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HIGHWAY STUDIES SERVE MANY USES

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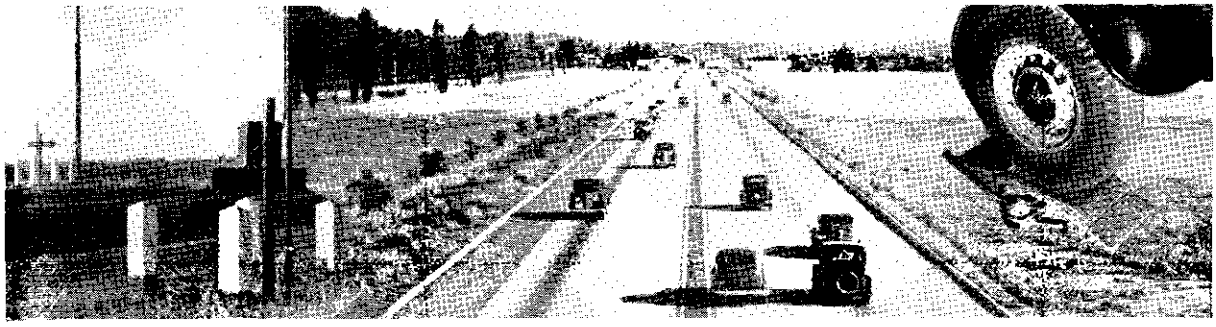

Automatic traffic recorder in Oregon. *Speed and safety characterize this arterial highway of the West.* *Inset shows loadometer weighing operation.*

THE ARTICLE "Roads to Market," published in the July issue of SOIL CONSERVATION, sketched the history of the Department's highway program and the background of the highway planning surveys begun in 1935 and now being carried on by 46 State highway departments in cooperation with the Bureau of Public Roads. In the following paragraphs are described the objectives of the surveys, the methods followed, and the progress made to date.

The primary objective of the surveys is to provide the facts needed in developing and maintaining an adequate national highway system. These facts include (*a*) the present extent and condition of all our rural roads; (*b*) the service rendered by the various parts of the road system; (*c*) the relation of road costs to the benefits obtained by road users; and (*d*) means by which we may meet the continuing cost of an adequate highway system.

The highway planning surveys are not projects to be closed within a scheduled time, but rather a continuing function of each State highway department and the Bureau. The intensive studies described herein make up a program of work to be accomplished within a definite period, but the data obtained in them must be kept current by continued studies from year to year if they are to retain their value.

The present extent and condition of the roads is measured by the rural road inventory. Records are made of the length, width, type, and condition of pavement of all rural roads; dimensions and condition of structures, such as bridges; the location and type of dwellings, stores, and other culture along the roadside; and the location, type, and condition of crossings, whether at grade or separated. Insufficient sight distances, excessive grades, and inadequate superelevation on main roads are noted. Special studies of railroad grade crossings both in cities and on rural roads are made in order to determine the order of priority of grade-crossing elimination projects. All these data are plotted on maps and summarized in statistical tables.

The service rendered by the various parts of the road system will be determined through the traffic surveys, which include traffic counts, weighing of vehicles, studies of origin and destination, and loading practice studies.

Traffic on main or primary highways is counted at key stations, where fourteen to eighteen 8-hour counts are made at different hours and on different days of the week. The whole schedule thus provides for the acquisition of samples of traffic under all conditions with its hourly, daily, weekly, and seasonal variation for a full year.

The traffic on the secondary and local roads is sampled by blanket counts made at a much greater number of points but less frequently.

The third important means of measuring traffic is the automatic traffic recorder. These devices, designed by engineers in the Bureau of Public Roads, are a very practical application of the photoelectric cell. At present, engineers of the Bureau are working on a design for portable automatic recorders using a different principle of operation. These will be used to supple-

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ment the photoelectric recorders, which are most effective at permanent locations.

