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THE
PROBLEM OF SOIL EROSION
ON THE NAVAJO INDIAN RESERVATION
AND METHODS BEING USED FOR ITS SOLUTION

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THE NAVAJO SOIL CONSERVATION PROJECT

THE PROBLEM

Original Condition of Reservation

The Navajo Indian Reservation comprises an area of about 17 million acres located on the watersheds of the San Juan and Little Colorado Rivers in New Mexico and Arizona. At the time of establishment in 1868, it had a population of approximately 9,000. Its population subsisted through the use of range lands principally for sheep and goat production and through small amounts of dry and floodwater irrigation farming. While the number of stock owned by the Indians at that time is undetermined, it is known that the range lands of the Navajo Indian Reservation were still in virtually undepleted condition. With the exception of certain "painted desert" and "bad land" areas of ancient origin, accelerated erosion was generally inactive. Except in the mountains and the few valleys containing more or less perennial streams, there were few actual water courses. In general, the alluvial valley bottoms were covered with heavy stands of grass, and when rains were sufficiently heavy to cause appreciable runoff of water, this water spread out across the valley floors in a thin sheet which trickled down through the grass slowly and without causing erosion, most of it sinking into the ground around the grass roots to build up a water table. In many areas, now denuded, it is known by the memory of living individuals that wild hay was extensively cut.

Changes Which Have Caused Erosion

Between the date of the formation of the reservation and the present time, two rather simple phenomena have resulted in completely changing the situation. The first of these involves an increase in the number of Indians supported on the reservation from 9,000 to about 50,000. The second involves an increase in the number of stock including sheep and goats on the reservation to a peak of about 1,888,000 sheep units in 1928.

The result of the above increase in number of stock on pasture within the reservation was exceedingly severe overgrazing. Overgrazing in turn resulted in a greatly increased runoff of rainwater, in contrast to former conditions under which most of the rainwater soaked into the ground. Alluvial valley bottoms once covered with dense stands of grass now became completely denuded. Greatly increased, and frequently torrential, flows of water now concentrated as rushing streams of great cutting power in the centers of these alluvial valleys and cut out great washes. From these

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washes long fingering gullies worked out towards the edge of the alluvial fill, with the result that in certain instances almost the entire valley fill has been removed to bedrock. As a part of this erosive process, not only were the grass lands devastated but also large areas, formerly cultivable by flood-water irrigation, were either destroyed or made inaccessible to such water through its concentration in gully bottoms, and rapid runoff and loss from such areas.

Coincident with the severe depletion and erosion of the range lands and the destruction of flood-water irrigated areas, has gone the impairment of woodland areas through an overgrazing so severe that all three reproduction was prevented through the destruction of young growing stock. Also there has occurred a change in the available water supplies. On the old Geological Survey maps are found records of many lakes, now completely dry due to siltation or drainage through gully cutting. Streams once perennial and known to have contained beaver, now are found alternately dry and rushing with silt- and detritus-laden torrents. Untold quantities of rainwater that formerly soaked into the earth, part of it to enter into the underground water supplies, now rush to the Colorado River, with the result that artesian water supplies are tending to fail and the moisture available for the growing of range grasses has been reduced. (In effect, the utility of rainfall actually has become less, since less of it goes into the soil and becomes actually available for plant growth and underground water supplies).

Effect of Erosion on Boulder Reservoir

The physical and geological processes which have occurred within the reservation, if unchecked must ultimately have an important effect on areas outside of the reservation, principally through the vastly increased deposit of silt in the Boulder Reservoir. If erosion continues unchecked, ultimately the entire alluvial fill of most of the valleys of the Navajo reservation will be deposited behind the dam, thus threatening the enormous Federal, State, municipal, and private investments involved in, or directly or indirectly dependent on, the maintenance of the storage capacity of the reservoir.

Effect on Habitability of Reservation

Within the reservation there has been brought about a progressively deteriorating situation which, if allowed to continue, will ultimately make the area virtually uninhabitable and will force the United States to remove the Indian population, and resettle them or support them on a dole, a procedure which in turn would destroy the resources of much of the non-Indian population surrounding the reservation, which is dependent on trade with the Indians and on tourist activities.

