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LAND AND LAND USE[1]

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THE United States is a very large country, but in this day and age of rapid transportation, of airplane travel from coast to coast with almost inconceivable speed, the enormous land area of the country is almost forgotten. Of course, we have been brought up in this "big" atmosphere and are so accustomed to it that it makes little impression upon us, except very infrequently. But foreigners are appalled at our size as a nation. For we are really enormous in comparison with most of the leading nations of the world, and people from those nations have often made us self-conscious and even awkward in our bigness. This size and our comparative youth as a nation have combined to affect our diplomatic relationships. But a big fellow does not need to be diplomatic. He can do just about as he pleases, while the little fellow must be cautious, wary and very diplomatic, if he is to survive. So it is with nations. The smaller they are the more diplomatic they become.

Size affects characteristics in the case of individuals and also in the case of nations. Our development as a nation has been amazing and our size or land area has played a large part in that development. It is not the whole story, but it is vastly important. Our whole national character is a reflection of our bigness. Our confidence and our attitude toward our national neighbors and toward the world is due largely to our size.

And we have always done things in a "great big way." Our fetish, nationally, locally and individually, has been size, bigness, numbers, speed. If we have

[1] Address delivered at the Iowa State College, February 20, 1936, in a series of lectures arranged by the college on national, state, regional and town planning.

one national characteristic that can be considered specific, in addition to our unconquerable enthusiasm and our unwavering confidence in our destiny, it is this direct result of our land size upon our national character. It is this "big thinking." True, it often goes to the extreme and leads to the "tall" stories which are so exasperating to the foreigner who can not understand and calls it boasting. The American sense of humor enjoys them, laughs at them and understands them. The foreigner often misses the humor.

Then, too, this big attitude seems to increase as one goes from East to West. The stories do, too. When you reach Texas you have reached the biggest state in the country, and when you get to California you find the biggest stories and the most enthusiastic propaganda. We here in the Middle West admit that we are in the best position of all. We have the bigness of size, bigness of vision and ideas, without the extreme views of the West or the often apparently narrower, smaller angle of thought of the eastern seacoast.

But throughout all the nation, even in New York, yes, even in Washington and in Congress, although we may sometimes question it, there is the same reflection of bigness, of our great land area, upon all our activities and characteristics. Naturally, there are some little two-by-four people in the country. They will always be with us. They are even found in politics and in some institutions of higher learning. But they are the exception. Once in a while, one rises to prominence politically and arouses much comment, perhaps achieving a notoriety and a following that causes us concern, but eventually our bigness as a people, as a nation, a result of our land size, wins through and disaster is avoided. "It Cannot Happen Here," by Sinclair Lewis, is an absorbing, thrilling, thought-provoking tale, designed to arouse the American people to guard against a dictatorship, against government by force, greed and ignorance. Perhaps they need to be aroused in these days of dictators in some foreign countries, but as we look back over our history as a nation, we find just as many and often more threats to our national welfare, but we have always come through safely, due to our bigness and the national characteristics resulting therefrom.

Now what does our enormous land area mean to us in other terms than the development of our national character and mode of thought and action? In the first place, the great land area of our country has lured peoples from all parts of the world to come and settle in it. This, along with our democratic form of government, our freedom of speech, our religious freedom and the opportunity offered for success and wealth and our national encouragement to immigrants as an aid to the development of the country, has been the reason for the rapid influx of peoples of all races, creeds and characteristics. Our size and the desire to develop our land area are the main reasons for the "melting pot" which has produced the American nation.

Then, too, the land has been the chief reason for our prosperity, without which we could not have developed nationally as we have. It has been well said that "no other people of the world has been endowed with more varied and valuable land." Where else in the world is there a Cotton Belt? We grow in our Cotton Belt more than one half the cotton produced in the world. Where else will one find such a Corn Belt? We produce nearly two thirds of all the corn in the world. Is there any other region quite so favored by soil and climate for wheat growing as our Central Plains? We normally produce more wheat than any other nation. Then there are other great agricultural regions where the results of our land use have been only somewhat less striking. Nearly one half of the tobacco of the world is grown in the belt north of the Cotton Belt; more milk is produced in the Hay and Dairy Belt than in any foreign nation. Then there are the products of the Middle Atlantic Trucking Belt, of the Subtropical Crops Belt and of the Grazing and Irrigated Crops Region.

