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Column: Will vegetation management boost our water supply?

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Vegetation management (thinning) has gotten a lot of press lately. Historically, thinning has been a tool to reduce the threat of uncontrollable, damaging wildfires. However, the Upper Verde River Watershed Protection Coalition (Coalition) now proposes thinning as a technique to increase the fraction of precipitation that recharges our aquifers. Is this expensive activity worth considering?

Beginning in the late 1800s, excessive cattle grazing in the Southwest removed grass from the forest floor. These fine grasses were the fuel needed to support frequent low-intensity fires that removed tree seedlings. Without fire, thickets of small trees grew - thousands per acre. Combined with previous Forest Service policy to suppress all fire, the fuel buildup fed enormous, catastrophic firestorms (like Rodeo-Chediski and Wallow). Now, forest managers agree that the solution is to return natural low-intensity fire to the landscape by thinning the dense growth of small trees - a serious problem in Arizona ponderosa pine forests along the Mogollon Rim.

Funding the thinning is a key function of the Four Forests Restoration Initiative (4FRI) created by the Forest Service, environmentalists and industry. In this case, the purpose of thinning is to restore ponderosa pine forest health and to prevent crown fires. Although 4FRI may create a short-term, minor increase in stream runoff, Salt River Project supports 4FRI to protect their reservoirs from post-fire silt deposits, not for water augmentation.

Locally, [Prescott National Forest](#) thins dense pinyon-juniper woodlands (PJ) to restore ecological function, reduce wildfire, improve pronghorn habitat, and for forage production. The Coalition is now preparing to thin PJ for an entirely different goal: to measurably increase groundwater recharge into the Big Chino aquifer. Will thinning achieve this goal? Soil scientists and rangeland managers in the arid Southwest have looked at this question closely for decades. Based on this research, the short answer is: very unlikely.

In March 2012, the U.S. Forest Service Rocky Mountain Research Station in Flagstaff published a review of the existing scientific literature: "Hydrologic Processes in the Pinyon-Juniper Woodlands." The review summary states that "there is little opportunity to reduce evapotranspiration losses on a watershed basis where annual precipitation is less than a threshold value of 18 inches" and that "streamflow volumes are not increased significantly in the pinyon-juniper woodlands by converting tree overstories to herbaceous understories."

Regional PJ and chaparral forests receive much less than 18" of precipitation; thus, thinning the PJ forest is unlikely to increase the flow of water into streams. The Arizona Department of Water Resources has



Gary Beverly/Courtesy photo
Juniper regrowth after thinning.

shown that groundwater recharge occurs primarily in streambeds and mountain fronts; this fact, combined with the above study, indicates that increased recharge from thinning is unlikely. Recharge in landscape areas (not in a streambed) is miniscule, occurring only infrequently when lengthy and gentle precipitation saturates the soil below the root zone. Local precipitation patterns typically wet the soil only a few inches deep, where the water is easily accessible by grasses and shrubs. Likely, there is no net gain to groundwater by removing either PJ forest or chaparral in low rainfall areas. To state the obvious, if there is not much rainfall, there isn't much water to recover.

The Coalition has not involved the environmental community in planning, has not identified a qualified science advisor and monitoring plan, and has not provided a cost analysis for their project. Further, they appear not to have considered that the tree-clearing project requires maintenance. If native grasses are restored (which is by no means certain), the landscape will be grazed by cattle. Unless the grasses are allowed to grow thick enough to support low-intensity fires, the PJ forest will return in a few decades. If grazing is permitted on the cleared lands, expensive retreatment will be required. Thinning followed by grazing is not a sustainable strategy.

Vegetation management can improve forest health, but it is unlikely to augment our groundwater supply. Prescott and Prescott Valley have promised the public to mitigate any harm to the Verde River base flow caused by pumping groundwater from the Big Chino Water Ranch; their vegetation management proposal appears to be an attempt to offset their planned pumping. Mitigation by thinning will be extremely difficult because of very long aquifer response times, the lack of scientific measurements of water yield, unknown maintenance requirements and high costs.

A comprehensive study of mitigation alternatives should precede any investment of public funds. For now, our tax dollars would be better spent on aggressive conservation, advanced wastewater reuse, and rainwater harvesting.

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