



Summer 1961

Multiple Land Use Management

Warren A. Starr

Recommended Citation

Warren A. Starr, *Multiple Land Use Management*, 1 NAT. RES. J. 288 (1961).
Available at: <https://digitalrepository.unm.edu/nrj/vol1/iss2/7>

This Article is brought to you for free and open access by the Law Journals at UNM Digital Repository. It has been accepted for inclusion in Natural Resources Journal by an authorized editor of UNM Digital Repository. For more information, please contact disc@unm.edu.

MULTIPLE LAND USE MANAGEMENT

WARREN A. STARR*

INTRODUCTION

According to the U. S. Forest Service, multiple-use means:

the management of forest and related acres in a manner that will conserve the basic land resource itself, while at the same time producing high-level sustained yields of water, timber, recreation, wildlife and forage harmoniously blended for the use and benefit of the greatest number of people.¹

Management of land on a multiple-use basis is a popular current concept that provides a method of balancing increasing land use needs with a limited land area and a diminished frontier. The concept has achieved currency because of the fact that increasing population and changing social habits are creating expansion in "non-agricultural" uses of land. Our land resource now has to accommodate a host of *primary* and *secondary* uses.

Primary needs for land are those involving production of essential commodities for food, shelter and raiment needed by an increasing population. Secondary needs are those involving sports, recreation, wildlife habitat, and embrace the specific sites needed for research and education in the natural sciences. The differentiation of these two needs are hereinafter considered as priority needs.

Multiple use, often referred to as multi-purpose use, has also been used to cover the array of possible benefits to society from water control and hydroelectric structures. Here the concept embraces the various uses, benefits or products derived from the existence and operation of the structure. It is not the purpose of this paper to discuss the multi-purpose benefits of water control or hydroelectric structures. The subject is introduced to cite the necessity for educational media that will separate more clearly the intentions, benefits, and management principles involved with multiple land use planning as contrasted to multi-purpose structural planning.

I. STRUCTURE OF THE CONCEPT

Analysis of the concept of multiple land use management reveals two important management systems. Initially, the concept deals with utilization of different kinds of land having contrasting use potential, across the area of an administrative

* Soil Scientist, Dep't of Agronomy, Washington State University.

1. Forest Serv. Region 6, U. S. Dep't Agriculture, Multiple Use Highlights 2 (1960).

or management unit. This will hereinafter be called the distributed tract system. Secondly, the concept provides for the intensive management of a single tract, having uniform use potential within its area but having adaptability for multiple simultaneous or rotated uses. This will hereinafter be referred to as the single tract system. Any discussion of planning for, application of, or management practices pertinent to multiple land use should clearly differentiate these two systems, since they differ in total objectives to be reached.

Three types of land unit are involved in multiple land use planning and management:

(a) *the inventory unit*: a parcel of land having practical limits of homogeneity of physical quality and use potential within its area. Included features are soil, natural vegetation or adaptability to introduced vegetation, and moisture supply. Such units should have practical uniformity in geologic, physiographic, climatic, and hydrologic characteristics. If properly defined and delineated, such units would have uniform adaptability for single, alternate or multiple use within their areas. It is admitted that this unit name may not be entirely suitable, and that other unit expressions such as site, type, etc., commonly used do not embrace all the land qualities of soil, vegetation, climate, and hydrologic behavior necessary to show land use potential for comprehensive multiple use interpretation. However, this is the local specific unit for which most inventory data will be collected. Interpretation of relationships of land features and evaluation of land use potential will be made for these units. A further discussion of this land unit will appear below.

(b) *the management unit*: a land unit prescribed as a manageable segment of land for reasons of organizational policy, economic feasibility, ownership pattern, or accessibility of the terrain. It may contain one or more of the above defined inventory units.

(c) *the administrative unit*: a land tract chosen solely for reasons of administrative control. These units are defined upon the basis of physiographic characteristics, geographic proximity to administrative headquarters, or areal dimensions. Sometimes they are organized according to the type of management or the land management problems involved. In other instances, political subdivisions are used as a basis for establishment. An administrative unit may contain many inventory units, and several management units. Occasionally, one may find that a management unit and an administrative unit cover the same area of land.