The land and its development have been largely responsible for our rise to power and to a position of prominence internationally. What of our population change which has gone along with this land development? In 1790 there were 4 million people, all rural, 10 million in 1820, 23 million in 1850, 50 million in 1880, 76 million in 1900 and 123 million in 1930; of this total in 1930 only 62 million or one half are classed as rural and one fourth as farm population. Farms increased from 1½ million in 1900 to 6¼ million in 1930. The land cultivated increased from 177 million acres in crops in 1880 to 413 million acres in 1931.

Comparing our situation with regard to land in relation to population it may be pointed out that in the United States for every square mile of land fit for the cultivation of crops there are nearly 100 persons; in France nearly 300; in Italy nearly 500; in Great Britain nearly 600; in Germany nearly 600; in Japan over 2,400; only in Russia a smaller number, 66.

All these years with our increasing population, the development and often exploitation of our land has gone on. We have grown and grown and produced more and more, become more and more efficient in handling the land, our foreign markets increased and finally during the great war under the urge of necessity to supply the warring nations with food and other necessities, we reached a pinnacle of production

which led to our downfall. We lost our foreign markets. We became a creditor instead of a debtor nation. There we were keyed up to a high peak of production with nothing to do with our product. We had called upon the land and the people to meet an emergency and they had responded nobly. But at what a cost!—the terrible depression which came upon us.

But while this disaster has been most deplorable and has caused great suffering and brought ruin to many of our people, out of it all there has appeared a ray of hope that it may lead us into a more stable, a more permanent system of land use. It has caused us to stop and take account of stock of what we have in the way of land and how we shall use it.

With all our background of bigness and of wealth and confidence we have been caused to about face and consider the "economics of scarcity." Is it any wonder that the American nation revolts at the term? We have been used to the "economics of plenty" and the proponents of scarcity can hardly hope to be popular. And is it necessary? That is the question. There are those who believe not. They hold to the theory of proper land use as the remedy. But this dooms exploitation of the land. This condemns land to be reforested, put back to grass, removed from cultivation or taken out of use by government purchase. But why is this not possible, why is it not desirable? The answer is that it is. In fact, it is about time that something is done about soil conservation and proper land use if our security as a nation is to continue.

Now let us see what has happened through these years of our growth and development to bring us to this condition. It has been well said that when our Pilgrim fathers landed, "they first fell upon their knees and then upon the aborigines." Then they attacked the forests and cleared the land. And this went on as the settlers moved westward to new and fertile lands. After a scant three centuries of conquest of our great heritage of land, we can follow the trails of the early settlers crossing the great continent clearing the virgin forests with their axes, laying bare the hills and valleys, breaking out the native prairie sod and exposing the bare earth. An empire arose where bigness was dominant, where large farms were and are the rule. The chief idea was to develop the country and exploit the land, to grow great crops, accumulate wealth and then move on west to new lands. There were always new lands to the west beckoning alluringly to the pioneer, richer, better, more productive acres to be brought under the plow.

The whole government attitude for many years was to get the land into private ownership quickly so that it might be settled and made productive. The speed of settlement under government subsidy was unparalleled. It seemed most successful at the time and it was, but naturally in such haste there were many mistakes and there was little or no thought of the future. As a result much of the land was developed "not wisely but too well." Between 1841 and 1861 three times as much public land had been given away as was sold. The Homestead Act of 1862 was the last attempt to stimulate settlement and by the end of the century most of the desirable land was in farms, including, unfortunately, millions of acres that should never have been brought under the plow.

The encouragement of the national and state government to settlers and the great concessions made to such interests as the railroads, along with the pioneering instinct of the people, were not the sole causes of the westward migration. Another and very potent reason was the land difficulties which began to appear in the older states in the East several generations ago. Western competition and depleted soils, destructive erosion and poor soil management forced the eastern farmers either to change their methods of farming radically or move, and many of them moved.

