ENCLOSURE

FOREST MANAGEMENT AND WATER YIELD CONSIDERATIONS

Increasing the yield of water through vegetation management has been a key research component for the Forest Service since the early 1900's. Experimental watersheds were developed to study this question and by the 1950's every Forest Service Experiment Station had a watershed management program that studied the impacts of vegetation management on increasing water yield. Anderson et al(1976) summarize the conclusions of the various research programs conducted by the Forest Service.

While research has clearly shown that water yield can be increased through various vegetation management techniques, it also has shown that the same techniques can result in undesirable consequences such as increased flooding and sedimentation of streams. Research has also shown that unless the vegetation is prevented from regrowing, the increase in water yield is short lived; generally within five years no increased yield can be measured. Perhaps the greatest shortcoming identified by the researchers is that all the studies were conducted on only a small portion of the watershed. Most were adjacent to streams so that increased flow could be directly attributed to the vegetation manipulation. It is unknown whether there would be measurable increases in water yield if much larger areas were considered, especially if only a small fraction of a watershed was treated (Kattleman, 1996).

The most effective vegetation management scenarios that increase water yield are those that also increase retention of snow packs. Other attributes that contribute to maximum yield include cutting the trees growing closest to streamcourses, conversion of conifer stands to hardwoods and prohibiting the growth of trees in riparian areas. In lower elevations, conversion of chaparral to grasslands is also an effective method of increasing water yield (Turner, 1991), but such a conversion requires that the landscape remains a grassland.

The Forest Service conducted an analysis of maximum water yield potential during development of Forest Plans in the 1980's and determined there would be at most a 3% increase in yield over the entire 20 million acres of National Forest Service lands (Kattleman etal, 1983, Rector and MacDonald, 1987). The vegetation manipulation prescriptions used in the analysis included large block timber clear cutting and conversion of all brush fields to grasslands. These practices are not representative of the type of management the Forest Service currently implements and thus actual yields from our management activities would be substantially less.

Other stumbling blocks identified by the California Department of Water Resources to capturing and capitalizing on increased water yield produced by vegetative manipulation include the lack of surface and groundwater storage facilities to capture the increased yield. Turner's review of DWR's study in the Feather River watershed showed that most of the increased flow occurred in the winter when existing reservoir storage is already full. Also during droughts, it is unlikely that much excess water will be yielded since the remaining vegetation will readily deplete any available soil moisture.

While a reduction in the basal area of vegetation will undoubtedly result in some increase in water yield, the small magnitude of the increase cannot be reliably measured. USGS and DWR flow models anticipate a minimum of 5% percent error in their flow measurements. The expected yield increase off of National Forest lands is within this error range and thus could not be accounted. Thus, it is unlikely that current Forest Service management techniques will readily yield a measurable increased water supply that could be sold to downstream water users .

This is not to say that there are no benefits to water supply from management of Forest Service lands. Studies dating back to the 1930's on the Stanislaus National Forest (Kittredge, 1953) have shown that judicious creations of small one to two acre openings within the snow zone can lengthen the duration and often increase the accumulation of the snow pack. Reducing sedimentation into streams and restoring or rehabilitating wetlands and meadows can also change the timing and duration of flow. These management actions can extend stream flow later into the summer and lessen flood peaks during spring runoff.

The bibliography attached to this paper is a sampling of the articles relevant to water yield management on National Forest lands in California. A more complete bibliography and discussion of hydrology issues in the Sierra can be found in Kattleman's paper in the Sierra Nevada Ecosystem Project:Final to Report to Congress, Volume II, chapter 30.

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