HALOPHYTE ET PROJECT

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Our research over the past 3 years suggests that the inclusion of halophytes in DW reuse has the potential to substantially reduce drainage volumes. We have measured high water use (ET) rates for two candidate halophytes, pickleweed (*Salicornia bigelovii*) and saltgrass (*Distichlis spicata*) under irrigation with highly concentrated drainage effluent (30 dS/m , > 25 ppm boron water from Mendota). This was the third collection of drainage (tertiary drainage).

Results of Previous Research

In 1997, Salicornia ET met or exceeded the reference ET published by CIMIS for much of a 2 ½ month period from early June to mid-August (Fig. 1). This is not, however, a direct comparison of Salicornia and nonsaline grass ET because the Salicornia ET comes from lysimeter measurements (volume balance approach) and CIMIS ETo is an estimate of nonsaline grass ET determined micrometerologically (via weather station data)

Consequently, in 1998 we included fescue in our lysimeter plantings in order to obtain a local estimate of nonsaline grass ET. The fescue was the "on-site" estimate of nonsaline grass ET-- the complement of CIMIS ETo, but measured using the same lysimeter system that we use to determine halophyte ET. Saltgrass ET averaged about 60 % of the fescue ET (nonsaline conditions) for most of the season (Fig. 2). For example, from Aug. 22 – 29th, saltgrass ET was 7.1 to 8.6 mm/day, whereas nonsaline fescue ET was 11.4 to 12.9 mm/day. Because Fig. 3 shows cumulative ET, the difference between salt grass ET and fescue ET increases as the season progresses (lines diverge).

In 1998, both our saltgrass and nonsaline fescue ET estimates were considerably higher than the CIMIS estimate of nonsaline grass ET (ETo) (Fig. 2). This suggests differences in the ET rates measured by our volume balance lysimeter system and those from the micrometerological calculation method used by CIMIS. We will continue to study the relationship between these two methods of ET calculation and will include fescue in future lysimeter plantings, in order to provide the on-site estimate of nonsaline grass ET, in addition to the comparison to CIMIS ETo.

From the ET data obtained for saltgrass in 1998 and for Salicornia in 1997, we conclude that both halophytes grow well under irrigation with the highly saline, high boron DW, and that they maintain water use rates at least half of those of a nonsaline grass.

Recent work by Oster et al. (1999b), proposes the use of saline DW as a resource for forage production. Experiments in sand tanks at the USDA Salinity Lab in Riverside and in field plots at Westlake farms (Stratford, CA) show good biomass production and acceptable forage quality (ADF and NDF) for common bermudagrass, siltgrass (*Paspalum vaginatum*) and the saltgrass under irrigation with DW up to 20 dS/m. Above 20 dS/m, biomass production began to decline slowly. Forages are considered ideal for the middle phase of the sequential DW reuse system. The forages are also attractive because (1) they currently have better economic potential than do the halophytes proposed for the final phase of the sequential reuse system, (2) current levels of forage production in the SJV are said to be insufficient to match the increase in dairy production, especially in Tulare county and (3) there is interest among resource agency personnel to move livestock grazing out of the Sierra foothills in order to reduce environmental impacts to native vegetation (Oster & Kaffka 1999).

1999 research

Re-location of our field site to Red Rock Ranch at Five Points, and the expansion of our lysimeter facility will allow us to begin ET measurements of salt tolerant forages under irrigation with saline DW-- in addition to continued measurements of halophyte ET. This year we will measure ET for the halophytes picklweed, saltgrass, and Atriplex, and for bermudagrass, irrigating with concentrated drainage (28-30 dS/m), and ET will be estimated for fescue under nonsaline conditions.

Mendota tertiary drainage used to irrigate saltgrass in 1998. Similar water was applied to pickleweed (Salicornia) in 1997.

