

Evapotranspiration (ET) in the Lower Walker River Basin, West- Central Nevada

By

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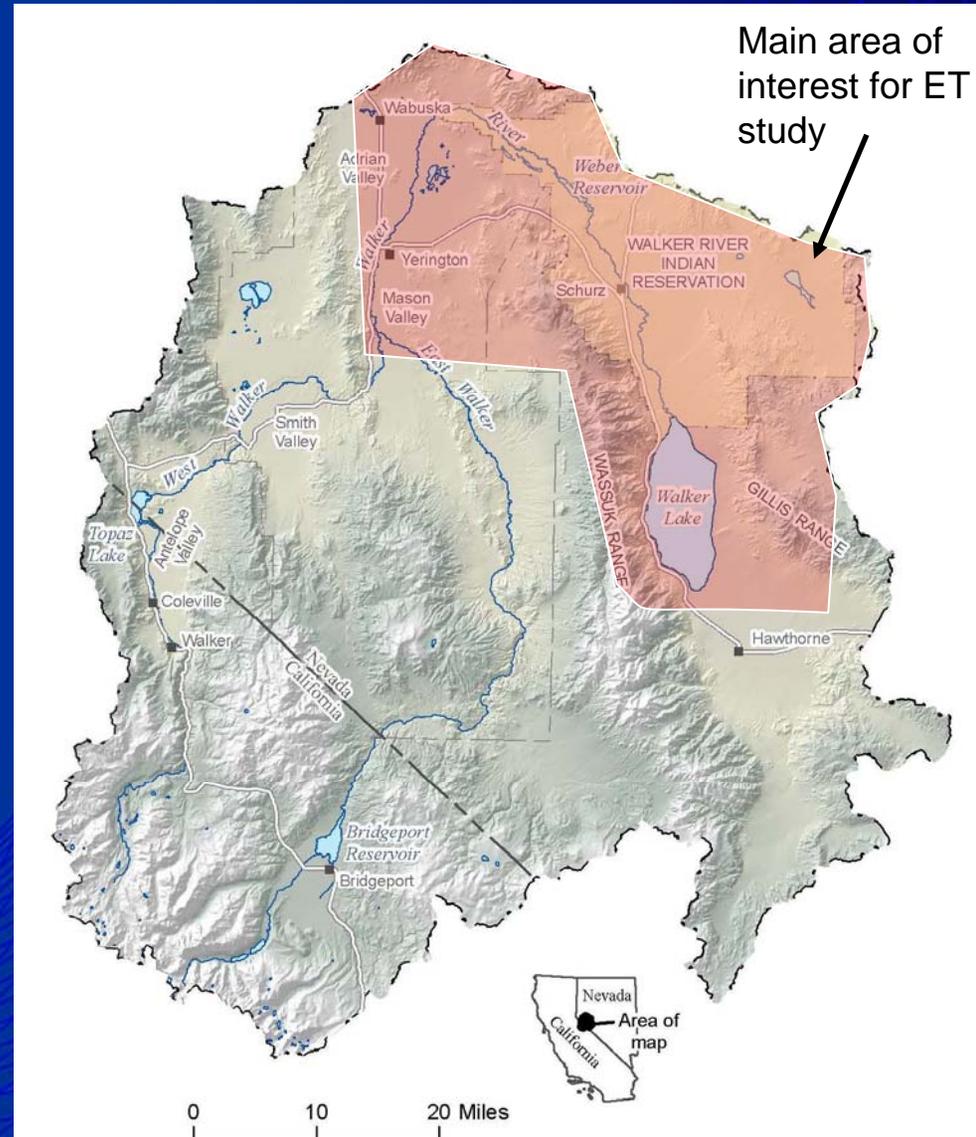
and Robert Pattison

U.S. Department of Agriculture, Agricultural Research Service

Nevada Water Resources Association
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Overview

- Objective
- Study Design
 - ET Network
 - Scaling up of ET
- Results
 - ET at Walker Lake
 - ET at Saltcedar
 - ET summary



Objective

of the ET component
Basin project is to
and from open-water surfaces.

