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Land Planning With Special
Reference to Utilization
of Forest Lands

by

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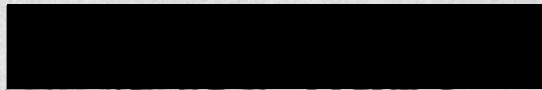
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THE OBJECTIVES

"Land Planning is the analysis and measurement of National needs, both present and prospective, quantitatively and geographically for every type of service and commodity derived from the land; followed by a systematic survey, classification, and dedication of the land resources of the Nation to the type of service or commodity production thus determined in the proper proportions and the geographic relationship." (7)

It is thus evident, then, that Land Planning not only concerns itself with the formulation of plans whereby it is possible to obtain the greatest economic return from the land but that social factors must be considered. Planning entails three fundamental steps namely a survey, formulation of plans, and then the adoption of those plans. Each step requires conscientious thought and foresight to obtain the best results, so it is evident that experts in the several different fields connected with the use of the land and its products must be employed to formulate the most efficient type of plan.

It is then the purpose of this paper to present a few of the major problems which are confronted by those undertaking to formulate plans which will divert the present use of sub-marginal lands into a more productive state and thus be of more value to society. To present the minute details and methods employed for each type of land is beyond the scope of this paper for it would require volumes of material to adequately cover the problem.

THE PRINCIPLES OF LAND PLANNING

Planning of one type or another has long been recognized as a necessary part of our social procedure. For modern business and industrial concerns to be successful necessitates planning

of the most complex form. Government business to make their functions more systematic and better correlated to the welfare of all concerned is conducted on a similar basis.

Three fundamental principles are the mainstays in planning: a realization of present conditions, methods for their improvement, and a means for accomplishment, namely the plan. Forethought and selection are the essentials of planning which necessitates a conscientious choice from among the numerous alternatives which are confronted. It is the process of thinking ahead and predetermining the method of obtaining the desired results.

Land Planning must be carried on with a full realization of the implications involved. It is one of a large number of subordinate fields of planning for particular phases of land use. Each type of planning has definite lines of procedure, and specific problems with which to cope. Land use planning does not attempt to plan all the uses to which land may be placed but efforts are directed to deal with a few of the more pressing and better understood problems. Then with this as a background, problems in close related fields may be dealt with more intelligently. Attempting to make plans at one logically, all inclusive will obviously be in error. (14) True that every phase of planning is closely correlated to every other phase, but it is beyond the scope of individuals to shape all these relationships into one well rounded pattern. Furthermore land planning is the application of more or less well defined policies and with a change in these policies it will necessitate a change in character of the plans as well.

PAST LAND POLICIES

Until the substantial reform of 1891, Federal land policies has without exception favored the professional land speculator. By that time a greater portion of the more desirable lands had fallen into private ownership. Thus the government had lost control of utilization from the favorable position of public proprietorship.

Several measures were adopted by the government which served to promote the transfer of public owned lands into private holdings. Of primary importance was the large land grants established for railroads as compensation in constructing lines. Later through provisions of the Indemnity Act they confiscated other large timbered tracts.

The Desert Land Laws were an inadequate adjustment of the homestead principle to meet semi-arid conditions. The Timber Culture and Timber and Stone Acts permitted timber corporations to obtain forested areas by fraudulent means. Grants and public sales were another means of acquisition available to those with capital. (29)

The Forest Reserve Act passed in 1891 marked the beginning of control by the Federal government. Through this measure larger tracts of forest land were reserved for different types of management. It was through this and similar policies that we fully recognized the fact that individualistic ownership and utilizations ^{are} is not always compatible with the general welfare. (29)

Slowly but surely we have adopted the principle of public ownership and have extended it to the federal purchase of lands from private owners. In line with this policy was the passage

of the Weeks Act of 1911 authorizing the acquisition of forest lands to protect the headwaters of navigable streams. This was revised by the Clark-McNary Bill passed in 1924 permitting purchase of private lands for timber production.

At present in the Departments of Interior and Agriculture there is a strong conviction that public domain should be retained in public ownership and as such should be administered with due regard to the conservation of timber, watershed protection and stabilization of range industry. They have come to realize the fallacies of the homestead policies and that it should be applied to lands physically and economically adapted to arable agriculture. This last restriction would make it practically non operative.

Encouraging the settlement of people on sub-marginal lands through the homestead acts is inconsistent with the present policy of retiring sub-marginal land. (12)

RECENT ACTIVITIES IN LAND PLANNING

Since the establishment of the Forest Reserves in 1891, several bills have been passed by Congress which, to a minor degree, have had a tendency at classification of forest lands. This has been due primarily to the attitude taken by those in power in realizing the poor management of the present owners.

