Regional Irrigation Efficiency Program

Paul Robins

Resource Conservation District of Monterey Co.

RCDMC
RESOURCE CONSERVATION DISTRICT OF MONTEREY COUNTY

UC CE University of California Cooperative Extension

ANR UNIVERSITY of CALIFORNIA

Central Coast Irrigation Efficiency Program Goal:

Provide a technical service that can address the needs of a sophisticated agriculture system

- Build local expertise
- Experienced in irrigation/nutrient management
- Knowlege of regional agriculture and economic challenges
- Connected to network of agency resources

Pilot Irrigation Efficiency Program in Santa Clara County (year 2)

- Joint effort of Monterey Co RCD, SC Farm Bureau , UCCE, and Santa Clara Valley Water Agency
- Turf, tomatoes, peppers, squash, cherries, wine grapes, flowers (greenhouse)
- Subsurface drip, surface drip, solid-set sprinklers, wheel line sprinklers, micro sprinklers

Why improve irrigation management?

- Improve production and quality
- Conserve fertilizer
- Conserve water
- Water quality: ground and surface water

Components of the Irrigation Efficiency Program

- Uniformity evaluation
- System design and operation audit
- Scheduling evaluation

Irrigation Efficiency =

$$\frac{\text{Water Requirement of the Crop (Crop ET)}}{\text{Total Amount of Water Applied}}$$

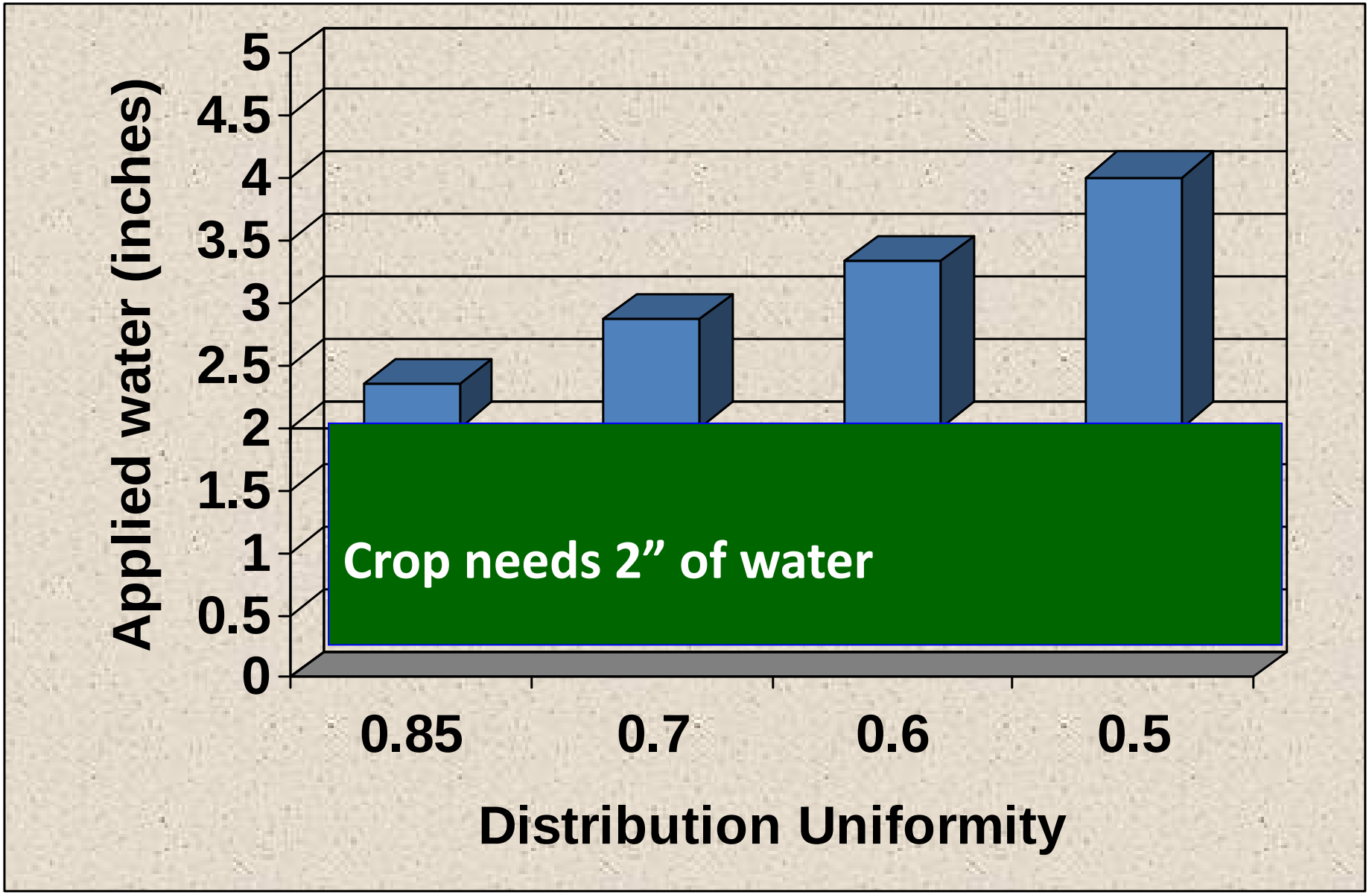
a very high irrigation efficiency > 0.9 or 90%

Goal is for all participants to work towards 80% or higher

Irrigation Requirement =

$$\frac{\text{Water Requirement of Crop (Crop ET)}}{\text{Distribution Uniformity}}$$

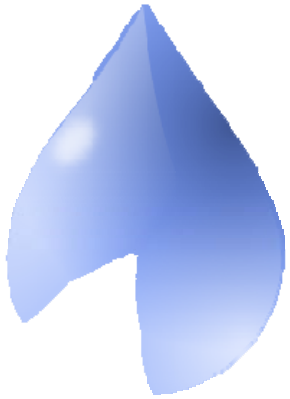
Irrigation Requirement and Distribution Uniformity