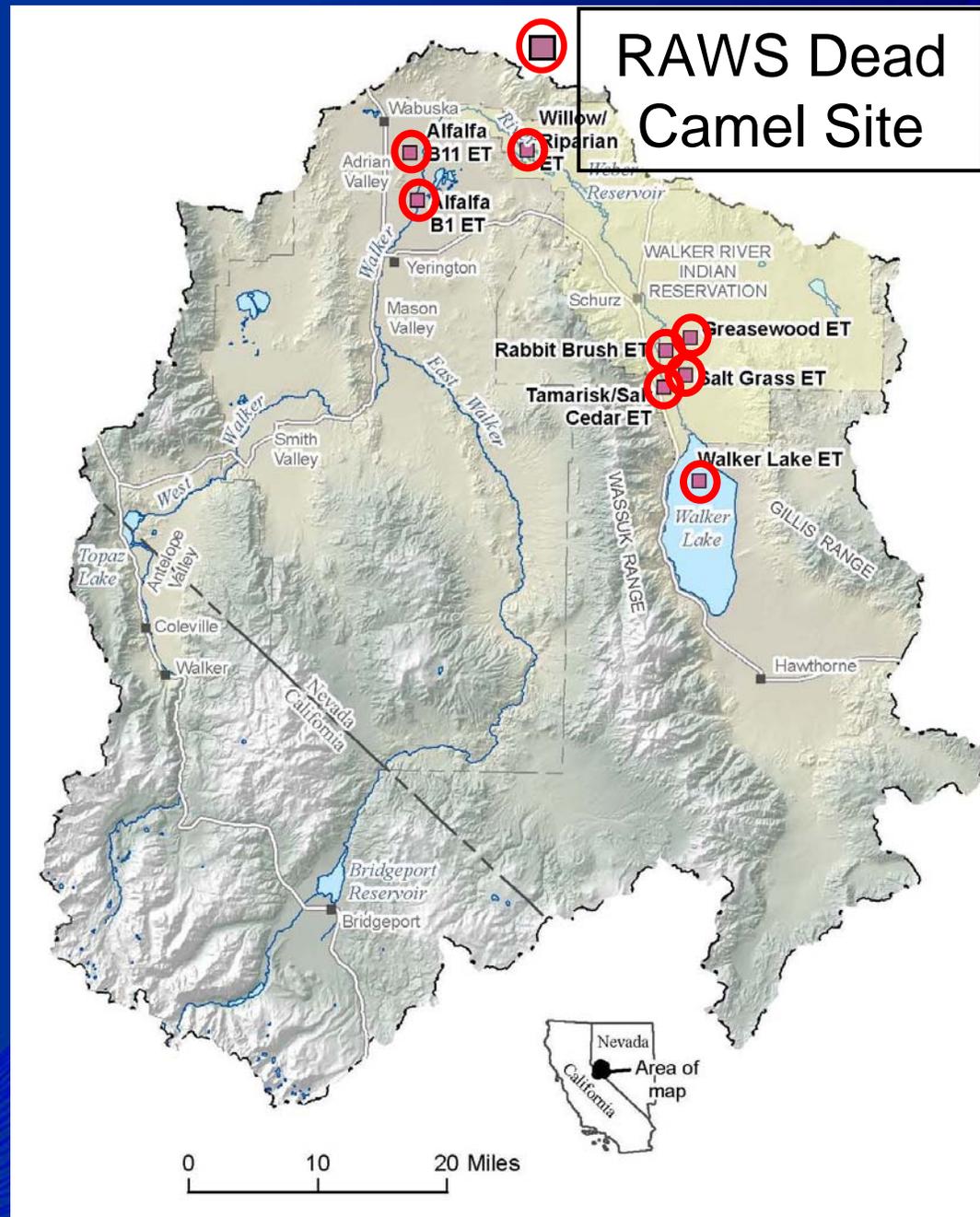


Natural V

Agriculture

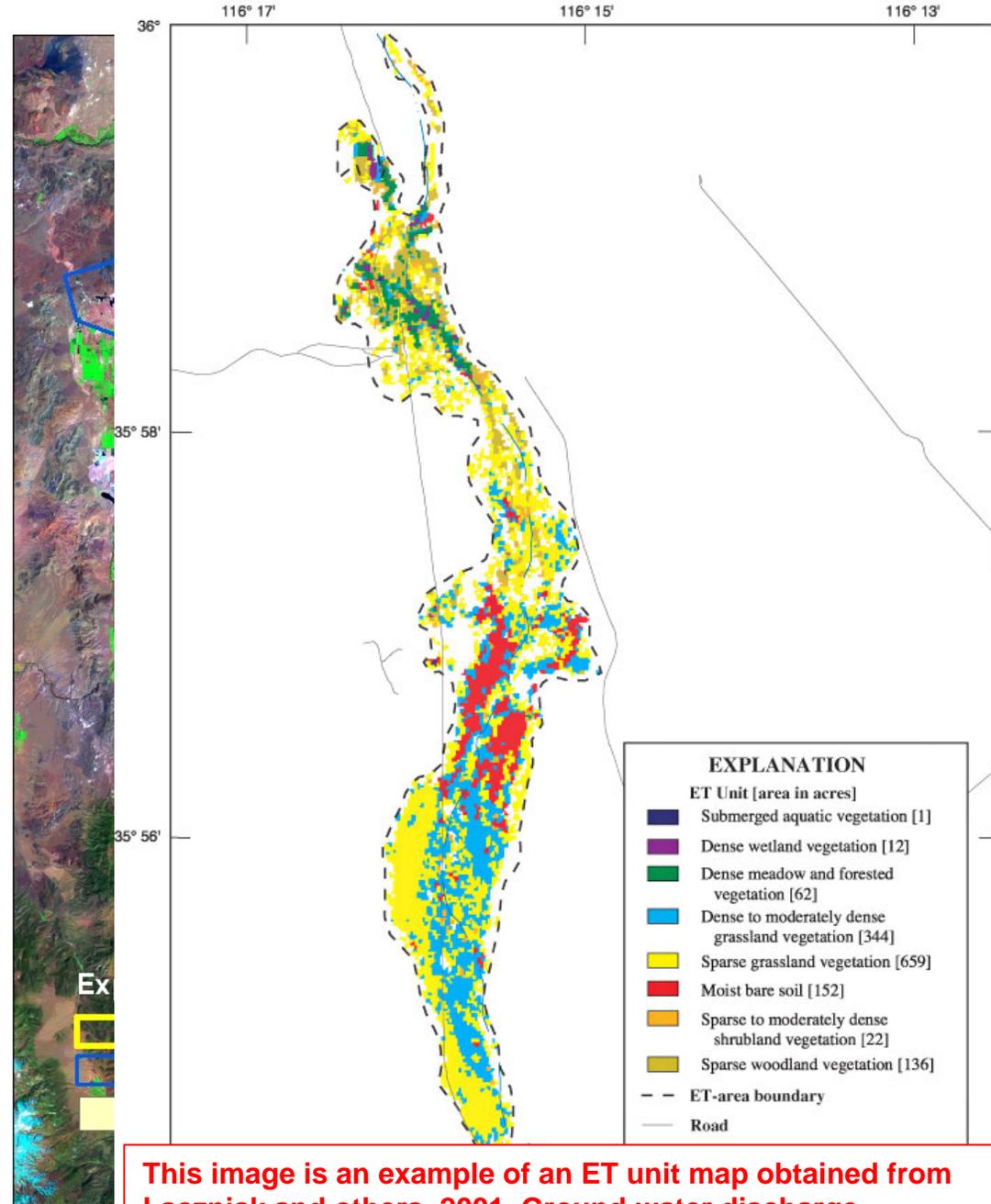
Study Design

- 8 ET Stations
- 5 are Bowen-ratio method
- 3 are Eddy-covariance method (3D)



Quantifying ET across the Study Area

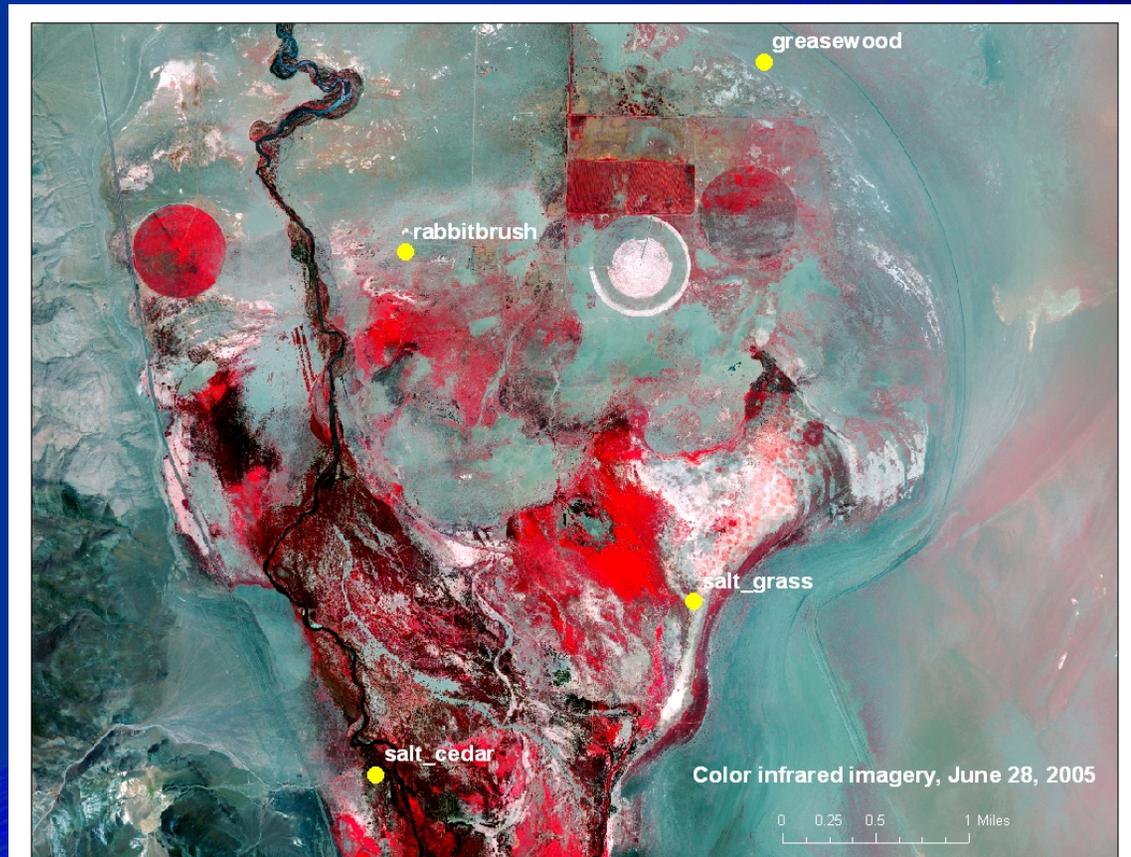
- Create map of ET units
 - Airborne imagery
 - Lidar



This image is an example of an ET unit map obtained from Laczniak and others, 2001, Ground-water discharge determined from estimates of ET, Death Valley Regional Flow System, NV and CA: USGS WRIR 01-4195, p. 23.

Imagery (infrared)

- Color infrared imagery will be used to classify vegetation based on its relative vigor and soil conditions.



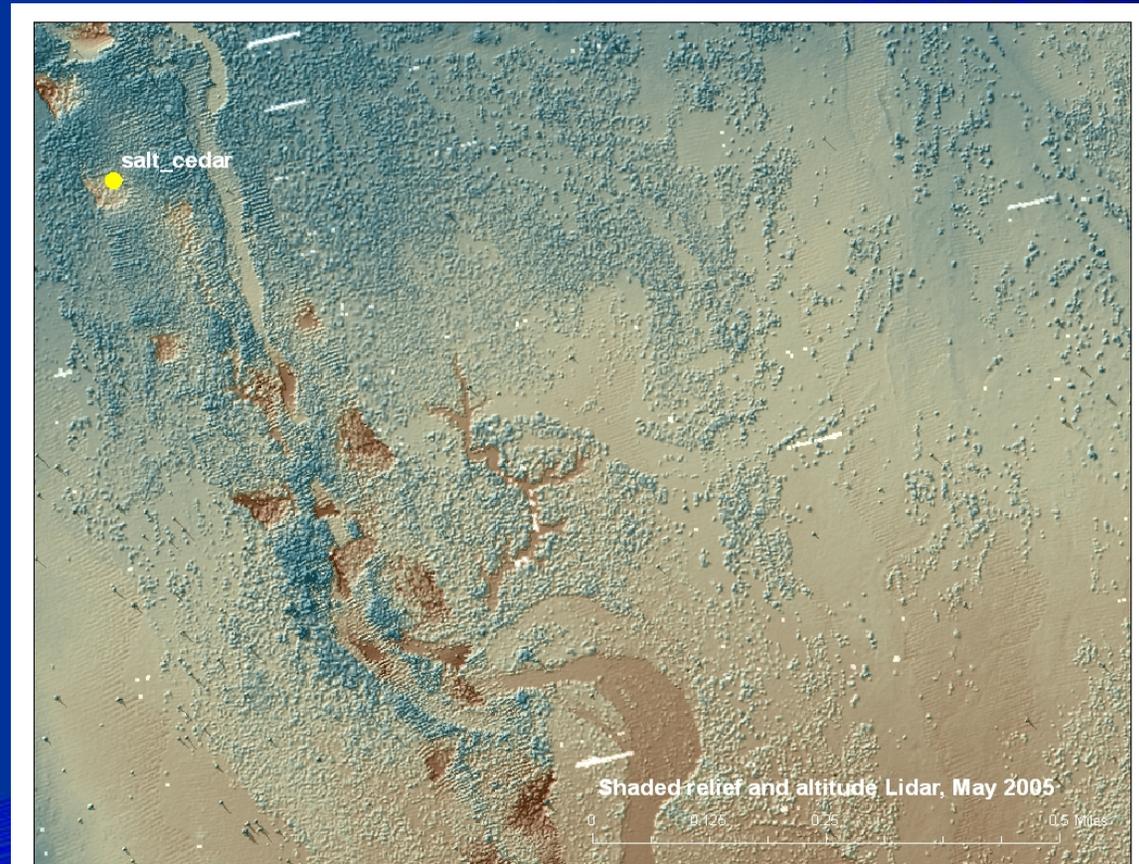
Imagery (natural color)

- Natural color imagery will be used to define the extent of riparian and phreatophytic vegetation.



