

Wetland Trees of Arizona for Possible Oasis Use in Arid Regions

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Editor's Note

Recently Warren Jones (*Desert Plants* 3(1): 17-28) has pointed out the value of the "mini-oasis" for human outdoor comfort in desert regions. In a quite independent basic research project Jon Rodiek has surveyed Arizona's wetlands for the presence of certain plants. Wetlands in Arizona often represent virtual oases surrounded by desert. In the present article Dr. Rodiek has sifted through the findings of his basic research to select what he considers the ten most successful trees in Arizona's wetlands. He reasons that these species may be specially adapted to oasis-like settings within arid regions. By making suggestions concerning possible landscaping values, he is showing how basic research in environmental science can result in applied benefits for man.

Introduction

Water fluctuations in desert pools, plant regeneration along river courses, the population of migratory waterfowl and sandhill cranes, or the ability of elk to survive the cold, dry winters in the coniferous forests in the White Mountains, all of these events fall within the realm of environmental studies. These phenomena represent a small sample of the knowledge base natural resource scientists are accumulating in an attempt to understand our environment. Herein lies some of the challenge of the study of the natural world.

An expanding population base in the Southwest has brought with it a variety of problems that seriously threaten the future picture of this environment. This brings to mind the question of whether it is wiser to continue expanding our understanding of the environment or to apply this understanding of the environment to the basic problems that directly confront us here in the Southwest. Most natural resource scientists believe that they are obliged to deliver benefits to the society that supports them. The problem is to determine the relative contribution to society of theoretical and applied science.

To abandon the pursuit of pure environmental research in favor of immediate problems could be judged a grave error of short sightedness. History has shown that solutions to environmental problems are many times extracted from basic knowledge developed for more theoretical purposes. The National Wetlands Inventory Project is contributing information that benefits both applied and theoretical lines of environmental research.

Values of Wetland Plants in an Arid Setting

One product emerging from the Wetlands Inventory carried out in Arizona is the identification of those plants associated with the wetland landscapes. Plants that survive extreme temperatures and water fluctuations of wetlands within an arid environment are important for many reasons. For example, such plants provide the majority of Arizona's wildlife with a primary source of cover and food. Furthermore many of these plants can be adapted to grow in man-made landscapes while maintaining the ecological and visual integrity of the surrounding native environment. Plants, especially the larger trees and shrubs found in and around wetlands, provide the recreationist and naturalist with a habitat unequalled in any other part of the arid landscape.

The identification of the dominant tree species found in and around Arizona's wetlands has value in the applied and theoretical realms of environmental study. The U.S. Forest Service is currently conducting research within the riparian environment. This work will benefit wildlife and wildlife habitat. Similar efforts have been carried out by the National Park Service and the Bureau of Land Management. These three federal agencies manage the bulk of the land contained within Arizona. These agencies have recognized the disproportionate value riparian and wetland landscapes play in maintaining the biological processes that sustain life in the southwest environment.

Tree species provide cover or shade and visual relief and diversity to our urban areas as well. Man has the option of modifying the desert environment in one of two general ways. In one, the man-made landscape is con-

structed and maintained in a manner that denies the arid condition. In another, the man-made landscape accepts and conforms to the limitations of the desert. Tree species play a key role in both cases. The difference is found in the types of species selected and their ability to cope with physiological and climatic stress and varying amounts of available water.

Climate and growing conditions continue to change over time within any given landscape. Arizona's environment whether it be desert (43.5%), grassland (23.5%), woodland (25.0%), or forest (8.0%) is sustained in part by plants that can survive these changes. In the short run the dominant plants that populate an environment do so by adjusting to the normal cycle of temperature and water fluctuation. In the long run plants must be biologically capable of readjusting to changes in these normal cycles.

Trees found in association with Arizona's wetlands represent one versatile kind of plant type. In the natural setting these plants must be able to establish themselves where surface and subsurface water supplies are adequate enough to maintain them against the high losses of water through evaporation and transpiration. These plants must be durable enough to withstand strong winds, heavy erosional forces of water flow and soil compaction that often occurs underneath their vegetative canopy. Finally these plants must have an effective reproductive strategy that insures their future survival despite these harsh growing conditions.