But they did not learn that they could not abuse the land with impunity and were led to continue their former methods of mining the soil because of the native richness of the new land on which they settled and the fact that it stood the "mining" operations so long. The rich virgin prairie soils it seemed to them would never "wear out." There was often no noticeable change in yields for many years. You will still find areas to-day where men will say the land is inexhaustible—rich bottomlands in the Missouri bottoms, for example, which seem to be good for all time. They are not. It is only a question of time until they will become depleted in fertility.

Through all the years when "plenty" was the common thing and more and more production was urged and brought about in one way or another, there were those who attempted to call a halt, who pointed out the way we were going and its dire dangers. But they were merely "a voice crying in the wilderness." Few people listened to them and fewer made any effort to follow the suggestions offered.

Only one or two highlights appear against the background of the era of pure exploitation. One was the successful initiation of the attempt to conserve our national forests which took place under Theodore Roosevelt and the beginning of the work of the Forest Service and the related work of the Parks Service. Then there was the famous conservation conference of governors in Washington which agreed upon desirable methods for the conservation of forests, waters, lands, minerals and game and pointed out the relation to public health, all in very general terms. But little

came of these attempts at a national program except to pave the way for later action.

What some of us had been predicting for years had begun to become evident to farm operators some time before the depression reached its height. The soil was wearing out and washing away, crop yields were decreasing alarmingly, there were abandoned farms, tax delinquency, corporate ownership of land in increasing acreages and all the evidences of a declining agricultural prosperity and of misuse of the land. The economic upheaval which was coming had an effect upon the land even before it really hit hard. It led to greater and greater misuse of the land in the vain attempt by land operators to increase their incomes by growing more and more corn on more and more acres, for example, with smaller and smaller yields per acre, plowing up pastures and rough land and making no attempt to stop erosion or keep up the fertility of the land. And there was no new land further west to move to, although a few people were still being lured to ruin by hopeless undertakings in the arid West.

We were beginning to "pay the piper" in a serious way for our sins against the land when the depression, all at once as if by magic, led to an appreciation of the land and its possibilities, a general soil consciousness, a political attempt to capitalize on the idea and as a result all the present furor over Land Use and Soil Conservation. And it is up to us to "strike while the iron is hot" and get something really constructive and permanent done.

Land Inventory and Classification

Now the first thing necessary in considering land use seriously and planning a policy is an inventory of our resources and a classification of our lands. Fortunately there has been under way over the years a soil survey of the land in the country being carried out as rapidly as possible, often without adequate funds and with little attention or sympathy, and about one half of the agricultural land has been surveyed. Now it is generally recognized that the soil survey is basic to a knowledge of the potentialities of land. It tells what we have in the way of land and permits of a decision as to proper use, what crops it is best adapted to grow. It provides an inventory of soil resources by locating, classifying and determining the adaptability of the soils.

Soils are classified into types which are kinds of soil corresponding to breeds of live stock. They are determined by their profile characteristics, which include their geological origin, color, structure, texture, reaction, depth and arrangement of the various horizons or layers of the profile.

All these factors affect the ability of the type to support plant growth, and hence soils are rated as to their potential crop-producing power. This may be modified by long-continued treatment and intensive management. But it forms the basis for a classification of land according to natural productivity. The use of the soil surveys and mapping and classifying of soils by types has led to the preparation of the report given by the National Resources Board of land ratings as a basis for land use.

The land acreage in the United States, exclusive of large cities, is 1,903,176,620 acres. This is divided as follows:

Land in farms	Million acres		Million acres
Crop land	413	Forest and woodland	457
Pasture and range ..	379	Grazing land not in forest or woodlands	329
Woodland grazed and not grazed	150	Non-agricultural non-forest	53
Miscellaneous	45	Of little or no use ..	77
Total	987	Total	916

About one half the total land area is in farms, but only 22 per cent. in crops.

The National Resources Board classification or grouping as to natural productivity is as follows:

Grade I—Excellent for staple crops...	101,038,000	acres
" II—Good	210,935,000	"
" III—Fair	345,872,000	"
" IV—Poor	362,559,000	"
" V—Essentially incapable of tillage	881,735,000	"

This grouping was made by Marbut on the basis of the soil maps and types and on productivity for the main crops grown, grains, grasses and fibers and for individual crops only in areas where they are grown. It is based also on the same kind of land treatment, on the inherent productivity of the land without the use of fertilizers and with standard methods of cultivation. As a whole the rating is based on soil, climate and relief of the land or environment.