Lidar

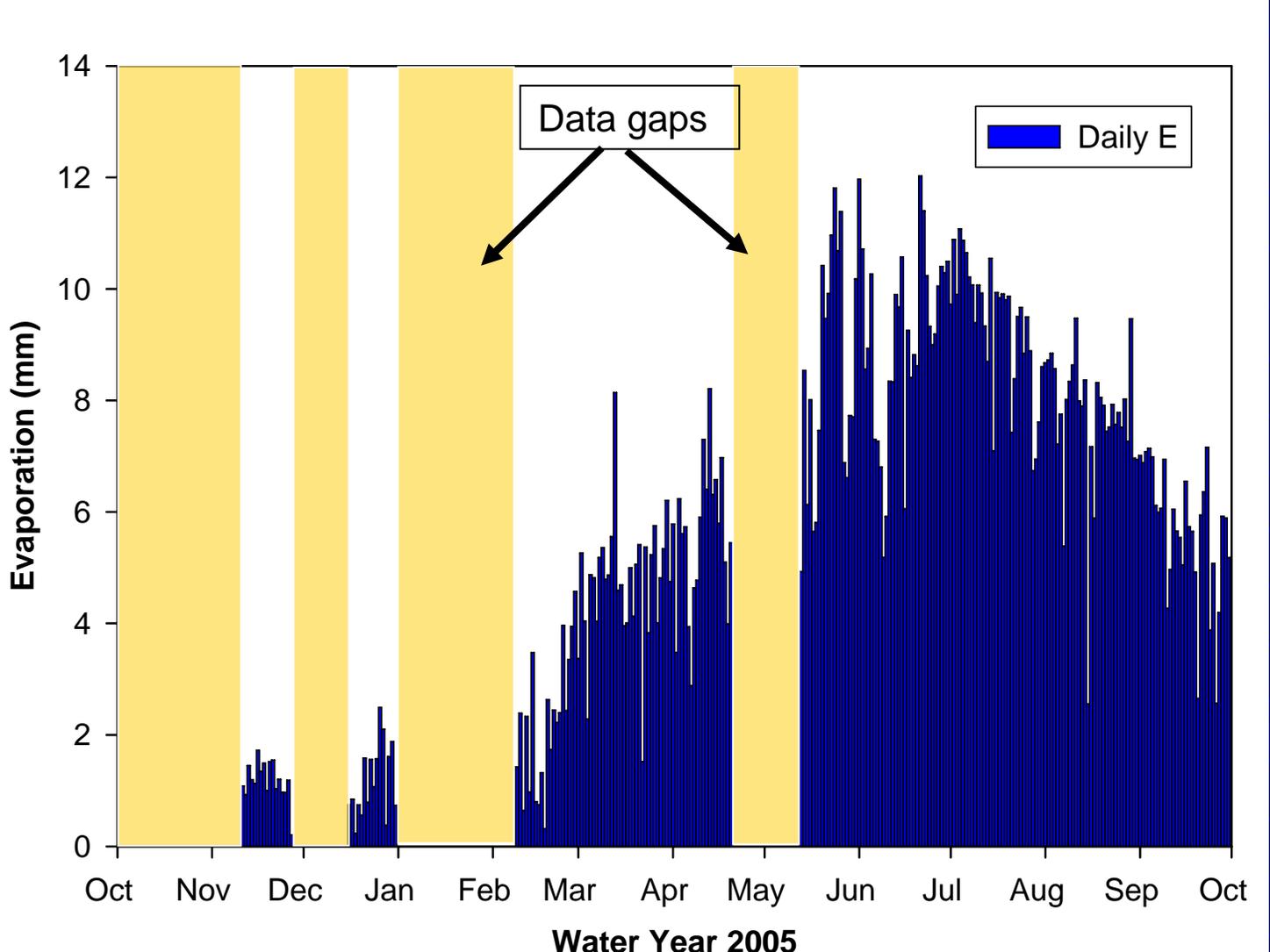
- Lidar imagery will be used to estimate vegetation density and canopy height.



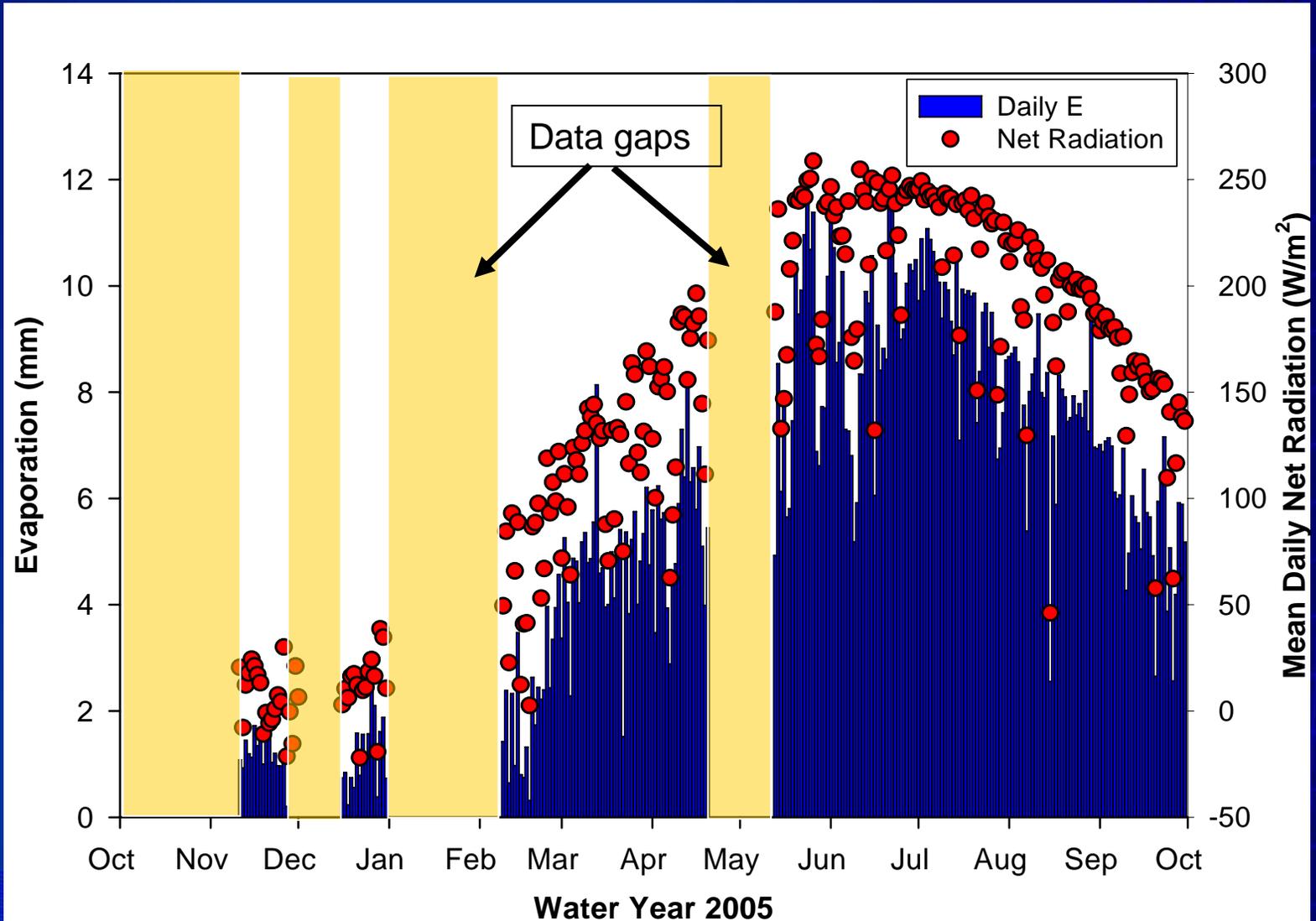
Results – Evaporation (E) from Walker Lake