EC dS/m	SAR	SAR adj.	Na meq /L	Ca meq /L	Mg meq /L	Cl Meq /L	SO_4 Meq /L	B ppm	NO_3-N ppm	pH
31	54.3	146	370	25	65	130	360	50.5	80	8.2

Fig. 1 **Cumulative Salicornia ETc and CIMIS ETo . 1997.**

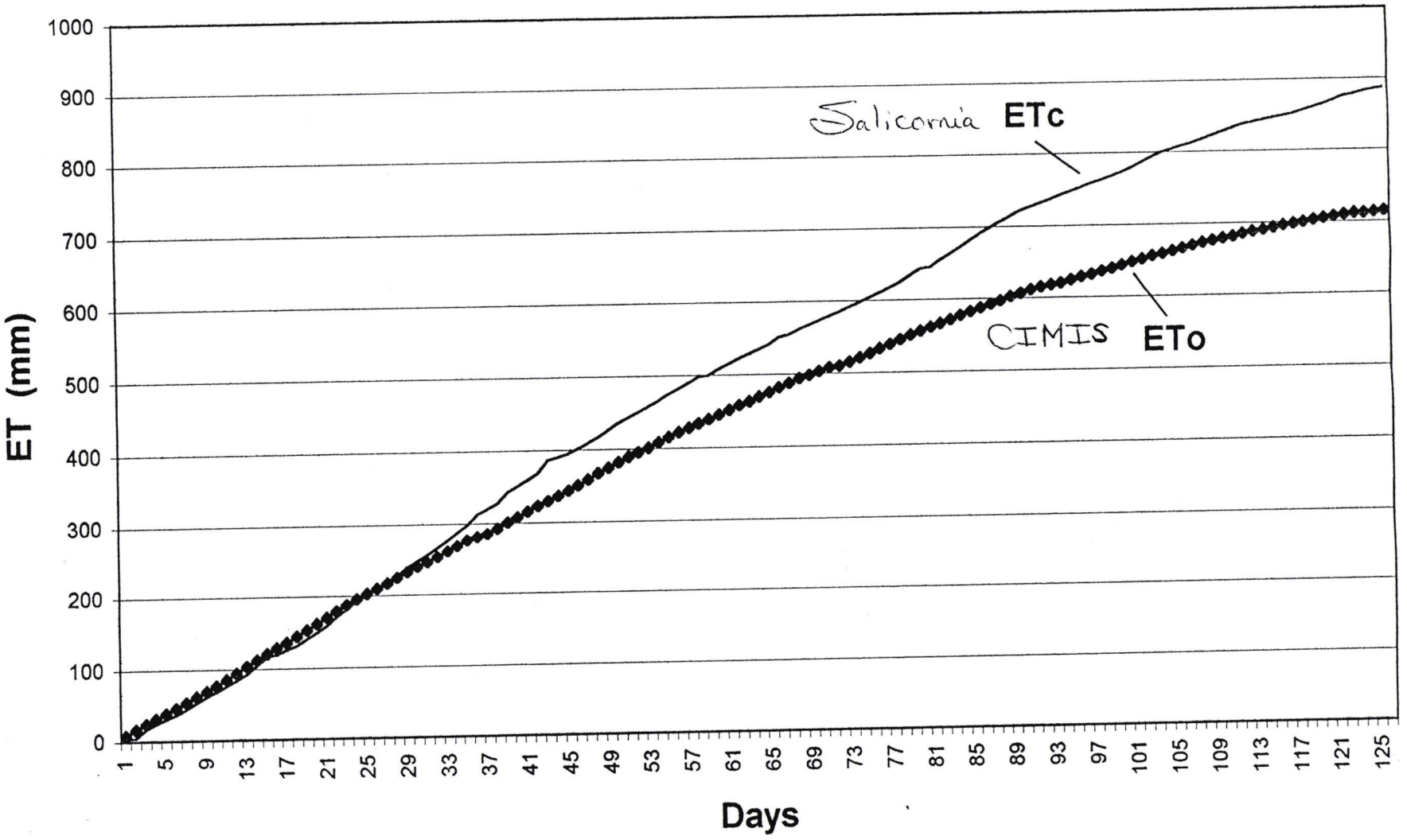

Fig. 2 **Cumulative saltgrass ET, fescue ET and CIMIS ETo. 1998.**