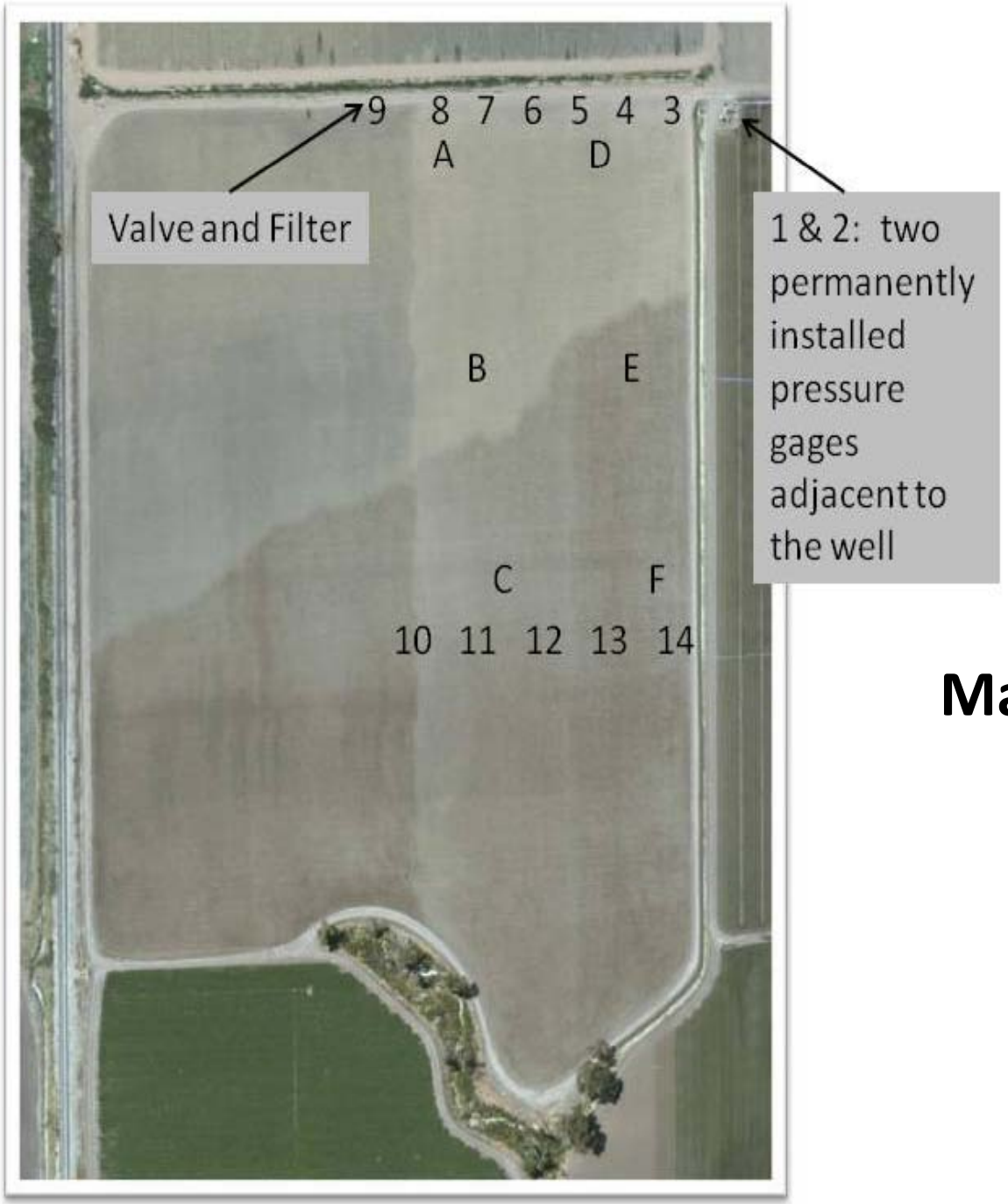
Components of the Irrigation Efficiency Program in Santa Clara County

- ✓Field Work (Equipment, Standard Operating Procedures, Data sheets)
- ✓Data analysis (Spreadsheet tools, datalogger programs)
- ✓Summary Report (Template report)
- ✓Grower consultation

Irrigation Efficiency Report



Part of the 2009 Santa Clara Irrigation Efficiency Project, a cooperative effort between ten Santa Clara County Farmers, Santa Clara County Farm Bureau, University of California Cooperative Extension, and the Central Coast Agricultural Water quality Coalition. Made possible by funding from the Santa Clara Valley Water District.