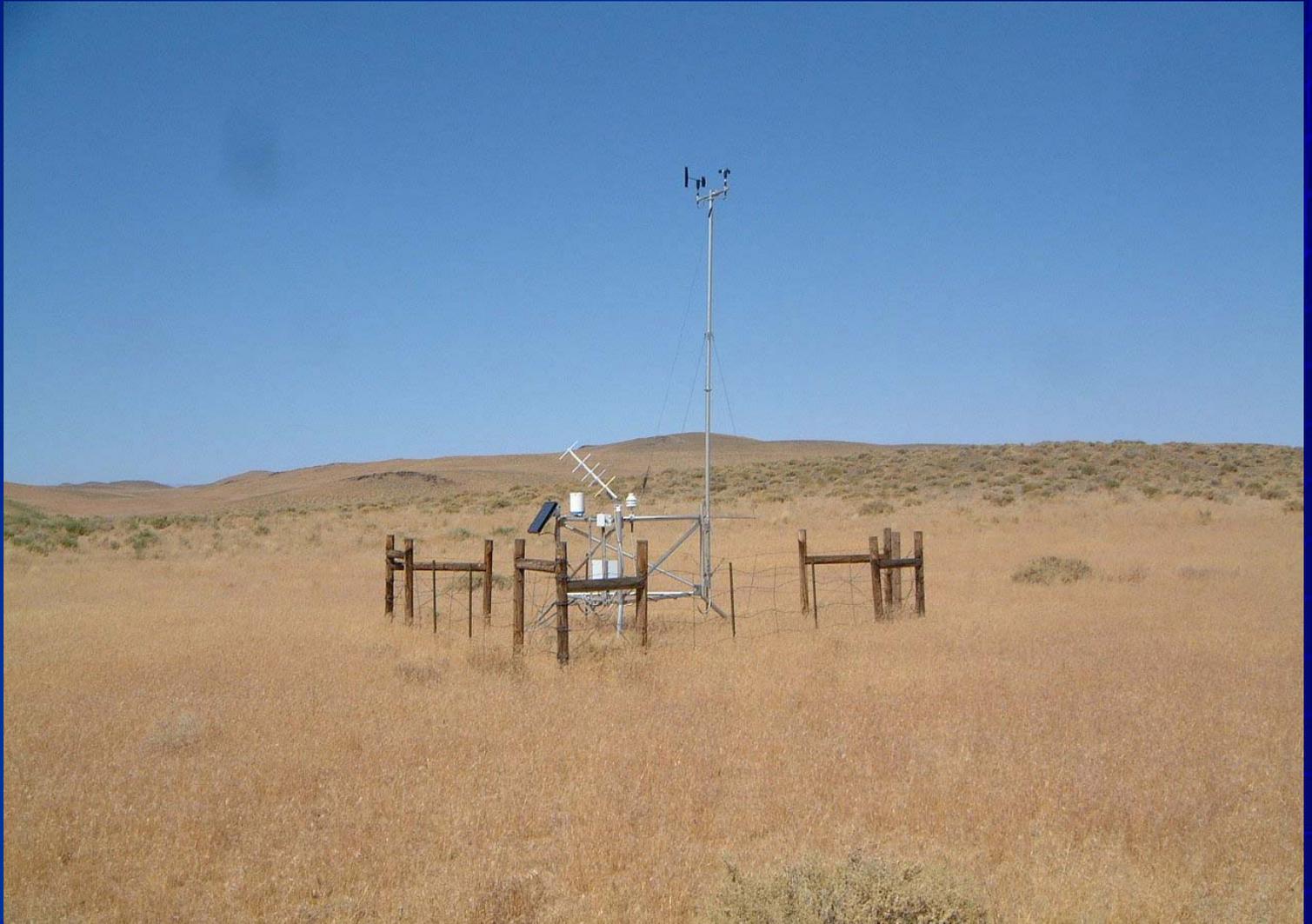
Measured E on Walker Lake



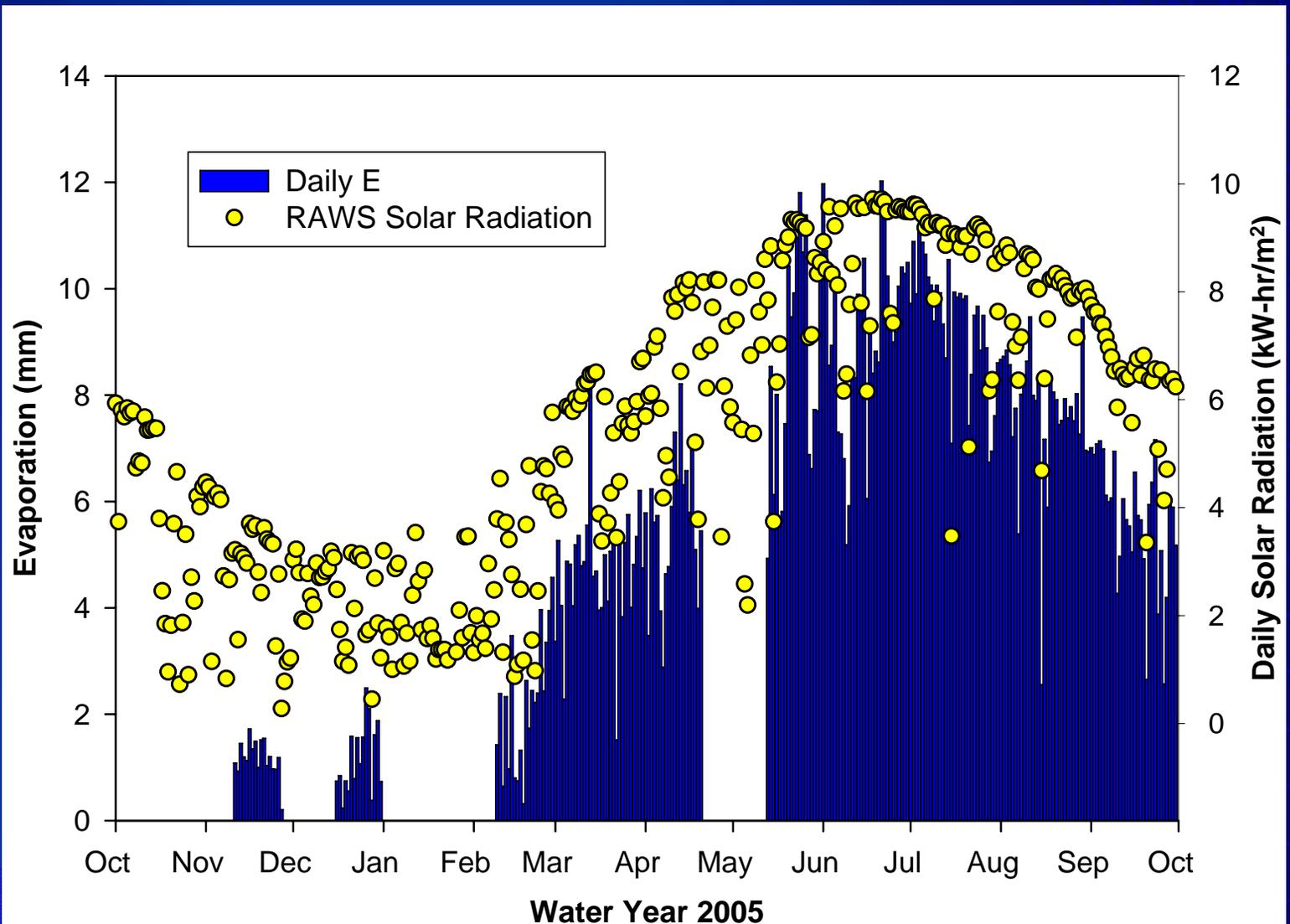
E compared with Net Radiation on Walker Lake