No worthwhile action towards scientific land planning was taken until Arthur M. Hyde, Secretary of Agriculture called a National Conference on Land Utilization in Chicago in 1931. This was attended by practically all organizations of the government, but also other governmental agencies such as State and County organizations. (13)

At this meeting a National Land Use Planning Committee was formed from the ranks of forestry, agriculture, and business professions; this was later replaced by the National Resources Board. Coupled with this board was the appointment of State and County planning boards which served the same purpose but in a more limited field of activity.

The National Resources Board members prepared a report covering their several inter-related fields of activity which was revised by the Board as a group and placed in the final draft.

The first section of the Report pertains to the basic conditions which might influence future land requirements. Population changes with respect to both Nation and State were considered; the relation of industry to land use and land policies; the mechanization in agriculture. These were all treated in detail with special attention being given to future trends.

The second section of the report dealt with land requirements for the various major uses. This pertained largely to the requirements of agriculture, grazing, forestry, wild life, and recreation.

The third section dealt with local mal-adjustments and the recommended procedure for correcting them. (26)

After having established the National Resources Board and receiving their report together with recommendations, the next move by the Federal Government was to enact measures that would embody the working principles of the Report.

The early measures which attempted to carry out the recommendations of the report in the land program was primarily concerned with the acquisition of sub-marginal lands. Under this policy of land acquisition, attempts were made to place it

in productivity of a type higher than it had been originally. (14)

The Taylor Grazing Act passed in 1934 was the first major step along this line of land acquisition. This Act recognized the fact that areas of good farm land had been exhausted and that further homesteading of the public domain would be incompatible with the policy of reducing sub-marginal land.

MAJOR FACTORS INFLUENCING CROP LAND REQUIREMENTS

Thus far has been presented a brief resume of the policies of the government in the past with regards to the acquisition and disposal of federally owned lands. Then we have related a few recent activities with regards to scientific land planning. The next step is a consideration of the problems which confront those who undertake planning of lands.

Population Trends:

The major factors influencing an increase in population has been immigration from foreign countries and an increased birth rate of resident population. This accounts for the present population of one hundred and twenty three million in relation to four million in 1790.

The rural birth is nearly twice that of cities of larger population. This is sufficient to maintain present numbers and have a surplus of 30% in urban centers and a 50% surplus in rural districts. The rate of migration from rural to urban districts is of major importance in predicting future populations. The birth rate of rural families migrating to cities tends to be reduced to that level while the city also has a higher death rate. Should there be a migration to the city, there would be a marked decrease in population.

Another factor influencing the population trends is the social and economic status of the families. Those people in the higher levels of the social pyramid tend to have fewer children than those of the lower levels.

All these factors bear directly on predictions of future populations. These predictions may be based either on past trends or on the economic condition of the country and the effect it will have on migration trends. (14)

Land Utilization and its Relation to Industry:

Future land policies are not only related to population trends but also to industry. Employment in industry tends to increase migration to large centers of population, conversely unemployment tends to increase the flow in the opposite direction.

The income from agriculture has been greatly decreased due to an increase in farm products and a lessening of urban requirements. This will have a marked effect on land requirements, consequently, it will effect the policies of land tenure and settlement. (14)

Changes in Diet:

During the present century there has been several marked changes in the diet of American people. Primarily among these has been the rapid decrease in consumption of cereals. Approximately 1.9 acres of agricultural lands are required to feed the average individual per year and .4 of other land to produce non-food products. The average individual requires approximately 2.5 acres of land for growing of products for his consumption. This has been a marked decrease from the early part of the century. Thus it is evident that trends in popula-

tion will bear indirectly on the land utilized in growing of agricultural crops. (12)

Exports and Land Use:

Of the land used for growing crops in the United States, approximately one-sixth is for export trade. Of this amount one-half is in the production of cereal crops.

A reduction in trade barriers would, therefor, have a tendency to increase our export trade and thus increase the acreage necessary for the production of those crops. Population trends in those countries receiving our exports is another item to consider.

Increased Productivity and Efficiency in the Use of Land:

An increase in the acre yield of our more important crop lands and also the carrying capacity of pasture lands offer two means of increasing the efficiency of crop lands. This may be brought about by the use of improved, certified seed, better tillage methods, crop rotation, reduction of disease and use of fertilizers.

Animal food crops require approximately $2/3$ of our total crop land. With the use of a better grade of stock and improvements in feeding methods to obtain best results, there will be a noticeable decrease in amount of land essential for this purpose.