The use capability method has been followed in recent land classifications, all, however, being based on the soil survey more than in the past. These classifications have separated submarginal land, forest land, land for recreation, for wild life and for parks, grazing land, land for cash grain, live stock or general farming and in some cases merely agricultural and non-agricultural land. In some cases the agricultural land has been classed into several groups on the basis of productivity, erosion, topography or some other character or combination of all of them. In the T.V.A. classification the living conditions on the farms on the land are also used along with the soil and topography as means of classification.

Removal of Submarginal Land from Production

After we have an inventory and classification of the land, the next step is the removal of the submarginal

land from production. That has been the purpose of the government program for the purchase of such land to be used for forest land, recreational purposes, wild life or for grazing. The National Resources Board proposes that the Federal Government buy up 5 million acres each year for fifteen years, thus taking out of production 75 million acres of real submarginal land.

Here there is, of course, some question as to the interference with private interests, and some people feel that it is a step in the direction of the nationalization of all our national resources. But I think it is generally agreed that government ownership and operation of submarginal land is the most desirable solution of the problem; there is no reason at all to carry the idea over to the operation of agricultural land. The problem is quite different and distinct and should be so recognized.

Protection and Regulation of Use of Land

Then when the submarginal lands have been taken out of the picture, the protection and regulation of the use of land must be planned by a process of education and publicity aided by some award such as is contemplated in pending legislation.

Proper use of the land is essential to permanent fertility, a permanent agriculture and the future security of the nation. Inasmuch as this is true it is equally true that the national government is vitally concerned with proper use and protection of the land *in all the states*. The states should, of course, participate to the limit in any program, but it is a matter of such deep concern nationally that the Federal Government should assume major responsibility in putting over a program.

In connection with the proper use of land as well as with the problem of the purchase of land by the national and state governments, the question of how much land we need to feed our people immediately arises. We must plan to do this, forgetting for the moment our foreign markets.

Experts have told us we shall reach the peak in our population between 1945 and 1960—135 and 141 millions. It requires 1.9 acres to feed the average American; about 1/7 acre of cotton and smaller acreages of minor crops bring the total to a little over 2.1 acres. It takes less than one half acre to feed work stock used in producing these products, and the total acreage utilized per capita is about 2.5 acres. The acreage required to feed our population would be about 335 million by 1945 and about 350 million by 1960.

We now have 305 to 310 million acres in use for food and clothing for domestic consumption: Domestic consumption in U. S., 280 million acres, and non-food crops, cotton, flax, etc., 25 to 30 million acres. This means that we will need to increase our acreage for home needs by 25 to 30 million acres in 1945 or by 40 to 45 million acres by 1960.

If we have any foreign markets at all and assume a need for 37 million acres for this purpose, a very conservative guess, then we may need from 67 to 82 million acres more by 1945 and 1960.

These figures indicate that we can not go too far in retiring land from production and should calm some fears regarding the overproduction possibilities of a sound land use program.

Then there is a question of erosion control. It may merely be mentioned that the Soil Conservation Service and the states are now engaged in an extensive program of education, demonstration and research along this line, in the attempt to show how important erosion is and how it may be controlled. When we remember the startling figures so often quoted on erosion losses, startling but conservative as we know now, we can appreciate this factor and its importance in a land use program: 100 million acres formerly cultivated are now largely ruined in this country; 125 million acres now cultivated have lost all or a greater part of the productive top-soil; 100 million acres are beginning to lose top-soil.

In connection with a study of land use in Iowa, our staff has worked out a plan for maintenance of soil fertility and for a permanent agriculture in the state, based upon the proper use of the various soil types mapped in the survey. It involves a change to a system of less corn and more legumes and pasture as the main feature. The figures show a change from 31 per cent. of the crop land in corn to 24 per cent., from 20 per cent. small grains to 16 per cent., from 10 per cent. hay to 19 per cent. and some increase in pasture.

