

# What is EvapoTranspiration and How to Estimate ET

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# What is EvapoTranspiration (ET)?

- Daily water loss from the soil due to
  - **Evaporation** from soil surface
  - **Transpiration** (water loss from plant through stomata)

# Evaporation “losses”

- From moist, bare soil
  - Occurs at potential ET rate for first 1-2 days then drops off as surface soil dries
  - Less when only part of soil surface is wet
  - Very low when water added by SDI and soil surface stays dry

Evaporation losses occur mainly from wet part of the total area





# Wetted area larger from surface drip than SDI



# Shallow tape placement still wets the surface

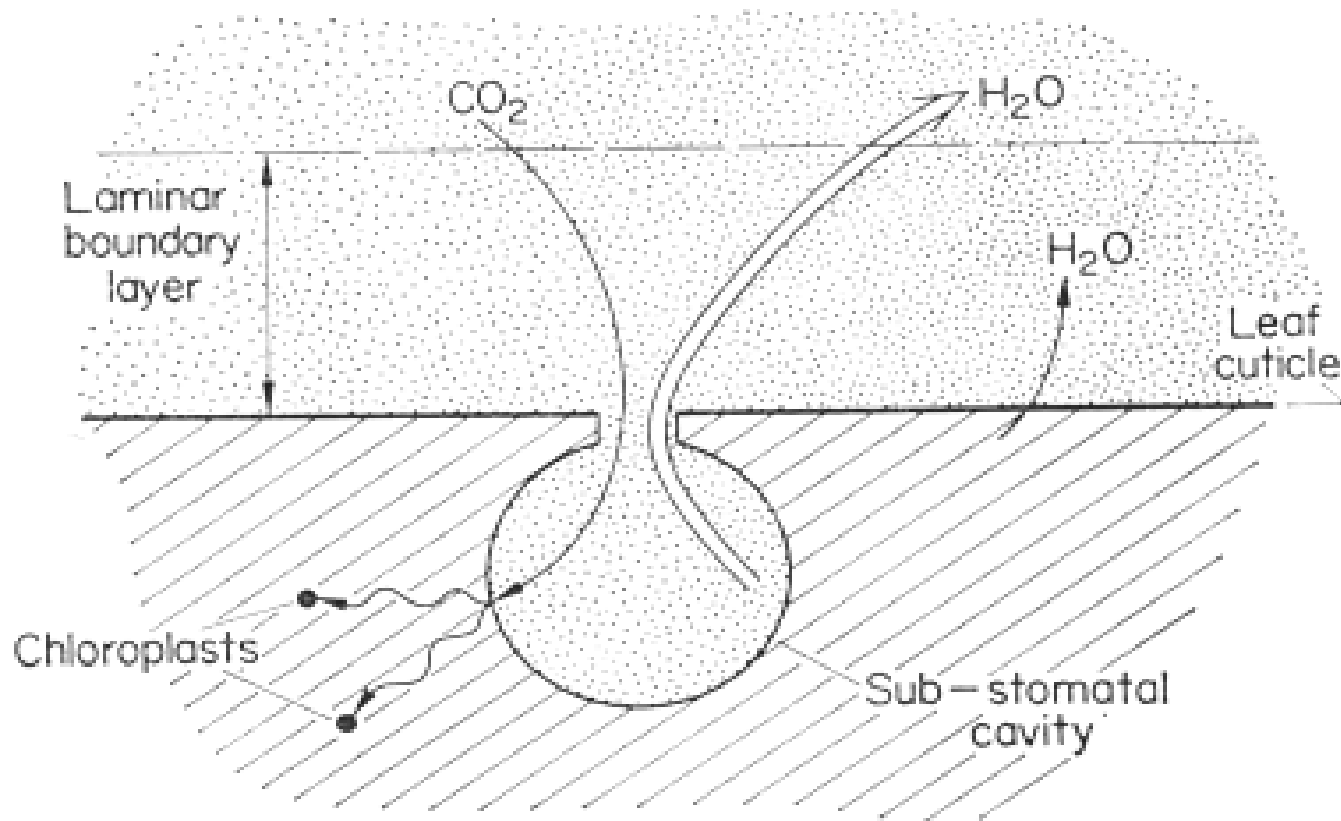


# Water Required for Transpiration

- Flow of water into the plant through roots,
- movement upward through the plant vascular system and
- vapor flow out through the stomata supplies water and nutrients throughout the plant for plant growth processes.