From the preceeding discussion it is evident that a determination of the amount of land essential for necessary food crop production presents a complex problem. It is necessary to balance past trends in population and consumption changes to present methods of production with an objective toward an

optimum in crop production. However, in consideration of all the factors under-lying the consumption of land products, judging from these past trends, there will be a gradual increase in the amount of land necessary for local and export trade. (13)

FOREST LAND REQUIREMENTS

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Timber Products:

Forest lands produce not only wood products but provide other services which are not fully appreciated. We must consider the effects of forest lands in retardation of soil erosion, equalization in stream flow, to some extent moderation of climate conditions, and protection for most of our wildlife. The monetary value of these items cannot be measured in dollars as it is possible to do in wood products. These are items of major importance in planning for future generations. The per capita consumption of timber is primarily dependent on the available supply. The countries of Europe with their high standard of living utilizes less timber products per capita, than in this country, due entirely to this condition. Even in certain sections of this country where timber resources have been depleted there is a marked reduction in consumption primarily due to this factor of availability. It follows, therefore, that future consumption of forest products will depend primarily on the amount of land available, the cost of establishment and maintenance in relation to the tangible and intangible values which may be obtained from the forest. (19)

Future trends in use of wood products can not be based on past consumption. This is primarily due to rapid expansion of the uses of wood. The United States supplies approximately

one-half of its own pulp products, due to some extent to inadequate facilities for manufacture but in the future this will probably be remedied. Thus there will be a greater demand for this type of product.

Fires, insects, and disease play an important role in the depletion of natural resources. However, it is difficult to estimate the effect this will have on future supply, any more accurate than have been in the past.

To offset these losses through fire, insects, disease and consumption of wood products it is possible to increase present production by proper methods of timber management. The intensity of this forest management depends on the probable demand in the future of forest products and on the other services rendered by the forests. (21)

At present there is approximately fifty million acres of sub-marginal crop land, which, if devoted to intensive timber production would, in itself, provide for the present consumption of wood products. (26)

There is yet another factor to consider and that is the element of time in creating a greater productivity on these sub-marginal lands. For some purposes such as poles, pulp, fence posts, and so on, returns could be achieved in a period of two to three decades. Production for saw timber would, in the main, require from seventy to one hundred years to obtain trees of a profitable size. It is the writers opinion that if present timber lands were properly managed, the possibility of timber shortage for any purpose would never occur. (16)

Land Needed for Recreational Uses:

The difficulties involved in the determination of areas

needed for recreational uses are varied. Various forms of recreation have different demands on space requirements, then too, some lands may have some uses for recreation that are secondary to other uses. The demand of the people will have a great effect on the amount and type of land allocated for recreation as either a primary or secondary use of the land.

Labor saving devices and increased efficiency of management is going to effect the amount of leisure time which any one man will have. Judgement based on past trends will indicate the possibility for greater use by the average man. Therefor, greater interest should be placed on this phase of forestry. (22)

Land Needed For Wildlife:

Wildlife refuges are established primarily to prevent the extinction of present wildlife species and to insure a sustained yield. Much land utilized for this purpose has also other uses making it a multiple use area. For some species of wildlife there can be only one use of the area such as the case of migratory birds whose habitat is swamp and marsh lands. The other use of this type of land would be practically negligible.

Wildlife is essentially a product of land or water as is the growing of timber, domestic stock, or agricultural crops. The recreational and educational value due to an abundance of wildlife is more intangible, therefor, more difficult to appraise than the economic value.

The fact that the forests serve as the reservoir of most upland game leads logically to a consideration of the relation of forestry to game conservation with a view to the best use of forest land. (27)

TECHNIQUE AND METHODS EMPLOYED IN CONSTRUCTING LAND USE PLANS

Assembly of Basic Facts With Regards to Land:

The factors involved in land classification are generally separated into two main groups, physical and economic. The more important of the physical factors include soil, topography, climate, and accessibility. Important economic factors are land use, land ownership, assessed valuation, tax delinquency and community pattern. The physical factors are set and consequently out of the control of man; however, the economic factors are the ones in which we are ultimately interested, and thus we can transform them to the greatest advantage of all concerned, which is the goal of any type of land planning.

The Physical Factors of Land Inventory Should Include:

1. Climate: It includes the effect of snow, rain, hail, extreme of temperature, and wind velocity. These items are the determining factors in the marginal profit of one type of land use over another. Areas located with respect to uniform seasonal precipitation are thus suited to agricultueal crops, other items remaining favorable whereas this same type of land would be sub-marginal to agricultueal crops without this seasonal distribution of precipitation but it might serve well for timber or possible grazing purposes. (12)

Likewise, the average length of the growing period free from frost determines the profitableness of agricultueal crops over other types of uses such as timber or grazing values of the land.

In the main, these items, may be obtained from past records of the United States Weather Bureau Stations located in or near the vicinity for which plans are being made. However, in an

extensive area where there are marked variations in altitude, there will also be variations in precipitation, frost conditions and temperature average which will necessarily be taken into account. Thus these variations will have to be obtained through personal inspection of areas in question and from the inhabitants themselves.

