

CONSERVATION NETWORKS

PART B

A National Network of Hydrologic Bench Marks

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We are engaged in great national programs of water control and development. An expanding population demands ever-increasing supplies of the natural resources which are to be found in or upon the landscape—soil, water, minerals, food, timber, and fiber. By his works, by his extractions, man's mark upon his environment becomes ever deeper, his effects more indelible.

We often read that water tables are falling, that floods are increasing, that springs go dry more often now than in grandfather's time, or that rivers are muddier than before. Such changes, if true, are troublesome—but water is a fluctuating resource, responding over time to changes in the environment. A recurring question of our times, and one that we anticipate will be increasingly vexing to posterity, is to know how much of the change in our environment is caused by man and how much is natural. In trying to answer this question we immediately face the insurmountable fact that changes must be measured relative to some standard base or datum. What can we compare against?

The most pervasive—and probably the most important—of the slow and subtle changes result directly or indirectly from variations in climate. Over a shorter or longer period of time, pulsations in precipitation and temperature change the amounts of water that are evaporated or transpired by the soil and vegetation, the amount of water that replenishes soil water, the quantity of water for recharge to ground water and for riverflow. Climatic variations also cause changes in the pattern of erosion, of which some spectacular consequences can be observed in the arid zones. Changes in climatic pattern, through their effects on the hydrologic cycle, on soil, and on vegetation, can produce results remarkably similar to those effected by the works of man.



Oraibi Wash, Navajo County, Ariz., July 1960.

About 20 miles upstream from Oraibi Village. The gully is about 20 feet deep, 30 feet wide, and tens of miles in length. Like many others in the Southwest, this gully was formed in the 1880's.

These are direct practical reasons for our concern. The division of water of highly developed streams between bordering States is often based on the so-called virgin flow. What constitutes the flow unvexed by the hand of man cannot be determined at the council tables of negotiation, or even in the halls of justice, without essential hydrologic facts.

It therefore becomes a matter of practical concern, as well as a matter of scientific interest, that the specific causes of given observed effects be identified. The chain of events—the linkage of interrelated factors—must be known in far more detail than is possible at present. Attainment of this objective requires a means for dissociating the direct and indirect effects of man's use from similar effects which are brought about by natural variations in climatic factors.

Determination of these changes is often sought in the analysis of records of streamflow, but the answer usually is neither simple nor unequivocal. Natural daily, seasonal, and secular changes in precipitation cause changes