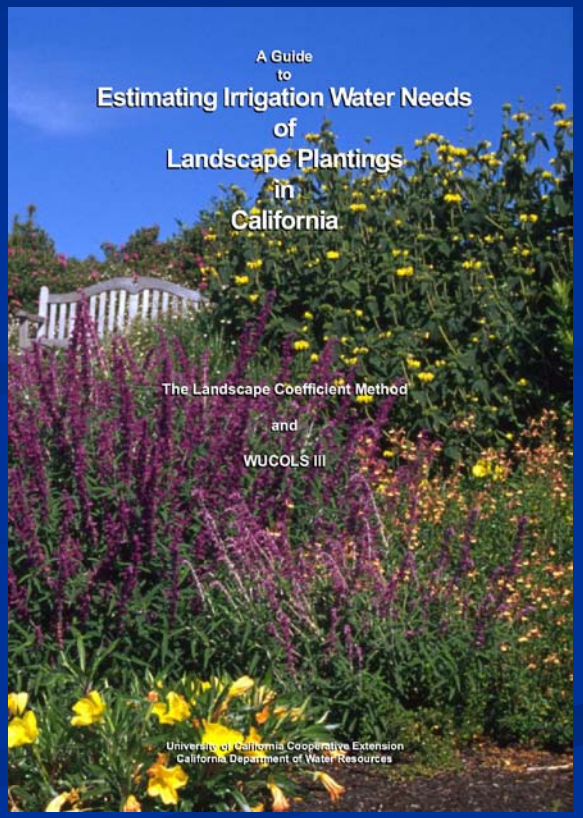
- Climate-based reference
- Inches/day

Assumptions of ETo, Crop Coefficients & Plant Factors

- Plant water need changes in lockstep with changes in ETo
- ETo × *Kc* = Amt. of water needed for *optimum* growth or yield
- ETo × *PF* = Amt. of water needed for *acceptable* level of appearance, growth, or function

Kc & PF Estimates for Landscape Plants

- Turfgrass Kc's developed
- No true Kc's for landscape plants
- Few reliable PFs for landscape plants
- WUCOLS & Landscape Coeff. (K_L)
  - Not research-based



Landscape Plants
Water ***Use*** ≠ Water ***Need***

- May use more water than needed to meet expectations

Turfgrass Irrigation Needs

- Cool-season Kc:

  80% ETo annual avg.

  (60% ETo minimum)

- Warm-season Kc:

  60% ETo annual avg.

  (35% ETo minimum)

Field Studies on Landscape Plants' Water Needs

- 79 plant species to date
  - 33 trees, 12 groundcovers, 34 shrubs
- Mulch water "use"
- Locations
  - Inland valley – 28 trees
  - South Coastal – 28 shrubs, 9 groundcovers, 5 trees
  - Low Desert – 6 shrubs, 3 groundcovers