The traffic counts represent only a part of the study of service rendered. Portable scales called loadometers are used to weigh trucks and busses at certain key stations simultaneous with the making of the key station count. The data obtained include registration numbers, the nature of the commodity or the number of passengers hauled, the weight of the load, the origin and destination, and the type of origin and destination - as farm to railroad, factory to retailer, etc.

In addition to these studies of commercial vehicles, origin-and-destination studies of private-car movements are made at some loadometer stations. Other studies of this type are to assist in determining the value of or necessity for bypass routes around congested areas.

Pit scales located at three or more strategic points are used to obtain very accurate weights of commercial vehicles and loads. The pit scale parties also measure the overall length, maximum width, and height of the vehicle and its load, and record tire sizes, axle loads, etc. The purpose of these studies is to determine what loading practices are actually followed and found most economical by haulers—this in view of the fact that many State laws restricting the size and weight of vehicles are known to have no scientific basis and to lack uniformity.

Certain other studies which have been aptly described as relating to the dynamics of highway traffic — as distinguished from its volume and the weights of its units—have recently been added to the program. They include investigation of hill-climbing ability of motor trucks and tractor-trailer combinations, studies of speed of vehicles, and of highway capacity.

The financial survey will produce most useful data on the relation between road use and the price paid for it by the user, and the all-important information the States and the Federal Government will need in the financing of our future highway program. The fiscal study analyzes the receipts, expenditures, and debts for all purposes of the State and its subdivisions, and shows the relation of highway income and expenditure to that for other purposes. The motor-vehicle allocation study, carried on by means of questionnaires addressed to car owners, shows the urban and rural distribution of taxpaying car owners. The road-use study, consisting of personal interviews with representative car owners, arrives at estimates of total yearly travel and gasoline tax payments, the extent to which each car owner uses different classes of roads, i. e., city streets, main highways, and secondary and local roads. The road-life study is an application of the actuarial methods used by life-insurance companies, by which the probable life of payments may be estimated from the pavement-life histories found in State highway-department records.

That transportation, and especially highway transportation, is a vital factor in our present economic and social scheme, is so obvious that it hardly need be mentioned. It is equally obvious that any really comprehensive study such as the highway planning survey is in itself a very important phase of general economic and social planning, and, as such, must take into consideration all the other phases which highway transportation affects and by which it is affected.

The detailed county-by-county study of the roads, their traffic, and the problem of financing them must be accompanied by a detailed analysis, county-by-county, of data on economic and social characteristics.

Highway transportation and the other factors in our present scheme of living are so interwoven that any planning study must coordinate the activities of many agencies. The Bureau of Public Roads is at present engaged in developing study outlines and suggestions for detailed analyses of economic and social characteristics; but the program is being developed in close coordination with other Bureaus of the Department, and with the intention of making full use of data which has been or is being obtained in other studies. On the other hand, the data which the Bureau and the States are obtaining and will obtain will be of value to every other Bureau in the Department, as well as to other agencies.

As one example of this general usefulness of the results of the surveys, there are the maps that are being made of every county in 46 States, showing al the highways by types and classes; all railways and their stations; all navigable streams and ports; air routes and airports; and the location of every farm, dwelling, church, school, factory, store, and recreational area outside municipalities. They show the transportation system in its entirety, and the relation of every part of it to every other part. It would be difficult to imagine any form of economic planning in which these maps would not be of real value. It is significant that the Bureau of the Census plans to use them in the 1940 census; that other Federal, State, and local agencies are finding daily uses for them; and that they are in great demand by power companies and industrial concerns. The making of these maps is in itself an example of coordination. Many of them were based on topographic maps of the Coast and

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those of planned resource management exemplified by the national forests. Planning for the protection, development, and use of the national forests is complicated by the wide diversity of problems and interests relating to their management. This is exemplified by such widely diversified conditions as are found in the old-growth forests of the Pacific Northwest, in national forests which have been established in exploited cut-over regions of the Lake States, with their stranded communities and populations, and in national forests in the South which are characterized by productive pine lands, poor farms, and rural poverty.

