

# Water Supply Enhancement through Brush Control

## Upper Llano River Watershed

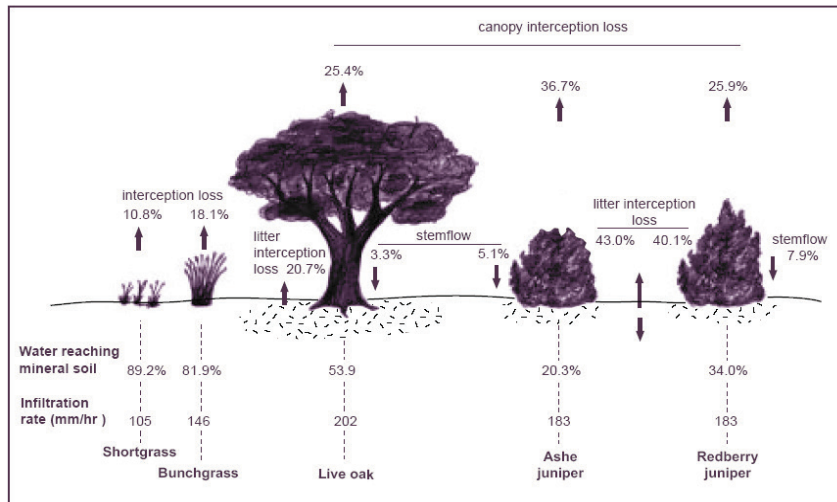
Prior to European settlement in the mid-1800s, the Texas Hill Country was largely grassland savannah that was maintained through grazing of bison, antelope, and frequent fires, both natural and man-made. This type of grazing and disturbance system favored a variety of forbs and grasses. The 19th century brought fences, which restrict wildlife movement, fire suppression and livestock, including cows, sheep, and goats. Overgrazing in combination with fire suppression caused the land to shift from grassland to brush land. Today, the Upper Llano watershed is dominated by medium- to high-density brush, primarily Ashe juniper.

Ashe juniper, often referred to as cedar, is commonly found across central Texas with the greatest abundance in the eastern and southern portions of the Edwards Plateau. They commonly grow in calcareous, shallow and rocky soils, but are also found in sandy, granitic soils. Ashe juniper is native to the Hill Country of Texas, but is now considered an invasive tree because of the shift in growing location and densities. Ashe juniper also provides nesting material for the endangered golden-cheeked warbler.

Brush may reduce the water yield of the Upper Llano watershed by increasing evapotranspiration, which is water taken from a land area by evaporation from water surfaces and soils and plant transpiration (water loss as vapor through leaves). Annually, Ashe juniper and the associated leaf litter intercept an average 74% of precipitation, whereas live oak intercept an average of 46%, and native grasses (such as shortgrass or bunchgrass) only intercept 14% of precipitation. In dense Ashe juniper canopies, nearly all of the precipitation returns to the atmosphere through evapotranspiration. Ashe juniper has high evapotranspiration rates because of the high leaf areas (water doesn't have the opportunity to reach the soil), extensive root systems that allow for greater access to water (what little water does reach the soil is immediately used by the brush), and evergreen nature (has leaves in all four seasons).



*Ashe juniper in the Upper Llano River Watershed.*



Influence of vegetation type on water yield (precipitation-including runoff and evapotranspiration) (from Thurow and Hester, 1997).

## BENEFITS OF BRUSH CONTROL

Brush control has a variety of benefits including potential for increased forage quality, increased wildlife habitat and reduction of potential fire hazard as fuels, such as cedar, are removed. Brush management may also potentially increase water yields in the Upper Llano watershed. Ecological modeling used in the creation of the Upper Llano River Watershed Protection Plan suggests that over the course of 25 years, removing 9,000 acres of brush annually from selected areas, coupled with follow-up prescribed burning, decreases evapotranspiration by 63,000 to 75,000 acre-feet annually during normal years and about 46,000 acre feet annually during drier periods. However, the positive hydrologic response—increased water availability resulting from decreased evapotranspiration—has a lag time of approximately 11 years following brush control.

How much water is 75,000 acre-feet annually? That volume equates to just over 100 cubic feet per second (cfs). For comparison, the mean flow of the Llano River at Junction is about 190 cfs.

While it is unlikely that there is a 1:1 relationship between decreases in evapotranspiration and corresponding increases in recharge and baseflow, the potential hydrologic and other range benefits associated with improved brush control and other upriver land stewardship practices in watersheds on the Edwards Plateau may be considerable.

## RESOURCES

Cost-share assistance to landowners for brush control activities is available through Natural Resources Conservation Service and Texas Parks and Wildlife Programs.

## REFERENCES

Thurow, T.L., and Hester JW. 1997. How an increase or reduction in juniper cover alters rangeland hydrology. P. 4: 9-22. In: C.A. Taylor, Jr. (ed.), *Juniper Symp.* Texas Agriculture Experiment Station, Sonora, TX, Technical Report 97-1.

## PARTNERS

Texas Tech University at Junction Llano River Field Station, Texas Water Resources Institute, Llano River Watershed Alliance, Texas Parks and Wildlife Department, Texas State Soil and Water Conservation Board

Funding provided through a federal Clean Water Act §319(h) Nonpoint Source Grant administered by the Texas State Soil and Water Conservation Board from the U.S. Environmental Protection Agency.

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