General Findings

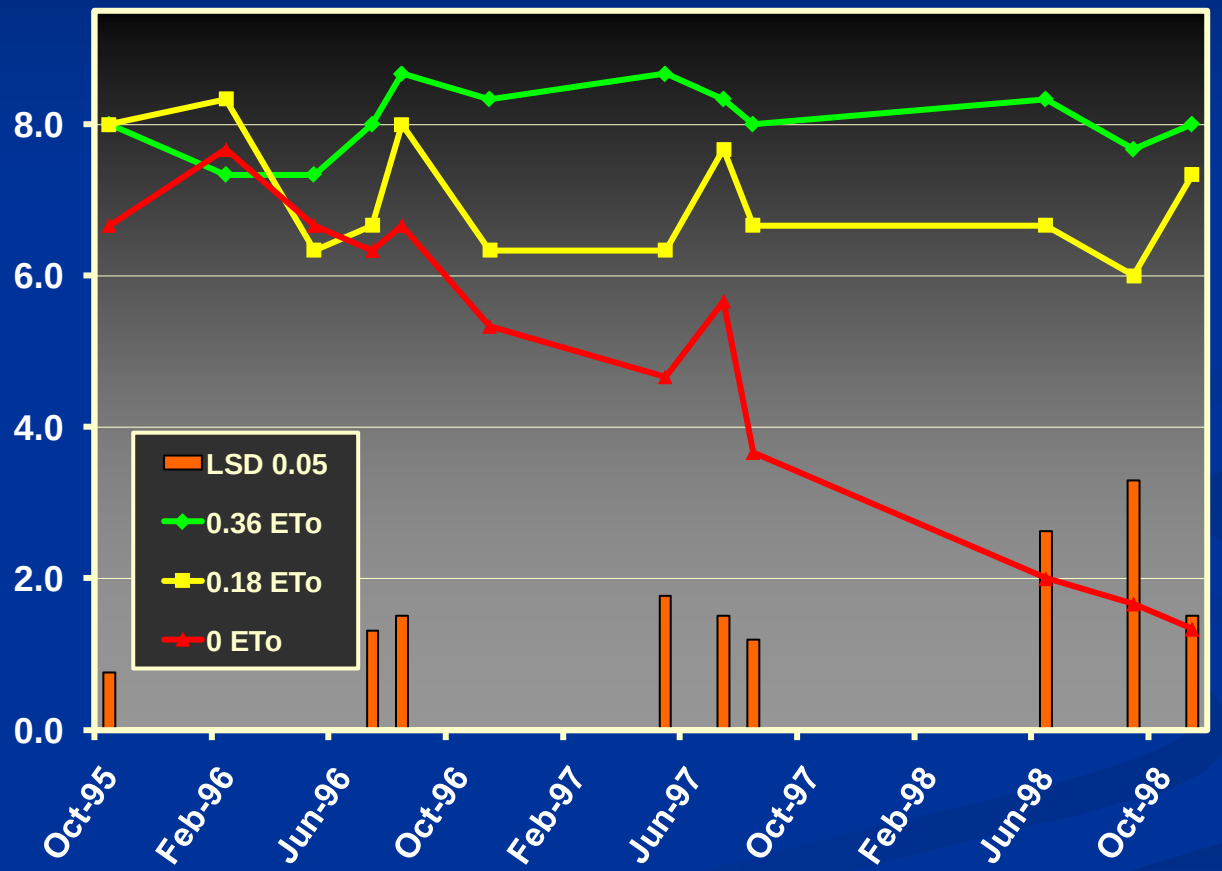
- More water does not always yield better plant performance
- Many traditional landscape plants perform acceptably with low amounts of water
- Less water often limits growth with limited loss of visual appearance
- Many discrepancies with WUCOLS and other sources

Our Research Approach

- Minimum water needed for acceptable performance/appearance (%ETo = PF)
- Apply multiple % ETo treatments
- Irrigate when:

  Σ(daily ETo × trtmt. %) = depletion target
- Evaluate plant performance
  - Aesthetics
  - Growth

Phormium tenax
Aesthetic Quality Ratings



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Phormium tenax

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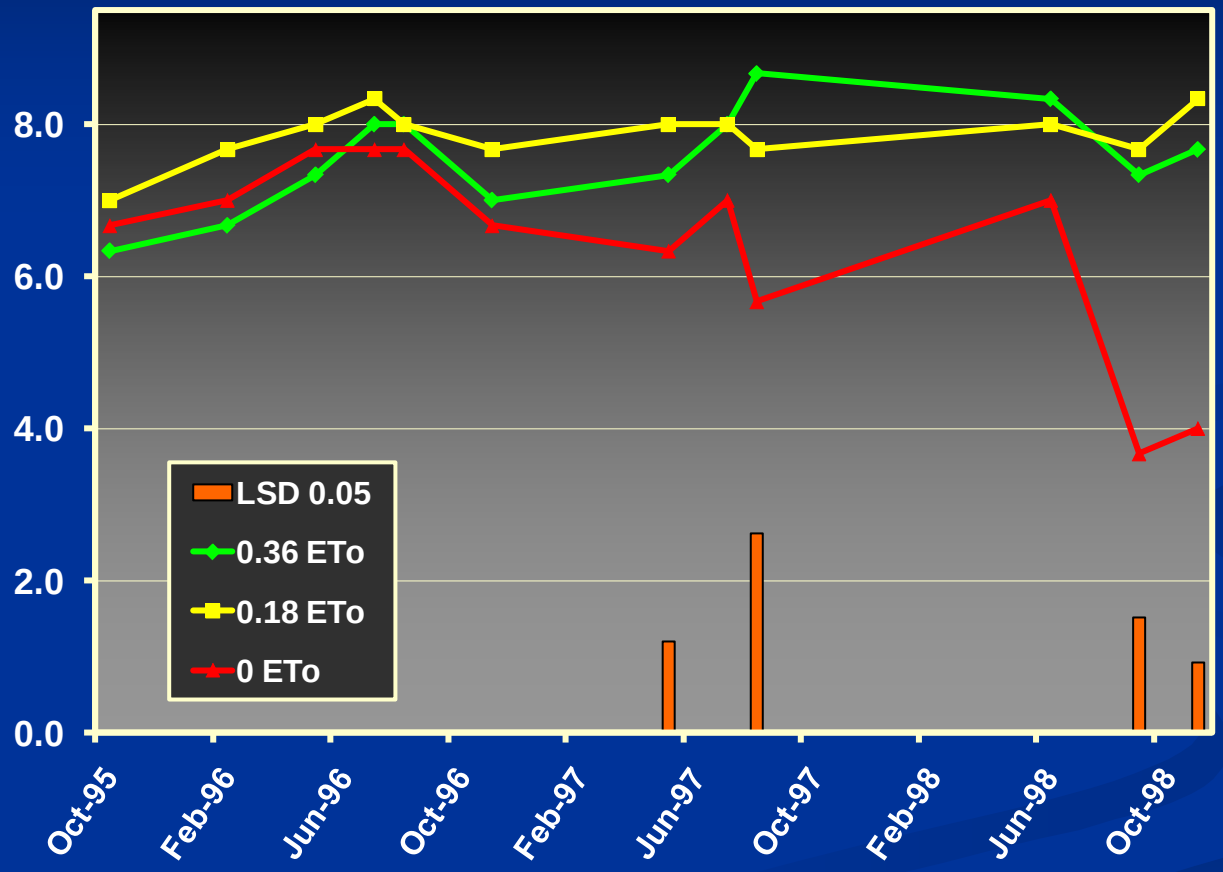
Raphiolepis indica
Aesthetic Quality Ratings