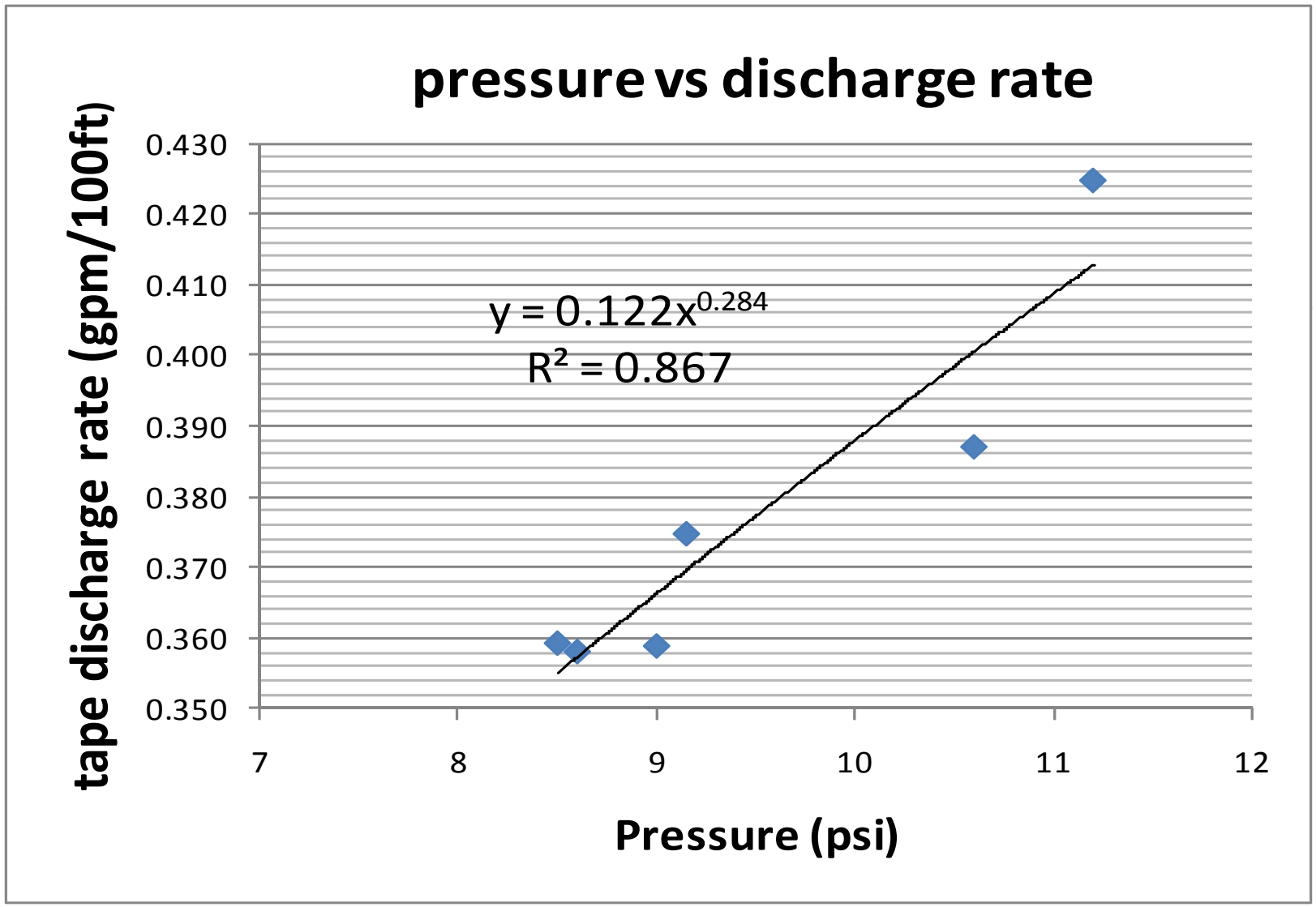


Map locations of all measurements

Evaluation of Pressure Uniformity

Summary of pressure measurements

Drip Tape Performance



Distribution Uniformity Evaluation

Uniformity calculations

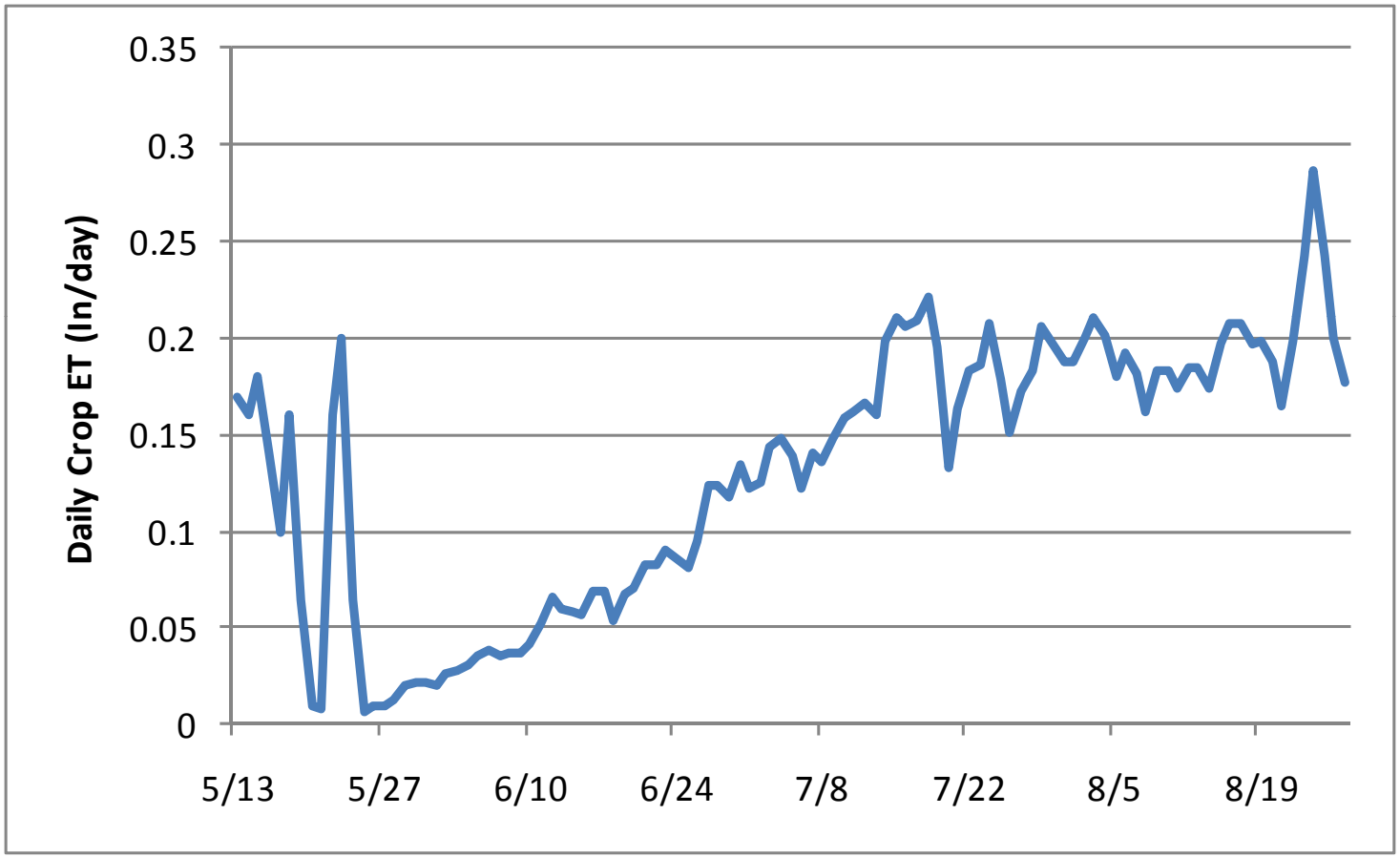
- Distribution uniformity of lowest quarter
- Distribution uniformity of lowest tenth
- Scheduling coefficient
- System application rate
- Discharge rate of emitter/sprinkler

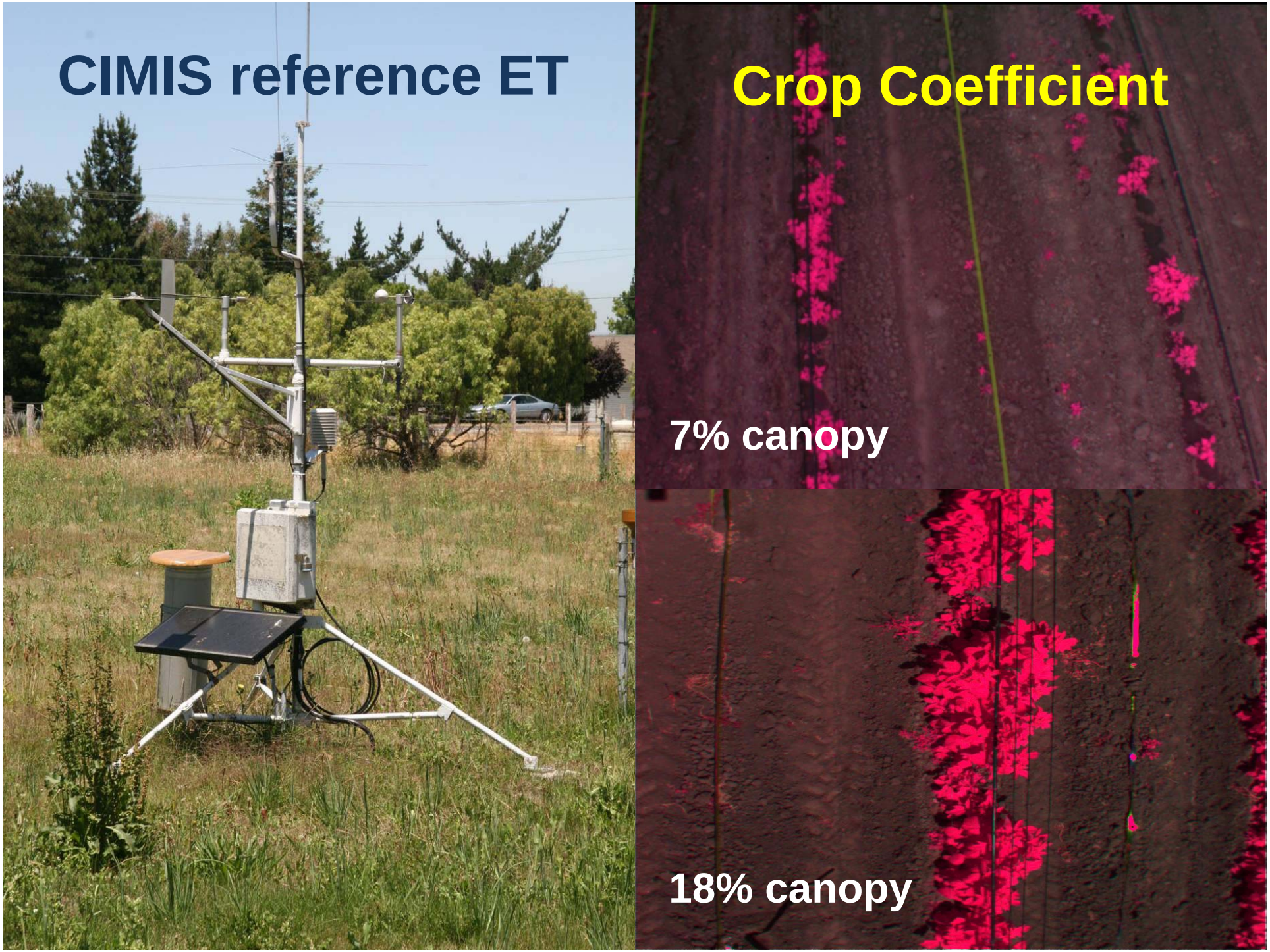
Emitter discharge uniformity evaluated in a vineyard