The inventory unit will be considered in appraising land use potential and management practices in the single tract system of management. The administrative unit is commonly concerned with the appraisal of land use potential and management practices in the distributed tract system. A management unit may be of proper size and location to be considered under either the single tract system or the distributed tract system.

In order to understand the operation of the multiple land use management concept across large areas of the landscape the reader must associate the three types of land unit involved with the two systems of management. If this is done, the following management options become available:

1. Management which commits the same land parcel (inventory unit) each season or year to dual or several uses, such as timber production, domestic and wildlife grazing, sports, recreation, and water supply. (We must admit that management for water control or supply has become a valid additional use upon practically all land parcels.)

2. Management according to a plan for several uses upon the same inventory unit, not simultaneously but on a rotated seasonal, annual, biennial, or period of years basis.

3. Management which plans separate uses on different inventory units having contrasting use potential across a management unit or an administrative unit, with the result that multiple land use is accomplished across the entire unit.

4. Multiple use which constitutes re-use of the indestructible water resources where, for example, water may be used for irrigation and recovery of field application loss as drainage is accomplished.

5. Further exploitation or complication of multiple land use by using combinations of items 1, 2 or 3, above, within a management or administrative unit.

Application of the multiple land use management concept requires important distinctions to be made in regard to land potential. They are:

1. Establishment of land parcels where intensive alternate or simultaneous multiple uses may be practiced under the single tract system.

2. Establishment of the most beneficial land use on different parcels of land under the distributed tract system.

3. By proper consideration of the objectives under items 1 and 2, above, accommodating the demands for both primary and secondary needs for the land resources.

These requirements introduce the problem of how best to appraise and evaluate land parcels in a multiple land use management plan. This problem will subsequently be amplified and suggestions made for its solution.

II. HINDRANCES TO OPERATION OF THE CONCEPT

Several influences which hinder operation of the multiple use concept are: (1) insufficient public concern for the land resources and their relationship to the public, (2) the limited or selective use concept, (3) competition for products from the land, and (4) need of a system of appraising and evaluating land parcels for multiple use potential.

A. *Public Concern*: First of all, the general public does not have a concept of multiple use potential for all segments of land. Past practice in land management

has dealt largely with single use on different distributed tracts or with dual use consideration on a single tract. Grazing has been practiced on forest lands, and watersheds have been used both for water yield and production of grazing and timber. We have commonly conceded that wildlife utilize the landscape, companions to domestic stock, cultivated or forestry use. Such natural advancements of dual or multiple uses have created many problems in the course of creating atmosphere for comprehensive long range planning on all the land. Too few people (principally technical and administrative personnel) properly appreciate the diverse disciplines involved with multiple use planning, or the complexity of management options existent under a multiple use concept.

There is a need for development of land use policy which will allow land use development upon a priority basis, and which will encourage development of use based upon potential of land for single, alternate or multiple use. Such policy must transcend individual choice, and prepare means by which coordination of ownership or vested interest may be integrated in landscape planning.

Finally, educational media should develop the reciprocal dependency which exists between the community and the land resources. While we currently have societies or organizations founded around single products of the land, we do not have sufficient interest groups promoting multiple benefits from the land on a priority needs basis.

B. *Limited Use*: In the second instance, some demands for land resources promote restrictive or limited use, rather than multiple use. For example, a recent piece of proposed Federal legislation states: "A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain."² This definition at first appears to require a serious restriction of use of the landscape. However, the bill contains the further provision: "(1) to secure the dedication of an adequate system of areas of wilderness to serve the recreational, scenic, scientific, educational, conservation and historical needs of the people, and (2) to provide for the protection of these areas for the gathering and dissemination of information regarding their use and enjoyment as wilderness."³ And "such areas of wilderness, like all other national forest land, shall be so managed as to protect and preserve the watersheds, the soil, the beneficial forest and timber growth, and all beneficial vegetative cover."⁴

In this philosophy of the wilderness area system, we find a concept of multiple use. However, the uses stated are largely secondary and the primary uses of production of food, fiber and raiment for the people are minimized. Restriction is placed on timber harvest, commercial mining other than that accomplished

2. S. 1123, 86th Cong., 1st Sess. (1959), 105 Cong. Rec. 2641 (daily ed. Feb. 19, 1959).

3. *Ibid.*

4. *Ibid.*

with hand tools, domestic grazing as well as on access road development which would increase recreation and sports use.