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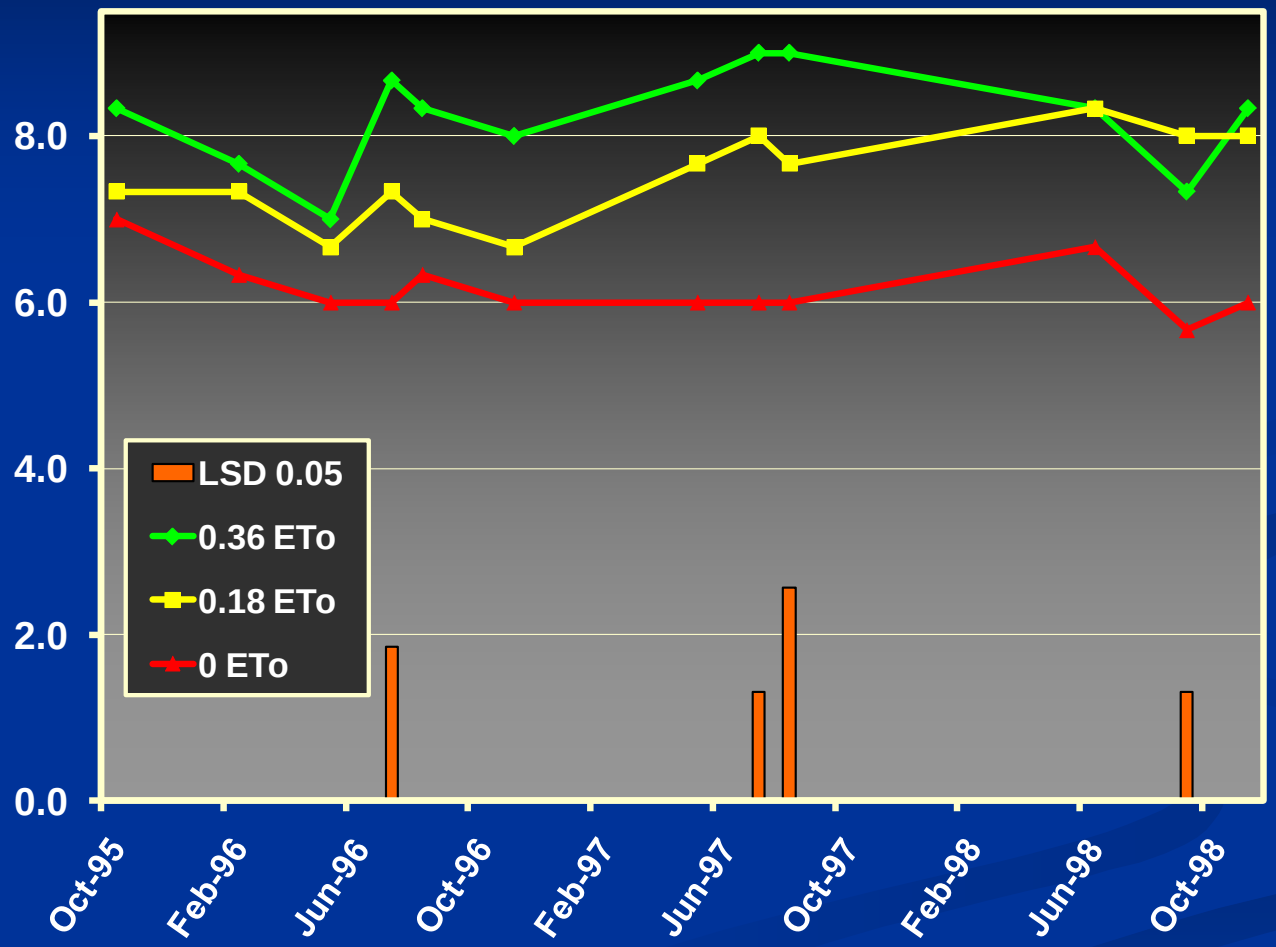
Arbutus unedo
Aesthetic Quality Ratings