Inventory field checks were carried on throughout the state (Sept. 78–Sept. 79) as part of the National Wetlands inventory project. Two hundred and ninety-five field sites were visited during that time. Three hundred and sixty-five observations of trees were recorded. The primary purpose for conducting such a survey was to confirm the continued presence of water in the landscape. These indicator

trees helped substantiate the judgements made from aerial photographs that in fact a given site was a bonafide wetland. The top ten tree species are listed in Table 1. Two of the species identified (Tamarisk, Eleagnus) were introduced into Arizona. All others are native to the state. By searching in the natural environment to see just what plant species there are and how they survive in their own habitats it is possible to develop a list of those plants to use when planting a degraded natural landscape or urban landscape.

Riparian and wetland habitats that possess a dominant canopy layer offer the greatest opportunity for wildlife in the arid environment. A primary reason for this is the occurrence of available water and diverse plant species, plus complex vegetative layering and microclimate variation. Research biologists use the knowledge of plant species in formulating an assessment of the wildlife habitat condition throughout a given region. Through the techniques of habitat manipulation it is possible then to maintain a level of a desired wildlife species.

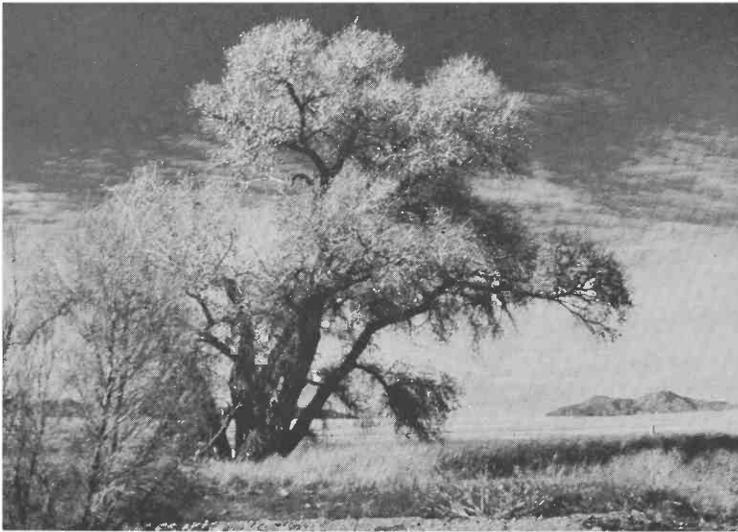
Land planners could also benefit from this information. Most of these tree species are tolerant of urban growing conditions established within desert habitats. In fact with some minor supplemental irrigation most species will thrive quite nicely. The costs of maintaining a man made landscape in the desert setting will eventually force the urban dweller to select the most water and energy efficient plant species. To date the strategy of plant selection for urban use is based upon costs, availability and ornamental appeal. These tree species if used properly could adequately substitute for less efficient plant species now being used.

Consider the following trees the next time there is an opportunity to plant in the desert. They may prove to be just what is needed to achieve the intended landscape effect.

Table 1. Trees Associated with Wetlands.

	Genus	Species	Common Name	% of Total	Size
1.	Tamarix (3)	pentandra aphylla gallica	Salt cedar	29%	Medium tree (30 feet)* (naturalized)
2.	Populus	fremonti	Fremont cottonwood	13%	Large tree (up to 70 feet)
3.	Salix	sp.	Willow	12%	Shrub to small tree
4.	Prosopis (3)	juliflora torreyana juliflora velutina pubescens	Western honey mesquite Velvet mesquite Screwbean mesquite	11%	Small to medium tree (up to 40 feet)
5.	Populus (2)	angustifolia acuminata	Narrowleaf cottonwood Lance leaf cottonwood	10%	Medium to large tree (60 feet)
6.	Platanus	wrightii	Arizona sycamore	4%	Medium to large tree (35–50 feet)
7.	Salix	gooddingii	Gooddingii willow	3%	Medium to large tree (40–50 feet)
8.	Juglans	major	Arizona walnut	3%	Medium tree (up to 50 feet)
9.	Eleagnus	angustifolia	Russian olive	2%	Small tree (15 to 20 feet) (naturalized)
10.	Fraxinus	velutina	Velvet ash	1%	Small tree (15 to 20 feet)

* Average height of species observed in field.



