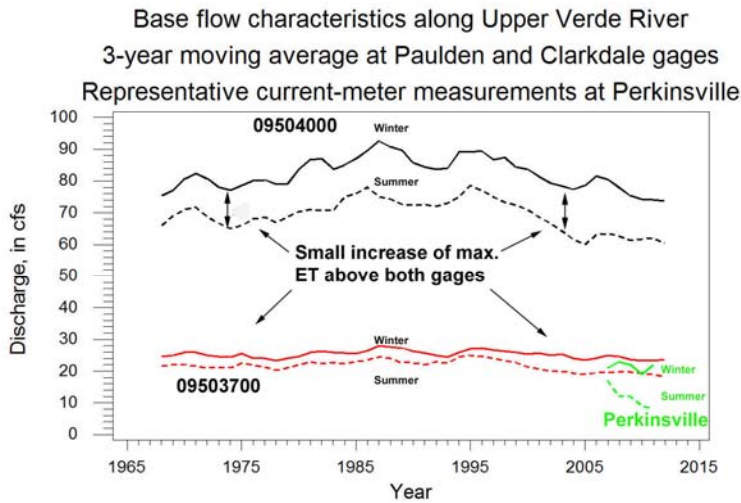


**Examination of base flow between Verde River gages 09503700 and 09504000.  
Sierra Club measurements at Perkinsville are also considered.**

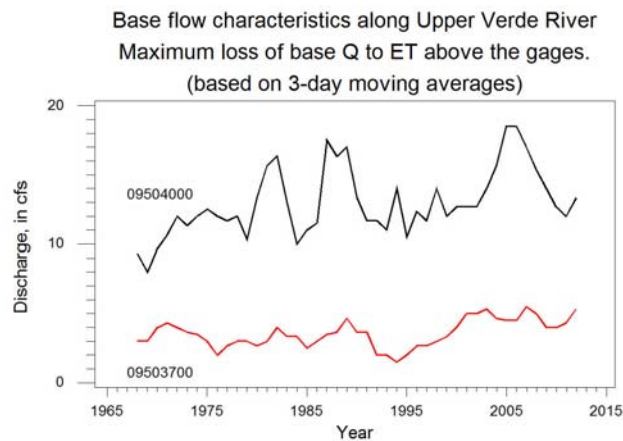
**Win Hjalmarson  
5 7 2013**

The following relations (3-day moving average) at the two gages are of maximum base flow (no ET) and minimum base flow (max ET) for the concurrent period of record. A small increase of ET with time is suggested for both of the gages (see next relation). Corresponding relations (individual measurements and not 3-day moving average) also suggest an increasing ET with time.

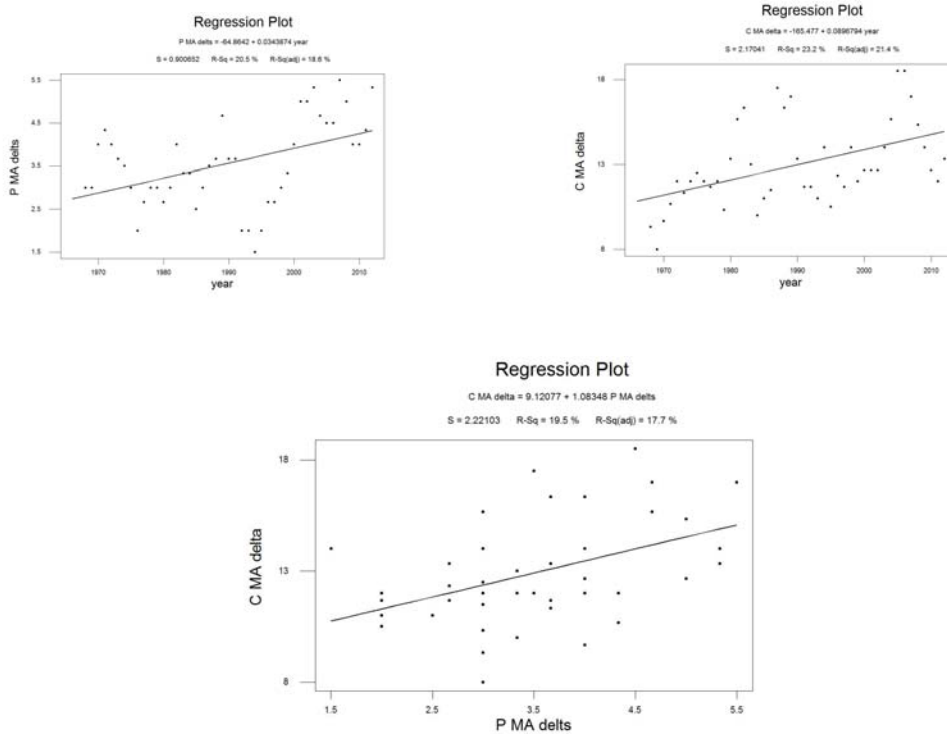
There is an increasing amount of ET along the river for the three sites as would be expected.



