

# Agricultural Applications of ET

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# Situation

- The Colorado River Valleys of Southern Arizona and California And the Imperial and Coachella Valleys of California represent more Than 700, 000 acres (280,000 ha) of irrigated cropland
- This region produces more than 95% of the nation's vegetables During the fall-winter-spring season each year.
- Many of the water rights on the lower Colorado have high seniority
- Colorado River resources over-subscribed
- USBR is responsible for delivering water, managing salinity, and meeting US/Mexico treaty obligations
- Remote sensing of ET has a role in assessing current water use & helping to manage water in the future.

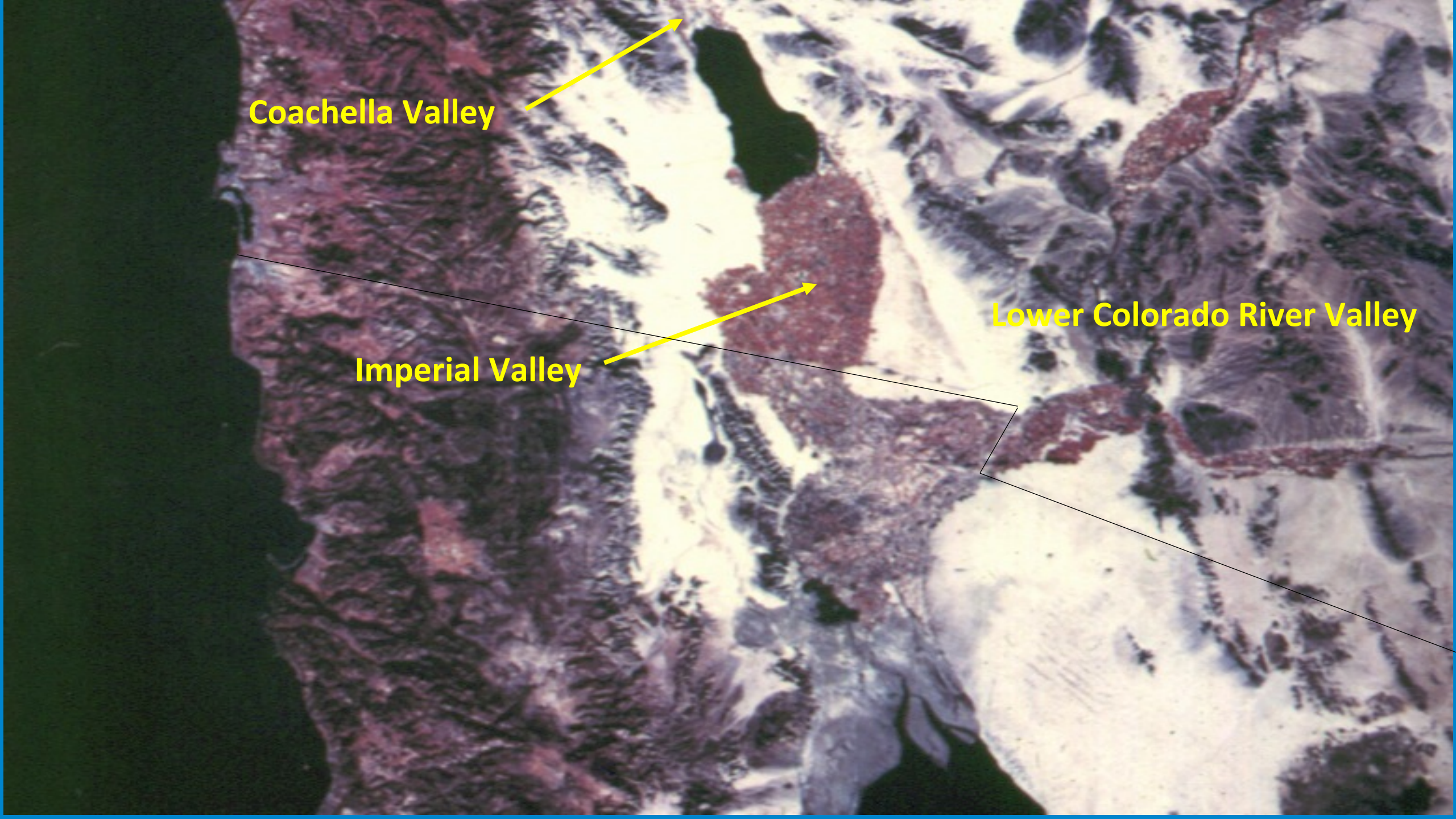




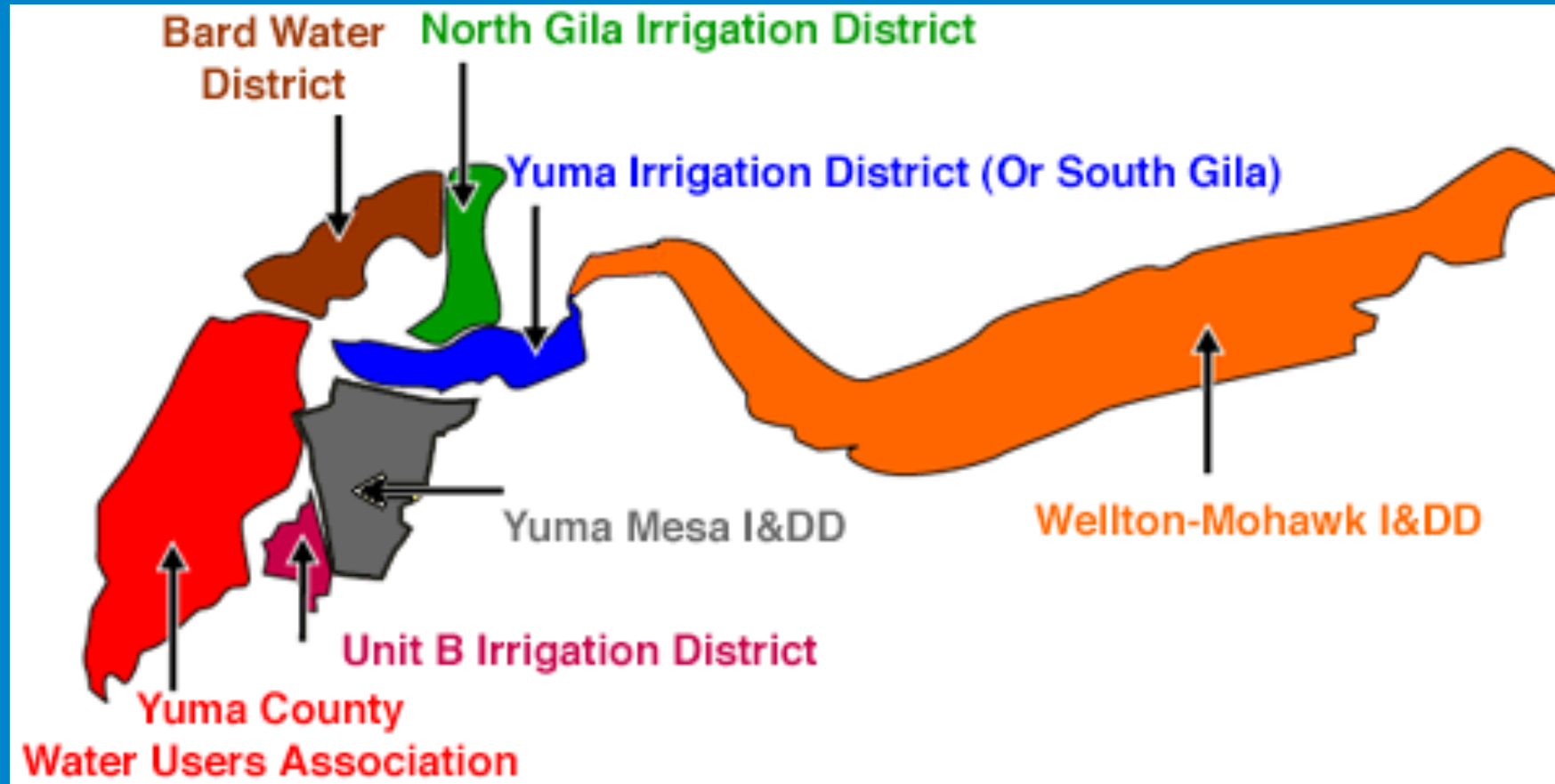
**Coachella Valley**

**Imperial Valley**

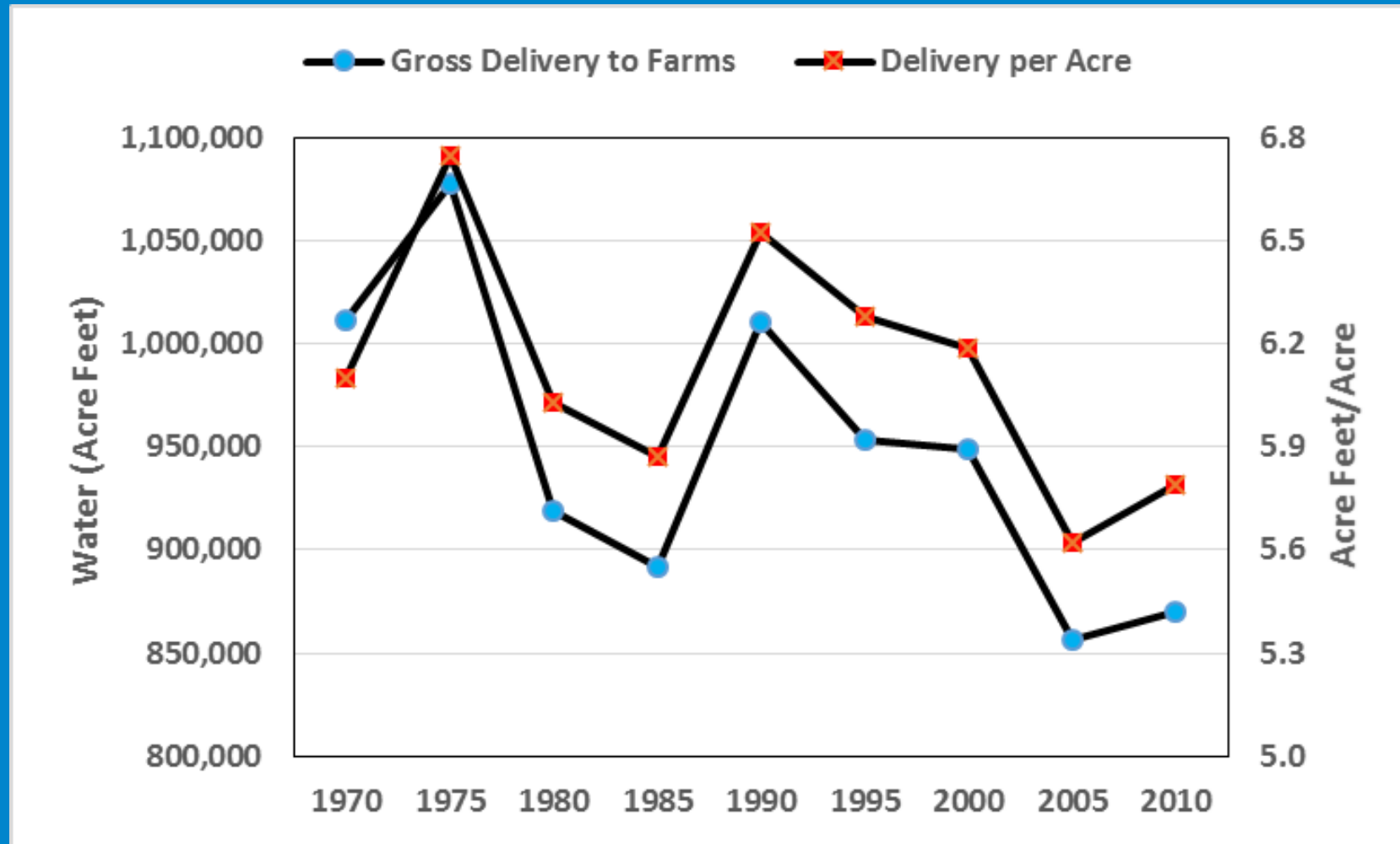
**Lower Colorado River Valley**



# Irrigation Districts for the Yuma Arizona Region



# Declining Irrigation Water Deliveries