# Outward Water vapor movement from leaf stomate and cuticle, and Inward diffusion of carbon dioxide for photosynthesis

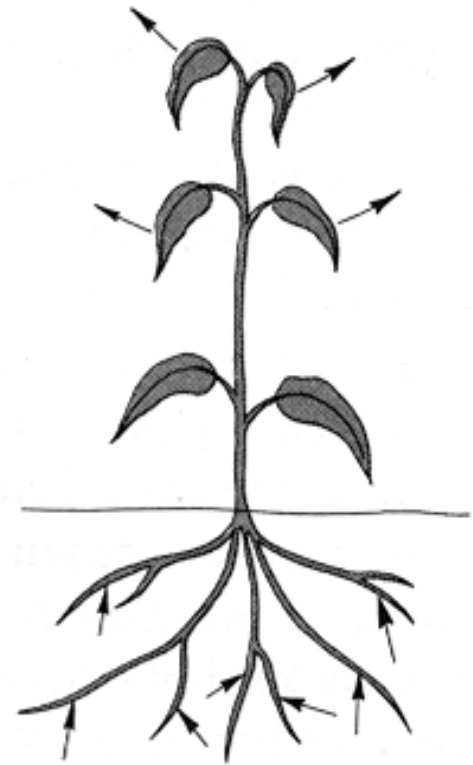


# Transpiration limited by guard cells that lose turgor causing stomata to close

- When water supplied by roots is less than atmospheric demand
- When temperatures rise too high (e.g. potatoes, ...)

# Plant wilting

1. **Very dry soil conditions**  
(water can't move into the plant quickly enough)
2. **Very hot, dry weather**  
(water can't move into the plant fast enough)
3. **Combinations of both 1 & 2**





# The contribution of E and T toward ET depend on:

- The fraction of total area composed of
  - Bare soil
  - Plant cover
- Size and shape of plants (leaf area)
- As plants grow and cover more soil surface, evaporation from soil decreases

# Small leaf area & open spaces for evaporation from soil



# Small plants but full soil cover – transpiration dominates



# Vigorously growing (not water limited ) alfalfa



# What factors most influence ET?

- Net solar radiation
- Air temperature
- Relative humidity
- Wind speed

# How do you get crop water use (ET) information?

- Lysimeter data (measured using water balance)
- Remote Sensing (Metric, EC)
- Estimated use based on daily weather data (historical data for planning and current year data for scheduling)
  - CIMIS
  - AgriMet
  - ...



