

## TR-338

### Effects of Brush Management on Water Resources

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For several decades, land managers have cleared brush species, such as mesquite and juniper (cedar), and observed increases in spring and streamflows. Scientists have also conducted numerous studies in which they have measured the effects of brush removal on different aspects of rangeland hydrology. These include the amount of rainfall that is intercepted and held by the plant leaves, surface runoff, spring flow, water use by individual plants and plant communities, fluctuation of shallow water tables, and streamflows. Considering this very diverse information, many scientists agree on several points:

1. The roots of some brush species extract water from greater depths than do grasses and forbs, and brush control can reduce the total amount of water used by vegetation.
2. Brush and other deep-rooted vegetation growing over shallow aquifers near streams can be expected to use large amounts of groundwater, likely reducing the amount in both the interconnected stream and aquifer.
3. Removal of brush like juniper and live oak from upland areas some distance from streams may increase streamflow and/or recharge aquifers especially when:
  - a. The brush canopy is dense and intercepts substantial amounts of rainfall (for example: dense juniper [cedar] or live oak stands), effectively reducing the amount of rainfall reaching the soil surface, and
  - b. Soils, subsoils and/or geologic strata are permeable, and streams in the area are fed by seeps and springs. Water can quickly percolate below the roots of grasses and forbs and move through subsurface pathways to local streams or aquifers.
4. Brush control in upland areas is unlikely to increase significantly water yields if soils and geologic formations are not conducive to increased runoff and/or subsurface flows to streams or to aquifers.
5. For brush control to have substantial long-term impacts on water yield, most or all of the woody vegetation in the treated area should be killed, and regrowth of brush and herbaceous vegetation should be controlled so that it is

less dense and more shallow rooted than the pretreatment vegetation.

6. New science-based tools can help pinpoint locations where brush control should substantially increase water flows in streams.
7. A geographically targeted brush control program with careful scientific verification of impacts is needed to guide long-term brush control policies.

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