A recent Forest Service report states that for the five year average from 1954-1959, lightning caused fires were 871 as against 414 man made fires.⁵ The authors point out "that trail-builders and tractor plows continue to be our main ground fire control weapon."⁶ These facts cause some doubt as to the validity of a wilderness system, which proposes to "maintain vegetative cover" and yet pre-empts establishment of man-made structures across the wilderness system. It is also difficult to imagine a system that would adequately protect and control the watersheds, the soil, and the forest resources and yet did not permit some access roads, man-made water control structures, or the application of land management practices.

There is no disagreement with the concept of a wilderness system which establishes and maintains some areas of land for special social purposes. The degree to which the concept is exercised is the important consideration. Under the multiple use concept of land management, there is no obstacle to setting aside some selected tracts of land for special social purpose. Such selected tracts can be those naturally intermingled with other tracts designated for primary production needs. This arrangement would be more desirable than one which creates vast areas of wilderness which include land tracts suitable for primary purpose, but which suitability has been denied by the seclusion concept of the wilderness system. This concept tends to pre-empt special land use privilege for the benefit of the few.

The National Reclamation Association stated the principles of good wilderness legislation as follows:

1. Lands capable of a variety of beneficial uses should be available for all such uses.
2. Where potential uses are inconsistent, those most essential should have preference.
3. Where a variety of beneficial uses are to be given consideration, the following order of preference, we believe, should prevail:
 - (a) National Defense;
 - (b) Production of necessities of life including water, food, timber, minerals, power and the means of transportation and communication,
 - (c) Recreation for all,
 - (d) Specialized recreation for the few,
4. The principle of multiple use should prevail,
5. Wilderness areas should be created, or added to, only by positive action by the Congress,
6. That before any wilderness system is created, or before any area is added to the wilderness system, it should be established beyond all reasonable doubt that

5. Forest Serv. Region 6, U. S. Dep't Agriculture, Multiple Use Highlights 9 (1959).

6. *Id.* at 10.

the lands to be included in the wilderness system or area are more valuable for wilderness than any other use ;

7. That any land or area which has had a historic character or long-time use in forestry, grazing, mining, or any other beneficial use, should be continued in the same category and any wilderness legislation should so provide.⁷

These principles are comprehensive, and adequately provide for the land needs of society. Various needs are placed upon a competitive basis, and land quality becomes the determinant for decisions as to single or multiple use. Also, these principles properly differentiate the primary and secondary needs of society for land, and encourage utilization of land as to primary needs, with secondary needs as a subordinate choice.

National defense has frequently required pre-emption of land for special single purpose. Such action has been regarded by some as an unfair advantage taken of other individuals and groups planning land use and business enterprise. While this pre-emption is, in fact, a selected, secluded use, it has great social advantage in that it provides benefit to the many. This is the important distinction between selective use under a wilderness system and that under a national defense pre-emption.

Generally speaking, national defense is entitled to land use occupancy necessary to maintain national security. Loss of national security and freedom would nullify any other projected land use planning or land use adjustment to fit demands of an increasing population and industrial empire.

Additional support may be given to national defense use by the fact that a good many defense installations which occupy large land areas, do so because of the necessity for having security and safety zones around their main area of operation. Much of this security or safety area is leased for grazing or crop production. In some instances, land used for firing ranges, aviation test areas or bombing ranges has also been used for limited grazing. Reasonable fire control on such areas can insure adequate vegetative cover for watershed protection. On defense areas, reasonable planning can and often does encourage multiple use advantage. The principle defense need is land for the actual defense structure and administrative control of use in the adjacent security or safety zones.

C. *Competition*: In the third instance, competition for products of the land is preventing full acceptance of multiple land use concept. For example, in the western United States there is growing demand among downstream water users for an increased water supply. They believe that vegetative improvements made in the uplands for watershed protection are utilizing water to which they are entitled.