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Looked at from the point of view of the ability of the reservation to support the still increasing population, we have a situation under which, if the growth of population and the productivity of the reservation are graphed on the same chart starting in 1868, the population curve shows a steady increase and the productivity curve shows a steady decrease due to the effects of range and water supply destruction and forced abandonment of agricultural lands. Thus, at one point the two curves cross and thereafter the population can no longer be supported by the resources of the reservation and it becomes necessary either to reverse the downward trend of productivity through soil and water conservation measures, or to support an ever-increasing proportion of the Navajo population through work relief or the dole.

That this situation already has occurred, is indicated by the fact that as of the present year, 43 per cent of the exceedingly meagre income of the Indians within the Navajo reservation is furnished by work relief, 41 per cent by the production of livestock, and 16 per cent by farming. The total income of the Navajo Tribe on this basis does not exceed about $86.00 per year per individual, including the market value of all crops and meat locally grown and consumed.

Cost of Maintaining Navajos on the Dole

Various estimates have been made as to the cost of maintaining the Navajo Indians on a dole if the reservation were to be wholly destroyed by erosion. One of these, included on page 2 of the memorandum attached, indicates that if half of the population became dependent upon Government subsidy, the minimum per capita subsistence need would be $36.00 per year, based on the local value of locally grown produce, giving a total cost of about $900,000 per year for half the population, or $1,800,000 per year for the entire population. However, this estimate is undoubtedly much too low, since ot does not take into consideration the much higher cost of importing food from outside the reservation at commercial retail prices.

A probably more accurate estimate of supporting the Navajo population on the dole if the entire reservation were destroyed by erosion gives a cost of $86.00 per person, or $4,300,000 per year to support the entire population through entirely imported produce, as would be necessary if the reservation were completely destroyed. This estimate is based on the present actual Navajo income, including all work relief wages and averaging $86.00 per person, or $430.00 per family. It is exceedingly low, as compared with the standards of the United States as a whole.

Neither of the above estimates takes into account the undoubtedly large costs which will be involved in the necessary moving of large parts of the Navajo population and their resettlement, involving the cost of housing, etc., nor does it involve the indirect

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costs in the destruction of trade and of traders dependent on the reservation.

If Erosion is Controlled, No Dole is Necessary

In contrast to the inevitable relief costs, should the reservation be destroyed by erosion, is the situation that will exist if the reservation be protected from erosion, the range restored, and the lands used to their fullest capacity in the most effective manner. Under such a situation, it is estimated that the maximum direct agricultural and livestock yield of the reservation would be $317.00 per family, or $63.40 per person— a total of $3,170,000 for the entire reservation. Since this amount would be supplemented in a small degree through handicraft products and income from work done by Indians for traders or others on a day labor basis, it is believed that under such a situation it would become unnecessary for the Government to support the Indians by the dole or by work relief.

From the above analysis it can be seen that the Government is faced with a situation in which it must choose between permitting the reservation to be destroyed by erosion, with large and continuing resultant costs, or of proceeding on an energetic program to stabilize the reservation and make possible the support of its population through subsistence farming without Government dole. To the latter end, through the control of erosion, are directed the efforts of the Soil Conservation Service.

OBJECTIVES OF THE NAVAJO PROJECT

The primary objective of the Soil Conservation work is of course to conserve soil and water, thereby to achieve the indirect objective of maintaining the habitability and productivity of the reservation. These major objectives can be subdivided somewhat as shown below.

Objectives

1. Range control. Reduction of stock to estimated carrying capacity of 560,000 sheep units, and introduction of proper range control practices, thereby restoring vegetation and stopping erosion.

2. Supplementing of natural revegetation by artificial measures to prevent gullying and restore vegetation. Measures to include check dams in gullies where necessary; the taking of flood waters out of major gully systems and spreading them on the land to prevent side cutting of gully banks and restore vegetation; and artificial revegetation where necessary and economically justifiable.

3. The development of supplemental stock feed and flood water farming as a by-product of water spreading for the purpose of erosion control, thereby enabling the Indians to reduce the numbers of stock on the open range through supplemental feeding and through the production of subsistence farm products as a substitute for meat.

