Accounting for Evapotranspiration Differences due to Microclimate in the Coachella Valley, CA.

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Introduction

Urban Irrigation Managers in California use the State weather station system CIMIS, (California Irrigation Management Information System) to find the Reference Evapotranspiration (ETo) for their general region. Unlike the agricultural crop managers who use this system, urban landscape water managers often find that the closest CIMIS station may not accurately determine the water use in their local area. Most CIMIS stations are located in areas to reflect the local agricultural crop growing regions. Urban sites can be quite different due to near-by natural and man-made structures (buildings, fences, trees, mountains, hills, lakes, etc.)

The Coachella Valley of California is a major agricultural growing region (grapes, dates, citrus, vegetables) and winter resort region with over 110 golf courses and 16,000 hotel rooms. The Valley covers 675 square miles with the Salton Sea at the south east end of the Valley. The Coachella Valley Water District supplies much of the water for the urban portion of the Valley and they were interested in refining the ETo data available to their customers who use large amounts of water annually for landscape irrigation.

This study placed three temporary weather stations in 14 locations for a minium of one year and compared the ETo estimates at each location to a single CIMIS station located in Indio, CA (station # 162 and later # 200).

Aim

The study was done to determine ETo differences in local parts of the Coachella Valley from the CIMIS station for the central part of the Valley near Indio, California.

If differences were significant a factor was calculated for the area of the Valley to allow landscape irrigation managers to use the CIMIS ETo and adjust it with the local factor to gain more accurate local crop water use information.

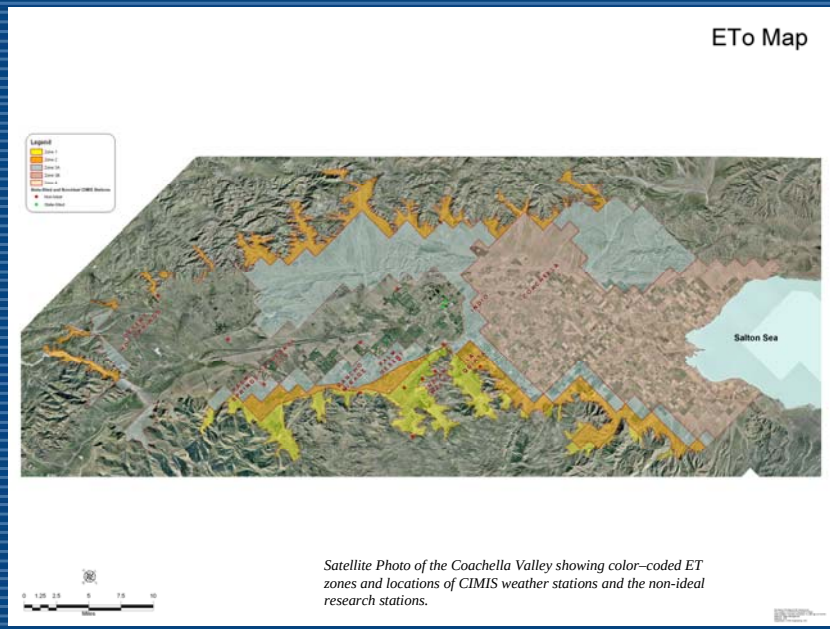
Methods

Three portable weather stations were placed in various urban locations throughout the Coachella Valley starting in 2000. The stations each contained a wind speed sensor (Anemometer, RM Young), a thermometer, a solar radiation sensor, (Licor, LI200), and a temperature and relative humidity sensor, (Viasala, HMP45C). Sensors were located 3 meters from the ground on a tripod stand with solar panel and battery to power the Campbell data logger (CR-650, Campbell Scientific, Logan, Utah).

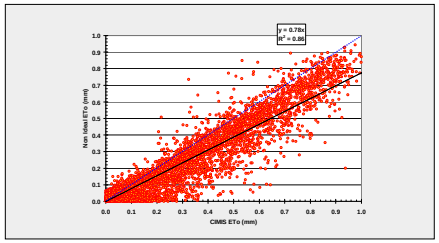
Sites were chosen to allow as much wind fetch and sun light as possible for that particular location. Stations were left in place for a minimum of one year, then moved to another site that represented a unique urban setting. Data were down-loaded from the weather station data-logger every three months and compared with the CIMIS station #162 / #200 data.

State CIMIS weather station # 136 at Oasis, California identical to the two CIMIS stations used for this study in Indio, CA.

Temporary weather station located in an urban site in Southern California.