to Yuma County Farms

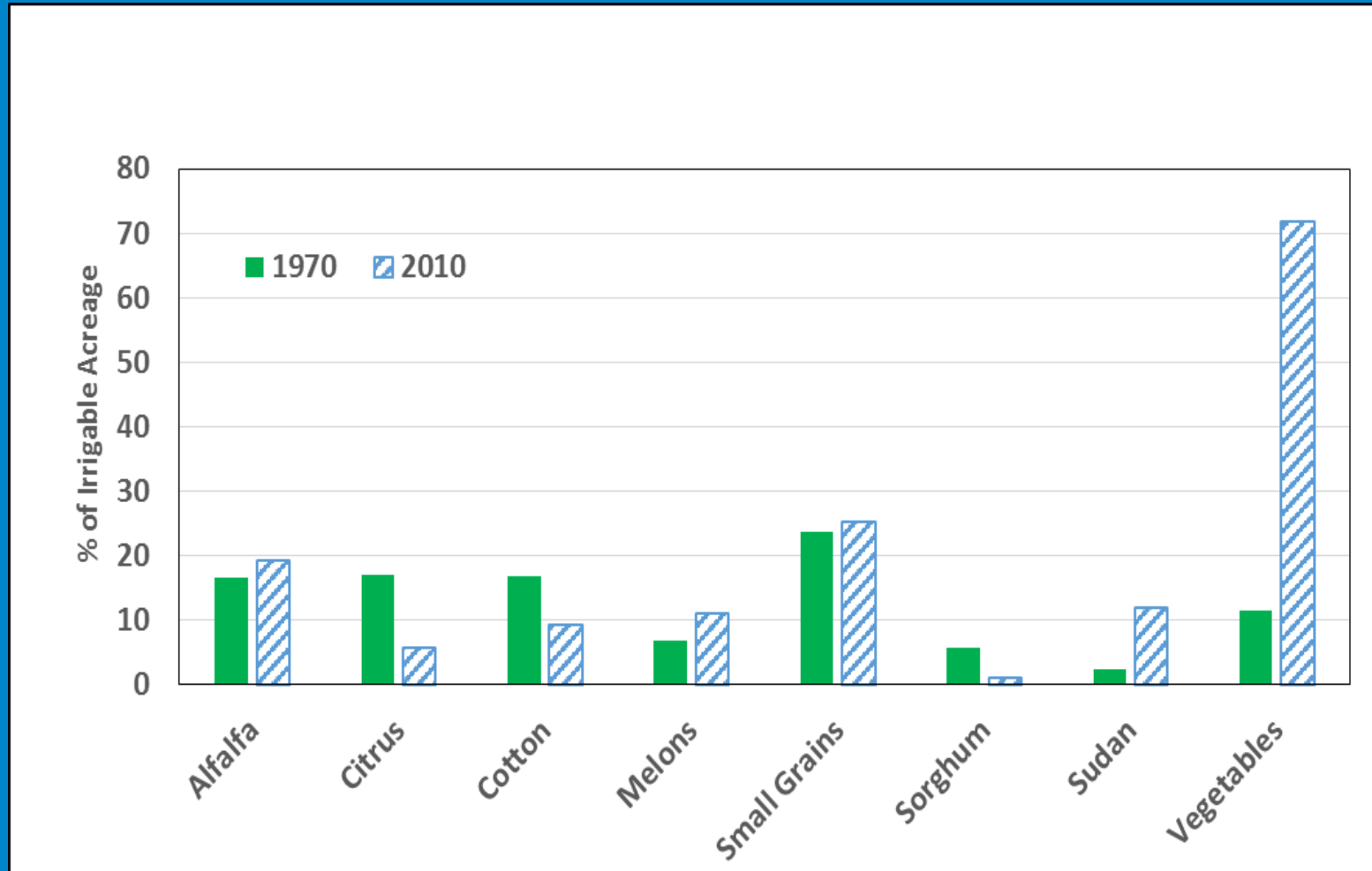




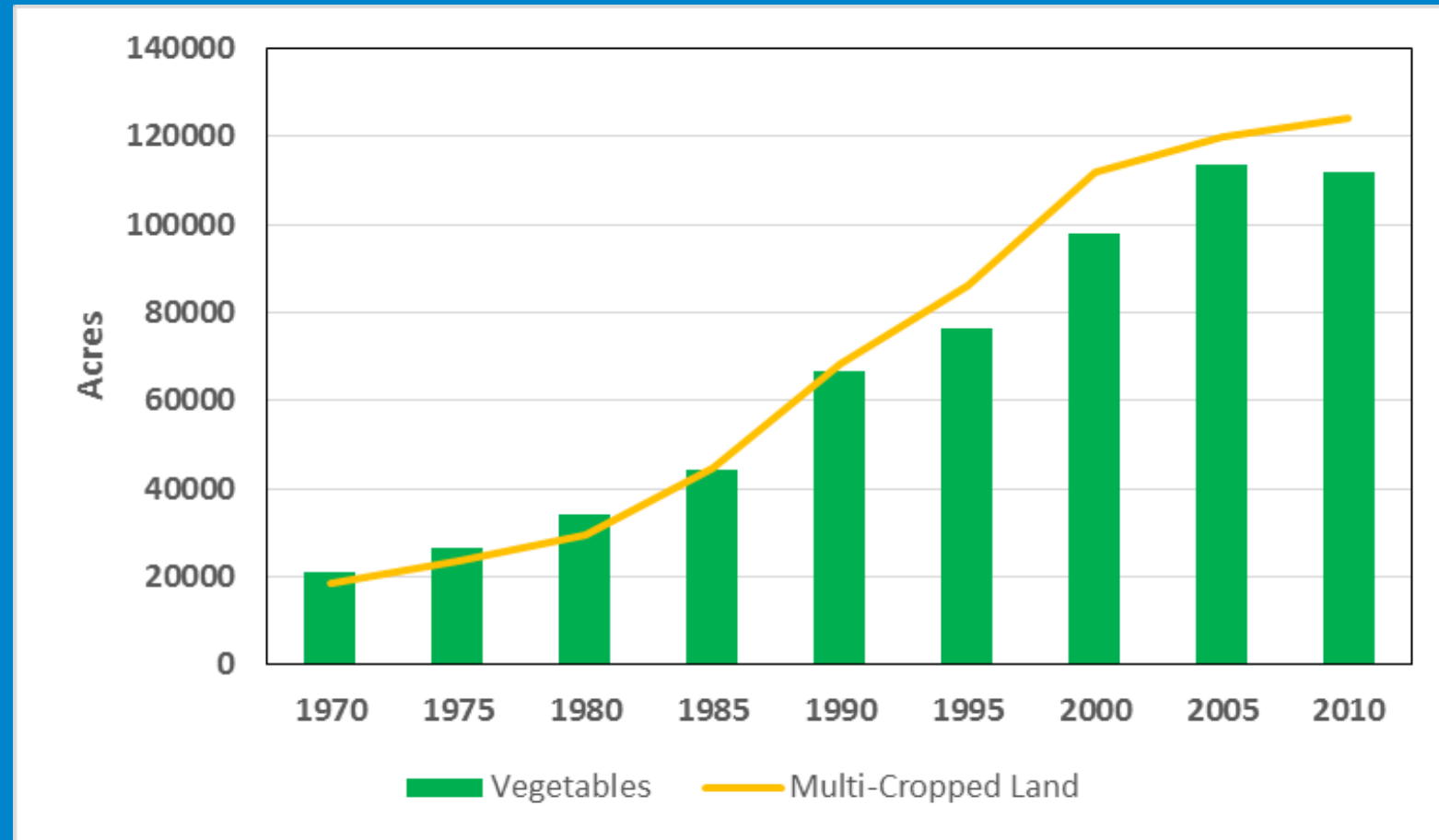
# Improved Water Management

- Laser leveling
- Concrete lined ditches
- High turnout gates
- Sprinkler irrigation
- Length of irrigation runs, furrow geometry, and manipulation of cutoff distance and time
- Cropping system shifts

