Commentary on "Effect of brush control on evapotranspiration in the North Concho River watershed using the eddy covariance technique" by Saleh et al. (2009)

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In a paper "Effect of brush control on evapotranspiration in the North Concho River watershed using the eddy covariance technique," published in the September/October 2009 issue of the *Journal of Soil and Water Conservation*, Saleh et al. argue that clearing mesquite has "great potential" for increasing water yield in the North Concho River watershed near San Angelo, Texas. The clear implication is that shrub removal is a viable strategy for increasing water supply to the city of San Angelo. The authors make this argument mainly on the basis of the small differences in evapotranspiration rates they measured between pastures with mesquite and those without mesquite.

We do not dispute the fact that the timing and amount of evapotranspiration may be affected by differences in tree cover and density, but we do not agree that these modest differences will translate to meaningful changes in water supply. There is already overwhelming evidence that brush management in the North Concho watershed will not lead to increases in water flow in the North Concho. A brush control project was begun in the North Concho watershed 10 years ago, and even though this period included one of the wettest years on record (2007), there has been no evidence of increased flow. In other words, brush control has been tried and has not worked in terms of increasing streamflows to the North Concho.

The North Concho project has been one of the most comprehensive and coordinated brush-control efforts in Texas. Between 2000 and 2005, about 1200 km$^2$ (463 mi$^2$) of the 3100 km$^2$ (1,196 mi$^2$) watershed was cleared of either mesquite or juniper in the hope of increasing flows in the North Concho River. In fact, as highlighted by Saleh et al., water planners were projecting that flows in the North Concho would increase three- to fivefold as a result of this $14 million program. However, as of 2010, there has been no perceptible increase in flow in the North Concho and even a suggestion of further decline since the brush control program was implemented (figure 1).

What is clear from figure 1, however, is that streamflows in the North Concho are much lower now than they were before 1960. Wilcox et al. (2008) attribute these declines to improvements in the condition of the rangelands, as the numbers of grazing animals were dramatically reduced. Improved range condition has lead to smaller flood events for a given amount of rainfall.

Given that background information, what Saleh and coauthors should have been asking is, Why are the results of our evapotranspiration study at variance with those of the North Concho River clearing program? Our response to this question would be that evapotranspiration is effectively decoupled from streamflow in this semiarid environment.

The underlying but unstated assumption of Saleh et al. is that differences in evapotranspiration between sites with and without mesquite will translate directly to differences in groundwater recharge, which in turn will translate to differences in streamflow. However, this is not the case, as demonstrated by a detailed analysis of streamflow on the North Concho (Wilcox et al. 2008). This analysis highlights the fact that groundwater sources provide only about 10% of the North Concho’s flow. The remainder comes from surface runoff during flood events (Wilcox et al. 2008). The clear implication is that evapotranspiration is effectively decoupled from...
streamflow. In other words, since streamflow is primarily a surface phenomenon, vegetation-management strategies that reduce evapotranspiration cannot have any significant effect.

Further, streamflow in the North Concho accounts for only 0% to 2% of the rainfall (during the period of this study, streamflow accounted for only 0.1% to 1.5% of annual rainfall). If one assumes that the North Concho is the major outlet for groundwater and surface water flows, then evapotranspiration must be on the order of 99%—unless one is prepared to argue that groundwater recharge in this semi-arid upland region is significant. In fact, groundwater recharge of more than a few millimeters a year is extremely unlikely on these upland sites (Scanlon et al. 2005). Local evidence arguing against a groundwater connection includes the following:

- Except for the alluvial aquifer adjacent to the river, there is no obvious, heavily used groundwater source (groundwater pumping is very limited in the basin).
- The groundwater table is 30 m (98 ft) deep or more in most locations.
- The Angelo soils on the site have well-developed calcic horizons, which cannot form where significant leaching is occurring.

Brush control on mesquite rangelands is a vitally important land management practice. If done properly, it can lead to better wildlife habitat, increased grazing potential, improved biodiversity, and even watershed protection. However, there is no compelling evidence at this time that it is a viable strategy for increasing water supply. In the case of the North Concho watershed, there is strong evidence that it does not increase water supply. To continue arguing otherwise confuses the public and ultimately undermines the credibility of the watershed conservation community.

**REFERENCES**


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