This Fremont Cottonwood survives dry conditions on the grassland plains in Santa Cruz County, Arizona by tapping groundwater supplies.



Arizona Sycamore indicates the presence of an underground water supply near Patagonia.

***Tamarix* sp. (Salt Cedar)**

This naturalized tree species is common to our desert landscapes. It survives along man-made waterways in the lower elevations of the state. The plants are drought resistant although they are found commonly along our major rivers and stream channels. The tree can tolerate extreme temperature ranges (to below freezing) and low water supplies. It requires pruning and cleaning in planted areas.

***Populus fremontii* (Fremont Cottonwood)**

This native thrives in our drainageways and along live streams seeps and lakes. The tree grows rapidly but it must have a constant supply of subsurface water to survive the heat. It is common up to elevations of 6,000 feet. It is one of the most important trees for wildlife in Arizona. It cannot tolerate fire and is vulnerable to grazing by livestock. The tree can do well in large open park like spaces if supplied with moderate amounts of water.

***Prosopis* sp. (Mesquite)**

Mesquite trees are found along our desert washes and bottom lands, in the desert grassland and occasionally into the wood-

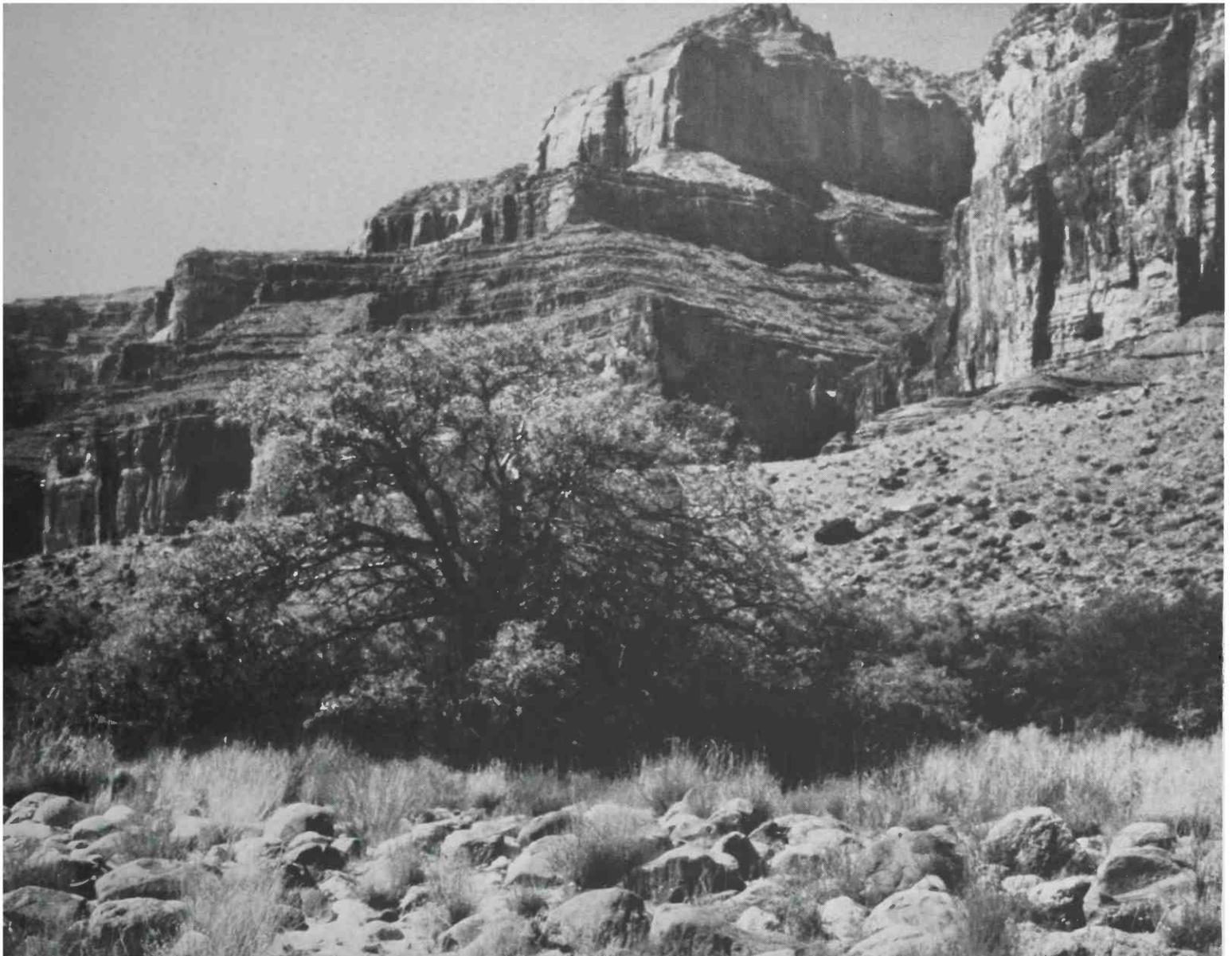


Arizona Sycamore, Velvet Ash, Fremont Cottonwood, Hackberry and Willow crowd the stream's edge near Buchman Canyon.

lands. They rarely extend higher than 4,500 in elevation. These trees are normally small and poorly developed where water supplies are low. They will develop a very healthy foliage when water is plentiful. The foliage, bark and fruit (beans) are taken by many wildlife species. The mesquite bosques which formerly occupied our desert riverways were home for many bird species. Mesquites do very well in our desert urban areas with a minimum supply of water once they become established. They are susceptible to very low temperatures but generally survive all but the severest of winters.

***Salix* sp. (Willow)**

There are many shrubs and small trees in the *Salix* family that survive the arid environment. These species are found along live stream courses and washes. They are common to the grasslands, woodlands and even the coniferous forests. Most species require an underground supply of water in order to sustain themselves against summer heat. *Salix* is commonly found in the wetland landscapes in association with other species such as *Populus*, *Tamarisk*, *Fraxinus* and *Juglans*. The foliage and bark are a valuable food source for a variety of wildlife. Most species would do