## Yuma County Crop Production Shift to Vegetables

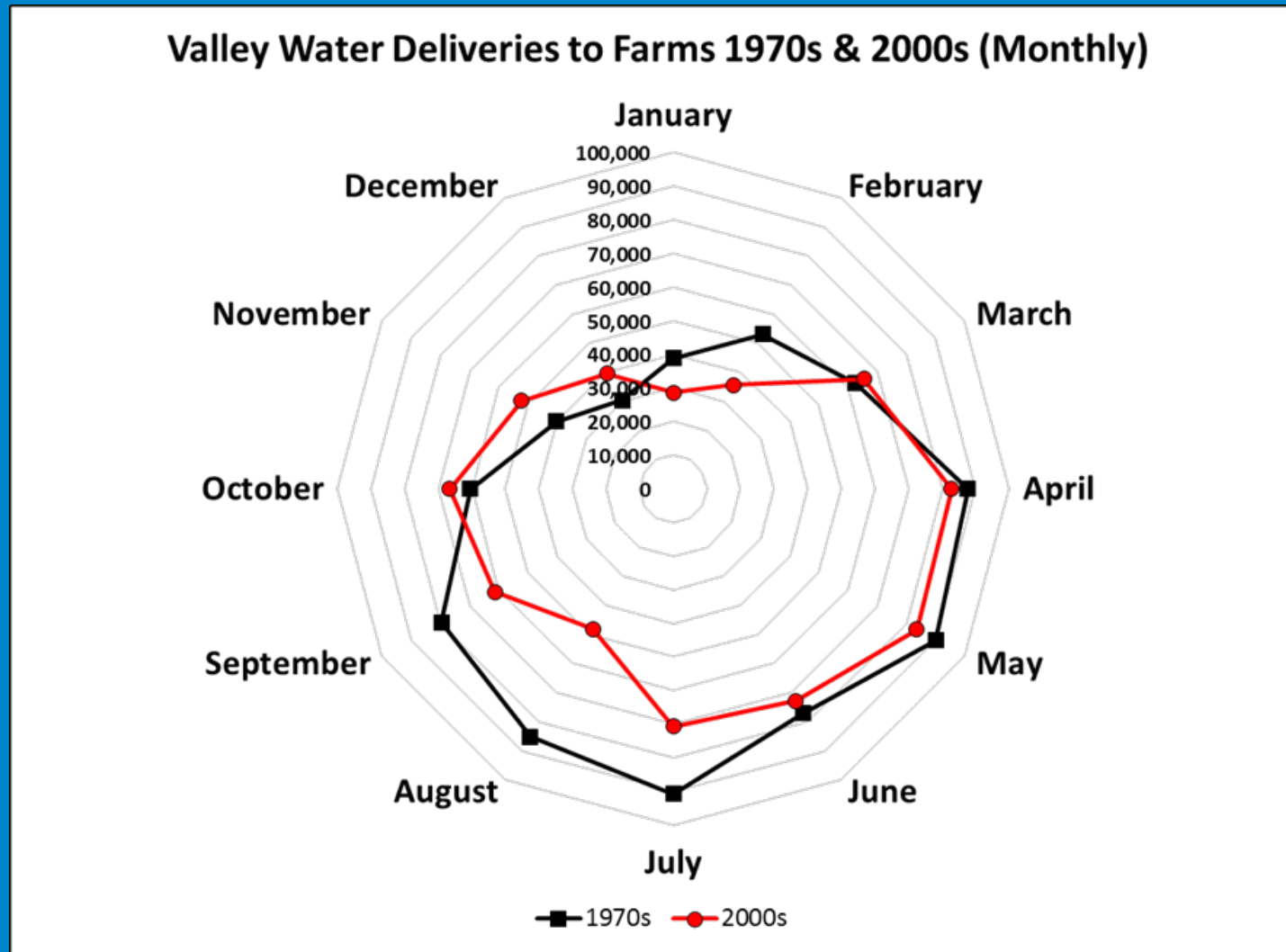


## Irrigable Acres in Yuma County Dedicated to Multi-Crops Increased 5x since 1970





# Water Conservation by Reducing Summer Month Cropping



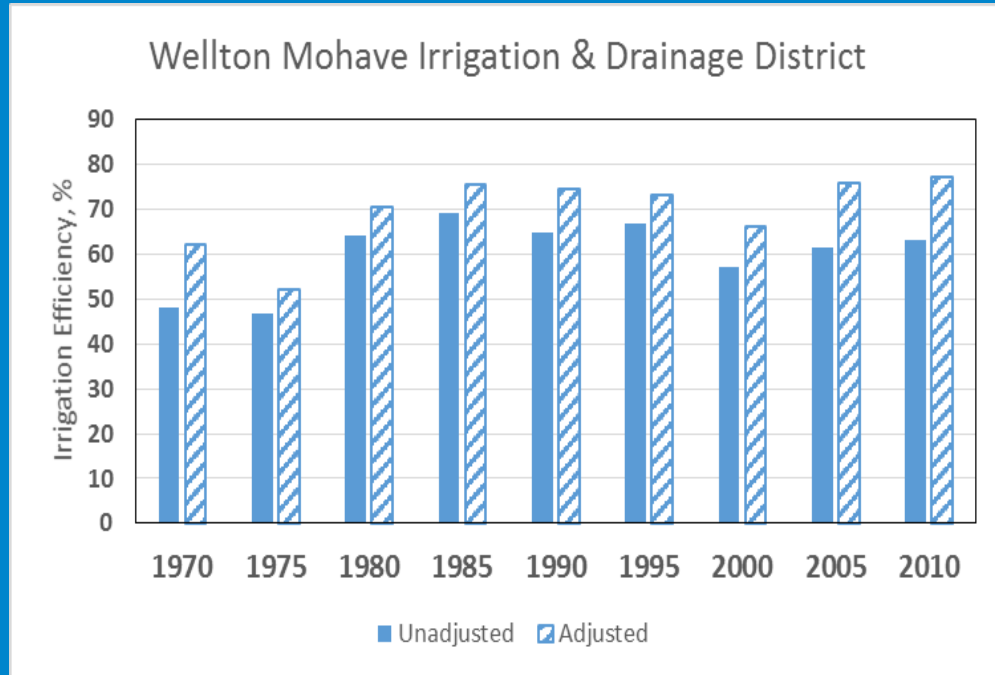
## Improved Water Management Practice: Flood -> Sprinkler