The conflict between demand for runoff water and need for watershed stability work is indicative of a problem involving economic worth of single-

7. Nat'l Reclamation Ass'n, 25 Reclamation News, March 1961, p. 5, col. 2.

versus multiple-use of land.⁸ The question is—can we support watersheds solely for the production of water, or must watershed management be applied with the intent “for the most good for all of the people”? In the later instance, water yield (possibly reduced), timber production, and domestic and wildlife grazing would be facilitated. Comparative evaluation will be required to arrive at the most equitable use or uses of such land for society as a whole. Appraisal of the use potential of the diverse individual land units within a watershed or among watersheds can support such evaluation. By such appraisal, differential land quality will appear that, in all probability, will accommodate both intentions for use of the watershed. Some land tracts may have potential to support water storage and vegetative production for harvest, while other tracts with limited potential may be managed solely for water production. This reasoning does not allow for all watershed precipitation to be recovered as downstream runoff to the water users. It does allow diverse uses which cumulatively serve more demands upon the land resources.

The establishment of intensive urban, industrial and commercial developments over large blocks of landscape also hinders development of the multiple use concept. Quite often those developments utilize the entire landscape in a solid construction use. They create a nucleus for associated part-time “gentleman type” farming. These conditions are not favorable to the development of other integrated uses. Such developments usually are not part of long range planning which incorporates multiple use benefits to all people of a community. Once land is developed solidly to a structural use, the chance of incorporating other future uses is gone.

In the Rock Creek drainage in the District of Columbia and Maryland, urbanization is occupying the landscape. Here an intended single use in suburban development is creating an asphalt and concrete pavement over blocks of land occupying a large segment of the watershed area. This selected use has limited value for watershed protection and storage. As Lathrop Smith states, “The relation between high-density development with its smaller lot sizes, roofs, concrete and asphalt and greatly reduced absorptive capacity and consequent increased surface run-off and erosion, to the eventual life of the [proposed flood] detention structure is obvious.”⁹ Local citizenry have acted to attempt to

8. Rosa & Croft, *Water Yield & Public Land Management*, 11 *J. Soil & Water Cons.* 157-61 (July 1956). Rosa and Croft have reviewed hydro-climatic data on several watersheds to get information which might clarify some of the controversy concerning watershed stability versus increased yield, where manipulation of the vegetation has been the practice used. They say, basically the problem involves two questions: first, how much has water yield been changed as a result of cover changes due to use of the watershed lands for grazing; and second, is it possible to increase water yield by managing the plant cover primarily in the interests of water yield with forage and timber as by-products.

9. Smith, *The Rock Creek Watershed*, Proc. 6th Nat'l Watershed Cong. 141 (May 27, 1959).

establish an anti-bulldozer law.¹⁰ This law would prevent total land clearing and development of solid urban areas at one time, and would require larger lot sizes and integration of other land use on the landscape.

More properly, suburban developments may be "fitted" into the landscape and allow the land to serve the multiple uses of forest cover, suburban building, wildlife habitat and watershed protection.

D. *Evaluation of Land Parcels*: When considering use and production potential for the single tract, what is the proper specific land unit involved? In this paper such a land unit has simply been called *the inventory unit*. Additional research attention should be given to the determination of that land unit, or single tract, which reflects specific land use potential, and upon which inventory or research data will be accumulated.

It is recognized that the single tract system could be employed on the basis of several definitive units of land. An individual unit might be considered as a single tract, or a specific physiographic unit may be used. It seems prudent to believe, however, that plans for multiple use management or watershed management should: (1) synthesize land areas to the segregated potential of inventory units (or some other selected *defined* parcel for the local tract) having practical homogeneity within, and (2) arrive at potential of larger (management or administrative) tracts by summation of the potential of the inventory units. Potential use of inventory, management, or administrative units should reflect the physical quality of the tract rather than solely economic or political choice.

Soil type or phase has been used to denote specific physical quality of land. Vegetative type has been used as a unit of vegetation for specific local management or developmental purposes. Often, site has been a term used to connote local land potential.

More recently some professional foresters are considering site on a comprehensive basis. They do not view lands from the standpoint of areal dimension or total uses involved, but rather from the standpoint of numbers and specific effects of factors influencing site value for forestry purposes. Wittick¹¹ has considered the total environmental factors and features to be considered in selection of site potential for forestry purposes, and Hills¹² has considered "total site" and used the "holistic" approach.