This rugged Mesquite endures high temperatures along the Colorado River in the Grand Canyon.

well in urban landscapes as background plants. They require moderate water through the dry months to be most effective.

***Eleagnus angustifolia* (Russian Olive)**

This introduced tree grows naturally along waterways or washes below 6,500 elevation. It remains a small shrub-like tree where wind is high and water supplies are low. Seeds are readily taken by many bird species. The foliage is occasionally browsed by livestock and deer. The plant will form excellent cover when foliage is dense. The tree will do moderately well on its own where rainfall exceeds 14 inches per year. It will provide an excellent windscreen or backdrop plant in urban settings. Russian olive requires some pruning and watering when used as a specimen tree.

***Fraxinus velutina* (Velvet Ash)**

Velvet ash does well along washes and drainageways in canyon areas. It has a pleasant fall foliage (yellow) and can produce a generous canopy when groundwater supplies are adequate. It is primarily an intermediate elevation tree (2,500–6,000) in its natural habitat. Cultivated varieties are well suited to the desert

landscape. It does require supplemental irrigation and occasional pruning so as to maintain a healthy branching structure.

***Juglans major* (Arizona Walnut)**

Arizona walnut is another intermediate elevation tree. It occurs in the washes and canyons at 3,000–6,500 elevations. This is the only walnut species found commonly in the southwest. The nuts are consumed by squirrels and rodents but because of their scattered occurrence they do not make up a major portion of any wildlife species diet. The wood is of high quality for wood working when available. Its primary value is for wildlife cover.

***Platanus Wrightii* (Arizona Sycamore)**

Arizona sycamore commonly occurs between 1,000–6,000 in elevation in washes and drainageways. It tolerates desert heat when water is available. The tree can grow to magnificent proportions in the upper elevations along live stream courses. It is most commonly used as ornamental shade trees in urban settings. Its use should be restricted to natural settings and where well formed alluvial soils occur. This tree will enhance a setting when growing conditions are adequate.