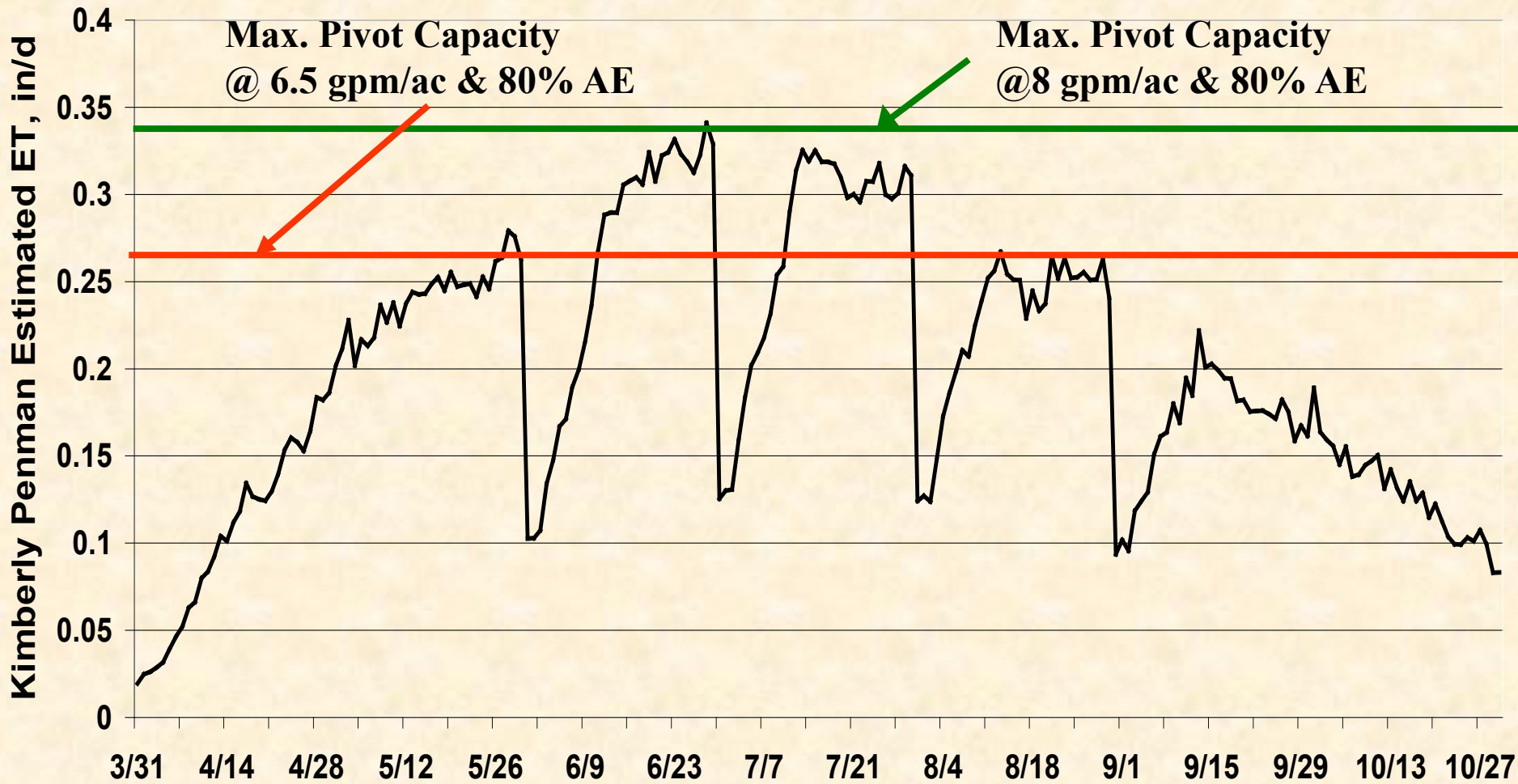
# Evaporation Pan



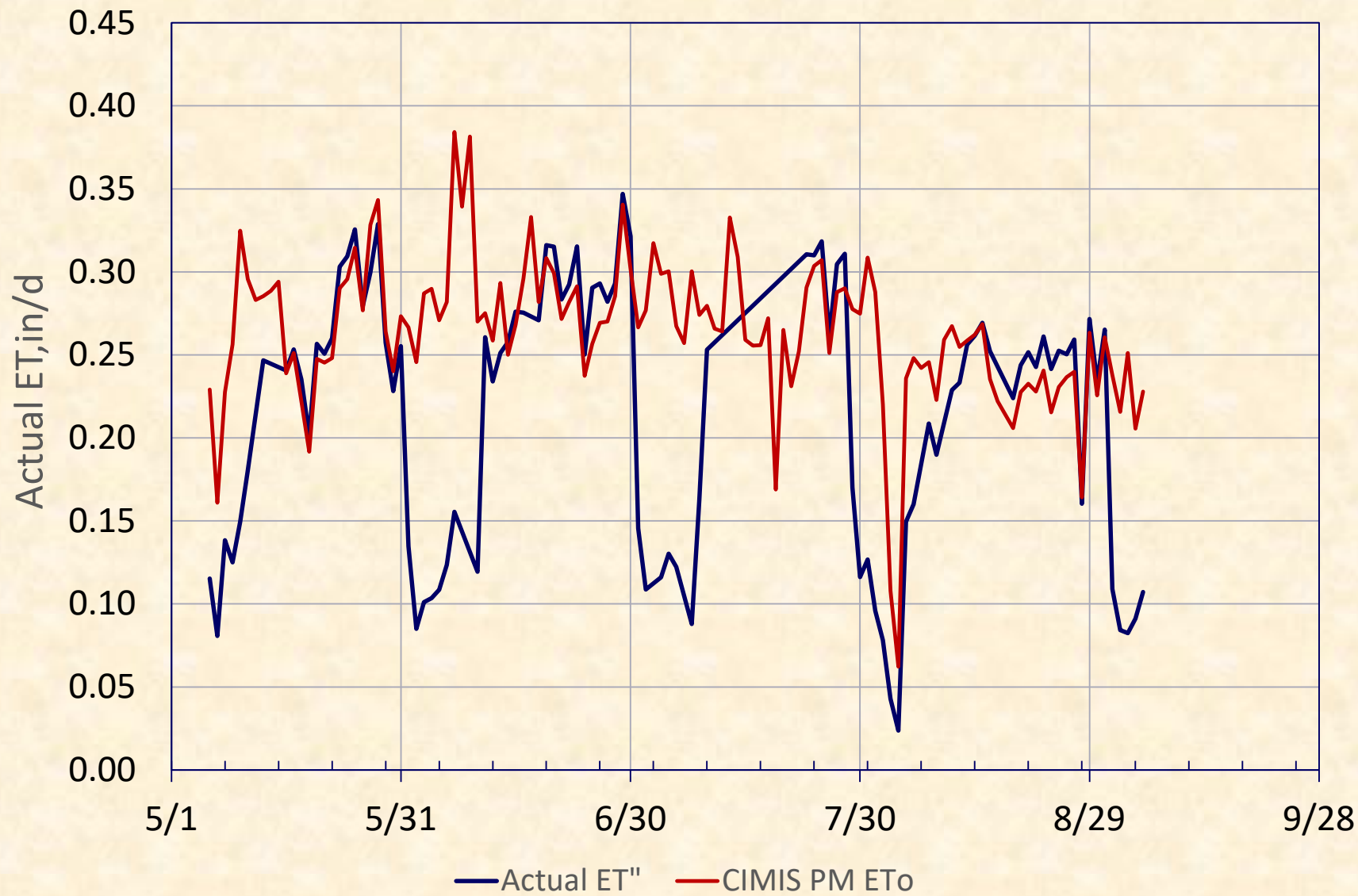
# What factors modify calculated ET?