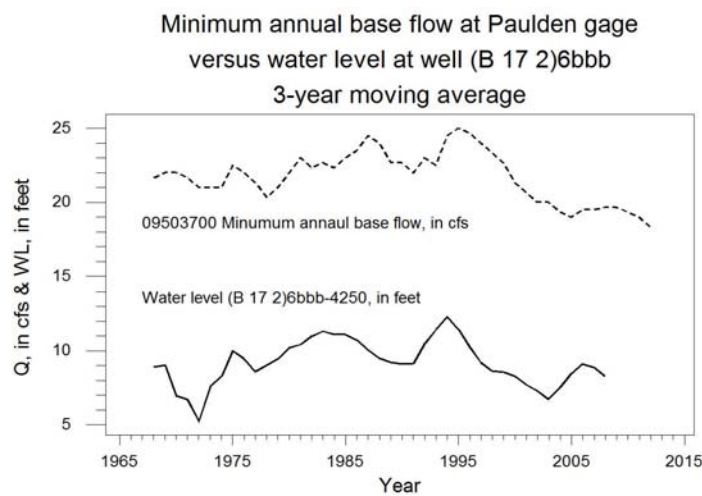
The maximum loss to ET above the two gages is shown below.



Trend is examined using linear regression. An increase of maximum ET is suggested but the scatter is great. The relation between max ET for the two gages also is not very significant but is suggested.



The water level of old USGS observation well at lower end of Big Chino Valley and the minimum annual base flow at the Verde-Paulden gage is shown below. See Wirt and Hjalmarson, USGS Open-File Report 99-0378 (2000) for discussion of this relation that ADWR (and judge Shedden?) did not want to believe.



Interesting computations follow:

The mean of losses to ET above the Clarkdale gage = 12.930 cfs

The mean of losses to ET above the Paulden gage = 3.6512 cfs

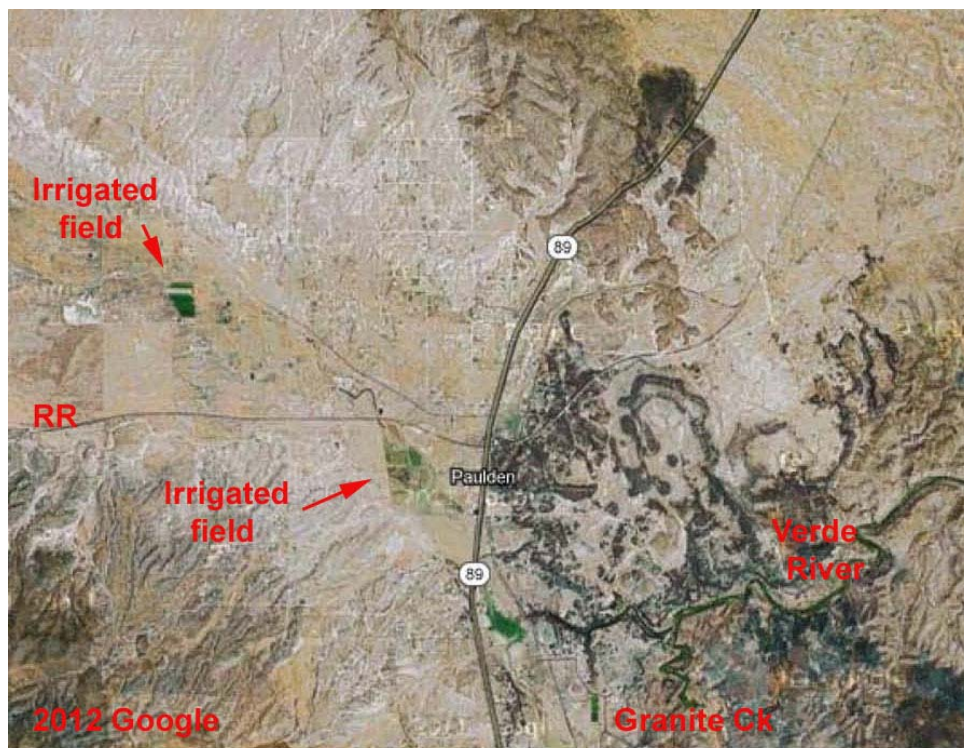
Above Paulden gage average annual maximum loss to ET? for 8 miles = 0.456250 cfs per mile

