

Soil Conservation Research in the Intermountain Region

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THE need for better understanding of the fundamental principles which govern the natural relationship of water, soil and plant cover has long been recognized by students and workers in many fields of natural science. More recently the need for better understanding of just how man has modified this natural relationship in a manner detrimental to his own present and future interests has developed in the Intermountain region of the western United States.

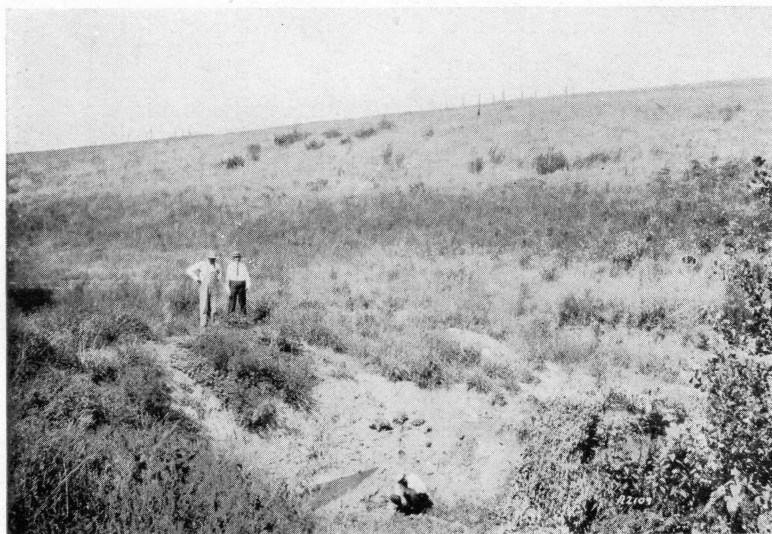
The most spectacular signs of the changes which have taken place are manifested by the frequent occurrence of floods with attendant debris deposits, the rapid conversion of normally slightly channeled stream valley floors into deeply entrenched streams. Less obvious, except to the careful observer, are such indications of changed conditions as the increased silt load of streams, the reduced water storage capacity of soils to produce plant growth. Such indicators furnish the basis for research determinations in soil conservation issues.

The erosion problem in the West proceeded so slowly as to escape the notice of all but a few of the most observant. It gained momentum progressively as the natural preventive barriers were gradually worn down.

The situation which brought about an erosion issue undoubtedly developed as a result of the course of events which mark the progress of human settlement in a virgin country. During the pioneer stage the small and scattered population had little reason to conserve any natural power. There seemed to be a more than sufficient native supply of everything to fulfill the needs. During the period of expansion which followed the pioneering stage there was a constantly increasing use of natural resources to accommodate the demands of increased population and wider distribution of settlement. Prodigal use and wasteful practices attended the utilization of timber and water by man. As a result there was wide spread but gradual depletion of vegetal cover and reduction of litter with correspondent increase the area of surface all exposed to action of wind and water. Favorable conditions for increased

erosion under some certain combinations of climatic conditions were thus brought about. At the time and places combination of circumstances and conditions obtained the destructive processes of erosion were initiated.

The establishment of Forest Reserves (later National Forests) which took place in the Intermountain Region principally during the decade 1897-1908 was one of the first moves toward



The destruction of the plant cover exposes the soil to the eroding actions of wind and water.

conservation of native resources in the West. There are early recognition by the Forest Service of the truism "under all-the soil". Appreciation of the need for conservation of soil resources and concern over some of the first indication of erosion conservation of native resources in the West. When the Forest Service established the Utah (Great Basin) experiment station in central Utah in 1912 it pioneered for the United States the field of experimental investigation of soil erosion on mountain watershed lands.

The "set-up" of the first erosion experimental work is of particular interest because it was original as applied to this type of work. The investigation was made to determine the relation of different densities of plant cover to surface run-off and erosion. Two generally comparable tracts (Areas A & B) each a small watershed with completely confined drainage were equipped with silt catch tanks and measuring devices so that all surface water and silt coming from the catchment

areas was measured. Plant cover differentiation was secured by grazing one area while protecting the other. Current records of precipitation, silt catch, and water flow from each of the two areas were kept, over a period of 20 years and correlations of precipitation on the areas with silt removal were worked out. Reports of the findings which were published as determinations of results progressed, and discussion and demonstration at occasional Field Days informed interested livestock growers, extension service workers and public officials of the work being carried on.