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4. The introduction of erosion-resisting vegetation of economic value which can be used to control gully and sheet erosion and at the same time produce subsistence food supplies, thus facilitating stock reduction. (An example of such vegetation is the wild plum, which is very efficacious as an erosion-resisting plant).

5. Reduction in vegetation-destroying rodents and other animals throu artificial means and through the establishment of proper ecological wild-life balances.

6. The introduction, demonstration, and encouragement of proper metho of dry and flood water subsistence farming, which will be of such a nature as to prevent the erosion of essential farm lands and as will make possible the safe utilization of a maximum area for the production of subsistence foods to supplement the reduced meat supply after necessary reductions in numbers of stock have been made.

PROCEDURE

Objectives Must Be Obtained Through an Integrated Program

To achieve the objectives outlined above, it is necessary to carry out an integrated program involving the use of a variety of measures and techniques. Such a program divides itself naturally into the obtaining of necessary basic information, preparation of plans based thereon, and the carrying out of such plans.

Surveys and Collection of Information

1. Aerial Surveys (completed).

Necessary to furnish basic information as to drainage, topography, distribution of water and wind erosion, location of agricultural lands, type of vegetation, location of tree cover, etc.

2. Range Surveys (extensive surveys completed, intensive surveys in process to prepare detailed range plans for each range district).

Necessary to determine carrying capacity and establish proper range practices to permit recovery of vegetation.

3. Erosion Surveys (6,359,425 acres completed).

Necessary to determine detailed distribution of erosion and soils as basis for artificial control measures.

4. Agricultural Surveys (15,020,400 acres completed).

Necessary to determine location, ownership, and condition of existing or potential agricultural lands.

5. Ground Engineering Surveys.

These are detailed surveys, as basis for laying out erosion control structures, etc., made as work progresses.

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PLANNING

On the basis of the surveys such as those outlined above, the Soil Conservation Service prepares complete land-use plans for each land utilization district in which work is being carried out. During the early part of the work, such complete plans were confined to the 43 comparatively small watershed areas in which intense demonstration work has been carried out. With the pending completion of the surveys for the entire reservation, work is under way in the preparationof such detailed land-use plans for each of the land-use districts which have been established pursuant to the regulations established by the Secretary of the Interior on November 6, 1935, providing for range control on the Navajo Indian Reservation. For each district the land-use plan contemplates a coordinated treatment and use of the natural land resources involved and provides for (1) the carrying capacity of the area, (2) scientific grazing within the established carrying capacity, (3) the necessary artificial measures of erosion control to be carried out to supplement measures of range control, and (4) the most effective utilization of existing or potential agricultural land within the land-use district so as to control erosion and provide a workable balance between production of subsistence agricultural products, production of supplementary range feed, and natural production of range feed to make possible the existence without Government subsidy of the local population.

In some instances, land-use districts will be virtually self-contained as to production and consumption of agricultural and livestock produce. In other instances, more livestock will be produced than needed for local consumption, which will be traded with the Indians in other districts having a small amount of livestock products and an accordingly increased amount of agricultural products. The net result for the reservation as a whole will be to create a self-supporting population consuming all of the agricultural produce grown on the reservation and exporting only livestock and handicrafts, the income of which would be used to purchase manufactured articles and to import raw materials, including agricultural products.

Application of Plan

The application of the land-use soil conservation plans prepared by the Soil Conservation Service involves a joint cooperative activity between the Soil Conservation Service, the Bureau of Indian Affairs, and the local Indian group. The Soil Conservation Service contributes technical direction and a part of the labor and materials. The Bureau of Indian Affairs contributes land-use regulation through its powers of administrative control, and administration within the

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area of the functions of law and order, public health, education, etc., and such Indian ECW labor as is available to it. The local community in turn contributes in the form of labor, teams, reduction of livestock, and in such other manner as is within its ability. Thus through the continued integrated action of the two Federal agencies and the local Indian groups it is anticipated that the Navajo lands can be permanently protected from erosion and made to support the Navajo race.

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