Satellite Photo of the Coachella Valley showing color–coded ET zones and locations of CIMIS weather stations and the non-ideal research stations.



ETo Comparison between the official CIMIS station in Indio, CA (#200) and non-ideal site located in Indian Wells, California at Big Horn Golf Club. The black line is the regression line, y = 0.78x. Data were collected between 14 June 2001 and 9 June 2002.

Conclusion

In this case it was feasible to use ETo adjustment factors developed from temporary weather stations to make adjustments of the ETo from the State CIMIS weather station who's data did not accurately predict the ETo for urban sites that did not match the CIMIS station conditions due to microclimate differences.

Acknowledgements

This study was funded in part by the CUWCC, Sacramento, California and the Coachella Valley Water District, Coachella, California. Numerous Golf Course Superintendents and owners supported this work through donation of their facilities for siting temporary weather stations.

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Introduction

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Aim

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Method

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Results

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Conclusion

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Acknowledgements

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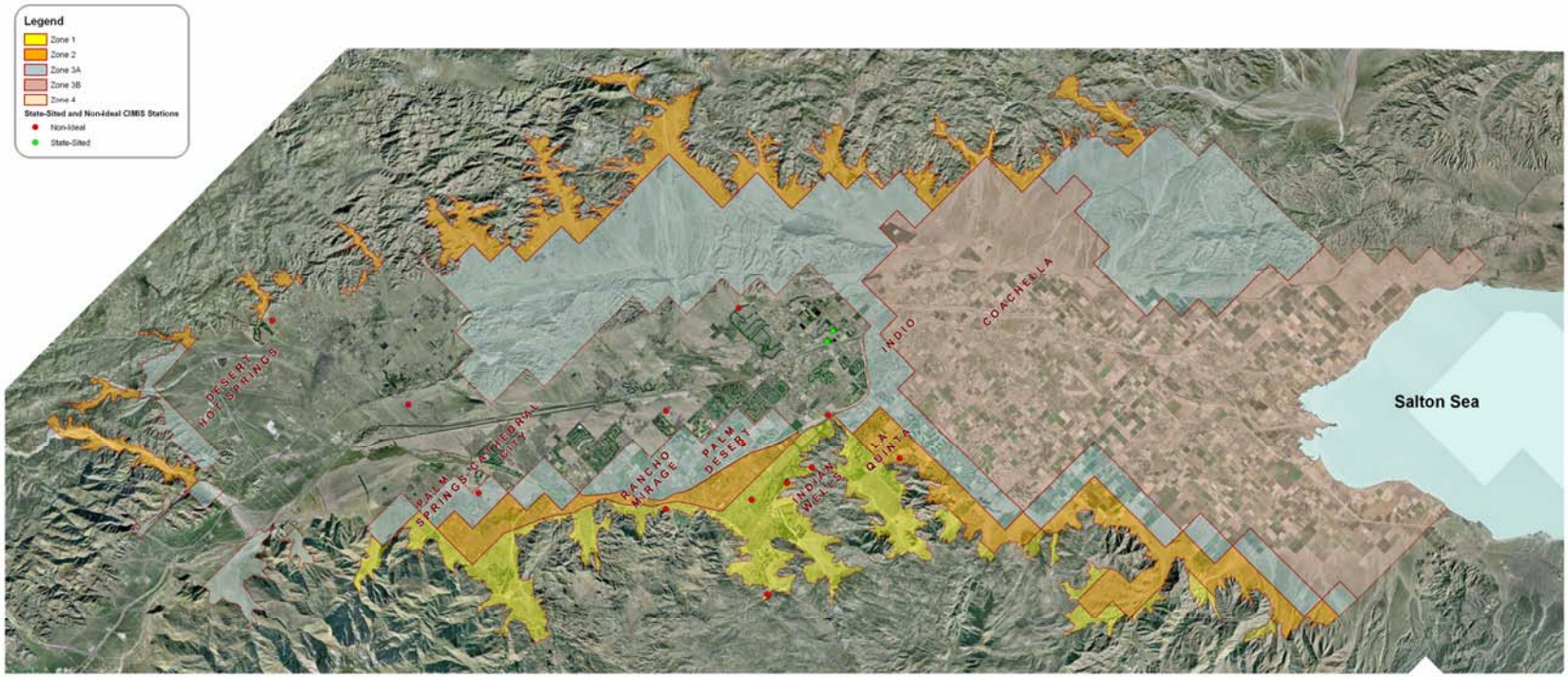
ETo Map



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