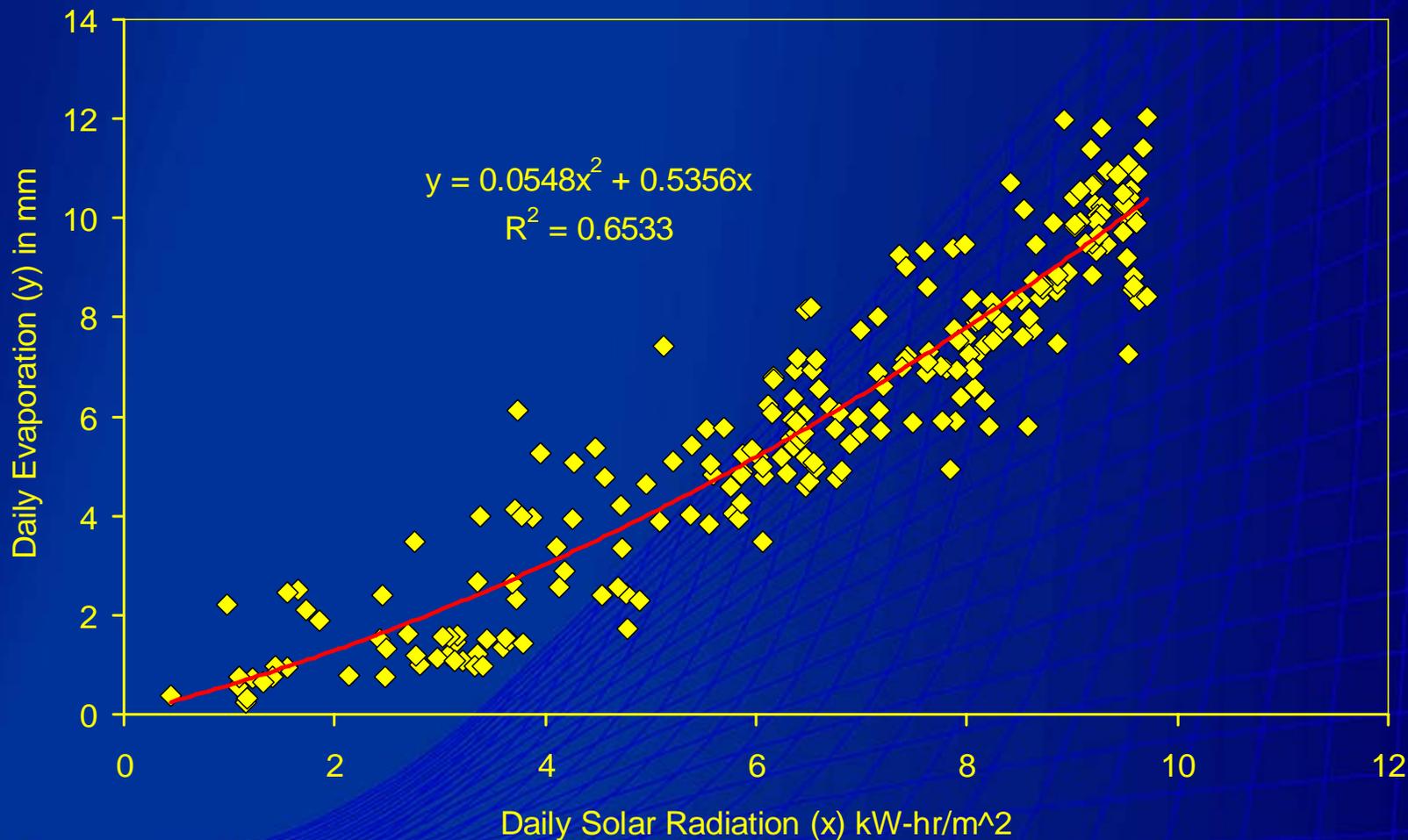
RAWS – Dead Camel Site



E at Walker Lake compared with RAWS solar radiation

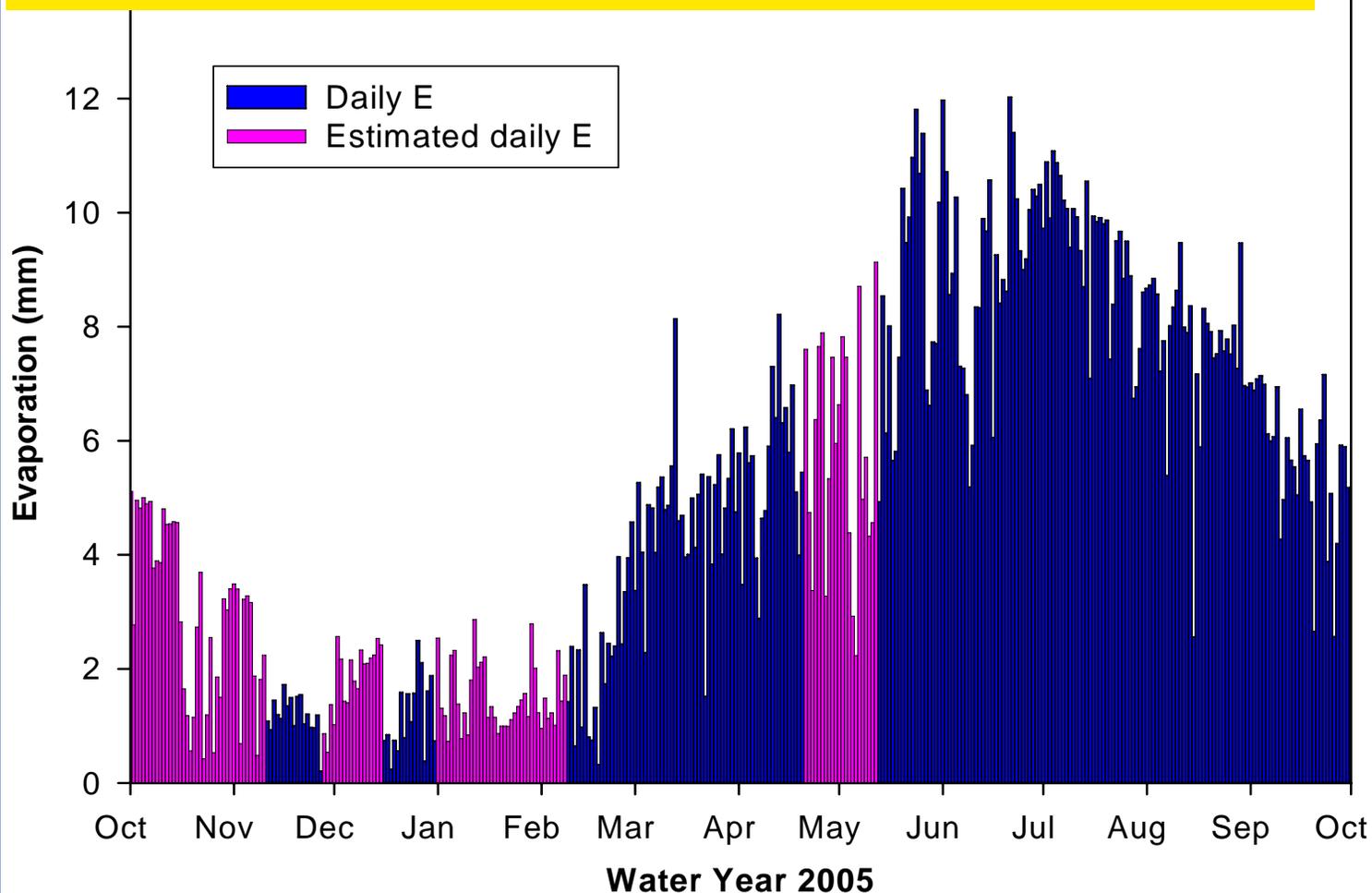


Relation between E at Walker Lake and RAWS solar radiation



Total E for Water Year (WY) 2005

Total E, WY 2005 = 1,814 mm or 6.0 ft*



Results – ET from Walker Lake

- Preliminary estimate of ET for WY 2005 was 6.0 ft*, up from previous estimates of 4.1 ft.
- Surface area of Walker Lake in June 2005 was 32,000 acres.
- Estimated water volume evaporated from Walker Lake in WY2005 was 191,000 acre-ft*.
- ~ 50% increase over previous estimates.
- If relation between lake ET and RAWS solar radiation data holds, may be able to estimate annual ET back to 1999.

Results – Saltcedar site

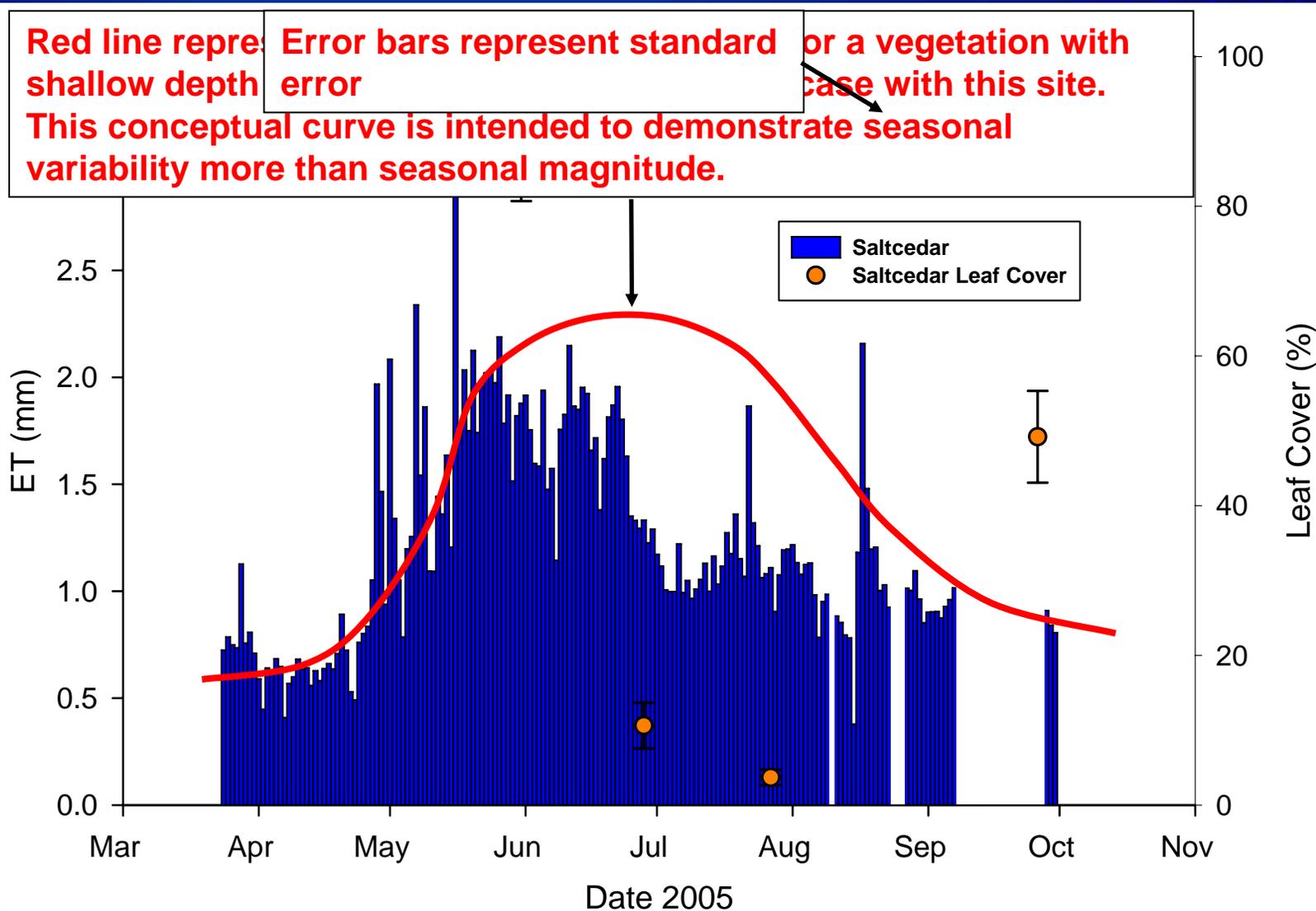


Saltcedar site

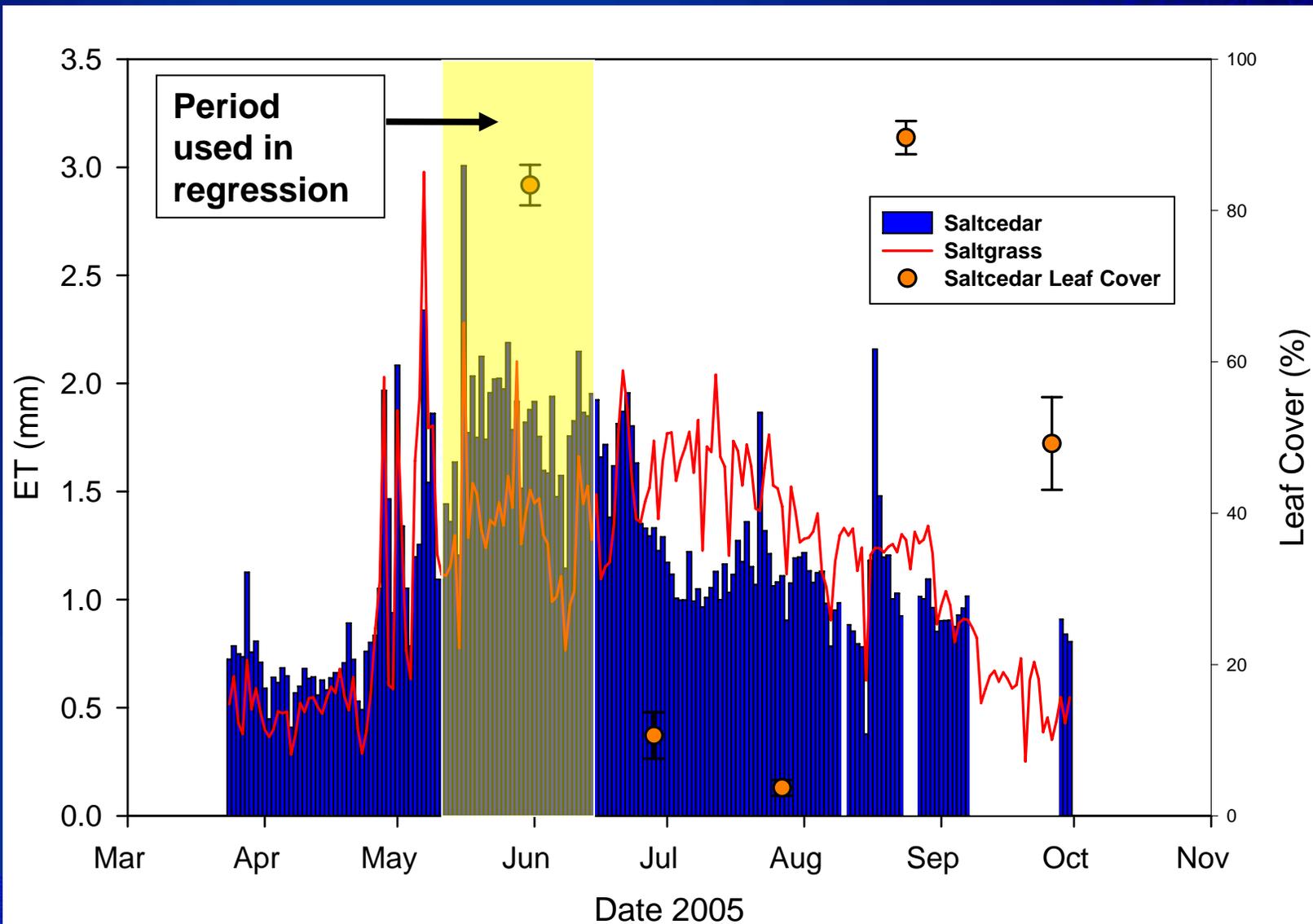
- Site underwent substantial defoliation due to introduction of a biologic control agent: Saltcedar Leaf Beetle (*Diorhabda elongata*)
- Changed characteristics and ET rate for large stand of Saltcedar