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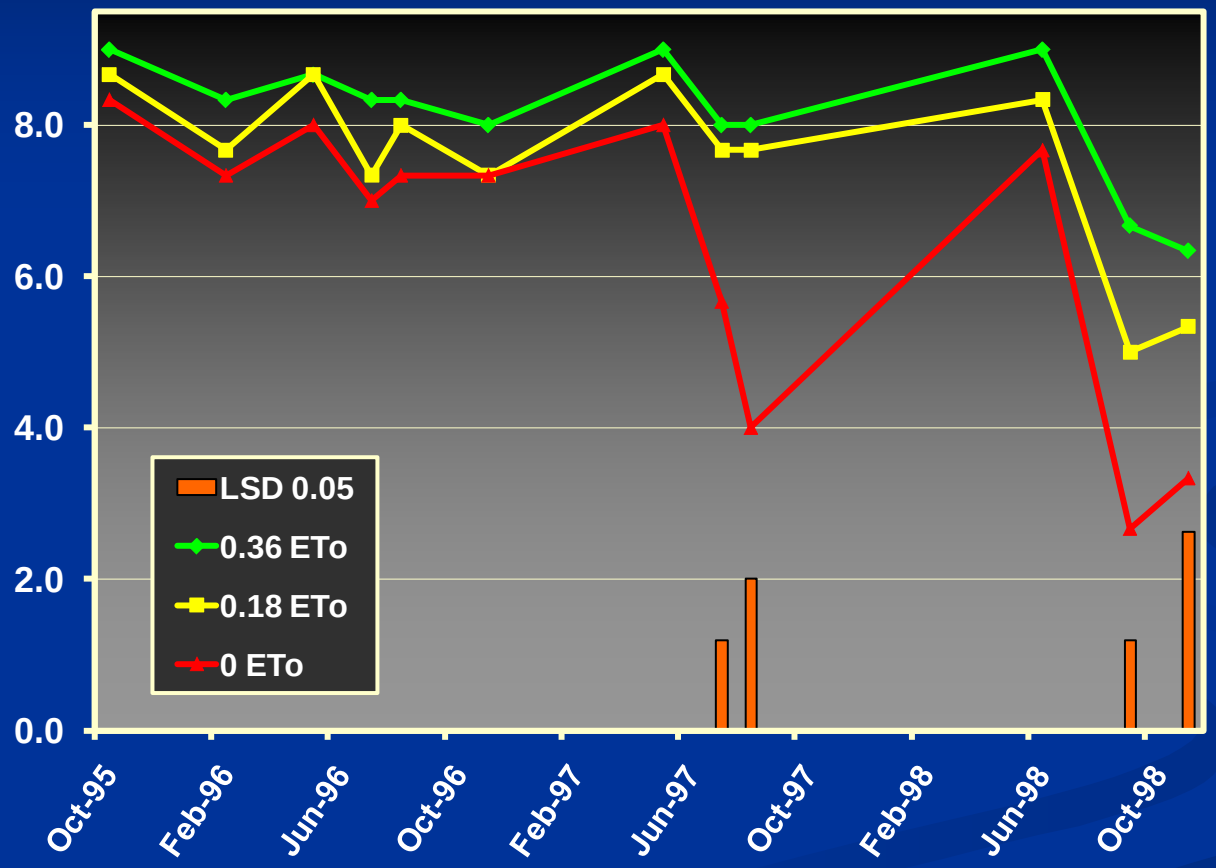
Ligustrum japonicum
Aesthetic Quality Ratings