The water intensive practice of “subbing” up vegetables by maintaining water in field furrows for 7-10 days has been replaced by sprinkler irrigation

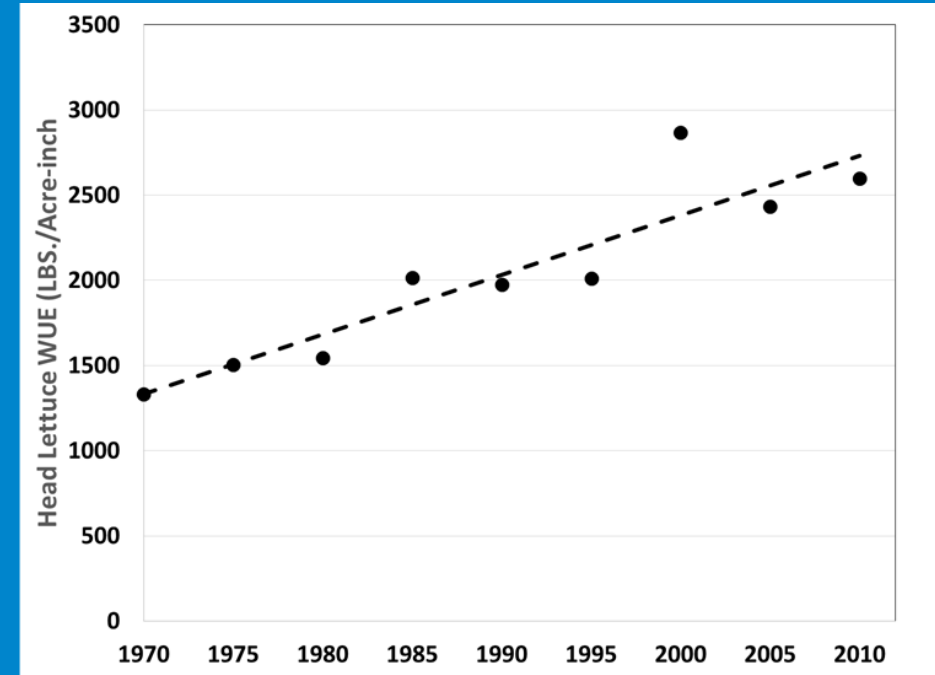
# Farm Management Practices have Increased Application & Crop Water Use Efficiencies from ~55% to ~75%

