

Phreatophyte Facts: The Truth About The Trees

By Ben Lomeli

Fremont cottonwood (*Populus Fremontii*) and black willow (*Salix nigra*) are native Arizona phreatophytes (*water table dependent plants*). The three native varieties of Mesquite (Velvet, Honey and Screwbean) also often grow as bosques in riparian areas.

Much like a protective scab, which forms over a cut on your body, these native riparian (*riverine*) trees are part of nature's healing process for entrenched (*down-cut*) rivers and streams.

The trees slow the flow, help build and hold soils in place, and provide a place for storage and slow release of water. Riparian vegetation helps regulate flows by making the system "spongy" again. Watershed values such as flood control and water quality are natural benefits of riparian areas. Increased storage in riparian zones makes available much of the water required for riparian growth.

An earthquake, climatic changes, historic overgrazing, fuel wood removal, beaver eradication, and altered fire regimes all contributed to the San Pedro River's entrenchment between 1890 and 1908. Entrenchment changed many other southwestern rivers around the same time period from surficial, sluggish cienga/marsh environments, to faster deeply incised rivers.

Following the entrenchment period, the San Pedro floodplain widened between 1908 and 1955. Geomorphic studies also show that widening has stabilized since 1955. Most southwestern alluvial streams experienced similar entrenchment and adjustment phases early this century.

As nature's response, rapid proliferation of cottonwood-willow riparian forests and increased river sinuosities immediately followed the entrenchment period.

Riparian vegetation increases roughness coefficients in channels and floodplains, slowing down flood flows, causing deposition of soils and debris that build and stabilize banks. Gradually, through this healing process called aggradation, river beds and banks are stabilized, floodplains are built-up, and perennial river reaches are extended, resulting in a rise of base flow levels and water tables.

Riparian vegetation requires water during the growing season, but through aggradation, floodplain water storage capacity is increased all year long. Along with increased storage capacity, peak flows are attenuated through increased roughness coefficients from the standing vegetation, and downstream sediment and flooding damages diminish. Under these natural conditions, water tables rise, base flows are extended, and water quality is improved.

No long-term cost-effective gain in water yields (*stream flows*) resulted from any of several studies attempting to show a salvage of water by removal of riparian vegetation in southwestern streams (*including the Gila, Salt, and Colorado Rivers*).

Good watershed ground cover is essential to infiltrate precipitation and to prevent excessive runoff and erosion. Grasses provide this necessary function but also require water for growth and maintenance. Watershed conditions shape the stream and floodplain.

In a floodplain, grasses and shrubs also help the healing process, but during higher flows each year, the larger trees provide better protection and faster aggradation.

Each tributary contributes naturally regulated flows of water, sediment, and nutrients, and provides temperature buffering and biotic diversity. Riparian tributaries act as wildlife corridors between mountains, uplands, and the river by providing habitat continuity for species migrations. Small pools and near-surface water along these washes make excellent habitats. The vegetation provides cover, food, and nesting and roosting areas. Riparian corridors also provide habitat for many insects and reptiles, which in turn serve as a base for a complete food chain.

Healthy tributary watersheds and riparian ecosystems help preserve the river's perennial nature by improving the form and timing of flows within the valley. Like scabs, as the river heals, the no longer needed trees die off. Although cottonwoods and willows need groundwater within reach of their roots (*only 10-15 feet*), they are intolerant to prolonged inundation and will be forced to reestablish farther out on the floodplain. They actually have a very narrow window of opportunity in which to grow. That is why the riparian corridor is so narrow.

All vegetated drainages play an important role in maintaining proper hydrologic function and a dynamic ecosystem equilibrium capable of supporting a healthy environment and a viable economy.

Our challenge in the Upper Santa Cruz basin is not just one of balancing the water budget. Concentrated groundwater over-drafting between the mountain-front recharge zones and the river can cause loss of base flows in perennial stream reaches, and subsequent loss of riparian habitats. However, working together, impacts can be mitigated with appropriate water management, groundwater recharge, and watershed improvement projects.

In short, the trees hold the soil, and the soil holds the water.

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