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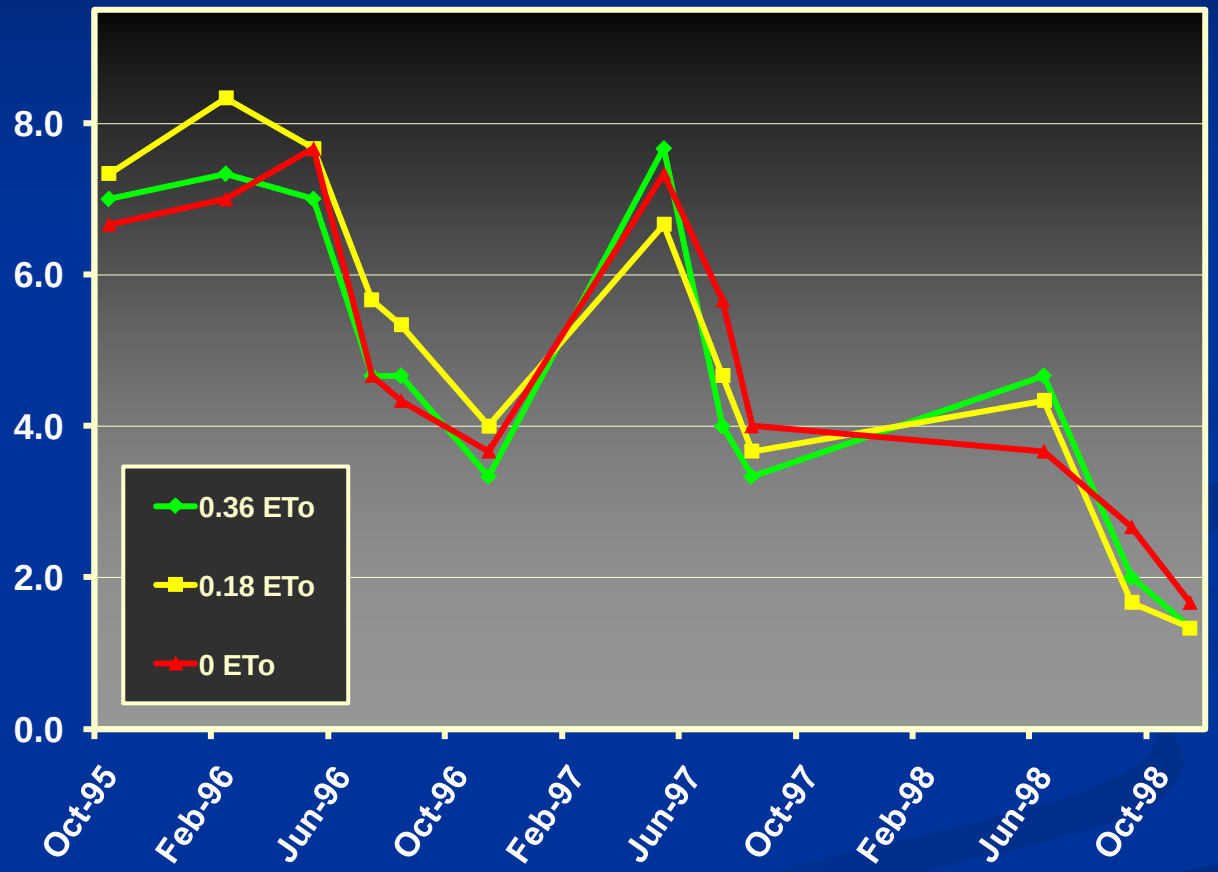
Salvia leucantha
Aesthetic Quality Ratings