## Application Efficiency: Crop ET/Water Applied



## All Crops

## WUE: Crop Yield/Water Applied



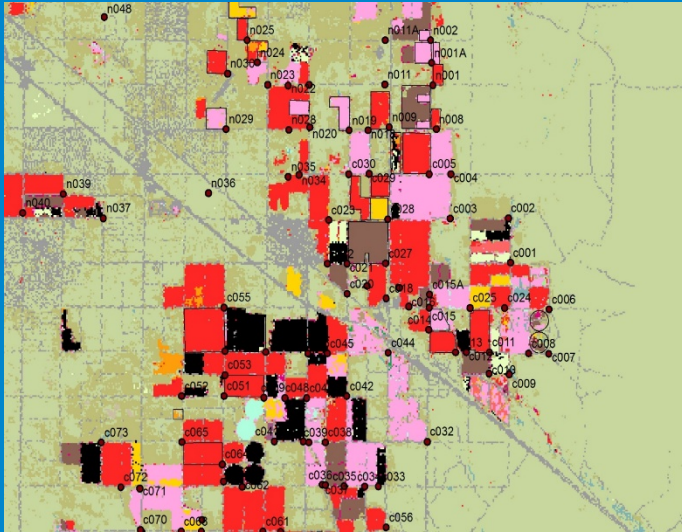
## Lettuce

## Elements of Irrigation and the Role of ET Monitoring

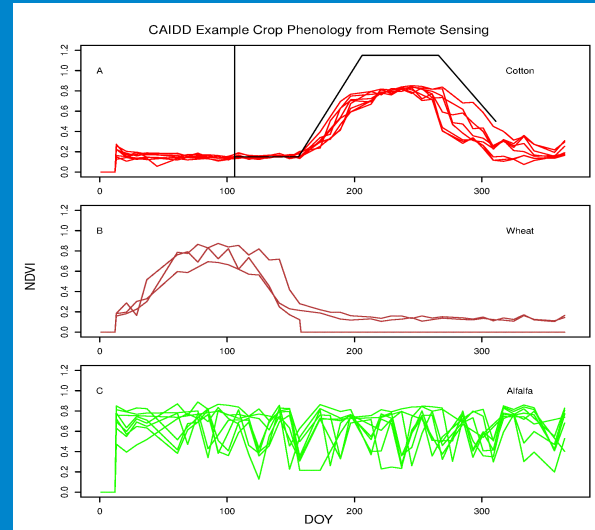
- Irrigation Scheduling: Timing and Required Depth
- Adjustment of Required Depth for Salt Management (Leaching)
- Irrigation Design and Management (Efficient & Uniform Application of Required Depth)
- Accuracy of water usage still a major question

## Role of Remote Sensing of ET for Agriculture

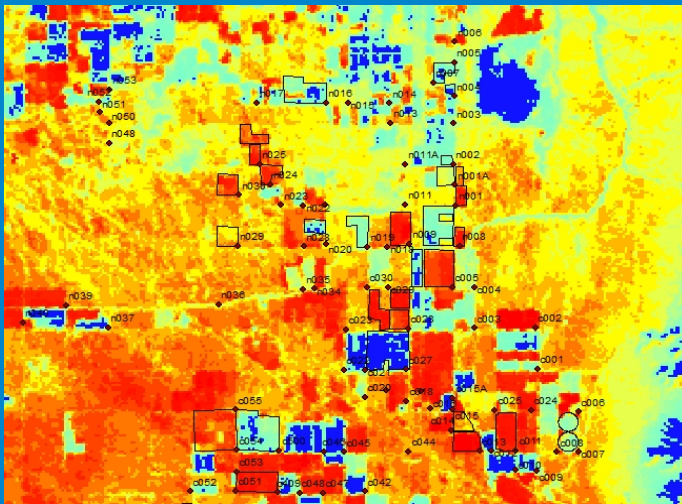
# Crop Classification



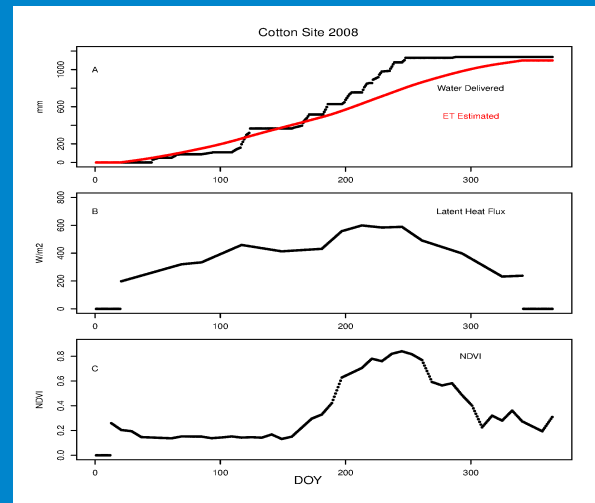
## VI-Based ET



- ET models can reasonably estimate seasonal water use
- Crop & region specific water use values for irrigation district management
- Useful remote sensing of ET needs to be at daily time steps, <100m resolution, and accessible to farmers and their advisors.



