NATIVE *versus* INVASIVE

Plant Water Use in the Middle Rio Grande Basin

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Water budget studies by the New Mexico Interstate Stream Commission (NMISC, 2003) in the Middle Rio Grande (MRG) estimate that water use by riparian vegetation constitutes 30 to 40 percent of the total water consumption in the basin. Concern over the spread and potential high water consumption of non-native species such as Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix* spp.) has led to increasing debate over the importance of eradication of these species to maintain riparian health.

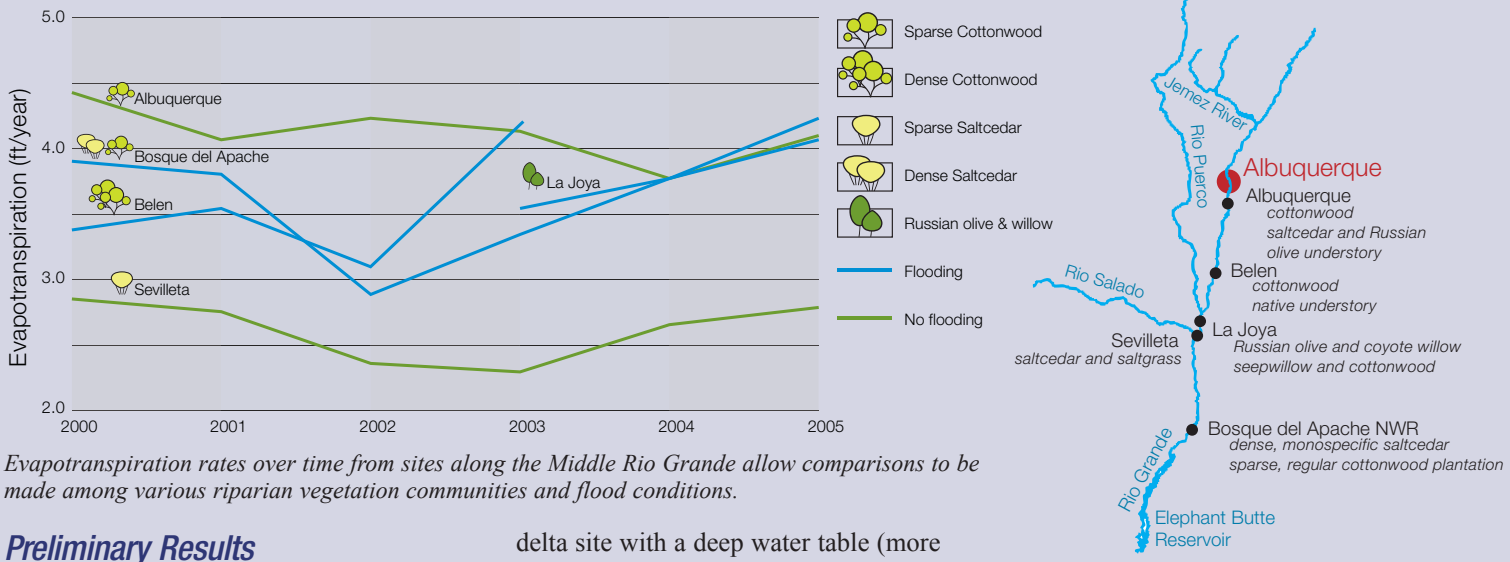
Due to the lack of quantitative data on actual water use of various riparian vegetation communities in the MRG, the Bureau of Reclamation, in coordination with NMISC, New Mexico State University, the University of New Mexico, and Los Alamos National Laboratory, formed the MRG ET-Workgroup. The group initiated a study that aimed to provide data that could be used to develop estimates of long-term evapotranspiration (ET) and to provide input to models for predicting consumptive water use by several riparian communities.

For areas where the water table is relatively shallow, saltcedar stands use less or about the same amount of water as cottonwood stands.

The ET Study

Data were collected from eddy covariance systems that allow water flux (ET) measurements to be made either directly or calculated from measurements of radiation, and convective heat flux into the atmosphere and the ground. Shallow piezometers were installed at each ET measurement location to measure depth to groundwater. Initially, the study design was limited to saltcedar and cottonwood vegetation communities; Russian olive and open water were added in 2003.

The map at right shows where ET data are being collected in the MRG. The sites represent different groups of riparian vegetation and flood conditions as follows: 1) an unflooded cottonwood forest (Albuquerque); 2) a frequently flooded cottonwood forest (Belen); 3) an unflooded saltcedar thicket (Sevilleta); 4) a frequently flooded saltcedar thicket (Bosque del Apache), and 5) a flooded Russian olive/willow grove (La Joya). All sites are located in dense vegetation between the river and the adjacent levee.



Evapotranspiration rates over time from sites along the Middle Rio Grande allow comparisons to be made among various riparian vegetation communities and flood conditions.

Photo: James Hogan

Preliminary Results

A large volume of data have been collected at each site since 2000, but comprehensive analysis of these data has not yet been completed. Many variables affect ET rates and it can be difficult to determine conclusive cause-and-effect relationships or to compare data between sites. The chart above presents the annual evapotranspiration rates at each of the tower locations for the period from 2000 to 2005.

In general, the data show that at sites with shallow depth to water (less than 10 feet below ground surface) the ET rate for cottonwood ranges from 3.7 to 4.4 feet per year while the ET rate for dense saltcedar ranges from 2.8 to 4.1 feet per year. Based on these data, for areas where the water table is relatively shallow, saltcedar stands use less or about the same amount of water as cottonwood stands. Further, sparse saltcedar stands used much less water than sparse cottonwood stands with the same groundwater conditions. The measured annual ET rate for Russian olive-dominated community varied from 3.5 to 4.2 feet per year, approximately the same as for cottonwood stands.

Based on the data collected and analyzed to date in the MRG, the current strategy of saltcedar eradication and replacement by native vegetation (cottonwood and willow) does not appear to result in water savings in areas of relatively shallow groundwater.

A study conducted at an Elephant Butte delta site with a deep water table (more than 10 feet below the ground surface) suggested that removal of saltcedar from areas with a relatively deep water table might produce some water savings (Bawazir and others, 2006). However, given the short period of measurement (189 days), additional work is needed to substantiate those results.

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References

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