2. Topography: A comparative measure of "roughness" may be determined by the number of times a fifty foot contour crosses the four sides of a quarter section. This takes into account only the general variations in altitude over comparatively large areas. Rock outcrops and marsh lands, which have a deleterious effect on the agricultural productivity of land, must be taken into account in the field and thus can govern the use to which any land may be placed.

Drainage systems and their future use possibilities must be given consideration, also. Where it is possible that arid districts could be irrigated through construction of ditches or dams, this should be also considered in determining the future use to which an area may be placed.

The United Coast and Geodetic Survey have made topographic maps which are available for some parts of the country.

3. Character of Soil: This is directly related to the topography of any unit and is also the determining factor in the productivity on any soil.

Soils which are formed under a native cover of grass or under open stands of broadleaf forest are much better adapted to grazing than soils developed under dense stands of coniferous forest. The grassland soils are yellowish-brown to dark brown

or black in color, high in organic matter and are only slightly acid. The soils developed under heavy coniferous forests are light yellow or red in color, highly acid in reaction, and low in organic matter. Since the grasses commonly used for grazing are poorly adapted to the coniferous forest soils, it is costly to maintain range on such lands. (3)

For agricultural purposes the depth and type of soil determines its favorability to the growing of crops. This is correlated with climatic factors and topography of ground in so far as the marginal productivity of a unit is concerned.

Certain portions of the country have been surveyed by the Bureau of Soils, and it is possible to obtain their maps, thus reducing the cost of this important item in the preliminary survey of land to be classified.

It is evident from the foregoing statements that all the physical factors of land classification are very closely connected. To omit one phase of this inventory would be deleterious to the final plans in as much as one item may be the limiting factor in the economic return of any unit of territory. (3)

INVENTORY OF ECONOMIC FACTORS.

Land Ownership:

The ownership and the intent of the land owner is of paramount importance in determining the feasibility of future plans for an area and for this reason should be given careful consideration in any land classification study. Public holdings including county, state, and federal are easily molded into the scheme of things, but it is the small private owner, the large private owner, and corporations with which we are primarily concerned.

Their plans present and future must be given primary consideration in determining the future policies of any classification study.

It is desirable to obtain the assessed valuation, tax rates and tax delinquencies, also their trend over the past several years in preparation of future plans. It is evident that without some analysis of this type, predictions as to the future status of land ownership will not be too accurate. (8)

Present Land Use:

Present land use is significant in land classification since in any new country settlers tend to develop land which in their opinion is most productive or most accessible. If experience indicates that the land is better adapted to other uses, the settler gradually allows his land to revert to such uses and either seeks other land or curtails his farming activities. Thus a study of present land use in any particular area presents the sum total of the settlers' experiences and knowledge of that land and its best use.

The present use of an area is not particularly an indication of its best use. Areas sub-marginal for crop-production would probably be favorable to grazing or timber growth. It is evident that those areas now covered with timber, will, in the future be covered with timber. The land on which there is timber now should at the present time be considered forest land and treated as such until the final crop is harvested.

Land utilization has been influenced not only by the soil types found in each locality and other growth factors such as climate and topography, but also by the manner in which different

classes of land are distributed in relation to each other. In other words, the utilization of a given tract of land is governed not alone by its character, but also by the character and utilization of adjoining lands. Hence, the uses of different kinds of land are frequently closely related. (1)

County Expenditures for Maintenance of Roads and Schools:

Adjustments in land use will undoubtedly necessitate adjustments in public finances. Utilization of land has an important element in a constructive program of tax reform.

In the past, it has been the policy of county governments to bring the schools to the children with little thought being given to the possibility that the family of the child might more economically be brought to the school. Attempts have been made in some counties to solve the problem by the consolidation of schools and the inauguration of bus service. (5)

Educational costs per student in the rural communities where there is a very small attendance runs well over two hundred dollars. Where as in districts where school attendance is over twenty-five pupils, the average cost is approximately fifty dollars. Thus, it is evident that the average cost per student varies inversely with the average attendance of the school.

Arrangements with power companies, lumber industries and other public service agencies might do much toward keeping families with children from having to reside permanently in remote locations where a school must be maintained for a very few children.

Road Costs:

An important element of the public cost involved in maintaining sparse populations on scattered farms is the construction

and maintenance of roads. Investigations have revealed the fact that the incomes derived by residents in these remote areas are, frequently in a large degree wages received from the state or county for work on the roads that are provided at public cost. Where the maintenance of the population of a rural area is dependent upon the income received by working on the roads, which would not be needed except by the people who work on them, there is a question as to the wisdom of continuing the construction and maintenance of such roads. County expenditures are not allocated in relation to the benefit derived by the greatest number of people.

Some county roads constitute means of travel through an area by its residents jointly with those of many other localities. In some instances, however, county roads could be abandoned if other opportunities could be found for the few residents of the area served.