For a considerable period of years, owing to limited funds and personnel, very little erosion investigative work was carried on by the Research Branch of the Forest Service aside from some elaboration of the experimental work at the Great Basin.

In the latter part of the decade 1920-1930 the notable increase in silting in the Arrow Rock Reservoir in western Idaho and the occurrence of floods in a number of locations in northern Utah were largely responsible for a new impetus given to research activities in soil conservation. The Forest Research organization, in cooperation with Forest Administration and such other governmental agencies as the Extension Service and State Land Commissions undertook further investigation of the erosion problem in the region. An intensive survey of field conditions responsible for floods was made in Davis County, Utah, and a combination range erosion reconnaissance was made on the Boise River watershed in Idaho. The findings of these surveys were in line with the experimental results which had been secured at the Great Basin area A and B project with regard to reduction in plant cover as a major influence responsible for conditions under which floods were produced and soil removal was accelerated. Further investigations on some forty flood areas in Utah secured by a survey, an intensive reconnaissance of erosion conditions in the Upper Basin of the Colorado River watershed, gave additional information as to the wide-spread occurrence of erosion, the apparent acceleration within recent years, and the indication that man had materially influenced the situation through alteration of previously existing natural conditions.

These observational studies were sufficient to establish the major outlines of the problem, to give some insight into the pertinent interrelation of climatic, topographic, geologic, and ecological influences, and to show the need for the fundamental research to determine the role of these influences so that remedial measures could be applied on the basis of determined facts. A multitude of private interests as well as many Federal, State, County and community agencies were interested

because of the economic aspects of land devaluation, crop losses, and culture, destruction. Conservation agencies and organizations were concerned with the ultimate effect on such native resources as wild life, recreational, and scenic values.

To meet the most urgent of the demands for knowledge of the basic principles involved in soil conservation, there had been a considerable expansion of experimental investigative work. Research branch or sub-stations had been established. These were in western Idaho (Boise Branch), northern Utah (Wasatch Substation), western Utah (Desert Branch) in addition to the previously established station in central Utah (Great Basin Branch), all these being under the general supervision of the Intermountain Forest and Range Experiment Station.

At each of these branch stations soil conservation research is now being carried on as a major line of activity, more or



The result of ignorance and neglect

less adjunctive to and correlated with numerous phases of forage and timber resource investigations.

The general lines of investigation now being pursued are climatic investigations, water supply investigations, erosion and flood investigations and economic studies.

Climatic investigations include the collection, measurement and recording of data concerning all climatic factors for several different altitudes in each locality where stations are located. Determinations of the influence of climatic factors on water production, stream flow, plant growth and erosion are being made. In addition, previous weather records from all available sources are being analyzed to work out possible correlations with stream flow and flood occurrence.

Water supply investigations include analysis of the physical characteristics of mountain water sheds which affect the production, storage and discharge of water. This refers to such factors as geological structure, topographic and land form features, soil mantle and plant cover. An evaluation of the effect of biotic influences which have served to modify plant cover, soil conditions or stream habit on the quantity and quality of water supply is being undertaken.

Erosion and flood investigations include historic records of flood and erosion occurrence; the analysis of the climatic, physiographic, ecological and biotic circumstances and conditions on water sheds as they influence erosion susceptibility; determinations by comparative measurement (duplicate plot method) in varied cover types of the relation of plant growth to erosion; measurement and classification of erosion as to extent of distribution, degree of advancement, time of inception and differentiation from the normal; the study of practical means and methods of prevention or reduction of the destructive effects of erosion and floods by removing causes and effecting rehabilitation by natural means; and the development of effective means of artificial systems of erosion and flood control suitable to the conditions of a particular site locality.

The economic studies being carried on refer particularly to the relation of settled valley lands to mountain water shed lands as the source of water supply for irrigation, hydroelectric power, municipal and other uses, and to studies of the economic and social aspects of land use and community maintenance as these are affected by the erosion problem.

An essential part of the research program aside from actual investigative work is the matter of presentation of research findings to the general public and to administrative agencies who may be in a position to take necessary action. This is accomplished through publications, field demonstrations, addresses, and personal contacts.

Soil conservation research is still in its infancy. Equipment, methods, and technique for research are necessarily originated or developed as the need arises. There is very little precedent on which to base practices and procedure for perpetuating soil resources.

Research is endeavoring to supply the definite demands for knowledge which seem to more than keep pace with the advance in actual determinations. The opportunities for workers in this field appears to be unlimited.