National forests in the devastated and cut-over regions require planning for the rehabilitation of both the physical and human resources with the greatest possible provision for permanent employment. Planning for the already productive national forests entails the same objectives, but without awaiting resource restoration.

Particularly in the national forests of the South and the northern Lake States, planning is directed toward a closer relationship between farming and forestry. Although these two regions are predominantly forested, they embrace one-half of the farms in the country. Within their limits, forestry as a supplement to farming operations offers definite promise of increased income and better living for farm families. In addition to the integration of farming with forestry in the national forests, forest-management planning requires the definition and evaluation of all beneficial uses inherent in the national-forest resources. It requires, furthermore, the development of plans of management which will recognize and encourage the widest permanent utilization of the resources in ways benefiting the greatest number of people.

The intensely intricate and complicated character of the forest as a biological entity compelled the Forest Service, early in its administration of the national forests, to recognize the indispensability of over-all or area management of forest lands for all beneficial uses, rather than a uni-functional form of management. This form of management requires a decentralized organization which, in turn, requires administrative planning that will foresee changing needs, provide the national forest administrator with sufficient freedom of action to enable him to deal with local problems locally, and ensure fair and equal treatment to all forest residents and users.

Within the national forests and their zone of influence live hundreds of thousands of people whose ways of living are directly influenced by the processes of national-forest administration and management. As public forest lands, the national forests must be so managed not only to safeguard the Nation's timber supply and assure favorable conditions of streamflow, but also to ensure the welfare of the dependent peoples.

PLANNING THE A. A. A. PROGRAM

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considered. This means, of course, that the particular idea or plan advanced by any one individual or group can rarely be adopted without some change or modification when the interests of other individuals or groups are considered.

But the essence of democratic planning, under the method of program development which the Agricultural Adjustment Administration endeavors to follow is to be found in full and free discussion by all interested parties. All questions involved are thus discussed so that the farmers, the consumers, and the technicians may all be aware of the many interests affected, and of the reasons underlying the decisions which must finally be reached and written into forms and rules and regulations for the administration of the program.

OVER-ALL PLANNING, THE NEXT STEP

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agriculture. With this structure built and functioning, and with its responsibility recognized, agricultural agencies will be ready to put their full weight behind the next vital step in planning: the coordination of agricultural planning within itself, with industrial planning, transportation planning, urban planning, and with planning for those other big divisions of the American economic and social structure that together constitute another and much more difficult and complicated level of "over-all" planning.

THAT SOILS AND WATERS MAY REMAIN PERMANENT ASSETS

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Thus, the apex of Service activity is now being moved away from demonstration areas toward districts, with cooperation the keynote. The ultimate growth and area of districts are, of course, matters of conjecture. Yet it is entirely conceivable that within the next decade they will cover a substantial segment of the country's erodible land. If this possibility materializes, no better avenue than the district will be available to the Service, and to other governmental agencies, for encouraging Nation-wide soil conservation and better land use. Looking to the future, Service planning considers such an eventuality.

The Land and the Perpetuation of Wildlife

By Ira N. Gabrielson

Chief, Bureau of Biological Survey

IN PLANNING the national wildlife restoration program the Survey seeks to provide for three requisites. The first of these is for land to be set aside upon what may be called the hereditary wildlife ranges for the preservation of all native species. From these reserves the seed stock may be drawn whenever it is necessary or desirable to restock denuded areas. Extensive game and wildlife surveys provide the information to indicate the regions where these reserves should be established with the greatest prospect of success. Provision must be made to ensure against the total loss of any species through disease or some other natural disaster that may conceivably eliminate all the seed stock on a single preserve. For example, bison are to be maintained on several widely separated ranges and similar precautions will be taken with respect to other species.