Lands utilized for grazing represent a very small annual income and it is in these areas that the greatest burden is placed on the county for school and road maintenance, or else it places an excessive burden on the owners of the property.

It is evident that the production capacity of the soil is not the only factor to consider in determining the marginal unit. The proximity of a production district in relation to consuming districts, and the relation of one farming unit to another, all bear directly on whether an area is sub-marginal for the purpose for which it is used at the present.

Classification on Basis of Productivity of Land:

After completion of a thorough inventory of the physical, economic, and social factors of a given area, the next problem lies in the establishment of certain well defined measuring sticks by which it is possible to pigeon-hole each parcel of land. At best this is unsatisfactory in that it is difficult to correlate the three main elements. It is possible, however, to obtain a fairly accurate correlation between the physical and economic factors in as much as they are relatively close and are tangible. The social factors of any classification are merely a view point expressed by the planning group and this cannot be confined to any set of rigid factors.

Soil fertility is perhaps the largest factor in determining whether or not land is classified as sub-marginal for its present use. In Montana this has been the measure of the economic value of the land to be classified. In this classification, division was made into farming, grazing, and irrigated lands. Each of these were then divided into four classes based on the comparative productivity of the land making twelve separate classifications. It is readily seen that this takes into account very little of the economic and social factors involved which are of prime importance to a complete classification.

Another means of classification has been advanced in the use of land character types. This primarily considers the physical factors of an area. In this classification they have established the following:

Type No.1 - Predominate porportion, deep soil, gently rolling, topography 1500 - 3000 feet elevation.

Type No. 2 - Deep light soil, gently rolling topography combined with an equal amount of rough land 200 - 1500 feet elevation.

Type No. 3.- Seventy-five per cent shallow soil and rolling topography. Twenty-five per cent deep soil and rough topography 1500 - 2000 feet elevation.

Type N. 4 - Large per cent shallow soil and gently rolling topography 500 - 2000 feet elevation.

Type No. 5 - Large per cent mountainous with shallow soil 500 - 2000 feet elevation.

In relating these different methods of land classification it should be borne in mind that they were established for a specific region, consequently, they cannot apply to all regions with equal effects.

The purpose in presenting these different methods of classification is in obtaining a full realization of steps taken by different planning groups in confronting their own specific situations. The measuring stick by which one planning group determines the marginal unit may be of no value to the next part of the country. In this light it is interesting to take a glance at these different methods of classification.

Classification on Basis of Economic and Actual Productivity:

A classification of this nature would of necessity take into consideration the productivity of land. However, there are other items that may be the determining factors in causing land to be sub-marginal. Thus it is evident that there is a distinct correlation between the physical or productive characteristics of the land and the economic conditions by which the land owner is governed.

Taxes, transportation costs, value of product, rent all have a direct connection with the marginal unit. (14)

Classification of Land on Basis of Physical Characteristics:

This has been the result of a correlation of physical and economic factors pertaining to land classification combined with a few of the major problems for which this classification was made. The classification as given indicates broad generalized areas in which a majority of the lands are adopted to the indicated use. Therefore, this classification does not imply that all areas within a general broad zone is adapted to the indicated use. (14)

Classification on Basis of Physical and Economic Factors:

" I. Agricultural areas

- A. Areas in which at least 50% of the acreage has soils and topography suitable for intensive cropping and in which there is sufficient such land to support ten families per area.
- B. Have the following characteristics.
 1. Topography level to gently rolling.
 2. Soil alluvial, free from stones, depth three feet or over and very productive.
 3. Drainage good, generally suited to forage or special crops.
 4. Capable of supporting an intensive type of farming.
 5. Public facilities adequate.
 6. Accessible to market and supplies.
 7. Assessed valuation generally higher than other lands.

8. Tax delinquency approximately normal.
9. Capable of supporting one family to every forty acres.

II. Grazing areas

- A. Fifty percent of acreage is suitable for grazing and capable of supporting $1/3$ sheep per acre or more, or its livestock equivalent and the area is of sufficient size to support ten or more families.
- B. No large bodies of merchantible timber or large areas which will require timber cover to prevent erosion are included. Areas natural beauty or recreational areas are paramount are also excluded.
- C. Grazing lands have following characteristics.
 1. Topography gentle to strongly rolling.
 2. Soils of slightly acid reaction and at least 18" deep.
 3. Generally not adopted to cultivation.
 4. Drainage generally adequate.
 5. Generally suited to grazing; capable of supporting $1/3$ to 1 sheep per acre or equivalent over a twelve month period.
 6. Public facilities adequate.
 7. Assessed valuation usually lower than agricultural use.
 8. Tax delinquency normal to sub-normal.
 9. Generally capable of supporting one family on each 500--1000 acres.
 10. Contains no large tracts of merchantible timber.