Application uniformity evaluated for micro-sprinklers in an orchard

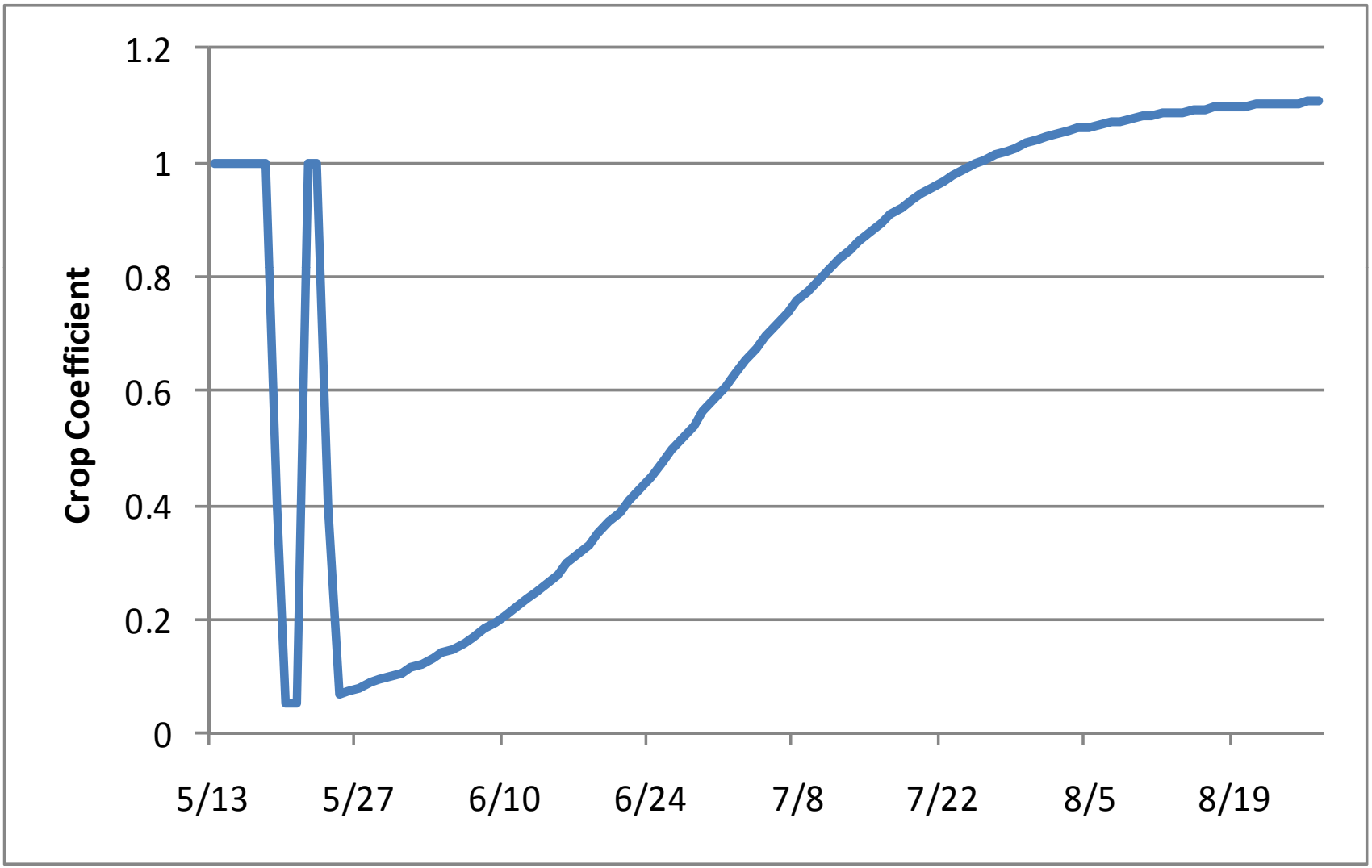
Evaluation of Irrigation Scheduling

Estimate Crop Water Use

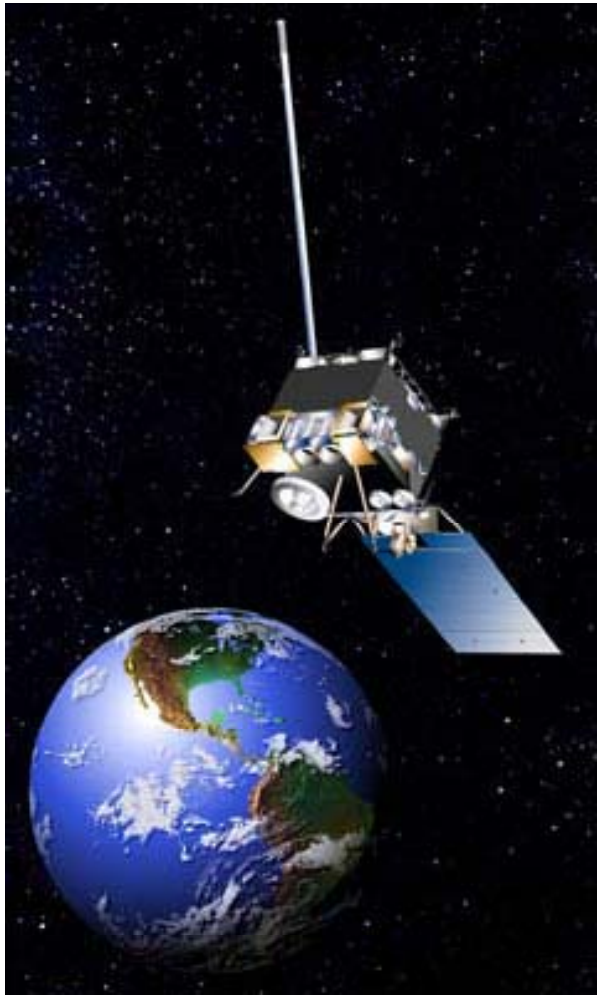