## LST Maps



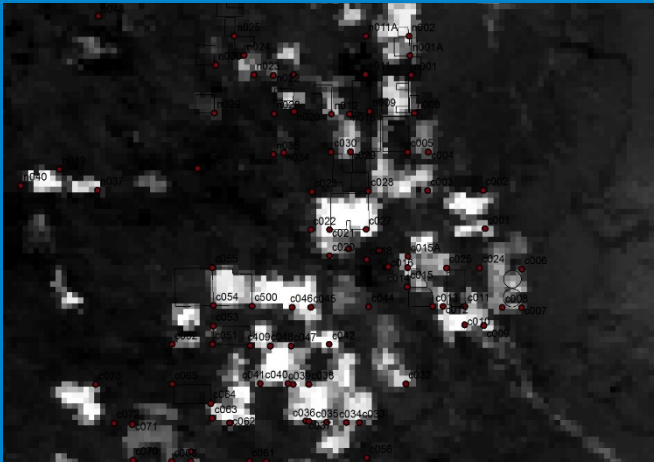
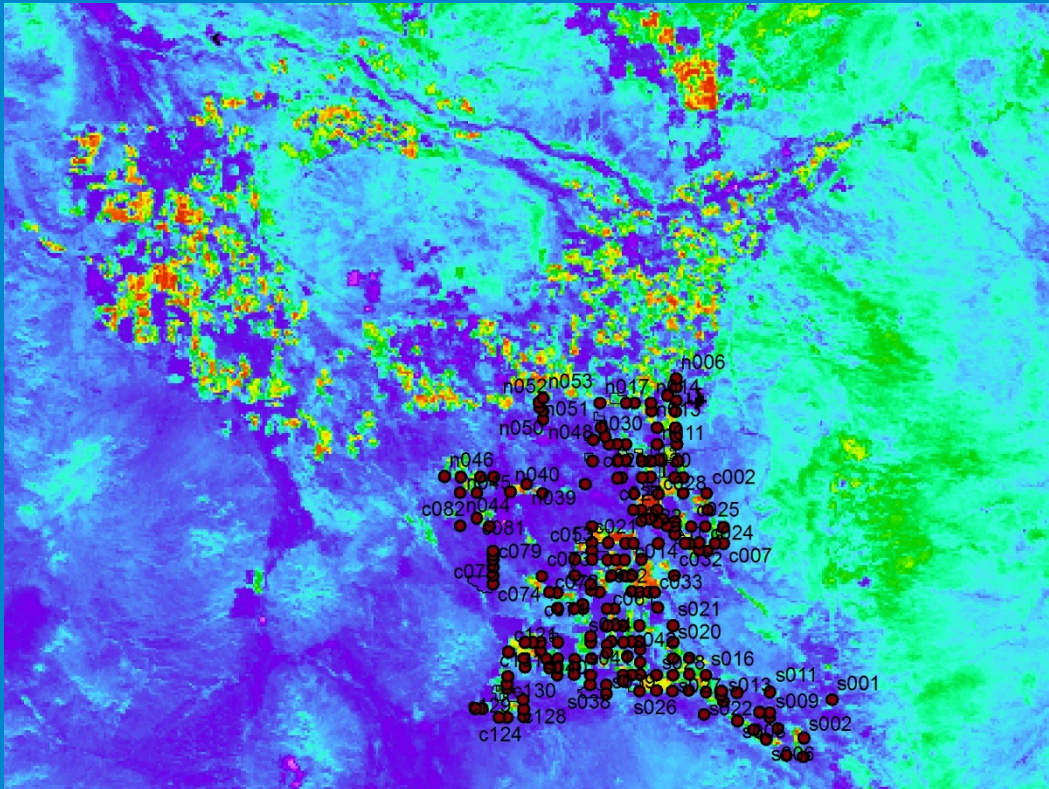
## Cumulative Water Used



## Agricultural Applications of ET

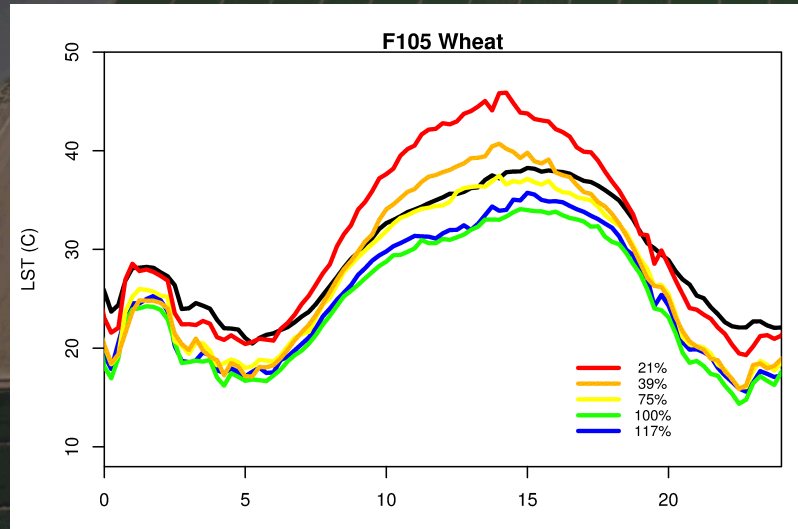
- ET uses/losses are the single largest unmeasured water flux
- New, updated water use baselines needed in the US Southwest
  - Scarcity & Farm vs. Urban Users
  - Salinity management
- Knowledge of ET would improve in-season forecasting of water requirements
- ET-based tools would be used if accurate, consistent, and easy-to use



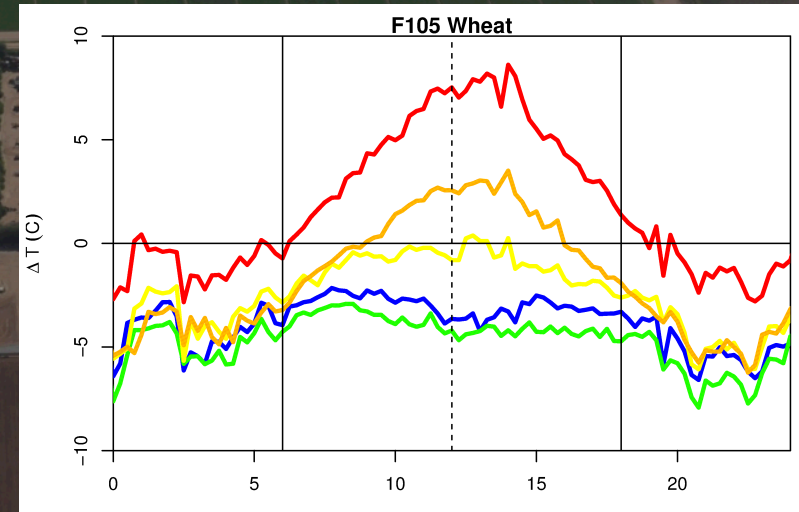




# Temperature Responses vs. Water Deficits



Temperature vs. Time of Day



Surface-Air Temperature Difference vs. Time of Day