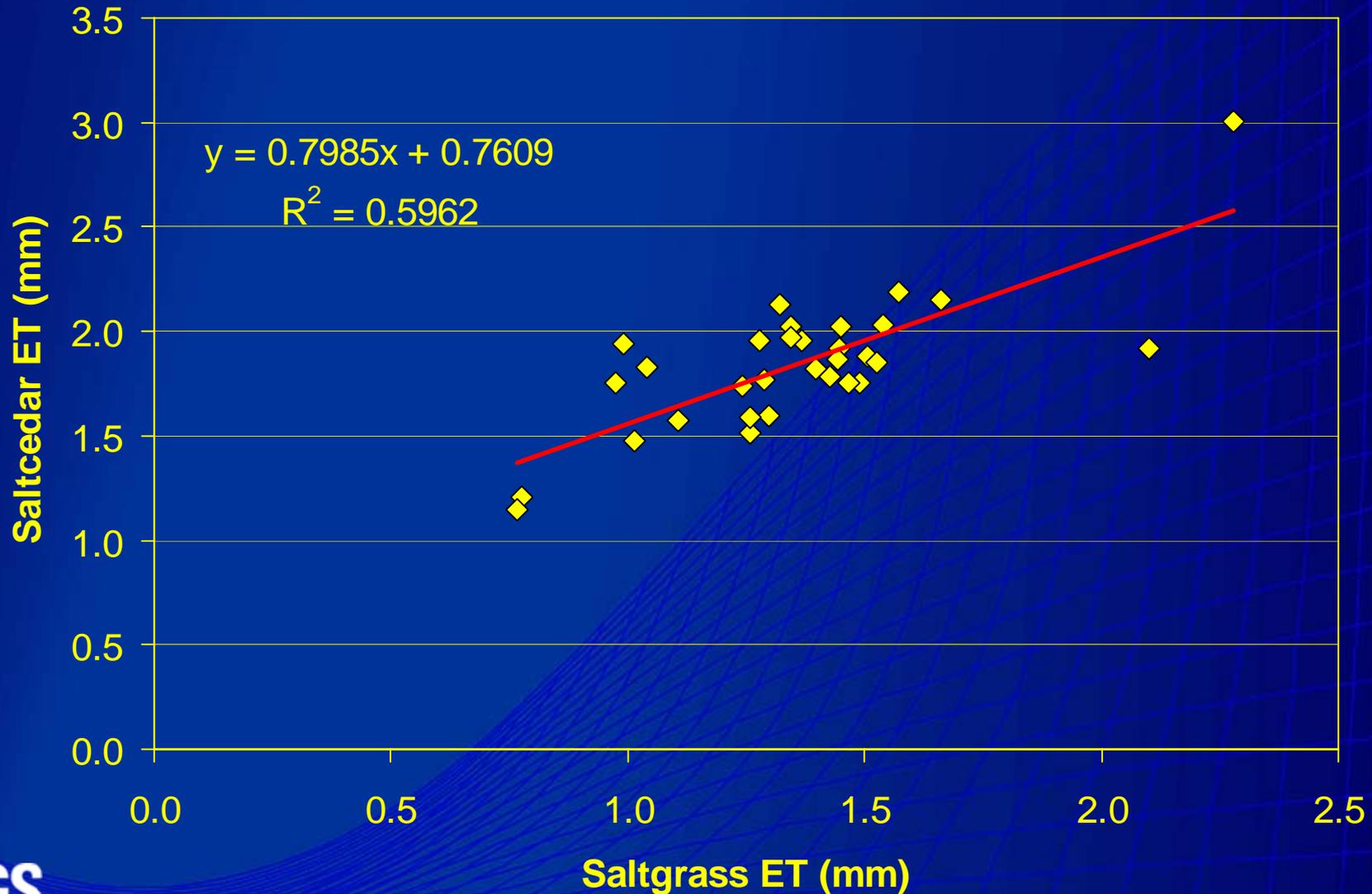
Measured ET at Saltcedar



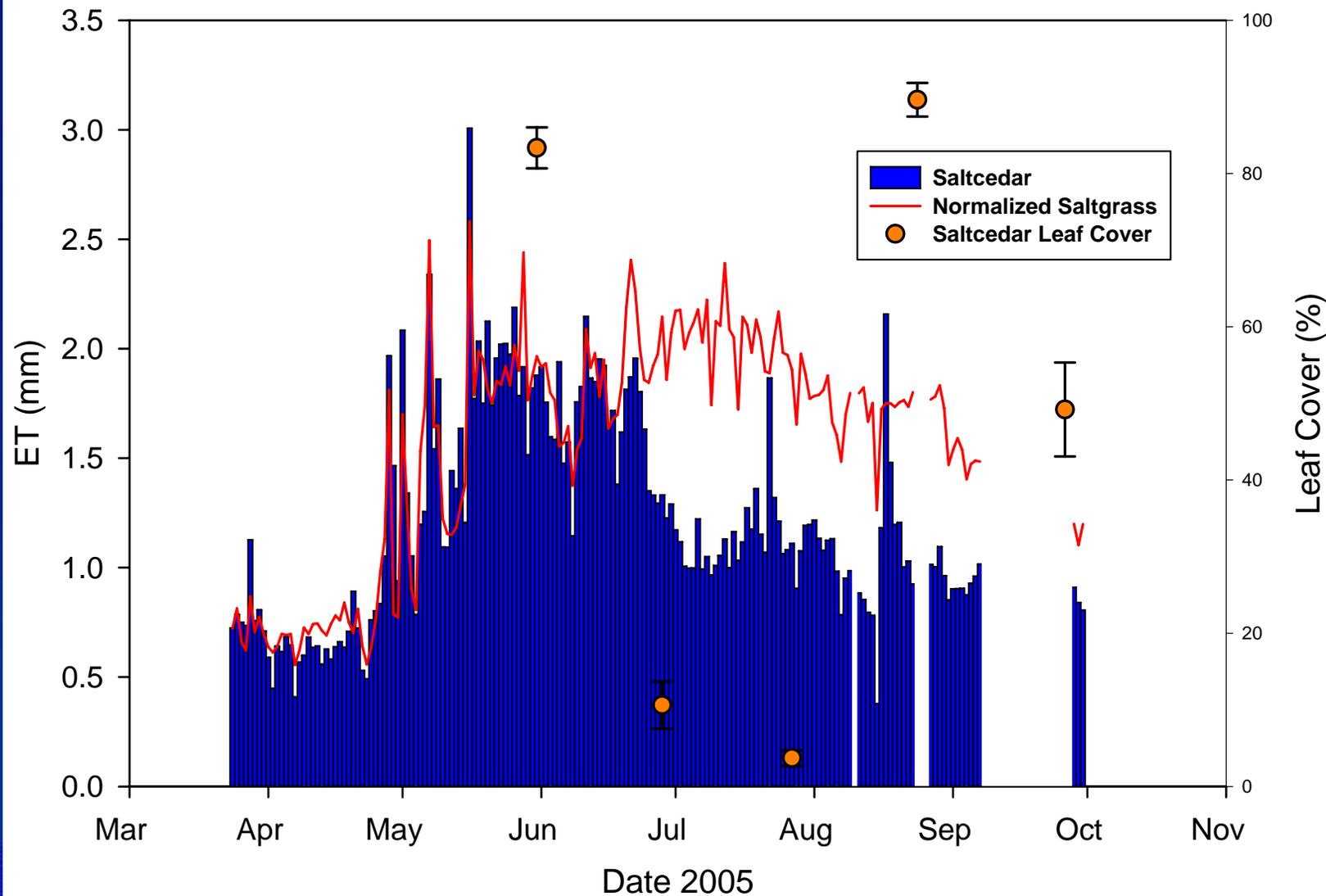
Comparison with Saltgrass ET



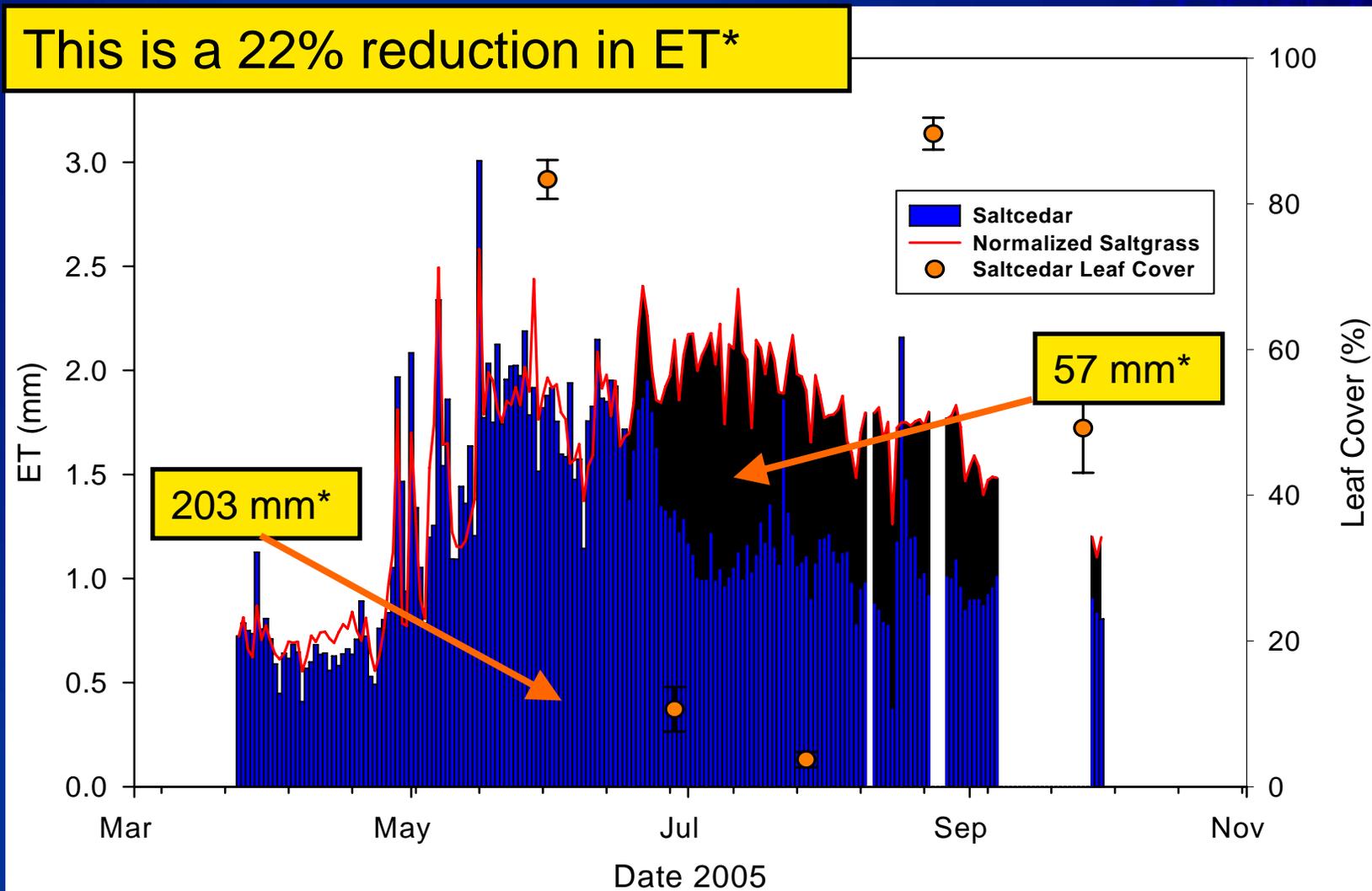