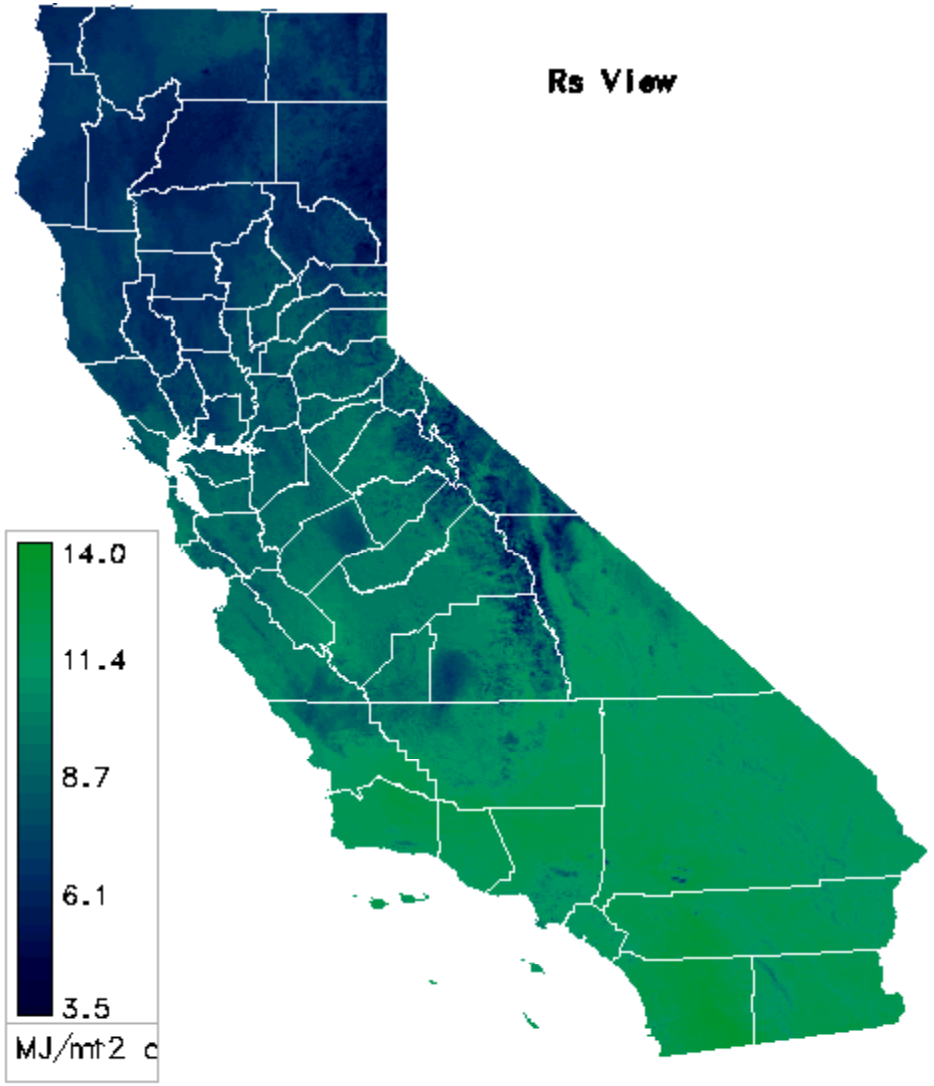

CIMIS reference ET
Crop Coefficient
7% canopy
18% canopy

Crop coefficient changes during the season

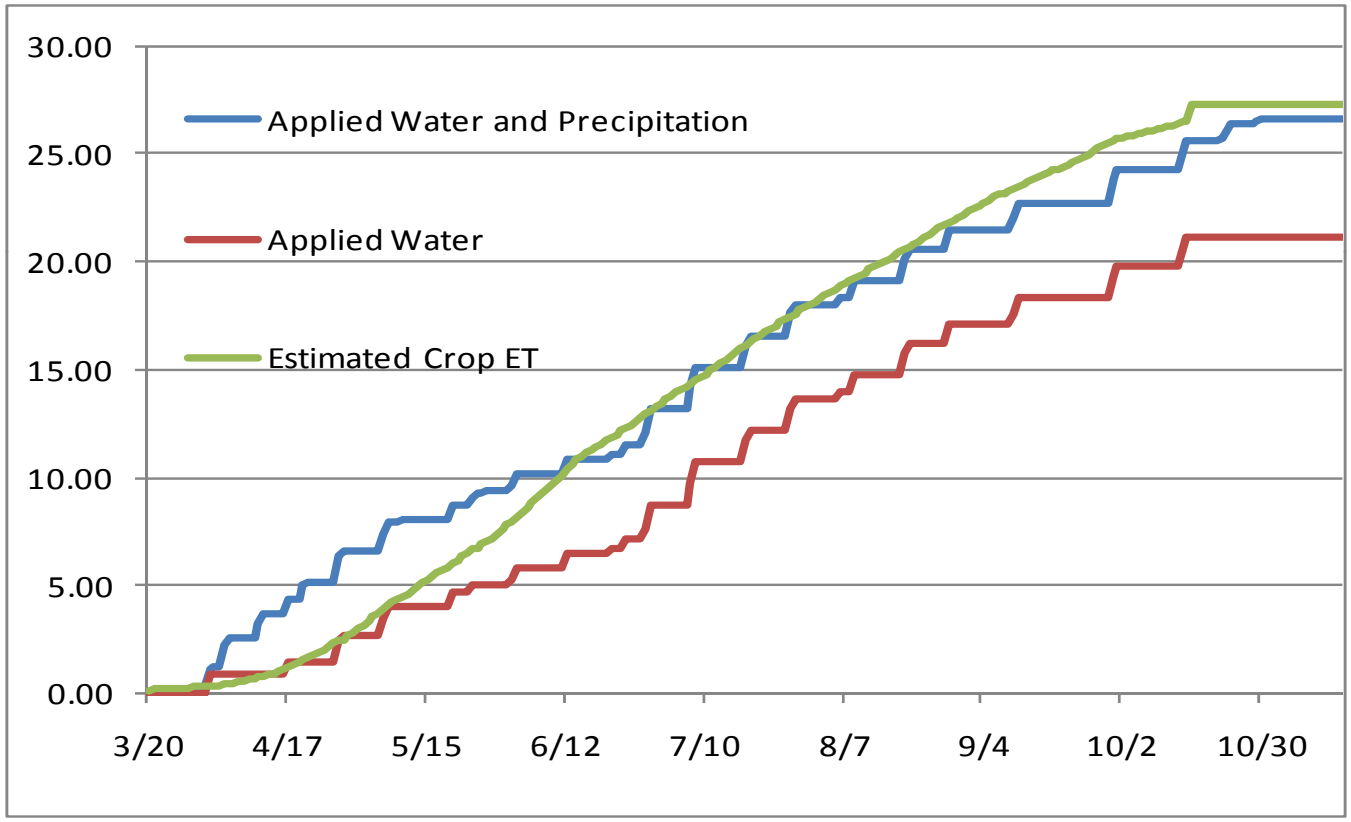


Spatial CIMIS ETo Reporting

