ABSTRACT: "WATERSHED MANAGEMENT OPPORTUNITIES IN THE WEST"

by
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Water is in short supply nearly everywhere in the West, and will become more so as the population grows in the future. For example, it is estimated that California will ultimately need 2-1/2 times as much water as is at present developed for use in that state.

Attempts to keep water supplies up with needs have usually taken the form of water storage and transport, often on heroic scales. Both are necessary. Dry summers, dry years, and the distinctly seasonal flow of streams make carry-over storage necessary. Moving water from areas of surplus to areas of deficiency makes transport necessary.

There are, however, other ways to approach solution of the West's water problems, ways that supplement storage and transport. Among these are cloud seeding, salt water conversion, re-use of waste water, and more efficient use of water for irrigation and other purposes. Intensive study of these approaches is needed to learn where and how they will work, and whether they are economically feasible.

Another way to aid solution of the water problem is by managing headwater lands to exert maximum control over their water yield. This is called watershed management. It can play an important role in the West because:

(1) The water yielding lands of the West are nearly all uncultivated (wild) lands, and water yield can be controlled more effectively on wild than on cultivated lands.

(2) Watershed management can be included in such activities as growing and harvesting crops of timber and forage, and in protection of the land against abuse or accidental damages such as burning. Thus part of the cost of managing such lands for water can be absorbed in the production of harvestable crops.

In watershed management we seek to reduce water waste by reducing high streamflows that waste water to the sea and cause damage; to improve water quality by reducing sediment load; to change the seasonal distribution of streamflow to increase water yield when water needs are greatest, and to reduce evaporation water losses (and thus increase yield) without increasing sediment load or water waste. Thus we are primarily interested in increasing the yield of usable water.

In California we can divide the water yielding lands into four parts, each part having rather different specific objectives for watershed management. In toto, the principal water-yielding area covers about 42 percent of the state. This area contributes about 95 percent of the state's average annual streamflow. Here briefly is how the four parts of this area are distinguished:

1. The brushland belt occupies 17.5 percent of the state's area and yields about 12 percent of its water. It is divided into two parts. From the Tehachapi Range south the wildlands are steep, mostly brush-covered, unstable as regards erosion, and the source of occasional severe floods. Little use is made of these lands; there is no logging to speak of, and only small areas where grazing is carried on. The primary concern here is to control fire, which sets the stage for the most severe floods, and to re-vegetate burned areas as quickly as possible. Research now under way on the San Dimas Experimental Forest will show if and how the native cover can be changed to increase soil stability and the yield of usable water.

North of the Tehachapis the brushland belt occupies the foothills of the Sierra-Cascade range and parts of the Coast Range mountains. Although water yield is relatively low, this area is an important source of sediment which muddies streams and fills reservoirs. Land uses in the brushland belt pose a threat to water yield and a challenge to manage water on the land. Much of the belt is grazed, and widespread efforts are being made to remove brush and replace it with better forage plants. Since 1945 about 1 million acres in this area have been burned to remove brush as a step in forage improvement. Burning is usually followed by increased surface runoff and erosion. Hence it is important that a protective--as well as forage--cover be established quickly in brush conversion. There are possibilities that a well managed area of improved forage will exert better control over water flow than brushland. But we still need research to learn how to manage the converted land to maintain good water flow conditions and to improve water yield.

2. The timber belt below the snow line occupies about 12.5 per cent of the state's area and accounts for about a third of the state's streamflow. This belt lies above the brush belt and below elevations of 3,500

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to 5,000 feet, mostly in the Sierra-Cascade and Coast Ranges. Timber harvesting is the most important land use, but meadows and other grassy areas are grazed. The first order of business here is to see that both the logging and the grazing of meadow land are carried on with as little increase in storm runoff and erosion as possible. We have adequate guides for both activities. Research, however, is needed before we shall know how forest stands can be managed to reduce evaporative losses and thus increase water yield, without impairing the usability of the water yielded.

3. The timber belt in snow-pack lands occupies some 9 percent of the state's area and yields about 38 percent of its streamflow. This area is the mainstay of dry season streamflow, because the deep winter snow packs continue well into the dry season in many places. Research elsewhere, and preliminary studies in California, suggest that there are opportunities to treat forest stands here to reduce winter melt, delay and slow spring melt, and reduce evaporative losses. The importance of this area as a source of water, the opportunities offered for water yield improvement, and the fact that most of the forests here are still uncut, make it important that we soon undertake research in snow-pack management.

4. The alpine lands occupy about 3 percent of the state's area and yield about 14 percent of its streamflow. This land, above the limit of commercial forest growth, is used mainly for recreation and to a lesser extent for grazing. Although its water yield per unit area is great, there are limited opportunities to manage the land for water yield improvement. Plant growth is slow and often sparse, which means that vegetation management opportunities are not great but, conversely, that protection of natural vegetation is important. Demands are great that the land be left in virgin condition for greatest recreational enjoyment. Together these requirements mean that the primary objective in watershed management should be to maintain native cover as intact as possible.

There are important opportunities in watershed management to contribute to solution of the West's water problems. In some instances this means protection of the land against increased erosion and storm flows. In others we can probably go further in improving water yield. We do not yet know how far we can go, because the science of watershed management is still too young to permit us to write prescriptions for best land use in most places. What we need now is wider application of what we know, and more research.

A REVIEW OF THE FIRST 10,000 ABSTRACTS PREPARED BY THE SIPRE BIBLIOGRAPHY PROJECT

by
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The Snow Ice and Permafrost Research Establishment (SIPRE), Corps of Engineers, U. S. Army, through its support of the SIPRE Bibliography Project at the Library of Congress, is preparing and publishing abstracts of all technical literature on snow, ice and frozen ground. The purpose of this paper is to present a brief progress report on the work accomplished to-date and to report recent changes in regulations governing the distribution of these abstracts.

Material on all aspects of the subject matter is included in the bibliography, although emphasis is placed on basic properties, geographical distribution and military applications. With snow, for example, such subjects as snow density, the distribution of snow in different countries and the use of snow in airfield construction are included. Subject headings representing the principal interests of each abstracted item are included and all of these headings periodically cumulated into a subject heading index. In addition to the subject headings, full cataloging information accompanies each abstract including a translation of all foreign titles and the number of references given, as well as the identity of a library in which the original material is deposited.

The abstracts themselves are for the most part intended to be informative rather than indicative or merely annotations. While the abstracts are not meant to replace the original, they often serve as an adequate substitute or at least as an aid to the reader in evaluating the original in terms of his own needs.

No particular time or language limitations are placed on the material to be abstracted, although priority is given to current papers and reports. The time and language distribution for the first 10,000 abstracts is given in Table 1 along with similar data compiled at the completion of 5000 and 7500 abstracts.

It is felt that the current language distribution substantially represents the proportional contribution of the various languages to the subject field. It is true, as can be seen from the table, that as the older material is incorporated into the bibliography, the contribution percentage-wise from the English decreases. However, this is expected to be balanced by the increasing tendency of authors to publish in English regardless of their native language. It is interesting to note that the number of languages contributing to the bibliography, in addition to the 3 major scientific languages, has now increased to 18, led by Japanese and French.

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