III. Forest Areas.

- A. Are all areas chiefly valuable for the growing of forests either for the production of forest crops, for forest recreation or as a protective cover to soil and water resources.
- B. Areas classified for timber production have following qualities.
 1. Topography level to rough and mountainous.
 2. Soils poor, acid in reaction, shallow and stony, low in organic matter.
 3. Drainage usually excessive.
 4. Usually covered with extensive stands of merchantable timber.
 5. Public facilities inadequate or wholly lacking.
 6. Usually inaccessible to market and supplies.
 7. Wide variation in assessed valuation.
 8. Delinquency usually subnormal.
 9. Generally capable of supporting good true growth.
- C. Areas suitable for recreation are not segregated.

This important part of the local economic life is an integral part of the three major land classes. "

CLASSIFICATION OF FOREST ON BASIS OF USE

Problems:

In a forest area there are four majors use of the land which govern its classification, namely, timber supply, watershed protection, grazing (domestic and wildlife) and recreation. These uses of a forest area are very closely correlated one with another. Thus it becomes evident that a forest area may serve

one or more of these uses.

1. Timber supply:

In the early days of the history of forestry, the principle objective of forest management was the preservation of a future timber supply. As early as 1682, William Penn, inserted in the titles he gave, a clause to the effect that one acre should be kept in forest for every five acres cleared. Later in the nineteenth century we find land being parceled out to the settlers provided they maintain forty of every one hundred and sixty acres in timber production. Now at the present time we have established reserves with this as one of their fundamental principles. (29)

The problem of initiating and maintaining timber crops for this and coming generations is extremely complex in its scope. To adequately do justice to this problem would necessitate a discussion of fire protection, fungus and insect control, grazing regulations, logging methods, silvicultural practices both past and future, and many other items pertinent to the situation.

From an economic standpoint the devastation of this natural resource has had a marked effect in those regions where it has been the policy. Towns have been constructed on the presumption that the timber supply of immediate vicinity would last indefinitely. Such has not been the case in most instances and those residents have been forced to move elsewhere for a livelihood. This problem has not aroused national concern for it has been obscured by the repeated shift of the industry to virgin fields. (5)

Thus it becomes evident that a stabilized forest industry will stabilize economic conditions of a community. Other items

remaining constant. With this type of forest management a future timber supply can be reasonably assured.

2. Watershed protection:

The removal of forest cover from large areas will seriously impair its service in watershed protection. At the same time the value to the nation of this service has become greater because of the increase in water power utilization, the growth of urban centers, with their increased need for water supply, and the expansion of agriculture to regions of a semi-arid condition.

Approximately four-fifths of the total forest cover of the nation is classified by Forest Service for water shed protection. This protective function is excercised by the regulation of the flow of streams draining forested areas, in restraining soil erosion of the watershed thus eliminating the sediment load in streams.

During periods of heavy precipitation, forests retard, runoff, and tus increases the amount of water which percolate into the soil thus miminizing flood stages and raising the average water level for a period of years.

The protective value of forests is little effected by the exact type of cover found on the area. Chaparral of one section of the country is as effective as a good stand of oaks of another section but to obtain maximum use of a forest area production of commercial species should be encouraged. (21)

Influence of forests on watershed protection and value varies from one locality to another. Thus in areas where the demand for water is usually critical, the forest cover, even though scanty, may be classed as exerting a major influence. Areas of steep slopes subject to heavy precipitation; areas of

excessive or rapid snow melt; and areas of soils which erode with unusual rapidity, where, in the absence of forest cover serious damage would probably be done would all be classed as of major influence. Sections of flat surfaces on old lava flows and deep sands through which precipitation readily percolates and from which erosion is slight would be classed as minor importance for watershed protection.

Between these two extremes may be found any number of variables in value of watershed cover to soil erosion and water supply. However, this gives rise to a possible means of establishing factors which could be taken into consideration in determining classes of forest for their watershed protection value. Those areas of steep slopes, high precipitation, and of soils highly susceptible to soil erosion, and a great demand for water the year around, could be classed as dominant for watershed protection, thus down the line to areas of little precipitation, levelslopes, soils not susceptible to erosion, and very little need for water, as being of minor value for watershed protection. (21)

3. Grazing:

Approximately 38 per cent of the total area of the United States is grass land and is grazed with varying degrees of intensity. Of this area, one third is in federal range divided among national forests, grazing districts, public domain and other withdrawals and reservations. One half of the total areas is under some form of private control. (30)

On the entire range, forage depletion has averaged more than one-half which is a result of only a few decades of livestock grazing. Grazing areas managed by the Forest Service have been gradually improved but still are not up to a normal capacity

which will take several years. The other types of ownership have allowed their areas to become depleted thus placing a greater burden on those areas under proper management.