Such considerations for total evaluation of site influence are directed toward what is needed as a basic land unit for multiple use planning under the single tract system. However, one must keep in mind additional factors such as: (1) erosion stability of land unit, (2) hydrologic behavior in terms of water deten-

10. Werner, The Rock Creek Watershed, Proc. 6th Nat'l Watershed Cong. 143-48 (May 27, 1959).

11. Wittich, Classification, Mapping and Interpretation of Soils for Forestry Purposes, Proc. 5th World Forestry Cong. (Aug.-Sept. 1960).

12. Hills, Soil-Forest Relationships in the Site Regions of Ontario, Proc. 1st Forest Soil Conf. 190-210 Mich. State U. (Sept. 1958).

tion and water retention, (3) behavior under all use influences, and (4) utility of land parcel for structural purposes.

In projected multiple use planning, the local land parcel, considered as the single tract, will have to have interpreted potential which encompasses ecologic, hydrologic and engineering behavior. Some research and investigation can assist field interpreters to arrive at what constitute logical local land parcels. A practical land unit is needed which can be used as a common denominator for the synthesis of watersheds or management and administrative land tracts.

In short, there is a need for comprehensive long range planning for use of all landscapes. Absence of such planning denies evaluation of land potential for any or all uses, allows premature abortive selection of incorrect or limited uses, and leads to a failure to consider priority value of use in terms of the maximum benefit to the greatest number of people.

III. ADVANCEMENT OF THE CONCEPT

The most popular public concept of multiple use management is that of a device for obtaining better integrated use on broad upland areas such as National Forests, Public Domain, or watershed lands. Common uses conceived as a part of multiple land use management are timber production, wildlife, sports, recreation and watershed protection. This conception generally has implied multiple land use on public lands, but excluded the multiple use concept from private land ownership. Recently, some larger private land owners, such as timber companies and ranchers, are becoming exponents of the value and need for multiple use management. Actually, dual or multiple use has been practiced on small private ownerships. Farmers have allowed hunting, fishing and limited recreation. Wildlife has been increased on private land by changing the arrangement and sequence of farming practice, and by the development of habitat sites in "odd" areas.

The United States Forest Service now develops multiple use plans on each Ranger District of each National Forest. Their annual regional reports indicate progress of the program on an administrative unit basis.¹³ Multiple uses considered are timber production, timber management, domestic grazing, wildlife habitat improvement and maintenance, recreation, sports, and watershed management.

In cultivated land and native pasture adjacent to cultivated land, it has been shown that good present day "conservation management practices" also provide good habitat for wildlife. Anderson and Compton¹⁴ and others¹⁵ testify that

13. Stone, *supra* note 1.

14. Anderson & Compton, *More Wildlife Through Soil and Water Conservation*, Soil Cons. Serv., U. S. Dep't Agriculture (Agr. Info. Bull. No. 175, March 1958).

15. Van Dersal, *Good Land Management Supports Wildlife* 1-47, Agr. Exper. Sta. Cir. 295, Wash. State U. (1957).

wildlife propagation and management can be integrated into the farm program and are an integral part of "conservation" planning. In many instances species of game have been re-introduced to areas by changing land management practice from "single crop" farming back to multiple use on distributed land.

The Soil Conservation Service has used, since 1940, a Land Use Capability Classification.¹⁶ The intent of this classification is primarily to segregate different use potentials of land parcels, and secondarily to show the hazards involved with land use, or the limitations to use imposed by different features of the landscape. This concept of classification for land favors the multiple use philosophy. By proper placement of land parcels in this classification, the array of different alternate uses possible on the same land parcel is recognized.

Most farm and ranch operators have become interested in water management over and above that necessary for crop production. The extent to which this has progressed is shown by the fact that the National and State organizations of Soil Conservation District Supervisors have changed the designation of their groups and purpose from Soil Conservation to Soil and Water Conservation. Thus, small private land owners have recognized water management as an additional obligation in land management.

State Departments of Game, and the U. S. Fish and Wildlife Service have for years been concerned with the decline of game species caused by pressure of other land uses upon natural game habitat. In contrast, Titus¹⁷ has recognized that "opening up" forest for timber harvest and commercial grazing has created "edge" and completed the environment of food, shelter, and water for game animals. In the forest areas, operation of multiple use management insures this habitat stability. Big game have been introduced and maintained on the range, grazing the land with domestic cattle.