- Upwind land use (wind from hot dry desert will increase ET by up to 10% on adjacent areas)
- Size of irrigated area (greater ET if it is small)
- Field conditions are different than those at nearest weather station
- Stage of re-growth

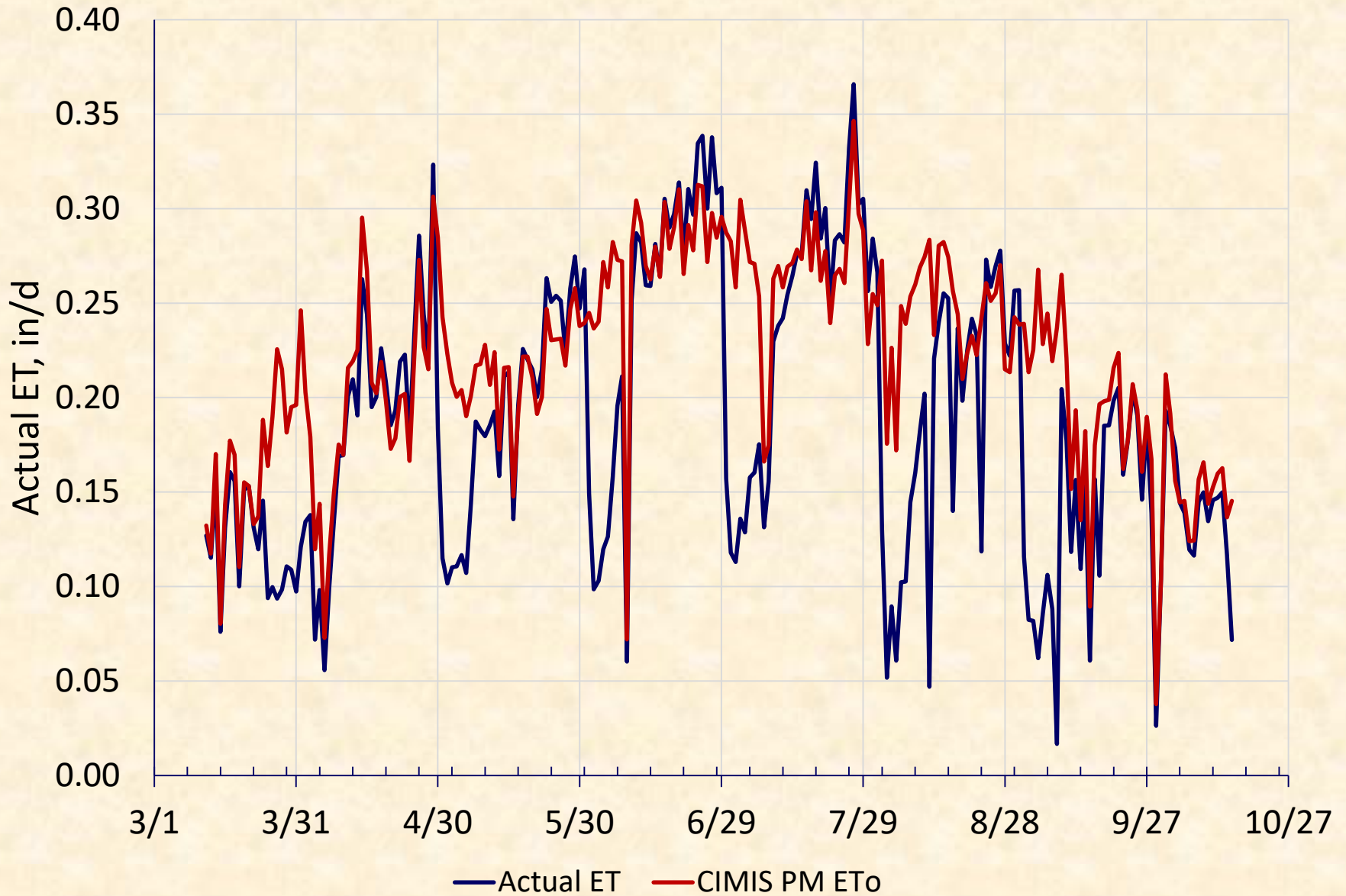
# Average 30-Year Alfalfa ET With Cutting, Kimberly



# Alfalfa Lysimeter Trial, 2014 Davis, CA



# Alfalfa Lysimeter Trial, 2015 Davis, CA



The End -- Questions?