In the earlier days of settlement, the pioneer had the traditional American attitude of inexhaustibility. This has been the major factor influencing the depleted condition of a large percentage of the present range lands. Several other factors of minor importance have contributed to the present condition.

In 1934 a bill was introduced into Congress to withdraw a large amount of public lands from grazing purposes. This bill known as the Taylor Grazing Act was passed in that year and will undoubtedly have great influence on conditions of the range.

Grazing is very closely related to the other forms of forest land use. It is limited by the silvical requirements of an area for growth reproduction. Different types of animals consume various species of annuals and perennials. Recreational areas indicate the bounds of a forest area for grazing so far as it is compatible with the best interest of the public. Grazing depends to a great extent on watershed protection, both for water, for the stock, and limited irrigational purposes. Thus we see that grazing is very closely correlated with the other major forest land uses. (21)

Wildlife grazing presents another problem in those areas utilized for stock grazing. For the most part, however, they graze areas which are, in the main, inaccessible to stock. Here we have a direct connection between wildlife, which is essentially a recreational value of the forest, with grazing.

4. Recreation:

This is the most recent of the four major uses of the forested

areas, not gaining much momentum until the past ten years. Large areas of land, most of it usable for other economic purposes, have been put to use in providing recreational grounds. However, land may be sub-marginal for recreational use just as it is sub-marginal for agriculture, forestry, and so on. What today is sub-marginal may, in a few years, be in great demand, thus one phase of recreational conservation is to see that areas not now in economic use are not materially disturbed but are left in their present condition until the future demands for this type of resource may be properly and fairly evaluated. (20)

If we were to evaluate recreation by the number of man days used or by areas utilized we would find that hunting and fishing predominate. This has been the major form of recreation of forest lands since the time of colonization of this country and it has only been the past few decades that a charge for this privilege has been made.

The national forests constitute the largest area of potential recreation/land in the United States, however, it is not located with respect to largest majority of recreationalists. The population centers are in the ~~the~~ eastern states while the larger portion of the national forests are in the western state. For this reason there has been an increased need for the acquisition of lands for national forests in eastern United States.

Campsites are being rapidly developed in proximity to areas of more or less high scenic value. The objective is to establish controlled locations for camping purposes for the greatest use of a given tract of land and still not have the inconveniences of their city home.

Roadside areas, residential districts, and outing areas are

all being allocated to their respective use for the forest recreationalist. Thus we find many forms of recreation within a comparatively small area and in this way the greatest good for all is obtained.

Superlative, natural and primitive areas have been established primarily for their scenic value.

Controls for establishment of these types of areas are:

1. Superlative areas.

- a. Localities of unique scenic value.
- b. No type of recreational use other than necessary to the enjoyment of scenic values will be permitted within such areas.
- c. No maximum or minimum size allotted to such areas.
- d. Administration will be fairly intensive.

2. Natural or Wilderness areas.

- a. Tracts of virgin timber in which human activities have never upset the normal process of nature and are now reserved for unmolested growth.
- b. No other form of land use will be permitted.
- c. One-thousand acres will be approximately minimum size.
- d. Maximum size will be controlled by character of the type.

3. Primitive Areas.

- a. Areas where unique natural resources and values have been conserved and where the public may observe conditions as they were during the pioneer days. Purpose is to retire completely from modes of transportation and the living conditions of the present

civilization.

- b. Utilization of timber, forage, and water resources will be permitted.
- c. Road and trail construction, other than that essential for protection, utilization, and management will be confined to a minimum.
- d. Object of management will be to maintain primitive conditions of transportation, subsistence, habitation and environment compatible with their highest public use. Management plans should be shaped accordingly. (22)

METHODS OF DETERMINING PROPER USE OF FOREST LAND

to establish physical controls governing the type of use to which a forest area might be placed is futile due primarily to conditions of multiple use. A given forest area has one principle economic use with other uses of minor importance, however these minor uses if not compatible to the major use may soon be detrimental, thus curtailing the economic return from the area. Any method of determining the major and minor use to which a forest area may be placed necessitates a conscientious consideration of the other uses and their general effect. Where one use of the area conflicts with the other major uses it is to be considered. For example, the largest portion if not all forest lands may be utilized for watershed protection, if however, the timber cut from the area reduces the use of the land for this purpose then it is a question of which will yield the greatest net return for the longest period of time and be of most service to the largest number of people. Therefore, a method of evaluating the income from forest lands presents

itself as the most logical means of determining the best use to which an area is adopted.