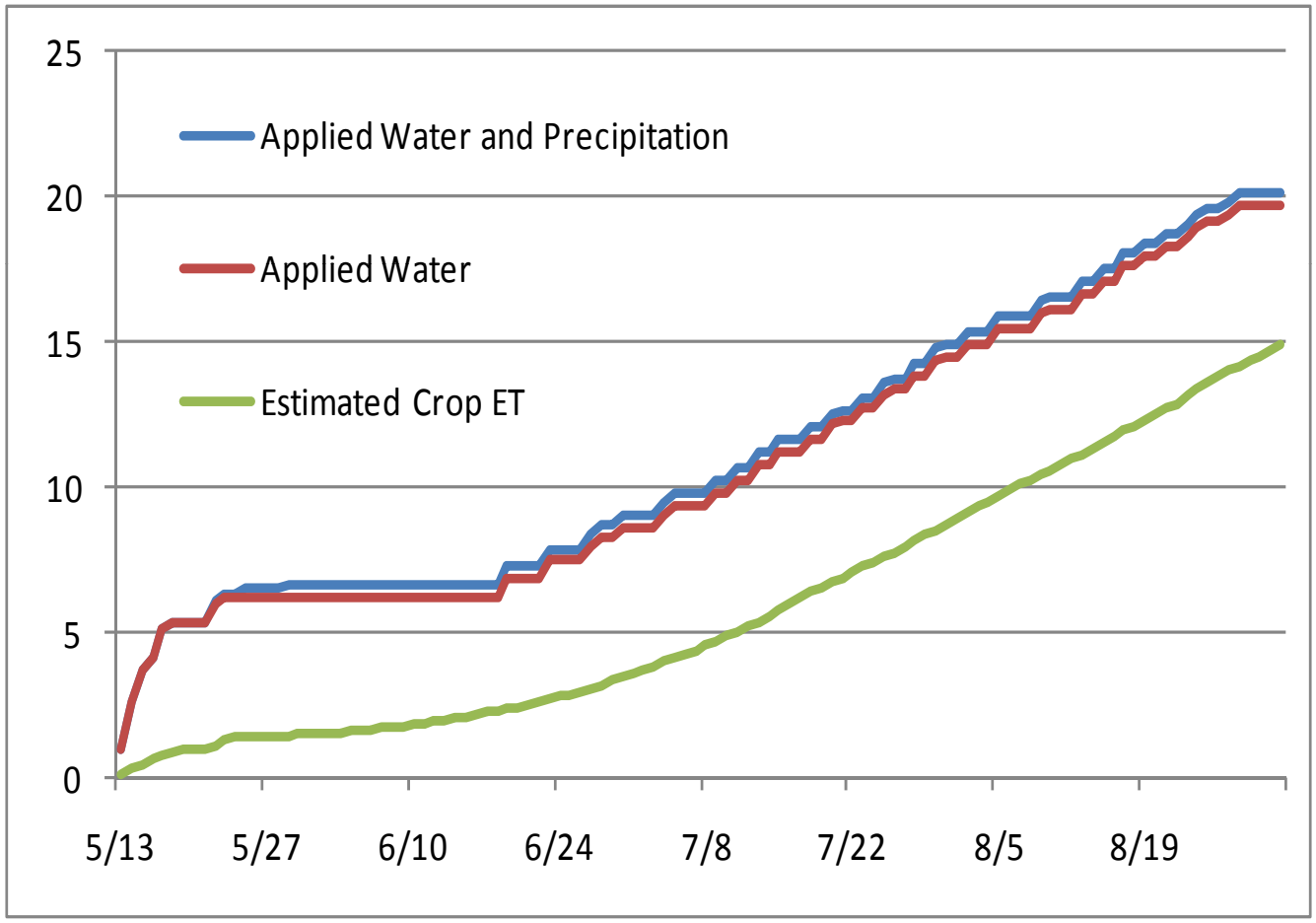




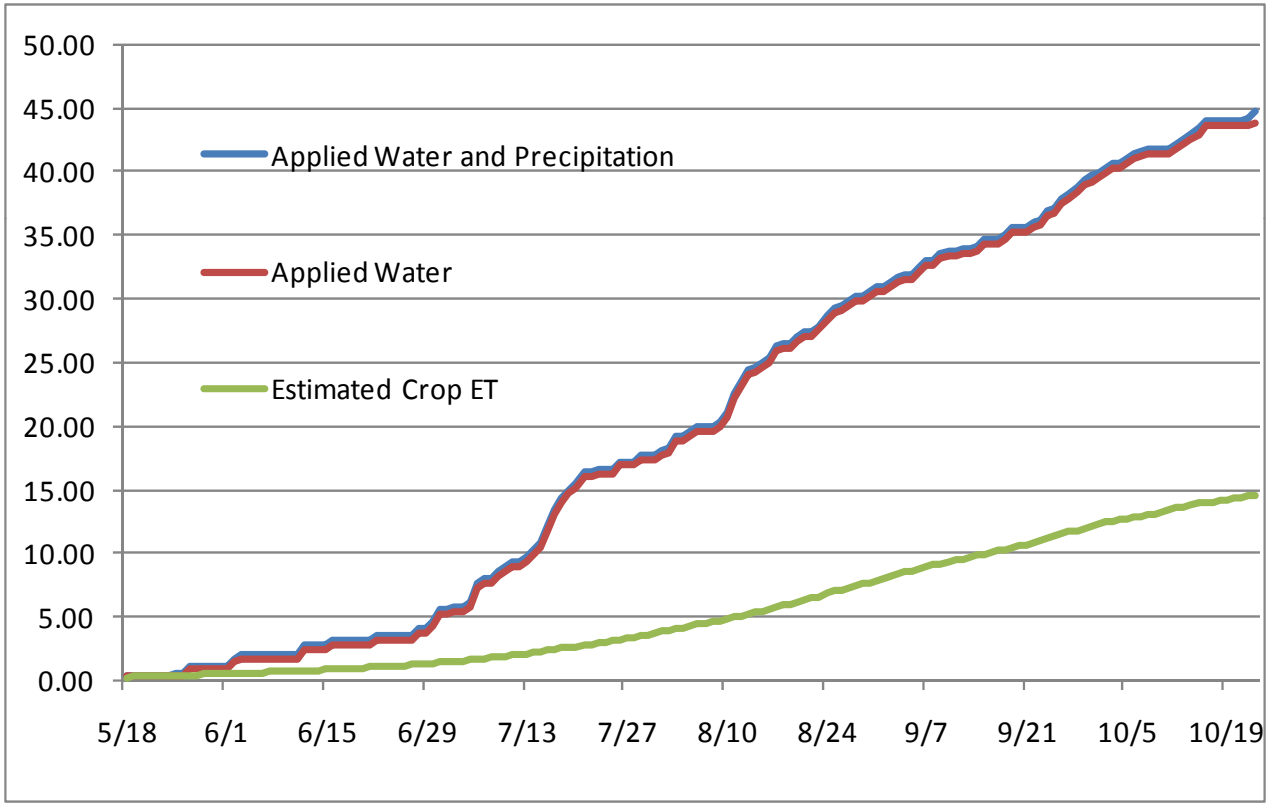
Applied Water vs Crop ET (example 1)



Applied Water vs Crop ET (example 2)



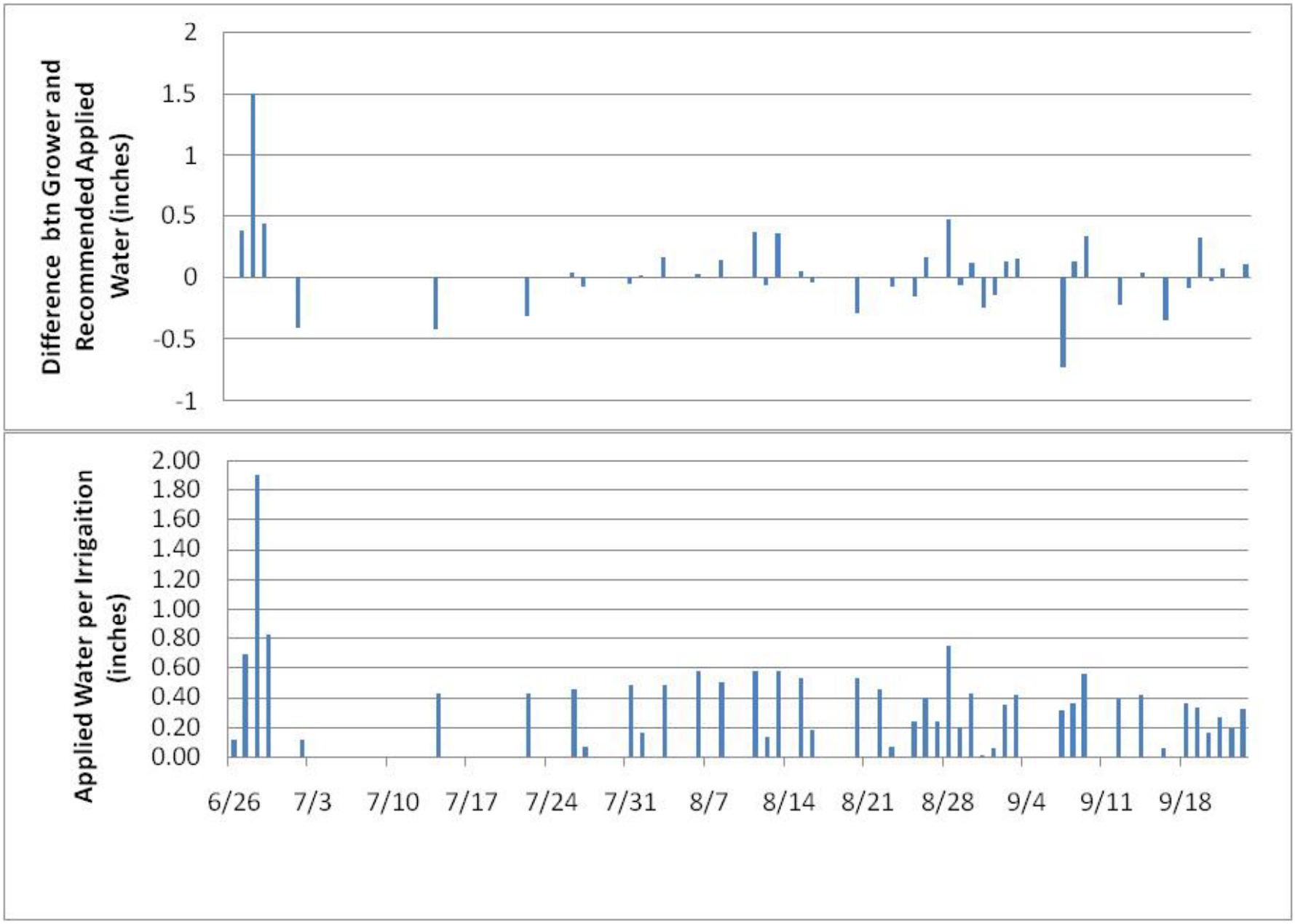
Applied Water vs Crop ET (example 3)