Now our farmers over the state in the various counties are working on the problem for their own land with data and all available information supplied by the Extension Service and Experiment Station, and suggestions and aid given by members of our staff at group and county meetings. We are looking forward with interest to seeing how these recommendations check with ours. The work may also form the basis for the long-time land use program of the state.

Land Use and Industry

It should be emphasized most emphatically that "the land is the heritage of all." Whatever our occupation we must live mostly upon the surface of the earth. As nations the land is our ultimate asset. The land is the source not only of food, clothing and shelter, but it furnishes much of the raw products of commerce and industry. The welfare of all people,

whether they live in the city or the country, is directly or indirectly associated with and dependent upon the land. Its preservation is essential to our national welfare. When land is used so as to diminish its productivity people as a whole have lower food supplies at higher prices.

There are many economic problems involved in this relationship of land use to industry which can not be discussed here. The farm population, the migration to the city or to the farm are involved, the price structure, the foreign markets, in fact, the whole industrial situation is involved. The fact remains that industry is bound to be affected by a sound land use policy. It is unavoidable. Just as surely will it reflect unsound land use practices.

It has been well said that what we need more than anything else is a development in the American people of the feeling of common ownership of our forests and lands, such as is found in Europe and with that a new sense of responsibility of what happens to our natural resources, no matter who holds title to them. When private enterprise does something which affects the welfare and future security of all the people, then it is time that something was done to stop such an enterprise. "If that be treason, make the most of it." Certainly some plan is needed by which individualism will not be stifled, private enterprise will not be throttled, "rugged individualism" will not be tampered with, but at the same time our future as a nation will be made secure.

It should be noted here that the situation with regard to the land is quite different in some respects than in the case of other natural resources. When a mine is worked out, it is gone; when a forest is cut, it takes many years to rebuild it. But when land is properly farmed—and it can be done—we may remove crops, the proper crops, indefinitely and keep the land productive. It is perfectly possible to plan a permanent agriculture on land and keep up crop production at a profitable point. Not only that, but it pays the farmer over a period of years to follow the right system of management on his land. Poor soil management and improper land use leads irrevocably and more or less quickly to land ruin; and when the land is so seriously eroded as some of ours is now, where all the top-soil is gone, then we must wait for many years to get back a fertile soil, just as the forester must wait for his trees to grow under a reforestation program. It takes 400 to 500 years to produce an inch of top-soil and it may all be lost in one year on a steep slope, in three years on a moderate slope poorly managed, and in one rain of the cloudburst type.

The idea that a proper land use and soil conservation program means that this generation must suffer in the supposed interest of the next generations is highly erroneous. Nothing of the sort. Proper land use means *wise use* of the land—use without waste.

The whole agricultural program is now centered around this idea of wise use of the land. An award to encourage farmers to do the right thing and protect them from temporary reductions in income is certainly well warranted by the need for immediate action, in order that we may save what we have of land now, to insure the future of the nation.

If there is any question as to the importance of agriculture to national welfare, we need only refer to the situation in China, as the most striking example of lack of protection of the land from erosion, absence of any land policy and continued misuse of the land. There millions of acres have been abandoned because of the ruin wrought by erosion. The population is now packed on a limited acreage of alluvial soils, and floods bring disaster, disease, starvation and loss of life regularly. China's decline as a nation is coincident with its loss of productive land, and the whole national character has been affected. Other examples might be given to show the interdependence of all the peoples of a country, to show how national welfare is inextricably bound up with agriculture and proper land use.

It must be emphasized, too, that land planning in its broadest sense, and as it is being interpreted, includes planning for the land proper, the lakes, streams and other waters, the forests and fields, recreational areas, the minerals and other resources under the soil and the conditions necessary for conserving wild life. It is apparent that all people are involved.

Then, too, we should mention the part-time farming and subsistence farming plans. Both are frankly experimental but with possibilities which may prove them to be worth while industrially as well as agriculturally, for industries are involved directly in the part-time farming plan. With the trend in industry toward the shorter day and shorter week, it seems probable that part-time employment in industry may make such a part-time farming program very significant.