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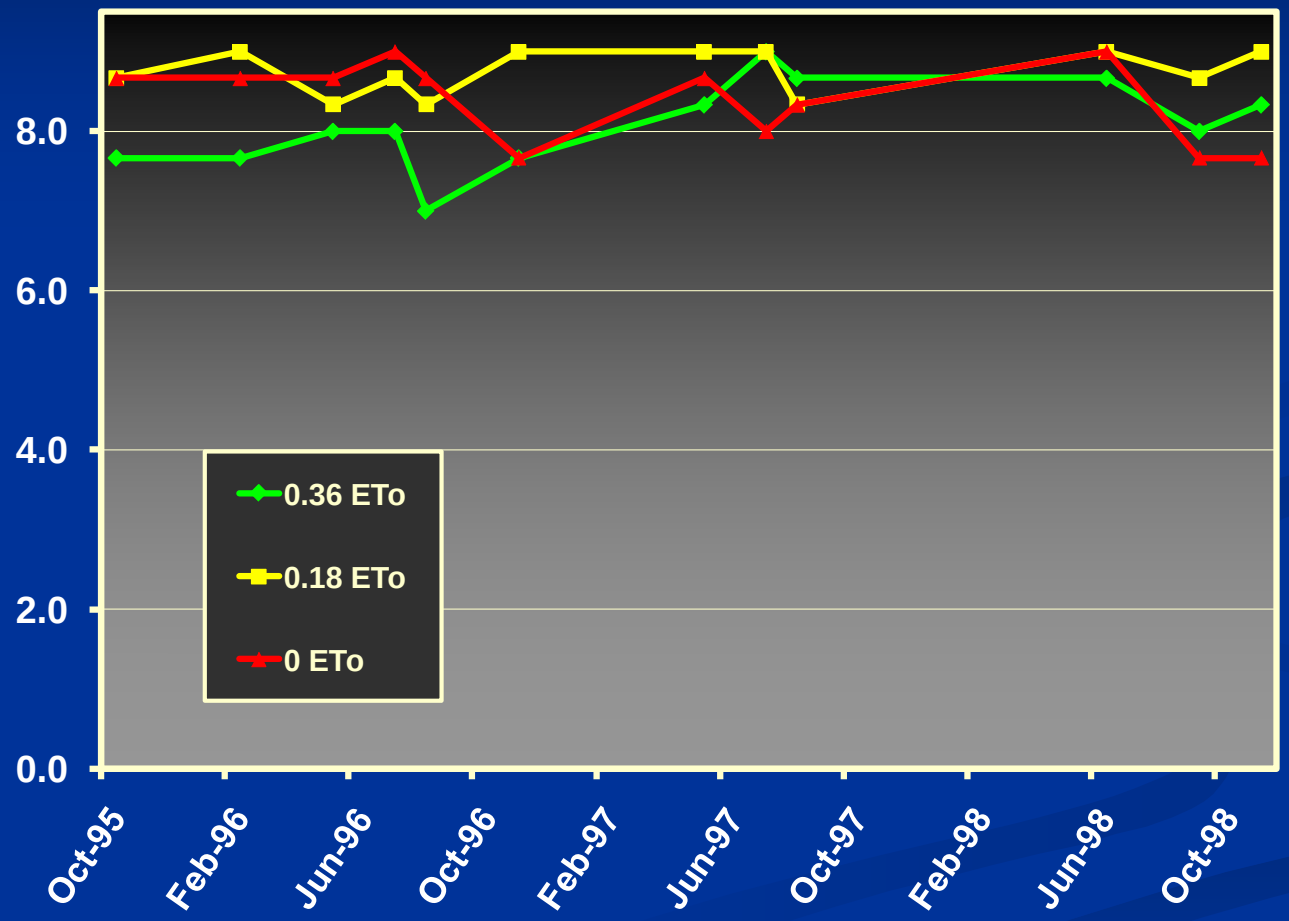
Pyracantha 'Santa Cruz'
Aesthetic Quality Ratings