Summarize Irrigation Schedule

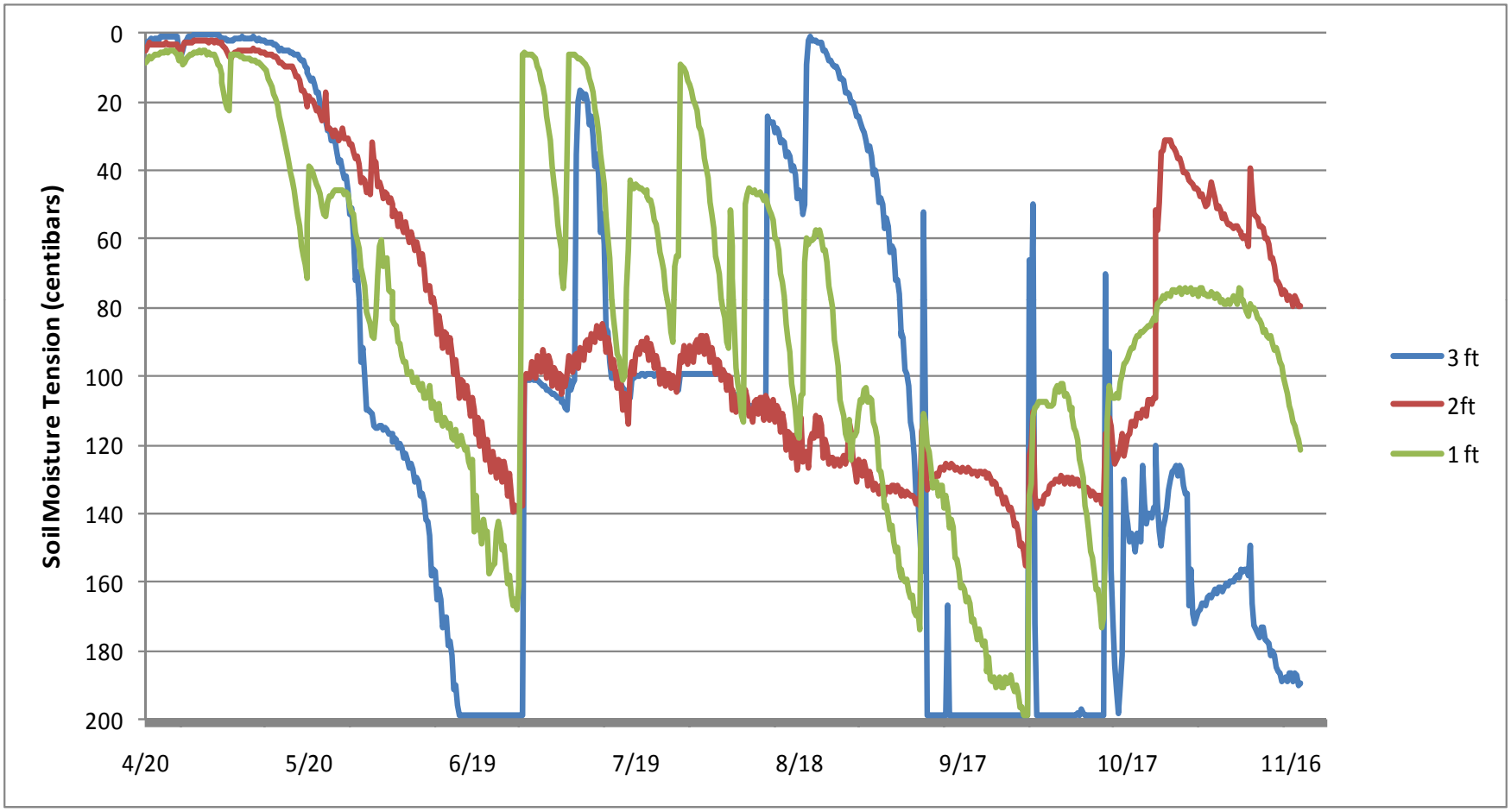
Summary of Irrigation Schedule	Value
Total amout of applied water (gallons)	5,656,850
Total amout of applied water (inches)	16.0
Estimated crop ET (inches)	12.9
Irrigation Requirement (inches)	15.6
Irrigation Efficiency (%)	80.7
average flow rate (gpm)	211.7
average field application rate (inches/hour)	0.036
coefficient of variation of system flow rate (%)	14.8
lowest flow rate (gpm)	79.7
highest flow rate (gpm)	251.5
average irrigation amount (inches)	0.28
minimum irrigation amount (inches)	0.03
max irrigation amount (inches)	1.03
average irrigation time (hours)	7.7
minimum irrigation time (hours)	0.8
maximum irrigation time (hours)	27.6