Land Use and Taxation

The problem of land use in relation to taxation is a grave one and difficult of solution. But it must be solved, for land has been carrying far too heavy a tax burden. It has been one of the reasons for the plight of the farmers and also for the rapid depletion of the land as to fertility. The necessity of getting all the money possible out of the land to meet taxes and interest, etc., has been the chief reason for the misuse of land. The answer to the tax problem is not clear, but we will undoubtedly reach a solution, again by force of necessity.

CONCLUSION

In conclusion, it would seem most desirable to emphasize the fact that proper land use requires planning first and then action. Our plans must be safe and sound, if they are to be put into effect successfully. We must not plan narrowly, locally or with too much attention to the immediate present. To be adequate the plans must take into account many things. First of all, the soil itself, its characteristics, capabilities and possibilities. Then the proper use of it in the interests of the future. This involves the elimination of the uneconomic, submarginal areas and the purchase by the government of such areas for pastures, forests, parks or recreation or wild-life areas. It also involves a planned farm use of the land in accordance with its abilities to support pasture or cultivated crops. The whole problem of live stock production enters the picture here, the type of live stock, the system of farming, etc. The relation of industry and close tie-up to agriculture demands a sound land use policy. Part-time farming has a direct relationship to industry and may be important in the future. Subsistence farming may also prove desirable. Finally, the relation of land use to taxation must be borne in mind, and the solution of the tax problem must come along to permit of the utmost success in the adoption of any land use program.

The important thing to remember is that the land is our one and only real heritage. Its proper use is of national significance and demands the attention of all our people. We must take care of what we have, not only from the standpoint of selfish interests, but also in the interest of succeeding generations. We must have a land use plan, and then we must have action.

OBITUARY

IN HONOR OF ROBERT DeCOURCY WARD

A MEMORIAL in the form of a comprehensive climatological collection has been assembled in honor of the late Professor Robert DeCourcy Ward, of Harvard University. For forty years he was a teacher of climatology and for nearly thirty years, from the time he published an expanded translation of "Hann's Handbook of Climatology," was generally recognized as America's leading climatologist. His scholarly output in this field was large and widely published both in journals and as books.

The Robert DeCourcy Ward Climatological Collection of Harvard University includes reference books, largely Professor Ward's own reference library, and climatographic publications from weather services all over the world, which have been brought together from the libraries of the Harvard College Observatory and the Blue Hill Observatory. This climatological reference library appears to be the most extensive in the United States outside of that in the central office of the U. S. Weather Bureau in Washington. The publications having been collected over a period of nearly a century embrace a large part of the world's printed climatological data. The collection is at present housed in the Institute of Geographical Exploration, in Cambridge, Mass. An endowment for the maintenance of this collection has been started by the children and sisters of Professor Ward, with a contribution of $1,000.

PETER C. KAISEN

PETER C. KAISEN, the veteran collector and preparator of vertebrate fossils, died in New York City on March 18, at the age of sixty-six years.

In 1897 Mr. Kaisen, a Dane by birth, was a foreman on a Union Pacific Railway section at Aurora, Wyoming, where he came in contact with the American Museum expedition which was that year inaugurating the dinosaur work of that institution, along the famous Como Bluff. The following year he joined the Museum party, which was continuing work in that region, and that association with the American Museum of Natural History, begun in 1898, remained unbroken until his death.

Following several years' work in the Jurassic dinosaur beds of southern Wyoming, Mr. Kaisen was transferred to the Montana field and later engaged for several seasons in the exploration, under the direction of Dr. Barnum Brown, of that richest of all dinosaur fields, the Red Deer River Valley of Alberta. Subsequently he made expeditions to Alaska and Mongolia and in recent years had been engaged in the Lower Cretaceous fields of southern Montana and northern Wyoming.

Through his energy and his skill, both in the field and in the laboratory, by a devotion to the task in hand and by a steadfast loyalty to his institution, Mr. Kaisen has placed the Department of Vertebrate Paleontology very much in his debt, and in his passing our branch of science has lost one of its outstanding technicians.

W. G.

MEMORIALS AND RECENT DEATHS

MEMORIAL exercises in honor of Lafayette Benedict Mendel, 1872–1935, Sterling professor of physiological chemistry at Yale University, will be held at 4:30 P.M. on Thursday, April 16, in Strathcona Hall, Yale University. The speakers will be President James