Relation between ET at Saltcedar and Saltgrass



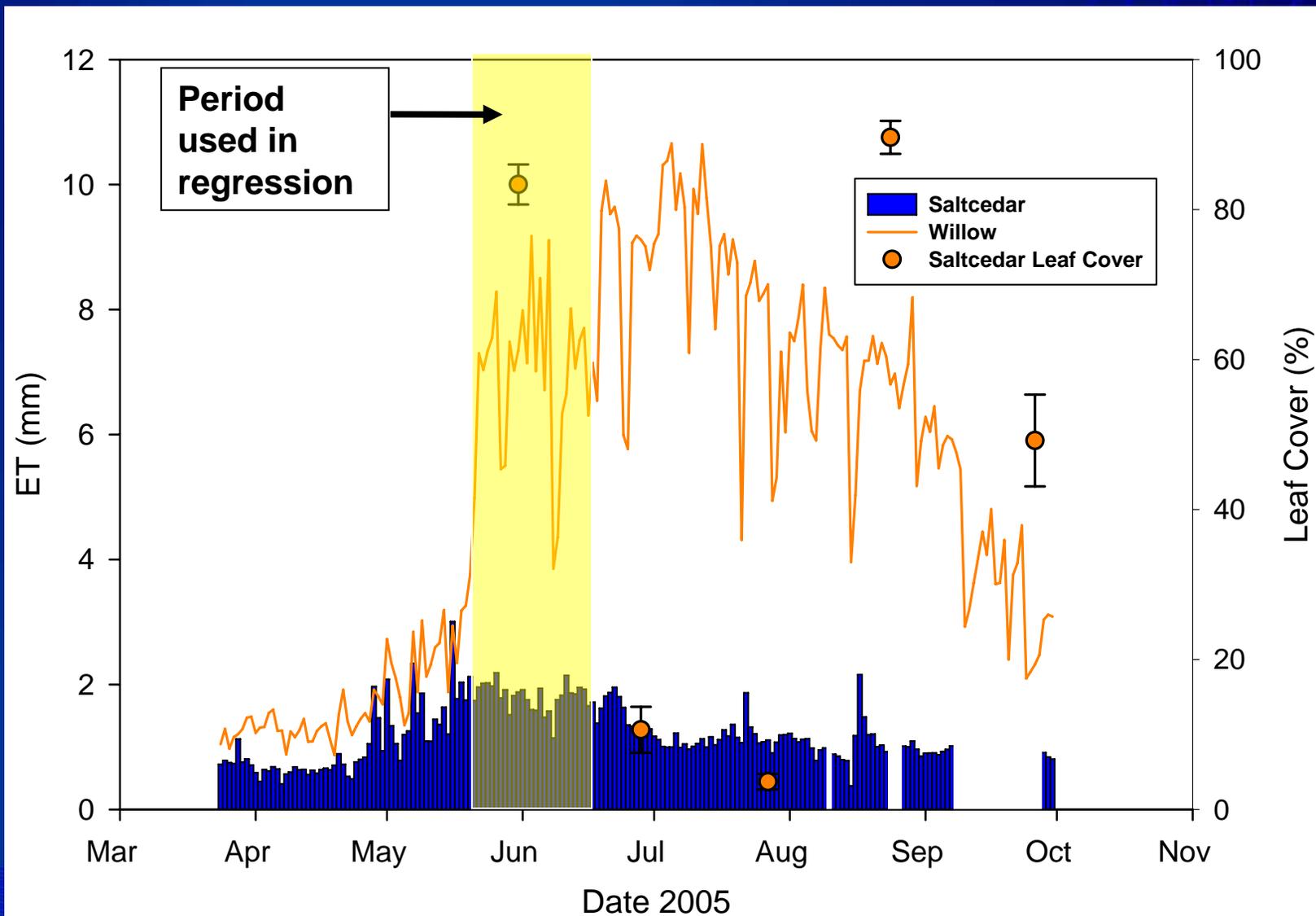
Saltgrass ET normalized to Saltcedar ET



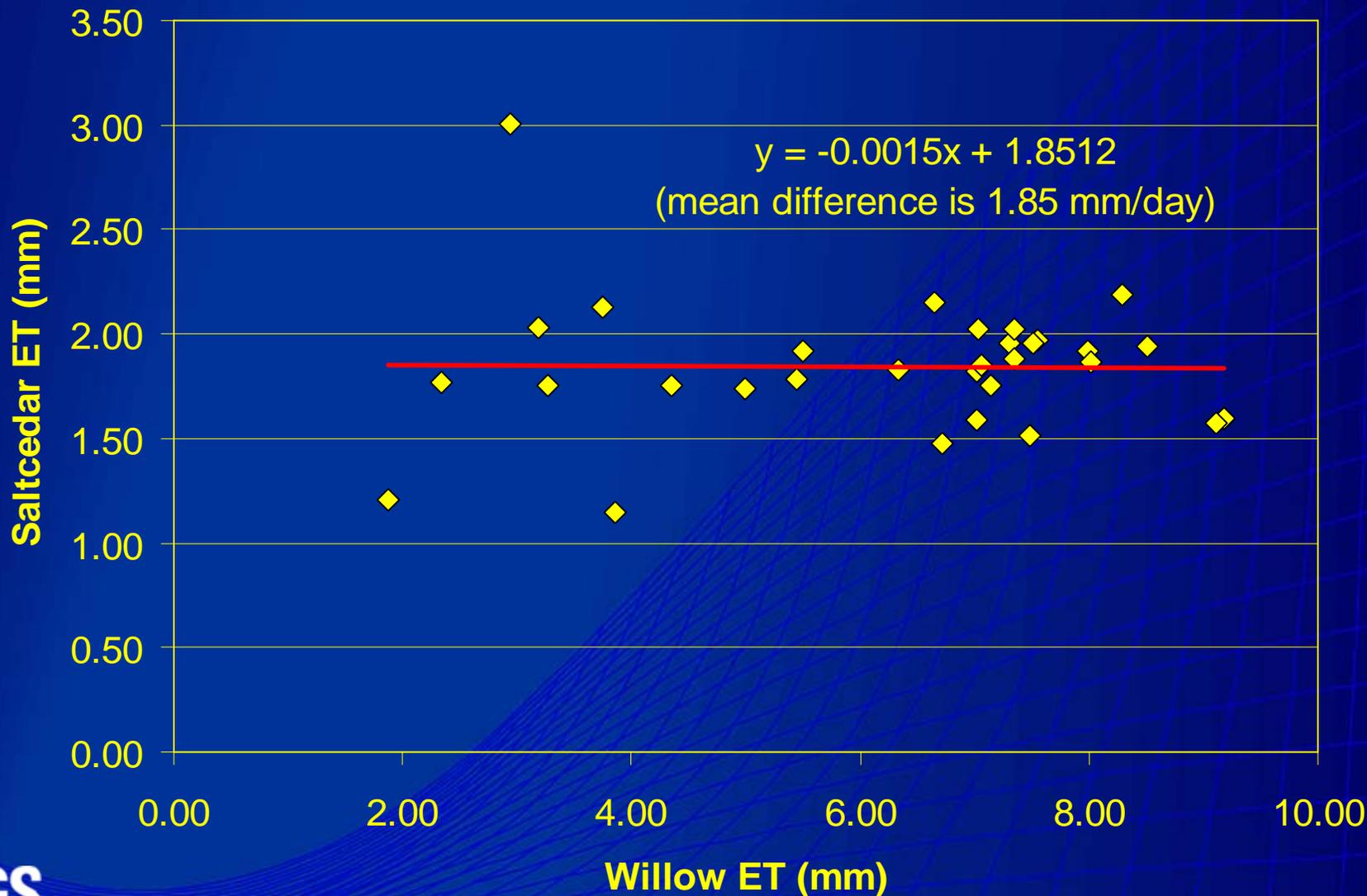
Reduction of ET using Saltgrass comparison