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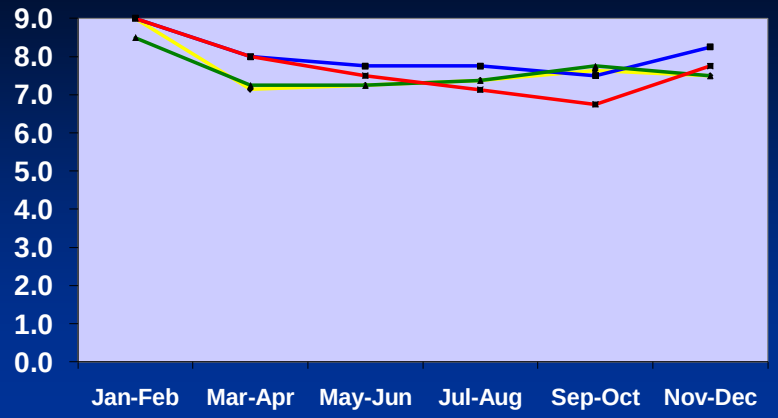
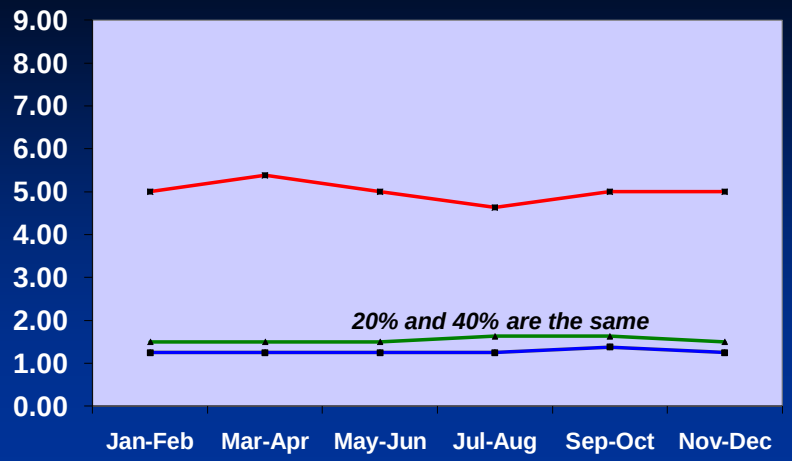
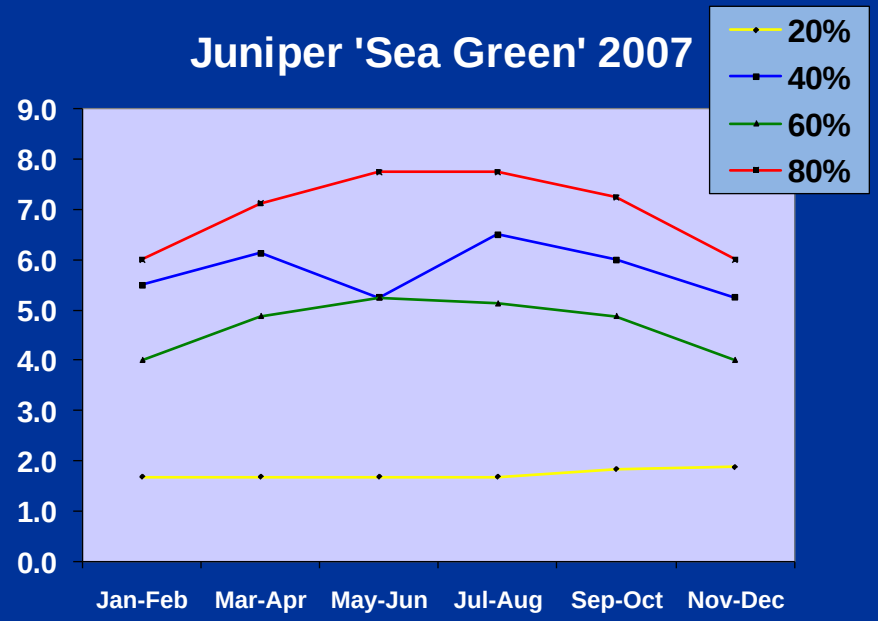
Cassia (Senna) 2007



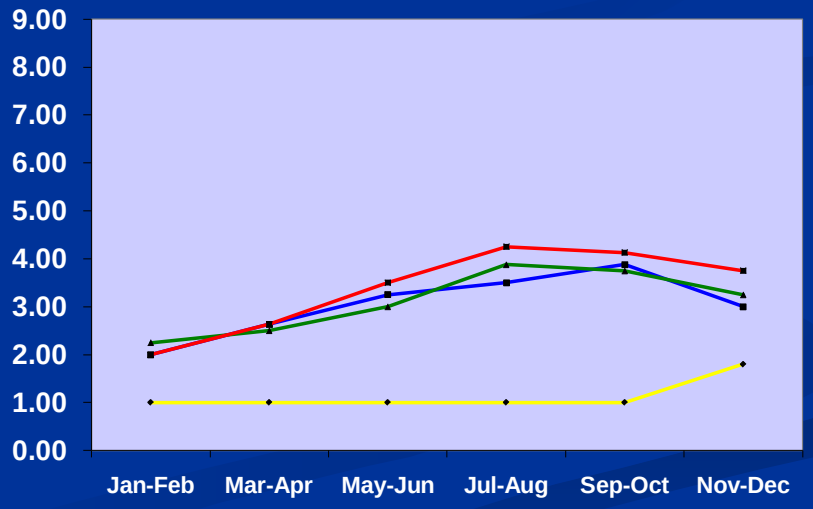
Star Jasmine 2007



Juniper 'Sea Green' 2007



Lantana 2007



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Groundcovers, Trees, Shrubs

- Acceptable performance 0-80% ETo
- Typically acceptable *30-60% ETo*
- Infrequent, thorough irrigation