Wildlife biologist McAtee¹⁸ solicits preservation of habitat at homes, parks, public gardens and on farms by simply supplying one of the necessary elements of food, shelter, or water. This often requires only proximity planning of such features that would ordinarily be present in the land area. In the Glackmeyer report,¹⁹ dealing with the Cockrane Clay Belt in Canada, the dominant impact is development of agriculture from forest land. The multiple use plan embodies two phases: (1) Individual land use plans for development of agricultural, forest, wildlife, recreation, and urban-suburban needs and (2) integration of these several separate use plans into a multiple land use plan.

16. Hockensmith, Classification of Land According to Its Capability as a Basis for a Soil Conservation Program, Proc. Inter-Am. Conf. on Cons. of Renewable Natural Resources 450-65 (Sept. 7-20, 1948).

17. Titus, Timber and Game—Twin Crops, Am. Forest Prod. Industries, Inc.

18. Fish & Wildlife Serv., U. S. Dep't Interior, Cons. Bull. No. 17, Local Bird Refuges (1942).

19. Ringham, The Glackmeyer Report of Multiple Land Use Planning, Ontario Dep't Lands & Forests (1960).

Chronological development periods are used, based upon judged development rate and the consideration of revolving use on forest land in a 100-year rotation cycle. Blocks of land within the belt are segregated on the basis of homogeneity in natural land quality, productive potential and development priority. Alternate choices for developed use of land are compared by classes both between and within land blocks. Comparison between and among parcels are made using classes which denote priority and intensity of development. Comparisons are made within blocks using classes which denote dominancy of use within the blocks.

The Glackmeyer report is encouraging in that it exemplifies a comprehensive plan to exercise orderly development of land on a multiple use basis.

This trend in modern planning and utilization of resources can be our only answer to demands for land caused by increasing population, changing social needs, and the fact that we have reached the limits of our frontier.

Watershed management is an important part of comprehensive multiple use planning. By organizing land management programs on a watershed basis, water management is facilitated.

Probably the first organization of land and water management on a watershed basis in the United States was the Coon Valley Watershed project, said to be "the nation's first watershed project."²⁰ It was begun in 1933 and it is still being maintained. Forestry management, wildlife habitat improvement, pasture improvement, better rotation, fertilization, strip cropping, terrace, gully and streambank improvement were multiple elements of the plan. The project was initiated under the Civilian Conservation Corps program.

The U. S. Forest Service has been concerned with watershed management for many years. Their work has been largely in the area of vegetative management for watershed stability. In the last ten years, research projects established on several watersheds have been directed toward finding out the effects of manipulation of vegetation upon watershed storage, and watershed yield. Love²¹ has shown that a 15 percent increase in water yields resulted from regulated timber harvest on the watershed. On the Coweeta watershed the U. S. Forest Service²² has 20 years of stream flow studies, relating climate and hydrology to modifications of land use and treatment on the watershed.

However, need for research in watershed management is still apparent. Keppel and Fletcher²³ indicate research is needed in an effort to provide basic hydrologic data necessary for the intelligent management of western rangelands. Given

20. Henderson & Hembre, *The Coon Valley Watershed Project—A Pioneer Venture in Good Land Use*, 10 *J. Soil & Water Cons.* 180-84 (1953).

21. Love, *Watershed Management in the Colorado Rockies*, 8 *J. Soil & Water Cons.* 107-12 (1953).

22. Forest Service, U. S. Dep't Agriculture, *Info. Bull. No. 117, Waters of the Coweeta* (1953).

23. Keppel & Fletcher, *Water in the Southwest*, *Soil Cons. Serv., U. S. Dep't Agriculture*, 25 *Soil Cons.* 54-56 (1959).

basic data these authors see an opportunity to compare or differentiate hydrographic characteristics of the watersheds.

Rich and Vanasek²⁴ report on the application of the Small Watershed Flood and Prevention Act²⁵ to the Walnut Creek watershed in California. Here the emphasis is on the downstream benefits of programs designed for water control, and development of conservation practices in the watershed which will alleviate downstream flood damages. The program is complicated by a rapid increase in urban, industrial and commercial development on the watershed.

Comprehensive watershed management planning involving the multiple use concept is registered in the report of the Upper Thames watershed in western Ontario in Canada. In this report²⁶ attention is given to the land, forest, water, and wildlife resources. Recreation use on the watershed is also considered. This watershed plan develops projections of future use in relation to availability of the resources.