EVALUATING FOREST LAND USES

Timber Value:

The simplest method of making a timber appraised in a determination of the best use of the land is to first make a cruise of the area. Under most circumstances a 10% cruise will be sufficient accuracy. After the quantity of timber has been determined, it will be necessary to obtain a stumpage value which may be ascertained by the Forest Service method of appraisal or by quotations on timber sales in the near vicinity which are under similar conditions. Multiply this by the quantity of material on the area; this will give an approximation of the present value of the timber on the area.

Consideration must also be given to reproduction and its present values for future timber stands. To determine the value of this reproduction it will be necessary to ascertain the number of years it will have to grow to obtain merchantable size and with the stumpage value at present to determine the present value of this future growth by use of compound interest tables and formulas.

The sum of this present value of future growth of reproduction together with present value of stumpage now on areas will be a close approximation to the value of a forested area for lumber production.

Grazing Value:

For a determination of the grazing value of an area it will be necessary to make a range survey. This will consider the

present condition of grazing unit which will bear directly on its carrying capacity for this and future years. From this range survey, the forage acres and thus the carrying capacity will be ascertained. Multiply this by the charge made by the Forest Service in the same vicinity for each animal unit and the result will be the grazing value for one year.

Consideration must now be given to the fact that it will be necessary to get this on a comparable basis with the stumpage appraisal value determined previous to this. Thus, again, with the use of compound interest formulas, we can determine the present value of these annual returns from grazing over a period of years equal to the number of years in cutting cycle for timber appraisal.

Another consideration will need to be given to the wild life on the area. For deer and elk a reasonable yearly rate could be established and thus be treated in the same manner as given above for livestock grazing.

Recreational Value:

To determine the recreational value of a given area it will be necessary to establish a rated value for each man-day of use made by recreationists. This at best will be an estimation because of the difficulty in ascertaining the value to the recreationist for each day he spends in the woods. It might, however, be based on the charge made by private concerns for the same type of use.

Determine the number of man-days the area is capable of handling for each different type of recreational use. This may be ascertained from registration booths, counts, and after census figures if available.

Multiply the rated man-day value by the capacity of the area in man-days; this will be a close approximation to the value of an area for this purpose. We have then ascertained a yearly return and in order to place it on a comparable basis with grazing and timber values it will necessitate computing the present value of these future annual rentals by use of compound interest formulas. The computations will be for the same number of years as figured in the cutting cycle of the timber appraisal.

Watershed Protection Value:

This entails a consideration, not only of maintaining continuous water supply throughout the year, but also the effect on soil erosion. Any method of determining the value of forests for this type of service will be, in the main, an estimation. It will be comparatively difficult to ascertain a value which will be in dollars as it is possible to do in the other uses of forested areas.

On the other hand, forests serve, to a greater or lesser degree, in maintaining a continuous water supply and protection of the soil from erosion. Whether the areas major use is for recreation, timber growth, grazing or a combination of these, it will also have some value for watershed protection. Thus, it is evident that under most forest conditions there will be multiple use of the area to a certain degree.

CORRELATION OF USE VALUES

Aside from determining the economic return on a given area from any of these major types of use, it is necessary to determine the effect one type of use will have on another use. Grazing will be detrimental to the regeneration of a hardwood

forest and in some cases would reduce the recreational value. Cutting of timber crops might be detrimental to recreational value and in nearly every case would reduce the value for watershed protection. So it is evident that, in order to obtain the greatest possible maximum use of an area it will be necessary to consider, not only the major use of the land, but also the other uses of the land where they are compatible with the major use.

By determining the combination whereby the greatest economic return over the longest period of time is obtained from a forested area, we have thus ascertained the best possible use of the area. This assumption is based entirely on the economic gain involved.

The above method of determining the best use or combinations of use, is the technical angle and theoretically would be correct. In practice, however, this is difficult to apply merely because of the political angles involved. Therefore, in considering forest land planning, it is necessary to take into account not only the technical phase but also the political angle in governing the final decisions.

CONCLUSIONS

Forest land planning presents a problem which is of a more complex nature than agricultural planning, because of the possibilities of multiple use. In agriculture there is one major use, with no other uses involved, however, in forestry it is essential to consider the multiple use of the area and their relation and effect on each of the other types of use. Thus the highest economic return combination will be the governing

factor in determining the best use of forested land. Where there are only two uses of the area, the one giving the highest return from the economic angle, will be given first preference. Here, again, the social value of the use of the area is a matter of consideration and will, in most cases be the governing factor in the final plans.

Forest land planning, as in agricultural land planning, most of necessity, take into account the social as well as the economic factors in determining the proper use of land. Taking these factors into consideration presents a very complex problem and entails conscientious consideration in determining the ultimate plan.

Land Planning is a comparatively new field of activity and as such offers a great opportunity for scientific research. At present the research in this important economic phase of our social structure has been very limited. The general public, however, is coming to realize its significance and all indications are that in the future it will serve a great purpose in planning the social and economic structures of our nation.

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