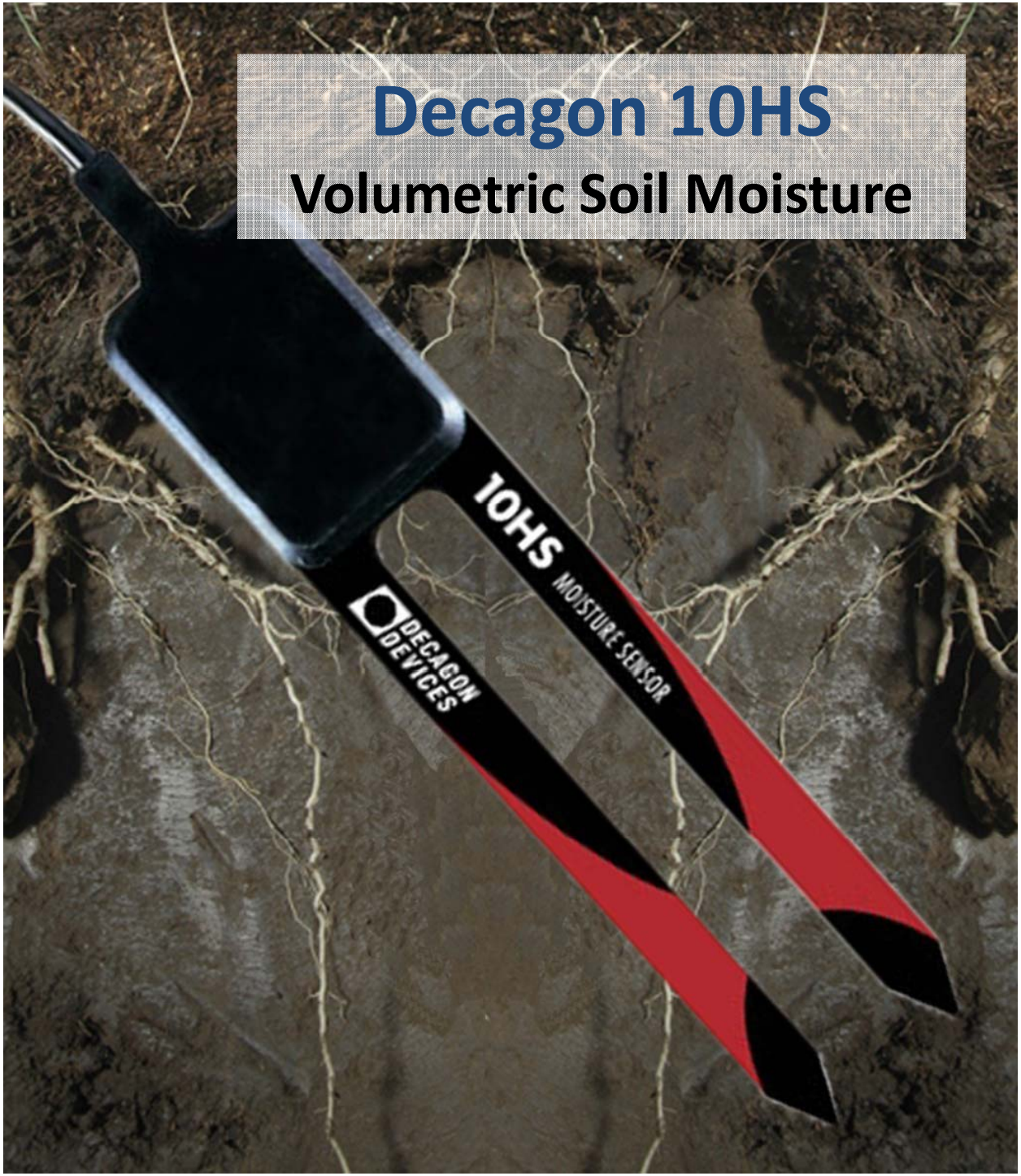
Actual *vs* Recommended Irrigation



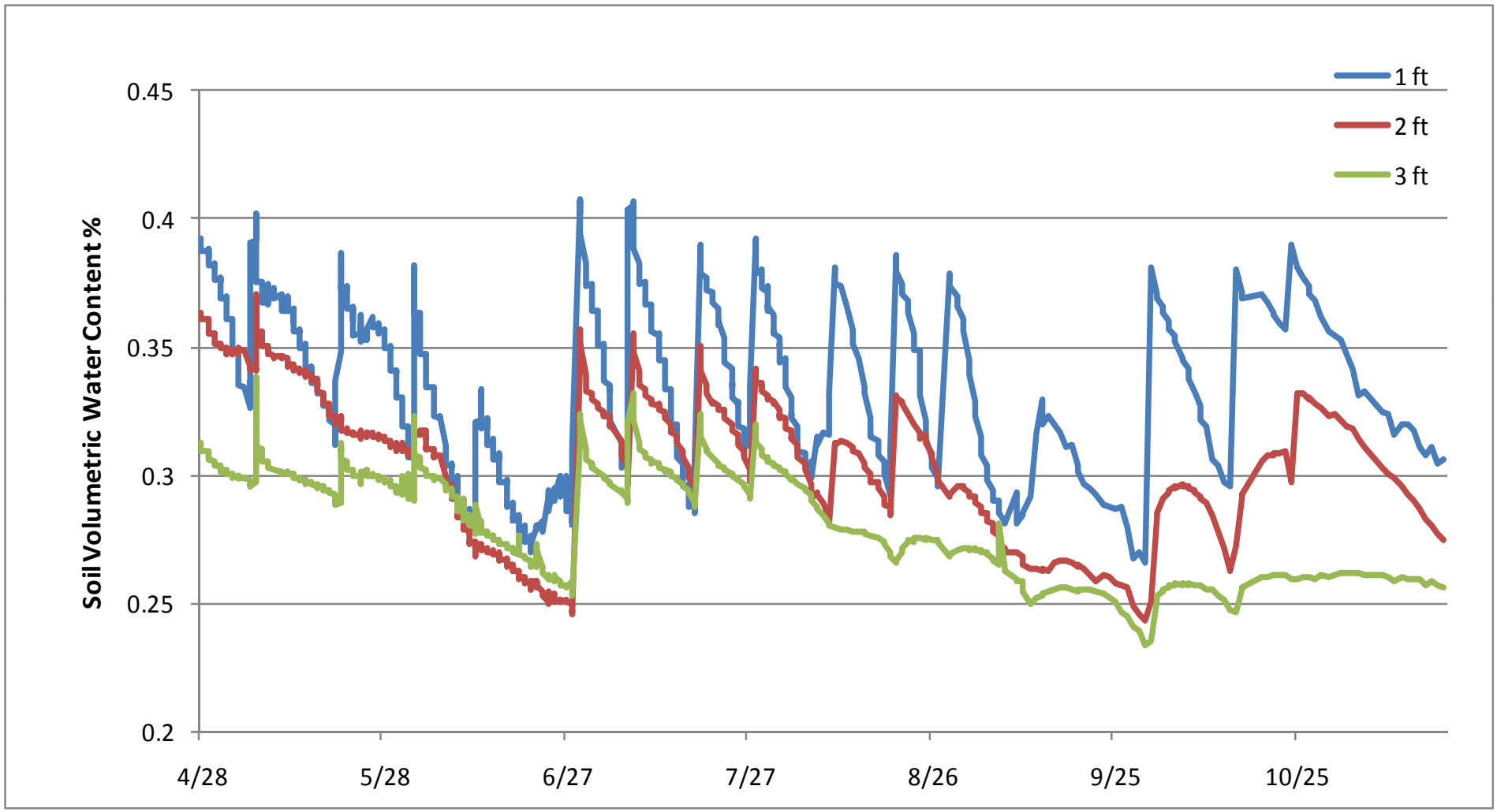

HANSEN

Watermark soil moisture tension




Decagon 10HS
Volumetric Soil Moisture
10HS MOISTURE SENSOR
DECAGON DEVICES

Volumetric soil moisture



Tensiometers monitor the matric potential (tension) of the soil

Measurement of soil moisture that is most related to water status in a plant

2010 Summary

Crop	Irrigation method	Irrigation Efficiency	Distribution Uniformity lowest quarter
		%	
Cherry	microsprinkler	100	81
Greenhouse mums	drip	58	77
winegrape	drip	100	93
winegrape	drip	100	76
turf grass	sprinkler	82	69
squash	drip	57	52
tomato	drip	100	92
pepper	sprinkler/drip	33	48
pepper	sprinkler/drip	44	82
celery	sprinkler/drip	71	93
Average		75	76

Distribution Evaluation and System Audit

- System pressure varied during irrigation
- Pressure too low in submain
- Leaks at submain-lateral connections
- Leaks on lateral lines
- Material in drip lines
- Plugged emitters
- Different nozzle orifice diameters (sprinkler)
- Dripper emission rate sensitive to pressure changes

Scheduling Evaluation

- Variation in flow rate among irrigation events (4% to 26%)
- Some growers applied more than 2 times crop ET
- Some growers applied 2 times less than crop ET
- Applied water amounts sometimes exceeded water holding capacity of soil
- Soil moisture monitoring is a good cross check of crop ET

Challenges

- Engage irrigation decision maker in IEP
- Streamline data processing and reporting
- Meeting growers' resource information needs…what parts of this would help YOU?

Contact Information

Paul Robins, RCD of Monterey County
paul.robins@rcdmonterey.org
831-424-1036, ext. 124

Michael Johnson, California H2orticultural Services, delsol@calcentral.com
831-325-3376

Or, your local Resource Conservation District