Above Paulden gage average annual loss to ET? for 8 miles = 0.198370 cfs per mile or 1,150 ac-ft.

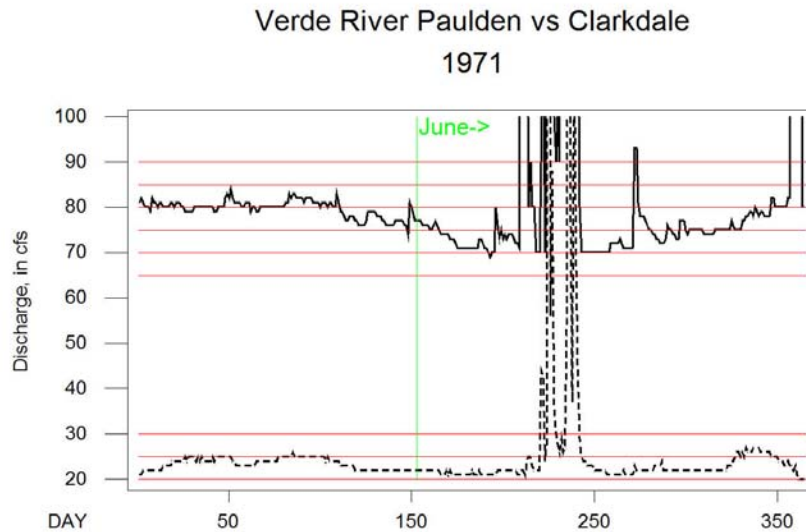
From Clarkdale to Paulden gages including 3 miles of Sycamore Creek (total of 34 miles) average annual maximum loss for 34 mile = 0.272941 cfs per mile

From Clarkdale to Paulden gages including 3 miles of Sycamore Creek (total of 34 miles) average annual loss for 34 mile = 0.118670 cfs per mile or 2,925 ac-ft.

Because the computed ET/mile above the Paulden gage is so much more than the lower reach, the ET above the Paulden gage may include a seasonal affect beyond the river such as irrigation at the lower end of Big Chino Valley (See relation above and photo below). Or, the effects of ET along Granite Creek and along the Verde River above Granite Creek are influencing the flow at the Paulden gage.



The above analysis is based on established applied river engineering methods using pairs of streamflow hydrographs for each year as shown below.



This analysis is inspired by the recent report “Going With the Flow, A summary of five years of Water Sentinels flow data collection on the Upper Verde River” and recent discussion with Gary Beverly concerning the measurements of streamflow at Perkinsville. You guys are the greatest.

In regard to the streamflow measurements at the Sierra Clubs Perkinsville site, future measurements made throughout the year may be of limited value because groundwater flow obviously bypasses the site. Under dry weather conditions with no melting snow, seepage investigations along the upper Verde can be very valuable. Generally speaking, seepage investigations in January and June when there is a little and a lot of ET, respectively, can be very valuable.

I hope these computations and thoughts are useful.

Win