It is anticipated that seed stock from these Federal reserves may be needed to carry out State and Federal restoration programs on areas made available under land-utilization programs.

The second objective of the program is to provide for the continuation of research work to accumulate factual information applicable to current problems, and also to enable wildlife administrators to anticipate future needs. Wildlife as a resource is subjected to constantly varying conditions occasioned by many physical influences. These may be of natural origin or may result from engineering, industrial, or agricultural projects. The program is intended to furnish facts to enable wildlife agencies to obtain the most favorable results from such developments by setting up stations for regional wildlife research in selected land-grant colleges throughout the United States. Eleven of these already have been established and four more are needed to complete the project.

By attaining this objective the third requirement of the plan will also be met—that of providing for a carefully trained personnel to administer the wildlife resources of America in the future. There is now a serious lack of men who are qualified for this work. The land-grant college units will serve as research stations, and they will also offer to graduate students courses in wildlife administration similar in purpose to those offered in forestry.

The main objective of the wildlife restoration program now being developed by the Biological Survey is to prevent, if possible, the extermination of any valuable species, and to increase the numbers of such wild birds and animals to the greatest extent consistent with land-use requirements of the human population. Wildlife has a very great economic value, and it also furnishes a means for recreation and relaxation that may well become of more importance to human beings subjected to the increasing strains and stresses of modern ways of living and working than are its financial values. Several very valuable and interesting species were allowed to become extinct in those years before there was any general conception of the need for a carefully worked out wildlife conservation program that could be coordinated with agricultural and industrial activities. It is bad logic to argue that because there is no realization of a loss no loss has been suffered. The present generation of Americans never knew, nor can they ever know, the passenger

victoriously from the present war why should she not turn to this meticulous work, Land Utilization in China, with its wealth of data pointing directly to important needed policies and at least make the start?

The long chapter on agricultural regions which Dr. Buck has given us might constitute an exceedingly valuable volume in itself. The regionalization, based on physical factors and factors affecting type of land use and success and failure, is especially fortunate as it enables us to comprehend agricultural China as developed and persisted throughout milleniums, apart from wars, apart almost from trade, absorbing invasions and other interferences from outside.

For the purpose of the land-use comparisons, China is divided into two major regions, the wheat region and the rice region. Eight subregions are called "areas"—spring wheat, winter wheat-millet, winter wheat-kaoliang, Yangtze rice-wheat, rice-tea, Szechwan rice, double-cropping rice, southwestern rice. In the discussion of data many variations are brought to light, only a few of which can be pointed out here.

In the spring-wheat area, bordering that land to the far northwards, "where originally the Tartars dwelt," today Hans, Manchus, Mongolians, Turki, and Tibetans all swarm together to cultivate the depressions between sand dunes, the western hill and mountain slopes, and the plains which can be irrigated for wheat. According to the survey findings, here is a precarious agriculture, for the loess deposits erode easily and once the grasses are destroyed and the soils deficient in organic matter a wasteland desiccation creeps in. It is in this dry spring-wheat area that the people are seen carrying pebbles from the streambeds to their fields. Here fragmentation of land is universal, and one wonders how it will ever be possible to introduce true erosion control and to set up a land-utilization system to include dry-farming methods and an improved livestock industry to take the place of the land-destroying cultivation practices of the five peoples now occupying the area.

In the winter wheat-millet area, to the east and south of the spring-wheat area, and taking in the giant elbow of the Yellow River, they have a proverb which goes like this:

> It is better to let your mother starve to death
> Than to let your crop seed be eaten up.

This is the great loessial plateau of China, with soils of high natural fertility but now low in organic matter, where the millions of people live in cavelike homes carved out of the loess cliffs, practice an exhaust-the-land-and-move-on-to-new-land system of farming to produce their wheat and millet, and suffer periodic floods and famines. In this area erosion is so severe that fields must be irregular and very small because of the gullies, and areas are to be found where land rent is determined by the depth of the soil on the hills. It is not too difficult to imagine the farmer of Shansi or Fowping grimly standing guard over his millet seed while his mother starves or eats grass and bark to prolong a miserable existence.