Comparison with Willow ET

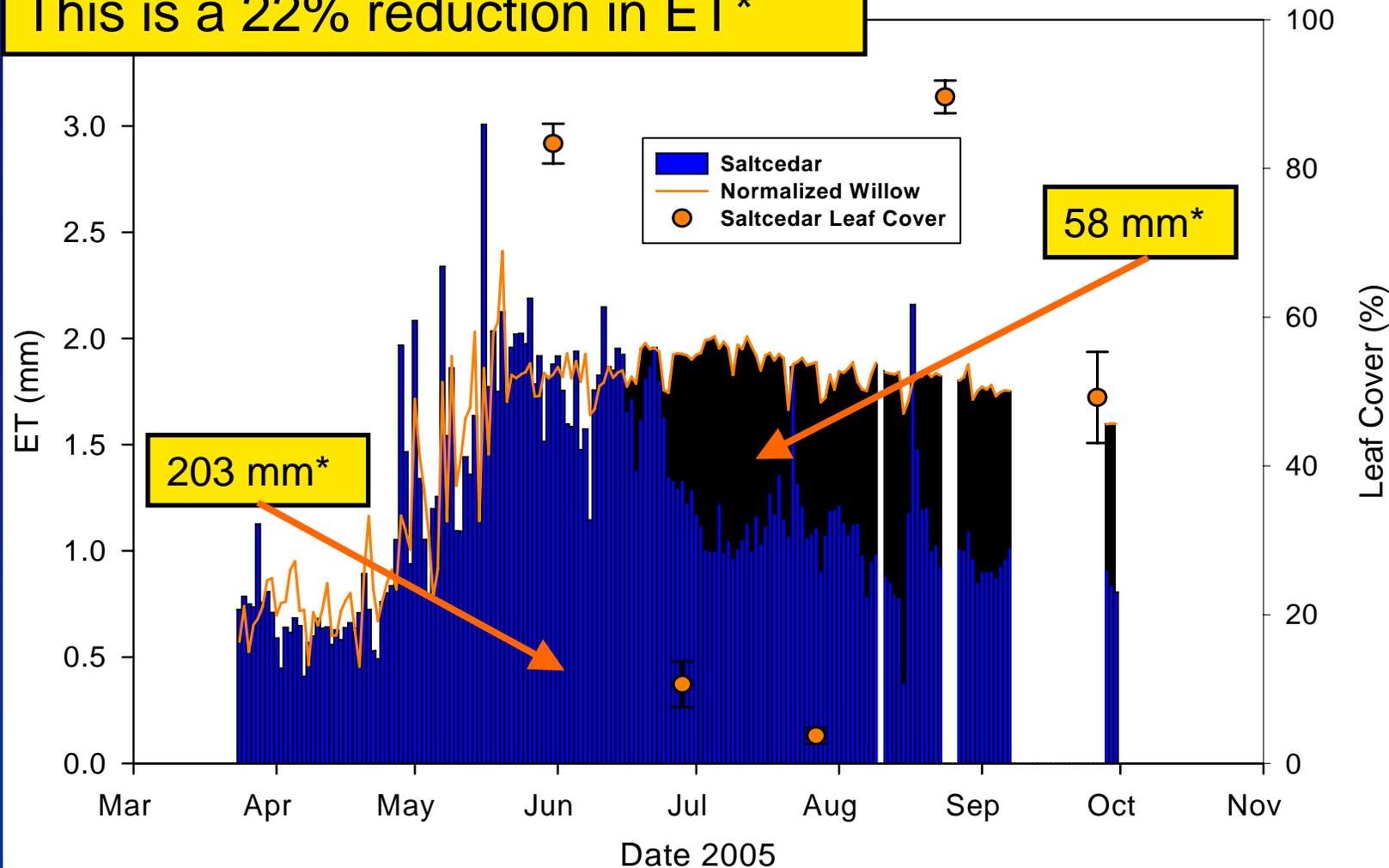


Relation between ET at Saltcedar and Willow



Reduction of ET using Willow comparison

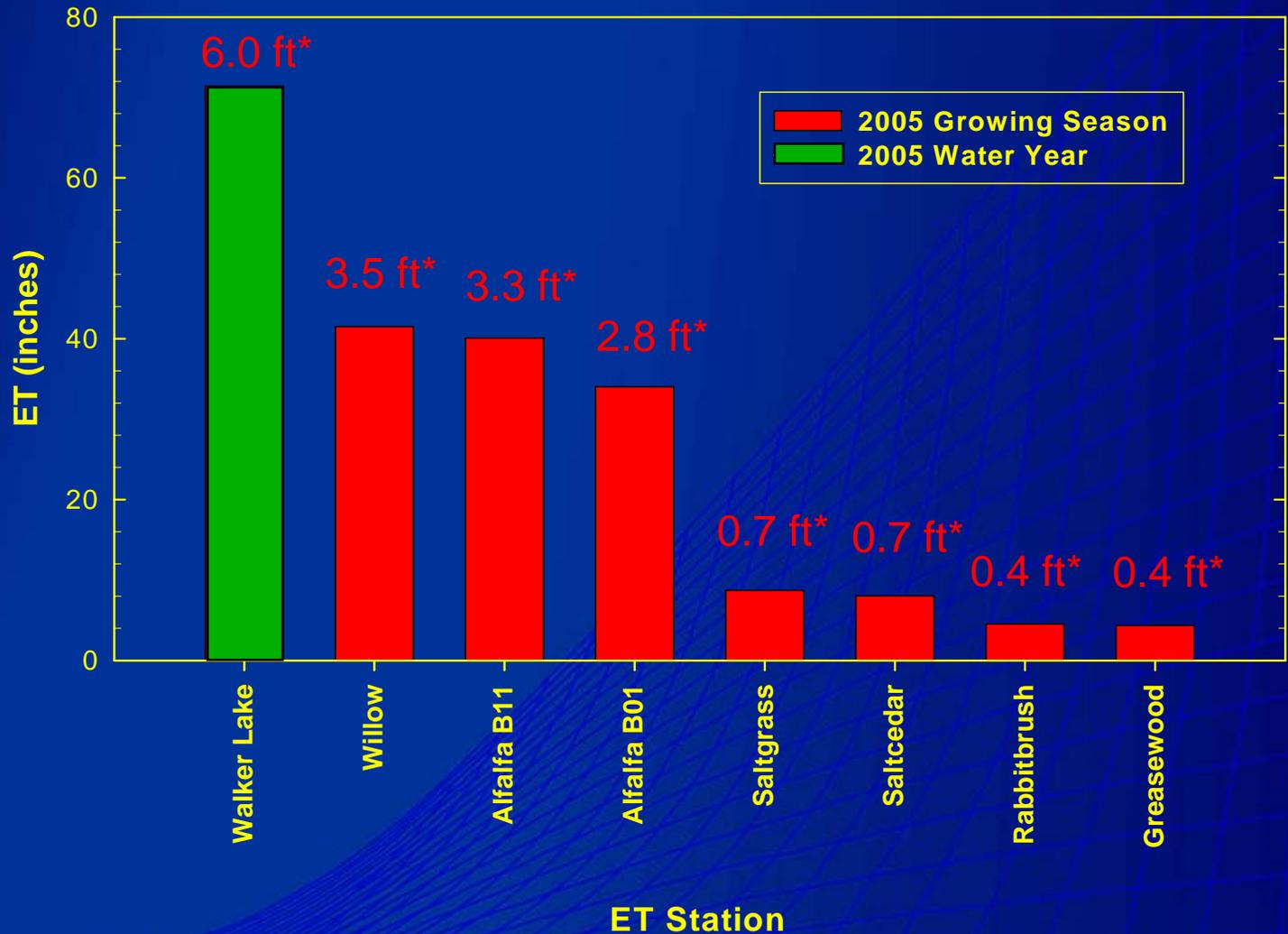
This is a 22% reduction in ET*



Results – Saltcedar site

- Saltcedar underwent substantial defoliation and associated reduction of ET due to introduction of biologic agent.
- ET rate may have been reduced by more than 20%, but a reduction even greater than this is likely.
- Saltcedar ET rates of 4.0 ft/yr have been observed in Southern Nevada.
- Actual pre-Saltcedar Beetle ET rates from Saltcedar in study area are undetermined at this time.

Results – ET Summary



Summary

- Open water has the greatest ET rates, followed by Willows and then Alfalfa.
- E from Walker Lake for 2005 water year was nearly 6 ft^{*}, almost 2 ft greater than previous estimates.
- Estimated volume evaporated from Walker Lake is approximately 50%^{*} greater than previous estimates.
- ET rates in Saltcedar were reduced by more than 20%^{*} with newly introduced biologic control, but a reduction even greater than this is likely.



<http://nevada.usgs.gov/walker/>