Under the Tennessee Valley Authority in the Parker Branch Pilot tributary watershed, a reduction in soil loss and increase in income from further diversification of land use in the watershed has been shown.²⁷ The pilot program has encouraged a greater diversity of land uses suited to variable land conditions, and has de-emphasized the predominance of a single-type use throughout large segments of the watershed.

In watershed management we may reach the ultimate goal in the application of the multiple use management concept. When multiple land use management is planned on a watershed basis, water supply can be incorporated as an additional use to be made of the land resources.

SUMMARY

The principles of land management involved with multiple use management or watershed management are not necessarily new. Employing these procedures in planning and management involves planning, principally the inclusion of the most beneficial use or uses, and the coordination of the action of management groups with social purposes. It is encouraging that ways are being found to enliven public interest, understanding and participation in proposed planning and development of land resources. Lately, research is providing more essential data about the interrelated impact of the climatic, hydrologic, soil and vegetative factors necessary to comprehensive planning of multiple use. It appears that multiple use planning on a watershed basis is likely to be the most effective means

24. Rich & Vanasek, *The Walnut Creek Watershed Story*, Proc. 6th Nat'l Watershed Cong. 32-45 (May 25, 1959).

25. 68 Stat. 666 (1954), 16 U. S. C. § 1001 (1958).

26. Upper Thames Valley Cons. Auth., Dep't Plan. & Dev., *Upper Thames River Cons. Rep.* (1952).

27. Baum & Coutu, *Economic and Hydrologic Developments in the Parker Branch Watershed*, 14 J. Soil & Water Cons. 260-65 (1959).

for developing and managing land resources to provide equitable priority and suitable diversity of uses of the land resources.

In land development and management programs, plans are now beginning to reflect the expanded future needs of society. It remains necessary to consider the needs for land in their relation to the distributed variability in land potential.

Multiple use can be a means by which increasing diverse land use needs of a growing population are supplied. The concept of multiple use, however, still needs amplification to the general public.

Watershed management needs additional stress as that unit of landscape within which multiple use plans are developed. This will encourage water development and management along with land development and management.

The following are some proposals for improving the evaluation of land resources which would contribute to the application of the multiple use concept on a watershed basis:

1. Strengthen the present programs of inventory which present data pertinent to the distributed variable use potential of the land. These inventories include geologic survey, soil survey, and vegetative surveys. Increase collection of climatic and hydrographic data and associate these data to natural segments of the land, in order to construct distributed hydrologic behavior for local land parcels. Land tracts need to be considered with regard to multiple land use potential and hydrologic potential for watershed stability and yield evaluations.

2. Develop additional research and field investigations directed to finding the proper kind of individual land unit which will most completely reflect ecologic, hydrologic and structural potential. This unit will be that which should be used in appraising use under the single tract system. It may require a complex unit, *e.g.*, a larger unit which has practical homogeneity in hydrologic potential, segmented to sub-units which are vegetative units. Again, they could be referred to as inventory units.

3. Using the physical potential of the individual inventory units as base units, summarize the distributed use potential for management or administrative units. Such a summation will reflect the distributed variable potential within these larger units. It will encourage planning upon the distributed multiple use potential. Use of average potentials for management units leads to single use planning and development intensity which has less than optimum use intensity on some single tracts, and more than optimum intensity on other single tracts.

4. Allow single, alternate, or multiple use choice of single tracts to be decided upon the competitive comparison of the single tract potentials. In this manner, land quality will determine use potential, and use potential will determine ultimate planned use. This will require segregation of inventory units, casting their distributed occurrence, and evaluating the present and future development potential of each. Once this distributed quality of the land is known, the tracts may be compared, associated, or differentiated as to their quality and use potential.

5. Allow use and productivity potential of land to have more impact upon the decisions to be made for use of the land. When this allowance is made, boundaries of specified use areas may in fact follow boundary lines between tracts of contrasting use potential. This, by itself, could alleviate some conflict between diverse interests for use of the land. Such natural boundaries could replace use boundaries normally drawn on an administrative or political basis.

6. Consider that water production is a valid, additional use for the land, and that a proper concept of multiple use will include management for water production.