Climate-based Water Budgets

- Maximum Allowable Water Allocation or Need

  MAWA = ETo PF or Kc LA 0.62

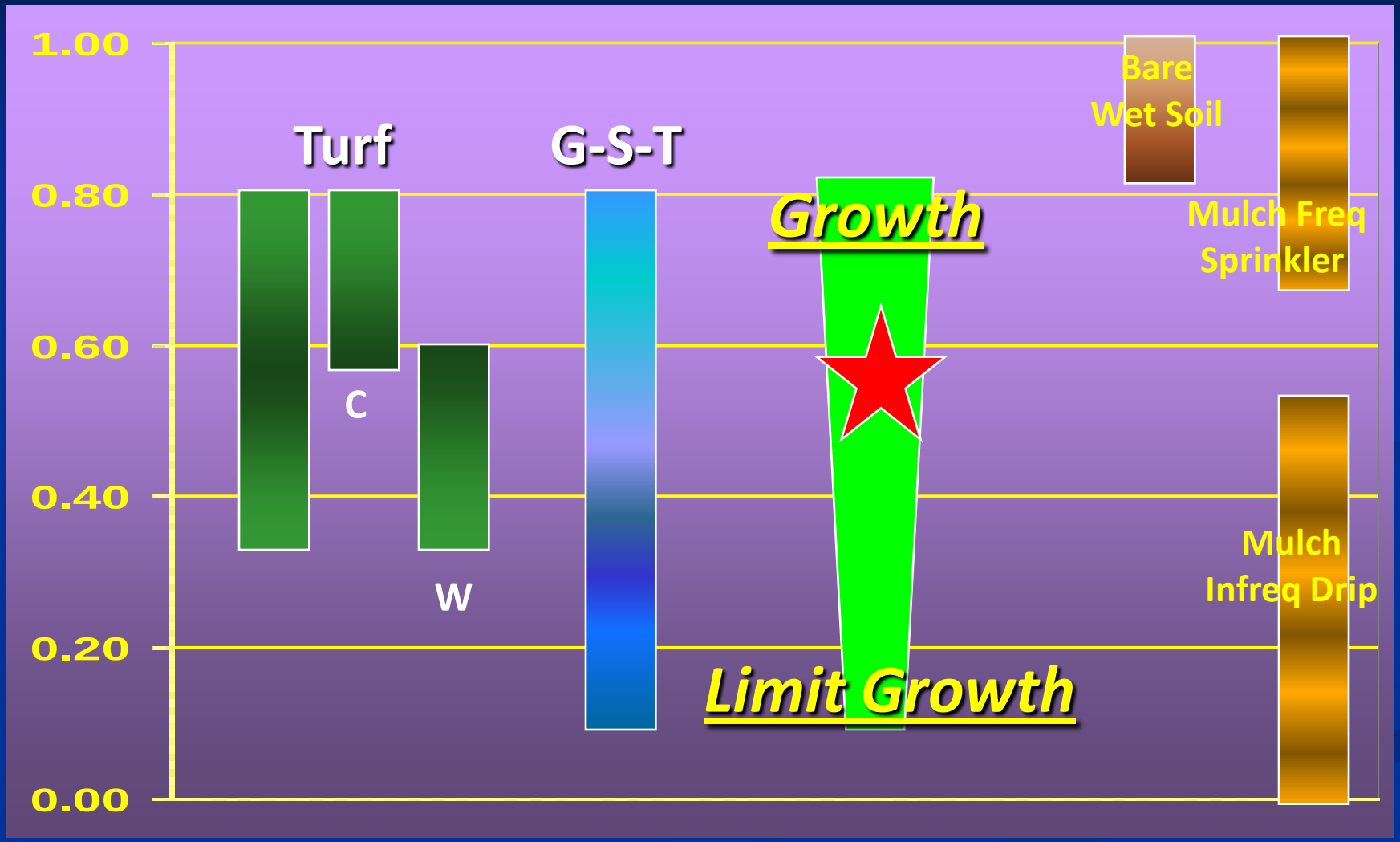
- Planning tool

- Water conservation tool (BMP)

Take Home

- Exact PFs not needed for water budgeting
- WUCOLS unreliable – false precision
  - ≈30% match + ≈ 30% partial match
  - ≈ 40% disagreement
- Budget 80% ETo for CST & 60% ETo for WST
- Budget 50%-60% ETo for non-turf plantings & adjust to meet performance expectations

Using & Adjusting PF & Kc Values



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