The southern two-thirds of China comprises the great rice region and here is the land of vast networks of dykes, lakes, canals, rivers and flood plains which when coupled with a temperate or subtropical climate is especially adapted to rice culture. Here there are more people, the population increasing as we move southward until in the southwestern rice area there are 2,636 human beings to each square mile of crop area. It must have been exceedingly difficult to winnow the data from the surveys in this overpopulated land and form opinions and recommendations for land-utilization improvement. But Dr. Buck has pointed out major needs, area by area:

Flood control of the Yangtze and the Hwai in the Yangtze Rice-Wheat transitional area, with improved dyke construction and maintenance, and afforestation and pasturing of hill lands; for the rice-tea and the Szechwan rice areas he suggests that the development of communication and transportation is important and that much of the mountainous land should be in forest or special tree products; for the double-cropping rice area he points out the need for a study of the severely eroded mountainous areas to determine whether they should be forested or grassed, and drainage as a special problem in the delta area; for the southwestern rice area he recommends "improved transportation to other parts of China . . ." so that ". . . the growing of the opium poppy could be more easily suppressed and the mountain sides could be devoted more readily to uses such as forests and special tree products."

Following his discussion of regional data, Dr. Buck presents chapters on the topography of China, the climate, the soils, "The Land" in which are some interesting features outside the survey data, land utilization practices entirely peculiar to China, crops grown and how utilized, livestock and fertility maintenance, size of farm, farm labor, prices and taxation, marketing as related to agriculture, population, nutrition, and standard of living. We are given an idea of the amazing altitudinal variations throughout China's agricultural areas, and from the climatic studies we acquire an understanding of China's famines as caused by droughts and floods. We read a detailed description of the soils and of erosion throughout the land, and an analysis of China's farm business from almost every conceivable angle. In the recommendations for China's "partial cure" we see some hope for China and a warning for the United States—that we may never know the day or the year or the century when we must include between the covers of an agricultural atlas a "record of famines" as caused by droughts and floods, by ruined soils, by overpopulation or by any other "modification of the land by man."

HIGHWAY STUDIES SERVE MANY USES

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Geodetic Survey, or on maps produced by other agencies. In several States, aerial photographs produced by the A. A. A. are being used both in making and checking the road inventory maps.

Such information as the volume and distribution of traffic on the highways, the extent of commercial movement of commodities and passengers, and other traffic data, concerns every bureau or commercial agency interested in marketing problems. In the collection of the data the States have been assisted by the Forest Service, the National Park Service, railroads, truck and bus operators, and other groups.

The relation of the highway planning surveys to the land use studies has already been discussed in the article "Roads to Market" (SOIL CONSERVATION, July).

Many other examples could be cited. Let it be sufficient to say that the data so far collected and analyzed in the highway planning surveys not only prove the value of the studies taken as highway planning exclusively, but also serve as a source for all kinds of economic planning, and therefore as a reservoir of information to be drawn upon by every bureau in the Department. The reservoir is being filled not only by the research activities of the State highway departments and the Bureau of Public Roads, but by the activities of many agencies within and outside the Department.

New Year Book.—The 1938 Yearbook of the Department of Agriculture, now in press, deals with soils. It is in five parts, with a summary by the editor. Part 1 pertains to public purposes in soil use and to problems, causes, and remedies. Part 2 discusses tillage, fertility, erosion control, irrigation, and drainage. Part 3 covers relationships between the soil and plants. Part 4 deals with fundamentals of soil science. Part 5 is a survey and description of the soils in this country, illustrated by a map. Information regarding availability of the yearbook will be given in a later issue of SOIL CONSERVATION.